Vizhinjam International Seaport
Thiruvananthapuram

Development of Vizhinjam International Deepwater Multipurpose Seaport

Environmental Clearance F. No. 11-122/2011-IA.III dated 3rd January 2014

Half Yearly Compliance Report (HYCR) for the Period April 2024 to September 2024

Project Concessionaire

Adani Vizhinjam Port Private Ltd. (AVPPL)

Project Authority

Government of Kerala (GoK)

Implementing Agency on behalf of GoK

Vizhinjam International Seaport Limited (VISL)
(A GoK Undertaking)

November 2024

Vizhinjam International Seaport Limited
(A Government of Kerala Undertaking)

VISL/53/2021-GM1(E)/ 738

Dated 28 Nov 2024

To
Additional Principal Chief Conservator of Forests (C),
Ministry of Environment Forest and Climate Change (MoEF&CC),
Regional Office (SZ), Kendriya Sadan, 4th Floor, E&F Wings, 17th Main Road,
Koramangala II Block, Bangalore-560034 (Karnataka)
E mail: rosz.bng-mefcc@nic.in; Ph: 080-25635901

Sub: Half Yearly Compliance Report (HYCR) of Environmental and CRZ Clearance (EC) for Vizhinjam International Multipurpose Deepwater Seaport for the period of **April 2024 to September 2024** – Reg.

Ref: 1) File No. 11-122/2011-IA.III dated 3rd January 2014
2) Letter No. 1285/A3/13/KCZMA/S&TD dated 24th August 2013
3) File No: EP/12.1/7/2013-14/Ker 829 dated 20th August 2019
4) F.No.11-122/2011-IA.III Proposal No. IA/KL/MIS/178082/2020 dated 29th December 2020

Dear Sir,

This has reference to the Environmental & CRZ Clearance (EC) issued on 3rd January 2014 (vide reference cited 1) by the Ministry of Environment, Forest & Climate Change (MoEF&CC) for the proposed Vizhinjam International Multipurpose Deepwater Seaport at Vizhinjam in Thiruvananthapuram District of Kerala State based on the recommendation of KCZMA (vide the reference cited 2). Subsequently, the validity of EC was extended by MoEF&CC dated 29th December 2020 (vide reference cited 4).

The Half Yearly Compliance Report (HYCR) of the conditions stipulated in the cited references for the period from **April 2024 to September 2024** is enclosed herewith for record and reference.

As per the MoEF&CC Letter (vide the reference cited 3), wherein submission of HYCRs by email /soft copy is declared acceptable, therefore the HYCR for the period **April 2024 to September 2024** is being submitted to the MoEF&CC, Regional Office (Bangalore), Zonal office of the CPCB (Bangalore), KSPCB & KCZMA via email.

Yours Sincerely,

For Vizhinjam International Seaport Ltd. (VISL)

28/11/24

Chief Executive Officer

Encl: As Stated Above

Copy to: CEO, Adani Vizhinjam Port Private Ltd. (AVPPL)
01, Port Operation Building, Vizhinjam Seaport, Mulloor P.O, Vizhinjam, Thiruvananthapuram-695521, Kerala, India

Half Yearly Compliance Report (HYCR) on Conditions Stipulated in Environmental & CRZ Clearance (EC) F.No.11-122/2011-IA.III dated 03.01.2014 for the Period April 2024 to September 2024		
S. No.	**Conditions**	**Compliance Status as on 30.09.2024**
11.	**Specific Conditions**	
(i)	"Consent for Establishment" shall be obtained from Kerala 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.	**Complied** Adani Vizhinjam Port Pvt. Ltd. (AVPPL) had applied for and obtained Consent for Establishment (CTE) from Kerala State Pollution Control Board (KSPCB) vide Consent No. PCB/HO/TVM/ICE/08/2015 dated 15.09.2015 which was valid up to 31.07.2018. The CTE was renewed vide Consent No. PCB/HO/TVM/ICE-R/02/2018 dated 19.07.2018 valid up to 31.07.2023. And the CTE was further renewed vide Consent No. KSPCB/TV/ICE/10029484/2023 dated 30.07.2023 valid up to 31.07.2028. A copy of the renewed CTE was submitted to Ministry of Environment and Climate Change (MoEF&CC) with the Half Yearly Compliance Report (HYCR) for the period April 2023 to September 2023.
(ii)	Project Proponent shall carry out intensive monitoring with regulatory reporting six monthly on shoreline changes to the Regional Office, MoEF.	**Being Complied** Based on the Shoreline Monitoring Plan prepared by L&T Infra Engineers Ltd (L&T IEL) under the guidance of National Institute of Ocean Technology (NIOT), oceanographic and shoreline monitoring is being carried out by agency Shankar Surveys Pvt. Ltd. (SSPL) for a stretch of 40 km (20 km on both sides of the project site) and reports are being regularly submitted to Ministry of Environment and Forests & Climate Change (MoEF&CC) as a part of the HYCRs. Broadly the scope covers: • Wave Observations • Onshore Cross beach profiling • Offshore Cross beach profiling • Littoral Environmental Observations (LEO) • Beach Sampling • Multi-beam Echo Sounder (MBES) survey • Grab Sampling • Current & Tide Observations • Weather Observations • Marine Water Sampling Shoreline Monitoring Report by SSPL for the period April 2024 to September 2024 is enclosed as **Annexure I**.

Half Yearly Compliance Report (HYCR) on Conditions Stipulated in Environmental & CRZ Clearance (EC) F.No.11-122/2011-IA.III dated 03.01.2014 for the Period April 2024 to September 2024

S. No.	Conditions	Compliance Status as on 30.09.2024
		L&T IEL had conducted data analysis based on available oceanographic and shoreline monitoring data provided by SSPL and carried out accompanying model study and the corresponding data analysis and modelling reports, which were vetted by NIOT, were submitted to MoEF&CC as a part HYCRs. Six modelling reports have been prepared by L&T IEL so far and submitted as detailed below: **Data Period** / **Modelling Report Submitted with HYCR for the Period** Feb 2015 to Feb 2017 — Apr 2017 to Sep 2017 Mar 2017 to Feb 2018 — Apr 2018 to Sep 2018 Mar 2018 to Feb 2019 — Apr 2019 to Sep 2019 Mar 2019 to Feb 2020 — Apr 2020 to Sep 2020 Mar 2020 to Feb 2021 — Apr 2021 to Sep 2021 Mar 2021 to Sep 2022 — Apr 2022 to Sep 2022 Oct 2022 to Sep 2023 — Apr 2023 to Sep 2023 Thereafter, AVPPL have engaged Assystem India Limited (Formerly known as L&T IEL) to carry out the data analysis and accompanying model study of the shoreline changes based on the oceanographic and shoreline monitoring data being collected for the period October 2023 to September 2024. The mathematical modelling report for the period October 2023 to September 2024 is given as **Annexure II**.
(iii)	The capital dredged material (7.6 Mm^3) shall be utilized for reclamation of berths.	**Complied** A total 7.21 Mm^3 dredged material has been utilized for reclamation of 63.43 Ha area of land. With respect to dredging and reclamation, the requirements for reclamation of berths for Phase I development of the port have been completed.
(iv)	Additional fish landing centre shall be developed as part of the proposed Vizhinjam port for upliftment of fisheries sector.	**Being Complied** Planning work for the fish landing center and the associated breakwater had been initiated as part of the funded work component of the Port concession agreement. However, based on the recommendations of the report on physical model studies carried out by Central Water and Power Research Station (CWPRS), the geometry of the breakwater originally proposed

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		for the fishing harbour is found to be not suitable with respect to tranquillity and therefore the design of the new fishing landing centre needed to be revisited. Consultations between Fisheries Department and Ports Department, Government of Kerala (GoK) are being held to decide the suitable location for the additional fishing harbour in consultation with the fishermen community. GoK would soon be finalising the plan of action based on the final CWPRS report to develop and make available the additional fish landing facilities for the benefit of the local fishermen in a time bound manner. *(Source: VISL)*
(v)	The project shall be executed in such a manner that there is minimum disturbance to fishing activity.	**Being Complied** Following are being practiced ensuring minimum disturbance to fishing activity: • Work has been planned in such a way that there is only minimal hindrance to the fishermen due to construction activities. • Signboards have been placed for demarcation of construction area and navigational buoys/marker buoys are placed in the marine area for fishing boats to maintain a safe distance from the areas of breakwater construction. • The number of buoys for monitoring in the project area has been optimized, considering the safety of the fishermen and ease of movement during construction. • For mutual understanding of the developmental activities with the local fishing community an exclusive CSR team has been assigned. • Using the technological advancements (such as WhatsApp), the dedicated CSR team of AVPPL are in constant touch with the fishermen/fishing community members to facilitate the flow of various project related information/updates. • AVPPL CSR team also provides regular updates to the committee which has been formed by the local church/other representatives adjoining to the port area, who in turn pass on relevant port project execution information to the fishermen. • Marine Water Quality is being monitored regularly and results are submitted as part of the

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		compliance reports. Abnormal results were not observed during the compliance period (**Refer Annexure III**). • Central Marine Fisheries Research Institute (CMFRI) have conducted a study on estimation of marine fish landings data from the potential impact zones of Vizhinjam International Seaport for the period June 2021 to May 2022. The report (submitted as part of HYCR for the period April 2023 to September 2023) concluded that Fish landings survey recorded an increase of 3.35% compared to the total landings reported in 2011. Seasonal and zonal variations of fish catch analysis portrays the higher catches in the direct footprint zone, implying that no significant impacts due to the 2development of Vizhinjam on the availability of fish resources.
(vi)	Steps would be taken to safeguard the interests of the fisheries sector as detailed in the Resettlement Action Plan (RAP), Corporate Social Responsibility (CSR) and in the Integrated Fishing Community Management (IFCMP), namely a component of Rs.7.1 crores as part of the compensation package for the fisheries sector, as livelihood restoration measures for mussel collectors, shore seine fishermen and others. Rs.41.30 crores as part of CSR activities in the fisheries sector under (i) water supply scheme (7.3crores) (ii) new fishing landing centre (16crores) (iii) adoption of existing fishing harbor (5crores)	**Being Complied** In consultation with the fishermen, enhanced livelihood compensation of Rs. 108.32 Crores was sanctioned by GoK and distributed up to date by VISL to the fishermen as livelihood compensation. Till 30.09.2024 an amount of Rs. 106.93 Crores have been disbursed for a total number of 2697 Livelihood Affected Persons (LAPs) whose verification was complete in all respects; this includes boat owners to whom kerosene is supplied free of cost during the breakwater construction period. Remaining few disbursals would be done as soon as possible. *(Source: VISL)* The status of the Social Welfare activities taken up in the fisheries sector is as follows: **Water Supply Scheme**: Kerala Water Authority (KWA) set up a 3.00 MLD water supply scheme for the project with the source of water being Vellayani Lake which was commissioned in April 2013 by VISL by expending an amount of Rs. 8.10 Crores. The net availability of treated water from this supply scheme is 2.49 MLD of potable water out of which 1.49 MLD of water shall be distributed to the local people as part of social welfare measures of VISL. The balance

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	(iv) sea food park (4crores) (iii) skill development centre (4crores) (iv) environmental sanitation (3crores) and (v) solid waste management (2crores).	1.0 MLD was to be used for port related activities. However, at present, the entire treated water from the scheme is being utilised by the community. For Operation & Maintenance (O&M) of the same, an amount of Rs. 5.38 crores have been spent up to 31.03.2021. From 04.04.2019 onwards, O&M of the scheme is being done by KWA. An additional amount of Rs. 1.74 Crores has been sanctioned and deposited by VISL to KWA to extend piped water connections for treated water supply facilities to the community at Kottapuram Village. More than 1000 free domestic water connections have been given to the project affected areas. KWA now have adequate coverage of water supply around the port and project affected areas. VISL is coordinating with local body representatives to identify water shortage areas and taking effort to resolve the same. *(Source: VISL)* **New Fish Landing Centre**: Refer Specific Condition S. No. iv. **Adoption of Existing Fishing Harbour**: GoK has formed a higher-level committee to prepare a master plan for the old fishing harbour. Government Departments concerned are coordinating to resolve the differences and to arrive at an acceptable plan in consultation with all stakeholders and accordingly a proposal for 25 crores for additional landing facilities at the southern side and a project for 45 crores with necessary facilities at the Northern Part has been formulated and submitted under PMMSY scheme and waiting for approval of GoI. *(Source: VISL)* **Seafood Park**: Procurement of land for seafood park (Rs. 26.00 crores) by VISL has been completed. Action for development of seafood park is being taken to commission the same along with the completion of the new fishing landing facilities planned. *(Source: VISL)* **Skill Development Centre:** Additional Skill Acquisition Program (ASAP) is a GoK initiative aimed to impart required skills to local youth for improving their

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		employability. A Community Skill Park (CSP) in an area of 1.5 acres of land handed over by VISL has been developed at Vizhinjam. The CSP operates on a PPP model wherein 25,000 sq. ft. building with facilities for students' hostel have been constructed by GoK by ASAP under ADB assistance, whereas the operation of the centre with logistics and other high-end courses are being taken up by Adani Skill Development Centre (ASDC) as per an agreement with GoK/ASAP/VISL. The CSP developed is a 3 storied building with facilities such as office space, seminar hall, training rooms, IT lab, library, meeting room, faculty room, etc. On 15.06.2024, the CSP training building and hostel block was inaugurated by Dr. R Bindhu, Minister for Higher Education, GoK. ASDC is conducting various domain courses, livelihood related courses, and high-end port related courses according to the anticipated vacancies arising in the port, in other top organizations and ports in India and abroad to benefit the community youth in and around Vizhinjam area and other locals.  **Inauguration of CSP** **Environmental Sanitation/Solid Waste Management:** Material Recovery Facility (MRF): As per the request received from Thiruvananthapuram Municipal

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		Corporation an MRF has been developed on land allotted by Harbour Engineering Department. This is carried out as a shared activity and funded by VISL, Thiruvananthapuram Corporation, Adani Foundation and AVPPL. Material Recovery Facility is mainly designed to effectively manage plastic waste generated in Vizhinjam. Waste materials generated at source level are collected at MRF and segregated to sort plastic wastes. Stones and glass materials are initially removed. Segregated plastic wastes are dust removed, transported via conveyor belt to the shredding unit. Plastic with size below 6 microns are crushed to powdered form. Plastics of size above 6 microns are shredded to cube form. These shredded plastics will be taken from MRF for further reuse. Nearly 1 ton of plastic is expected to reach MRF daily. Waste will be collected from the wards of Kottapuram, Vizhinjam, Mulloor, Harbour and Venganoor by Haritha Karmasena members hired by Corporation. The MRF is constructed in 3500 square feet area and all the civil works are completed. The operation and maintenance of the MRF building will be undertaken by Clean Kerala Company. Socio-Economic Foundation (SEUF).  **MRF**

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(vii)	Rail connectivity shall be parallel to the harbour road on elevated structures at +4/5.00 m level without affecting the entry to the existing harbor.	**EC Amendment granted by MoEF&CC** Konkan Railway Corporation Limited (KRCL) has been engaged for turnkey execution of the project. Out of the total rail route length of 10.7 km, about 9.0 km is planned to be passing through an underground tunnel to minimize the disturbance to the local population. Detailed Project Report (DPR) has been approved by Southern Railway and Railway Board. EC amendments in this regard has been granted by MoEF&CC on 17.07.2024 vide EC Identification Number EC24A033KL158955 and related compliances are being filed under the same. *(Source: VISL)*
(viii)	Compensation packages in accordance with the Central/State Government norms shall be given to all the authorized-cum-affected (having valid clearances as applicable) resort owners.	**Being Complied** All authorized-cum-affected resort owners evicted have been compensated adequately for land as per Central/State government norms. Payment transfer for the land acquisition of the last three resorts has been made to District Collector and which is in the process of acquisition. *(Source: VISL)*
(ix)	The port shall ensure that all ships under operation follow the MARPOL convention regarding discharge or spillage of any toxic, hazardous or polluting material like ballast water, oily water or sludge, sewage, garbage etc. The emission of NOx & SOx shall remain within permissible limits.	**Will be Complied** Currently project is under construction and trial runs are ongoing. This shall be complied during operational phase. All vessels entering the port are complying with DGS Circular No 02 of 2023 for Annex VI of MARPOL. Vizhinjam Port is also registered under Swachh Sagar portal of DG shipping. KSPCB approved vendors for waste collection under Swatch Sagar Portal has been adopted for disposals. Summary of the Ambient Air Quality Monitoring (AAQM) during the compliance period April 2024 to September 2024 at 5 monitoring locations in and around the port site are provided below:

Parameter	Unit	Max	Avg.	Min	Perm. Limit
PM_{10}	$\mu g/m^3$	85.4	53.2	35.8	100
$PM_{2.5}$	$\mu g/m^3$	43.5	26.0	14.8	60

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<table>
<tr><th>S. No.</th><th>Conditions</th><th>Compliance Status as on 30.09.2024</th></tr>
<tr><td></td><td></td><td>
<table>
<tr><th>Parameter</th><th>Unit</th><th>Max</th><th>Avg.</th><th>Min</th><th>Perm. Limit</th></tr>
<tr><td>SO_2</td><td>$\mu g/m^3$</td><td>5.36</td><td>4.41</td><td>BDL</td><td>80</td></tr>
<tr><td>NO_2</td><td>$\mu g/m^3$</td><td>6.75</td><td>5.00</td><td>4.22</td><td>80</td></tr>
<tr><td>CO</td><td>mg/m^3</td><td>BDL</td><td>BDL</td><td>BDL</td><td>4</td></tr>
<tr><td>HC</td><td>ppm</td><td>BDL</td><td>BDL</td><td>BDL</td><td>--</td></tr>
</table>
</td></tr>
<tr><td>(x)</td><td>CSR activities shall cover villages within 10 km radius of the project.</td><td>Being Complied
All CSR activities are being carried out in villages within 10 km radius of the project. CSR activities are being taken up and carried out mainly in the fields of education, community health, sustainable livelihood development, community infrastructure development and general administration; after receiving formal demands from social controlled institutions, government-controlled institutions and recognized platforms. An amount of Rs. 184.42 Lakhs has been spent on CSR activities during the compliance period (April 2024 to September 2024) as shown below:

<table>
<tr><th>S. No.</th><th>Head</th><th>Amount (Rs. Lakhs)</th></tr>
<tr><td>1</td><td>Education</td><td>35.30</td></tr>
<tr><td>2</td><td>Community Health</td><td>14.80</td></tr>
<tr><td>3</td><td>Sustainable Livelihood Development</td><td>62.00</td></tr>
<tr><td>4</td><td>Community Infrastructure Development</td><td>61.80</td></tr>
<tr><td>5</td><td>General Administration</td><td>10.52</td></tr>
<tr><td colspan="2">Total</td><td>184.42</td></tr>
</table>

Details on CSR activities carried out by AVPPL during compliance period (April 2024 to September 2024) are enclosed as Annexure IV.</td></tr>
<tr><td>(xi)</td><td>Oil Contingency Management Plan shall be put in place.</td><td>Being Complied
After duly incorporating the comments of Indian Coast Guard (ICG), the final facility Level Oil Spill Contingency Plan (OSCP) in line with the National Oil Spill-Disaster Contingency Plan (NOS-DCP) has been submitted to ICG for approval vide letter No. AVPPL/ICG/2020-21/1134 dated 22.05.2020.</td></tr>
</table>

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		After final review by Pollution Response Team (PRT) (West), ICG has made specific remarks on the compliance of OSCP prepared in line with NOS-DCP guidelines; directing AVPPL to submit the OSCP for approval after Oil Spill Response Equipment (OSRE) are in place before start of operation. The OSCP will be re-submitted for review and approval after receipt of OSRE at site. Delivery of OSRE is planned in three lots out of which 1st lots of OSRE has already been delivered at site. 2nd & 3rd lots of OSRE is expected by end of December 2024 respectively. Meanwhile, the following mandatory OSRE were mobilized from OSL (Ocean Sparkle Ltd., a subsidiary company of Adani) and made available at site: • Elastec USA boom – 300 m • Elastec USA power pack & hydraulic hose • Air blower backpack • Fence boom • Skimmer boom • Sorbent boom • Sorbent pads Besides this, a mutual-aid agreement was also executed between OSL and AVPPL for support in case of any eventuality.  **Oil Spill Response Equipment**

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		 **Oil Spill Response Equipment**  **Oil Spill Response Equipment**
(xii)	All the recommendations /conditions stipulated by Kerala Coastal Zone Management Authority (KCZMA) shall be complied with.	**Being Complied** The recommendations/conditions of KCZMA are being complied with. Copies of the HYCRs are also being submitted to KCZMA. Compliance to the recommendations/conditions of KCZMA for the period April 2024 to September 2024 is enclosed as **Annexure V**.
(xiii)	The responses/ commitments made during public hearing shall be complied with in letter and spirit.	**Being Complied** The project proponent is complying with the responses/commitments made during public hearing (as applicable). Status of the same is being submitted regularly along with HYCRs to all the authorities concerned. The compliance status of the commitments made during Public Hearing and actions taken on the same during the period April 2024 to September 2024 is enclosed as **Annexure VI**.
(xiv)	All the recommendation of the EMP shall be complied	**Being Complied**

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	with in letter and spirit. All the mitigation measures submitted in the EIA report shall be prepared in a matrix format and the compliance for each mitigation plan shall be submitted to MoEF along with half yearly compliance report to MoEF-RO.	Project is presently in the final stages of construction and trial runs are ongoing. Recommendations of the construction stage EMP are being implemented. Operation stage EMP would be followed once the port is commissioned. Status of EMP compliance in matrix format is enclosed as **Annexure VII**.
(xv)	The project proponent shall bring out a special tourism promotion package for the area in consultation with the State Government and implement the same along with the project.	**Being Complied** Implementation of the Tourism Management Plan is being discussed with tourism department and which would be integrated with the tourism directorates plan in the area. *(Source: VISL)*
(xvi)	The project proponent shall place on its website its response to the Public Hearing, and representations as presented to the EAC in the 128th meeting held on 23rd November 2013, for information of the general public.	**Complied** All the relevant details pertaining to EIA, ToR, EAC meetings, Public Hearing, etc. related to the project have been placed on VISL website: https://vizhinjamport.in/.
(xvii)	There shall be no withdrawal of groundwater in Coastal Regulation Zone Area, for this project. In case any groundwater is proposed to be withdrawn from outside the CRZ area, specific prior permission from the concerned State/Central Groundwater Board shall be obtained in this regard.	**Noted** There will not be any withdrawal of groundwater from the CRZ Area. In case of requirement of groundwater withdrawal outside CRZ area, specific prior permission will be obtained from State/Central Groundwater Board. At present, the water for construction purposes for the port is being sourced from the open market/private suppliers. On an average about 149 KLD water is being consumed for construction related activities, dust suppression sprinkling, and construction workers drinking water during the compliance period (April 2024 to September 2024).

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		For water for operation purposes, AVPPL have applied for Kerala Water Authority (KWA) connection through E-Tapp dated 19.01.2024. KWA Water Supply Division Neyyattinkara have subsequently facilitated the connection of water supply to Vizhinjam port through deposit of necessary funds by AVPPL and have provided a tapping point inside the project site in August 2024. Till 30.09.2024, 75 KL of water has been utilized for port related operations and port office buildings.  **KWA Water Supply Tapping Point in the Port**
(xviii)	The Hazardous waste generated shall be properly collected and handled as per the provision of Hazardous Waste (Management, Handling and Transboundary Movement) Rules, 2008.	**Being Complied** The Hazardous Waste at site are being disposed to authorized (CPCB/KSPCB) handlers as per the provision of Hazardous Waste (Management, Handling and Transboundary Movement) Rules, 2008. During the compliance period (April 2024 to September 2024) 14.6 KL of used oil, 46 KGs of oily cotton material, 26 Nos. battery waste, 45 Nos. oil contaminated filters and 33 Nos. of discarded containers had been generated and are being disposed to authorized (CPCB/KSPCB) handlers.
(xix)	No hazardous chemicals shall be stored in the Coastal Regulation Zone area.	**Noted for Compliance** No hazardous chemical is being stored in the CRZ area.
(xx)	The wastewater generated from the	**Noted**

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	activity shall be collected, treated and reused properly.	All the wastewater generated from the port is of the nature of sewage and will be collected and treated in the STP and reused properly for watering of horticulture/landscape developments in the port.
(xxi)	Sewage Treatment facility should be provided in accordance with the CRZ Notification.	**Being Complied** Sewage Treatment Plant (STP) facility of adequate capacity in phased manner in accordance with the CRZ Notification is being implemented and is expected to be commissioned by the end of December 2024. Presently, STP with capacity of 50 KLD is being developed with following status: 1. The STP material is received as site along with Sewage Pumps 2. Excavation and Rock breaking activity has begun at the STP location 3. Sewage Pump Stations are under construction 4. Laying of Sewer Line is in progress  **Sewage Pump Station under Development**

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		 **STP Materials at Site** Sewage generated of 48 KL from port office buildings and construction site offices during the compliance period (April 2024 to September 2024) are collected through tankers and sent to the STP at Muttathara being operated by Thiruvananthapuram Corporation.
(xxii)	No solid waste will be disposed of in the Coastal Regulation Zone area. The solid waste shall be properly collected, segregated and disposed as per the provision of Solid Waste (Management and Handling) Rules, 2000.	**Noted for Compliance** No solid waste is being disposed in the CRZ area. Bio-degradable waste is being treated in an Organic Waste Converter (OWC) installed at site and the output is being used as manure in greenbelt development within the port project areas. The dry waste is being properly collected, segregated, and disposed of in line with the Solid Waste Management Rules 2016, as amended. The Half Yearly Report of the Solid Waste Management at Vizhinjam Port for the period April 2024 to September 2024 is enclosed as **Annexure VIII**.
(xxiii)	Installation and operation of DG set if any shall comply with the guidelines of CPCB. Oil spills if any shall be properly collected and disposed as per the Rules.	**Being Complied** 34 DG sets were on site of which 10 were on standby. These are compliant to CPCB guidelines. If any oil spill occurs, it shall be properly collected and disposed as per the Rules.

Half Yearly Compliance Report (HYCR) on Conditions Stipulated in Environmental & CRZ Clearance (EC) F.No.11-122/2011-IA.III dated 03.01.2014 for the Period April 2024 to September 2024		
S. No.	**Conditions**	**Compliance Status as on 30.09.2024**
	Project proponent shall install necessary oil spill mitigation measures.	
(xxiv)	No construction work other than those permitted in Coastal Regulation Zone Notification shall be carried out in Coastal Regulation Zone area.	**Complied** Construction of the project has been carried out as per the approval obtained under CRZ Notification.
(xxv)	The approach channel shall be properly demarcated with lighted buoys for safe navigation and adequate traffic control guidelines shall be framed.	**Complied** Deployment of 12 Nos. of navigational buoys have been deployed and are operational.  **Port Hand Lateral Buoy**  **Starboard Hand Lateral Buoy** A layout of the approach channel demarcated with Buoys for safe navigation with navigational aid buoys was submitted as a part of HYCR for the period April 2023 to September 2023.

Half Yearly Compliance Report (HYCR) on Conditions Stipulated in Environmental & CRZ Clearance (EC) F.No.11-122/2011-IA.III dated 03.01.2014 for the Period April 2024 to September 2024		
S. No.	**Conditions**	**Compliance Status as on 30.09.2024**
		A Vessel Traffic Management System (VTMS) is being implemented. The berthing tariff and policy structure (BPTS) will be circulated to relevant trade forums which will have port information on traffic guidelines. The Navigation Chart of Vizhinjam International Seaport was released by Joint Chief Hydrographer of India and handed over to AVPPL on 25.09.2024.
(xxvi)	The project proponent shall take up development of greenbelt in the project area, wherever possible. Adequate budget shall be provided in the Environment Management Plan for such development.	**Being Complied** Greenbelt: A natural greenbelt exists around the port boundary towards the landward side. A greenbelt development plan has been considered in the Master Plan and budgetary provision has been kept for this purpose. Greenbelt of adequate width with suitable species as identified in the EIA is being developed in all possible areas in line with the establishment of the port.  **Greenbelt Development** Landscape Development: Landscape development work has also been completed at several locations in the port areas. The landscaping at the port site is maintained by Vanitha Karsheeka Karma Sena, one of the livelihood groups formed as part of the CSR activities. This includes the daily watering, weed control and management.

Half Yearly Compliance Report (HYCR) on Conditions Stipulated in Environmental & CRZ Clearance (EC) F.No.11-122/2011-IA.III dated 03.01.2014 for the Period April 2024 to September 2024

S. No.	Conditions	Compliance Status as on 30.09.2024

Landscape Development

Compensatory Afforestation (CA): AVPPL, in collaboration with Forest department, have carried out planting of 40,040 trees in two Phases in adequate land as identified by social Forest Department, for a total area of 29.65 Ha spending Rs. 254.50 Lakhs. This has sufficiently covered the obligation of compensatory afforestation required for the development of all the phases of Vizhinjam Port. Details of the same are provided below:

Phase	Location	Area (ha)	No. of Trees	Cost (Rs. Lakhs)
1	Sainik School, Kazhakootam	12.05	15,540	80.50
2	Kerala University Campus, Karyavattom	12.60	16,500	174.00
	STP, Muttathara	5.00	8,000	
Total		**29.65**	**40,040**	**254.50**

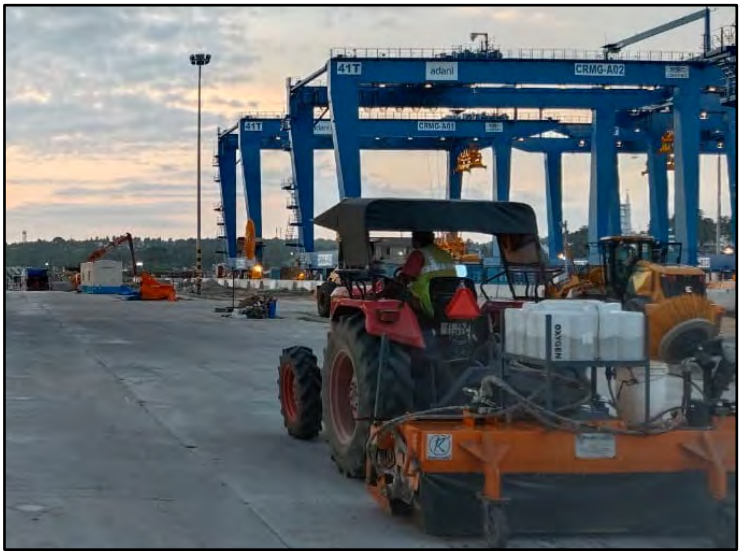
Half Yearly Compliance Report (HYCR) on Conditions Stipulated in Environmental & CRZ Clearance (EC) F.No.11-122/2011-IA.III dated 03.01.2014 for the Period April 2024 to September 2024		
S. No.	**Conditions**	**Compliance Status as on 30.09.2024**
		 **Compensatory Afforestation**
(xxvii)	The fund earmarked for environment management plan shall be included in the budget and this shall not be diverted for any other purposes.	**Complied** An amount of 40 Crores was kept solely for EMP implementation as per the commitment in the EIA; and this amount was not diverted for any other purpose. However, despite having exhausted the funds earmarked through EMP activities and having exceeded the required expenditure, AVPPL continue to be committed to environmental responsibility. An amount of Rs. 12.75 Crores has been utilized towards EMP implementation measures during compliance period April 2024 to September 2024. Till date, an amount of Rs. 42.44 Crores has been spent on environmental protection measures. The details of EMP expenditure is enclosed as **Annexure IX**.
(xxviii)	The project proponent shall set up an organizational mechanism/institutional structure for Environment, Health & Safety & CSR under the supervision of a General Manager as outlined in the EIA Report for effective implementation of the stipulated EHS safeguards & CSR activities.	**Complied** An officer of VISL has been designated as General Manager – Environment for supervision of the stipulated Environment, Health and Safety (EHS) safeguards. AVPPL has also appointed competent and qualified professional team for the effective implementation of EHS safeguards & CSR activities. In addition to the above, an Environmental Expert of the independent engineer and safety consultants have been appointed as per concession agreement signed between GoK and AVPPL. It is also ensured that contractors executing the work also deploy qualified and competent EHS personnel for effective implementation of EHS measures.

Half Yearly Compliance Report (HYCR) on Conditions Stipulated in Environmental & CRZ Clearance (EC) F.No.11-122/2011-IA.III dated 03.01.2014 for the Period April 2024 to September 2024		
S. No.	**Conditions**	**Compliance Status as on 30.09.2024**
		Organizational Structure for EHS & CSR is enclosed as **Annexure X**.
(xxix)	Staff Colony should be located beyond CRZ area.	**Not Applicable** Phase I of the Vizhinjam Port Project Development does not envisage a Staff Colony for employees. As the Port is located at a reasonable distance from the existing residential zones of Thiruvananthapuram Corporation and adjoining Municipalities and Panchayaths, staff of the Port are availing accommodation independently in the existing residential zones outside the Port.
12.	**General Conditions**	
(i)	Construction of the proposed structures shall be undertaken meticulously conforming to the existing Central/local rules and regulations including Coastal Regulation Zone Notification, 2011 & its amendments. All the construction designs/drawings relating to the proposed construction activities must have approvals of the concerned Statutory Departments / Agencies.	**Complied** All the construction activities are being carried out as per existing Central/local rules. Necessary permissions under CRZ Notification 2011 and its amendments have been obtained. Further, necessary approvals from concerned Statutory Departments/Agencies have been obtained for the construction designs/drawings as mentioned hereunder: • CTE No. PCB/HO/TVM/ICE/08/2015 dated 15.09.2015 valid up to 31.07.2018 was renewed from KSPCB vide Consent No. PCB/HO/TVM/ICE-R/02/2018, dated 19.07.2018 valid up to 31.07.2023 and further renewed vide Consent No. KSPCB/TV/ICE/10029484/2023 dated 30.07.2023 valid up to 31.07.2028 (A Copy of the same was submitted along with HYCR for the period April 2023 to September 2023). All other port construction related aligned activities such as paver blocks, batching plants, etc. fall under this CTE taken for the port development. • Airport Authority of India NOC vide NOC no AAI/SR/NOC/RHQ dated 07.12.2015. • As per the exemption granted by GoK G.O. No. 310/2015/LSGD dated 01.10.2015, AVPPL is not required to obtain any further building permits/permission to construct port related building within the port premises. • Permissions with respect to store petroleum in tank/s in connection with pump outfit for fuelling motor conveyances has been obtained in Form

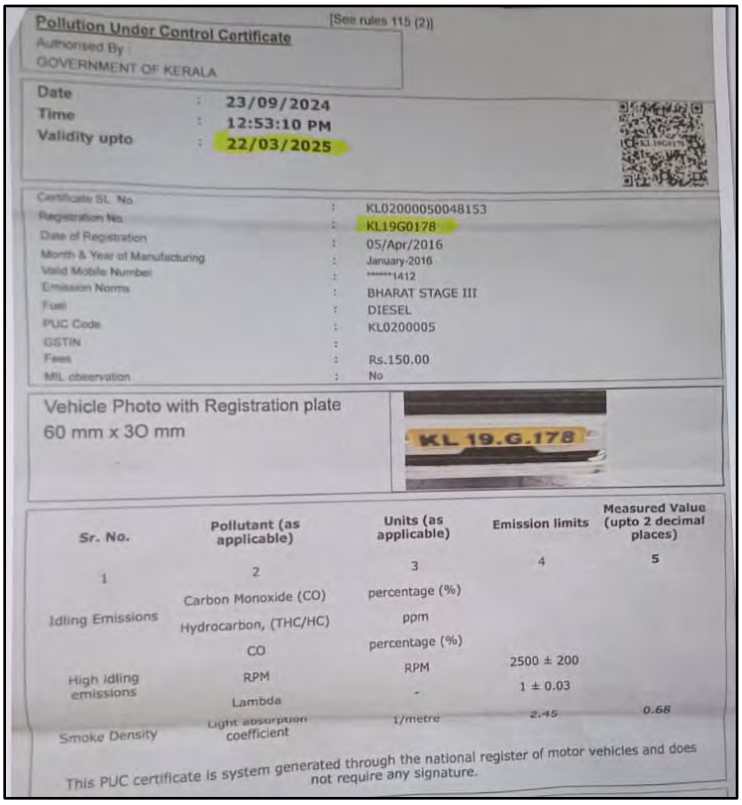
Half Yearly Compliance Report (HYCR) on Conditions Stipulated in Environmental & CRZ Clearance (EC) F.No.11-122/2011-IA.III dated 03.01.2014 for the Period April 2024 to September 2024		
S. No.	**Conditions**	**Compliance Status as on 30.09.2024**
		XIV for the storage of 40.00 KL of Petroleum class B in tank/s in the port premises from Petroleum & Explosives Safety Organisation (PESO) as per the provisions of the Petroleum Act, 1934 and under the Petroleum Rules, 2002 vide License No.: P/SC/KL/14/3732(P499906) dated 05.10.2023 (Copy of the same was submitted along with HYCR for the period October 2023 to March 2024).
(ii)	Adequate provision for infrastructure facilities including water supply, fuel and sanitation must be ensured for construction workers during the construction phase of the project to avoid any damage to the environment.	**Complied** There is no labour camp. It is ensured that construction workers who are staying outside in the contractor rented houses/apartments are provided with necessary infrastructure facilities.
(iii)	Appropriate measures must be taken while undertaking digging activities to avoid any likely degradation of water quality.	**Being Complied** Mitigation measures are being followed while undertaking digging activities. Surface and Groundwater quality is monitored monthly in line to Environment Monitoring Plan prescribed in EIA and analysis reports are enclosed as **Annexure III**. There are no significant changes observed in the water quality during the compliance period.
(iv)	Borrow sites for each quarry sites for road construction material and dump sites must be identified keeping in view the following: (a) No excavation or dumping on private property is carried out without written consent of the owner. (b) No excavation or dumping shall be allowed on wetlands, forest areas or other	**Complied** • Quarry material has been obtained from approved sites only. The building stone materials for Phase I Development of Vizhinjam Port has been attained and requirement for further rock supply from quarries is not envisaged. • No excavation has been carried out in private property. • No excavation or dumping has been carried out in wetlands, forest area or other ecologically valuable or sensitive locations. • Kerala State Remote Sensing and Environment Centre (KSREC) have studied the impact due to construction of port approach road. Recommendations of KSREC are being implemented and suitable mitigation measures as

Half Yearly Compliance Report (HYCR) on Conditions Stipulated in Environmental & CRZ Clearance (EC) F.No.11-122/2011-IA.III dated 03.01.2014 for the Period April 2024 to September 2024		
S. No.	**Conditions**	**Compliance Status as on 30.09.2024**
	ecologically valuable or sensitive locations. (c) Excavation work shall be done in close consultation with the Soil Conservation and Watershed Development Agencies working in the area, and (d) Construction spoils including bituminous material and other hazardous materials must not be allowed to contaminate water courses and the dump sites for such materials must be secured so that they shall not leach into the ground water.	suggested in the KSREC report are being adopted during construction. • No bituminous or hazardous material has been used. • Construction spoils are stored in such a way that they do not contaminate water courses and the dump sites for such materials are secured so that they shall not leach into the ground water. • Surface and Ground water quality is monitored monthly in line to Environment Monitoring Plan prescribed in EIA and analysis reports are enclosed as **Annexure III**.
(v)	The construction material shall be obtained only from approved quarries. In case new quarries are to be opened, specific approvals from the competent authority shall be obtained in this regard.	**Complied** The construction material was obtained from approved quarries only. The building stone materials for Phase I Development of Vizhinjam Port has been attained and requirement for further rock supply from quarries is not envisaged.
(vi)	The project authorities shall make necessary arrangements for disposal of solid wastes and for the treatment of effluents by providing a proper wastewater treatment plant outside the CRZ area. The quality of treated effluents, solid wastes and noise level etc. must conform to the standards laid down by	**Being Complied** • No solid waste is being disposed in the CRZ area. • Bio-degradable waste is being treated in an OWC installed at site and output is being used as manure in greenbelt development. • The dry waste is being properly collected, segregated, and disposed in line to Solid Waste Management Rules 2016, as amended. • The Half Yearly Report of the Solid Waste Management at Vizhinjam Port for the period April 2024 to September 2024 is enclosed as **Annexure VIII**.

Half Yearly Compliance Report (HYCR) on Conditions Stipulated in Environmental & CRZ Clearance (EC) F.No.11-122/2011-IA.III dated 03.01.2014 for the Period April 2024 to September 2024		
S. No.	**Conditions**	**Compliance Status as on 30.09.2024**
	the competent authorities including the Central/State Pollution Control Board and the Union Ministry of Environment and Forests under the Environment (Protection) Act, 1986, whichever are more stringent.	• A Provision for installing Sewage Treatment Plant (STP) facility of adequate capacity in phased manner in accordance with the CRZ Notification is being implemented. • Environment Monitoring is being carried out as per Environment Monitoring Plan prescribed in EIA by NABL accredited agency Standards Environmental & Analytical Laboratories. • Ambient Noise is being monitored as per Noise Pollution (Regulation & Control) Rules, 2000 (Rules 3 (1) and 4(1)) at 5 locations (Residential, commercial & Industrial) twice a month. It is observed that noise readings at the port site were within limits on all monitoring days during the monitoring months (from April 2024 to September 2024). • Half Yearly Environmental Monitoring Report for the period April 2024 to September 2024 is attached as **Annexure III**.
(vii)	The proponent shall obtain the requisite consents for discharge of effluents and emissions under the Water (Prevention and control of Pollution) Act, 1974 and the Air (Prevention and control of Pollution) Act, 1981 from the Kerala State Pollution Control Board before commissioning of the project and a copy of each of these shall be sent to this Ministry.	**Being Complied** CTE was obtained from KSPCB vide Consent No. PCB/HO/TVM/ICE/08/2015 dated 15.09.2015 valid up to 31.07.2018. The CTE was renewed vide Consent No. PCB/HO/TVM/ICE-R/02/2018 dated 19.07.2018 valid up to 31.07.2023. The CTE was further renewed vide Consent No. KSPCB/TV/ICE/10029484/2023 dated 30.07.2023 valid up to 31.07.2028. AVPPL have submitted application for Consent to Operate (CTO) under the Water (Prevention and control of Pollution) Act, 1974 and the Air (Prevention and control of Pollution) Act, 1981 to KSPCB before commissioning of the project vide Application No-10076351 dated 06.08.2024. The application is under scrutiny by KSPCB. A copy of the CTO will be sent to Ministry on receipt.
(viii)	Adequate precautions shall be taken during transportation of the construction material so that it does not affect the environment adversely.	**Complied** Following precautionary measures are undertaken during transportation of the construction material as environment safeguard: • Tarpaulin cover is being used during transportation of construction material.

Half Yearly Compliance Report (HYCR) on Conditions Stipulated in Environmental & CRZ Clearance (EC) F.No.11-122/2011-IA.III dated 03.01.2014 for the Period April 2024 to September 2024		
S. No.	**Conditions**	**Compliance Status as on 30.09.2024**
		• All vehicles coming into the site are under a speed restriction of 20 km/hr. • Regular Water Sprinkling is done on the approach road by water tankers. • It is ensured that all vehicles entering the Port have a valid PUC certification. • The dumpers have speed governors ensuring adherence to speed limit. • AVPPL have engaged a dust sweeper sprinkling system for dust suppression along the roads and on the storage yard.  **Dust Sweeper**  **Tarpaulin Covered Truck**

Half Yearly Compliance Report (HYCR) on Conditions Stipulated in Environmental & CRZ Clearance (EC) F.No.11-122/2011-IA.III dated 03.01.2014 for the Period April 2024 to September 2024

S. No.	Conditions	Compliance Status as on 30.09.2024
		 **Speed and Saftey Sign Board**
		 **PUC Certificate**

Half Yearly Compliance Report (HYCR) on Conditions Stipulated in Environmental & CRZ Clearance (EC) F.No.11-122/2011-IA.III dated 03.01.2014 for the Period April 2024 to September 2024		
S. No.	**Conditions**	**Compliance Status as on 30.09.2024**
(ix)	Full support shall be extended to the officers of this Ministry/Regional Office at Bangalore by the project proponent during inspection of the project for monitoring purposes by furnishing full details and action plan including action taken reports in respect of mitigation measures and other environmental protection activities.	**Noted** VISL had submitted prior EC application for the future phases (Master Plan Development) of Vizhinjam Port to MoEF&CC. In order to comply with the Terms of Reference obtained from MoEF&CC stating: "*Latest Certified EC Compliance report of the existing EC from the concerned/RO, Ministry shall submit*", VISL requested MoEF&CC Regional Office (SZ), Bangalore to issue a Certified Report of the Status of compliance of the prior EC granted to the Phase I of the project. In this regard, Dr. Murali Krishna, Additional Director/Scientist E, IRO office, Bangalore (Southern Zone), MoEF&CC, conducted a site visit of the Vizhinjam Port along with the Chief Environmental Engineer (CEE), KSPCB on 05.03.2024 for inspection of the project (Copy of the Certified Compliance Inspection Report was submitted along with HYCR for the period October 2023 to March 2024).
(x)	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.	**Noted for Compliance**
(xi)	The Ministry reserves the right to revoke this clearance if any of the conditions stipulated are not complied to the satisfaction of the Ministry.	**Noted**
(xii)	In the event of a change in project profile or change in the implementation agency, a fresh reference shall be made to the Ministry of Environment & Forests.	**Noted and Will be Complied** AVPPL is the concessionaire for implementing the project and operating it for the next 40 years, based on concession agreement signed between the GoK &, AVPPL on 17.08.2015. Vizhinjam International Seaport Limited (VISL) is the Project Proponent and the nodal agency for development of the port on

Half Yearly Compliance Report (HYCR) on Conditions Stipulated in Environmental & CRZ Clearance (EC) F.No.11-122/2011-IA.III dated 03.01.2014 for the Period April 2024 to September 2024		
S. No.	**Conditions**	**Compliance Status as on 30.09.2024**
		behalf of GoK. As on date, there is no change in the project profile.
(xiii)	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** Concession agreement with AVPPL was signed on 17.08.2015. The layout of the port has been approved by GoK by letter No.308799/E1/15/F&PD dated 30.10.2015 (Submitted along with the Compliance Report for the period October 2015 to March 2016). The preliminary construction activities commenced at site on 16.11.2015 followed by official inauguration on 05.12.2015. Financing agreement forming part of financial closure was submitted by the concessionaire on 13.05.2016.
(xiv)	Kerala 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.	**Noted** This condition does not pertain to project proponent. KSPCB had complied with the same.
13.	These stipulations would be enforced among others under the provisions of Water (Prevention and Control of Pollution) Act, 1974, The Air (Prevention and Control of Pollution) Act 1981, the Environment (Protection) Act, 1986, the Public Liability (Insurance) Act, 1991 and EIA Notification 2006, including the amendments and rules made thereafter.	**Noted for Compliance**
14.	All other statutory clearances such as the approvals for storage of diesel from Chief Controller of Explosives, Fire Department, Civil Aviation Department,	**Complied** All the construction activities are being carried out as per existing Central/State rules. Necessary permissions under CRZ Notification 2011 and its amendments have been obtained. Further, necessary approvals from concerned Statutory Departments/Agencies have been obtained for the

Half Yearly Compliance Report (HYCR) on Conditions Stipulated in Environmental & CRZ Clearance (EC) F.No.11-122/2011-IA.III dated 03.01.2014 for the Period April 2024 to September 2024		
S. No.	**Conditions**	**Compliance Status as on 30.09.2024**
	Forest Conservation Act, 1980 and Wildlife (Protection) Act, 1972 etc. shall be obtained, as applicable by project proponents from the respective competent authorities.	construction designs/drawings as mentioned hereunder: • CTE No. PCB/HO/TVM/ICE/08/2015 dated 15.09.2015 valid up to 31.07.2018 was renewed from KSPCB vide Consent No. PCB/HO/TVM/ICE-R/02/2018, dated 19.07.2018 valid up to 31.07.2023 and further renewed vide Consent No. KSPCB/TV/ICE/10029484/2023 dated 30.07.2023 valid up to 31.07.2028. • Airport Authority of India NOC vide NOC no AAI/SR/NOC/RHQ dated 7.12.2015. • As per the exemption granted by GoK G.O. No. 310/2015/LSGD dated 01.10.2015, AVPPL is not required to obtain any further building permits/permission to construct port related building within the port premises. • Permissions with respect to store petroleum in tanks in connection with pump outfit for fuelling motor conveyances has been obtained in Form XIV for the storage of 40.00 KL of Petroleum class B in tank/s in the port premises from Petroleum & Explosives Safety Organisation (PESO) as per the provisions of the Petroleum Act, 1934 and under the Petroleum Rules, 2002 vide License No.: P/SC/KL/14/3732(P499906) dated 05.10.2023.
15.	The project proponent shall advertise in at least two local Newspapers widely circulated in the region, one of which shall be in the vernacular language informing that the project has been accorded Environment Clearance and copies of the clearance letters are available with the Kerala State Pollution Control Board and may also be seen on the website of the Ministry of Environment & Forest at http://www.envfor.nic.in.	**Complied** Details regarding the advertisement that the project had been accorded EC and copies of the clearance letter that were published in local newspapers was intimated (along with copy of advertisement) to the regional office of MoEF&CC, vide letter No. VISL/EC/MoEF/2013 dated 20.01.2014 (Submitted along with the HYCR for the period October 2015 to March 2016). Copy of the EC is available on VISL website at https://vizhinjamport.in/environmental-clearance/. The same is also uploaded on Adani Ports and Special Economic Zone (APSEZ) website at https://www.adaniports.com/Downloads.

Half Yearly Compliance Report (HYCR) on Conditions Stipulated in Environmental & CRZ Clearance (EC) F.No.11-122/2011-IA.III dated 03.01.2014 for the Period April 2024 to September 2024		
S. No.	**Conditions**	**Compliance Status as on 30.09.2024**
	The advertisement should be made within 10 days from the date of receipt of the Clearance letter and a copy of the same should be forwarded to the Regional office of this Ministry at Bangalore.	
16.	This Clearance is subject to final order of the Hon'ble Supreme Court of India in the matter of Goa Foundation Vs. Union of India in Writ Petition (Civil) No.460 of 2004 as may be applicable to this project.	**Noted** There are no eco-sensitive zones (ESZ), national parks and sanctuaries in the project area.
17.	Any appeal against this clearance shall lie with the National Green Tribunal, if preferred, within a period of 30 days as prescribed under Section 16 of the National Green Tribunal Act, 2010.	**Noted** Three appeals challenging the EC granted to the project (two appeals filed at NGT, Southern Regional Bench, Chennai and one at NGT, Principal Bench, Delhi) and one original application (OA-filed at NGT, Principal Bench Delhi) indirectly challenging the CRZ Notification, 2011 were filed as per the NGT Act, 2010. The appeals filed at Chennai bench were later transferred to the Delhi bench. The Delhi Bench of NGT has upheld the EC granted to the project vide its judgment dated 02.09.2016.
18.	A copy of the clearance letter shall be sent by the proponent to concerned Panchayat, ZilaParishad/Municipal Corporation, Urban Local Body and the Local NGO, if any from whom suggestions/ representations, if any, were received while processing the proposal. The clearance letter shall also be put on the website of the company by the proponent.	**Complied** The EC was submitted to the concerned Panchayat, Zila Parishad/Municipal Corporation, Urban Local Body and the Local NGOs from whom representations were received vide letter No. VISL/EC/MoEF/2013 dated 29.01.2014. Copy of the EC is available on VISL website at https://vizhinjamport.in/environmental-clearance/. The same is also uploaded on APSEZ website at https://www.adaniports.com/Downloads

Half Yearly Compliance Report (HYCR) on Conditions Stipulated in Environmental & CRZ Clearance (EC) F.No.11-122/2011-IA.III dated 03.01.2014 for the Period April 2024 to September 2024		
S. No.	**Conditions**	**Compliance Status as on 30.09.2024**
19.	The proponent shall upload the status of compliance of the stipulated Clearance conditions, including results of monitored data on their website and shall update the same periodically. It shall simultaneously be sent to the Regional Office of MoEF, the respective Zonal Office of CPCB and the SPCB. The criteria pollutant levels namely; SPM, RSPM, SO_2, NOx (ambient levels as well as stack emissions) or critical sectoral parameters, indicated for the project shall be monitored and displayed at a convenient location near the main gate of the company in the public domain.	**Being Complied** The copy of the latest HYCR for the period October 2023 to March 2024 including the results of six monthly monitoring data for the same period has been uploaded on VISL website https://vizhinjamport.in/compliance/ and also on APSEZ website https://www.adaniports.com/Downloads. The HYCR for the period October 2023 to March 2024 has been submitted to the MoEF&CC, Regional Office (Bangalore), Zonal office of the CPCB (Bangalore), KSPCB & KCZMA via email dated 29.05.2024 (a copy of the email is enclosed as **Annexure XI**). Environment Monitoring is being carried out as per Environment Monitoring Plan prescribed in EIA by NABL accredited agency Standards Environmental & Analytical Laboratories. Detailed Monitoring reports (Air, Water, Noise, Marine Water, and Sediment) for the Compliance Period April 2024 to September 2024 are enclosed as **Annexure III**. Additionally, summary of monthly Environment monitoring results is also uploaded on the APSEZ website: https://www.adaniports.com/Downloads.
20.	The project proponent shall also submit six monthly reports on the status of compliance of the stipulated Clearance conditions including results of monitored data (both in hard copies as well as by e-mail) to the respective Regional Office of MoEF, the respective Zonal Office of CPCB and the SPCB.	**Being Complied** HYCRs on the status of compliance of the stipulated clearance conditions including results of monitored data are regularly submitted to all the concerned agencies. As per the MoEF&CC Notification dated 26.11.2018, wherein submission of HYCRs by email/soft copy is declared acceptable, therefore the HYCR for the period October 2023 to March 2024 has been submitted to the MoEF&CC, Regional Office (Bangalore), Zonal office of the CPCB (Bangalore), KSPCB & KCZMA via email dated 29.05.2024 (a copy of the email is enclosed as **Annexure XI**). Additionally, as per the MoEF&CC Office Memorandum dated 14.06.2022, the HYCR for the period October 2023 to March 2024 has been

Half Yearly Compliance Report (HYCR) on Conditions Stipulated in Environmental & CRZ Clearance (EC) F.No.11-122/2011-IA.III dated 03.01.2014 for the Period April 2024 to September 2024		
S. No.	**Conditions**	**Compliance Status as on 30.09.2024**
		submitted online through compliance module in the PARIVESH Portal.
21.	The environmental statement for each financial year ending 31st March in Form-V as is mandated to be submitted by the project proponent to the concerned KSPCB as prescribed under the Environment (Protection) Rules, 1986 as amended subsequently, shall also be put on the website of the company along with the status of compliance of Clearance conditions and shall also be sent to the respective Regional Offices of MoEF by e-mail.	**Will be Complied** AVPPL have submitted application for CTO to KSPCB before commissioning of the project vide Application No-10076351 dated 06.08.2024. The application is under scrutiny by KSPCB. The submission of Form-V as is mandated will be submitted for each financial year after obtaining the CTO from KSPCB during operational phase.

Enclosures:

Annexure No.	Details of Annexure
Annexure I:	Shoreline Monitoring Report (April 2024 to September 2024)
Annexure II:	Mathematical Modelling Report (October 2023 to September 2024)
Annexure III:	Environment Monitoring Report (April 2024 to September 2024)
Annexure IV:	CSR Activities by AVPPL (April 2024 to September 2024)
Annexure V:	Compliance to Conditions of KCZMA Recommendation
Annexure VI:	Compliance of the Commitments made during Public Hearing
Annexure VII:	Status of Environment Management Plan
Annexure VIII:	Solid Waste Management Report (April 2024 to September 2024)
Annexure IX:	EMP Expenditure
Annexure X:	Environment Health, Safety & CSR Organizational Structure
Annexure XI:	Email Submission of HYCR for the Period October 2023 to March 2024

Annexure I

Shoreline Monitoring Report

(April 2024 to September 2024)

SHANKAR SURVEYS

Adani Vizhinjam Port Pvt. Ltd.

OCEANOGRAPHIC AND BATHYMETRIC DATA COLLECTION FOR ASSESSMENT OF SHORELINE CHANGES

Shankar Surveys Pvt. Ltd.
115, Neco Chambers,
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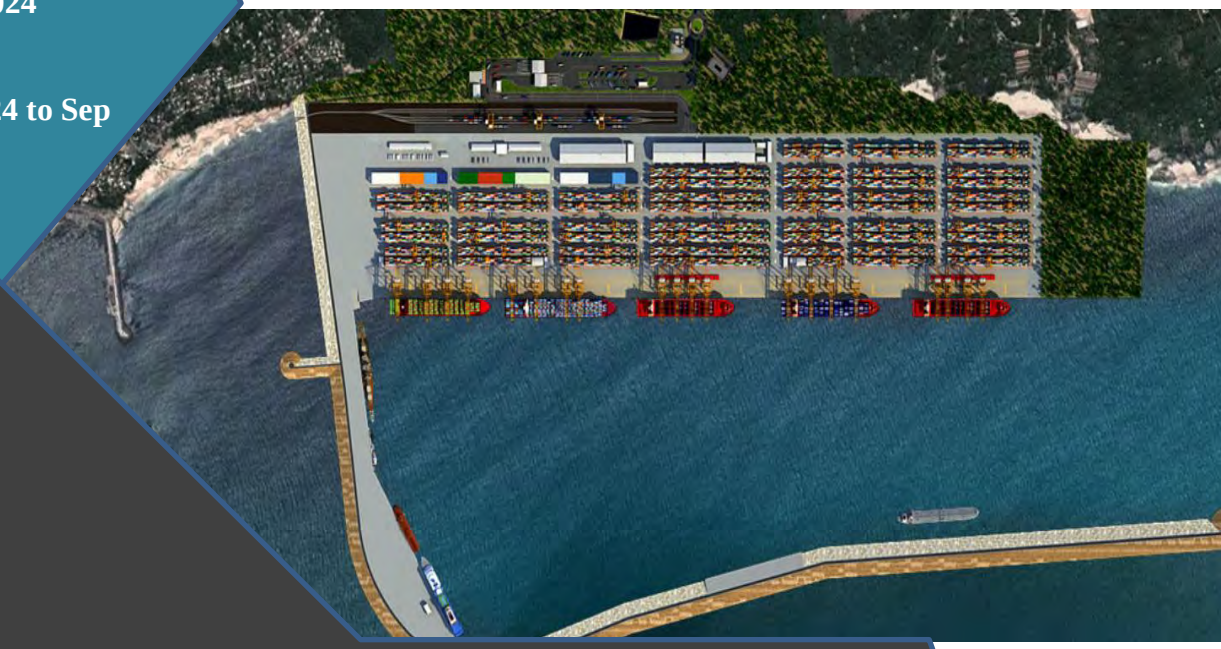
Navi Mumbai – 400 614

Date: **26th November 2024**

SSPL Ref #
SSPL/P050-24/Apr 2024 to Sep 2024 Rev 1



HALF YEARLY REPORT

(APRIL 2024 – SEPTEMBER 2024)

"APPROVAL SHEET"

Prepared by:	*Signed*	*Date*
V Mehta		*25/11/2024*

Approved by:	*Signed*	*Date*
S Philip		*26/11/2024*

REVISION CONTROL

Date	Rev	Section / Page No.	Remarks	Comment made by
07/11/2024	0		Submitted for approval	
26/11/2024	1	Sec 2, Pg 8	Removed the word 'proposed' from first and second paragraphs. Changed 'April 2023' to 'April 2024' in second paragraph.	AVPPL
		Sec 2, Pg 10	Removed 'relocated' from ATG location and amended Figure 2-2	AVPPL
		Sec 2, Pg 11	Removed 'relocated' from AWS location and amended Figure 2-3	AVPPL
		Sec 6, Pg 34	Changes made as suggested	AVPPL & NIOT
		Sec 6.1, Pg 38	Reason for data gap in tide provided	AVPPL
		Sec 6.2, Pg 42	Sentence removed as suggested, Table 6-2 updated	AVPPL
		Sec 6.3, Pg 55	Figure 6-12 amended	NIOT
		Sec 6.5, Pg 56	Changes made as suggested in first paragraph	NIOT
		Sec 9, Pg 80	Added along-shore current details	AVPPL

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ABBREVIATIONS

ADCP	Acoustic Doppler Current Profiler
APHA	American Public Health Association Guidelines
CES	Coastal Erosion Stone
AVPPL	Adani Vizhinjam Port Pvt. Ltd.
BDL	Below Detectable Level
C.M.	Central Meridian
CD	Chart Datum
cm	Centimetre
COG	Course over ground
dd mm.mmm	Degrees minutes. Decimal minutes
DGPS	Differential Global Positioning System
DTM	Digital Terrain Model
EC	Environmental & CRZ Clearance
EIL	Engineer In Charge
EEZ	Exclusive Economic Zone
GoI	Government of India
GoK	Government of Kerala
GPS	Global Positioning System
HSE	Health, Safety & Environment
HWM	High Water Mark
IHO	International Hydrographic Organization
INCOIS	Indian National Centre for Ocean Information Services
IS 1498	Indian Standard for Classification and Identification of Soils for General Engineering Purposes
IS 3025	Indian Standard or Methods of Sampling and Test for Water and Waste water Part 1 - Sampling
kHz	Kilohertz
Km	Kilometre
kPa	Kilo Pascal
LAT	Lowest Astronomical Tide
Lat	Latitude
LEO	Littoral environmental observation
Long	Longitude
m	Metre
MBES	Multibeam Echo Sounder
Mg/L	Milligram per litre
MoEF	Ministry of Environment & Forests

MoU	Memorandum of Understanding
MSL	Mean Sea Level
MV	Motor Vessel
NA	Not Applicable
NABL	National Accreditation Board for Testing and Calibration Laboratories
NHO	Naval Hydrographic Organization
NIOT	National Institute of Ocean Technology
nm	Nautical mile
NTU	Nephelometric Turbidity Units
PEP	Project Execution Plan
PVD	Progressive vector diagram
PPP	Public Private Partnership
ppt	Parts per Thousand
RTK	Real Time Kinematics
SSPL	Shankar Surveys Private Limited
SBES	Single Beam Echo Sounder
SoI	Survey of India
SOG	Speed over ground
SOW	Scope of Work
TEU	Twenty Foot Equivalent Unit
UNCLOS	United Nations Convention on the Law of the Sea
UTM	Universal Transverse Mercator projection
VISL	Vizhinjam International Seaport Ltd.
w.d.	Water depth
WGS84	World Geodetic System 1984
WMO	World Meteorological Organisation

DEFINITIONS

Project Owner	Vizhinjam International Seaport Ltd (VISL), Thiruvananthapuram
Project Concessionaire	Adani Vizhinjam Port Pvt. Ltd. (AVPPL), Thiruvananthapuram
Advisor to VISL	National Institute of Ocean Technology (NIOT), Chennai
Survey Contractor	Shankar Surveys Private Limited (SSPL), Navi Mumbai
Survey Requirement	Oceanographic & Bathymetric Survey for Shoreline Monitoring
Chart Datum	Chart datum is the level to which soundings on published charts are reduced, and above which tidal predictions and tidal levels are given in the Tide Table. All depths on charts are referred to this datum.
Rip Current	A relatively strong, narrow current flowing outward from the beach through the surf zone
LEO	Littoral Environmental Observations
Wave Peak period (Tp)	The peak period gives the characteristic frequency of the arriving wave energy. This gives the period at which the spectrum has its highest value.
Significant Wave Height (Hs)	Significant wave height is the average peak-to-peak amplitude of the largest one third of the waves in a given field.
Wave direction	The direction **from which** the waves are coming. A westerly wave implies that the waves are moving from west to east.
Wind Speed	The speed at which the air moves with respect to the surface of earth. The speed is denoted in m/s
Wind Direction	Wind direction is an indicator of the direction that the wind is **blowing from**. A northerly wind is coming from the north and blowing towards the south
Atmospheric pressure	It is defined as the force per unit area exerted against a surface by the weight of the air above that surface. Atmospheric pressure is expressed in millibars (mb)
Relative Humidity	Relative humidity is defined as the ratio of the water vapor density (mass per unit volume) to the saturation water vapor density, usually expressed in percent

1 EXECUTIVE SUMMARY

The **Vizhinjam International Deepwater Multipurpose Seaport** is an ambitious project taken up by the Government of Kerala, (GoK). It is designed primarily to cater to container trans-shipment besides multi-purpose and break-bulk cargo. The port is being currently developed in a Public-Private Partnership (PPP) component on a design, build, finance, operate and transfer ("DBFOT") basis. The private partner, the Concessionaire - **M/s Adani Vizhinjam Port Private Limited** (**AVPPL**) had commenced construction on 5th December 2015.

Vizhinjam International Seaport Ltd (**VISL**) - a company fully owned by GoK is the implementing agency for the project, will be responsible for all obligations and responsibilities of GoK in respect of the Project and the Concession Agreement.

With its numerous natural advantages and potential, the port will contribute greatly to economic development and will be an asset in terms of infrastructure development in the country.

The project obtained Environmental & CRZ Clearance ("EC") from the Ministry of Environment & Forests (MoEF), Government of India (GoI) on 3rd January 2014, wherein it has been specified to carry out intense monitoring and regulatory reporting of the shoreline changes in the project area. Accordingly, VISL has entered into a memorandum of understanding (MoU) with the National Institute of Ocean Technology (NIOT), Chennai, under the Ministry of Earth Sciences (MoES), for a long-term shoreline monitoring programme including the seasonal bathymetry mapping.
(Source: https://www.vizhinjamport.in/home.html)

Shankar Surveys Private Limited, hereinafter referred to as SSPL, based in Navi Mumbai, has been awarded the contract to carry out Shoreline Monitoring – Oceanographic & Bathymetric Data Collection in the vicinity of the proposed site for the development of the Vizhinjam International Deepwater Multipurpose Seaport.

This report provides the results of the data collected for the half yearly period from April 2024 to September 2024.

All the co-ordinates in the report are referenced to WGS-84, UTM Projection, CM 75° East, Zone 43, Northern Hemisphere.

2 INTRODUCTION

The project is being developed as a PPP project on a DBFOT basis in accordance with the terms and conditions set forth in the concession agreement signed between AVPPL and GoK/ VISL. The investment for land, external infrastructure (rail, water and power) and breakwater will be borne by the landlord (VISL/ GoK). The investments for other port infrastructure (dredging & reclamation, berths, terminals, superstructure & equipment) will be shared on PPP basis availing Viability Gap Funding (VGF). The PPP concessionaire, AVPPL has been given the right to operate the port for a specified concession period of 40 years. Traffic-linked stage-wise future development of the project with an ultimate berth length of 2000m is also envisaged.

The site is endowed with a natural depth of 23 to 25m (which is by far the best compared to other ports in the world) as close as 2 km from the coast. This will enable berthing of mother vessels of 18000 TEU and higher. Since the port site is located at the southern tip of India, barely 10 nautical miles from the international sea route (Suez – Far East route & Far East – Middle East route), it has the potential to become the future trans-shipment hub of the country.
(Source: https://www.vizhinjamport.in/download/Feasibility-Report.pdf)

The study includes carrying out Met-Ocean observations (meteorological parameters and tide) at one location, bathymetric survey of up to 20m contour in two seasons, cross-shore profiling (CSP) from 10m CD (4 CSP lines carried out up to a depth of 20m during the months of January, May, August and October) to 100m inland from the high-water line along a stretch of 40 km, water & grab sampling, and littoral environmental observation. All these surveys and field data measurements are to be carried out for a period of 1 year commencing April 2024.

The Google Earth images, showing the Multibeam survey area, locations of the Automatic Tide Gauge (ATG), Wave Rider Buoy (WRB) and Automatic Weather Station (AWS) are given in Figure 2-1, **Error! Reference source not found.**, Figure 2-2 and Figure 2-3.

Figure 2-1: Location of Multibeam survey area and WRB

On 28th May 2024, the ATG was relocated to the berth area inside the Vizhinjam Adani Seaport as the tide gauge which was installed at the Coast Guard Jetty got damaged when it was hit by a barge. The AWS was relocated to the sub-station building on 3rd July 2024, as the Port Office building on which it was installed was being converted to an Immigration Check Post. The Google earth imageries of the relocated ATG and AWS locations are shown below.

①

Figure 2-2: Location of ATG

①

Figure 2-3: Location of AWS

The CSP lines, which coincide with the Littoral Environment Observation (LEO), beach sampling and photographic documentation, are indicated in Figure 2-4. The cross-shore profiles are named as CSP-01 to CSP-81. CSP-01 corresponds to the southernmost profile which lies to the south of the existing Vizhinjam Harbour and gradually increases progressing towards north for the entire 40 Km stretch (20 Km on either side of the port) with a 500m interval between each CSP line, CSP-81 being the northernmost profile.

Figure 2-4: CSP, LEO and Photographic Documentation Locations

3 SCOPE OF WORK

The survey scope of work as per the Contract includes the following:

- To mobilize a suitable marine spread including a survey boat at site for carrying out the survey operations.
- To provide requisite personnel and equipment for undertaking of oceanographic measurements and study of the shoreline.
- Monthly cross-shore beach profiling perpendicular to the shoreline for a 40 Km stretch at intervals of 500m; using RTK or total station landward up to 100m from HTL or +2m of HTL and using shallow draft boats, sled or any other suitable techniques, seaward down to 10m CD (4 CSP Lines carried out up to a depth of 20m in the months of January, May, August and October).
- Monthly monitoring of littoral zone (at the CSP locations) to observe the littoral transport direction and alongshore current speed by means of appropriate drogue observations and visual observations.
- Monthly photographic documentation of geomorphological changes (at the cross-shore beach profiling locations in four directions).
- Seasonal beach sediment sampling and analysis (at the CSP locations).
- Bathymetry survey twice in a year, i.e., just after the monsoon season and just prior to the commencement of the next monsoon to generate 0.5m contours (with bathymetric survey lines spaced at 25m interval) in areas with depths to 20m CD using multibeam echo sounder.
- Seabed sediment sampling and analysis in 80 sq. Km with one sample per sq Km; once in a year.
- Collection and analysis of water samples at specified periods (seasonal) for total suspended solids (TSS) and turbidity from four specified locations.
- Tide measurements using an automatic tide gauge close to the survey area to observe the tidal variations around the clock at 6-minute intervals or as specified to cover one full year. The tide gauge shall be connected to the nearest Survey of India Benchmark.
- Collection of wind speed & direction, atmospheric pressure, humidity, temperature at 1 location specified by the Client/ EIC (Engineer-in-Charge) by establishing an automatic weather station (AWS).
- Processing and documentation of monthly wave data provided by INCOIS.
- Processing and documentation of seasonal current data provided by INCOIS.
- Shoreline monitoring survey using RTK in GPS mode is to be carried out along the entire 40 Km stretch every month (commenced from November 2021 onwards).

- Sled survey to be carried out for the nearshore areas along 7 CSP transects (CSP-2, CSP-33, CSP-34, CSP-68, CSP-69, CSP-73 and CSP-74) every month using pressure sensor. This survey shall be carried out till the minimum depth which can be navigated by the offshore CSP survey boat.
- Analysis and processing of the data and submission of periodic reports.

3.1 Location Coordinates

The location co-ordinates of the tide station are provided below:

Table 3-1: Tide station location coordinates

Tide Station Co-ordinates			
WGS-84 Spheroid, Geodetic Coordinates			
Name	**Latitude**	**Longitude**	**Height above CD (m)**
Tide station	08° 22' 33.55" N	76° 59' 16.69" E	2.711

The location coordinates of the relocated tide station at the berth area inside Vizhinjam Adani are provided below.

Table 3-2: Relocated tide station location coordinates

Relocated Tide Station Co-ordinates			
WGS-84 Spheroid, Geodetic Coordinates			
Name	**Latitude**	**Longitude**	**Height above CD (m)**
Tide Station	08° 22' 17.50" N	76° 59' 39.69" E	3.687

The EMCON Automatic Weather Station (AWS) was installed on the terrace of the Port Control Office. The following table shows the coordinates of the AWS installation.

Table 3-3: Weather station location coordinates

Weather Station Co-ordinates			
WGS-84 Spheroid, Geodetic Coordinates			
Name	**Latitude**	**Longitude**	**Height above CD (m)**
Weather Station	08° 22' 22.75" N	76° 59' 39.62" E	14.785

Note: The wind sensor was installed at a height of 14.235m above MSL (14.785m above CD). As suggested by NIOT, 7% of the speed was reduced to derive the wind speeds at 10m above MSL as per WMO standards.

The location coordinates of the relocated AWS are provided in the table below.

Table 3-4: Relocated weather station location coordinates

Weather Station Co-ordinates			
WGS-84 Spheroid, Geodetic Coordinates			
Name	**Latitude**	**Longitude**	**Height above CD (m)**
Weather Station	08° 22' 0.94" N	77° 00' 14.45" E	19.180

Note: The wind sensor was installed at a height of 18.631m above MSL (19.18m above CD). As suggested by NIOT, 12% of the speed was reduced to derive the wind speeds at 10m above MSL as per WMO standards.

The Datawell DWR 4 Wave Rider Buoy (WRB) was deployed by INCOIS and AVPPL on 21st December 2023. The location co-ordinates of the Wave rider buoy are provided below:

Table 3-5: Wave rider buoy location coordinates

WRB Co-ordinates			
WGS-84 Spheroid, Geodetic Coordinates			
Name	**Latitude**	**Longitude**	**Water Depth (m)**
WRB	08° 19.656918’ N	77° 1.078776’ E	Approx. 25m

3.2 Beach and Water Sampling

A total of 81 beach samples were to be collected in each season, as part of the contract. The samples were to be analyzed for grain size distribution as per Wentworth classification.

In the pre- monsoon 2024 period, 44 samples could be collected out of 81. The samples which could not be collected due to lack of beach were BS-11 to BS-14, BS-39, BS-40, BS-47 to BS-52, BS-56, BS-59, BS-63, BS-64, BS-65 and BS-66. Beach samples at CSP locations 1 to 8 and 23 to 30 could not be collected due to the protests from local people residing at those locations.

Table 3-6: Beach Sampling Locations

BEACH SAMPLING LOCATIONS WGS-84, Geodetic Coordinates		
Location	**Latitude**	**Longitude**
BS-1	8° 16.0265' N	77° 7.9532' E
BS-2	8° 16.1775' N	77° 7.7195' E
BS-3	8° 16.3348' N	77° 7.4987' E
BS-4	8° 16.4955' N	77° 7.2778' E
BS-5	8° 16.6565' N	77° 7.0579' E
BS-6	8° 16.8176' N	77° 6.8379' E
BS-7	8° 16.9782' N	77° 6.6187' E
BS-8	8° 17.1382' N	77° 6.3980' E
BS-9	8° 17.2984' N	77° 6.1765' E
BS-10	8° 17.4586' N	77° 5.9566' E
BS-11	8° 17.6207' N	77° 5.7379' E
BS-12	8° 17.7276' N	77° 5.5946' E
BS-13	8° 17.8899' N	77° 5.3756' E
BS-14	8° 18.0524' N	77° 5.1568' E
BS-15	8° 18.2151' N	77° 4.9388' E
BS-16	8° 18.3603' N	77° 4.7165' E
BS-17	8° 18.5517' N	77° 4.5120' E
BS-18	8° 18.7213' N	77° 4.3003' E
BS-19	8° 18.8852' N	77° 4.0829' E
BS-20	8° 19.0488' N	77° 3.8659' E
BS-21	8° 19.2152' N	77° 3.6499' E
BS-22	8° 19.3848' N	77° 3.4369' E
BS-23	8° 19.5582' N	77° 3.2282' E
BS-24	8° 19.7318' N	77° 3.0196' E
BS-25	8° 19.9075' N	77° 2.8098' E
BS-26	8° 20.0796' N	77° 2.5989' E
BS-27	8° 20.2492' N	77° 2.3841' E
BS-28	8° 20.4130' N	77° 2.1703' E
BS-29	8° 20.5731' N	77° 1.9581' E
BS-30	8° 20.7305' N	77° 1.7499' E
BS-31	8° 20.8951' N	77° 1.5274' E
BS-32	8° 21.0493' N	77° 1.2973' E

BEACH SAMPLING LOCATIONS WGS-84, Geodetic Coordinates		
BS-33	8° 21.1815' N	77° 1.0911' E
BS-34	8° 21.3210' N	77° 0.8491' E
BS-35	8° 21.3974' N	77° 0.6359' E
BS-36	8° 21.6830' N	77° 0.4829' E
BS-37	8° 21.8799' N	77° 0.2980' E
BS-38	8° 22.1369' N	77° 0.1947' E
BS-39	8° 22.3420' N	76° 59.9895' E
BS-40	8° 22.5417' N	76° 59.7689' E
BS-41	8° 22.8201' N	76° 59.0753' E
BS-42	8° 23.0287' N	76° 58.7934' E
BS-43	8° 23.1727' N	76° 58.6741' E
BS-44	8° 23.3709' N	76° 58.5145' E
BS-45	8° 23.7061' N	76° 58.3743' E
BS-46	8° 23.8974' N	76° 58.3798' E
BS-47	8° 24.1304' N	76° 58.2814' E
BS-48	8° 24.4789' N	76° 58.1346' E
BS-49	8° 24.6320' N	76° 58.0289' E
BS-50	8° 24.8665' N	76° 57.8917' E
BS-51	8° 25.0976' N	76° 57.7474' E
BS-52	8° 25.3176' N	76° 57.5868' E
BS-53	8° 25.5653' N	76° 57.4562' E
BS-54	8° 25.7602' N	76° 57.2767' E
BS-55	8° 25.9643' N	76° 57.0963' E
BS-56	8° 26.1500' N	76° 56.9073' E
BS-57	8° 26.3461' N	76° 56.7308' E
BS-58	8° 26.5741' N	76° 56.5678' E
BS-59	8° 26.7782' N	76° 56.4051' E
BS-60	8° 26.9997' N	76° 56.2272' E
BS-61	8° 27.2030' N	76° 56.0492' E
BS-62	8° 27.4175' N	76° 55.8762' E
BS-63	8° 27.6142' N	76° 55.6937' E
BS-64	8° 27.8102' N	76° 55.5014' E
BS-65	8° 28.0132' N	76° 55.3255' E
BS-66	8° 28.2159' N	76° 55.1437' E

BEACH SAMPLING LOCATIONS		
WGS-84, Geodetic Coordinates		
BS-67	8° 28.4224' N	76° 54.9642' E
BS-68	8° 28.6228' N	76° 54.7840' E
BS-69	8° 28.8276' N	76° 54.6048' E
BS-70	8° 29.0316' N	76° 54.4243' E
BS-71	8° 29.1104' N	76° 54.3586' E
BS-72	8° 29.3118' N	76° 54.1755' E
BS-73	8° 29.5150' N	76° 53.9964' E
BS-74	8° 29.7202' N	76° 53.8181' E
BS-75	8° 29.9258' N	76° 53.6393' E
BS-76	8° 30.1345' N	76° 53.4652' E
BS-77	8° 30.3450' N	76° 53.2940' E
BS-78	8° 30.5558' N	76° 53.1226' E
BS-79	8° 30.7701' N	76° 52.9558' E
BS-80	8° 30.9840' N	76° 52.7867' E
BS-81	8° 31.1988' N	76° 52.6188' E

The water samples (132 from four locations) were collected and analysed for TSS as per IS 3025, Part 17:1984 (reaffirmed 2012); Turbidity was analysed as per IS 3025, Part 10:1984 (reaffirmed 2012) technical specifications. The salinity was analysed as per American Public Health Association (APHA) guidelines.

This report provides the results of water samples collected for the pre-monsoon 2024 period.

The location co-ordinates of water sampling locations are provided below:

Table 3-7: Water Sampling Locations

WATER SAMPLING LOCATIONS WGS-84, Geodetic Coordinates			
Location	**Water Depth (m)**	**Latitude**	**Longitude**
L1 (Mulloor)	21.1	08° 21.923’ N	76° 58.860' E
L2 (Proposed Dredge dumping)	23.2	08° 21.705’ N	76° 59.565’ E
L3 (Pachalloor)	27.4	08° 24.143' N	76° 56.268' E
L4 (Poovar)	23.0	08° 17.597’ N	77° 04.058’ E

4 SURVEY CONTROL

4.1 Geodesy

The survey operations were conducted in the WGS 84 Spheroid, Universal Transverse Mercator Projection based on the geodetic parameters presented below. All co-ordinates quoted within this document are with reference to it.

Table 4-1: Geodetic Parameters

GEODETIC PARAMETERS	
Satellite Datum	
Spheroid	WGS-84
Datum	WGS 84
Semi-Major Axis	6378137.000m
Semi Minor Axis	6356752.314m
Inverse Flattening	298.2572
Projection Parameters	
Grid Projection	Universal Transverse Mercator
Latitude of Origin of Projection	0° (Equator)
Longitude of Origin of Projection	75° E, Zone 43
Hemisphere	North
False Easting (metres)	500000
False Northing (metres)	0
Scale Factor on CM	0.9996
Units	Metres

4.2 Survey Vessel

The survey boat “Bismi” was utilized for the survey operation:

Figure 4-1: Multibeam Survey Boat “Bismi”

4.3 Personnel

The following survey personnel from SSPL / AVPPL were assigned to the project in the capacities listed in the table below during the period.

①

Table 4-2: Personnel

Shankar Surveys Pvt. Ltd.		
Name	**Designation**	**Period**
Rajinder Singh Sandhu	Project Manager (Navi Mumbai office)	1st April – 31st May 2024
Sharon Philip	Project Manager (Navi Mumbai office)	1st June – 30th September 2024
Akash K. Joshilal	Operations Manager	10th July – 30th September 2024
Vasil Chathurala	Oceanographer (Navi Mumbai office)	Duration of Project
Vishnu K.	Party Chief / Hydrographic Surveyor	1st April – 30th June 2024
Sachu S.	Party Chief / Hydrographic Surveyor	30th June – 30th September 2024
Abhiram J	Land / Hydrographic Surveyor	Duration of Project
Ajeesh A.S.	Assistant Surveyor	Duration of Project
Amal Deva	Assistant Engineer	Duration of Project
Thouheed S N	Assistant Surveyor	Duration of Project
Sanjeevanee Khaire	Data Processor (Navi Mumbai office)	Duration of Project
Vishtasp Mehta	Reporting Geophysicist (Navi Mumbai office)	Duration of Project
Adani Vizhinjam Port Pvt. Ltd.		
Name	**Designation**	**Period**
Hebin C	Senior Manager - Environment	Duration of Project
Jesse Fullonton	Assistant Manager - Environment	Duration of Project

5 SURVEY EQUIPMENT DETAILS

5.1 Automatic Tide Gauge

The Valeport Tidemaster Automatic Tide Gauge (ATG) was installed at the Coast Guard jetty, inside the fishing harbour for measuring the tides. A new ATG was installed at the berth area, inside the Vizhinjam Adani Seaport on 28th May 2024, as the one at the Coast Guard Jetty was damaged after being hit by a barge. The tide gauge is a pressure-sensor based instrument, measuring the water level due to change in pressure on the surface of sensor. The sensor was installed in such a way that the zero of sensor is always in water, irrespective of the phases of tide. This was levelled to the local benchmark, situated on top of the jetty. The tide station was programmed to measure the tide at 6-minute intervals throughout the duration of the project.

A photograph of the tide gauge location is shown below.

Figure 5-1: Automatic Tide Gauge

5.2 Wave Rider Buoy (WRB)

The Datawell DWR4 Wave Rider Buoy was deployed by INCOIS and AVPPL. The WRB was programmed to measure all the wave parameters at half-hourly intervals. The data is collected by INCOIS and sent to SSPL after quality check.

The system has an accuracy of 1 cm + 0.5% of vertical motion; resolution of 1mm and range of ± 20 m at the sampling rate of 5.12 Hz. The directional accuracy and resolution are 0.1° within the range of 0° to 360°.

Figure 5-2: WRB deployed at site

5.3 Automatic Weather Station (AWS)

An EMCON Automatic Weather Station (AWS) was installed on top of the Port Control Office building. Since this building was being converted into an Immigration Check Post, the system was shifted to the Sub-station building on 3rd July 2024. The system measures wind speed/direction, atmospheric pressure, temperature, relative humidity and rainfall.

The system consists of the following:

- Cup anemometer
- Relative humidity & temperature sensor
- Pressure sensor
- Rainfall Gauge
- Datalogger

The data is logged in a datalogger installed at the receiving station at intervals of 10 minutes. The data is also transmitted from the data logger to a cloud-based server for further processing and QC checks.

Some images of the automatic weather station are provided below:

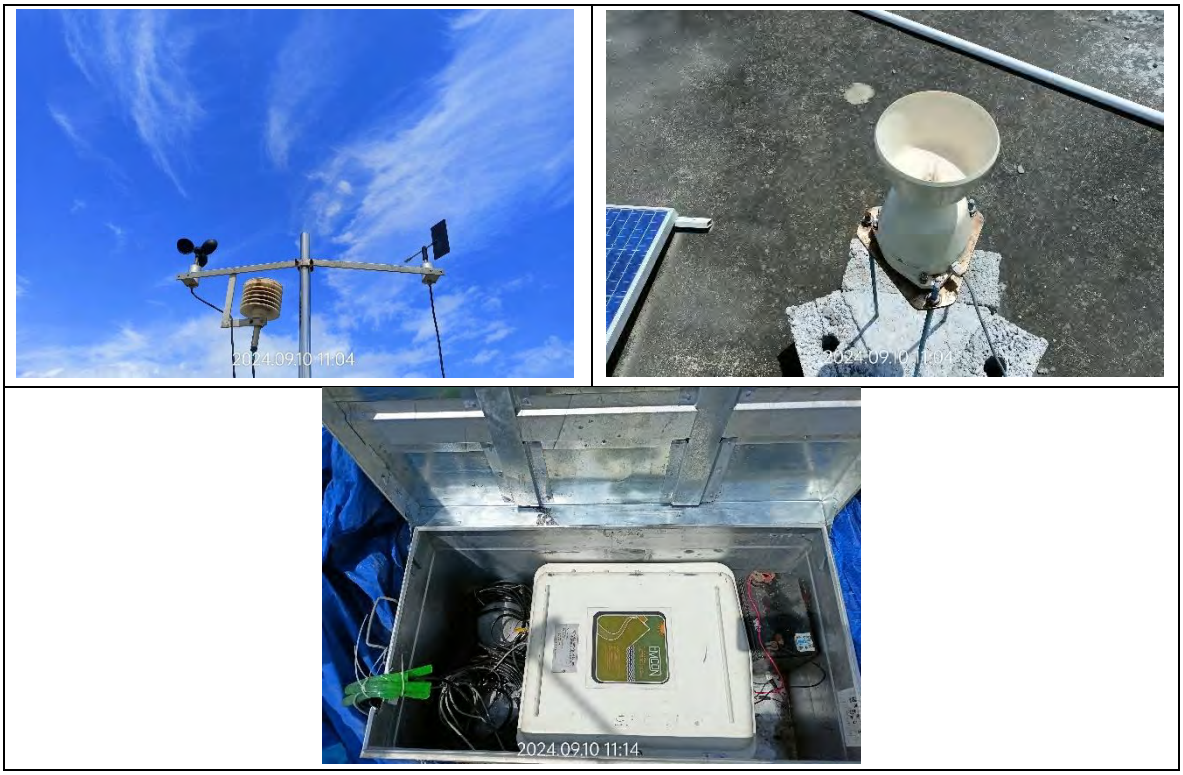


Figure 5-3: AWS on top of Sub-station building

5.4 Real Time Kinematic (RTK) Survey

An RTK system was mobilized at site to carry out cross-shore profiling on the landward side. The system used was a Geomax Zenith 35 Pro RTK system with base station and rover. A photograph of the system is provided below:

Figure 5-4: RTK System (base station)

5.5 DGPS Positioning System

Vessel positioning was carried out by the Trimble SPS 461 dual antenna DGPS system which also provided vessel heading. Vessel track and offset positions were recorded digitally in the navigation software. The positioning system was interfaced to the navigation software as well as the digital data acquisition system. DGPS positioning accuracy of the moving vessel was better than ±1m.

The computed position of the vessel from the DGPS receiver was interfaced to the navigation computer system. Hypack navigation and data acquisition software was used to provide track guidance information to the survey crew and also output the position of the vessel to assist the helmsman in maintaining the selected track guidance line. The VDU displays the selected survey line, the position of the vessel in relation to that line

and numerical data to assist the helmsman such as the along-line and off-line distances, vessel speed and course made good, gyro heading, distance and bearing to end of line and water depth. The position of each fix, together with other information such as fix numbers, depths, PDOP and along-line distances were logged to the hard drive.

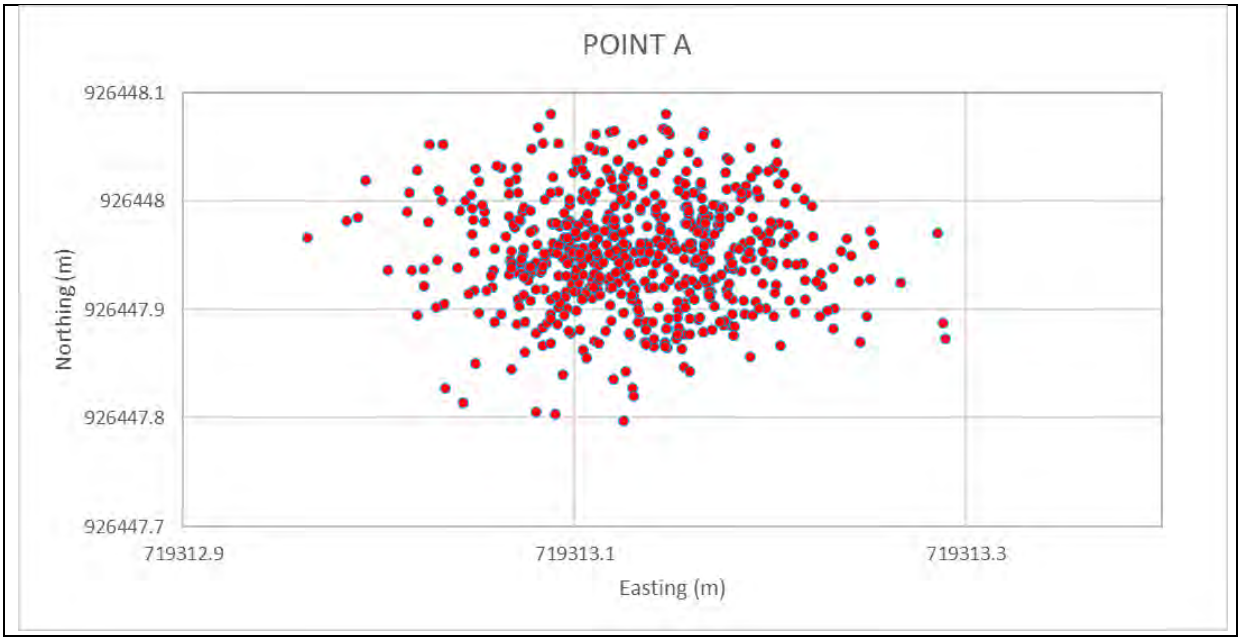
5.5.1 DGPS Consistency Check

In order to determine the integrity and reliability of the positioning system, the system was checked for its consistency during mobilization.

After installing the Trimble DGPS positioning system on board the vessel, two points were marked on the jetty. The DGPS antenna was set up on the jetty at these two points, designated as Point A and Point B.

Time was synchronized between Trimble, Hypack and the observer's watch, for which local time (GMT+5:30) was used. The Trimble SPS 461 DGPS antenna positions were logged in the Hypack navigation software. The logged data was processed to derive the final positions of both the points.

The difference between the calculated distance and measured distance was found to be within the permissible accuracy. The scatter plot of the DGPS calibration carried out in the month of April 2024 is shown in the figure below.



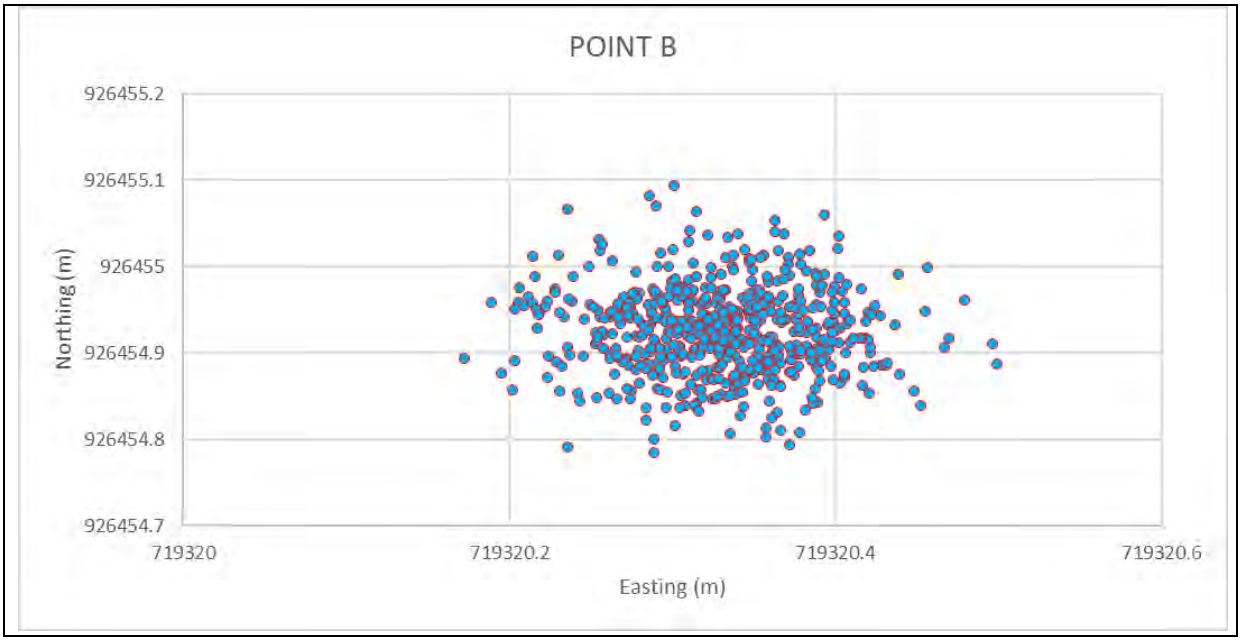


Figure 5-5: Scatter plot of DGPS calibration onboard Multibeam Survey Boat "Bismi"

Table 5-1: DGPS Calibration results

Average Positions		
Point	**Easting**	**Northing**
A	719313.13	926447.95
B	719320.33	926454.93
Distance between points		10.02m
Measured Distance		10.00m
Difference		0.02m

5.5.2 Gyrocompass Calibration

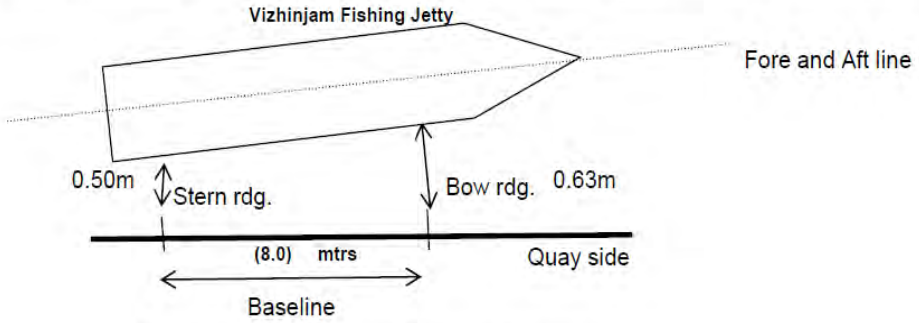
The calculated heading of the vessel was compared with the recorded gyrocompass heading to derive a calculated-observed (C-O) value. A final C-O of 0.02° was obtained, which was entered into the navigation software before commencing the survey. The Gyrocompass verification table for the month of April 2024 is placed below.

GYRO CALIBRATION
(Quay/Tape off set Method)

Job	**AVPPL Shoreline Monitoring**	**Job No**	**P050-24**
Client	**AVPPL**	**Vessel**	**BISMI**
Location	**Vizhinjam Fishing Jetty**	**Date**	**10-Apr-24**
Gyro S/N	**20872**		

Quay heading(T)	Baseline length(m)	Gyro Name : TRIMBLE GA 830	Quayside on:
45.89	8.00	S/No. 12172	Starboard

Observations				Calculations			
Time	Gyro (true)	Bow	Stern	Calc. angle	Calculated Heading	True Quay Hdg	C-O
10:00:00	45.3	0.6	0.4	-1.43	46.73	45.89	-0.84
10:00:10	45.5	0.8	0.7	-0.72	46.22	45.89	-0.33
10:00:20	45.7	0.6	0.2	-2.86	48.56	45.89	0.72
10:00:30	45.5	0.5	0.8	2.15	43.35	45.89	2.54
10:00:40	45.6	0.4	0.6	1.43	44.17	45.89	1.72
10:00:50	45.9	0.7	0.5	-1.43	47.33	45.89	-0.66
10:01:00	45.3	0.8	0.3	-3.58	48.88	45.89	-2.99
	45.54	**0.63**	**0.50**	**-0.92**	**46.46**	**45.89**	**0.02**



Note: Drawing not on scale only for representaion purpose

Signed			
Designation	**Name**	**Signature**	**Date**
Surveyor	Ajeesh A S		10-Apr-24
Party Chief	VISHNU K		10-Apr-24

Figure 5-6: Gyrocompass Calibration on board multibeam survey boat “Bismi”

5.6 Multibeam Echo Sounder System

An R2Sonic 2020 multibeam echo sounder, operating at a frequency of 220 kHz, is used to delineate the topography of the seabed. The measured sound velocity and observed tide are fed into the system during data processing.

5.6.1 Multibeam Swath Calibration

The calibration (or patch test) of the R2Sonic MBES was used to fix the time and angle offsets between the various positioning systems and the transducer head. This was done after mobilization.

The system offsets were entered in the acquisition software prior to surveying and raw data acquisition. Some of these were easily measured and entered and others were corrected through the calibration procedure. The details of the patch test carried out for the month of April 2024 are provided below.

Offsets:

The directly measured system offsets are:

- Transducer sensor offsets measured as the distance from the COG to the transducer point (X= 0.000m, Y= 0.00m, Z = 0.800m from water line for “Bismi”).
- Antenna offsets measured as the distance from the COG to the antenna (X= 0.000m, Y= -0.965m and Z = -2.130m from transducer).
- Heave offset measured as the vertical distance from the centre of the transducer to the water surface (X= -0.340m Y= 0.450m, Z= -1.450m for “Bismi”).
- Time offset (latency) introduced by DGPS computer/ navigation computers or during the serial data transfers.

A DMS-05 MRU provided compensation for vessel heave, roll, pitch and yaw. The sound velocity profiles and tide readings were used to get an accurate calibration form the patch test.

The recommended order of calibration is:

- Calibrate for Latency
- Calibrate for Roll
- Calibrate for Pitch
- Calibrate for Yaw

This is called the LRPY sequence. The figure below shows the sensor offsets for the survey vessel “Bismi” in Hypack software.

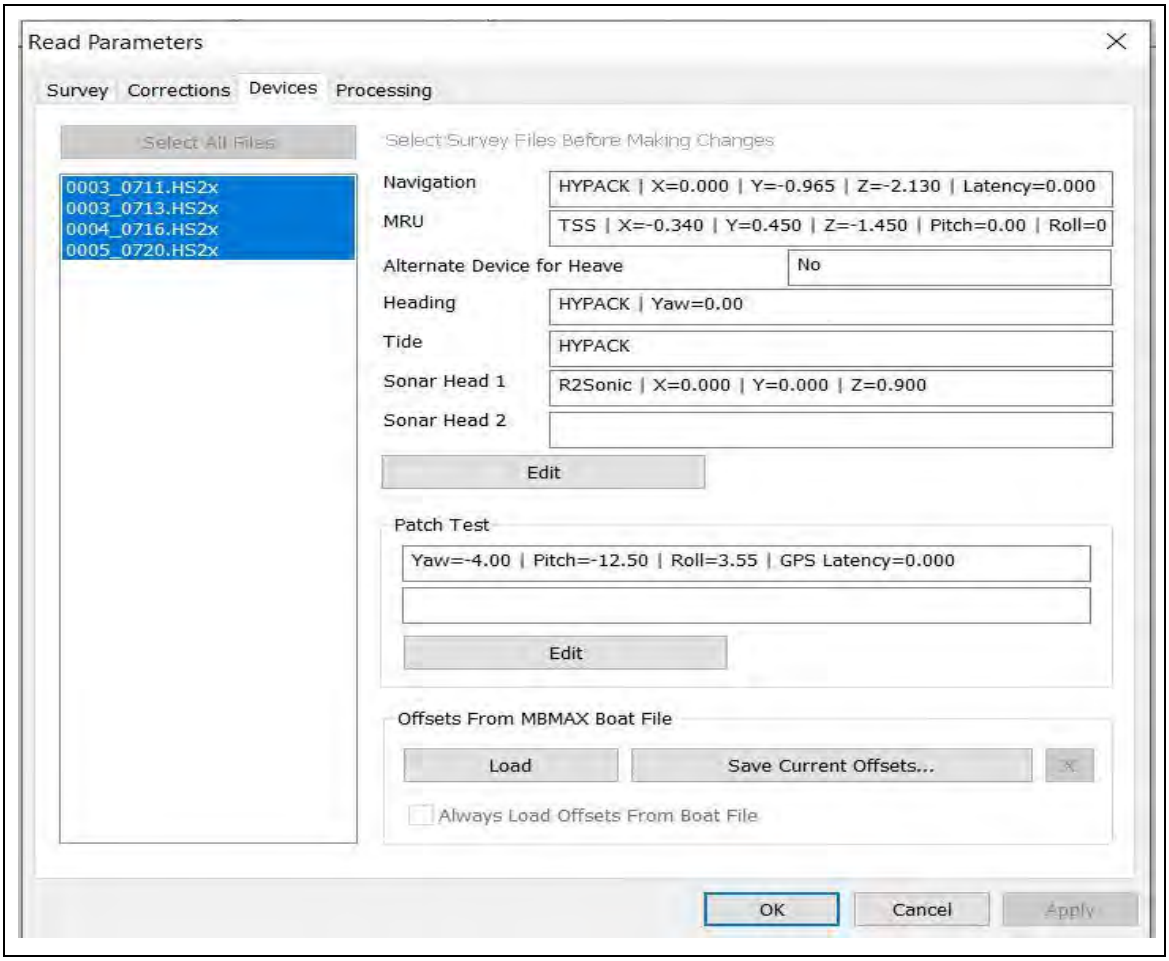


Figure 5-7: Multibeam sensor offsets of MBES survey boat "Bismi"

Roll Calibration:

- Three survey lines, were run in opposite directions at 4 knots over flat topography approximately 600m long with 100% overlap before the start of the survey.
- The sound velocity profile was carried out before running the calibration lines.
- Observed ATG tide of Coast guard jetty at Vizhinjam was applied with respect to Chart Datum correction to the calibration files.

Pitch Bias and Navigation Delay Calibration:

- Unlike the roll offset, these offsets will not cause false depth values, but will assign the measured depth values to wrong positions. Both calibrations are dependent on each other and have to be separated by calculating the offsets in a fixed order.
- Three lines were run in opposite directions for pitch and two lines were run in the same direction at different speeds, over a distinct object or a steep slope perpendicular to the contours.

Yaw Calibration:

Three lines were run in opposite directions for yaw correction on either side of a conspicuous object. This is often the same object that is used calculate the residual pitch bias and navigation time delay.

- The lines length was approximately 600m since the seabed feature exhibited a good slope in the area.
- The lines were run at normal survey speed, approximately 4 knots, to obtain a "suitably high resolution".

The Table below shows the calibration values which were obtained and used for data processing.

Table 5-2: MBES Calibration results

Parameter	Value	Comments
Latency	0.00s	Trimble SPS 461 positioning system
Roll	3.55°	DMS accuracy 0.05° in roll
Pitch	-12.50º	DMS accuracy 0.05° in pitch
Yaw	-4.00º	Accuracy better than 0.2°

The figure below provides the comparison grid (with and without calibration) to show the calibration results.

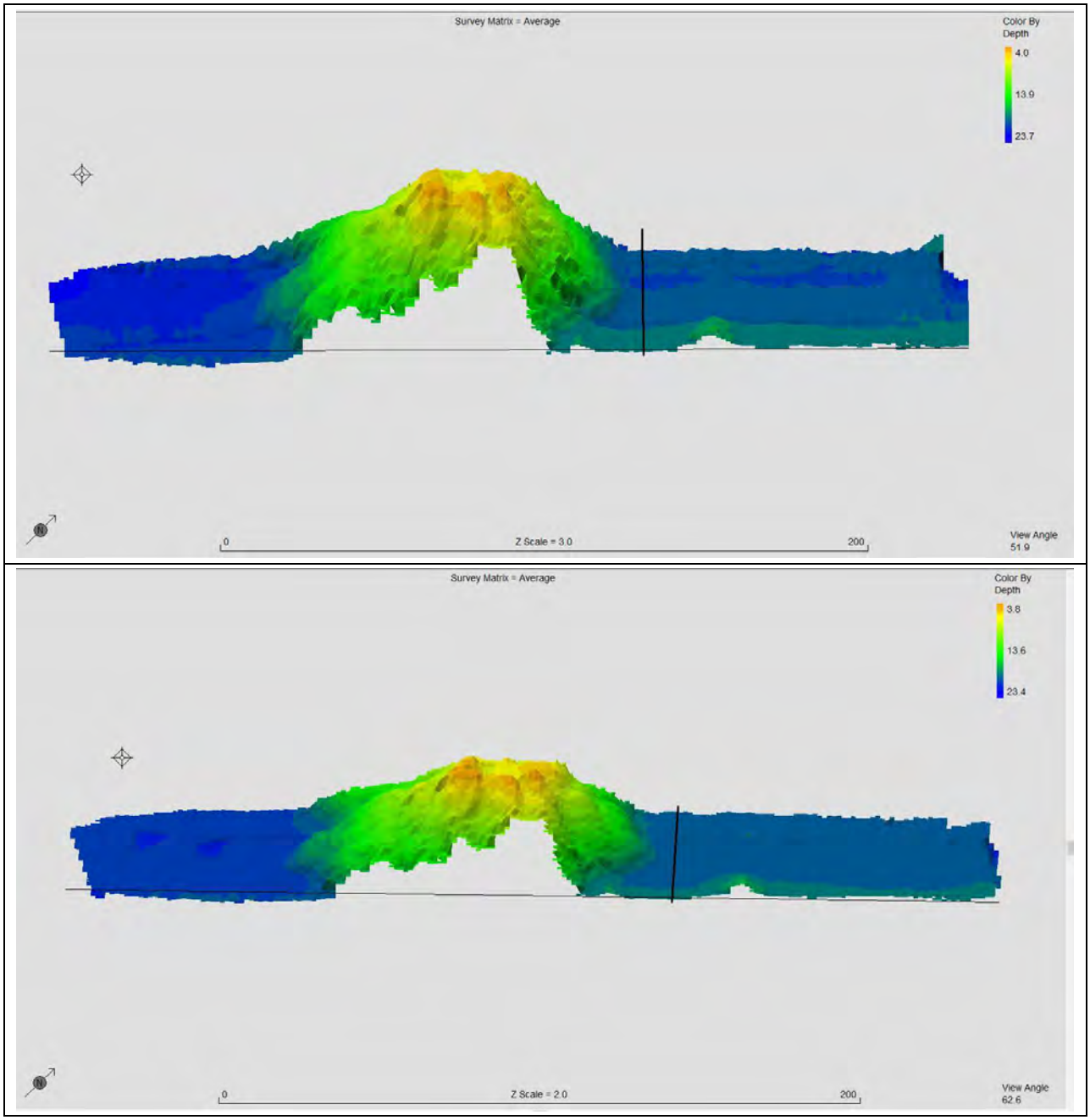


Figure 5-8: Calibration results with cross profiles (Above: without calibration, below: with calibration)

6 SURVEY RESULTS

① The following table illustrates the data collection parameters along with duration and frequency of measurement.

Table 6-1: Summary table of data collection parameters

Parameter	Duration of Measurement	Frequency of Measurement
Tide	1st April 2024 – 30th September 2024	6 minutes
Wave height and direction	1st April 2024 – 24th August 2024	10 minutes
Wind speed and direction	1st April 2024 – 30th September 2024	10 minutes
Current speed and direction		10 minutes
Temperature		10 minutes
Atmospheric Pressure		10 minutes
Relative Humidity		10 minutes
	Locations Surveyed	**Remarks**
Littoral Environment Observations	Apr 2024: 58 out of 81 May 2024: 65 out of 81 Jun 2024: 64 out of 81 Jul 2024: 64 out of 81 Aug 2024:64 out of 81 Sep 2024: 62 out of 81	CSP-1 to CSP-9 and CSP-23 to CSP-30 could not be approached due to protests from locals
Photographic Documentation	Apr 2024: 58 out of 81 May 2024: 65 out of 81 Jun 2024: 64 out of 81 Jul 2024: 64 out of 81 Aug 2024: 64 out of 81 Sep 2024: 62 out of 81	
Cross Shore Profiles	Apr 2024: 57 out of 81 (on) Apr 2024: 17 out of 81 (off) May 2024: 64 out of 81 (on) Jun 2024: 57 out of 81 (on) Jul 2024: 64 out of 81 (on) Aug 2024: 61 out of 81 (on) Sep 2024: 61 out of 81 (on)	CSP -1 to CSP-9 and CSP-23 to CSP-30 could not be approached due to protests from locals. Offshore profiles could not be attempted due to rough weather
Near Shore Survey	3 out of 42	Could not be attempted due to instrument damage and rough weather
Shoreline monitoring Survey	88%	CSP-1 to 9 and CSP-23 to 30 could not be approached due to

		protests from the locals
Collection of beach samples	44 out of 81 (pre-monsoon 2024 season)	Some samples could not be collected due to local protests and lack of beach. BS-01 to BS-09 and BS-23 to BS-30 could not be collected due to protest from locals
Collection of water samples	132 out of 132 (pre-monsoon 2024 season)	-
Bathymetry	Pre-monsoon 2024	445 / 1300 line km

6.1 Tidal Measurements

The tides were observed near the newly constructed berth inside the breakwater. The tide is referenced to the chart datum. The latest updated image of the jetty top value marked on the wharf to which the tide gauge has been levelled is provided below.

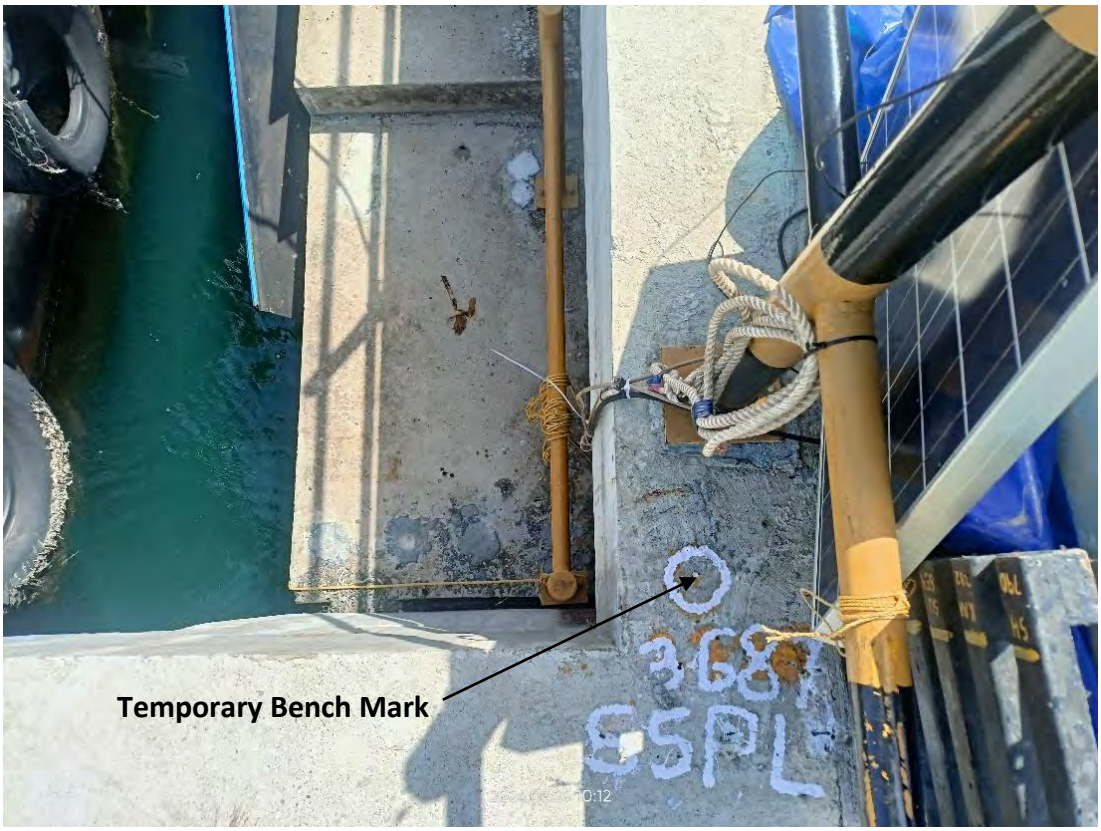


Figure 6-1: Location of TBM

The offset calculation of the Tidemaster tide gauge based on the 'jetty top' value is given in the figure below:

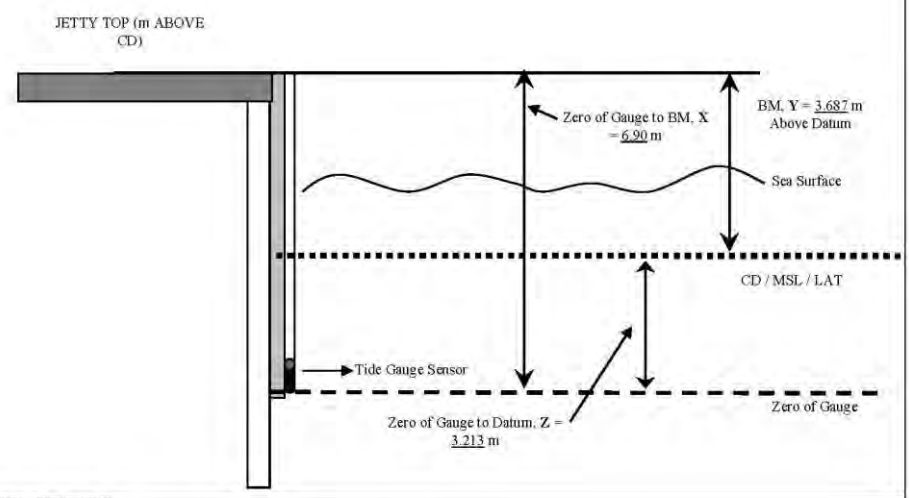
SHANKAR SURVEYS

OP 21
ATG Installation Schematic

Job Number	P050-24	**Project**	AVPPL Shoreline Monitoring
Client	AVPPL		
Location	Vizhinjam	**Installation Date**	01/08/2024
Tide Gauge Sr. No.	84143	**Party Chief**	Sachu S.

Tide Gauge setup refers to: ✓ **CD** | **MSL** | **LAT**

Diagram



Bench Mark details:

Value of Bench Mark	**3.687 Meters above Chart Datum**
Levelled By	**Abhiram J.**
Date	**19/07/2024**

Checked the level from zero of the gauge to TBM on: 13/08/2024

Calculations:

X, Length from Bench Mark to Zero of Tide Gauge	**6.90 m**
Y, Level of Bench Mark above Datum	**3.687 m**
Z, Tide Correction factor, Z=X - Y	**3.213 m**
Tide height in m above Datum = Raw Tide reading - Z	

Signature:

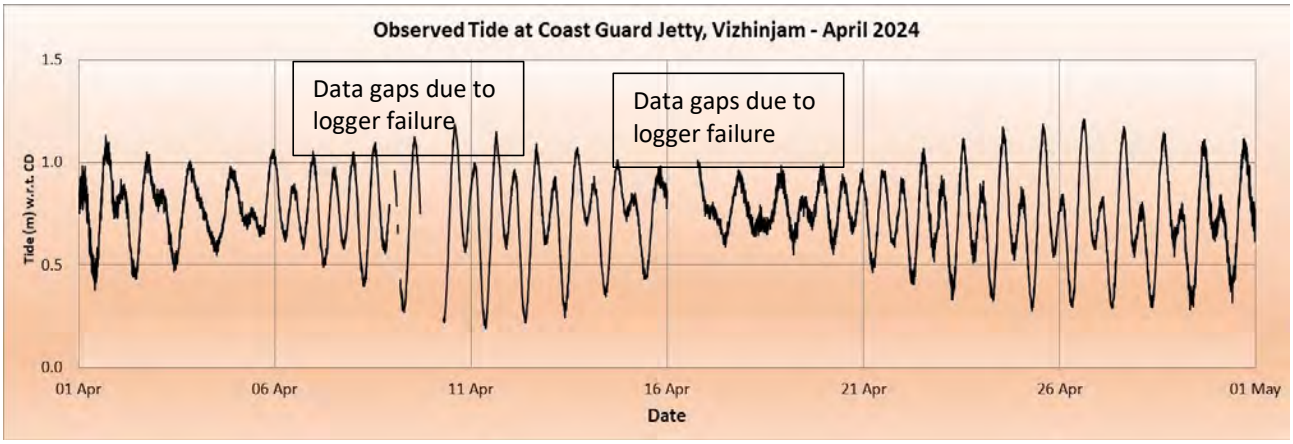
Party Chief	**Sachu S.**
Surveyor / Engineer	**Ajeesh Anilkumar**

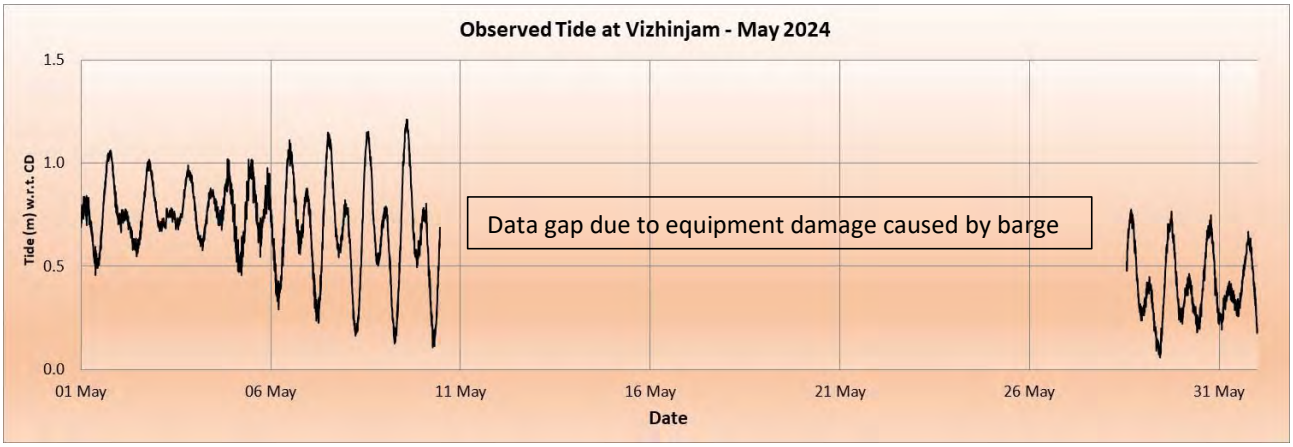
OP 21 Page: 1 of 1 Rev. No. 0: Date: 29 July 2024

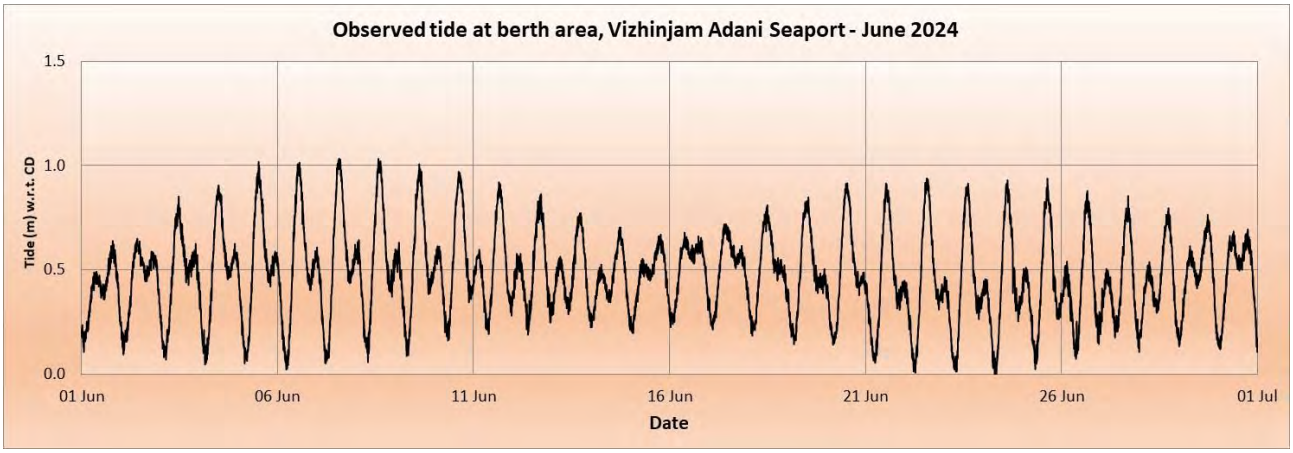
Figure 6-2: Schematic Diagram of Valeport Tidemaster Tide Gauge

The tides observed are mixed semi-diurnal in nature, with the maximum range being observed in the springs. The representation of tide data collected, in the form of graphs is placed below.

①







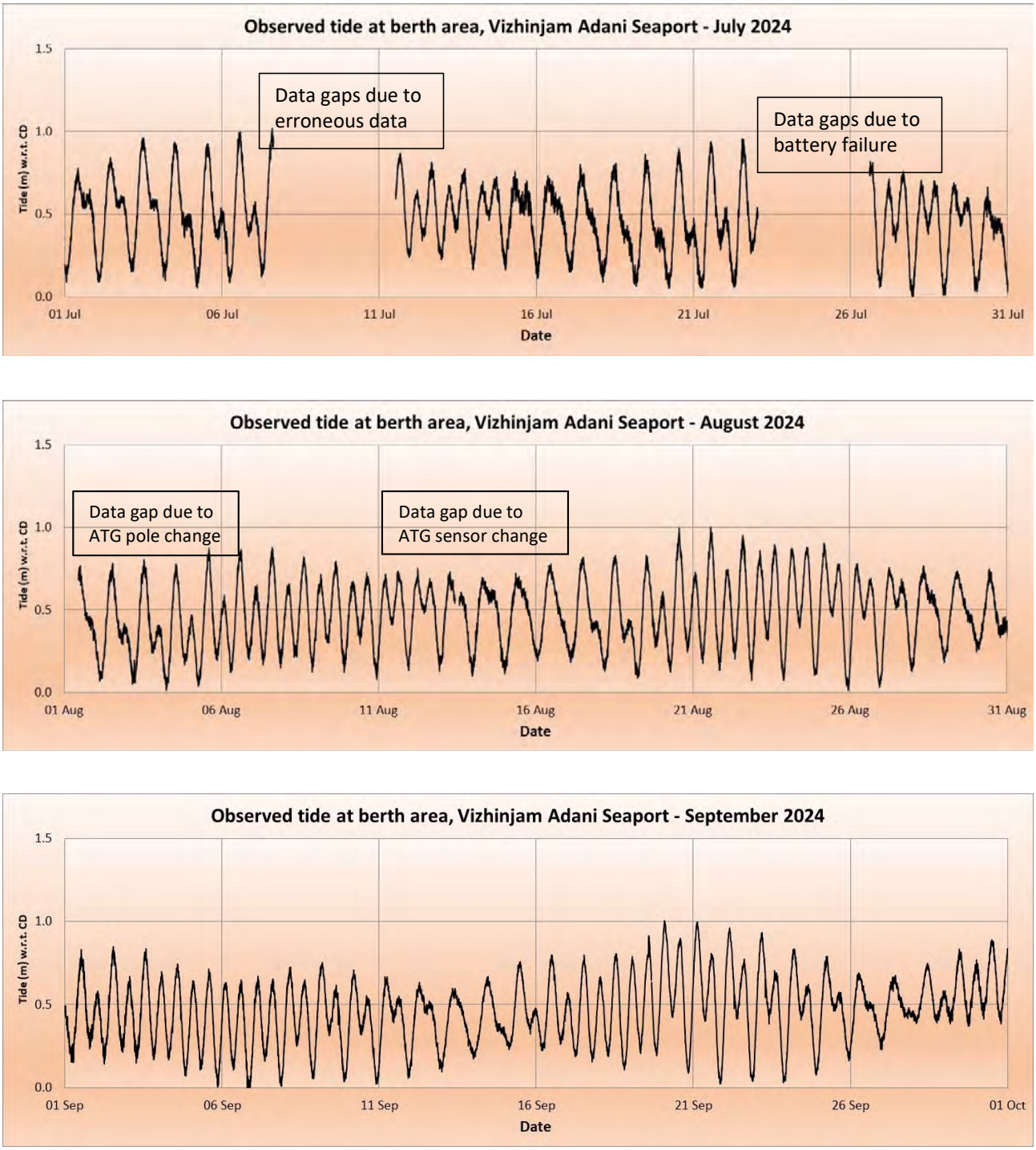


Figure 6-3: Time series of tide

6.2 Wave Measurements

The data from the WRB (provided by INCOIS after processing and quality control) was used to produce the time series and rose diagram, which are provided below:

Refer to the following rose plots of significant height (Hs) v/s direction for the entire period from April 2024 to September 2024.

The WRB drifted away on 24th August 2024. It was redeployed on 8th October 2024, therefore, no wave data is available from 24th August to 30th September 2024.

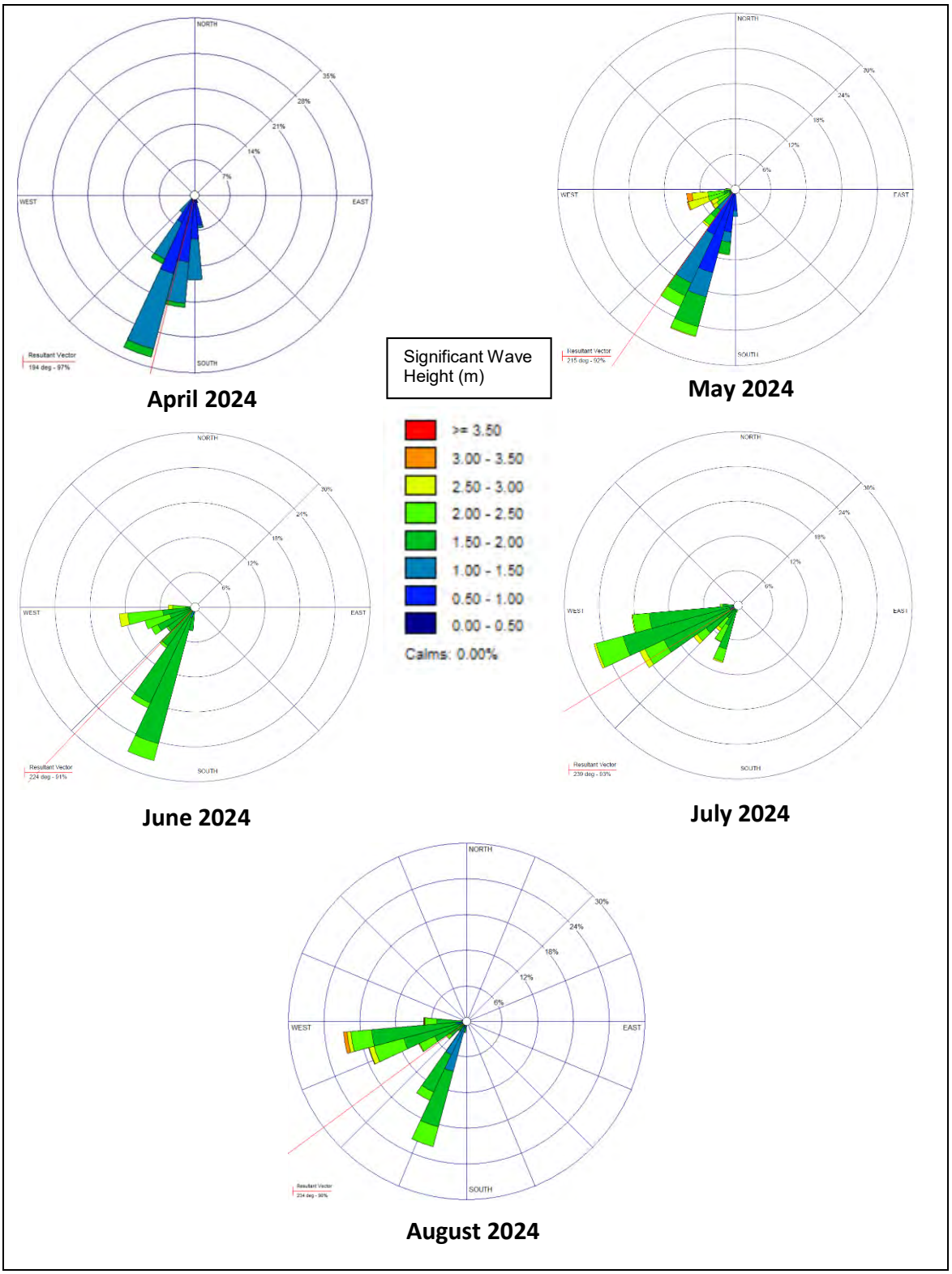


Figure 6-4: Wave Rose (Hs in metre v/s Direction)

① The following table provides the monthly maximum significant wave height (Hs), wave period (Tp) and Zero upcross period (Tz) observed during the period from April 2024 to September 2024.

Table 6-2: Monthly maximum Hs and Tp

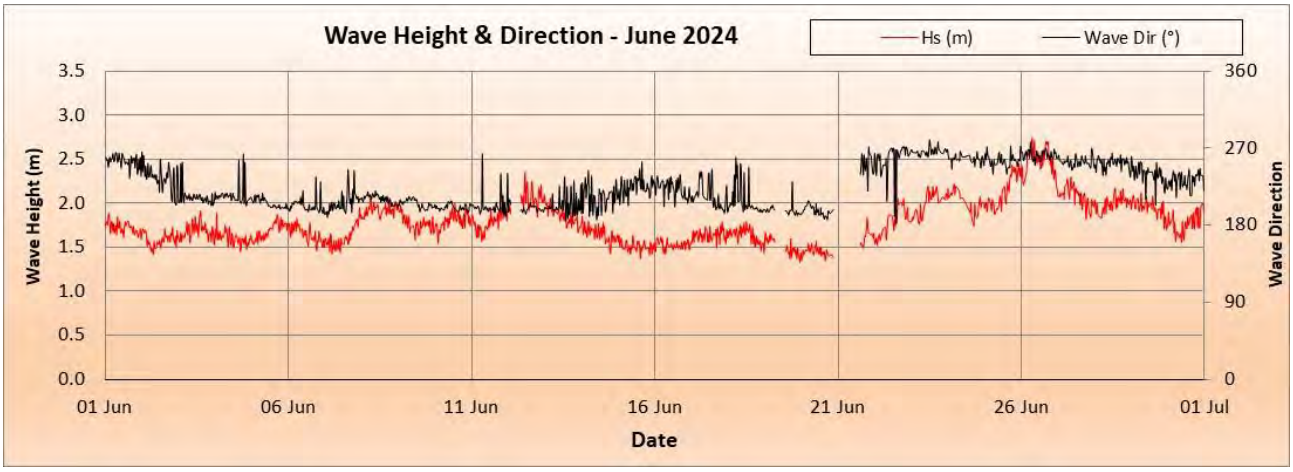
Maximum significant wave height (Hs), Maximum wave period (Tp) and Zero upcross period (Tz)				
Month	**Hs (m)**	**Predominant Direction (°)**	**Tp (sec)**	**Tz (sec)**
April 2024	1.84	194	18.18	10.41
May 2024	3.35	215	22.22	7.57
June 2024	2.74	224	20.00	8.92
July 2024	2.78	239	21.35	9.69
August 2024	3.30	214	25.00	11.92
September 2024	No data	No data	No data	No data

The above table indicates that with the onset of monsoon, the wave heights increased.

The time series of the available wave data from April 2024 to September 2024 is shown below.


Wave Height & Direction - April 2024
Hs (m)
Wave Dir (°)
Wave Height (m)
Wave Direction
0
1
2
3
4
5
6
7
0
90
180
270
360
01 Apr
06 Apr
11 Apr
16 Apr
21 Apr
26 Apr
01 May
Date


Wave Height & Direction - May 2024
Hs (m)
Wave Dir (°)
Wave Height (m)
Wave Direction
0
1
2
3
4
5
6
7
0
90
180
270
360
01 May
06 May
11 May
16 May
21 May
26 May
31 May
Date


Wave Height & Direction - June 2024
Hs (m)
Wave Dir (°)
Wave Height (m)
Wave Direction
0.0
0.5
1.0
1.5
2.0
2.5
3.0
3.5
0
90
180
270
360
01 Jun
06 Jun
11 Jun
16 Jun
21 Jun
26 Jun
01 Jul
Date

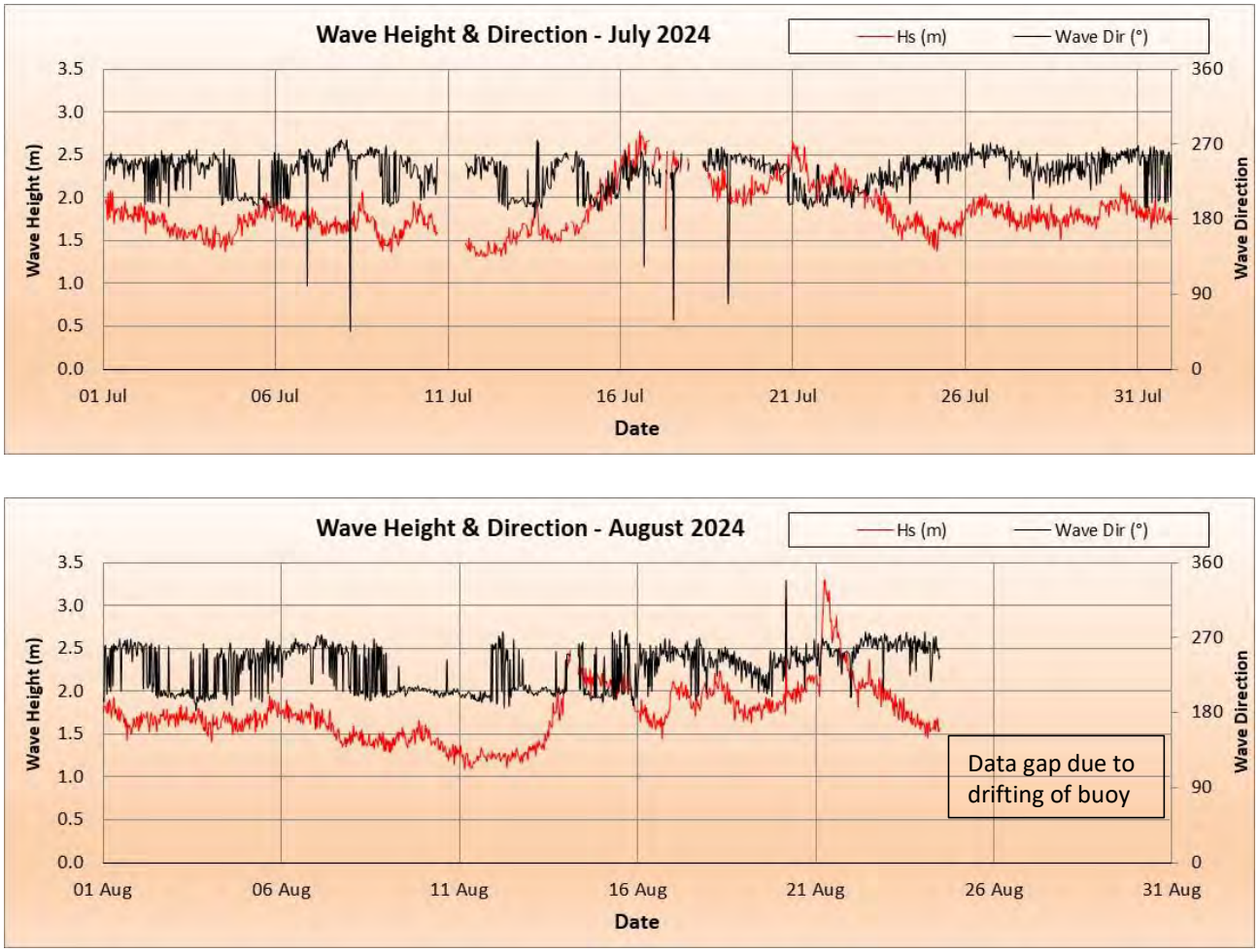


Figure 6-5: Time series of wave parameters

6.3 Current observations from WRB

The data from the wave rider buoy also has the surface current speeds and directions at the location. The data available for the period of April 2024 to September 2024 is documented here.

Refer to the following rose plots of current speed v/s direction for the available data.

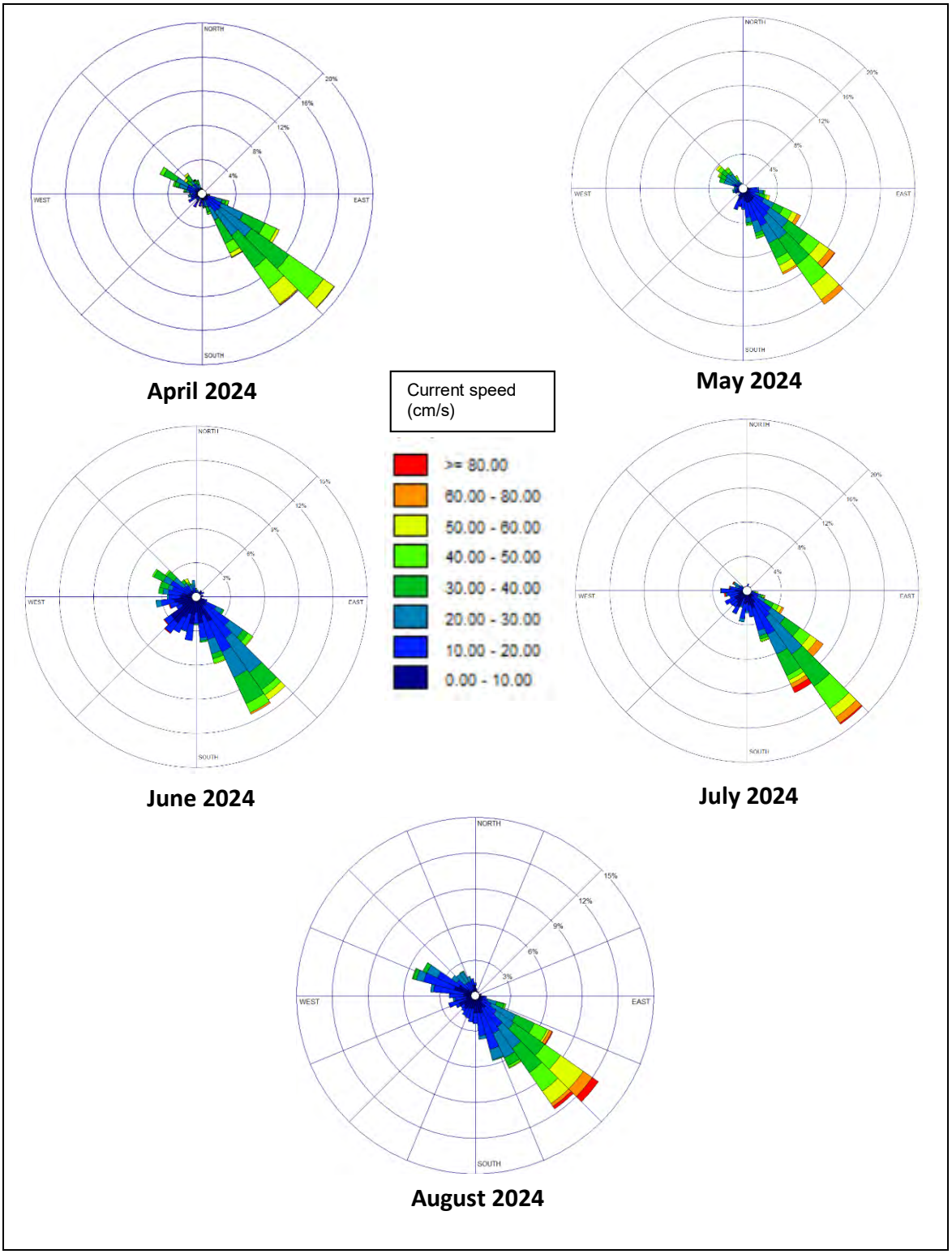


Figure 6-6: Wave Rose (current speed v/s direction)

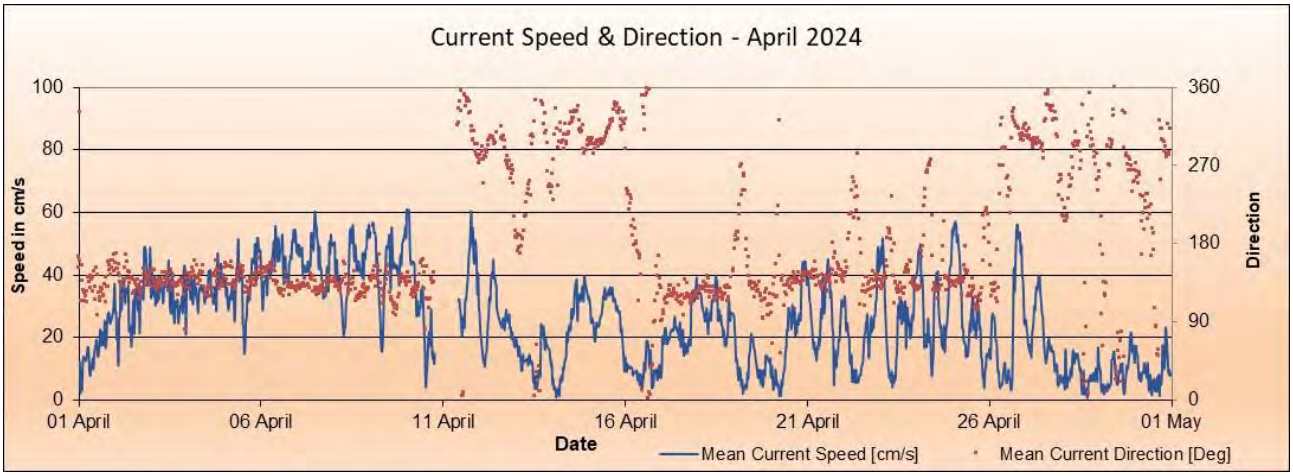
The following table provides the monthly maximum surface current speed (cm/s) and predominant direction observed during the period from April 2024 to September 2024.

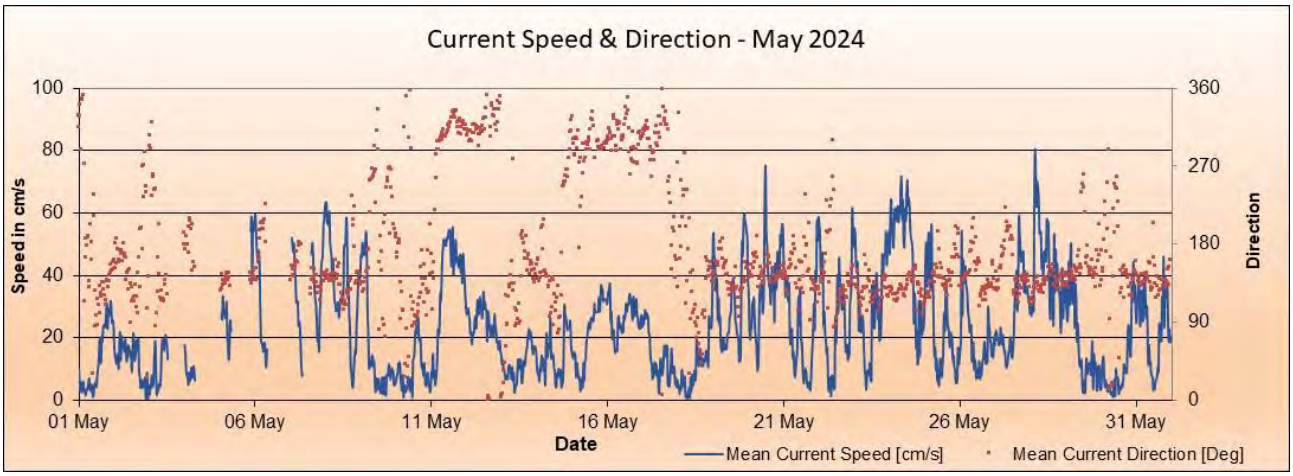
Table 6-3: Monthly maximum current speed and predominant direction

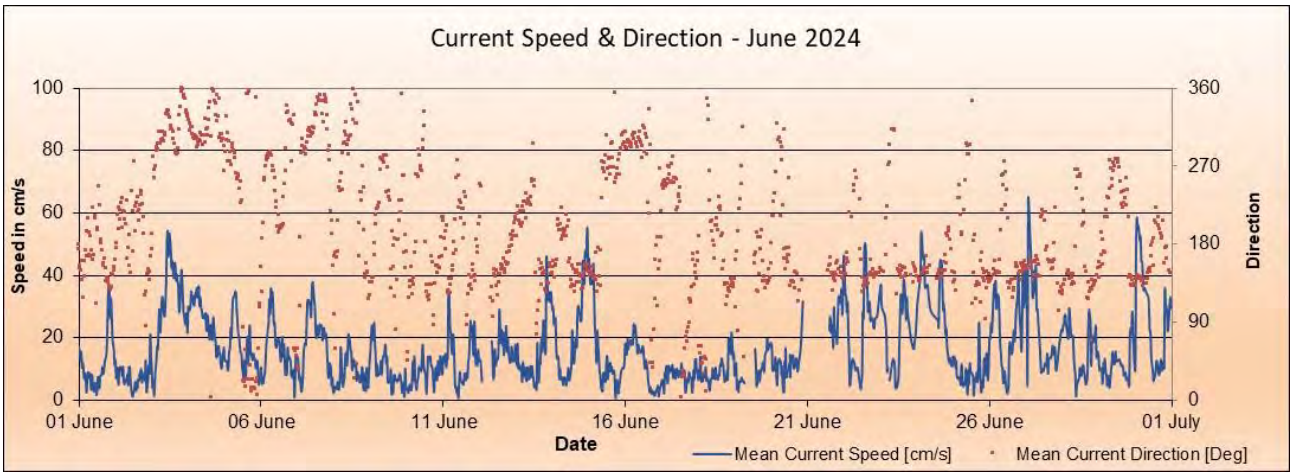
Maximum current speed (cm/s) and predominant direction		
Month	**Speed (cm/s)**	**Predominant Direction**
April 2024	60.9	Southeast
May 2024	80.4	Southeast
June 2024	64.7	Southeast
July 2024	91.2	Southeast
August 2024	87.9	Southeast
September 2024	No data	No data

The rose plot reveals a flow parallel to the shore. During the observation period, the flow was predominantly towards the southeast. The current speed increased with the onset of monsoon.

The time series of the available current data from April 2024 to September 2024 is shown below:


Current Speed & Direction - April 2024
Speed in cm/s
Direction
Date
01 April
06 April
11 April
16 April
21 April
26 April
01 May
Mean Current Speed [cm/s]
Mean Current Direction [Deg]


Current Speed & Direction - May 2024
Speed in cm/s
Direction
Date
01 May
06 May
11 May
16 May
21 May
26 May
31 May
Mean Current Speed [cm/s]
Mean Current Direction [Deg]


Current Speed & Direction - June 2024
Speed in cm/s
Direction
Date
01 June
06 June
11 June
16 June
21 June
26 June
01 July
Mean Current Speed [cm/s]
Mean Current Direction [Deg]

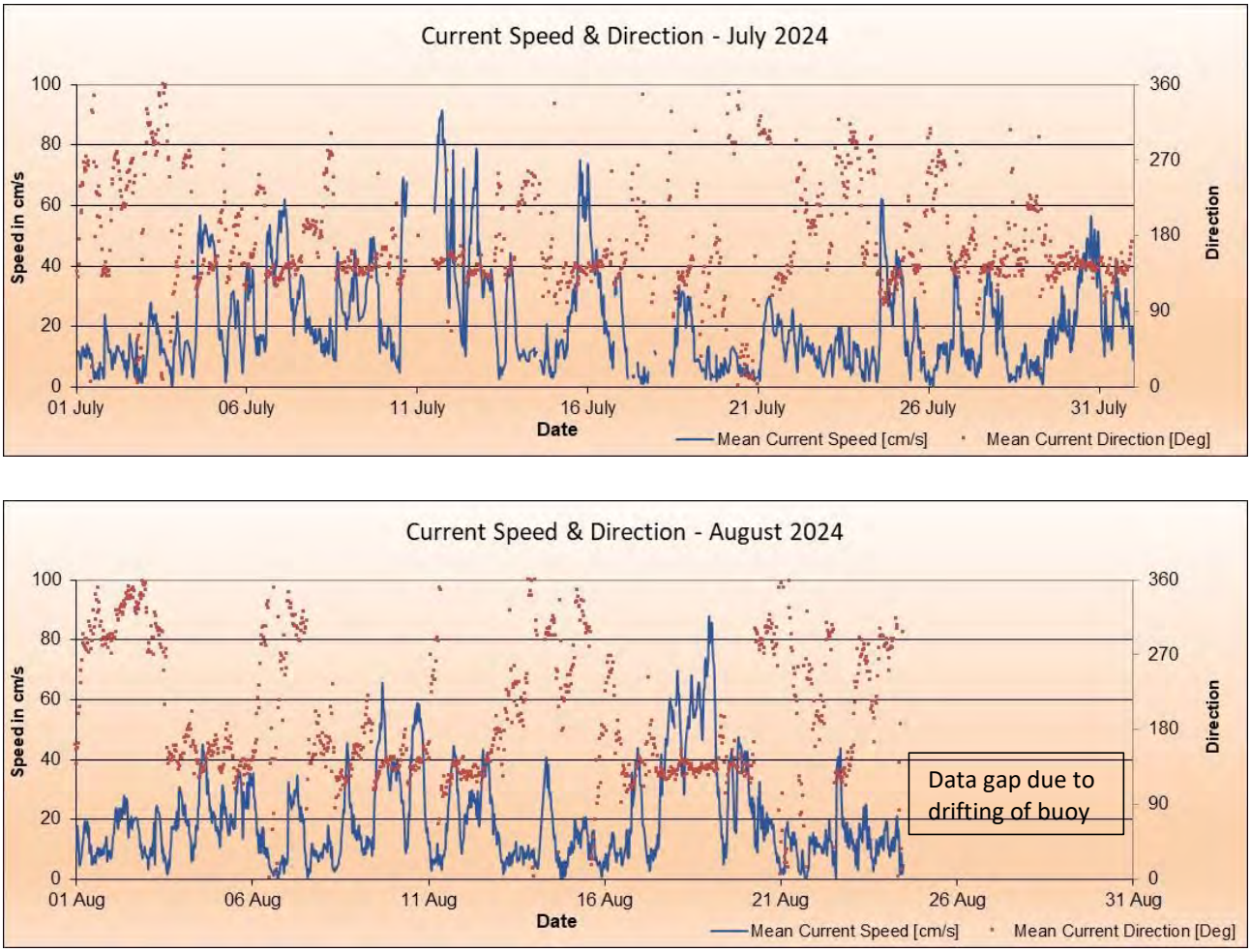


Figure 6-7: Time series of current and direction

6.4 Measurement of Meteorological Parameters

The automatic weather station was installed on the terrace of the Port Control Office building. On 3rd July, the same was shifted to the Sub-station building. The wind data from April 2024 to September 2024 is compiled and presented in the form of rose plots below.

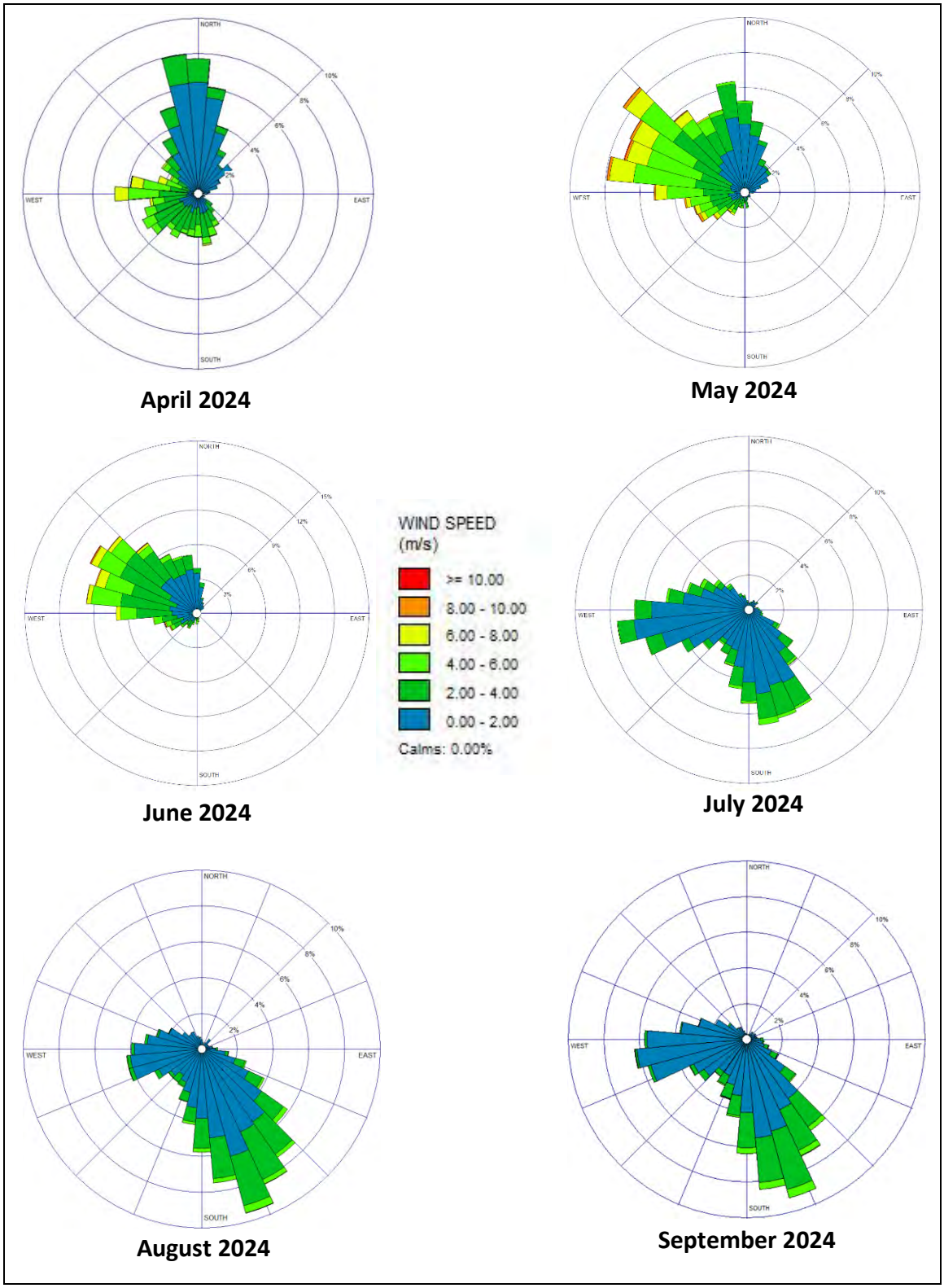


Figure 6-8: Wind rose (Speed in m/s vs direction)

The monthly maximum wind speed and predominant direction are provided in the tables below.

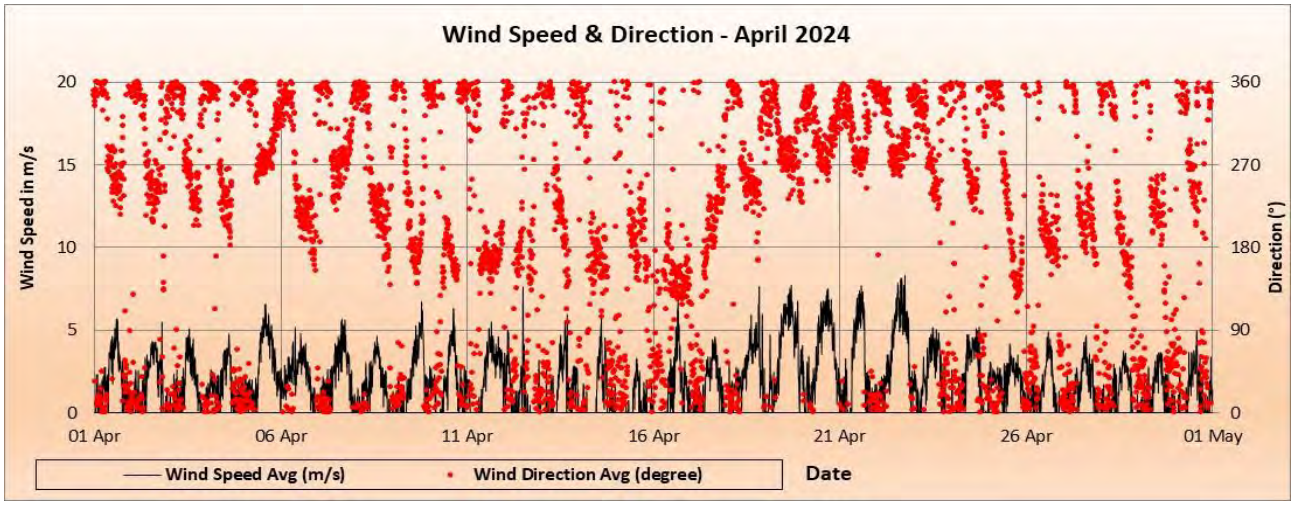
Table 6-4: Monthly maximum landward wind speed

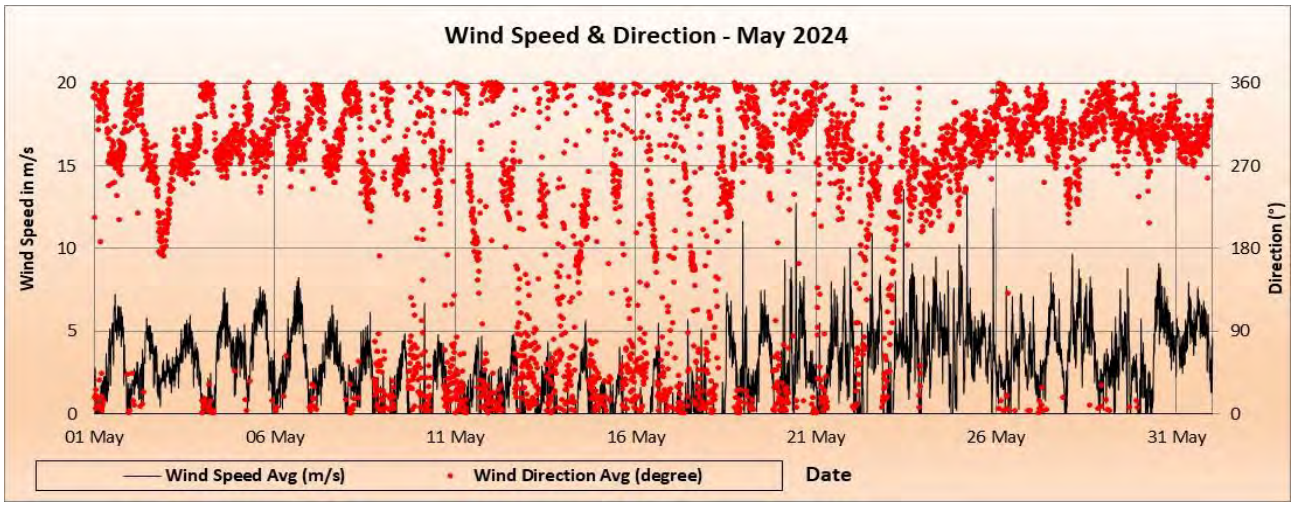
Month	Wind Speed (m/s)	Predominant Direction (°)
April 2024	7.57	47.77
May 2024	5.95	34.33
June 2024	6.49	30.72
July 2024	6.38	150.77
August 2024	5.62	146.45
September 2024	7.2	151.65

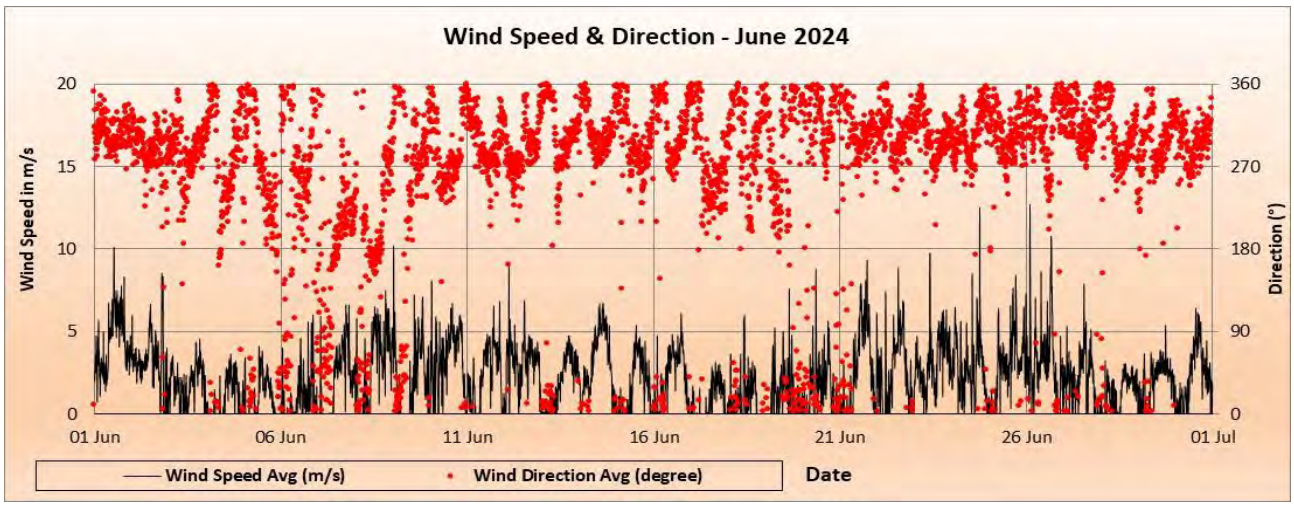
Table 6-5: Monthly maximum seaward wind speed

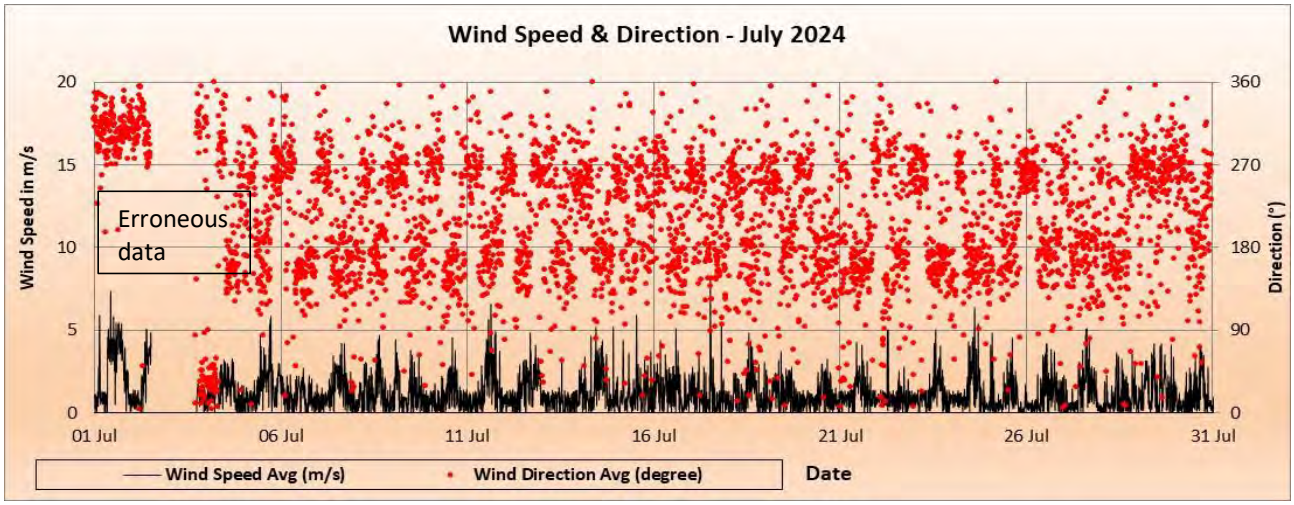
Month	Wind Speed (m/s)	Predominant Direction (°)
April 2024	8.34	281.65
May 2024	13.58	296.76
June 2024	12.47	296.38
July 2024	8.11	256.96
August 2024	4.74	251.70
September 2024	7.21	251.49

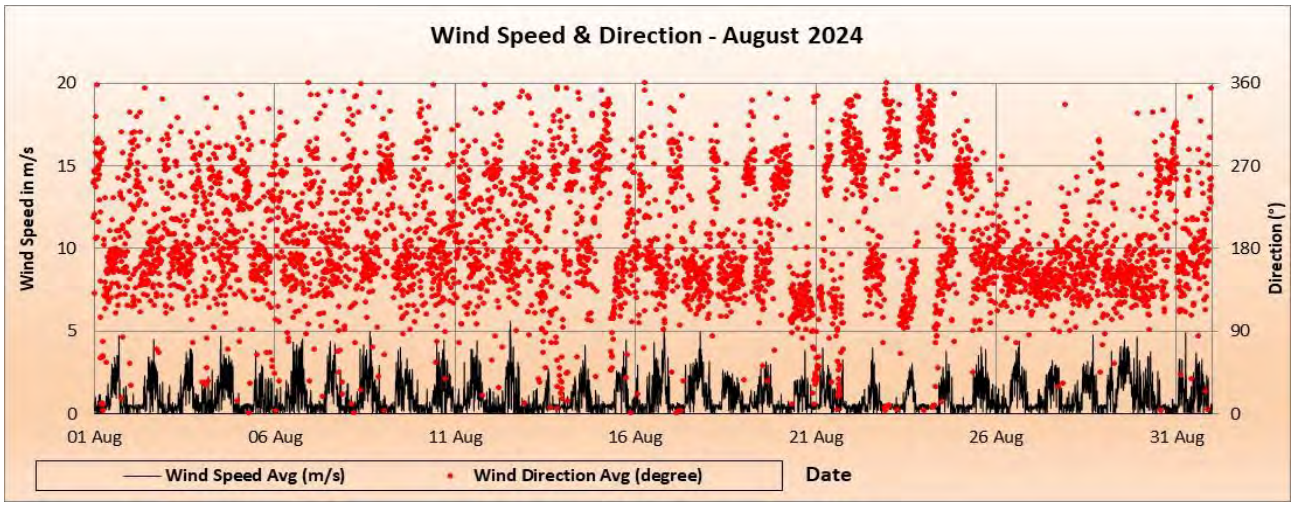
The time series of wind data from April 2024 to September 2024 is shown below:


Wind Speed & Direction - April 2024
Wind Speed in m/s
Direction (°)
0
5
10
15
20
0
90
180
270
360
01 Apr
06 Apr
11 Apr
16 Apr
21 Apr
26 Apr
01 May
Wind Speed Avg (m/s)
Wind Direction Avg (degree)
Date


Wind Speed & Direction - May 2024
Wind Speed in m/s
Direction (°)
0
5
10
15
20
0
90
180
270
360
01 May
06 May
11 May
16 May
21 May
26 May
31 May
Wind Speed Avg (m/s)
Wind Direction Avg (degree)
Date


Wind Speed & Direction - June 2024
Wind Speed in m/s
Direction (°)
0
5
10
15
20
0
90
180
270
360
01 Jun
06 Jun
11 Jun
16 Jun
21 Jun
26 Jun
01 Jul
Wind Speed Avg (m/s)
Wind Direction Avg (degree)
Date





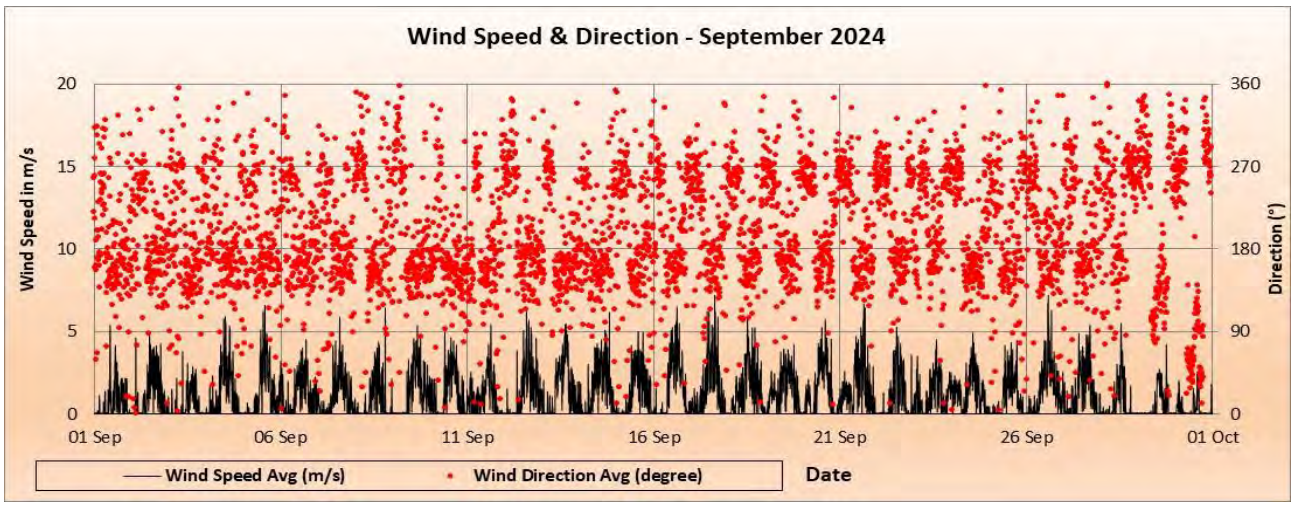


Figure 6-9: Time series of wind data

The percentage occurrence tables for atmospheric pressure, temperature and relative humidity for the period of April 2024 to September 2024 are shown below.

Table 6-6: Frequency distribution of atmospheric pressure

Frequency Distribution	Apr-24	May-24	Jun-24	Jul-24	Aug-24	Sep-24
Atm. Pressure (mb)	**Percentage Occurrence**					
<1000	53.88	84.25	65.37	86.72	60.19	65.41
1000-1004	39.87	15.46	32.55	13.28	36.83	34.29
1004-1008	6.25	0.29	2.08	0.00	2.98	0.30
>1008	0.00	0.00	0.00	0.00	0.00	0.00
Total	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**

Table 6-7: Frequency distribution of temperature

Frequency Distribution	Apr-24	May-24	Jun-24	Jul-24	Aug-24	Sep-24
Temperature (°)	**Percentage Occurrence**					
20-24	0.00	0.00	0.00	0.00	0.00	0.00
24-28	0.00	0.07	2.34	9.33	27.37	8.01
28-32	36.14	27.36	48.08	21.82	43.28	34.94
>32	63.86	72.57	49.58	68.84	29.35	57.05
Total	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**

Table 6-8: Frequency distribution of relative humidity

Frequency Distribution	Apr-24	May-24	Jun-24	Jul-24	Aug-24	Sep-24
Rel. Humidity (%)	**Percentage Occurrence**					
50-60	0.00	0.00	0.00	0.00	0.00	0.00
60-70	2.89	0.63	0.00	0.37	1.08	0.74
70-80	54.60	29.29	2.36	15.89	17.72	25.79
>80	42.51	70.09	97.64	83.73	81.21	73.47
Total	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**

Table 6-9: Cumulative rainfall in mm

Cumulative rainfall in mm	Apr-24	May-24	Jun-24	Jul-24	Aug-24	Sep-24
	60.6	210.0	212.0	216.4	83.2	138.6

The frequency histograms for atmospheric pressure, temperature and relative humidity for the period of April 2024 to September 2024 are shown below.

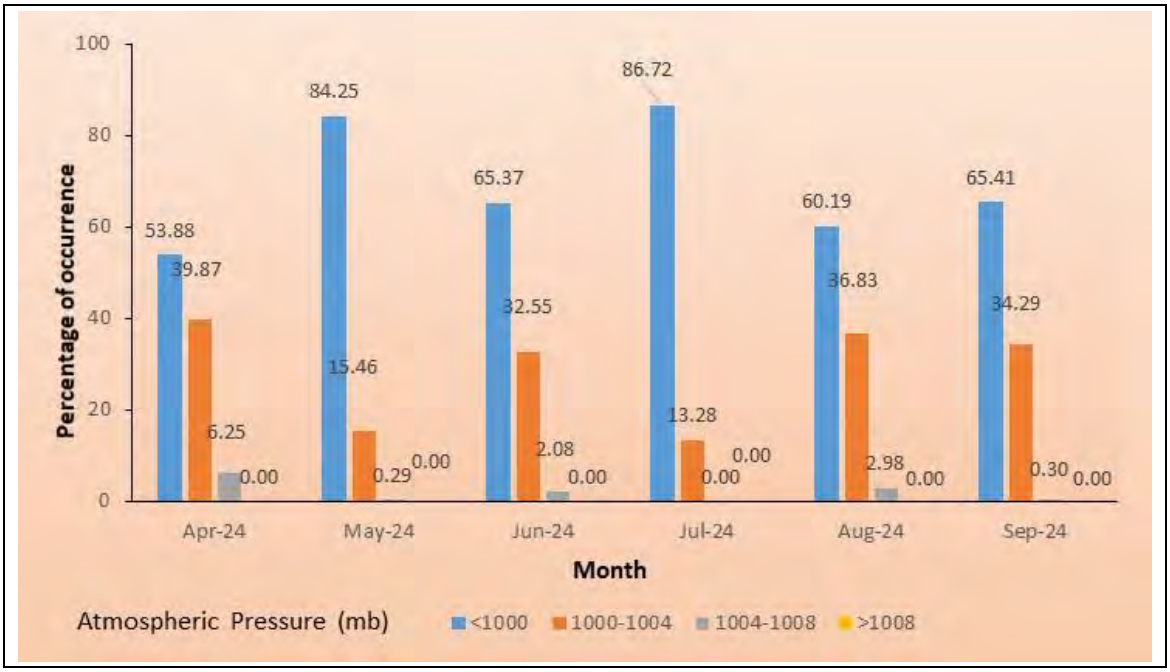


Figure 6-10: Histogram of atmospheric pressure

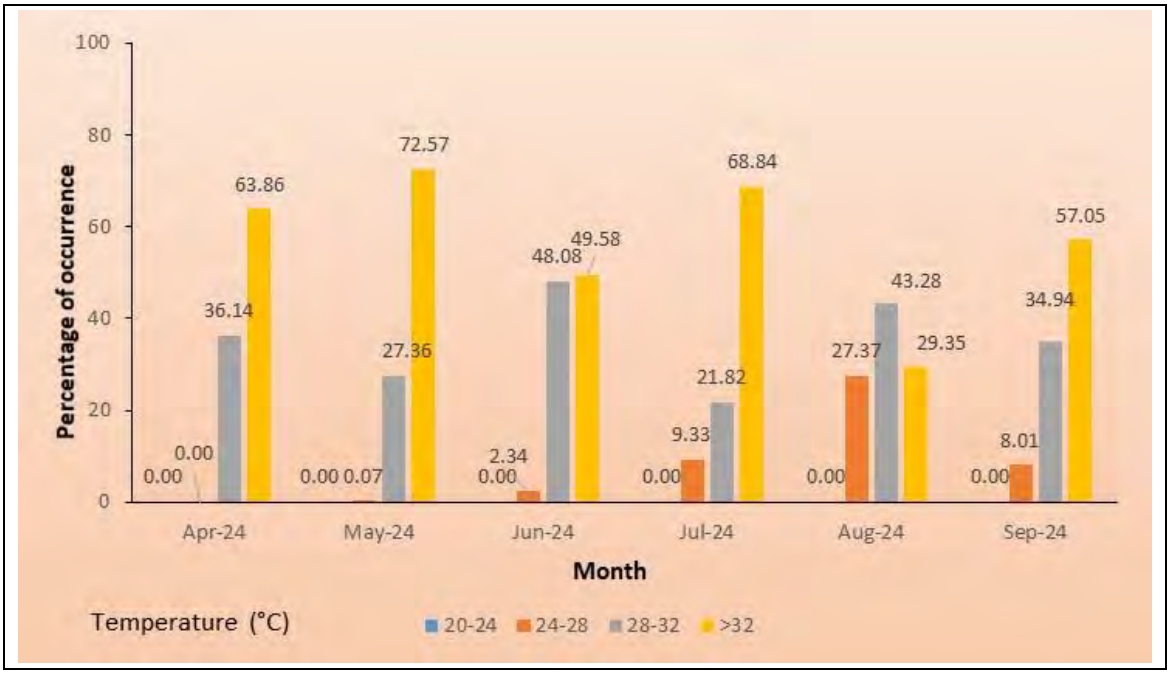


Figure 6-11: Histogram of temperature

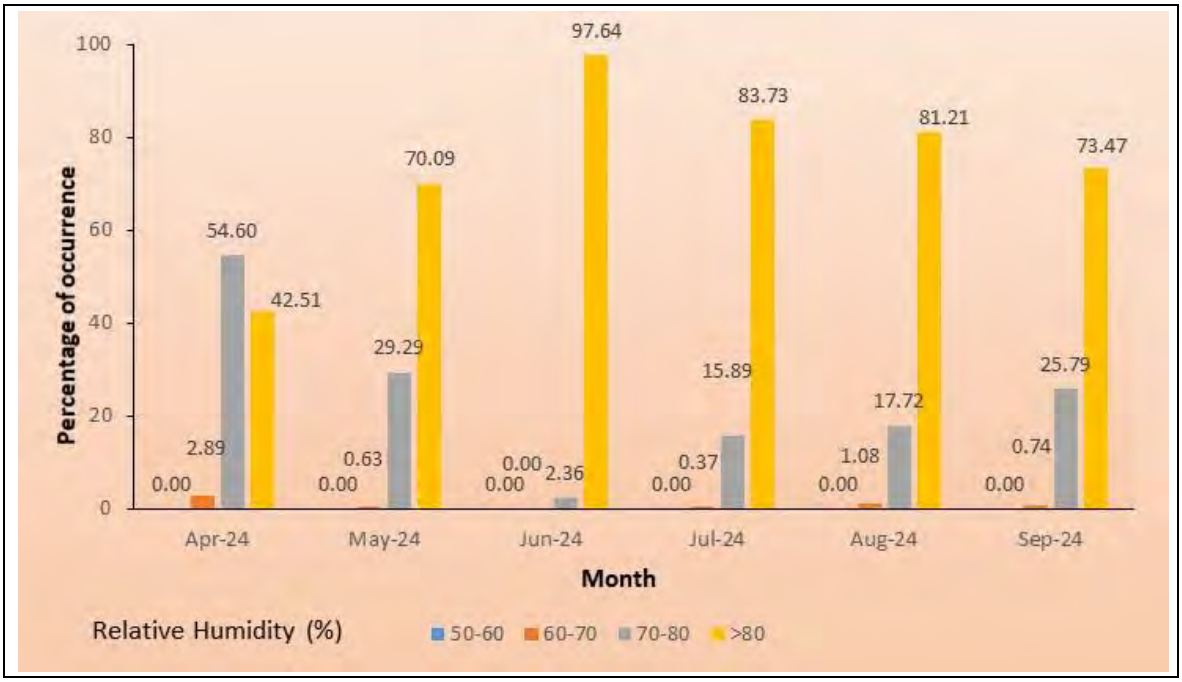


Figure 6-12: Histogram of relative humidity

Figure 6-13: Histogram of cumulative rainfall

The data reveals that the temperature decreased with the onset of monsoon. The maximum occurrence of relative humidity readings greater than 80% was observed in the month of July 2024.

6.5 Littoral Environment Observations

① The LEO was to be carried out at 81 locations from April 2024 to September 2024. In the month of April 2024, 57 locations were covered, 65 locations in May 2024, 64 locations in June, July and August 2024 and 62 locations in September 2024. The CSP locations 1 to 9 and 23 to 30 in which the LEO could not be carried out were primarily due to increased opposition faced from the locals residing in those areas. In the month of September 2024, the agitation had spread to CSP locations 10 and 11 as well, hence, the LEO activity was hampered at these locations also. The LEO plate was deployed at all the locations and the same was tracked for about five minutes, as per the site conditions. The initial and final GPS positions were then used to calculate the SOG and COG. The estimated wave height, angle of wave, period and the stretch of breakers were also noted down in the log.

The along shore current followed a northward trend in the post-monsoon 2023 period. The following table shows the maximum along shore current speed recorded in each month.

Table 6-10: Monthly maximum along shore current

Month	Max Speed (cm/s)	Predominant Direction	Line No.	Location
April 2024	12.20	North	49	Panathura
May 2024	26.70	North	67	Valiyathura
June 2024	9.47	South	12	Pozhiyoor
July 2024	23.46	South	77	Kochuveli
August 2024	17.20	South	38	Adani Port Office
September 2024	17.20	South	38	Adani Port Office

A pictorial representation of the alongshore current direction during the pre-monsoon 2024 and monsoon 2024 periods is shown in the Google Earth image below.

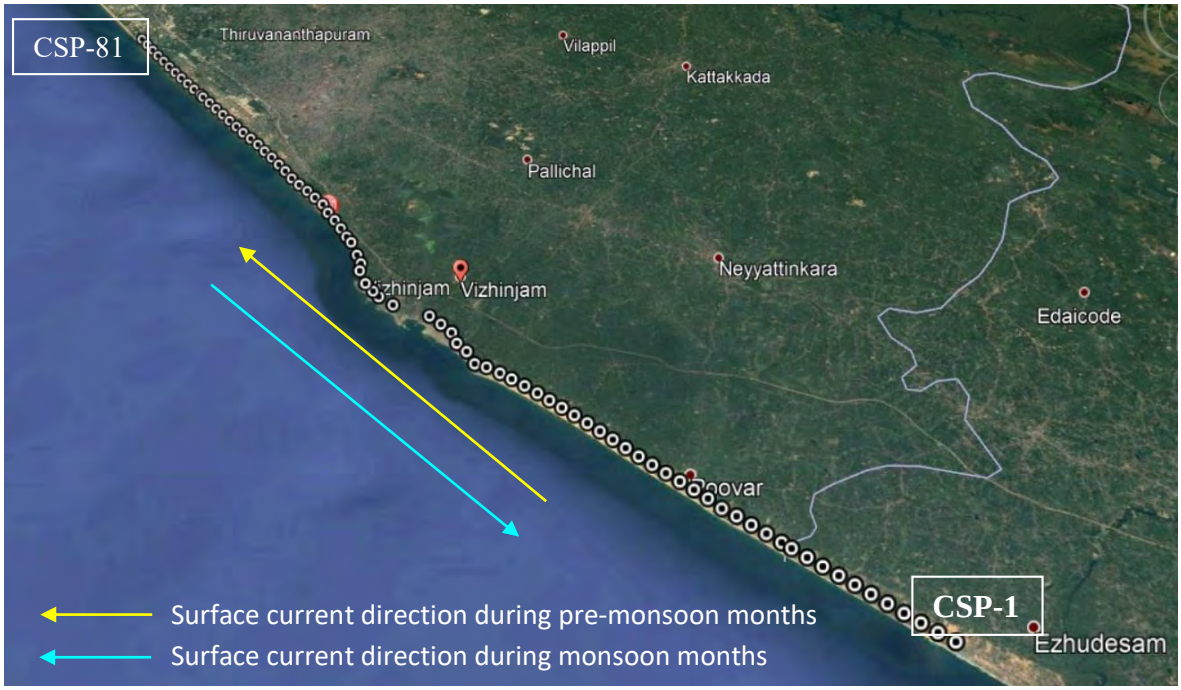


Figure 6-14: Representation of surface current direction from April to September 2024

6.6 Photographic Documentation

Photographic documentation was to be carried out for all the 81 locations from April 2024 to September 2024, coinciding with the cross-shore profiling. Due to the local agitation, photographic documentation could not be carried out at CSP locations 1 to 9 and 23 to 30.

The latest photographs for the month of September 2024 are provided in **Annexure I**. As a common reference point, a flag was fixed at each of the cross-shore profiling alignments while taking the photograph. Using the RTK system, this point was staked during the photography.

6.7 Cross Shore Profiles

The cross-shore profiling for the period was carried out using RTK in the onshore region and a wide swath bathymetric system in the offshore region. The offshore profiling could not be carried out in the months of May 2024 to September 2024 as a result of bad weather and rough sea conditions. The nearest depth which could be attained was about 4m to 5m due to the presence of waves breaking in the zone. The boat is not able to approach this zone, due to breakers nearshore considering the safety of personnel onboard.

The table below provides the identification of CSP vis-à-vis the local name. CSP locations 1 to 11 and 23 to 30 were not approachable due to the protests from locals in these areas. Hence, the shoreline details are not available. However, the details of groynes have been provided.

Table 6-11: CSP Location names

CSP NO.	LANDMARK	LOCATION	SITE CONDITION
CSP-1	CATHOLIC CHARISMATIC PRAYER CENTER	EDAPPADU BEACH	Groyne No. 1
CSP-2			Inaccessible due to opposition from locals
CSP-3			Inaccessible due to opposition from locals
CSP-4	ST. MARY'S CHURCH	VALLAVILAY	Groyne Nos. 2 to 5 in the vicinity
CSP-5			Groyne Nos. 6 to 8 in the vicinity
CSP-6			Groyne Nos. 9 to 13 in the vicinity
CSP-7	ST. NICOLAS' CHURCH	NEERODY	Groyne Nos. 14 to 16 in the vicinity
CSP-8			Groyne Nos. 17 to 21 in the vicinity
CSP-9			Groyne Nos. 22 to 24 in the vicinity
CSP-10	SREE BHADRAKALI TEMPLE	POZHIYOOR	Groyne Nos. 25 to 27 in the vicinity
CSP-11			Groyne Nos. 28 and 29 in the vicinity
CSP-12			Seawall
CSP-13	ST. MATHEW'S CHURCH	PARUTHIYOOR	Seawall
CSP-14	CHURCH OF CHRIST		Seawall
CSP-15	POOVAR ISLAND RESORT	POOVAR BEACH SOUTH	Beach
CSP-16			Beach
CSP-17			Beach
CSP-18	POZHIKARA BEACH	POOVAR	Beach
CSP-19			Beach
CSP-20	ST. ANTONY'S CHAPEL	POOVAR BEACH NORTH	Beach
CSP-21			Beach
CSP-22	ST. ANTONY'S CHURCH	KARUMKULAM	Beach
CSP-23			Inaccessible due to opposition from locals
CSP-24			Inaccessible due to opposition from locals
CSP-25			Inaccessible due to opposition from locals
CSP-26			Inaccessible due to opposition from locals
CSP-27	GOTHAMBU ROAD	PULLUVILA	Inaccessible due to opposition from locals

CSP NO.	LANDMARK	LOCATION	SITE CONDITION
CSP-28			Inaccessible due to opposition from locals
CSP-29			Inaccessible due to opposition from locals
CSP-30			Inaccessible due to opposition from locals
CSP-31	ADIMALATHURA CATHOLIC CHURCH	ADIMALATHURA	Beach
CSP-32			Beach
CSP-33			Beach
CSP-34			Beach
CSP-35	AZHIMALA TEMPLE	AZHIMALA	Rocky area
CSP-35A	AZHIMALA TEMPLE	AZHIMALA	Beach
CSP-36	NAGAR BHAGAVATHY TEMPLE	MULLUR	Beach
CSP-37			Beach and Seawall
CSP-38	ADANI PORT RECLAMATION AREA	ADANI PORT OFFICE VIZHINJAM	Beach and Seawall
CSP-39			Port Construction
CSP-40			Port Construction
CSP-40A			Beach and Seawall
CSP-41	VIZHINJAM LIGHT HOUSE	KOVALAM	Beach and Seawall
CSP-42			Beach and Compound Wall
CSP-43			Beach and Compound Wall
CSP-44			Beach and Seawall
CSP-45			Beach and Compound Wall
CSP-46			Beach and Seawall
CSP-47	SAMUDRA BEACH PARK		Beach and Seawall
CSP-48	MOSQUE	PANATHURA	Beach and Seawall
CSP-49			Seawall
CSP-50	PANATHURA TEMPLE		Seawall
CSP-51			Seawall
CSP-52			Groyne No. 30 in the vicinity, Seawall
CSP-53	PUNTHURA FISH MARKET	PUNTHURA	Groyne No. 31 in the vicinity, Beach and Estuary
CSP-54			Beach
CSP-55			Beach and Seawall
CSP-56			Beach and Seawall
CSP-57			Beach and Seawall
CSP-58	BEEMA PALLY	BEEMA PALLY	Beach and Seawall
CSP-59			Seawall
CSP-60			Beach and Seawall
CSP-61	CHERIYATHURA SPORTS	CHERIYATHURA	Groyne Nos. 38 to 42 in the

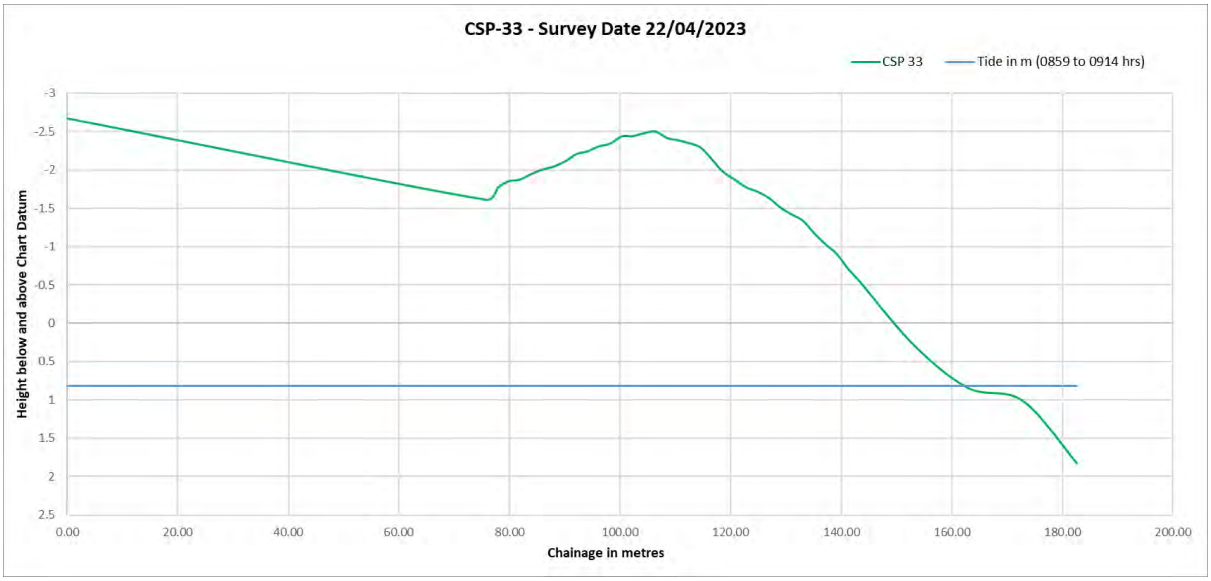
CSP NO.	LANDMARK	LOCATION	SITE CONDITION
	GROUND		vicinity, Beach and Seawall
CSP-62			Groyne Nos. 43 to 47 in the vicinity, Beach and Seawall
CSP-63	VALIYATHURA BRIDGE	VALIYATHURA	Groyne Nos. 48 to 51 in the vicinity, Seawall
CSP-64			Seawall, Valiyathura Bridge
CSP-64A			Beach
CSP-65			Seawall
CSP-66			Seawall
CSP-67			Beach and Seawall
CSP-68	SHANGUMUGHAM BEACH	SHANGUMUGHAM	Beach and Seawall
CSP-69			Beach and Seawall
CSP-70	ST. PETER'S CHURCH		Beach and Seawall
CSP-71			Beach and Seawall
CSP-72	VETTUCAUD CHURCH	VETTUCAUD	Beach
CSP-73			Beach and Seawall
CSP-74			Beach
CSP-75	VELI CHILDREN'S PARK	KOCHUVELI	Beach
CSP-76			Beach
CSP-77			Beach
CSP-78	ST. THOMAS' CHURCH	VALIYAVELI	Beach and Seawall
CSP-79			Beach and Seawall
CSP-80	CHRISTIAN BROTHEREN CHURCH	THUMBA	Beach
CSP-81			Beach

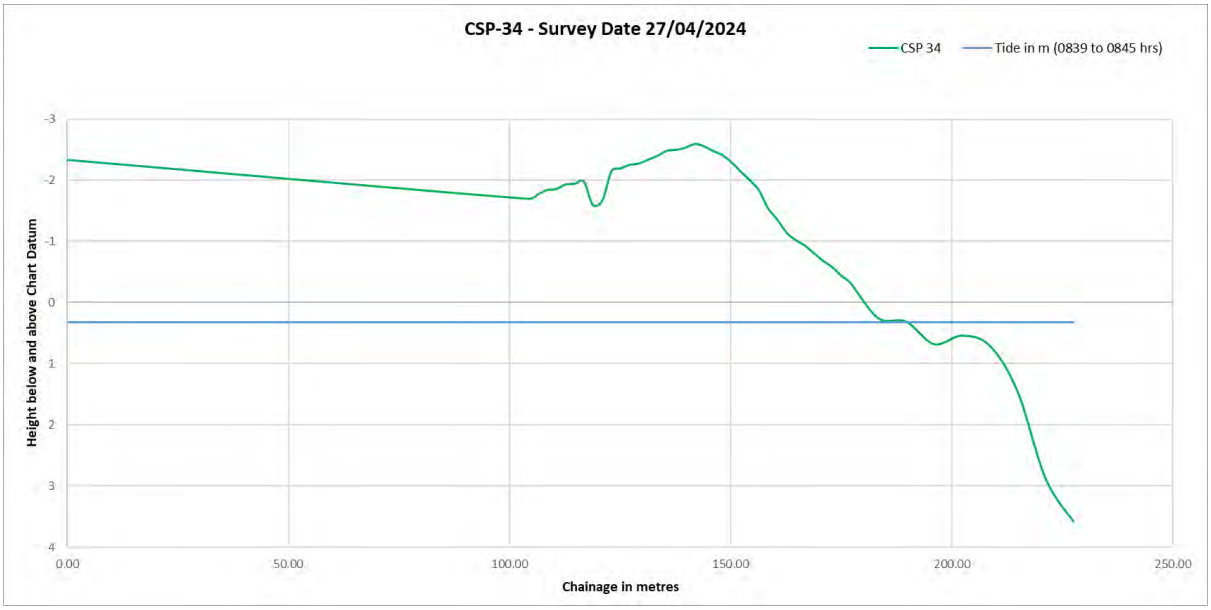
6.8 Near-shore (Sled Survey)

Near-shore survey was carried out along 3 CSP lines namely CSP-33, CSP-34 (Adimalathura) and CSP-73 (Vettucaud) using pressure sensor in the month of April 2024.

No near-shore survey could be carried out from May 2024 to September 2024 due to bad weather and rough sea conditions.

The graphs for the near-shore survey carried out during April 2024 are provided below:


CSP-33 - Survey Date 22/04/2023
CSP 33
Tide in m (0859 to 0914 hrs)
Height below and above Chart Datum
-3
-2.5
-2
-1.5
-1
-0.5
0
0.5
1
1.5
2
2.5
0.00
20.00
40.00
60.00
80.00
100.00
120.00
140.00
160.00
180.00
200.00
Chainage in metres


CSP-34 - Survey Date 27/04/2024
CSP 34
Tide in m (0839 to 0845 hrs)
Height below and above Chart Datum
-3
-2
-1
0
1
2
3
4
0.00
50.00
100.00
150.00
200.00
250.00
Chainage in metres

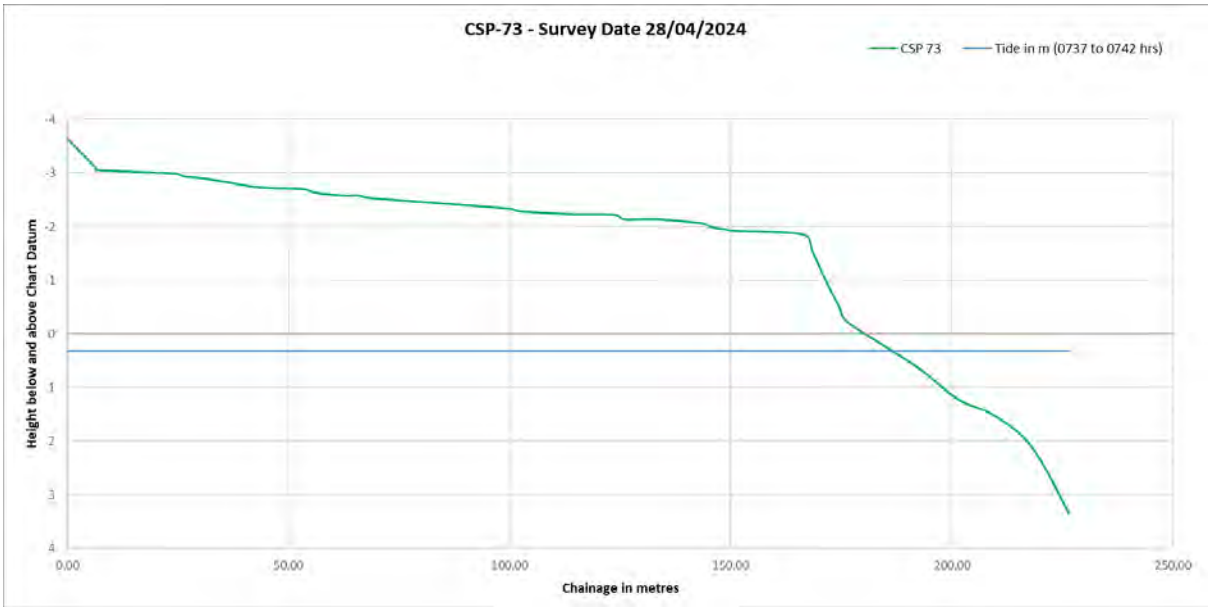


Figure 6-15: Graphs of near-shore survey

6.9 Shoreline Monitoring Survey

The entire 41 km of shoreline was to be surveyed during the period of April 2024 to September 2024. CSP locations 1 to 11 and 23 to 30 could not be approached due to the agitation by the locals. The survey was carried out using RTK system in GPS mode. This stretch extends from CSP-1 in the south (Eddapadu) to CSP-81 in the north (Thumba). A total of 51 groynes have been observed within the survey area. An overlay of month-on-month GPS survey charts is provided in **Annexure II** (8 charts).

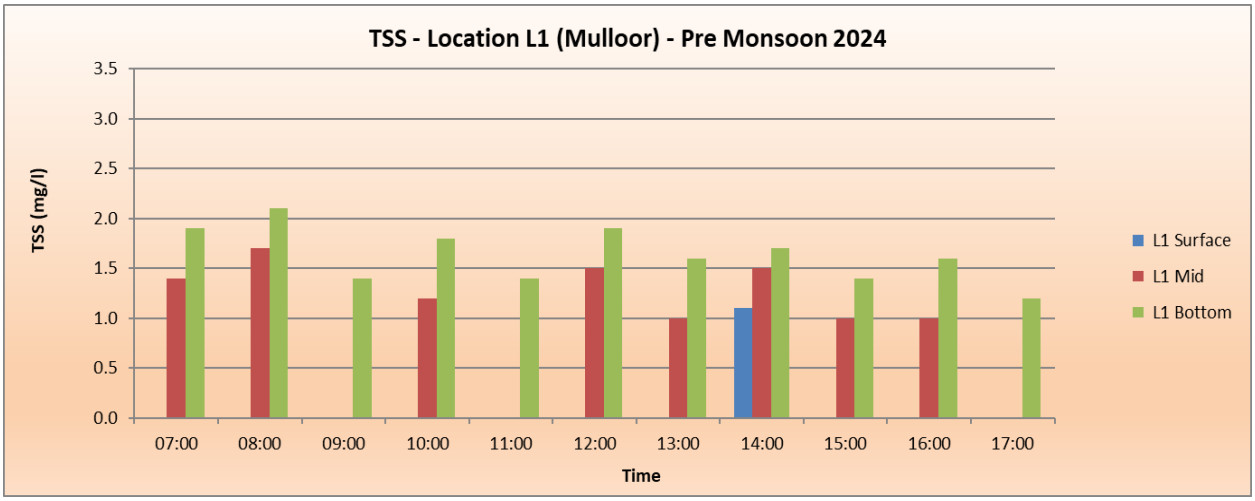
Table 6-12: Area wise number of groynes

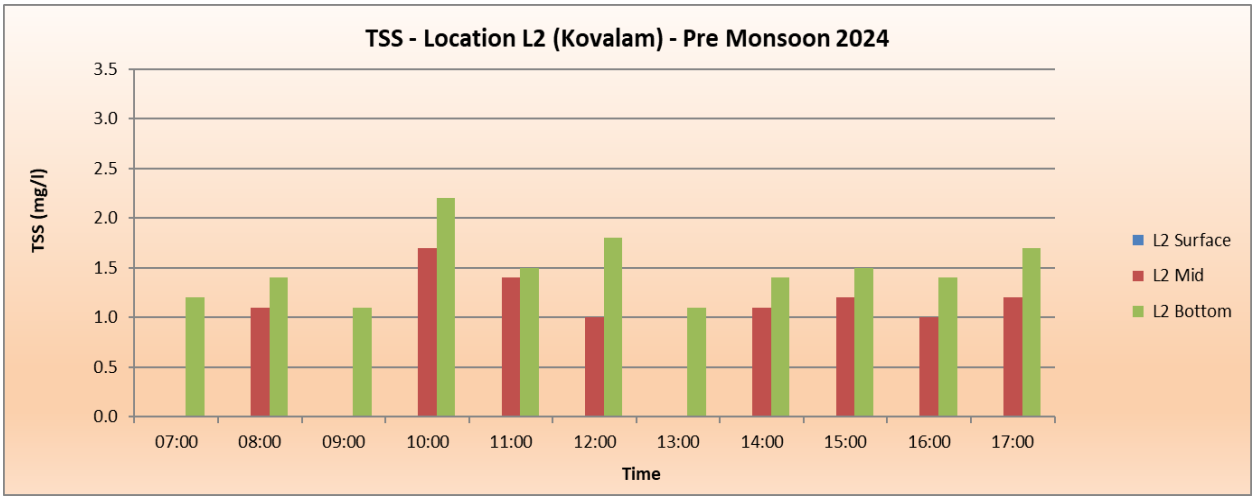
Area	Number of Groynes	North / South of the Port Area	Total no. of Groynes North/South of the Port
Edappadu Beach	1	South	29 South
Vallavilay	12	South	
Neerody	11	South	
Pozhiyoor	5	South	
Panathura	1	North	22 North
Punthura	2	North	
Beemapally	4	North	
Cheriyathura	10	North	
Valiyathura	5	North	
Total number of groynes			**51**

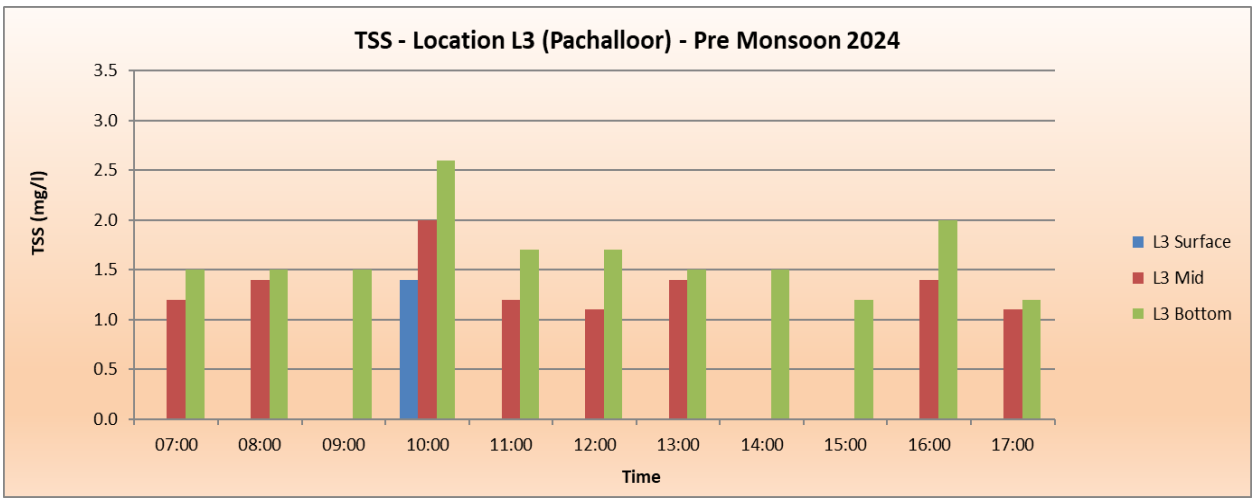
6.10 Water Sampling

For the pre-monsoon 2024 period, water samples were collected from 4 locations, namely L1 (Mulloor) on 25th April, L2 (Kovalam) on 26th April, L3 (Pachalloor) on 27th April and L4 (Poovar) on 28th April 2024. The parameters measured were Total Suspended Solids (TSS), salinity and turbidity.

The histograms for TSS (in mg/l) for the above-mentioned locations are provided below.


TSS - Location L1 (Mulloor) - Pre Monsoon 2024
TSS (mg/l)
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
07:00
08:00
09:00
10:00
11:00
12:00
13:00
14:00
15:00
16:00
17:00
Time
L1 Surface
L1 Mid
L1 Bottom


TSS - Location L2 (Kovalam) - Pre Monsoon 2024
TSS (mg/l)
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
07:00
08:00
09:00
10:00
11:00
12:00
13:00
14:00
15:00
16:00
17:00
Time
L2 Surface
L2 Mid
L2 Bottom


TSS - Location L3 (Pachalloor) - Pre Monsoon 2024
TSS (mg/l)
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
07:00
08:00
09:00
10:00
11:00
12:00
13:00
14:00
15:00
16:00
17:00
Time
L3 Surface
L3 Mid
L3 Bottom

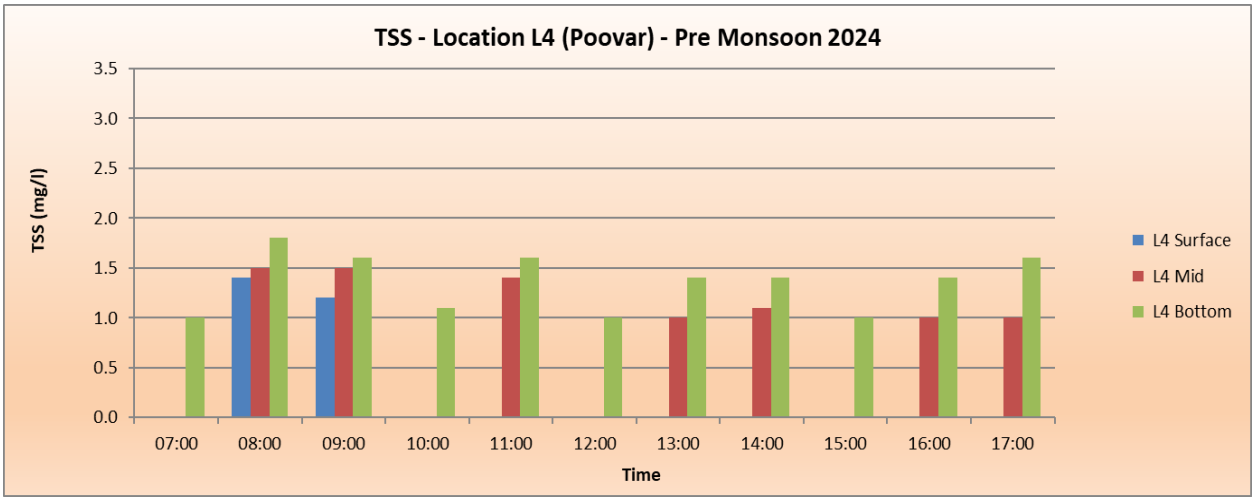
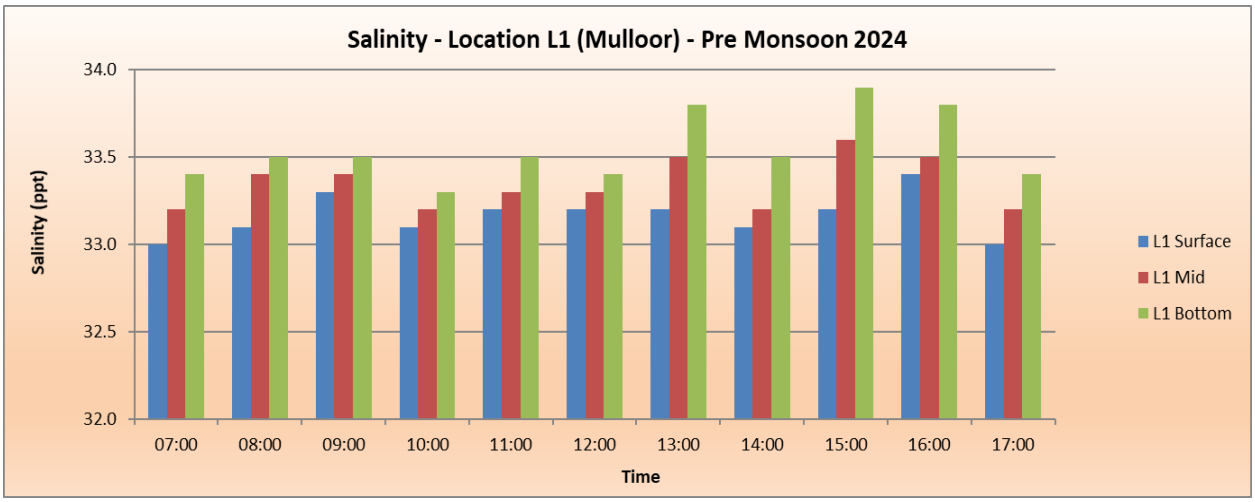


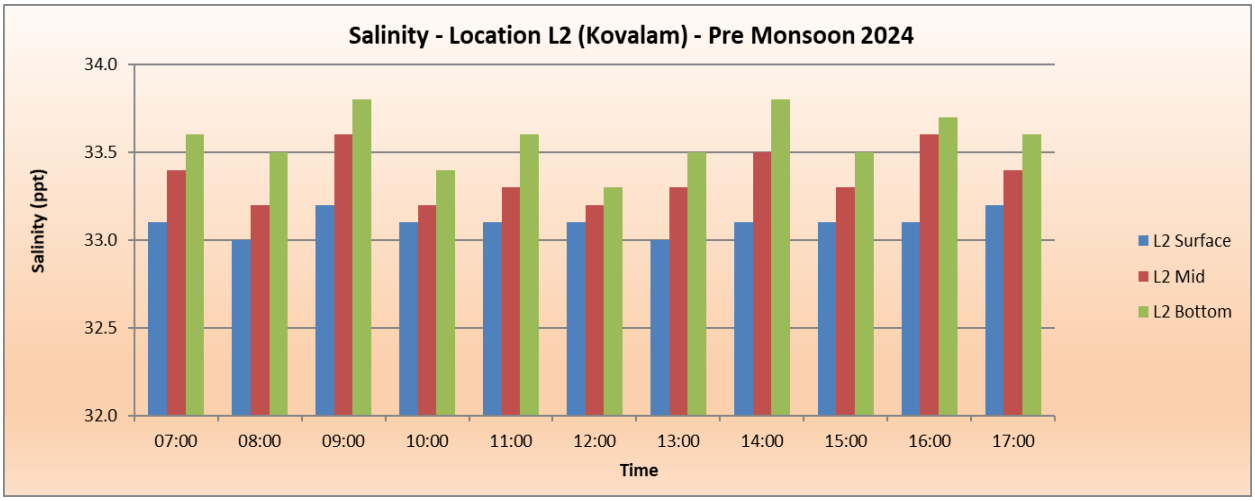
Figure 6-16: Time Series of TSS

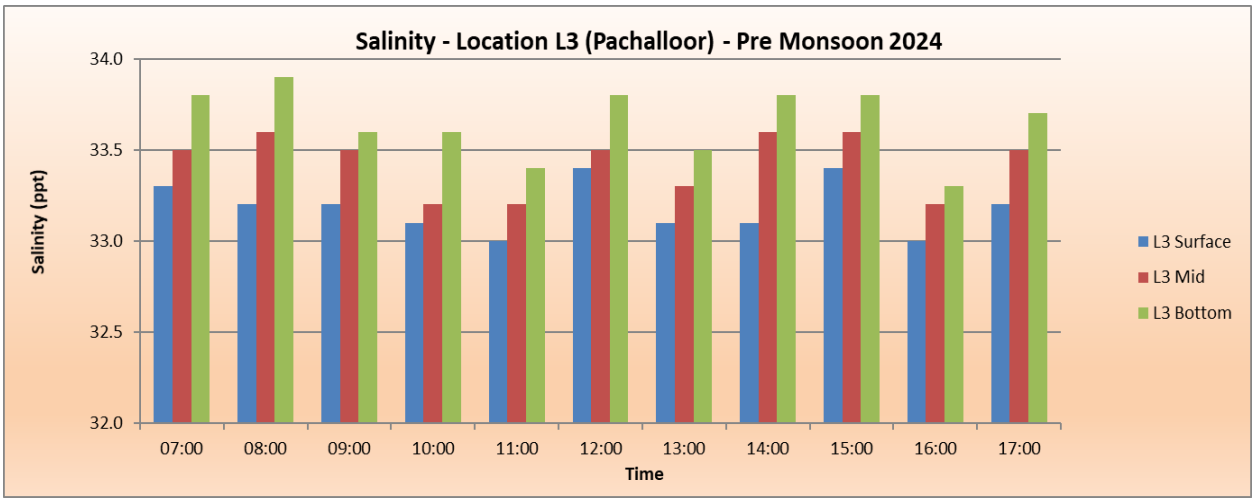
The maximum TSS recorded was 2.6 mg/l near the bottom at Location L3 (Pachalloor).

Note: TSS values below 1 mg/l are Below Detectable Limit (BDL) of the system and are hence not shown on the bar charts.

The histograms for salinity at all three levels for all the locations are given as follows.







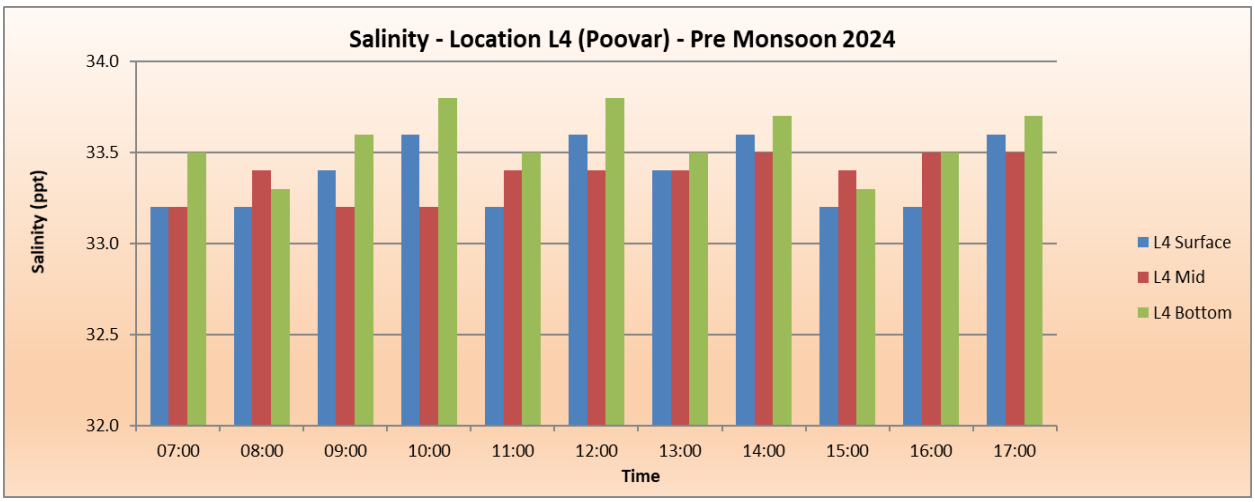
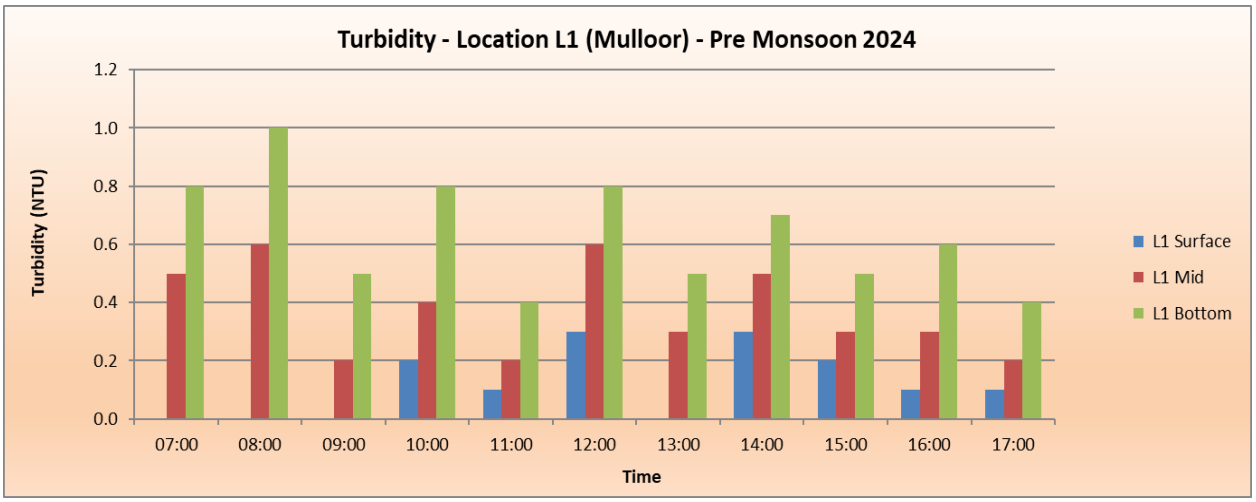


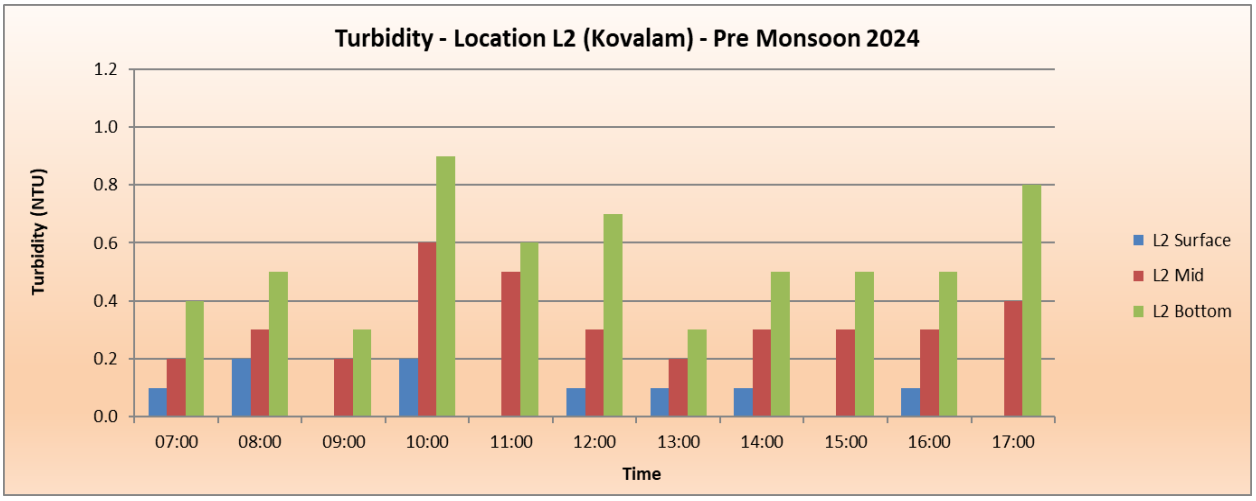
Figure 6-17: Time Series of salinity

The salinity at all locations is seen to be between 33.0 and 33.9 parts per thousand (ppt). The maximum salinity recorded was 33.9 ppt at Locations L1 (Mulloor) and L3 (Pachalloor) all near the bottom.

The histograms for turbidity at all levels for the locations are shown below. The maximum turbidity recorded was 1.2 NTU near the bottom at Location L3 (Pachalloor).

Note: Turbidity values below 0.1 NTU are Below Detectable Level (BDL) of the system and are hence not displayed on the bar charts.





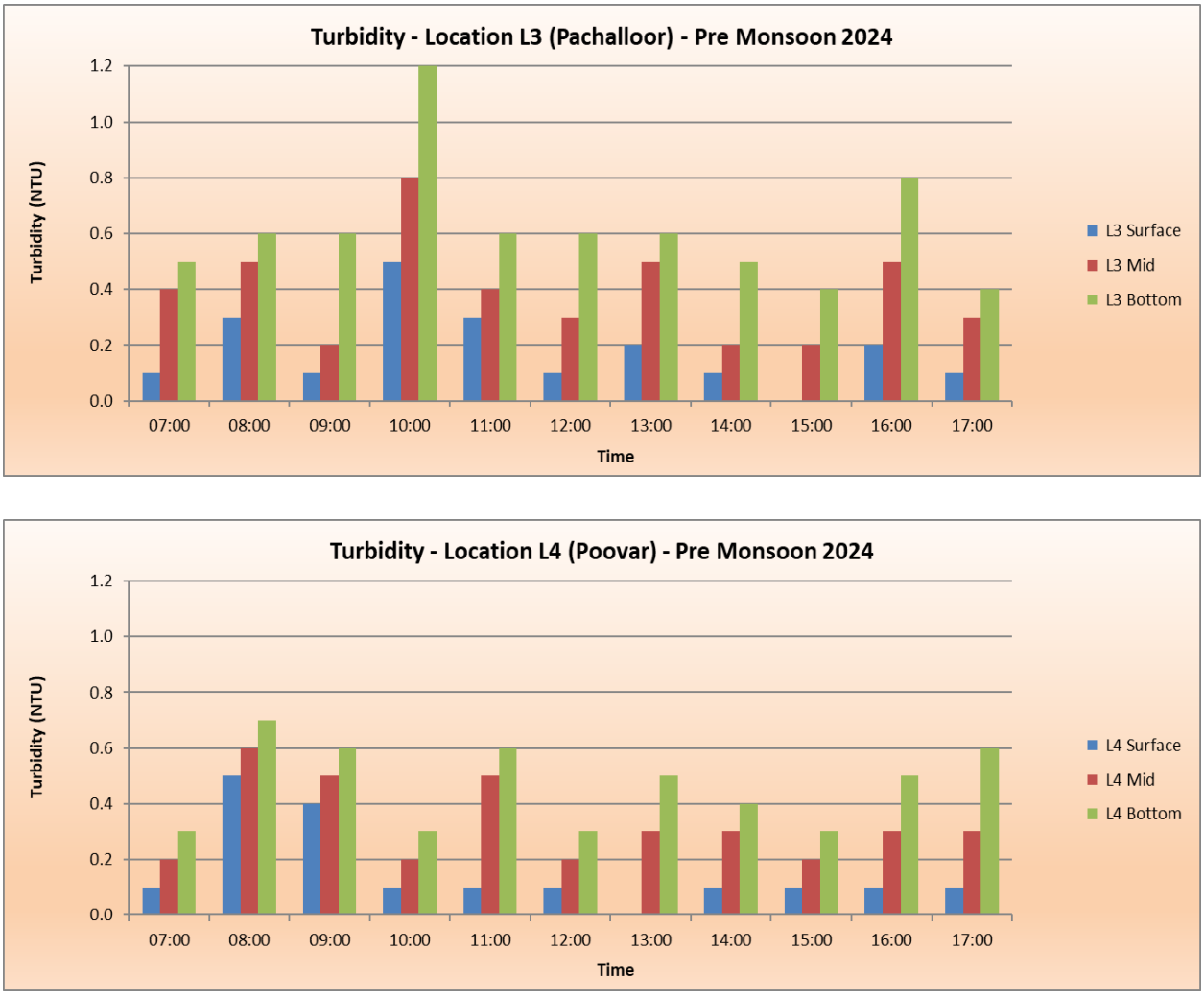


Figure 6-18: Time Series of Turbidity at water sampling locations

6.11 Beach Sampling

Beach samples were collected from 44 out of the 81 locations for the pre-monsoon 2024 period in the month of April 2024. The samples which could not be collected due to lack of beach were BS-11 to BS-14, BS-39, BS-40, BS-47 to BS-52, BS-56, BS-59, BS-63, BS-64, BS-65 and CSP-66. Beach samples at CSP locations 1 to 8 and 23 to 30 could not be collected due to the protests from local people residing at those locations. The following table shows the D50 value (in mm) of the sediments collected along with the soil classification as per Wentworth scale.

Table 6-13: Beach sample soil classification

Sample Name	Gravel %	Sand %	Mud%	Total	D50 (mm)	Classification
BS-1	Sampling locations not approachable due to protests from locals					
BS-2						
BS-3						
BS-4						
BS-5						
BS-6						
BS-7						
BS-8						
BS-9	0.00	100.00	0.00	100.00	0.4848	Medium Sand
BS-10	0.00	100.00	0.00	100.00	0.4451	Medium Sand
BS-11	Not collected due to lack of beach					
BS-12						
BS-13						
BS-14						
BS-15	0.00	100.00	0.00	100.00	0.6317	Coarse Sand
BS-16	0.00	100.00	0.00	100.00	0.6585	Coarse Sand
BS-17	0.00	100.00	0.00	100.00	0.6467	Coarse Sand
BS-18	0.00	100.00	0.00	100.00	0.5916	Coarse Sand
BS-19	0.00	100.00	0.00	100.00	0.6124	Coarse Sand
BS-20	0.00	100.00	0.00	100.00	0.6239	Coarse Sand
BS-21	0.00	100.00	0.00	100.00	0.6984	Coarse Sand
BS-22	0.00	100.00	0.00	100.00	0.5830	Coarse Sand
BS-23	Sampling locations not approachable due to protests from locals					
BS-24						
BS-25						
BS-26						
BS-27						
BS-28						
BS-29						
BS-30						
BS-31	0.00	100.00	0.00	100.00	0.6579	Coarse Sand
BS-32	0.00	100.00	0.00	100.00	0.6424	Coarse Sand
BS-33	0.00	100.00	0.00	100.00	0.6041	Coarse Sand
BS-34	0.00	100.00	0.00	100.00	0.6864	Coarse Sand
BS-35	0.00	100.00	0.00	100.00	0.4962	Medium Sand
BS-35A	0.00	100.00	0.00	100.00	0.6035	Coarse Sand
BS-36	Not collected due to lack of beach					
BS-37						
BS-38						
BS-39						
BS-40						
BS-40A						
BS-41						

Sample Name	Gravel %	Sand %	Mud%	Total	D50 (mm)	Classification
BS-42	0.00	100.00	0.00	100.00	0.3914	Medium Sand
BS-43	0.00	100.00	0.00	100.00	0.4315	Medium Sand
BS-44	0.00	100.00	0.00	100.00	0.7009	Coarse Sand
BS-45	0.00	100.00	0.00	100.00	0.4189	Medium Sand
BS-46	0.00	100.00	0.00	100.00	0.4824	Medium Sand
BS-47	Not collected due to lack of beach					
BS-48						
BS-49						
BS-50						
BS-51						
BS-52						
BS-53	0.00	100.00	0.00	100.00	0.4526	Medium Sand
BS-54	0.00	100.00	0.00	100.00	0.6053	Coarse Sand
BS-55	0.00	100.00	0.00	100.00	0.5884	Coarse Sand
BS-56	Not collected due to lack of beach					
BS-57	0.00	100.00	0.00	100.00	0.3937	Medium Sand
BS-58	0.00	100.00	0.00	100.00	0.4430	Medium Sand
BS-59	Not collected due to lack of beach					
BS-60	0.00	100.00	0.00	100.00	0.4382	Medium Sand
BS-61	0.00	100.00	0.00	100.00	0.6313	Coarse Sand
BS-62	0.00	100.00	0.00	100.00	0.4318	Medium Sand
BS-63	Not collected due to lack of beach					
BS-64						
BS-64A	0.00	100.00	0.00	0.00	0.7461	Coarse Sand
BS-65	Not collected due to lack of beach					
BS-66						
BS-67	0.00	100.00	0.00	100.00	0.6181	Coarse Sand
BS-68	0.00	100.00	0.00	100.00	0.5235	Coarse Sand
BS-69	0.00	100.00	0.00	100.00	0.4202	Medium Sand
BS-70	0.00	100.00	0.00	100.00	0.6412	Coarse Sand
BS-71	0.00	100.00	0.00	100.00	0.5498	Coarse Sand
BS-72	0.00	100.00	0.00	100.00	0.5301	Coarse Sand
BS-73	0.00	100.00	0.00	100.00	0.5631	Coarse Sand
BS-74	0.00	100.00	0.00	100.00	0.4401	Medium Sand
BS-75	0.00	100.00	0.00	100.00	0.4427	Medium Sand
BS-76	Not collected due to lack of beach					
BS-77	0.00	100.00	0.00	100.00	0.4629	Medium Sand
BS-78	0.00	100.00	0.00	100.00	0.5661	Coarse Sand
BS-79	0.00	100.00	0.00	100.00	0.4539	Medium Sand
BS-80	0.00	100.00	0.00	100.00	0.5007	Coarse Sand
BS-81	0.00	100.00	0.00	100.00	0.4867	Medium Sand

The classification is based on Wentworth scale as provided below:

Very fine Sand – 0.0625 to 0.125 mm
Fine Sand – 0.125 to 0.250 mm
Medium Sand – 0.250 to 0.500 mm
Coarse Sand – 0.500 to 1.000 mm
Very coarse Sand – 1.000 to 2.000 mm

The following graph shows the distribution of D50 value of the sediments collected in each location.

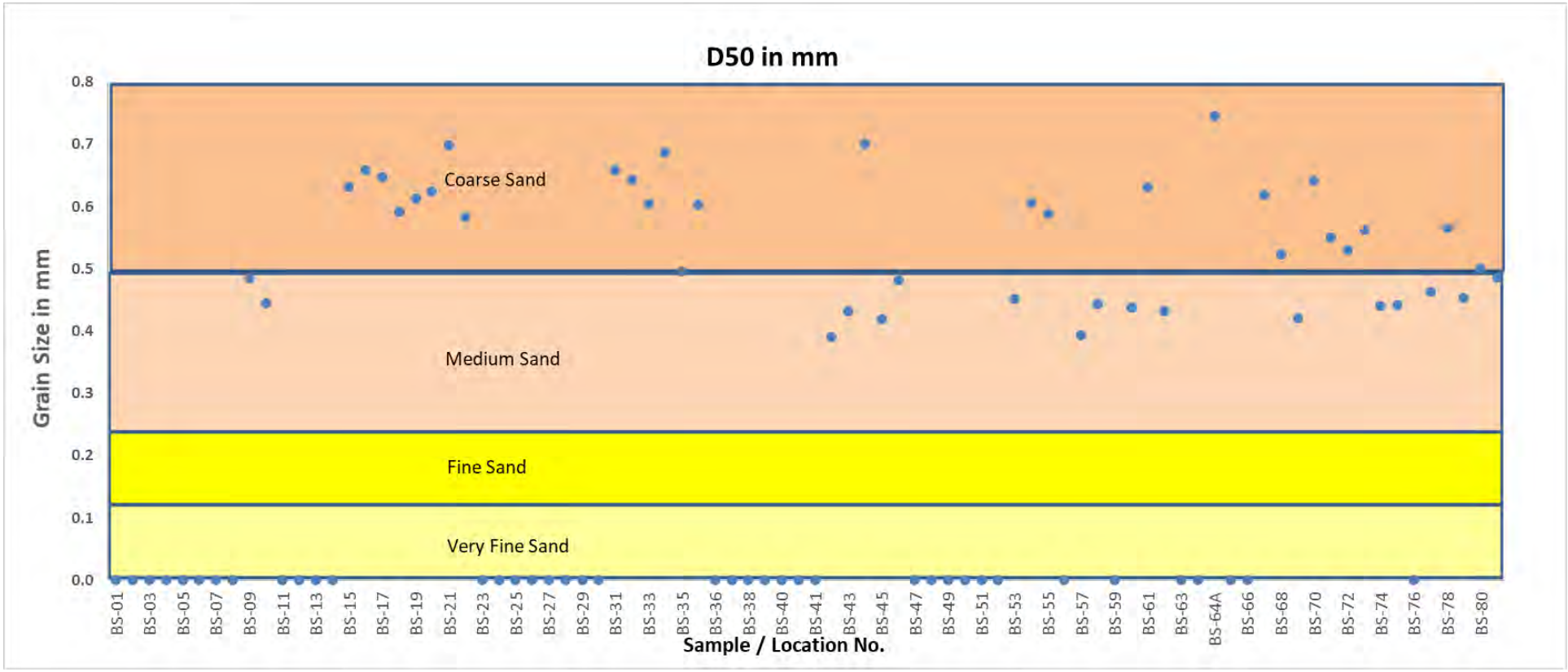
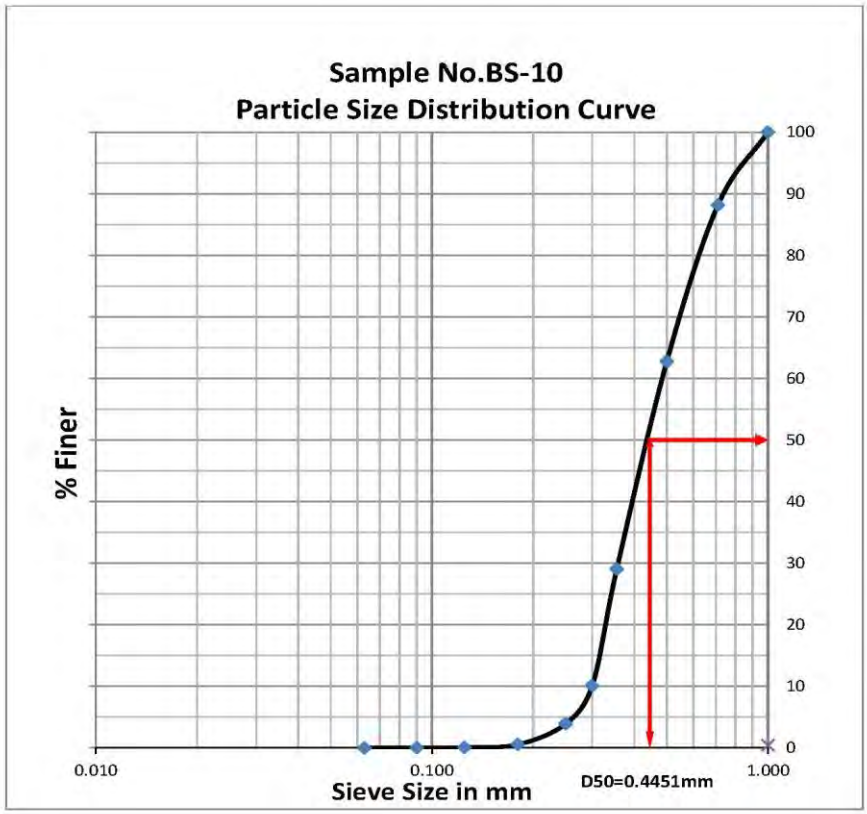


Figure 6-19: Distribution of D50 value of beach samples

The particle size distribution curves for beach samples collected a few locations are placed in the images below.

Standards



Standards Environmental & Analytical Laboratories
Approval: "A" Grade Laboratory approved by Kerala State Pollution Control Board.
'Standards' Bldg. No: 338/A,B,C,D,E (Behind BPCL Petrol Pump), Edayar, Muppathadam P.O., Ernakulam Dist.-683 110
Tel. 0484-2546660, 93872 72402, 90743 41443, Web: www.sealabs.in, E-mail: seaalab@gmail.com

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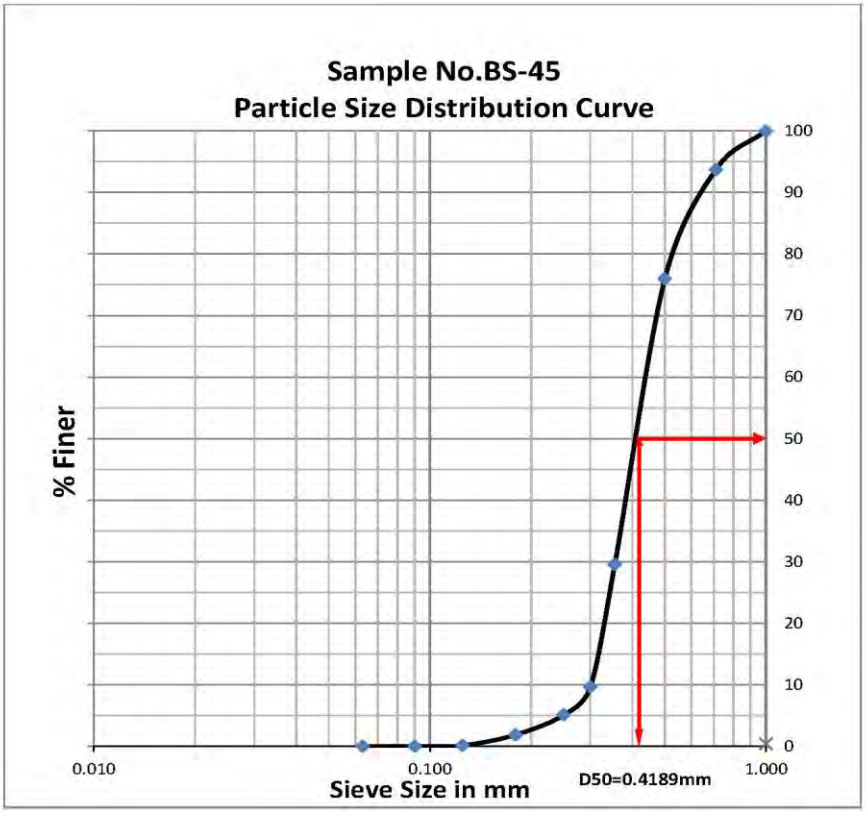
Figure 6-20: Grain size distribution curve for BS-10 (Pre-monsoon 2024)

Standards



Standards Environmental & Analytical Laboratories
Approval: "A" Grade Laboratory approved by Kerala State Pollution Control Board.
'Standards' Bldg. No: 338/A,B,C,D,E (Behind BPCL Petrol Pump), Edayar, Muppathadam P.O., Ernakulam Dist.-683 110
Tel. 0484-2546660, 93872 72402, 90743 41443, Web: www.sealabs.in, E-mail: seaalab@gmail.com

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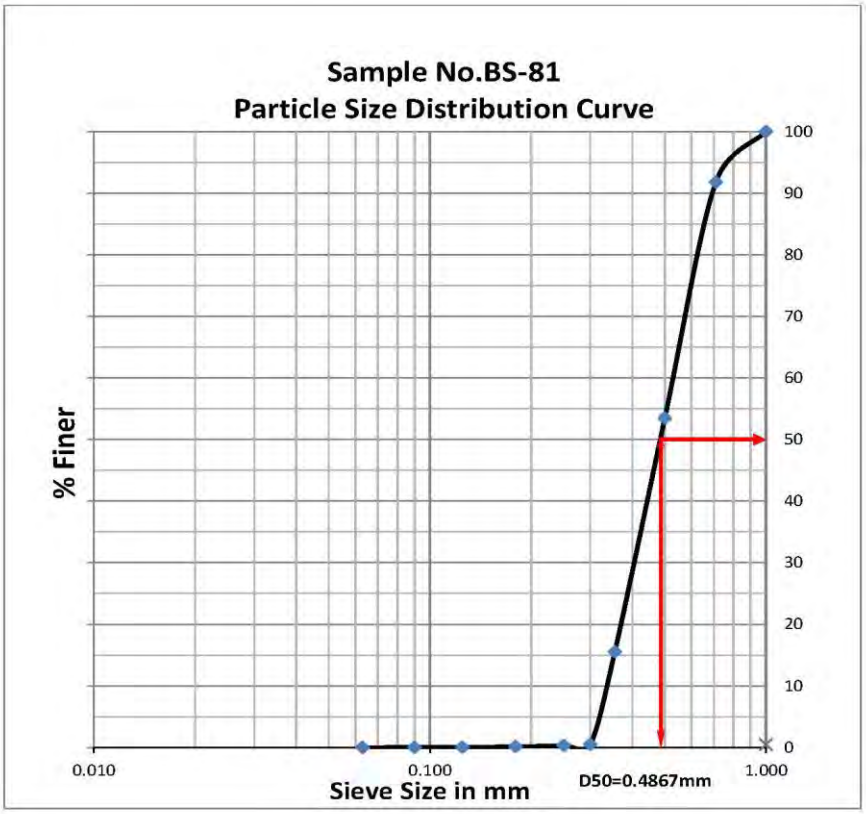
Figure 6-21: Grain size distribution curve for BS-45 (Pre-monsoon 2024)

Standards



Standards Environmental & Analytical Laboratories
Approval: "A" Grade Laboratory approved by Kerala State Pollution Control Board.
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Tel. 0484-2546660, 93872 72402, 90743 41443, Web: www.sealabs.in, E-mail: seaalab@gmail.com

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Figure 6-22: Grain size distribution curve for BS-81 (Pre-monsoon 2024)

6.12 Bathymetry

Survey Location

The following image shows the coverage of the area surveyed using R2Sonic 2020 multibeam echo sounder.

Figure 6-23: Bathymetry area coverage

Line Plan and Survey Methodology

The survey lines were planned at intervals of 25m parallel to the coast up to the depth of 20m for the pre-monsoon 2024 period. The vessel was positioned using a Trimble DGPS system which also provided the heading. The vessel tracks and offset positions were recorded digitally and the data from the multibeam echo sounder was logged digitally within the Hypack acquisition software.

Prior to commencement of the survey, the DGPS and gyrocompass calibrations were carried out when the survey vessel was berthed at the Vizhinjam Fishing Jetty. The multibeam echo sounder was calibrated by conducting the patch test. The bathymetric

data was reduced to Chart Datum (CD) by using the observed tides from the tide gauge installed at the Coast Guard Jetty. A Valeport Sound Velocity Probe (SVP) was used to measure the speed of sound in the water column. Motion compensation was achieved by the DMS-05 Motion Reference Unit (MRU). Data was processed using Hypack software. Calibration values obtained from the patch test were applied to the acquired data along with the required sound velocity profile and tide data for creation of final xyz file.

Results

The maximum depth recorded by multibeam echo sounder is 26.3m below CD in the northern part of the survey area at few locations along the western boundary. The seabed is seen to slope gently towards the southwest.

A colour-coded image of the pre-monsoon 2024 bathymetry is provided below.

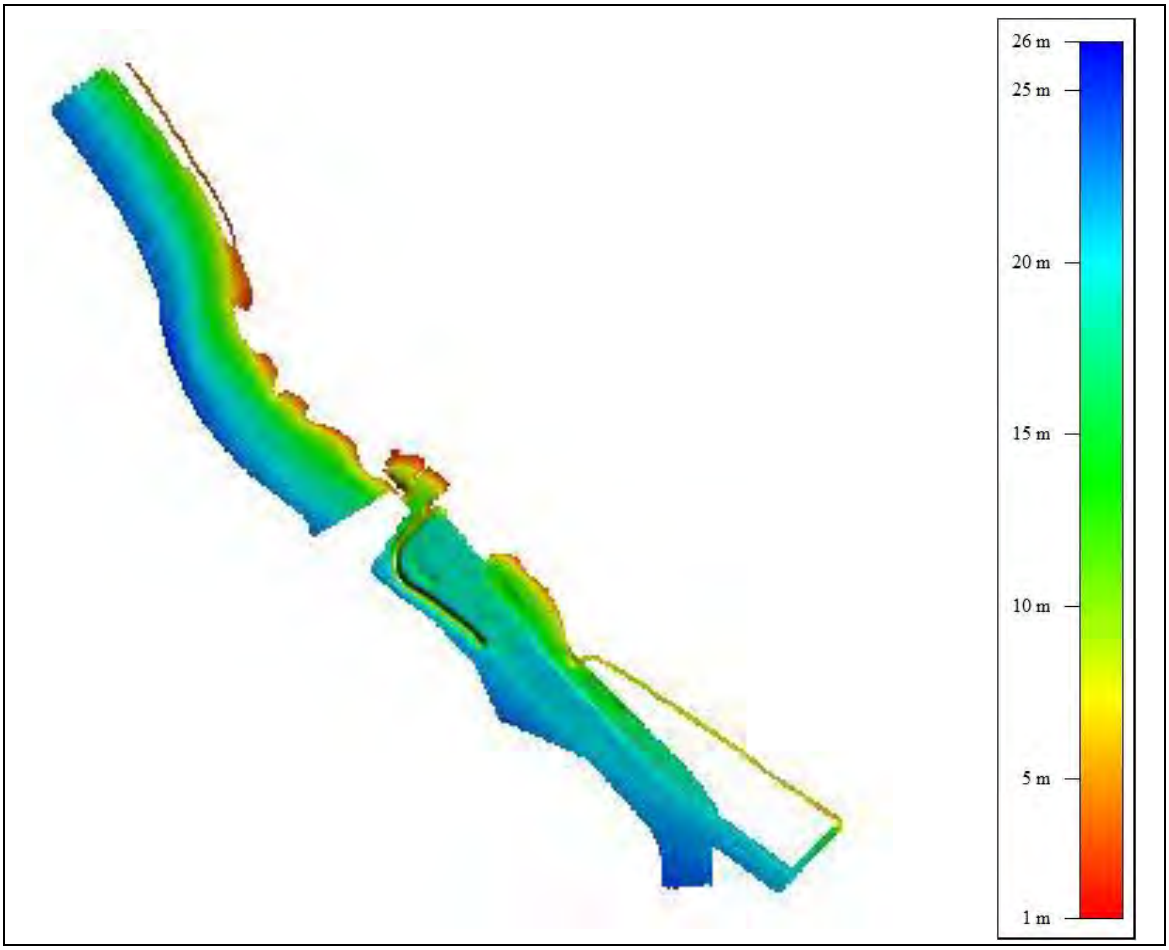


Figure 6-24: Colour-coded bathymetry image

7 WEATHER

The weather was not conducive to the survey operations. The offshore survey was carried out during favorable weather windows.

8 REFERENCES

The following documents/web sites were referenced during the preparation of the report.

- AVPPL Service order 5702011433 dated 05th June 2023
- Web site https://www.vizhinjamport.in/home.html, and https://www.vizhinjamport.in/download/Feasibility-Report.pdf
- WMO manual, section 5.2.2
- Monthly survey reports from April 2024 to September 2024.

9 CONCLUSIONS

The following conclusions were made during this phase of the project:

1. Tide was mixed semi diurnal with a maximum range being observed during spring tide. The maximum tidal range of 1.08 m was observed in the month of May 2024.
2. The significant wave heights increased during the onset of monsoon. The maximum significant wave height observed was 3.35 m in the month of May 2024. The maximum surface current speed of 91.2 cm/s was observed in the month of July 2024. The current direction was predominantly towards southeast direction.
3. The maximum wind speeds were blowing from the north and northwest during the pre-monsoon period and from west and south-southeast during the monsoon period. The maximum wind speed recorded was 13.58 m/s in the month of May 2024.
4. The along-shore current speed was recorded in a northward direction in pre-monsoon period and toward south during the monsoon period. The maximum along shore current speed recorded was 26.70 cm/sec at CSP-67 (Valiyathura) in the month of May 2024.
5. At the water sampling locations, a maximum TSS content of 2.6 mg/l was recorded at Location L3 (Pachalloor) at the bottom, the salinity was in the range of 33.0 and 33.9 ppt and maximum turbidity of 1.2 NTU near the bottom of Location L3 (Pachalloor).

6. The beach sediments are seen to consist of medium to coarse sand in most locations.
7. The seabed is seen slope gently towards the southwest. The maximum depth recorded by multibeam echo sounder is 26.3m below CD in the northern part of the survey area at few locations along the western boundary.

10 ACKNOWLEDGEMENTS

During the course of project, the support received from AVPPL staff is highly appreciated and acknowledged. The guidance received throughout the project from NIOT scientists is also hereby appreciated. The boat crew and all others, who had supported us during the project is also acknowledged.

Annexure I

Photo Documentation At CSP Locations




Figure 1: September 2024 CSP 12




Figure 2: September 2024 CSP 13

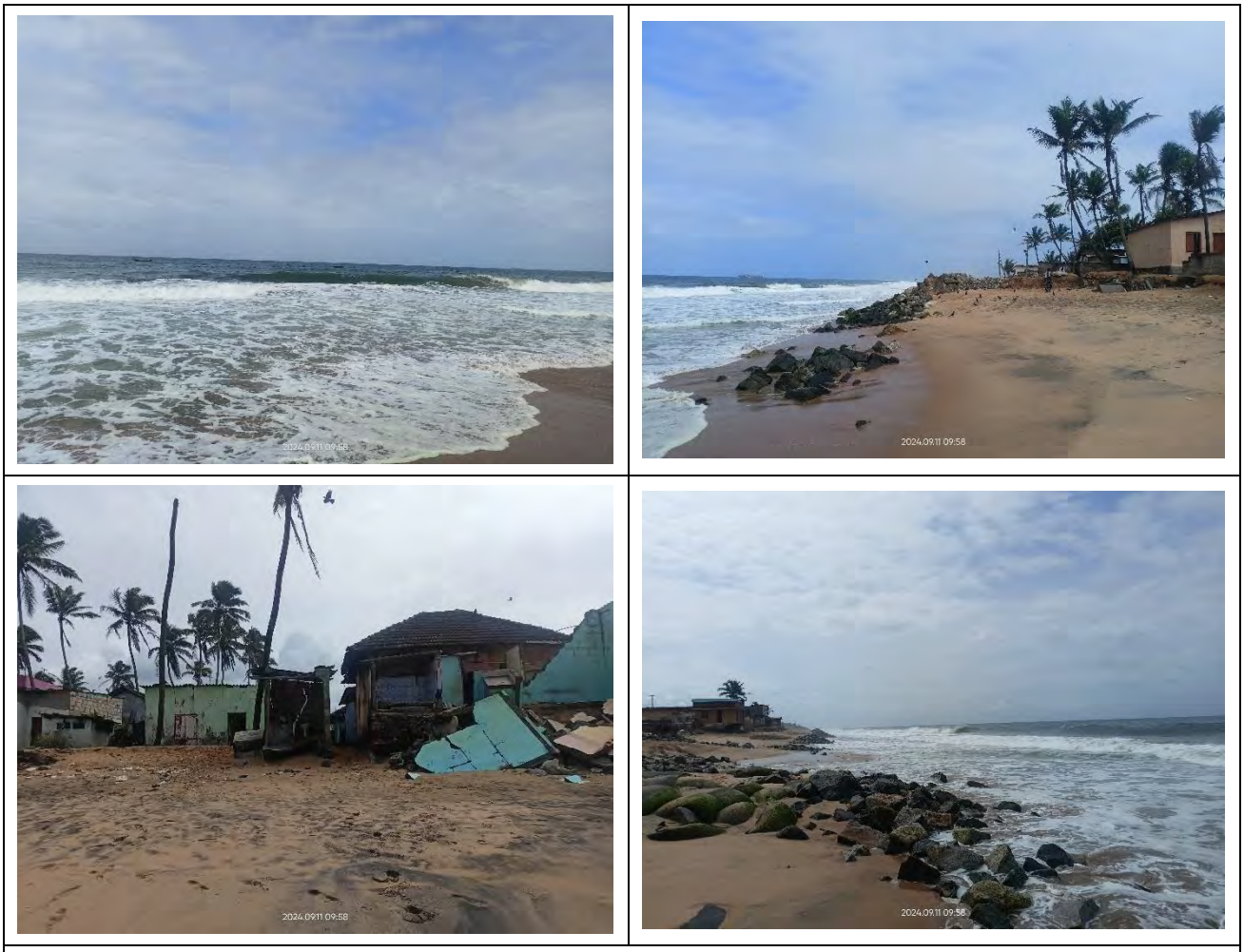


Figure 3: September 2024 CSP 14

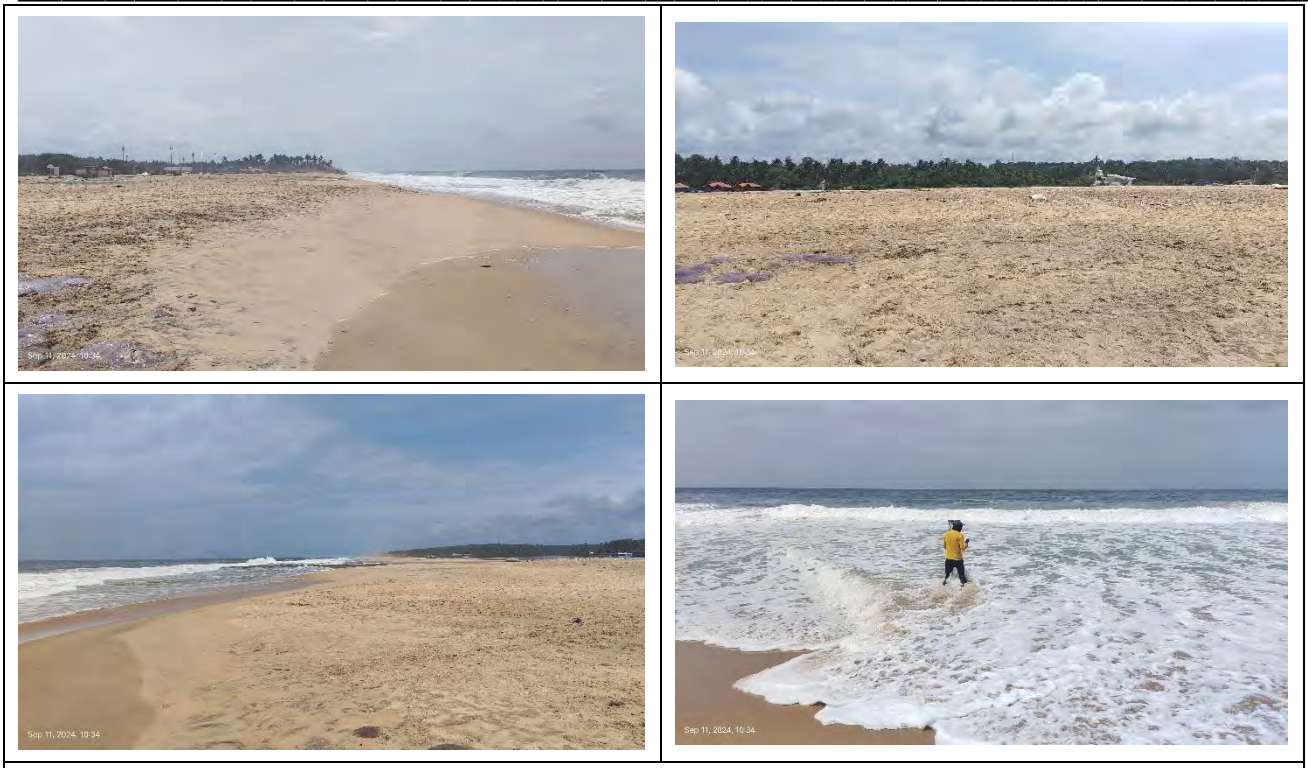


Figure 4: September 2024 CSP 15

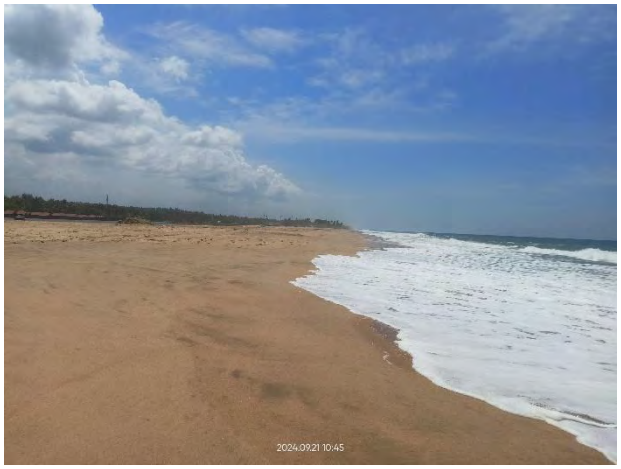


Figure 5: September 2024 CSP 16

Figure 6: September 2024 CSP 17

Figure 7: September 2024 CSP 18



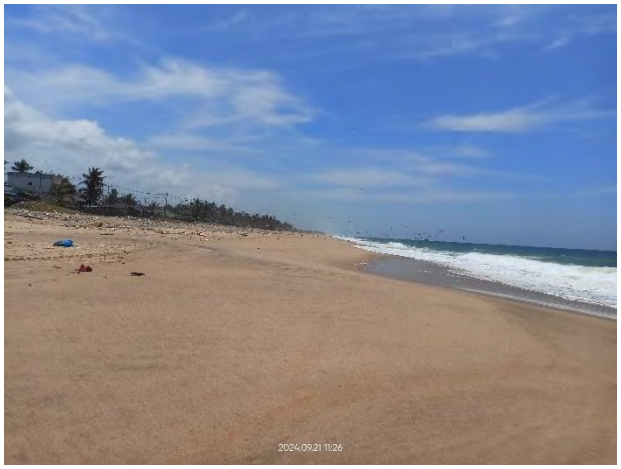



Figure 8: September 2024 CSP 19



Figure 9: September 2024 CSP 20

Figure 10: September 2024 CSP 21




Figure 11: September 2024 CSP 22




Figure 12: September 2024 CSP 31




Figure 13: September 2024 CSP 32

Figure 14: September 2024 CSP 33




Figure 15: September 2024 CSP 34




Figure 16: September 2024 CSP 35




Figure 17: September 2024 CSP 35A

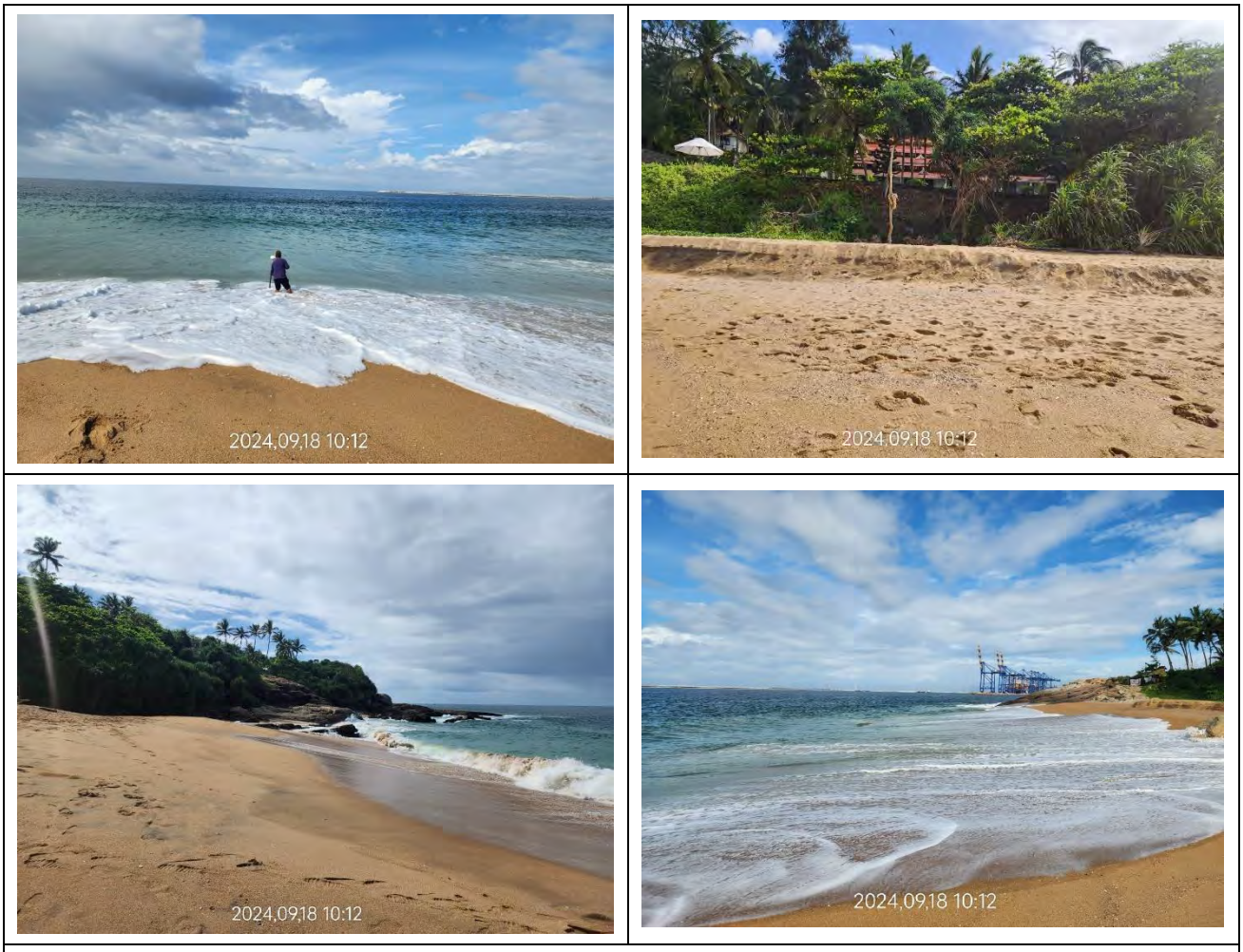
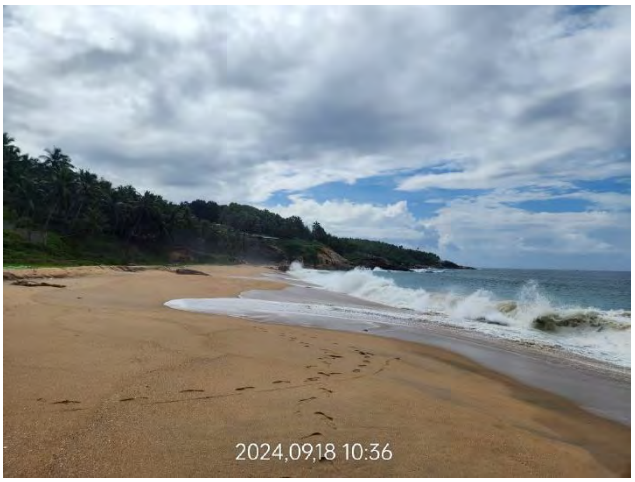


Figure 18: September 2024 CSP 36



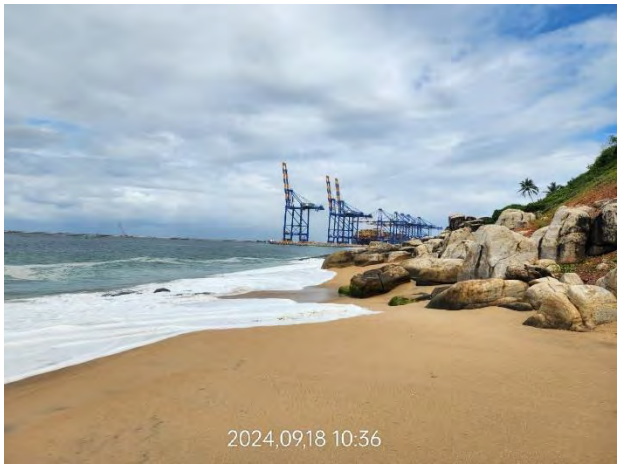
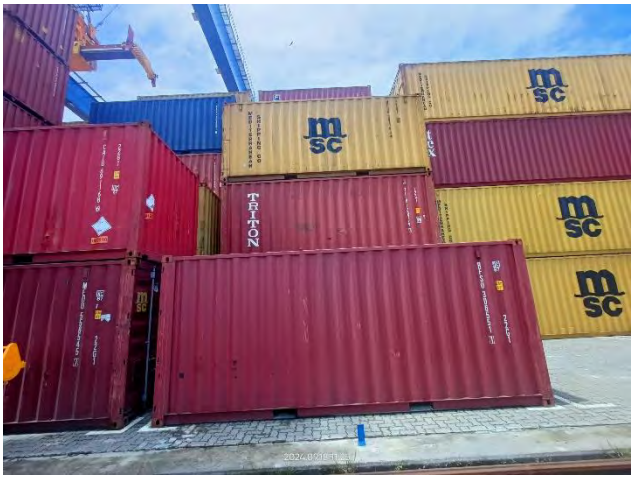


Figure 19: September 2024 CSP 37




Figure 20: September 2024 CSP 38



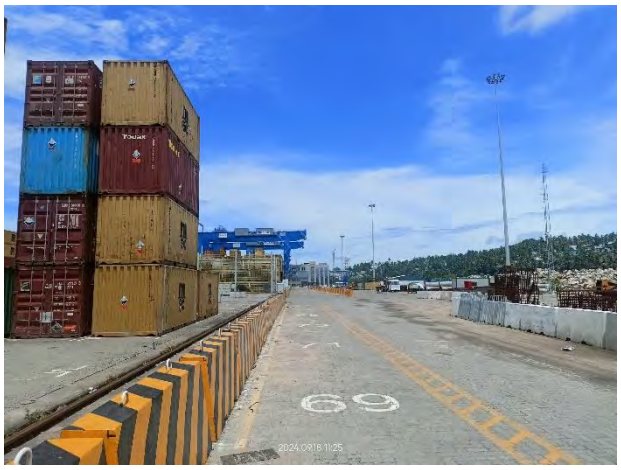


Figure 21: September 2024 CSP 39



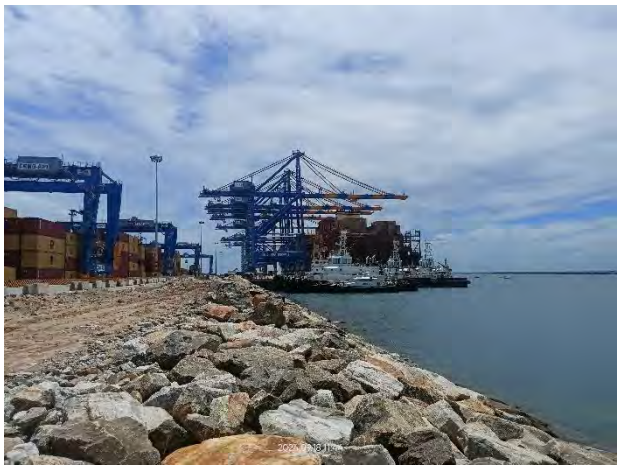



Figure 22: September 2024 CSP 40

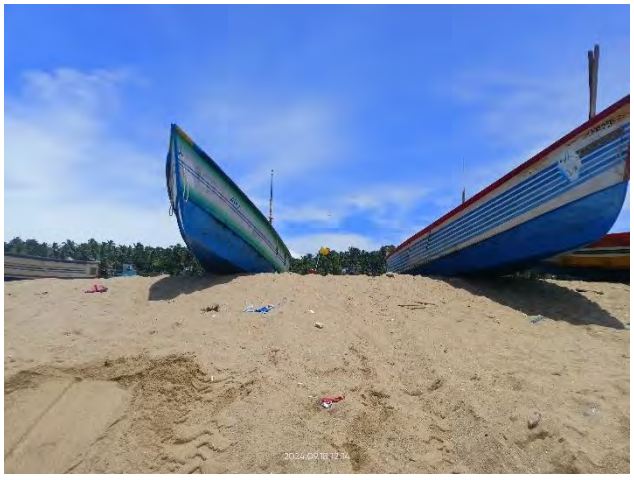


Figure 23: September 2024 CSP 40A

Figure 24: September 2024 CSP 41




Figure 25: September 2024 CSP 42

Figure 26: September 2024 CSP 43




Figure 27: September 2024 CSP 44

Figure 28: September 2024 CSP 45




Figure 29: September 2024 CSP 46

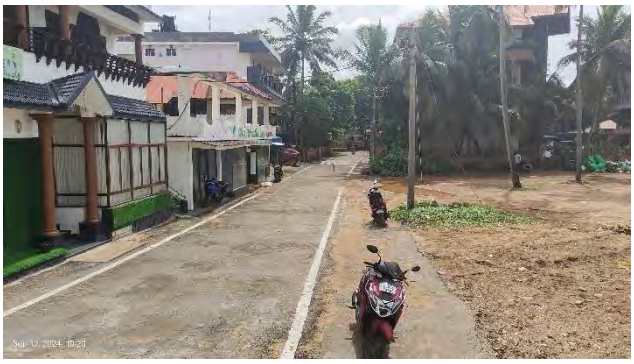


Figure 30: September 2024 CSP 47




Figure 31: September 2024 CSP 48

Figure 32: September 2024 CSP 49

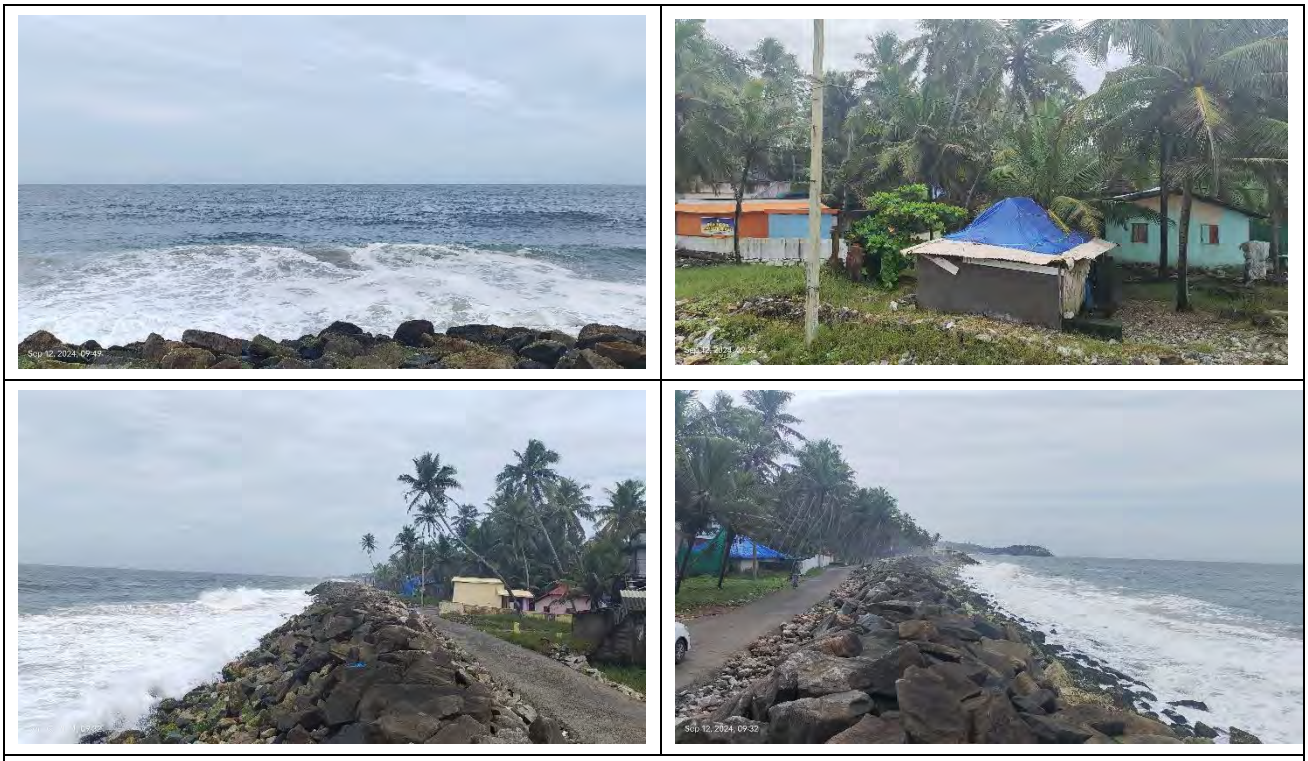


Figure 33: September 2024 CSP 50

Figure 34: September 2024 CSP 51

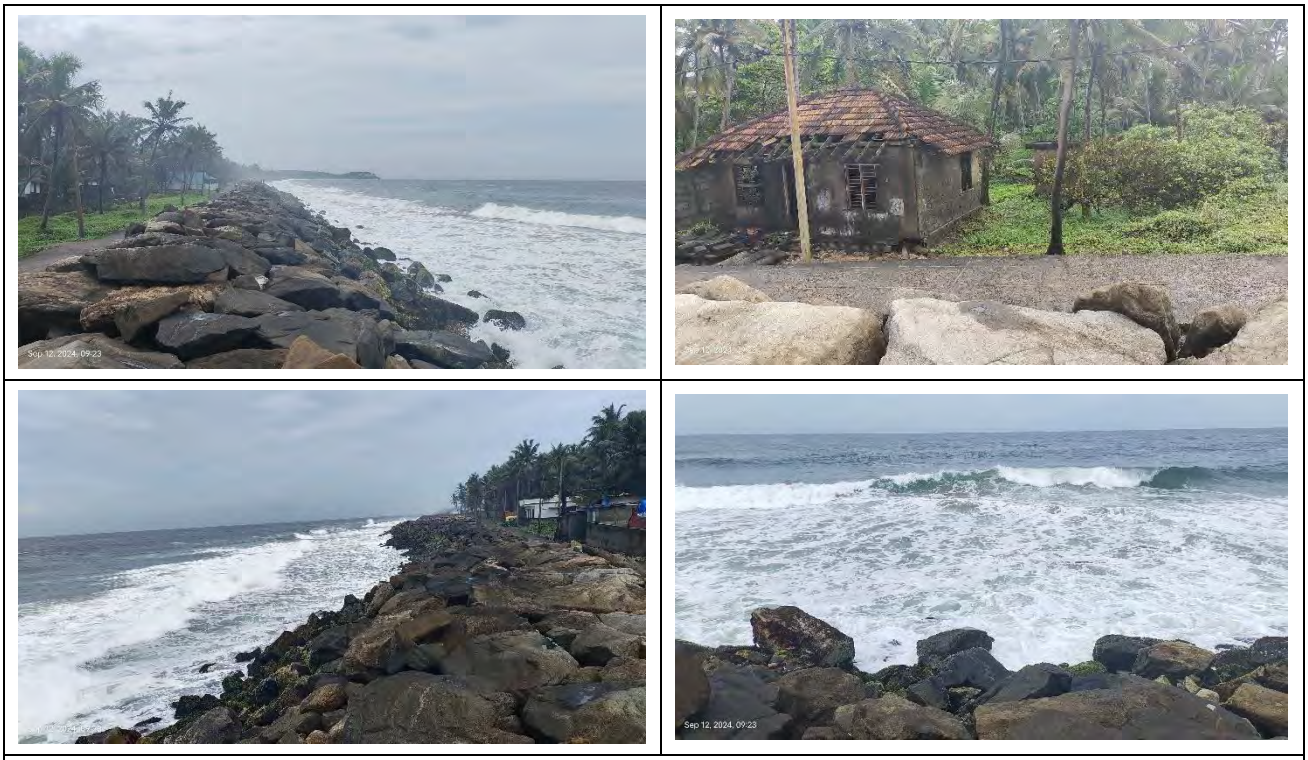
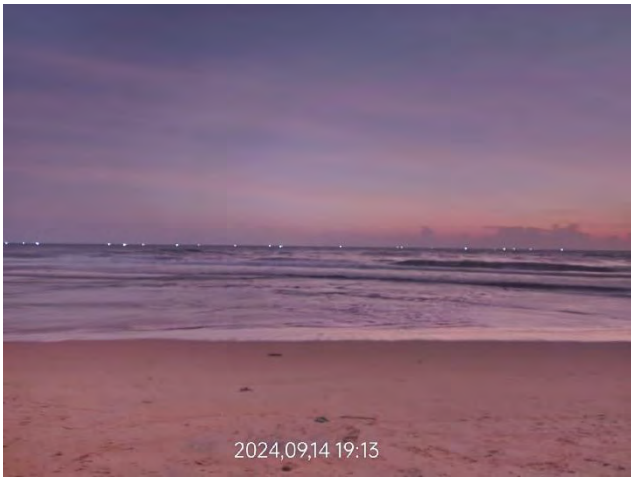
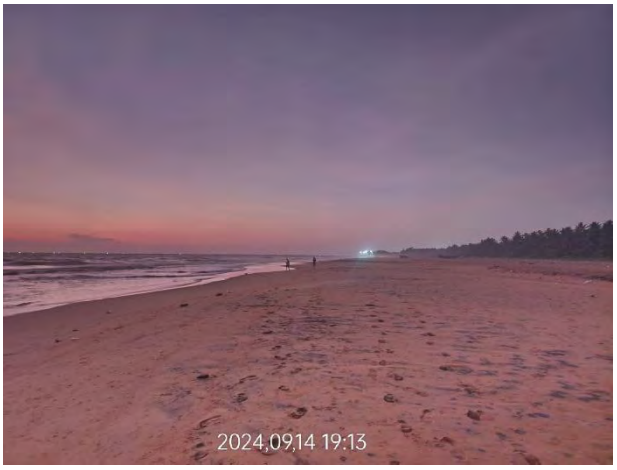


Figure 35: September 2024 CSP 52





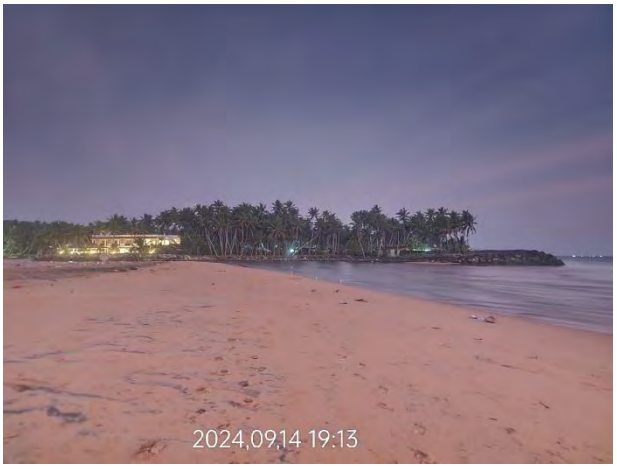


Figure 36: September 2024 CSP 53

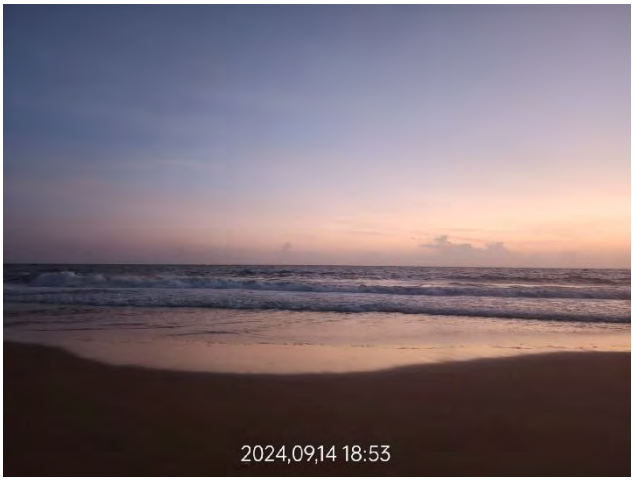


Figure 37: September 2024 CSP 54

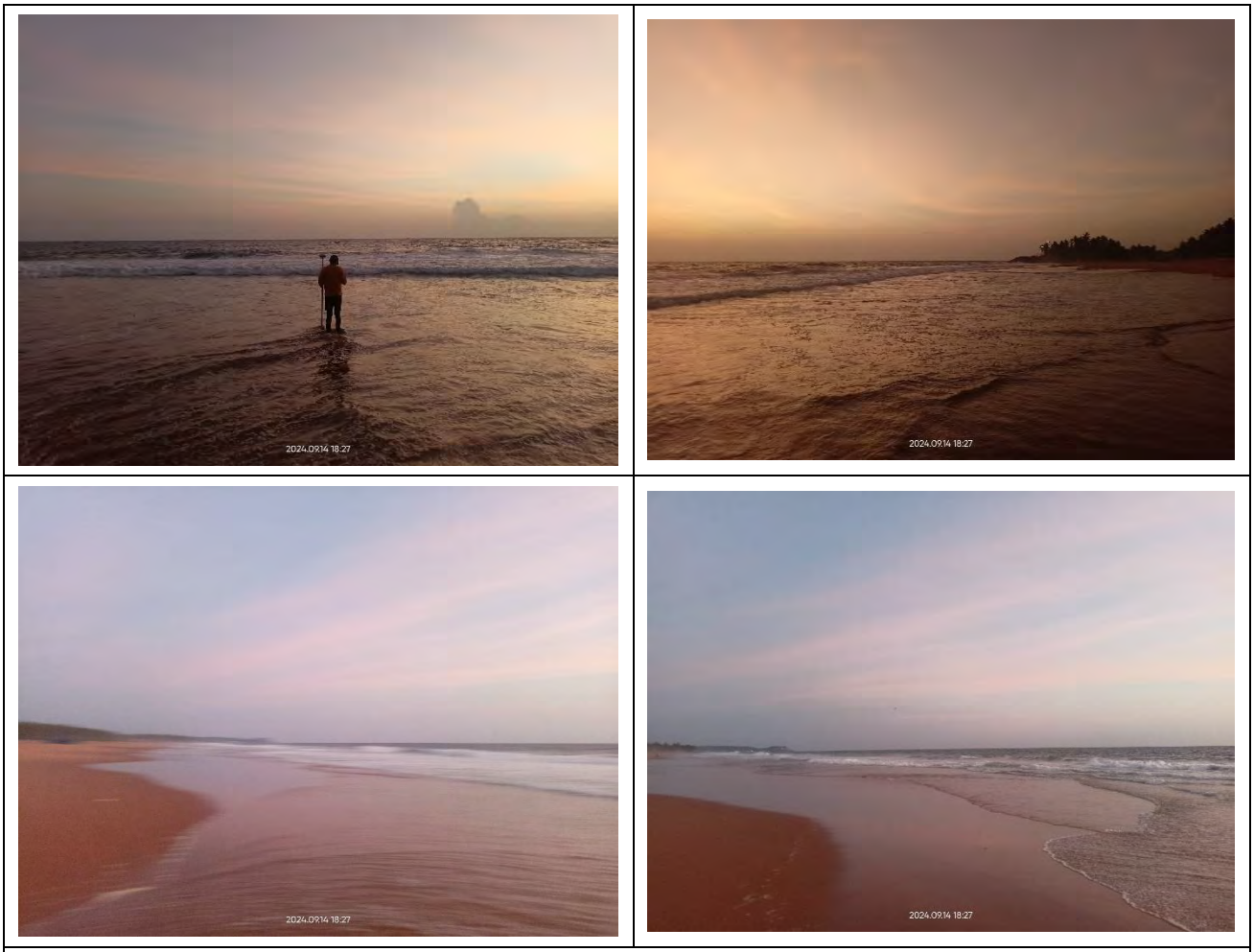


Figure 38: September 2024 CSP 55

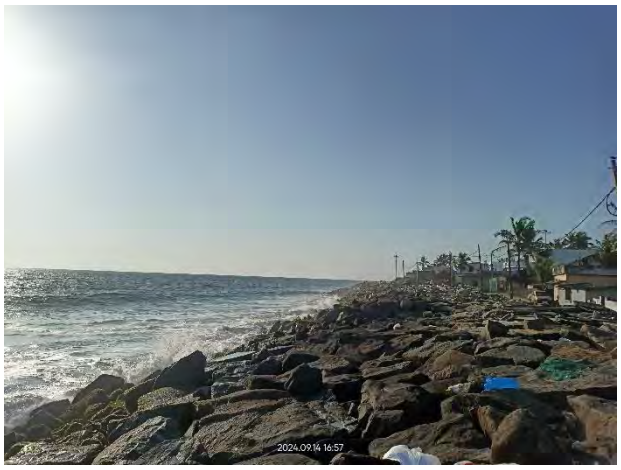



Figure 39: September 2024 CSP 56

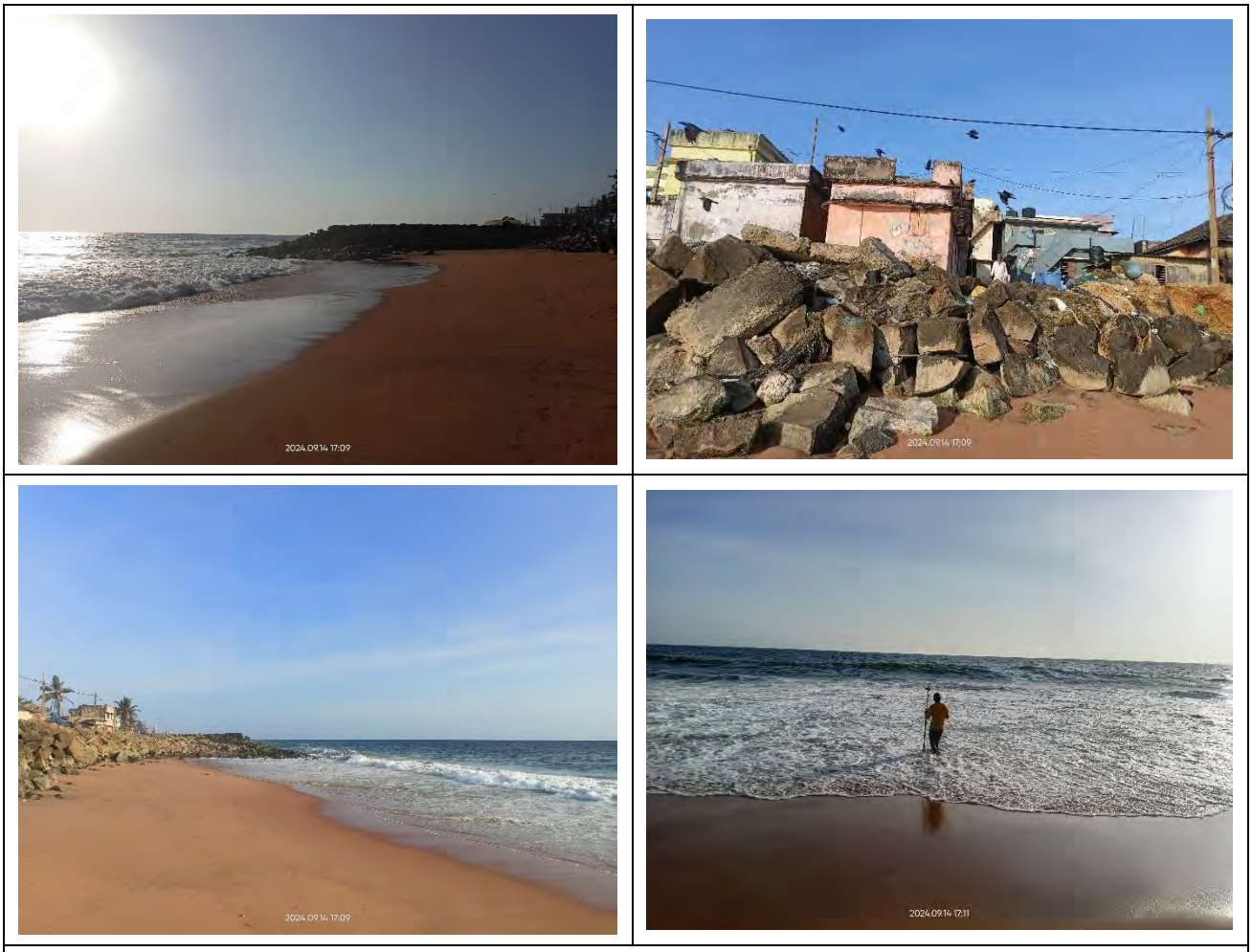
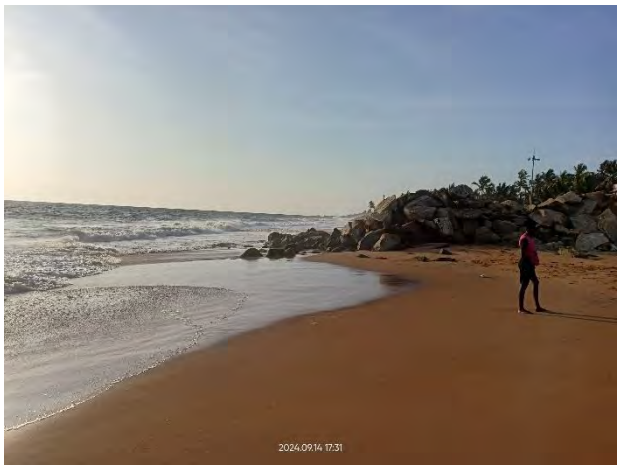


Figure 40: September 2024 CSP 57



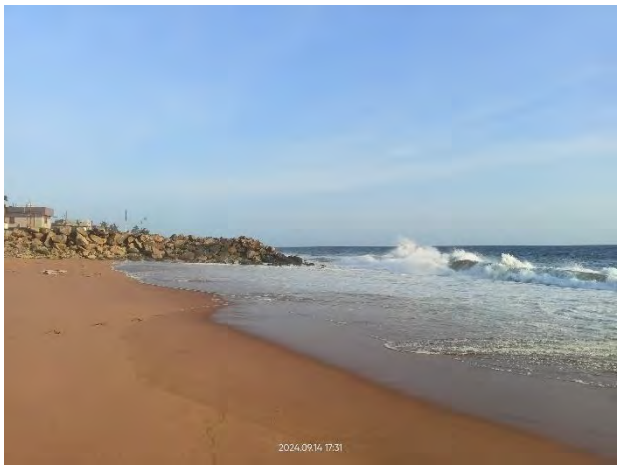


Figure 41: September 2024 CSP 58

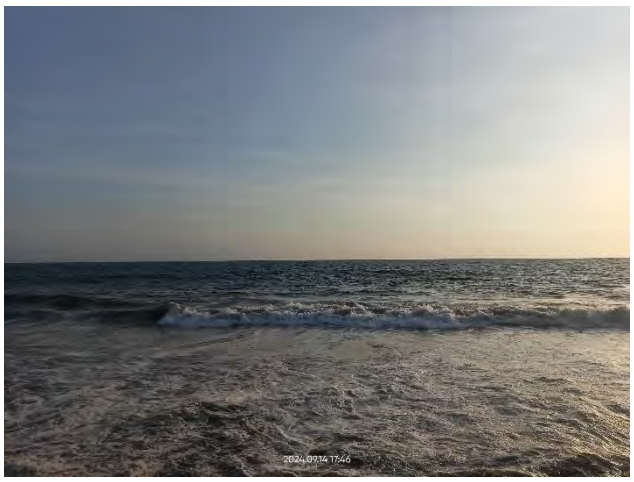
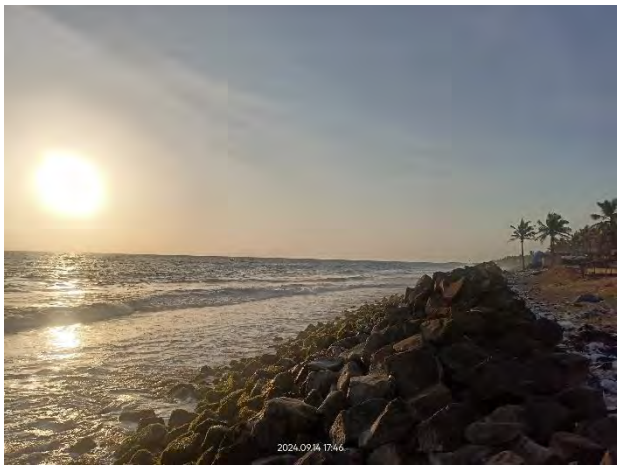
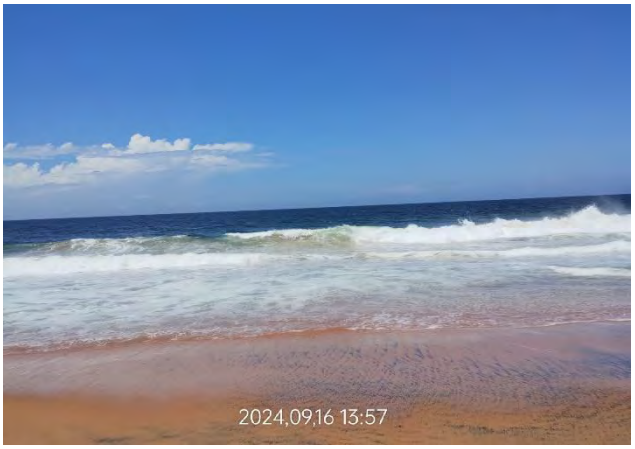



Figure 42: September 2024 CSP 59



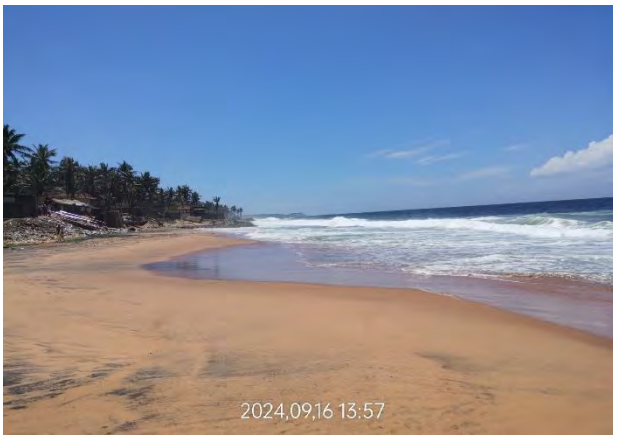


Figure 43: September 2024 CSP 60

Figure 44: September 2024 CSP 61



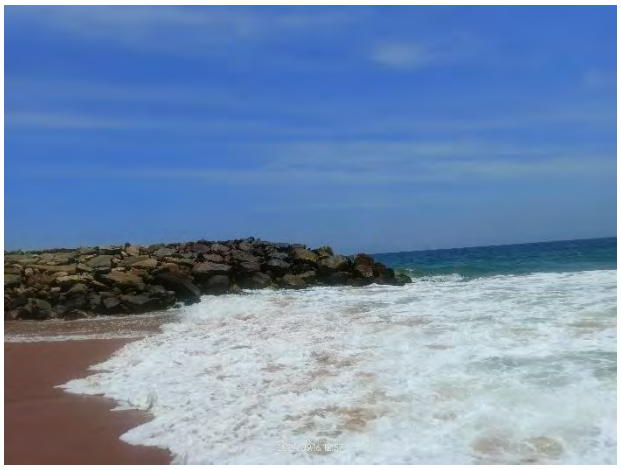



Figure 45: September 2024 CSP 62

Figure 46: September 2024 CSP 63

Figure 47: September 2024 CSP 64




Figure 48: September 2024 CSP 65

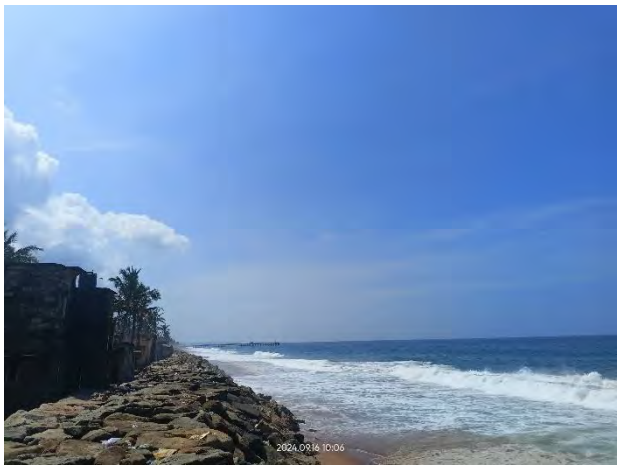


Figure 49: September 2024 CSP 66

Figure 50: September 2024 CSP 67

Figure 51: September 2024 CSP 68

Figure 52: September 2024 CSP 69

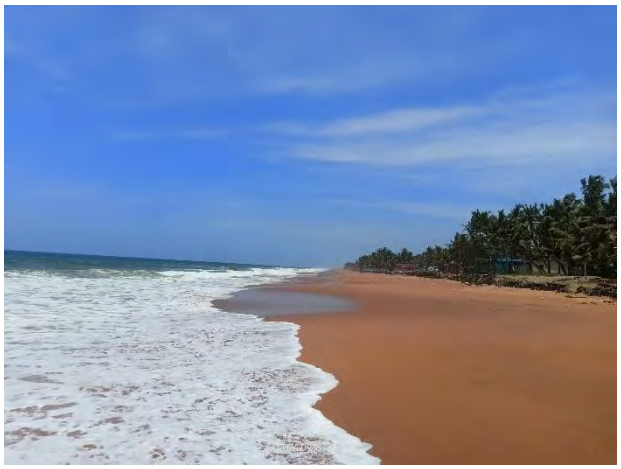


Figure 53: September 2024 CSP 70




Figure 54: September 2024 CSP 71

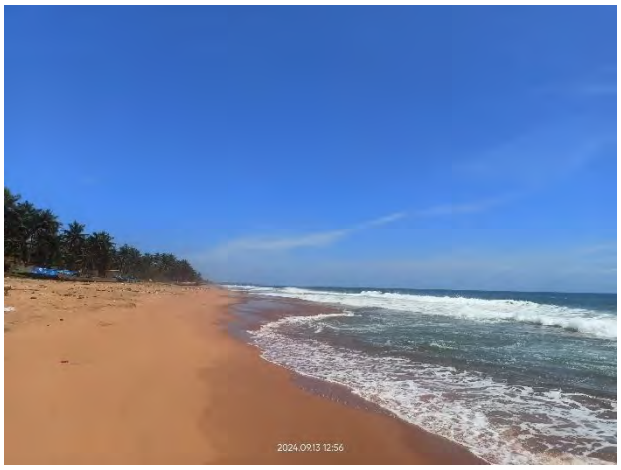


Figure 55: September 2024 CSP 72

Figure 56: September 2024 CSP 73

Figure 57: September 2024 CSP 74

Figure 58: September 2024 CSP 75




Figure 59: September 2024 CSP 76



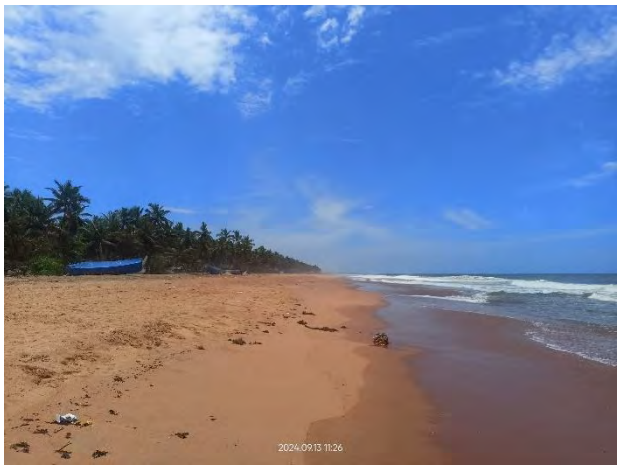



Figure 60: September 2024 CSP 77

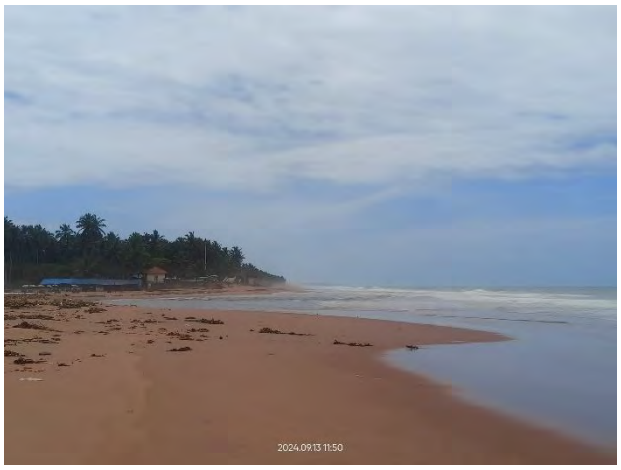


Figure 61: September 2024 CSP 78

Figure 62: September 2024 CSP 79



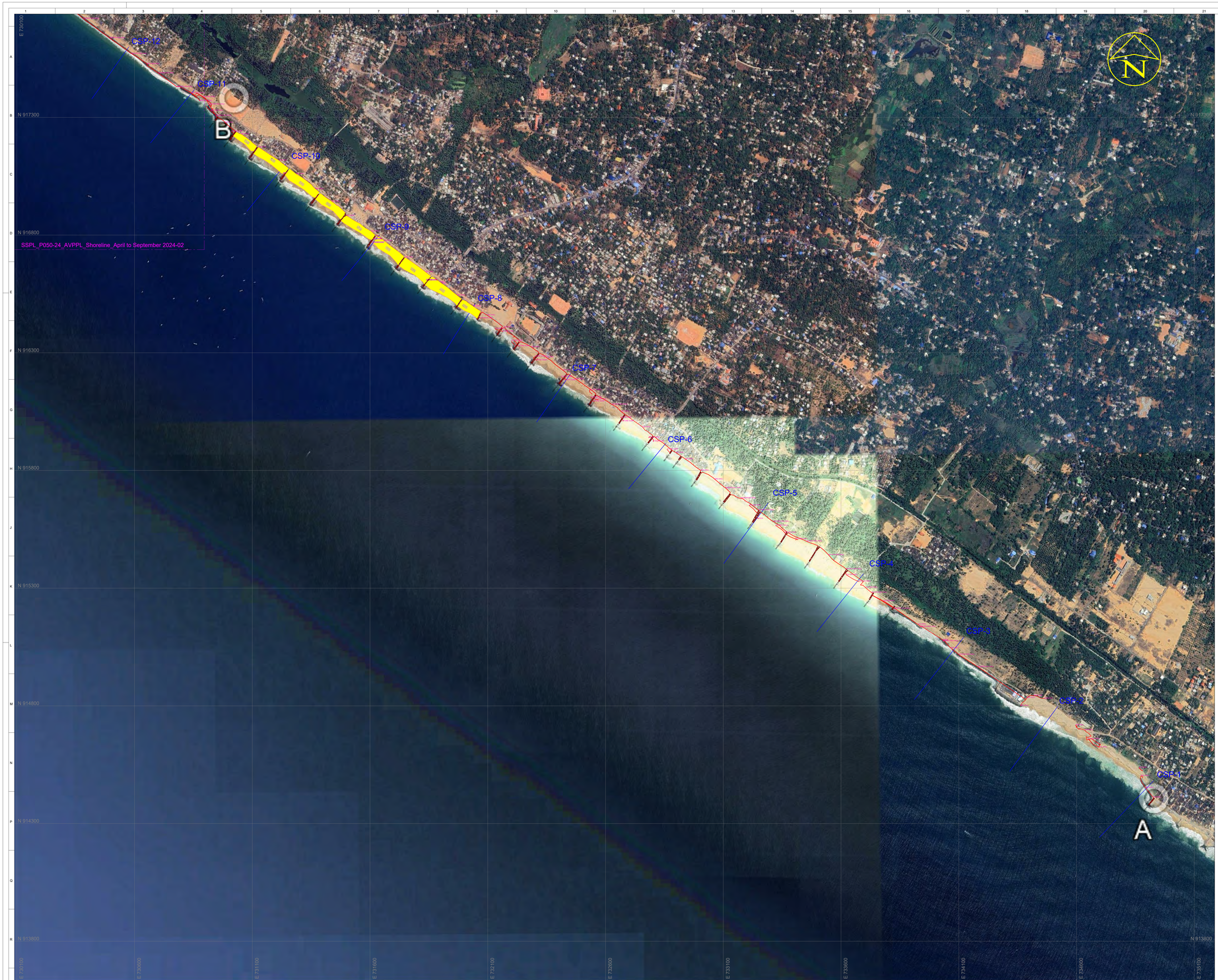

Figure 63: September 2024 CSP 80




Figure 64: September 2024 CSP 81

Annexure II

Overlay of month-on-month Shoreline Monitoring Charts



Notes :

1. All coordinates are in WGS 84 datum, UTM grid system, Zone 43 North

LEGEND

- GROYNES
- BEACH
- ROCK
- SEAWALL
- SHORELINE APRIL 2024
- SHORELINE MAY 2024
- SHORELINE JUNE 2024
- SHORELINE JULY 2024
- SHORELINE AUGUST 2024
- SHORELINE SEPTEMBER 2024

Survey Notes

Surface Positioning : Geomax Zenith (GPS Mode)

Geodetic Parameters :

Horizontal Coordinate System	:	WGS84
Geodetic Datum / Spheroid	:	WGS84
Semi-Major Axis (a) (meters)	:	6378137.000m
Semi-Minor Axis	:	6356752.314245m
Inverse Flattening	:	298.2572235630
Projection	:	Universal Transverse Mercator
Longitude of Origin (CM)	:	75° E (Zone 43)
Latitude of Origin	:	0° N (Equator)
Hemisphere	:	North
False Easting	:	500.000 m
False Northing	:	0 m
Scale Factor at CM	:	0.9996
Units	:	Metres

Scale

HORIZONTAL 1 : 5000

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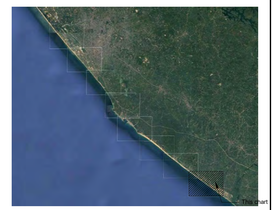
Key Plan



Client

ADANI VIZHINJAM PORT PVT. LTD.
3rD Floor, Aspinwall House,
Kawdiar Road, Kuravankonam,
Thiruvananthapuram - 695003

Survey Contractor

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Project

Oceanographic And Bathymetric Data Collection
For Assessment of Shoreline Changes

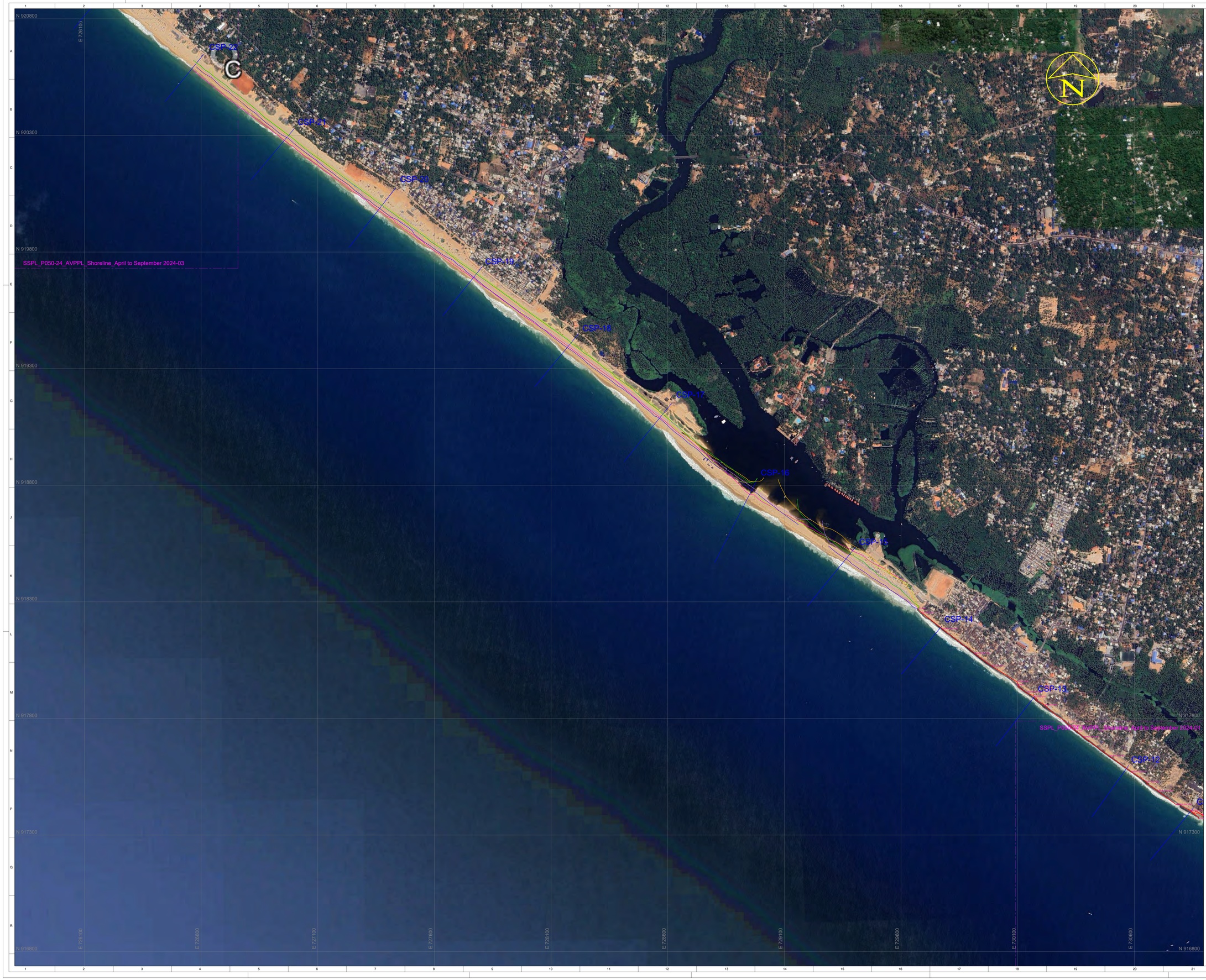
Drawing Title

Shoreline Monitoring Chart

Rev.No.	Description	Date
0	First issue	31.10.2024

Drawn : S. Khaire | Interpreted : Sachu.S | Checked : V. Mehta

Dwg No. SSPL_P050-24_AVPPL_Shoreline_April to September 2024-01



Notes :

1. All coordinates are in WGS-84 datum, UTM grid system, Zone 43 North

LEGEND

- GROYNES
- BEACH
- ROCK
- SEAWALL
- SHORELINE APRIL 2024
- SHORELINE MAY 2024
- SHORELINE JUNE 2024
- SHORELINE JULY 2024
- SHORELINE AUGUST 2024
- SHORELINE SEPTEMBER 2024

Survey Notes

Surface Positioning : Geomax Zenith (GPS Mode)

Geodetic Parameters :

Horizontal Coordinate System	:	WGS84
Geodetic Datum / Spheroid	:	WGS84
Semi-Major Axis (a) (meters)	:	6378137.000m
Semi-Minor Axis	:	6356752.314245m
Inverse Flattening	:	298.257223563D
Projection	:	Universal Transverse Mercator
Longitude of Origin (CM)	:	75° E (Zone 43)
Latitude of Origin	:	0° N (Equator)
Hemisphere	:	North
False Easting	:	500 000 m
False Northing	:	0 m
Scale Factor at CM	:	0.9996
Units	:	Metres

Scale

HORIZONTAL 1 : 5000

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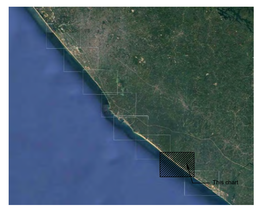
Key Plan



Client

ADANI VIZHINJAM PORT PVT. LTD.
3rD Floor, Aspinwall House,
Kawdiar Road, Kuravankonam,
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Project

Oceanographic And Bathymetric Data Collection
For Assessment of Shoreline Changes

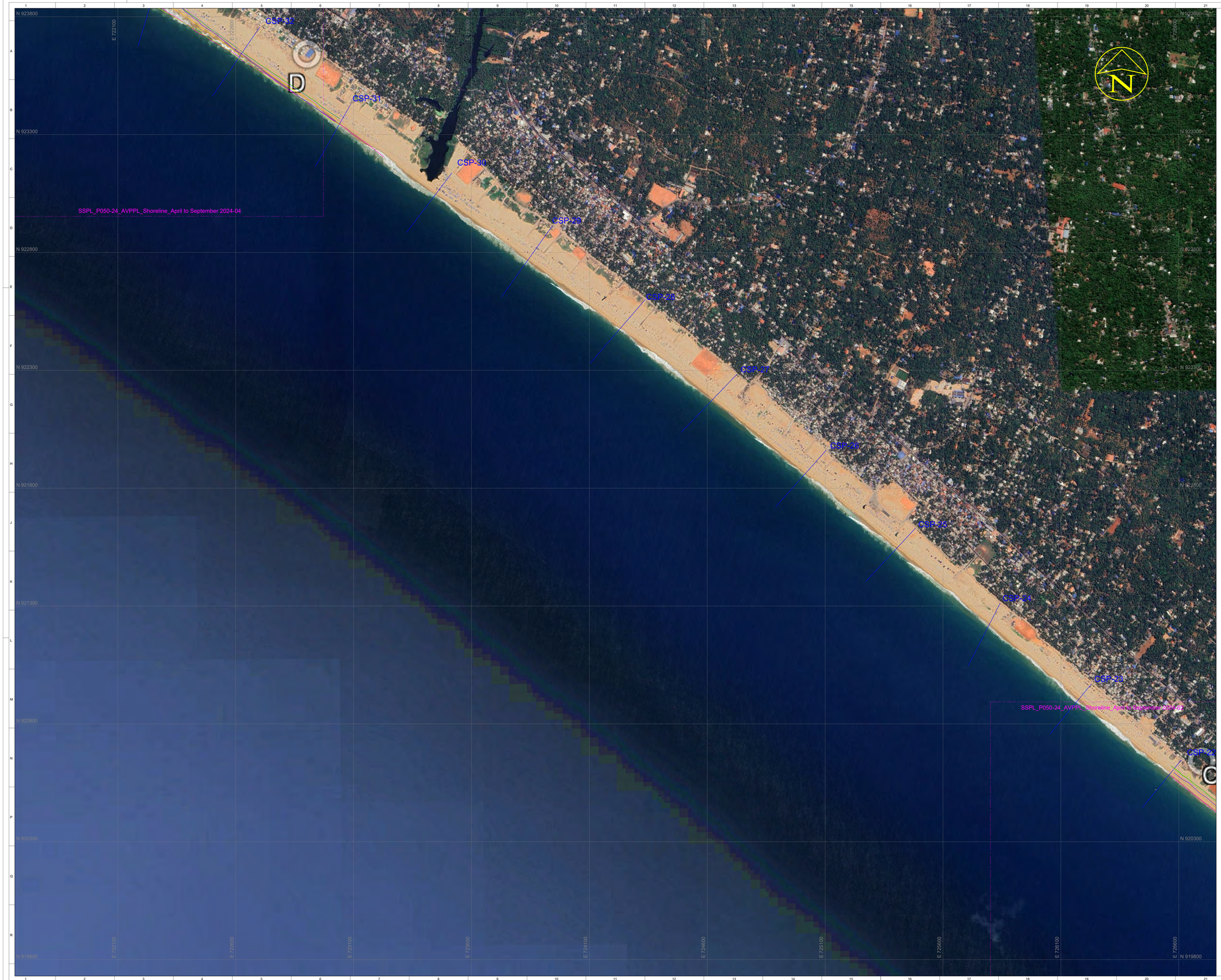
Drawing Title

Shoreline Monitoring Chart

Rev.No.	Description	Date
0	First issue	31.10.2024

Drawn : S. Khaire | Interpreted : Sachu. S | Checked : V. Mehta

Dwg No. SSPL_P050-24_AVPPL_Shoreline_April to September 2024-02



Notes :

1. All coordinates are in WGS 84 datum, UTM grid system, Zone 43 North

LEGEND

- GROYNES
- BEACH
- ROCK
- SEAWALL
- SHORELINE APRIL 2024
- SHORELINE MAY 2024
- SHORELINE JUNE 2024
- SHORELINE JULY 2024
- SHORELINE AUGUST 2024
- SHORELINE SEPTEMBER 2024

Survey Notes

Surface Positioning : Geomax Zenith (GPS Mode)

Geodetic Parameters :

Horizontal Coordinate System	:	WGS84
Geodetic Datum / Spheroid	:	WGS84
Semi-Major Axis (a) (meters)	:	6378137.000m
Semi-Minor Axis	:	6356752.314245m
Inverse Flattening	:	298.2572235630
Projection	:	Universal Transverse Mercator
Longitude of Origin (CM)	:	75° E (Zone 43)
Latitude of Origin	:	0° N (Equator)
Hemisphere	:	North
False Easting	:	500 000 m
False Northing	:	0 m
Scale Factor at CM	:	0.9996
Units	:	Metres

Scale

HORIZONTAL 1 : 5000

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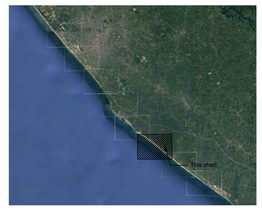
Key Plan



Client

ADANI VIZHINJAM PORT PVT. LTD.
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Thiruvananthapuram - 695003

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Project

Oceanographic And Bathymetric Data Collection
For Assessment of Shoreline Changes

Drawing Title

Shoreline Monitoring Chart

Rev No.	Description	Date
0	First issue	31.10.2024

Drawn : S. Khaire | Interpreted : Sachu. S | Checked : V. Mehta

Dwg No. SSPL_P050-24_AVPPL_Shoreline_April to September 2024-03

Notes :

1. All coordinates are in WGS 84 datum, UTM grid system, Zone 43 North

LEGEND

- GROYNES
- BEACH
- ROCK
- SEAWALL
- SHORELINE APRIL 2024
- SHORELINE MAY 2024
- SHORELINE JUNE 2024
- SHORELINE JULY 2024
- SHORELINE AUGUST 2024
- SHORELINE SEPTEMBER 2024

Survey Notes

Surface Positioning : Geomax Zenith (GPS Mode)

Geodetic Parameters :

Horizontal Coordinate System	:	WGS84
Geodetic Datum / Spheroid	:	WGS84
Semi-Major Axis (a) (meters)	:	6378137.000m
Semi-Minor Axis	:	6356752.314245m
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Longitude of Origin (CM)	:	75° E (Zone 43)
Latitude of Origin	:	0° N (Equator)
Hemisphere	:	North
False Easting	:	500 000 m
False Northing	:	0 m
Scale Factor at CM	:	0.9996
Units	:	Metres

Scale

HORIZONTAL 1 : 5000

100 0 100 200 300 400 500metres

Key Plan

Client

ADANI VIZHINJAM PORT PVT. LTD.
3rD Floor, Aspinwall House,
Kawdiar Road, Kuravankonam,
Thiruvananthapuram - 695003

Survey Contractor

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Project

Oceanographic And Bathymetric Data Collection
For Assessment of Shoreline Changes

Drawing Title

Shoreline Monitoring Chart

Rev No.	Description	Date
0	First issue	31.10.2024

Drawn : S. Khaire | Interpreted : Sachu. S | Checked : V. Mehta

Dwg No. SSPL_P050-24_AVPPL_Shoreline_April to September 2024-04

Notes :

1. All coordinates are in WGS 84 datum, UTM grid system, Zone 43 North

LEGEND

- GROYNES
- BEACH
- ROCK
- SEAWALL
- SHORELINE APRIL 2024
- SHORELINE MAY 2024
- SHORELINE JUNE 2024
- SHORELINE JULY 2024
- SHORELINE AUGUST 2024
- SHORELINE SEPTEMBER 2024

Survey Notes

Surface Positioning : Geomax Zenith (GPS Mode)

Geodetic Parameters :

Horizontal Coordinate System	:	WGS84
Geodetic Datum / Spheroid	:	WGS84
Semi-Major Axis (a) (meters)	:	6378137.000m
Semi-Minor Axis	:	6356752.314245m
Inverse Flattening	:	298.2572235630
Projection	:	Universal Transverse Mercator
Longitude of Origin (CM)	:	75° E (Zone 43)
Latitude of Origin	:	0° N (Equator)
Hemisphere	:	North
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False Northing	:	0 m
Scale Factor at CM	:	0.9996
Units	:	Metres

Scale

HORIZONTAL 1 : 5000

100 0 100 200 300 400 500metres

Key Plan

Client

ADANI VIZHINJAM PORT PVT. LTD.
3rD Floor, Aspinwall House,
Kawdiar Road, Kuravankonam,
Thiruvananthapuram - 695003

Survey Contractor

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Tele/Fax:- 022 27562900
E-mail : info@shankarsurveys.com

Project

Oceanograohic And Bathymetric Data Collection
For Assessment of Shoreline Changes

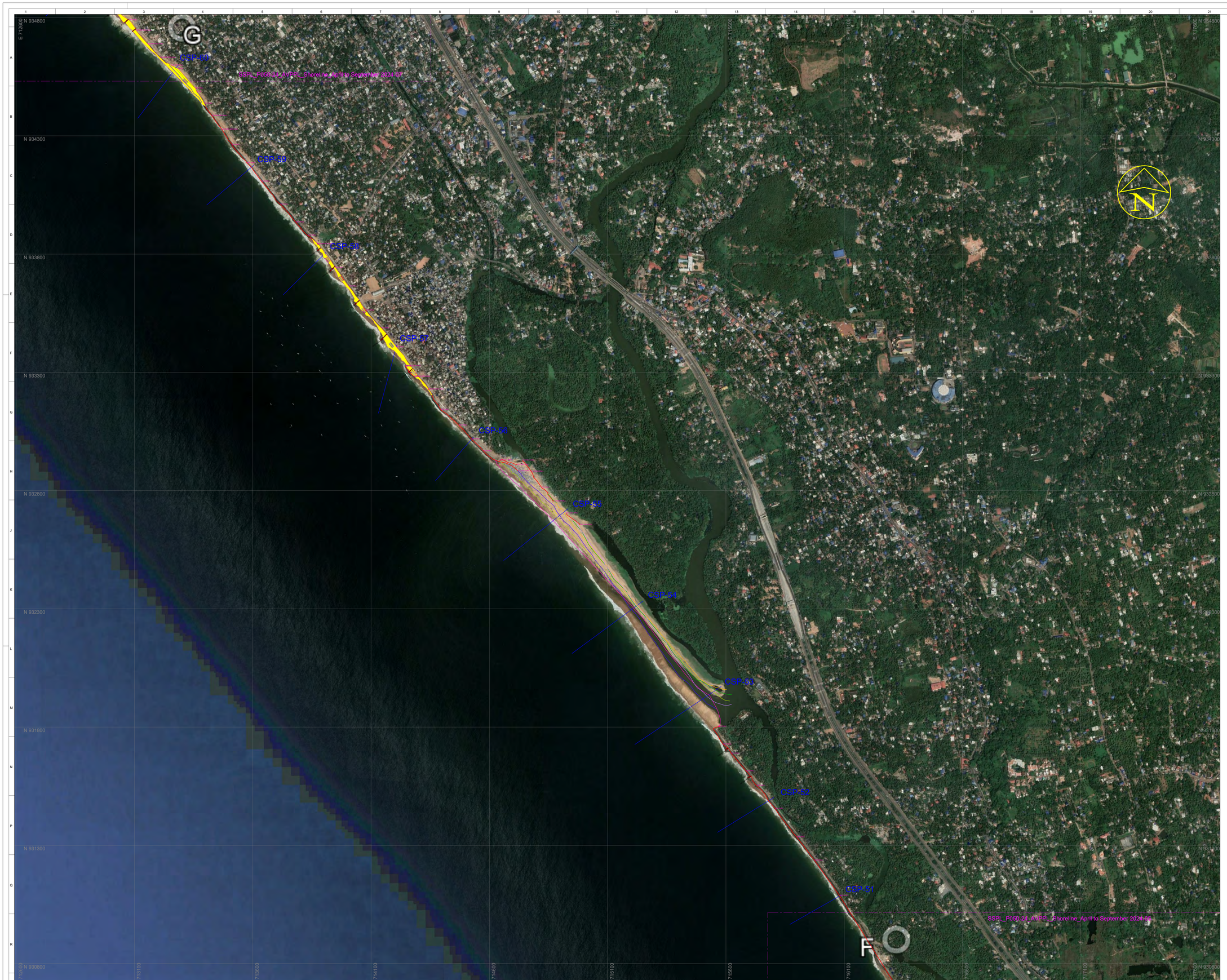
Drawing Title

Shoreline Monitoring Chart

Rev No.	Description	Date
0	First issue	31.10.2024

Drawn : S. Khaire | Interpreted : Sachu. S | Checked : V. Mehta

Dwg No. SSPL_P050-24_AVPPL_Shoreline_April to September 2024-05



Notes :

1. All coordinates are in WGS 84 datum, UTM grid system, Zone 43 North

LEGEND

- GROYNES
- BEACH
- ROCK
- SEAWALL
- SHORELINE APRIL 2024
- SHORELINE MAY 2024
- SHORELINE JUNE 2024
- SHORELINE JULY 2024
- SHORELINE AUGUST 2024
- SHORELINE SEPTEMBER 2024

Survey Notes

Surface Positioning : Geomax Zenith (GPS Mode)

Geodetic Parameters :

Horizontal Coordinate System	:	WGS84
Geodetic Datum / Spheroid	:	WGS84
Semi-Major Axis (a) (meters)	:	6378137.000m
Semi-Minor Axis	:	6356752.314245m
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Latitude of Origin	:	0° N (Equator)
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False Easting	:	500 000 m
False Northing	:	0 m
Scale Factor at CM	:	0.9996
Units	:	Metres

Scale

HORIZONTAL 1 : 5000

100 0 100 200 300 400 500metres

Key Plan

Client

ADANI VIZHINJAM PORT PVT. LTD.
3rD Floor, Aspinwall House,
Kawdiar Road, Kuravankonam,
Thiruvananthapuram - 695003

Survey Contractor

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115, 1st Floor, Neco Chambers
Sector 11, CBD Belapur, Navi Mumbai
Tele/Fax:- 022 27562900
E-mail : info@shankarsurveys.com

Project

Oceanographic And Bathymetric Data Collection
For Assessment of Shoreline Changes

Drawing Title

Shoreline Monitoring Chart

Rev.No.	Description	Date
0	First issue	31.10.2024

Drawn : S. Khaire | Interpreted : Sachu. S | Checked : V. Mehta

Dwg No. SSPL_P050-24_AVPPL_Shoreline_April to September 2024-06

Notes :

1. All coordinates are in WGS 84 datum, UTM grid system, Zone 43 North

LEGEND

- GROYNES
- BEACH
- ROCK
- SEAWALL
- SHORELINE APRIL 2024
- SHORELINE MAY 2024
- SHORELINE JUNE 2024
- SHORELINE JULY 2024
- SHORELINE AUGUST 2024
- SHORELINE SEPTEMBER 2024

Survey Notes

Surface Positioning : Geomax Zenith (GPS Mode)

Geodetic Parameters :

Horizontal Coordinate System	:	WGS84
Geodetic Datum / Spheroid	:	WGS84
Semi-Major Axis (a) (meters)	:	6378137.000m
Semi-Minor Axis	:	6356752.314245m
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Latitude of Origin	:	0° N (Equator)
Hemisphere	:	North
False Easting	:	500 000 m
False Northing	:	0 m
Scale Factor at CM	:	0.9996
Units	:	Metres

Scale

HORIZONTAL 1 : 5000

100 0 100 200 300 400 500metres

Key Plan

Client

ADANI VIZHINJAM PORT PVT. LTD.
3rD Floor, Aspinwall House,
Kawdiar Road, Kuravankonam,
Thiruvananthapuram - 695003

Survey Contractor

SHANKAR SURVEYS PVT.LTD
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Sector 11, CBD Belapur, Navi Mumbai
Tele/Fax:- 022 27562900
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Project

Oceanographic And Bathymetric Data Collection
For Assessment of Shoreline Changes

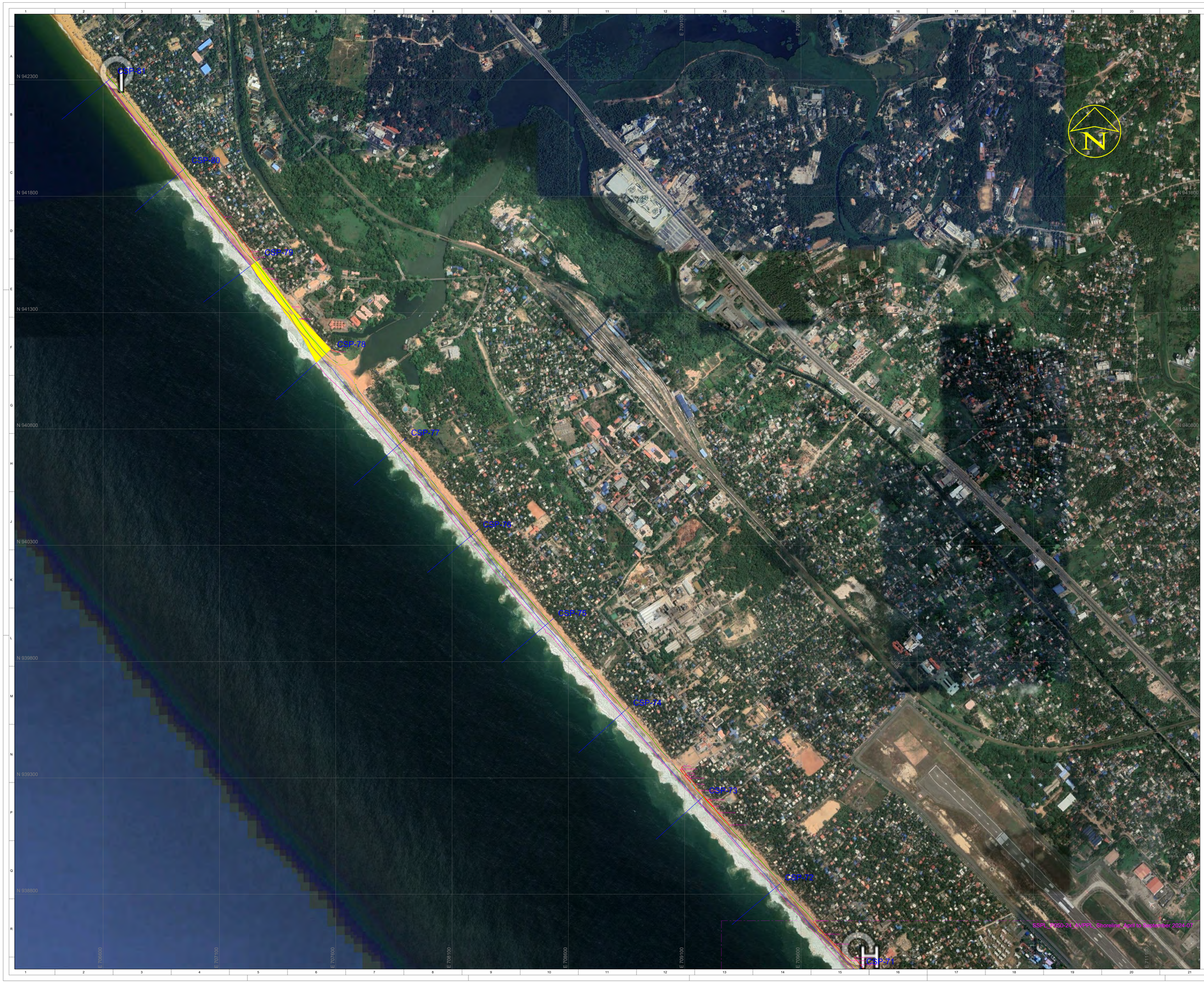
Drawing Title

Shoreline Monitoring Chart

Rev.No.	Description	Date
0	First issue	31.10.2024

Drawn : S. Khaire | Interpreted : Sachu. S | Checked : V. Mehta

Dwg No.. SSPL_P050-24_AVPPL_Shoreline_April to September 2024-07



Notes :

1. All coordinates are in WGS 84 datum, UTM grid system, Zone 43 North

LEGEND

- GROYNES
- BEACH
- ROCK
- SEAWALL
- SHORELINE APRIL 2024
- SHORELINE MAY 2024
- SHORELINE JUNE 2024
- SHORELINE JULY 2024
- SHORELINE AUGUST 2024
- SHORELINE SEPTEMBER 2024

Survey Notes

Surface Positioning : Geomax Zenith (GPS Mode)

Geodetic Parameters :

Horizontal Coordinate System	:	WGS84
Geodetic Datum / Spheroid	:	WGS84
Semi-Major Axis (a) (meters)	:	6378137.000m
Semi-Minor Axis	:	6356752.314245m
Inverse Flattening	:	298.257223530
Projection	:	Universal Transverse Mercator
Longitude of Origin (CM)	:	75° E (Zone 43)
Latitude of Origin	:	0° N (Equator)
Hemisphere	:	North
False Easting	:	500 000 m
False Northing	:	0 m
Scale Factor at CM	:	0.9996
Units	:	Metres

Scale

HORIZONTAL 1 : 5000

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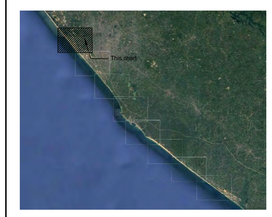
Key Plan



Client

adani

ADANI VIZHINJAM PORT PVT. LTD.
3rD Floor, Aspinwall House,
Kawdiar Road, Kuravankonam,
Thiruvananthapuram - 695003

Survey Contractor

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Project

Oceanographic And Bathymetric Data Collection
For Assessment of Shoreline Changes

Drawing Title

Shoreline Monitoring Chart

Rev No.	Description	Date
0	First issue	31.10.2024

Drawn : S. Khaire. | Interpreted : Sachu. S | Checked : V. Mehta

Dwg No. SSPL_P050-24_AVPPL_Shoreline_April to September 2024-08

Annexure II

Mathematical Modelling Report

(October 2023 to September 2024)

Assystem India Limited

Client: **Adani Vizhinjam Port Private Limited**
Vizhinjam

Project:	Data Analysis & Model Studies for Vizhinjam Port using data collected by AVPPL (Oct 2023 – Sep 2024)	**Project No.:** C1241501
Title:	Draft Data analysis and Model study report (October 2023 – September 2024)	**Document No.:** RP001 / **Rev.:** 0

File path:
S:\53 - CJob\Ports\2023\C1231501 - ADANI-MODEL-STUDY-22-23\Working\Reports\RP005

Notes:

1.

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Revision Details:

Rev.	Date	Details	Prepared Init.	Prepared Sign.	Checked Init.	Checked Sign.	Approved Init.	Approved Sign.
0	28-11-2024		DKV/ PDR		PRJ		PRJ	

TABLE OF CONTENTS

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` Executive Summary

Government of Kerala (GoK) is planning to setup a green field modern deep water multipurpose seaport at Vizhinjam in Thiruvananthapuram District of Kerala. Vizhinjam International Seaport Limited (VISL), which is a fully owned GoK undertaking, has been entrusted with the task of developing the green field seaport. VISL has awarded Adani Vizhinjam Port Private Limited (AVPPL) the job of constructing the port as a concessionaire. As a part of the project requirements, AVPPL must continuously monitor the impact of the port construction on the surrounding environment. A continuous monitoring will help to assess if at all the port construction has any impact on the neighbouring environment.

ASSYSTEM INDIA LIMITED (formerly known as L&T Infrastructure Engineering Limited) has been long associated with VISL and had carried out comprehensive marine model studies in August 2013. In 2022, ASSYSTEM INDIA LIMITED submitted a report based on the data received from February 2021 - August 2022. A report encompassing model studies was also submitted. In a follow up for the project, ASSYSTEM INDIA LIMITED was awarded the job for carrying out the data analysis and accompanying model study for the data collected from October 2023 to September 2024. ASSYSTEM INDIA LIMITED was given the task of assessing the impact of port construction on shoreline and beach morphology. Parameters in consideration were waves, current, tides, wind, bathymetry, beach profile, etc. Physical oceanographic parameters such as waves, current and tides are primary variables. The variation in these parameters will cause changes in the dependent variables such as bathymetry and beach profile. In addition, impact of any major weather change has been evaluated. Since the trends are expected to change owing to the dynamic nature of the parameters, any abnormal changes in them were further investigated.

With this background, ASSYSTEM INDIA LIMITED has prepared this report by carrying out the analysis of the data received from October 2023 to September 2024 to assess the impact of port development.

Following are the summary of the works carried out by ASSYSTEM INDIA LIMITED to arrive at the intended scope of the project:-

1) Data Analysis

- The bathymetry analysis has been carried out to check whether any changes occurred in the sea water depth due to the upcoming port. Analysis was carried out by considering seven transect lines perpendicular to the shore; four on the North of port, two on the South of port and one near the port. Post-monsoon 2023 and pre-monsoon 2024 bathymetric cross sections were compared to post-monsoon 2015 and pre-monsoon 2015. There is erosion at Shanghumugham and Valiyathura, but there is accretion at Panathura, Adimalathura, and Poovar Beach North.
- An analysis and comparison are made between the observed wave data from October 2023 to September 2024 provided by AVPPL and the observed wave data from October 2015 to September 2016. The majority of the waves that are seen at the project site are between 0.5 and 1.5 metres in height. Additionally, a comparison between the wave data from 2015 and 2024 is made. From these comparisons, the variability of wave heights and directions are within expected ranges.
- The current data was provided at one location. Analysis has been carried out to check if there are any changes in the trend of current components from the previous years due to the construction of breakwater. It can be noticed that the current speed

in the region is in the range of 0.1 to 0.4 m/s. However, occasionally maximum current speed observed during all the seasons is in the range of 0.6 to 0.9 m/s.

- ASSYSTEM INDIA LIMITED extracted +2m, -3m, -4m, -6m, -8m and -10m contours from cross shore profile data and time series plots of respective contours over two-year data are shown at Neerody, Pozhiyoor, Karumkulam, Panathura, Beemapally and Vettucaud locations. From this plot it can be noticed that the beach undergoes seasonal variation of erosion on monsoon season and accretion on other seasons.
- From the LEO data, it can be observed that the current movement is towards the south during the monsoon, and from the model studies, it is evident that the tide and current pattern at several locations follow trends set in the previous years. This indicates that transport of sand during the monsoon season is towards the south.

2) Model Studies

a) Assessment of Hydrodynamics

- Earlier in 2013, ASSYSTEM INDIA LIMITED had comprehensively covered the assessment of hydrodynamics in the port vicinity. To understand the impact of the port construction on the hydrodynamics, ASSYSTEM INDIA LIMITED carried out the assessment of hydrodynamics with the latest surveyed bathymetries.
- From the assessment of hydrodynamics, it was found that current speeds prevailing near the project location over past years (2013, 2023 and 2024) were identical. In addition, the model was also calibrated using the latest data. From the model studies it was found that the tide and current pattern at several locations follow trends set in the previous years.

b) Long shore sediment transport

- Long shore sediment transport refers to the cumulative movement of beach and near shore material parallel to the shore by the combined action of tides, wind, waves and the shore-parallel currents produced by them.
- The study area extends from Edappadu Beach (CS 01) in the South to Thumba (CS 81) in the North over a stretch of approximately 40km. This coast can be distinguished into two subsets depending on the coastal orientation. The shore angle on south side is in the range of 125^0 to 130^0 (True North) and shore angle on north side is in the range of 135^0 to 145^0 (True North). This change in orientation will have effect on long shore sediment transport and its behaviour.
- To compute longshore transport rate, breaking parameters need to be estimated first. The breaking parameters such as breaking wave height, breaking depth and breaking angle (shore normal) were calculated using depth limited criterion. The wave parameters were collected from WRB and the breaking characteristics of waves were determined by combining wave refraction and shoaling calculations with wave breaking criteria.
- Depending on the coast orientation two average LSTR estimates were calculated based on available 7 years data (Feb 2015 – Feb 2024), Feb-Feb is considered since most beach profiles have built up. The northerly and southerly (annual average) longshore sediment movement in south stretch is in the range of 0.16 to 0.17 M m^3/yr (Northwards) and -0.09 to -0.11 M m^3/yr (Southwards). In north stretch, the range is 0.22 to 0.23 M m^3/yr (Northwards) and -0.11 to -0.12 M m^3/yr (Southwards). The net annual average longshore sediment movement in south stretch is in the range of 0.06 to 0.07 M m^3/yr (Northwards) and in north stretch in the range of 0.11 to 0.12 M m^3/yr (Northwards).

c) Impact of breakwater, groynes and seawalls on 12km radius of Vizhinjam port

- The shoreline evolution model study has been carried out for various phase of breakwater development incorporating all the existing coastal features (manmade and natural). The model considers a 12km coastal stretch for the simulation of shoreline evolution on either side of the port. All the groynes and seawalls present within this area were included in the model.
- From the simulated results it is noticed that the shoreline evolution follows a similar trend as of no breakwater case whilst the introduction of breakwater in the model. Shoreline changes are noticed near the groin fields north of the port which were constructed by Government of Kerala. However, the changes around groin fields are localised and the port has no effect on these changes.
- The shoreline change study was carried out using GENESIS. It is evident from the plot of shoreline evolution with and without breakwater (Figure 4.8) that the construction of breakwater has minimal effects on shoreline changes
- The absence of any adverse effect on the shoreline towards north-west side of the proposed port can be attributed to many factors including the presence of headlands, the low longshore sediment transport rates and relatively high cross-shore sediment transport, and presence of distinct sediment cells.

1 Introduction

Government of Kerala is setting up a green field, modern deep water, multipurpose seaport at Vizhinjam in Thiruvananthapuram District of Kerala. Vizhinjam International Seaport Limited (VISL), which is a fully owned Government of Kerala undertaking, has been entrusted with the task of developing the green field seaport.

In this regard, VISL had appointed Royal Haskoning DHV India (RHI) as their technical consultant in April 2010 and entrusted RHI with the task of preparing the concept port Master Plan. The port layout and the conceptual design were provided by RHI. As an initial study, Ministry of Environment and Forests (MoEF) had suggested VISL to explore the likely impacts on the existing fishing harbour and adjacent coastal regions due to the proposed port. Later, as part of the EIA studies, VISL appointed AECOM India Private Limited (AEIPL) to prepare the Detailed Project Report (DPR) for the Development of Vizhinjam Port. As a part of DPR and EIA studies, the design criterion for the port as well as the impact of the port on the marine environment was studied.

ASSYSTEM INDIA LIMITED (formerly known as L&T Infrastructure Engineering Limited) has been long associated with VISL. ASSYSTEM INDIA LIMITED had assisted VISL in preparing a comprehensive model studies report containing details of effects of the port construction on various oceanic parameters such as wave, currents, sedimentation, shoreline changes, etc. ASSYSTEM INDIA LIMITED had also assisted VISL in NGT hearings and other activities necessary to obtain clearances for development of the port.

With subsequent progress in the project, Adani Vizhinjam Port Private Limited (AVPPL) was appointed as a concessionaire by VISL. During NGT's hearings it was ordered by the honourable court to carry out intense monitoring to assess the impact of the upcoming port on the environment. This included regular collection and assessment of environmental data and assessment of the impacts of the port construction on environment through these data. As a concessionaire, AVPPL was assigned the task to collect environmental data at regular intervals. Considering ASSYSTEM INDIA LIMITED's long association with this project and the fact that ASSYSTEM INDIA LIMITED had carried out most of the previous marine related model studies earlier, AVPPL approached ASSYSTEM INDIA LIMITED with the task of assessing the data collected by AVPPL and to carry out model studies to study the impact on the environment due to the port construction.

In this context, ASSYSTEM INDIA LIMITED have been carrying out data analysis and the required model studies based on the data collected from February 2015 to September 2022, ASSYSTEM INDIA LIMITED has produced reports containing analyses for all these years and has drawn out comparisons with the baseline data (2015; pre-project scenario). In continuation, AVPPL has awarded the job to ASSYSTEM INDIA LIMITED for carrying out the data analysis and accompanying model study for October 2023 to September 2024 period. AVPPL has measured oceanographic data from October 2023 to September 2024 and provided it to ASSYSTEM INDIA LIMITED for carrying out the data analysis and accompanying model study. This report is a part of the final report and contains the analysis of data and named as "Draft Data analysis and Model study report.

1.1 Project location

The deep-water port is being constructed at Vizhinjam in Thiruvananthapuram District of Kerala. A Vizhinjam fishing harbour is located at about 300m north of the port and is a major landmark at this location. The port location is shown in Figure 1-2.

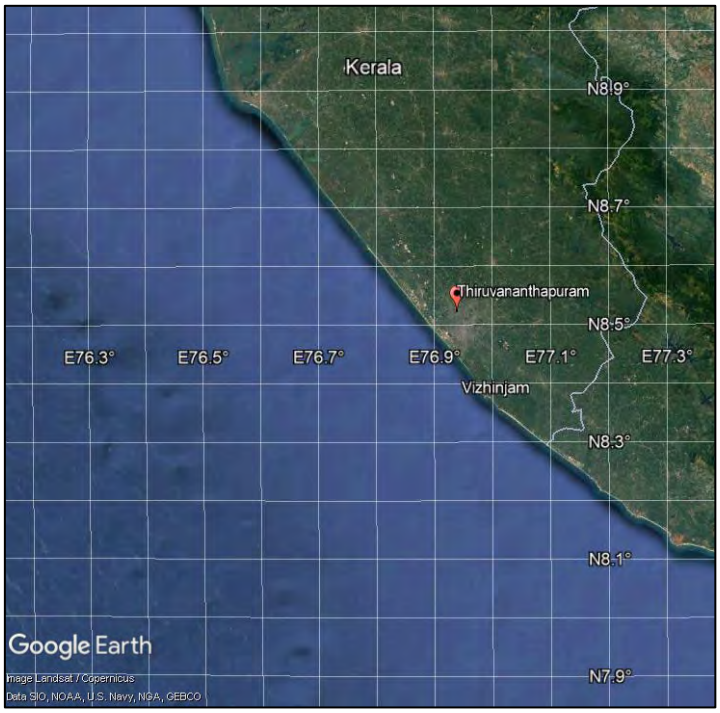


Figure 1-1 Location map of Vizhinjam

Figure 1-2 Location of the port (zoomed in)

2 Data Analysis

AVPPL has measured oceanographic data from October 2022 to September 2023 and has shared the list of data presented in Table 2-1.

Table 2-1 Data covered in present analysis

S. No	Data covered in present analysis
1	Wave data recorded continuously during the period of October 2023 to September 2024. (Missing Data : 5th October to 31st October 2023, November 2023,1st December to 21st December 2023)
2	Long term observation of water level variations for the period October 2023 to September 2024.
3	Measurement of wind speed and direction from October 2023 to September 2024
4	Surveyed bathymetry for Post Monsoon 2023 and Pre monsoon 2024
5	Cross shore beach profiles at 81 locations which cover approximately 40 km along the coastline.
6	Littoral Environment Observations

2.1 Waves

Wave data is being recorded continuously off Vizhinjam since early 2015. This section of the report discusses about the wave parameters based on the observed wave data. Wave parameters were measured using WRB at 8°19'39.42"N, 77° 1'4.73"E (-25 m depth) during the period of 01st October 2023 to 31st September 2024 for this cycle of study. The measured significant wave height, peak wave period and direction are represented in the form of graphs and are presented in Figure 2-1 to Figure 2-3.

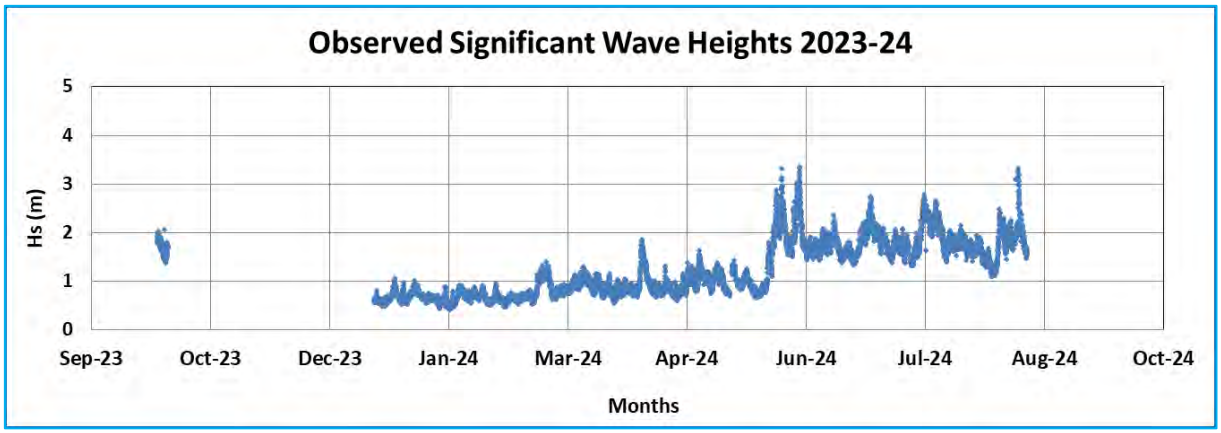


Figure 2-1 Temporal plot of wave height for observed wave data

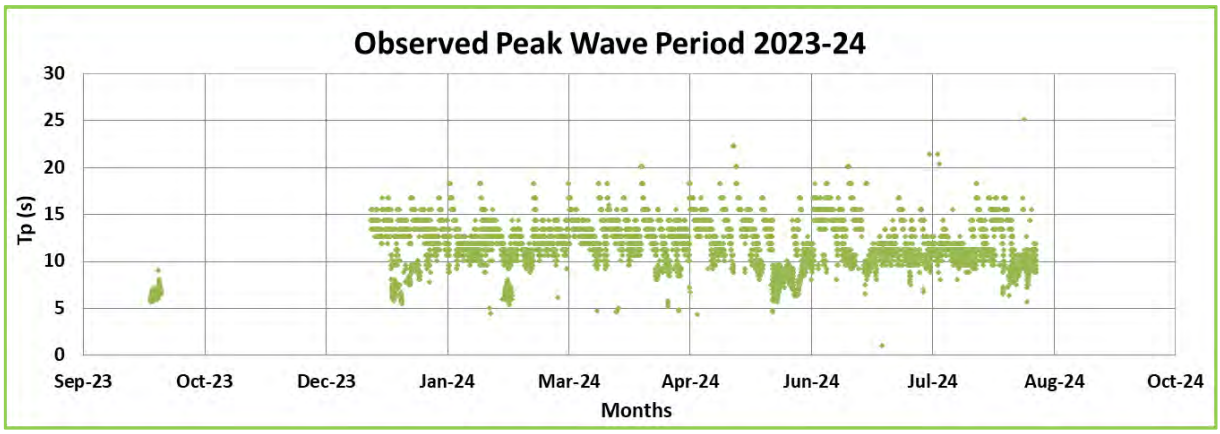


Figure 2-2 Temporal plot of peak wave period for observed wave data

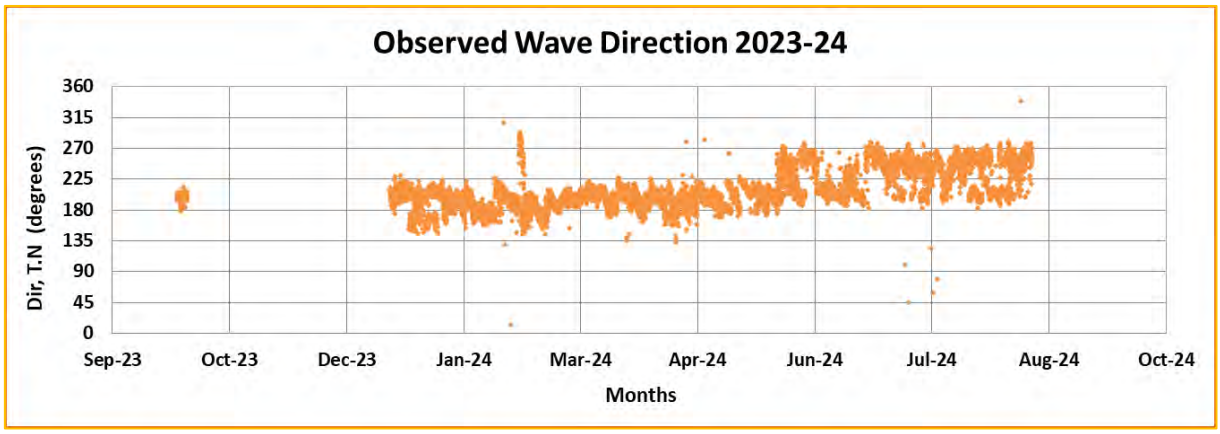


Figure 2-3 Temporal plot of wave direction for observed wave data

From the above graphs, we can observe that the significant wave heights are mostly in the range of 0.5 m – 1.5 m during non-monsoon period and it reaches around 3.5m during monsoon period.

It can be observed that wave direction throughout the period is mostly between 180^0 – 270^0 (S to W) with respect to true North. The predominant wave direction is observed to be from SSW. During Non-monsoon season the direction is mainly from S to SW.

As a general trend, an increase in wave heights is observed over past few years and at least one strong event per year. But no such event has been observed this year as no cyclonic event or storm is reported over the period of time.

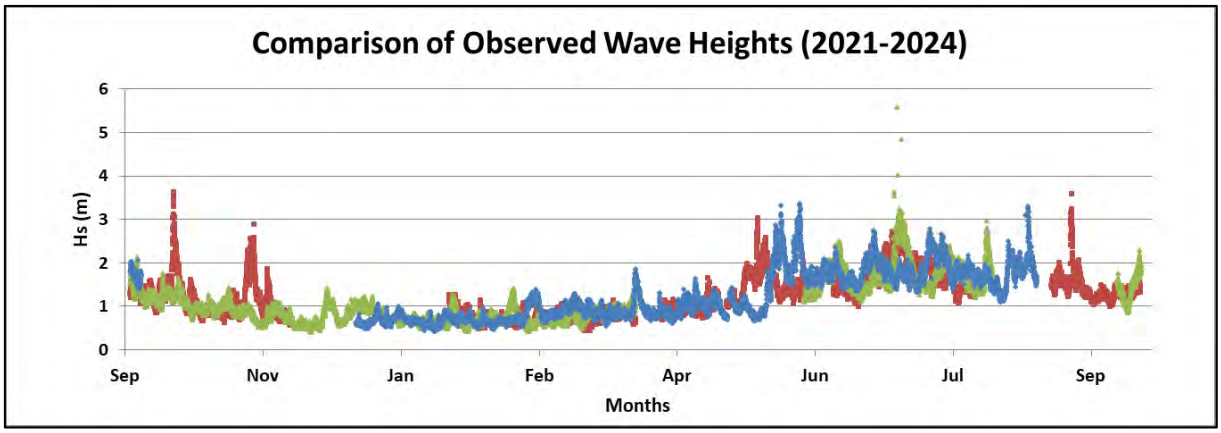


Figure 2-4 Comparison of wave heights for past 3 years (2020 – 2023)

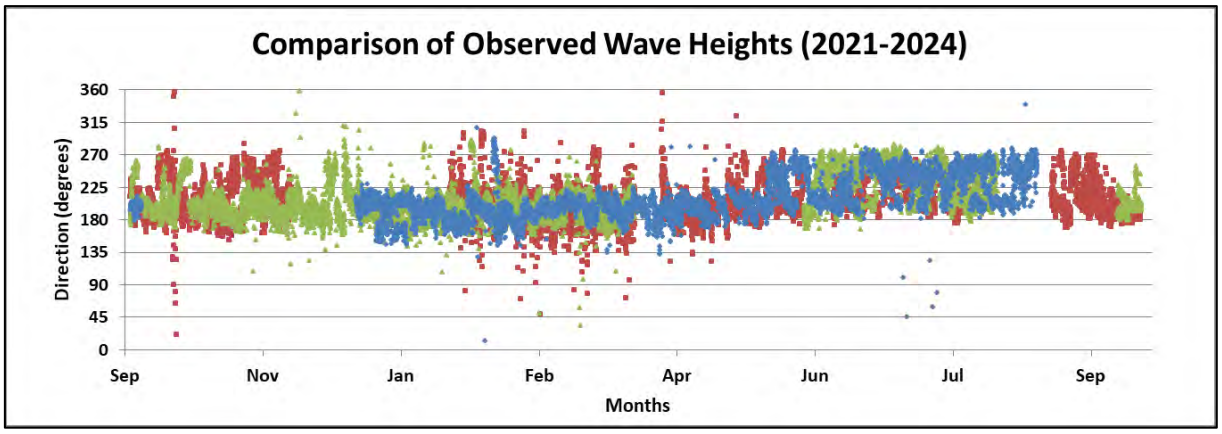
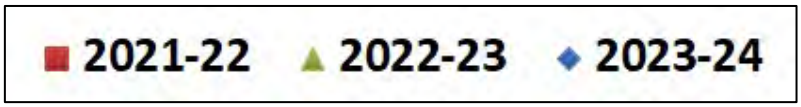


Figure 2-5 Comparison of wave directions for past 3 years (2020 – 2023)



Legend of wave height and wave directions plots (2021 – 2024)

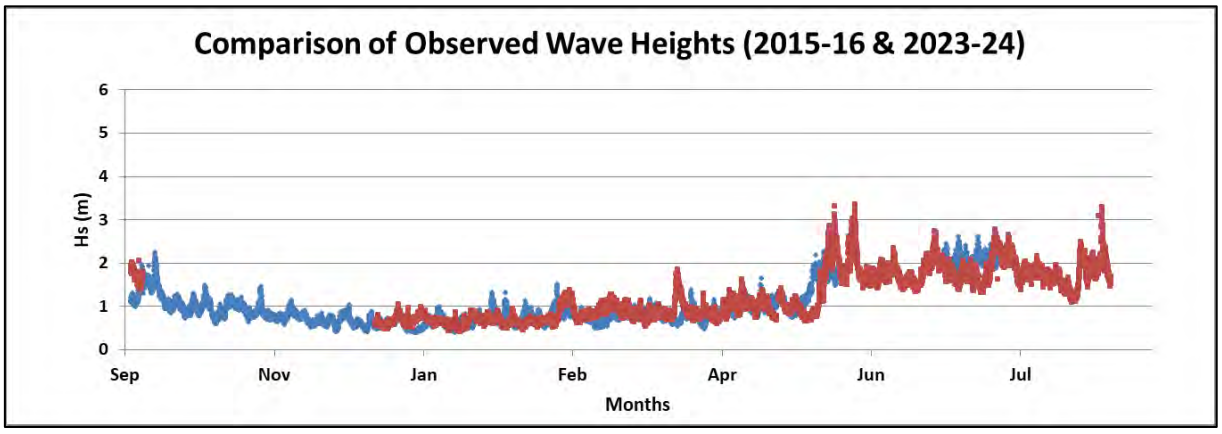


Figure 2-6 Comparison of wave heights (2015-16 & 2022-23)

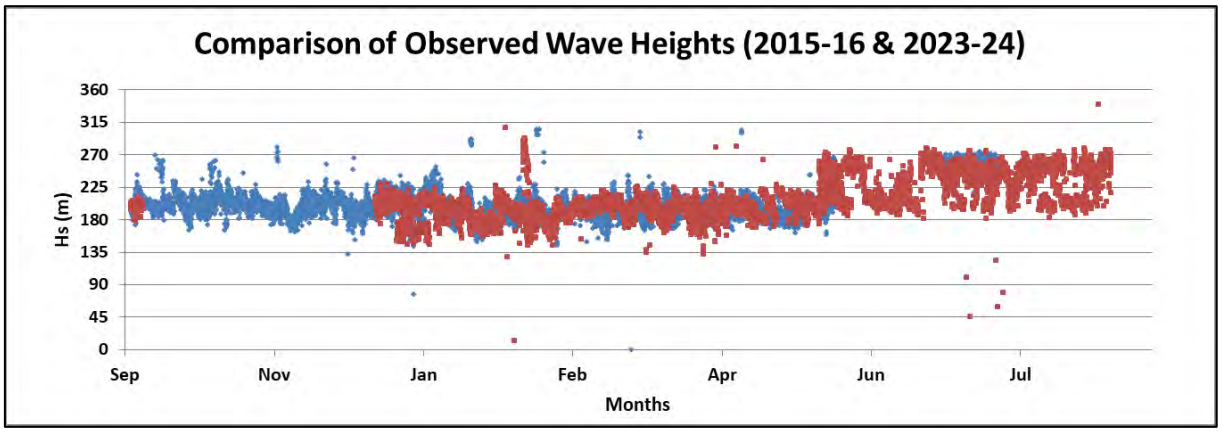


Figure 2-7 Comparison of wave directions (2015-16 & 2022-23)

Legend for wave height comparison plots (2015-16 & 2021-22)

From these comparisons, it can be observed that wave direction remains mostly between 180^0 – 270^0 (S to W) with respect to true North. The predominant wave direction is observed to be from SSW.

2.2 Tide

Long term observation of water level variations at a location is useful as it provides the required data for estimating the tidal harmonic constituents, which can be used to arrive at the tidal statistics as well as for the prediction of tidal levels at the location. Long term observation of tidal elevation at Vizhinjam, though intermittent, is available from 1971 to present. In addition to these data, in-situ tide measurements using ATG were also available in earlier reports. Due to the low range, the influence of tide on the coastal currents is expected to be low. AVPPL also provided tide data collected by NIOT for the period from 03rd November 2012 to 7th March 2013, 25th May to 3rd August 2013, 7th February 2015 to 29th February 2016, 01st March 2017 to 28th February 2018 and February 2018 to February 2019. For the period March 2019 to June 2020, Ocean Science collected data at 08° 22' 33.68" N, 76° 59' 16.65" E and at a depth of 3.3 m. Shankar & Co. (SAC) collected data from July 2019 to September 2022. These data were reported in the earlier reports by ASSYSTEM INDIA LIMITED.

Subsequently, SAC collected data, at the above mentioned location, for the period October 2023 to 30th September 2024. The measured tide is presented in Figure 2-8.

In December 2021 Survey of India (SOI) corrected the datum used for tide measurement and notified vide no 2497/39-C-(Vizhinjam). As per the notification an adjustment of 0.549 m has been applied to all bathymetries and cross shore profile data as required.

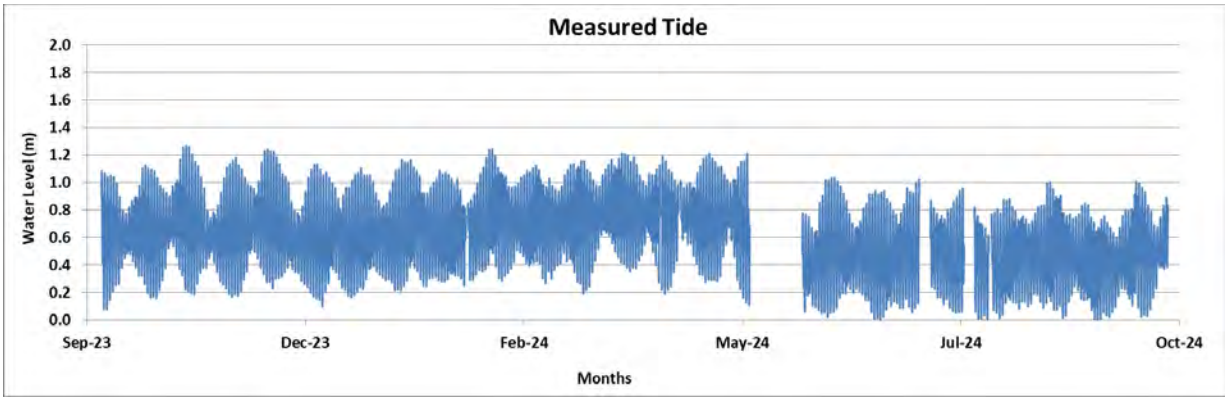


Figure 2-8 Tide data measured during Oct 2023 to Sep 2024

2.3 Currents

Current parameters were measured using WRB at 8°19'39.42"N, 77° 1'4.73"E (-25 m) during the period of 01st October 2023 to 31st September 2024 for this cycle of study.

Figure 2-9 Location from where the current data are collected

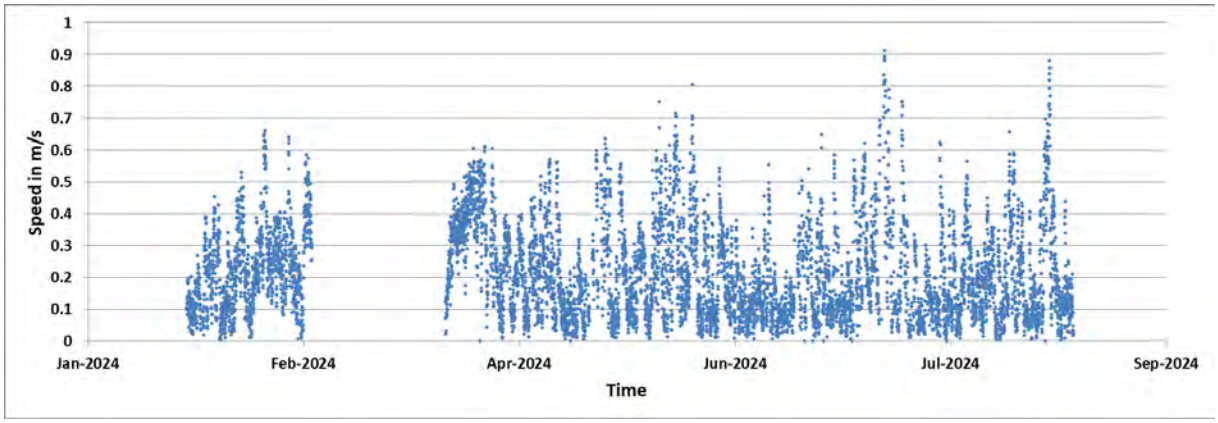


Figure 2-10 Measured Current Speed

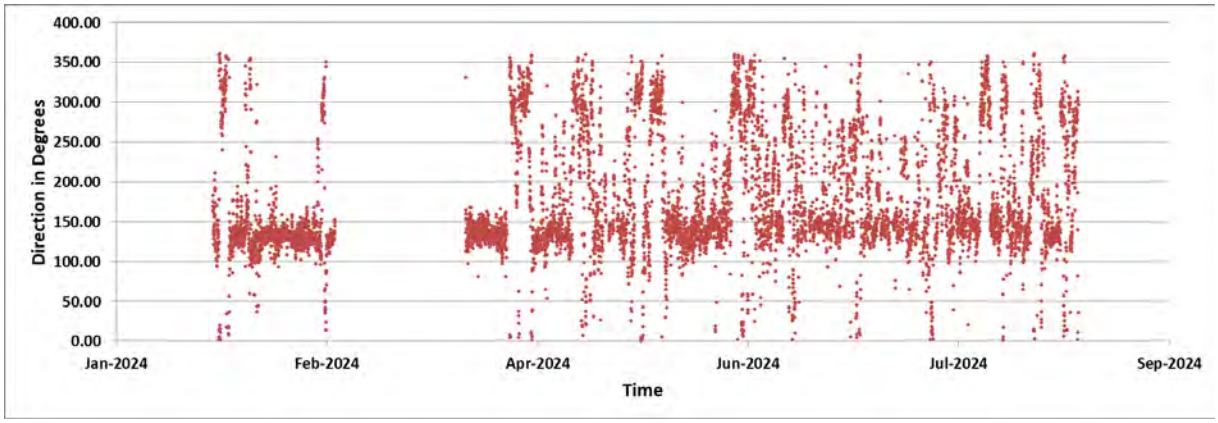


Figure 2-11 Measured current direction

It can be noticed that the current speed in the region will be in general in the range of 0.1 to 0.5 m/s. However, occasionally maximum current speed observed during all the seasons is in the range of 0.6 to 0.9 m/s.

2.4 Wind

The Automatic Weather Station (AWS) is installed at 08° 22' 22.75"N, 76° 59' 39.62"E (on the terrace of the Port Control Office). The location of AWS is presented in Figure 2-12.

AVPPL provided the measurement of wind speed and direction from 1st October 2023 to 31st September 2024. The wind speed mostly varies from 2 to 7 m/s and the maximum wind speed measured is 14 m/s. The graph showing the variation of wind speed and wind direction, measured at an elevation of 10m with respect to MSL is presented in Figure 2-13 and Figure 2-14.

Figure 2-12 Location of AWS

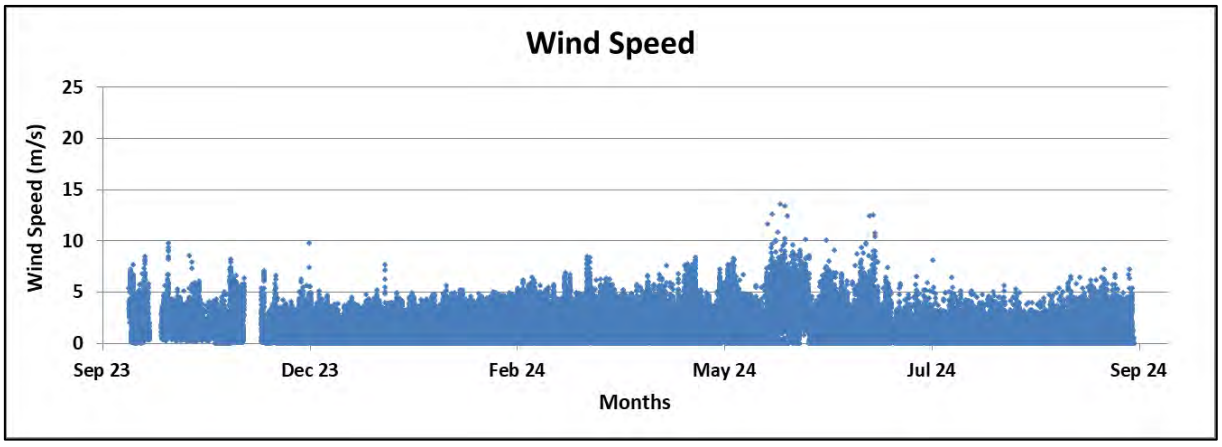


Figure 2-13 Wind speed measured during October 2023 to September 2024

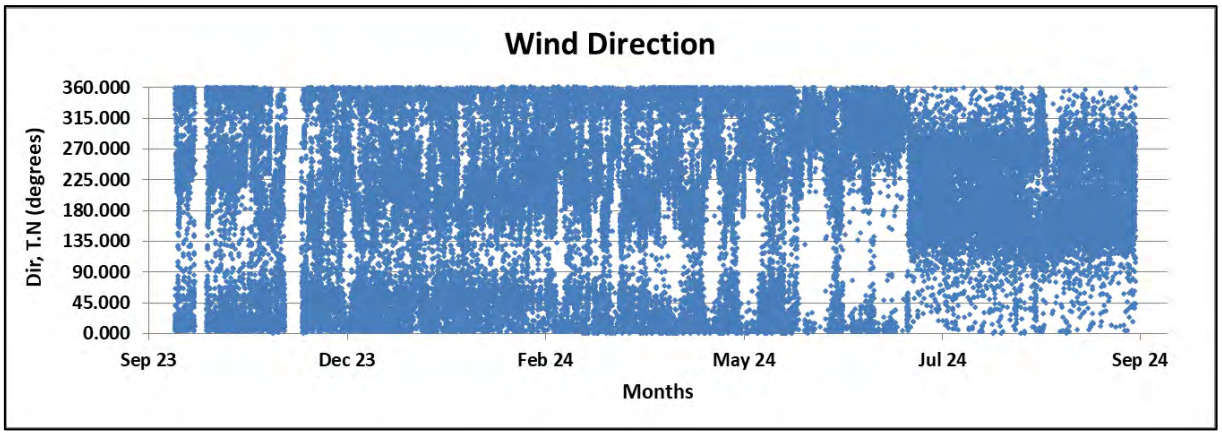


Figure 2-14 Wind direction measured during October 2023 to September 2024

2.5 Bathymetry

A bathymetry survey was done by National Institute of Ocean Technology (NIOT) in April 2003. The survey was carried out in a 1.5 km x 10 km wide corridor along the shore. The bathymetry survey for the proposed project area was done during February to March 2011 by Fugro Survey India Private Limited (FSINPVT). Secondary information on bathymetry from Naval Hydro graphic Chart (NHO – chart no. 2111) and those from ETOPO1 global relief model of NOAA were extracted for the project site. The bathymetry for the model study reports submitted earlier was created by combining the primary data from the surveys by NIOT and FSINPVT with those available from NHO Charts and ETOPO1.

The surveyed bathymetry for Post Monsoon 2023 and Pre Monsoon 2024 are shown in Figure 2-15 and Figure 2-16.

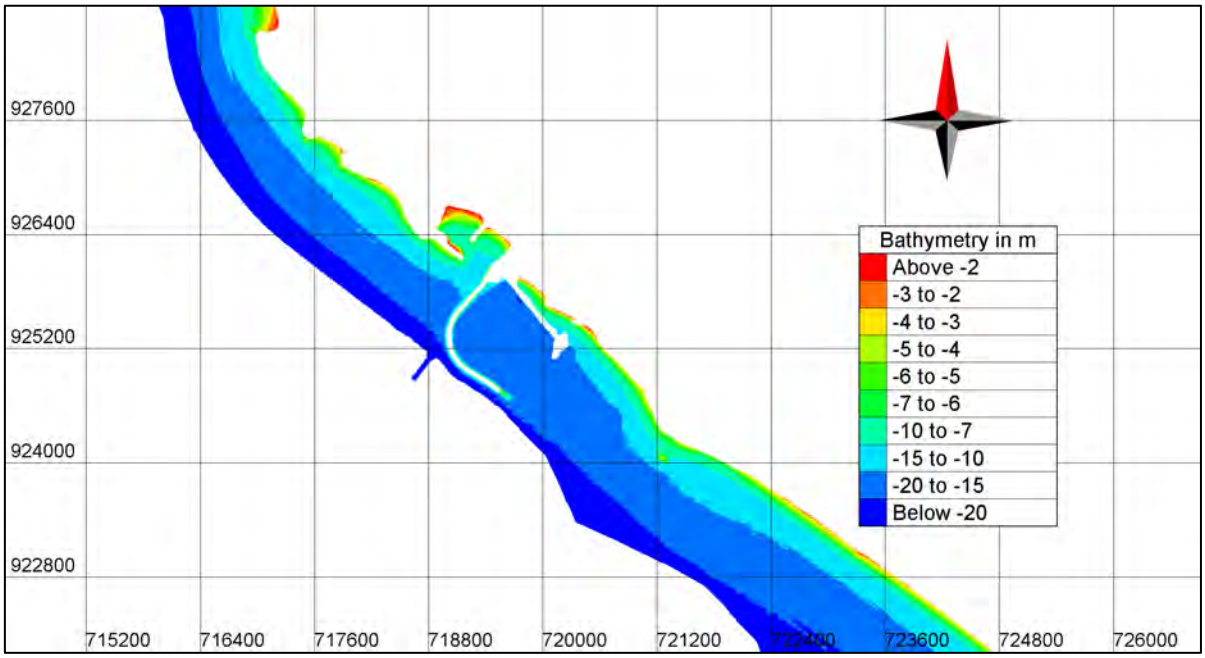


Figure 2-15 Bathymetry survey data using MBES for Post Monsoon 2023

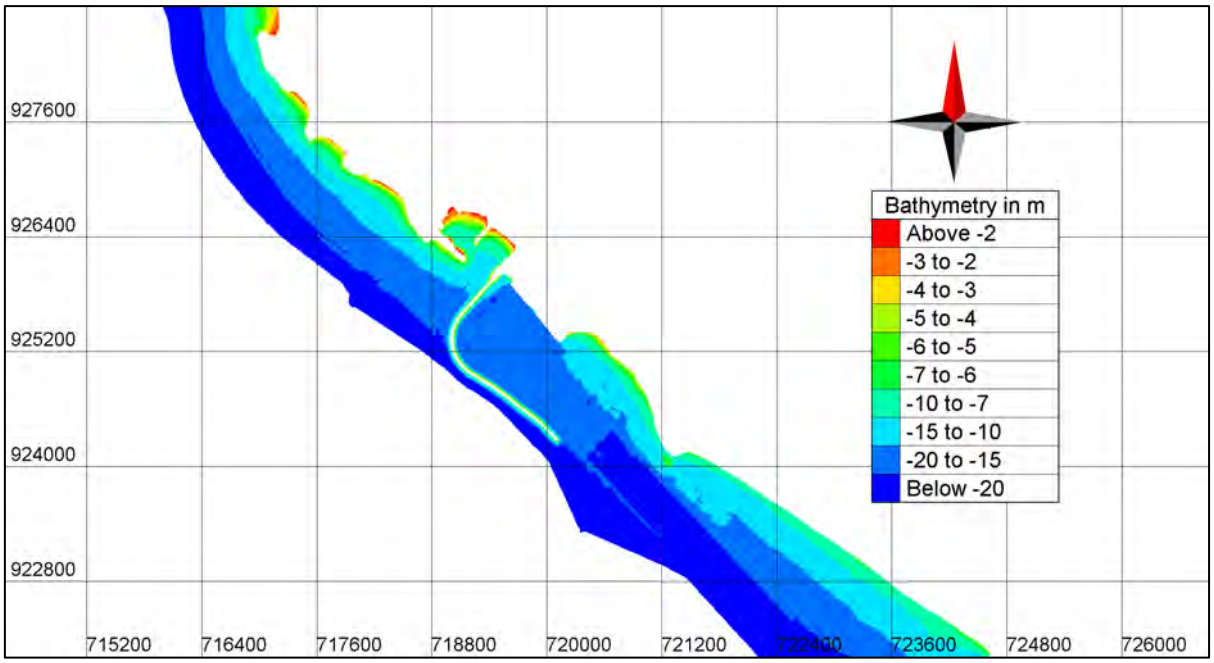


Figure 2-16 Bathymetry survey data using MBES for Pre Monsoon 2024

A comparison was made between Post monsoon 2022 and Post monsoon 2023 MBES data and is shown in Figure 2-17.The comparison of bathymetry data between pre monsoon 2023 and pre monsoon 2024 is shown in Figure 2-18.

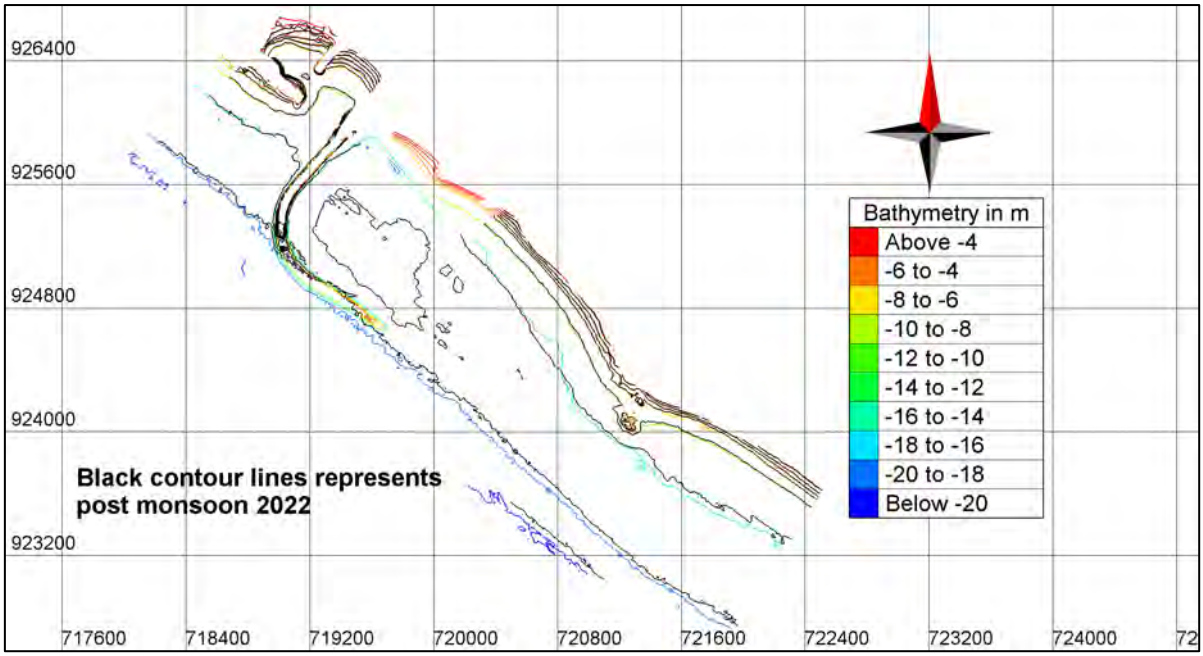


Figure 2-17 Difference in Bathymetry during Post monsoon 2022 and 2023

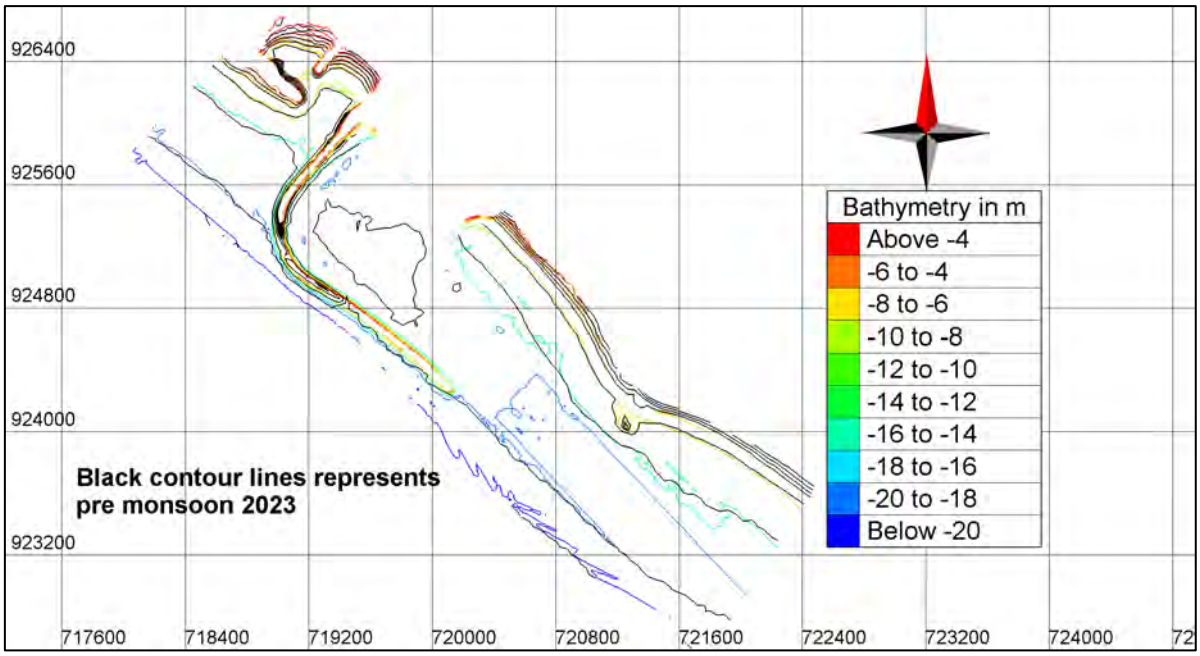


Figure 2-18 Difference in Bathymetry during Pre monsoon 2023 and 2024

In addition to the above-mentioned analysis, seven lines were selected to check the variation in bathymetry profiles for different seasons (Pre monsoon 2015, Post monsoon 2015, Pre monsoon 2016, Post monsoon 2016, Pre monsoon 2017, Post monsoon 2017, Pre monsoon 2018, Post monsoon 2018, Pre monsoon 2019, Post monsoon 2019, Pre monsoon 2020, Post monsoon 2020, Pre monsoon 2021, Post monsoon 2021, Pre monsoon 2022, Post monsoon 2022, Pre monsoon 2023, Post monsoon 2023 and Pre monsoon 2024). The locations of these sections are as shown in Figure 2-19. The aim of this analysis is to identify any significant changes in bathymetry because of dredging and reclamation works carried out as on date near port vicinity.

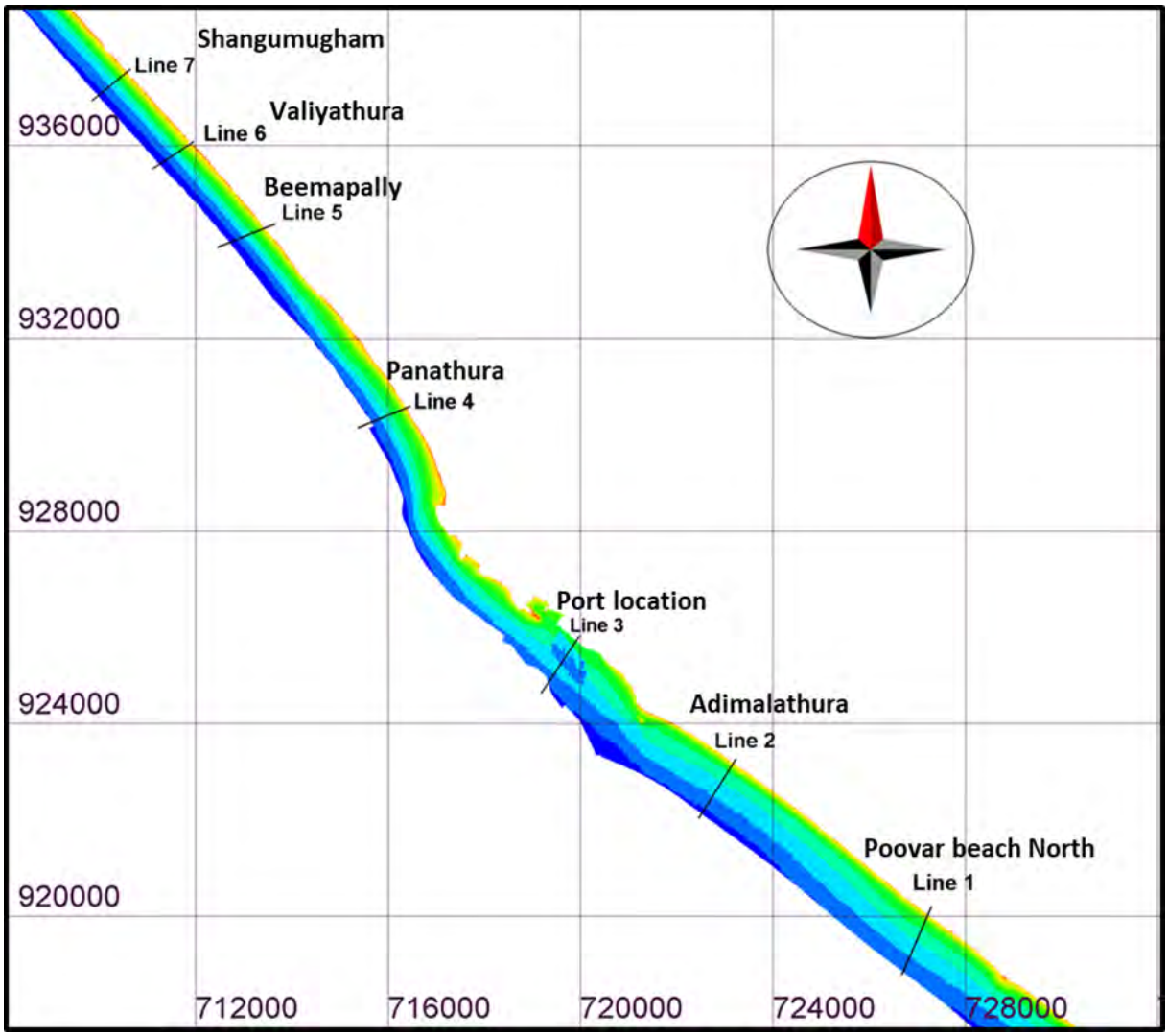


Figure 2-19 Location of the selected transect lines

Figure 2-20 to Figure 2-39 shows the comparison of Pre monsoon and Post monsoon of nine years (2015, 2016, 2017, 2018, 2019, 2020, 2021, 2022 & 2023) bathymetry data and Pre monsoon 2024 bathymetry along the selected sections.

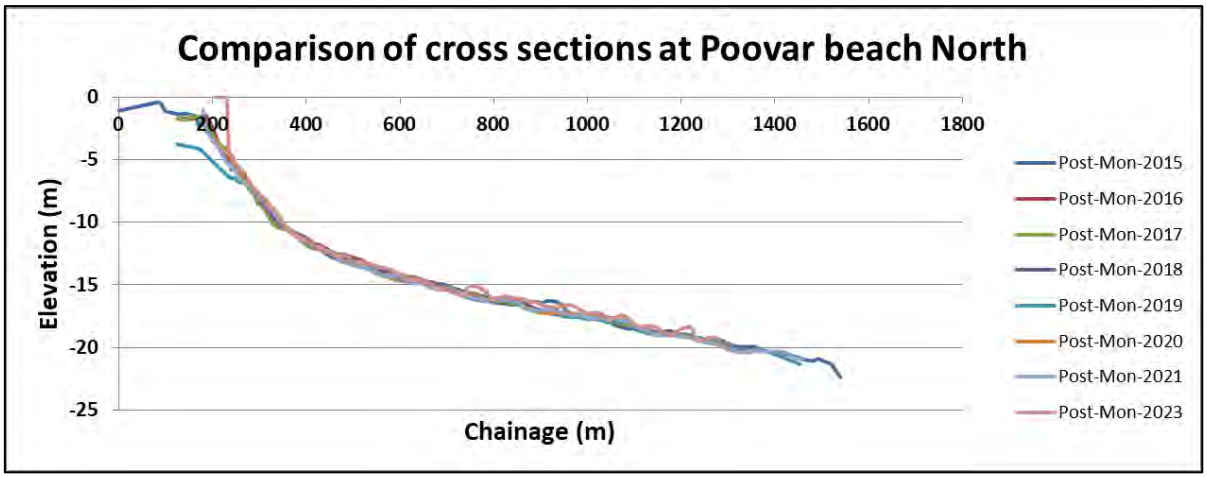


Figure 2-20 Bathymetry – Cross section comparison at Poovar beach North (Post-monsoon)

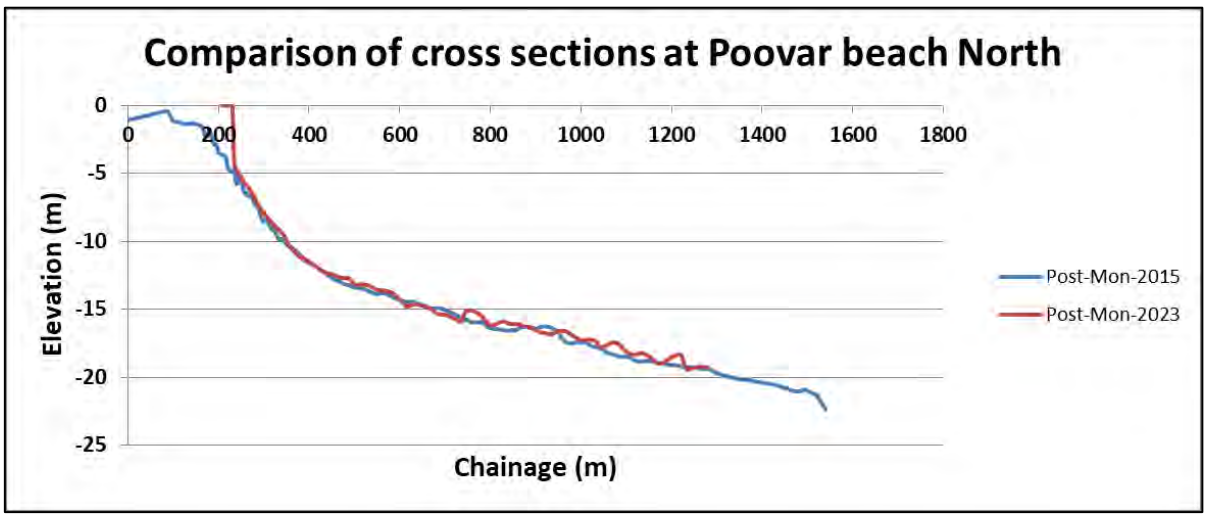


Figure 2-21 Bathymetry – Cross section comparison between 2015 and 2023 at Poovar beach North (Post-monsoon)

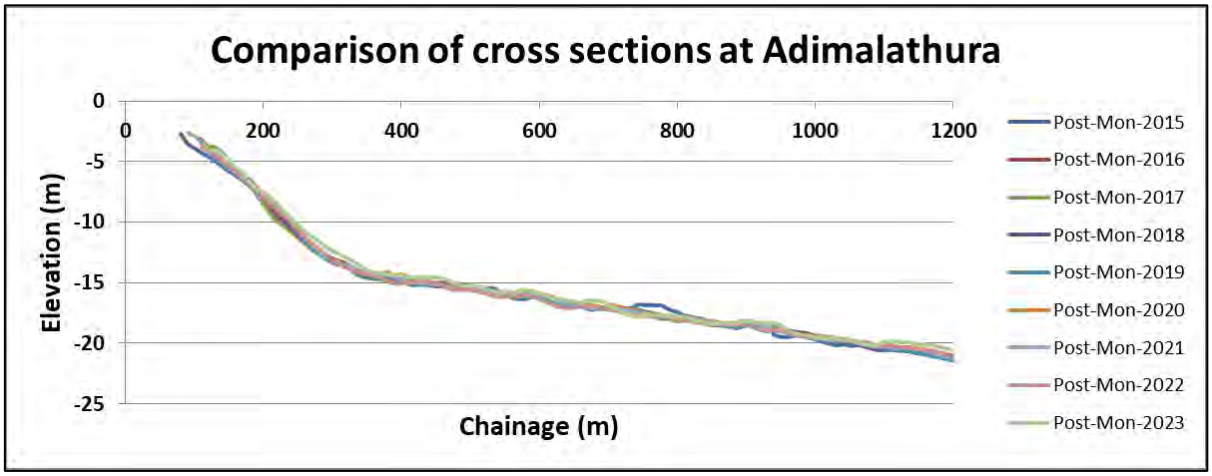


Figure 2-22 Bathymetry – Cross section comparison at Adimalathura (Post-monsoon)

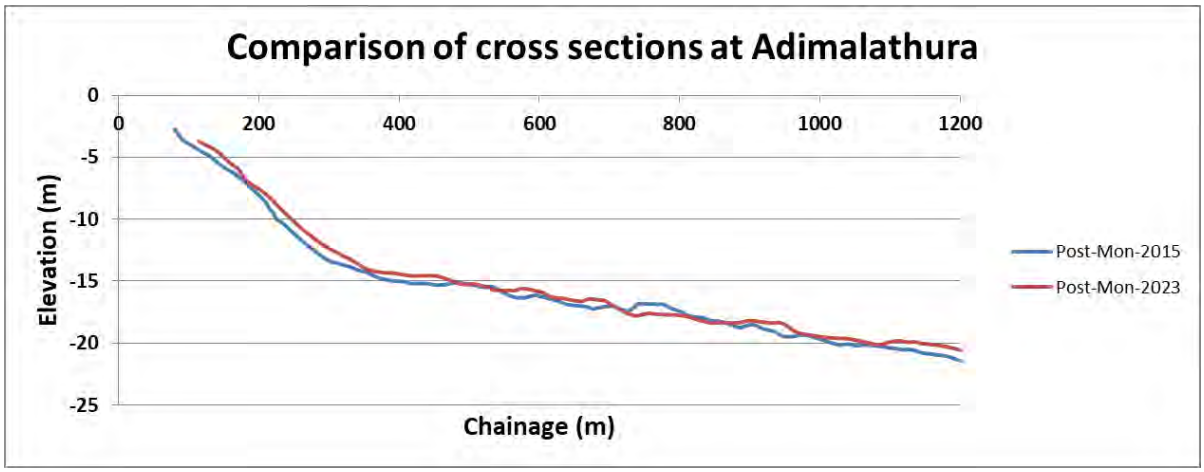


Figure 2-23 Bathymetry – Cross section comparison between 2015 and 2023 at Adimalathura (Post-monsoon)

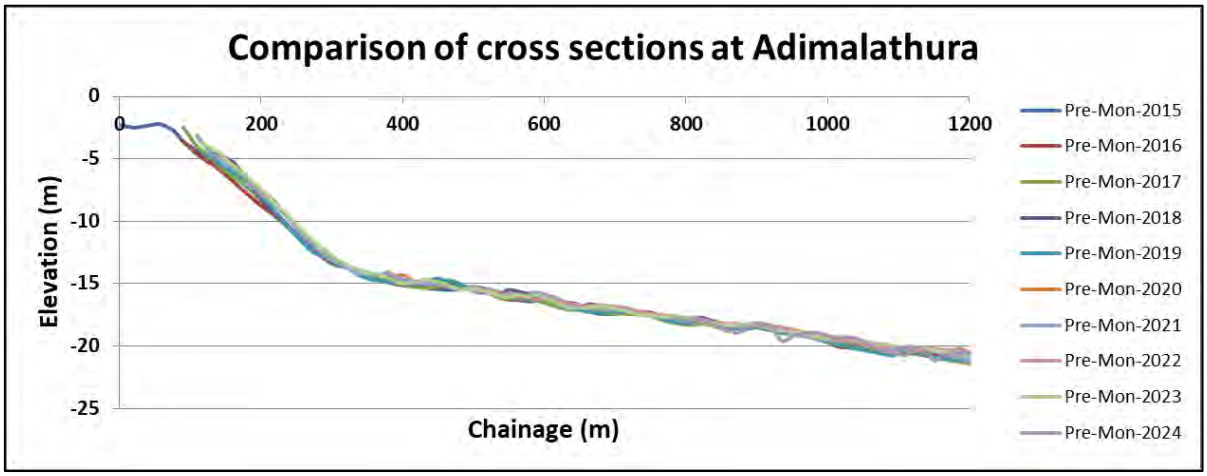


Figure 2-24 Bathymetry – Cross section comparison at Adimalathura (Pre-monsoon)

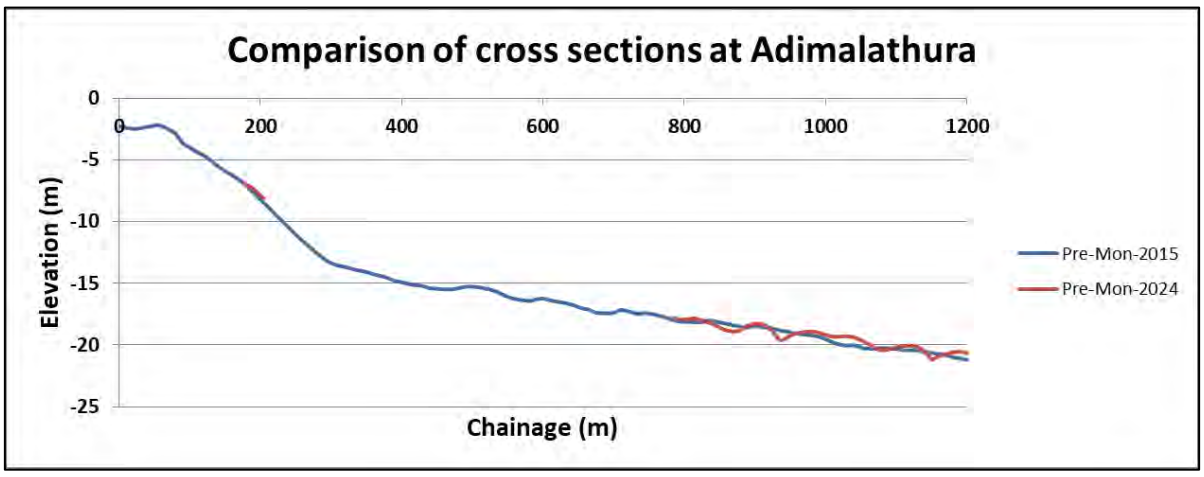


Figure 2-25 Bathymetry – Cross section comparison between 2015 and 2024 at Adimalathura (Pre-monsoon)

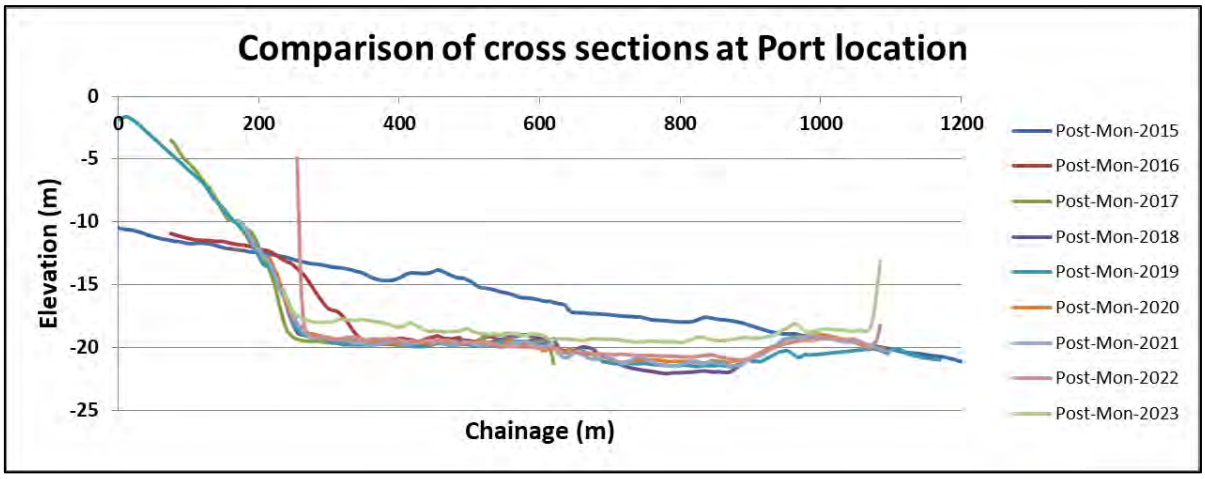


Figure 2-26 Bathymetry – Cross section comparison at Port location (Post-monsoon)

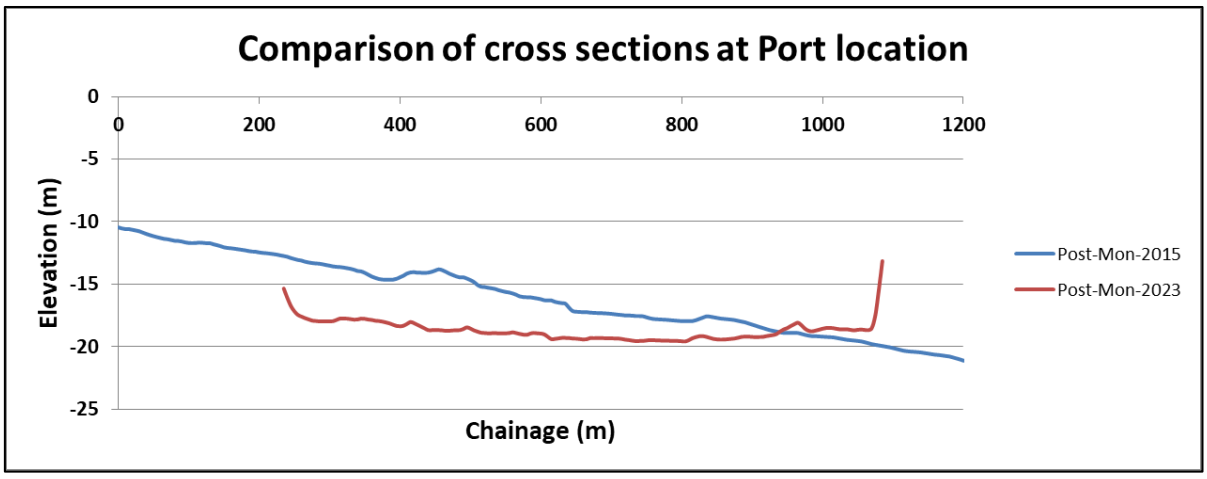


Figure 2-27 Bathymetry – Cross section comparison between 2015 and 2023 at Port location (Post-monsoon)

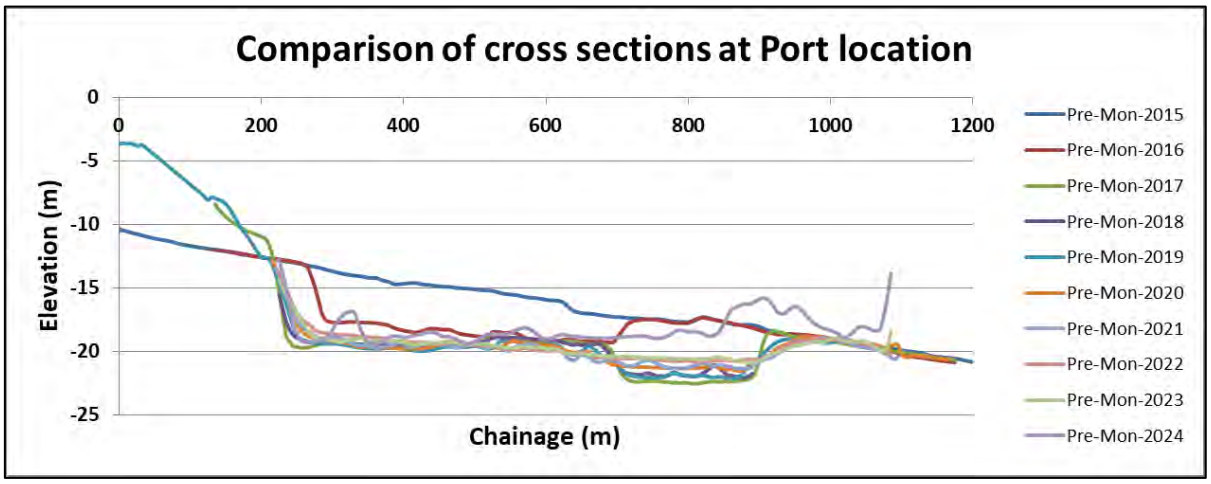


Figure 2-28 Bathymetry – Cross section comparison at Port location (Pre-monsoon)

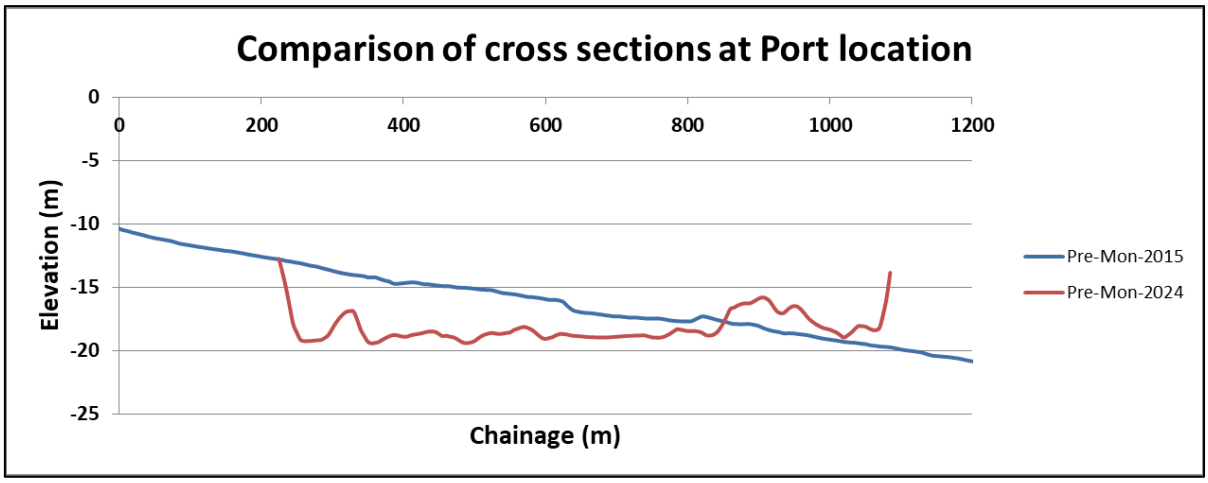


Figure 2-29 Bathymetry – Cross section comparison between 2015 and 2024 at Port location (Pre-monsoon)

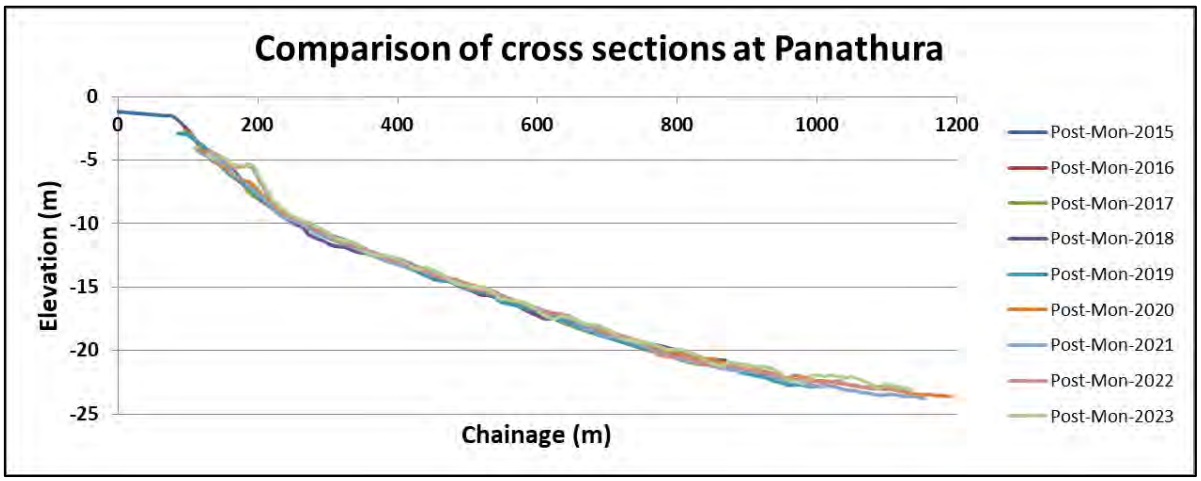


Figure 2-30 Bathymetry – Cross section comparison at Panathura (Post-monsoon)

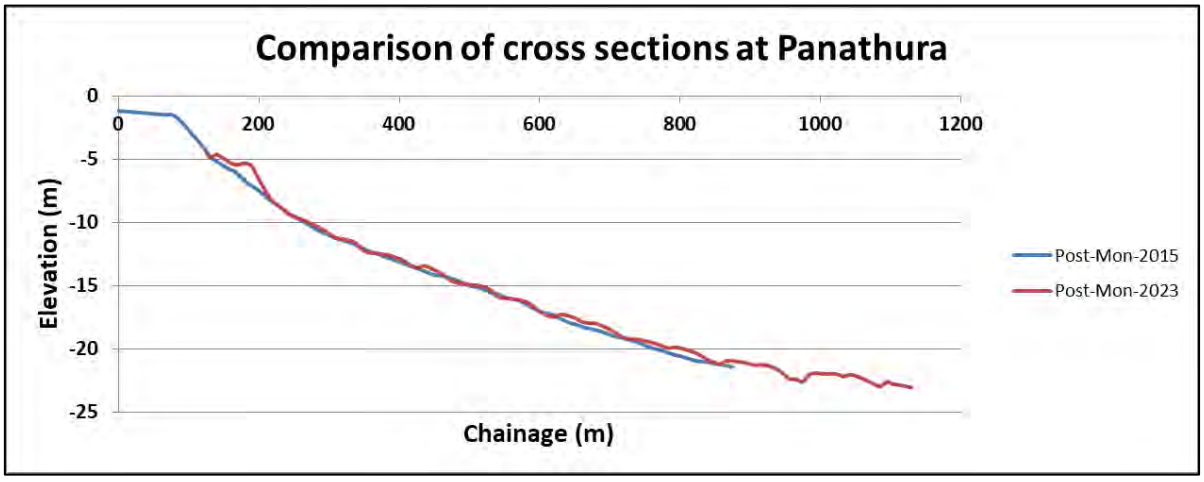


Figure 2-31 Bathymetry – Cross section comparison between 2015 and 2023 at Panathura (Post-monsoon)

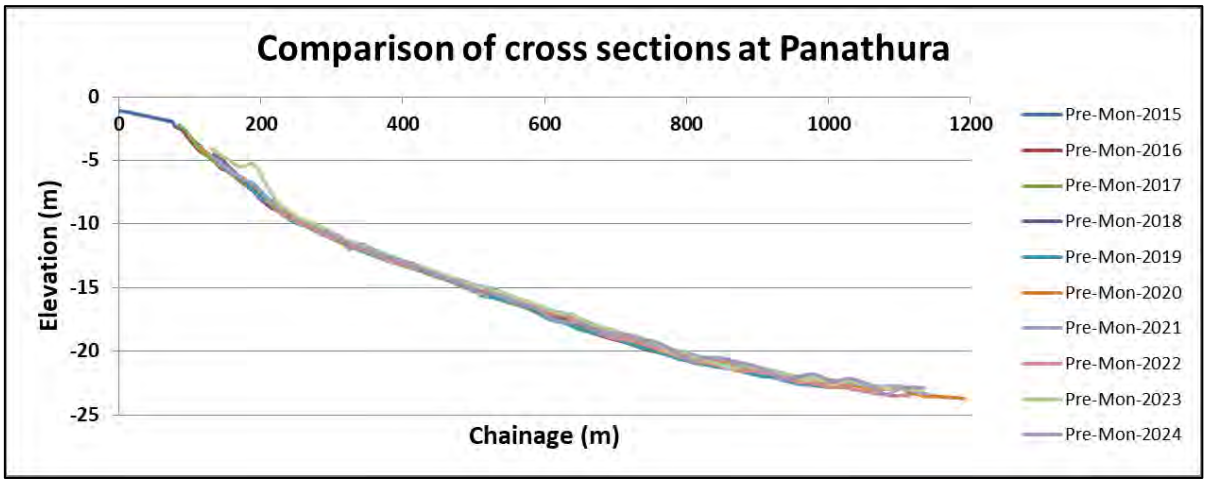


Figure 2-32 Bathymetry – Cross section comparison at Panathura (Pre-monsoon)

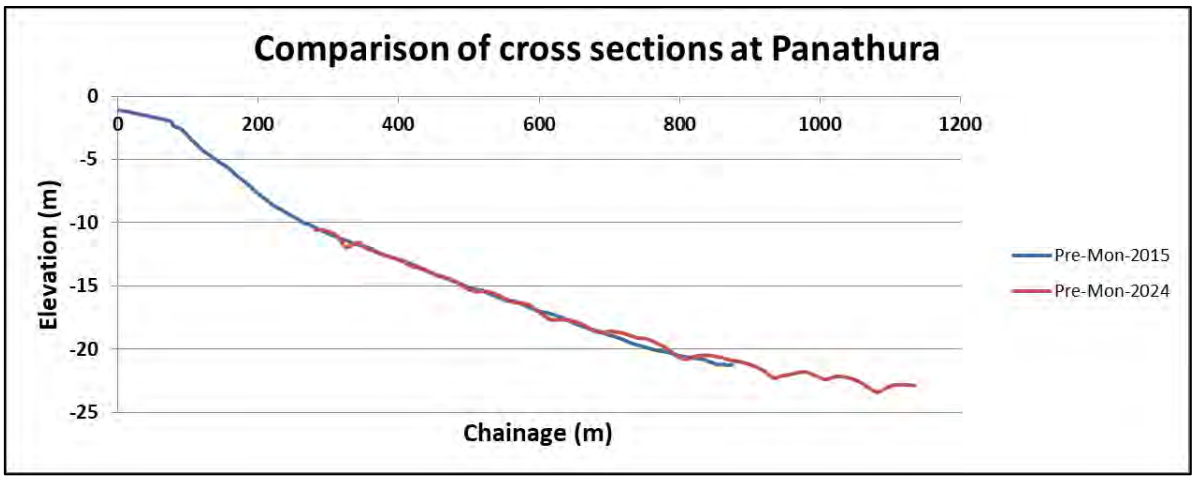


Figure 2-33 Bathymetry – Cross section comparison between 2015 and 2024 at Panathura (Pre-monsoon)

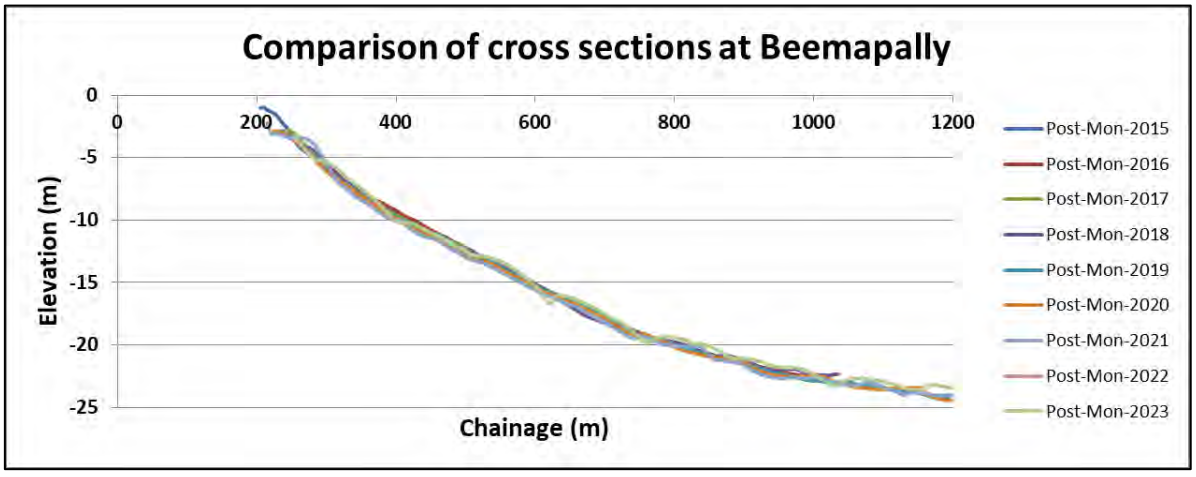


Figure 2-34 Bathymetry – Cross section comparison at Beemapally (Post-monsoon)

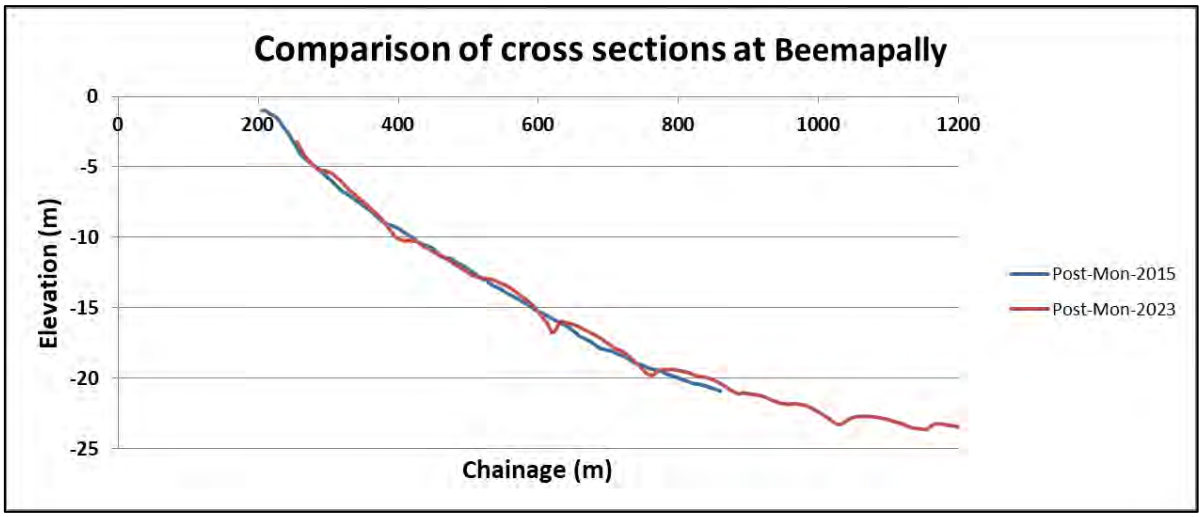


Figure 2-35 Bathymetry – Cross section comparison between 2015 and 2023 at Beemapally (Post-monsoon)

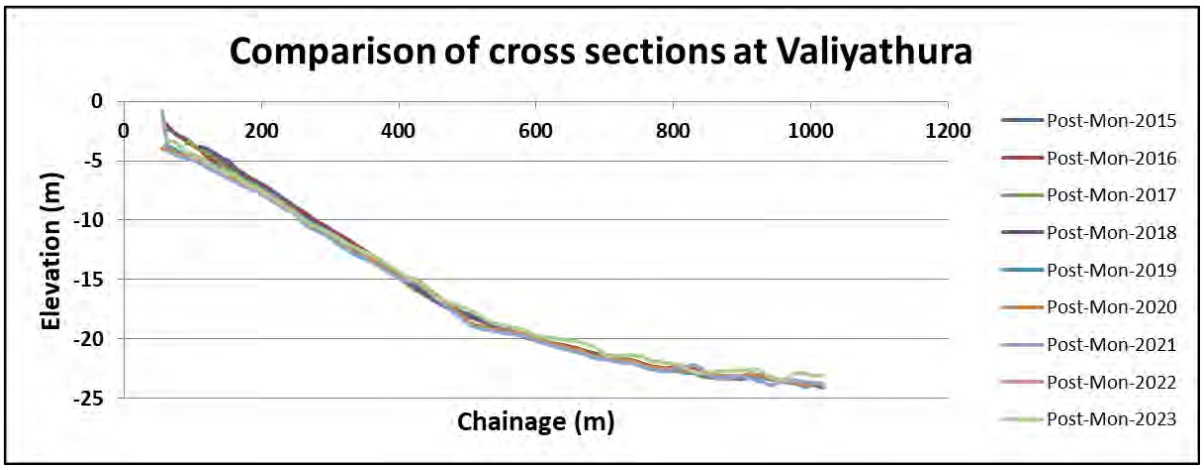


Figure 2-36 Bathymetry – Cross section comparison at Valiyathura (Post-monsoon)

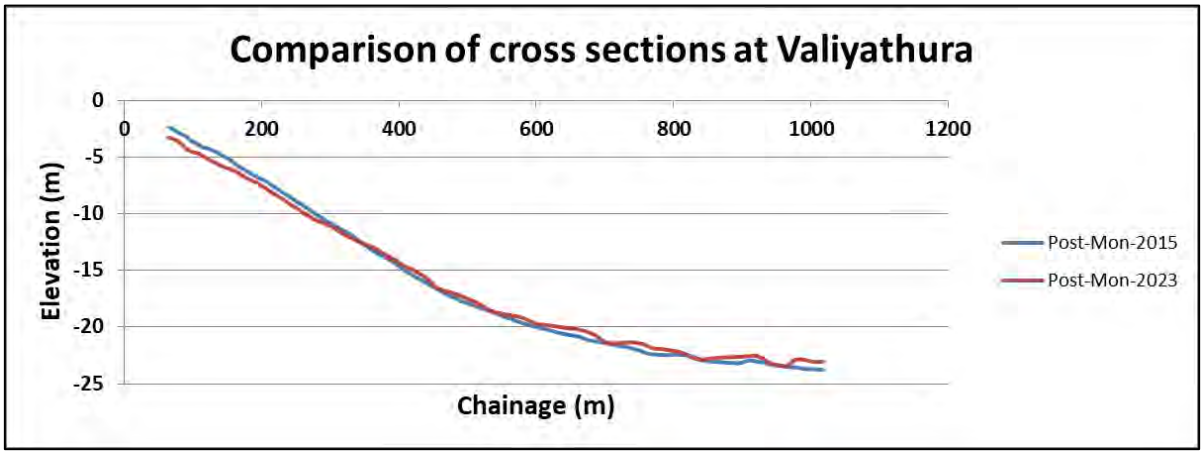


Figure 2-37 Bathymetry – Cross section comparison between 2015 and 2023 at Valiyathura (Post-monsoon)

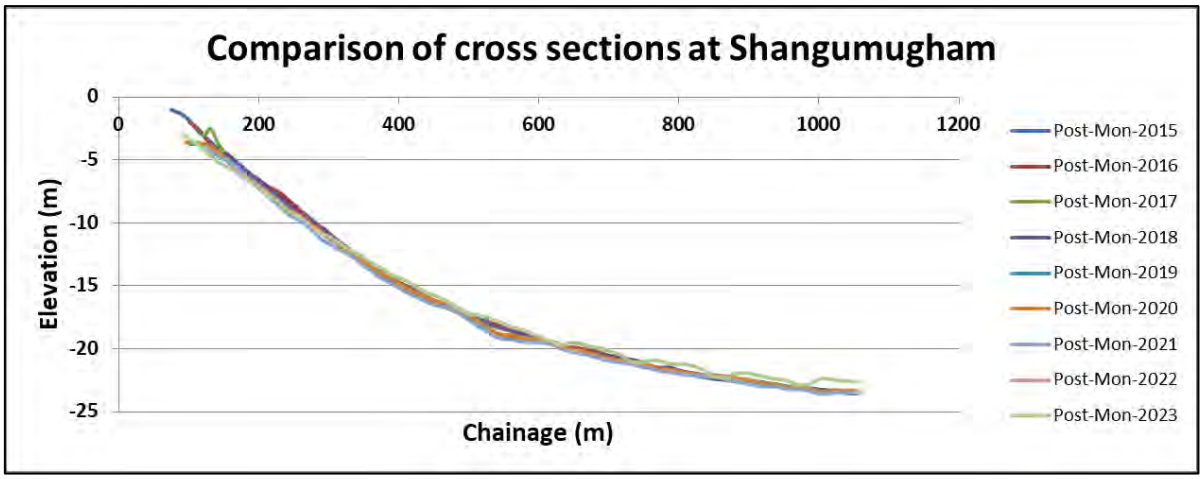


Figure 2-38 Bathymetry – Cross section comparison at Shangumugham (Post-monsoon)

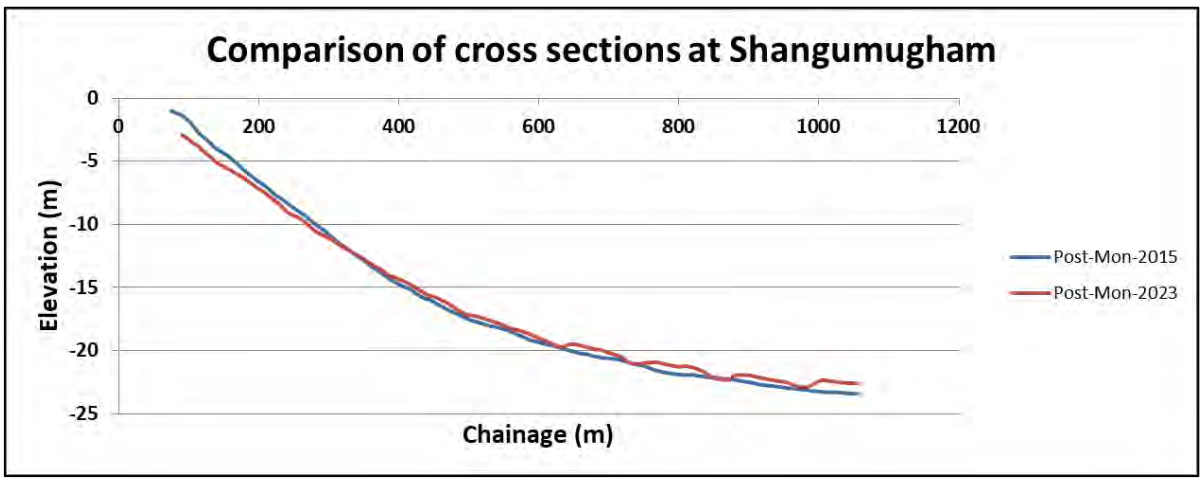
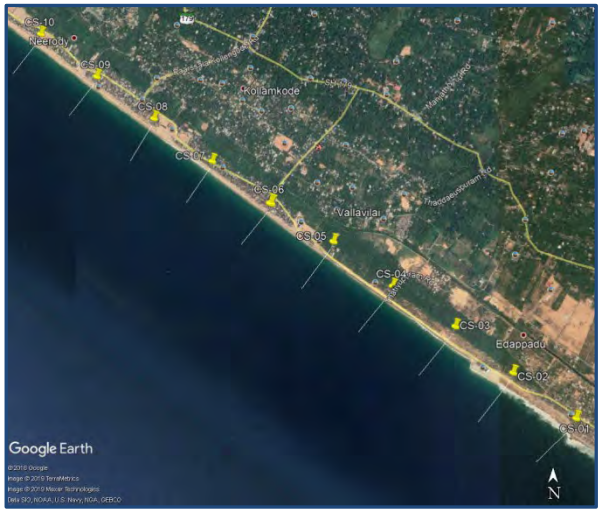
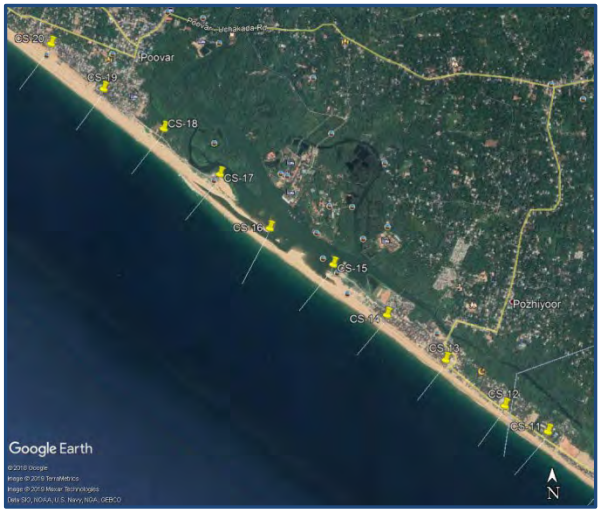


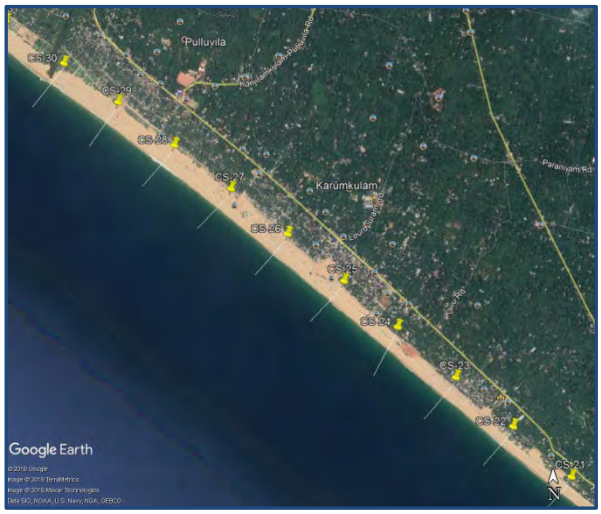
Figure 2-39 Bathymetry – Cross section comparison between 2015 and 2023 at Shangumugham (Post-monsoon)

2.6 Cross Shore Profile

Cross shore beach profiles were collected by AVPPL at 81 locations which cover approximately 40 km along the coastline. The spacing between two adjacent cross sections is approximately 0.5 km. Among the 81 locations, 41 are to the north of port, 37 are to the south of port and 3 are at the port location. Survey data from February 2015 to September 2023 is available. The cross-shore profile locations are shown in Figure 2-40.


CS-10
Neerody
CS-09
Kollamkode
CS-08
CS-07
CS-06
Vallavilai
CS-05
CS-04
CS-03
Edappadu
CS-02
CS-01
Google Earth
N


CS-20
Poovar
CS-19
CS-18
CS-17
CS-16
CS-15
Pozhiyoor
CS-14
CS-13
CS-12
CS-11
Google Earth
N


Pulluvila
CS-30
CS-29
CS-28
CS-27
Karumkulam
CS-26
CS-25
CS-24
CS-23
CS-22
CS-21
Google Earth
N


CS-41
CS-40
CS-39
CS-38
CS-37
CS-36
CS-35
CS-34
CS-33
CS-32
CS-31
Google Earth
N


CS-51
CS-50
Vazhamuttom
CS-49
CS-48
Muttak
CS-47
CS-46
Kovalam
CS-45
CS-44
CS-43
CS-42
CS-41
Google Earth
N


CS-60
CS-59
CS-58
CS-57
CS-56
CS-55
CS-54
CS-53
Pachalloor
CS-52
Google Earth
N

Figure 2-40 Cross Shore Profile Locations

AVPPL provided names of the 81 locations and the respective landmarks for easy identification and discussion. Table 2-2 shows the names of the landmarks and the corresponding CSP numbers.

Table 2-2 CSP Location Details

CSP NO.	Land Mark	Location	Remarks
CSP-01	Catholic Crismatic Prayer Center	Edappadu Beach	Groyne
CSP-02			Beach
CSP-03			Seawall
CSP-04	St.Mary's Church	Vallavilai	Groyne
CSP-05			Groyne
CSP-06			Groyne
CSP-07	St.Nicolas Church	Neerody	Groyne constructed in 2020
CSP-08			Groyne constructed in 2020
CSP-09			Groyne constructed in 2020
CSP-10	Sree Bhadrakali Temple	Pozhiyoor	Groyne constructed in 2020
CSP-11			Seawall
CSP-12			Seawall
CSP-13	St.Mathew's Church	Paruthiyoor	Seawall
CSP-14	Church Of Christ		Seawall

CSP NO.	Land Mark	Location	Remarks
CSP-15	Poovar Island Resort	Poovar Beach South	Beach near Neyyar River Mouth
CSP-16			Beach near Neyyar River Mouth
CSP-17			Beach
CSP-18	Pozhikara Beach	Poovar	Beach
CSP-19			Beach
CSP-20	St.Antony's Chapel	Poovar Beach North	Beach
CSP-21			Beach
CSP-22	St.Antony's Church	Karumkulam	Beach
CSP-23			Beach
CSP-24			Beach
CSP-25			Beach
CSP-26			Beach
CSP-27	Gothambu Road	Pulluvila	Beach
CSP-28			Beach
CSP-29			Beach
CSP-30			Beach
CSP-31	Adimalathura Catholic Church	Adimalathura	Beach
CSP-32			Beach
CSP-33			Beach
CSP-34			Beach
CSP-35	Azhimala Temple	Azhimala	Azhimala Cliff
CSP-36	Nagar Bhagavathy Temple	Mullur	Beach
CSP-37			Mullur Beach View Point
CSP-38	Adani Reclamation Area	Adani Port Office Vizhinjam	Beach Inside AVPPL Port
CSP-39			Inside AVPPL Port
CSP-40			Inside AVPPL Port
CSP-41	Vizhinjam Light House	Kovalam	Beach
CSP-42			Beach
CSP-43			Beach
CSP-44			Beach

CSP NO.	Land Mark	Location	Remarks
CSP-45			Beach
CSP-46			Beach
CSP-47	Samudra Beach Park	Kovalam	Beach
CSP-48	Mosque	Panathura	Seawall
CSP-49			Seawall
CSP-50	Panathura Temple	Panathura	Seawall
CSP-51			Seawall
CSP-52			Seawall
CSP-53	Punthura Fish Market	Punthura	Killi River Mouth
CSP-54			Beach
CSP-55			Beach
CSP-56			Seawall
CSP-57			Seawall
CSP-58	Beemapally	Beemapally	Seawall between Groynes
CSP-59			Seawall
CSP-60			Seawall
CSP-61	Cheriyathura Sports Ground	Cheriyathura	Seawall between Groynes
CSP-62			Beach between Groynes
CSP-63	Valiyathura Bridge	Valiyathura	Groyne
CSP-64			Seawall near Valiyathura Pier
CSP-65			Seawall
CSP-66			Seawall
CSP-67			Seawall
CSP-68	Shangumugham Beach	Shangumugham	Beach
CSP-69			Beach
CSP-70	St.Peters Church	Shangumugham	Beach
CSP-71			Beach
CSP-72	Vettucaud Church	Vettucaud	Beach
CSP-73			Beach
CSP-74			Beach
CSP-75	Veli Childrens Park	Kochuveli	Beach

CSP NO.	Land Mark	Location	Remarks
CSP-76			Beach
CSP-77			Beach
CSP-78	St.Thomas Church	Valiya Veli	Veli Lake Mouth
CSP-79			Beach
CSP-80	Christian Brotheren Church	Thumba	Beach
CSP-81			Beach

2.6.1 Survey Methodology

The survey area was divided into land side and sea side. On the land side, the survey was carried out using Real Time Kinematic (RTK) system up to 100 m from HTL or +2 m of HTL. On the sea side bathymetric survey was carried out using Multi Beam Echo Sounder (MBES) up to a depth of 10m till August 2018 and later on survey was conducted up to a depth of 20m till April 2019 as per the guideline of shoreline committee. Further during the shoreline committee meeting held on 13-03-2019, it was decided that: Only 4 CSP lines needs to be carried out up to a depth of 20 m in the month of January, May, August and October. All other lines, during all months need to be carried up to a depth of 10 m only. Accordingly, two lines were selected (CSP 2 & CSP 35) to south of the port and two more lines (CSP 64 & CSP 74) to north of the port to carry out the survey up to 20m depth.

The RTK system comprises the following:

- Hemisphere GPS R320 GNSS base station
- Hemisphere GPS R320 rover

The bathymetric survey was carried out using the following systems:

- Geoswath GS+ 250 KHz wide swath bathymetric system for the Multi beam area

Data gaps were observed in the foreshore zone (as shown in Figure 2-41) due to inaccessible depths and due to rough weather condition during survey period (i.e. whenever rough weather occurred in the period October 2023 to September 2024). June 2023, July 2023, August 2023, September 2023,May 2024 June 2024, July 2024, August 2024, September 2024 data were removed from analysis which did not pass the quality control. The details of data included in analysis were shown in Table 2-3.

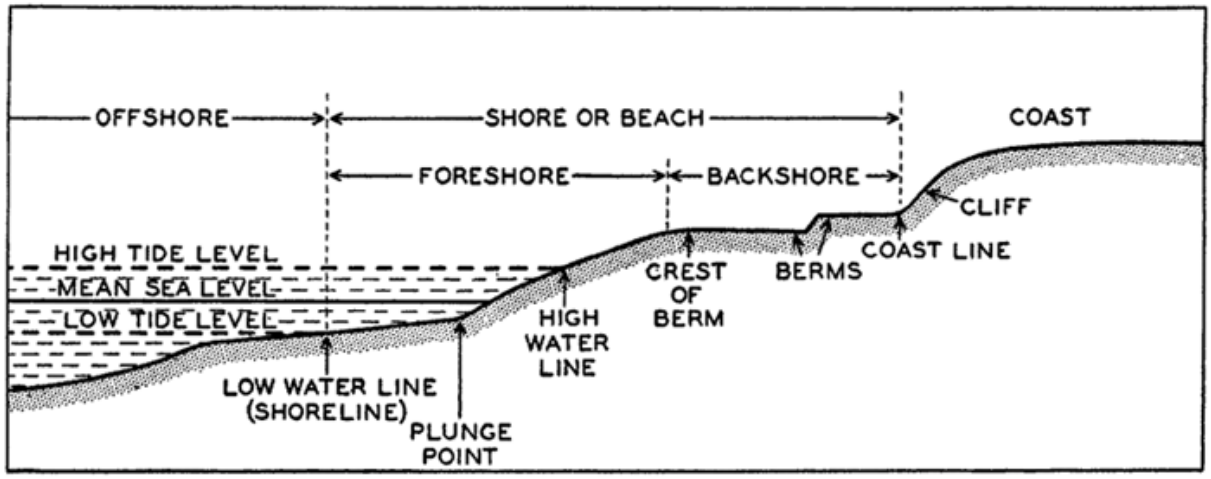


Figure 2-41 Beach profile terminology

Table 2-3 Details of CSP data included in analysis

Status of data received										
	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Jan										
Feb										
Mar					Only 52 profiles					
Apr										
May										
Jun								Only 4 profiles		
Jul										
Aug										
Sep										
Oct										
Nov										
Dec										

	Data not collected:		Data omitted due to lack of offshore data
	June - Aug 2019 due to Monsoon and change of contractor		Data included
	July 2020 due to COVID-19 restrictions		
	At certain locations during the period of October 2022 to November 2022 due to locals protest		

2.6.2 Analysis of cross shore profiles

The data received by ASSYSTEM INDIA LIMITED was analysed by plotting each of the profiles. The aim of this comprehensive exercise was to check the data quality and to compare profiles with surveyed data from different locations which would help to visualise erosion or accretion during different seasons and locations. The assessment of the profiles before/during the construction of the port at Vizhinjam can be compared in future with the profiles collected after the port construction. Any difference, if arising, can be investigated further to understand if the port has any impact on the shoreline evolution.

At first, ASSYSTEM INDIA LIMITED analysed average profiles for different seasons and location wise. The trends of beach profile were assessed qualitatively. In general, the beach profile variations tend to be daily, monthly, seasonal or annual. However, since the data is collected monthly once, analyses of daily variations are not possible. Even prediction of monthly variation of profiles will be difficult due to data gap near foreshore region. Therefore, the monthly profiles were averaged to obtain seasonal profiles. The months considered for seasonal average was as follows:

Pre-Monsoon – April to May

Monsoon – June to September

Post-Monsoon – October to November

Fair Weather – December to March

The above seasons were adopted as advised in MOM of the shoreline committee meeting held on 13th February 2019.

For example, if we consider October 2023 to September 2024, the seasons will be as follows:

Post-Monsoon 2023 – October 2023 to November 2023

Fair Weather 2023 – December 2023 to March 2024

Pre-Monsoon 2024 – April 2024 to May 2024

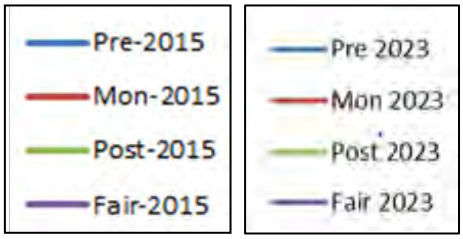
Monsoon 2024 – June 2024 to September 2024

The focus was on comparison of profiles of different seasons over a year (seasonal comparison) and comparison of same seasonal profiles of different years (yearly comparison) at a particular location to thoroughly understand the seasonal variations. As there were many cross-shore profiles over a stretch of 40km, it was not feasible to show all the profiles in the report. Therefore, ASSYSTEM INDIA LIMITED grouped similar sections into a category and presented one of the sections in each category to report. Thus, ASSYSTEM INDIA LIMITED selected three sections to South of the Port (CS-07 – Neerody, CS-12 – Pozhiyoor and CS-26 – Karumkulam) and three sections to North of the Port (CS-49 – Panathura, CS-58 – Beemapally and CS-74 – Vettucaud). The plots are shown in Figure 2-42 to Figure 2-124. In Figure 2-42, Abscissa represents the distance in meters from an arbitrary point which is constant for all profiles at a cross section, ordinate represents elevation in meter and legend is self-explanatory. First chart (Figure 2-42) shows comparison of profiles of different seasons in a particular year (Seasonal charts) and second chart (Figure 2-44) shows comparison of profiles of different years of a particular season (Yearly charts).

Legend: CSP – Cross Shore Profile, CS – Cross Section

Table 2-4 Classification of stretches

Stretch	Cross sections		Selected Cross section
	From	To	
1	3	10	7
2	11	14	12
3	18	34	26
4	47	52	49
5	56	65	58,62
6	66	81	74



Legend of seasonal charts

2.6.2.1 Stretch 1

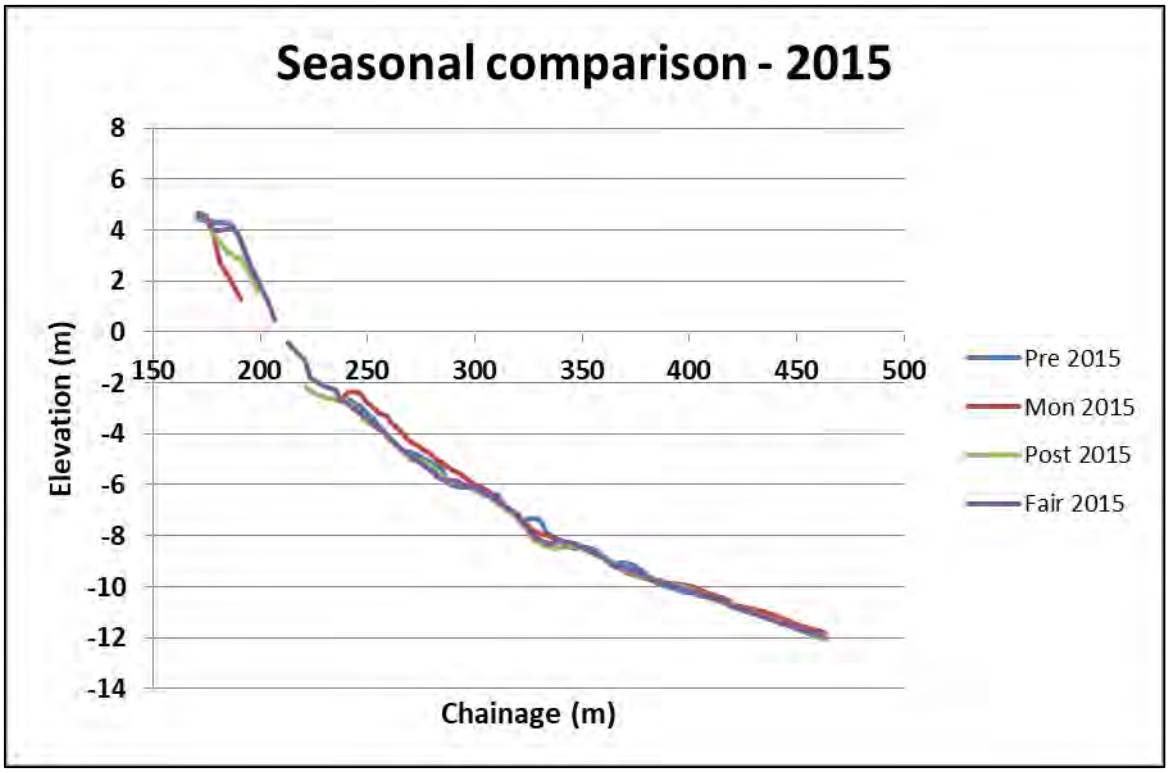


Figure 2-42 Profiles at Neerody (CS 07) – Seasonal comparison (2015)

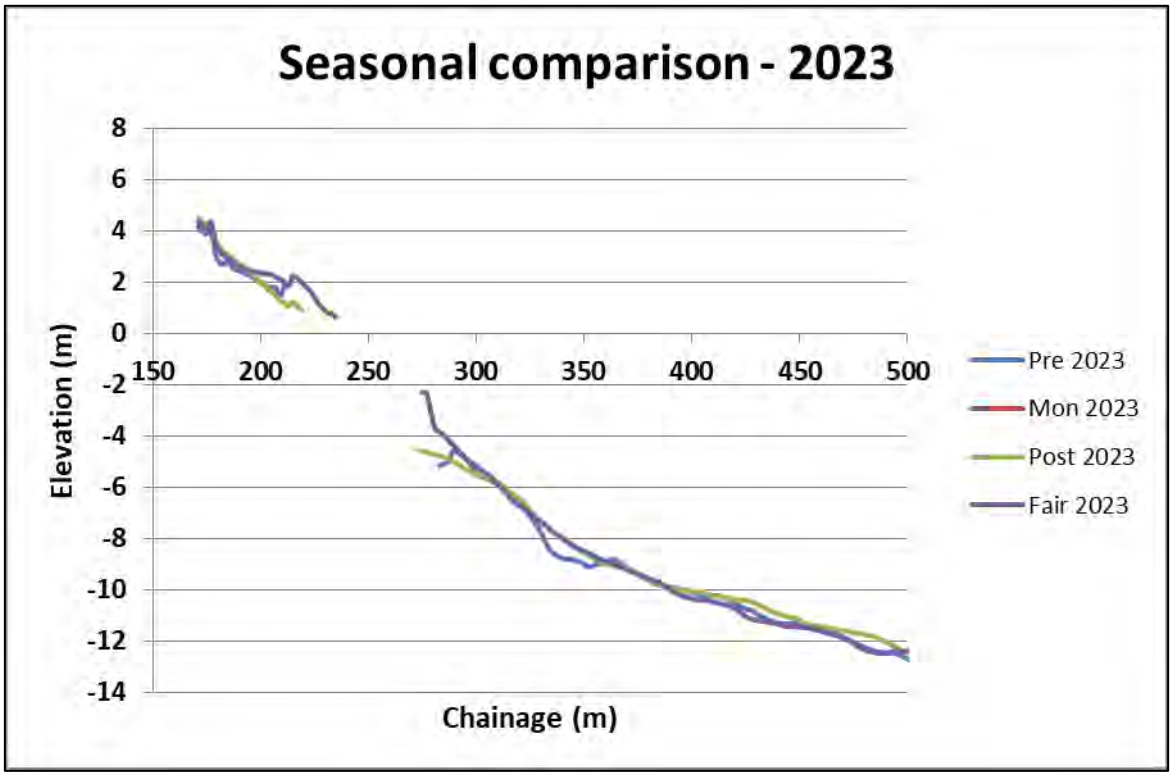


Figure 2-43 Profiles at Neerody (CS 07) – Seasonal comparison (2023)

Seawalls are present in the stretch of CS 3 to CS 10. Among these sections, CS 7 which is at Neerody, in Tamil Nadu, was chose to illustrate the seasonal trends.

From Figure 2-42 to Figure 2-43, it can be noticed that the seasonal variations were very minimal.

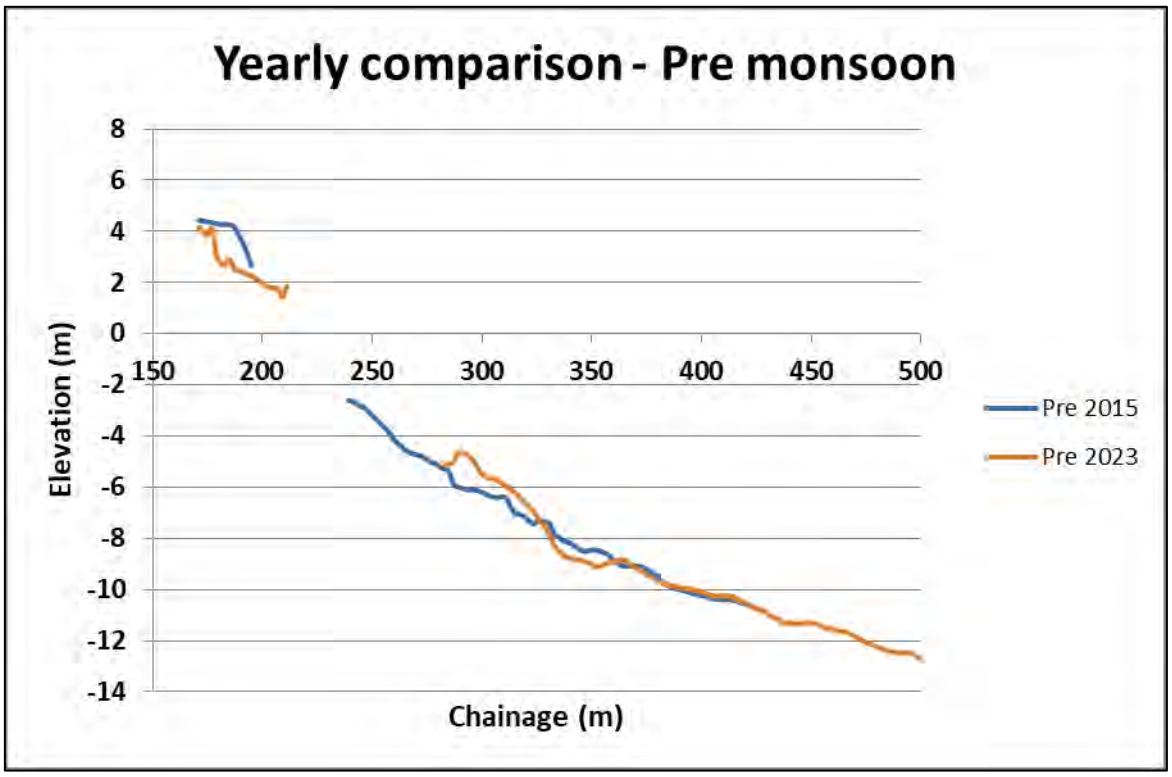


Figure 2-44 Profiles at Neerody (CS 07) – Yearly comparison – Pre monsoon

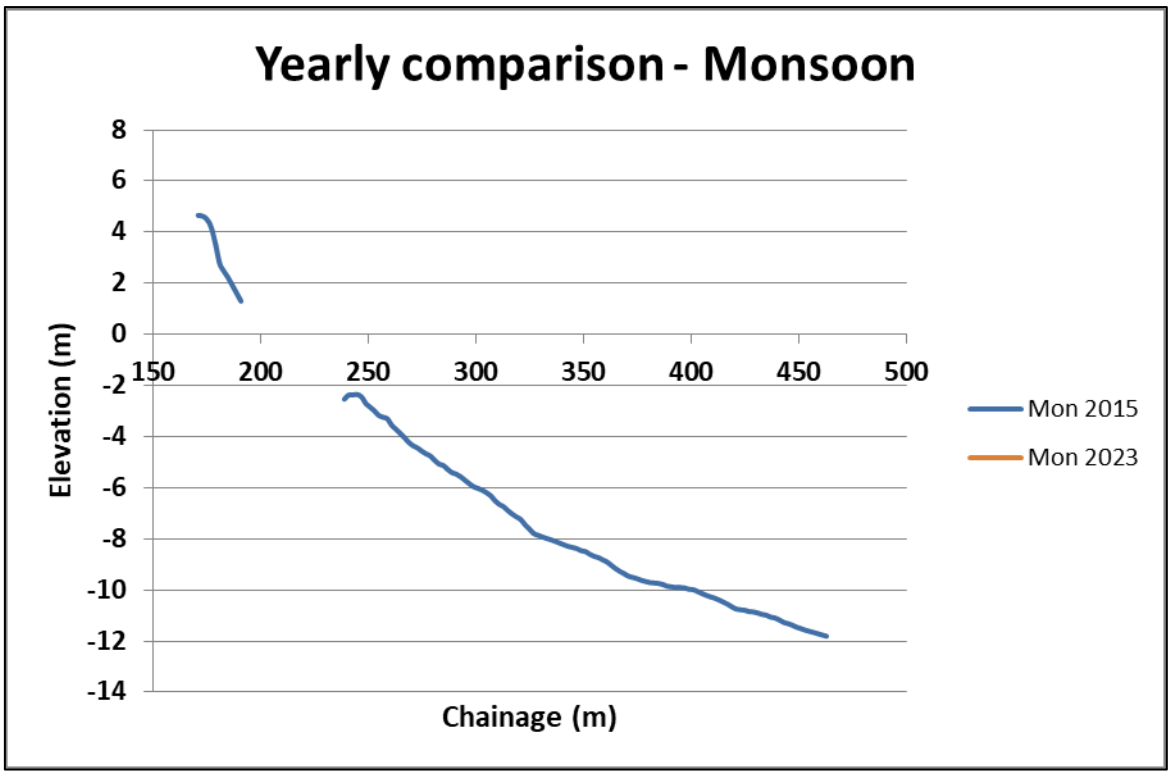


Figure 2-45 Profiles at Neerody (CS 07) – Yearly comparison - Monsoon

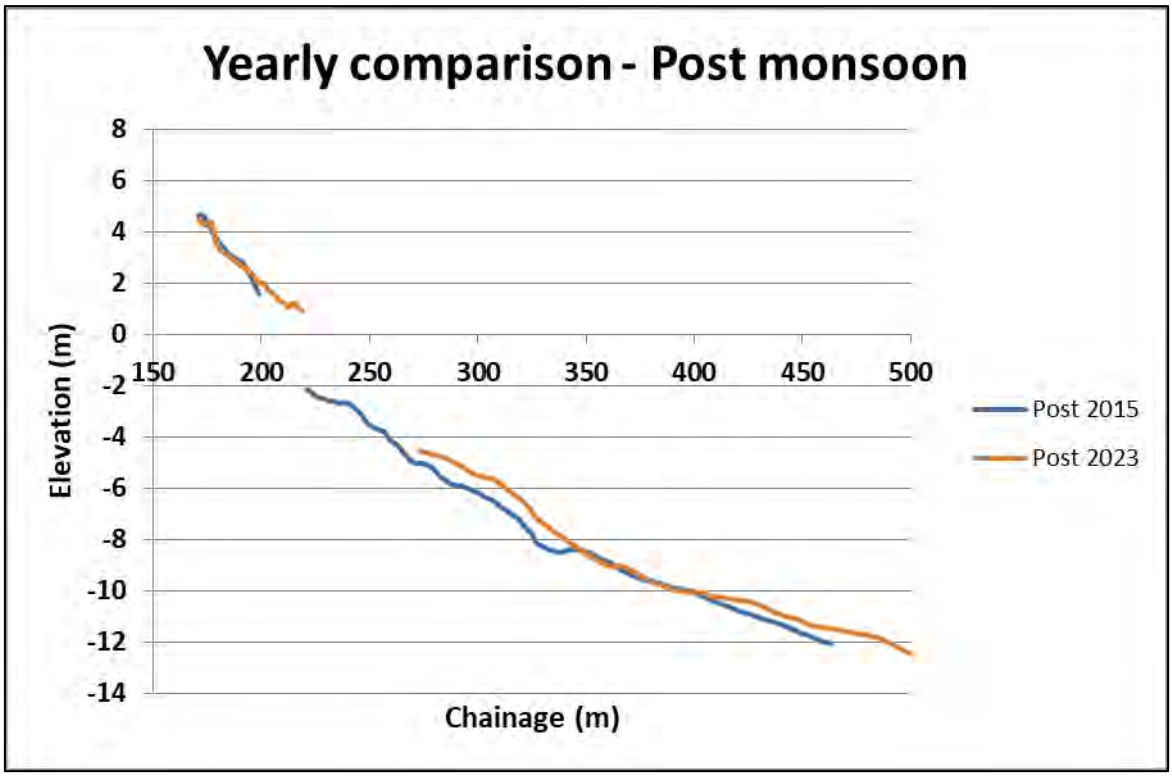


Figure 2-46 Profiles at Neerody (CS 07) – Yearly comparison – Post monsoon

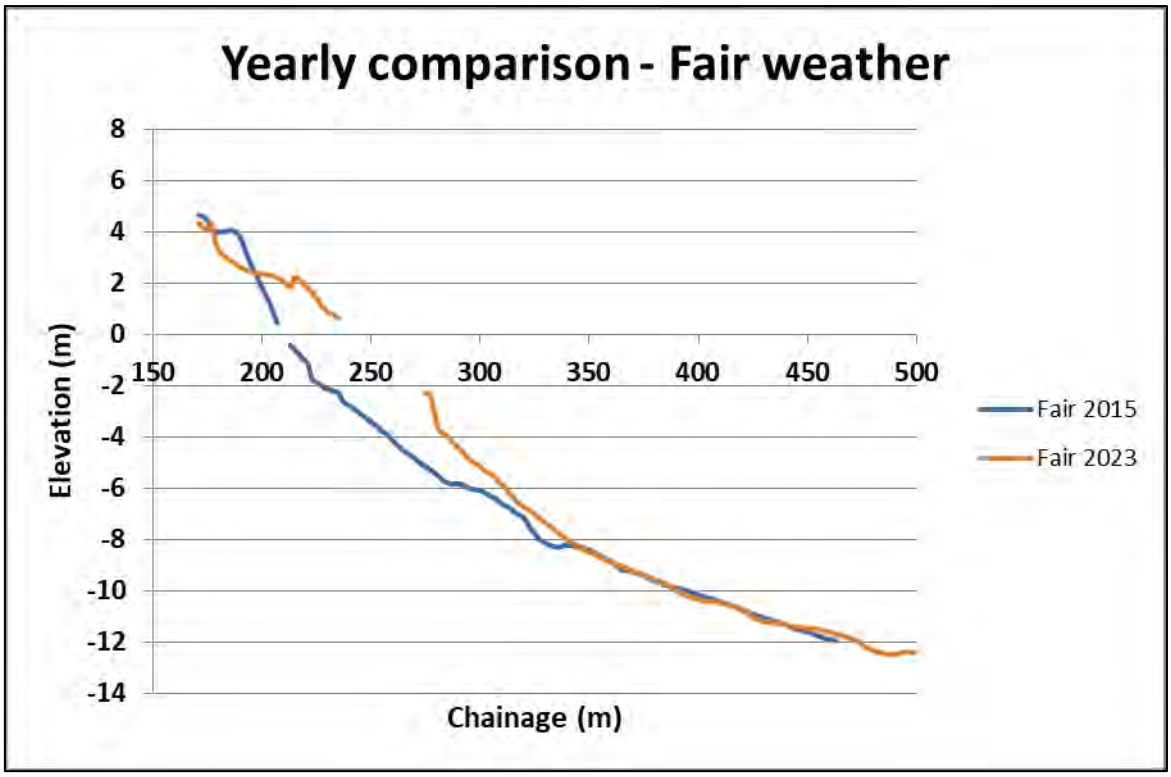


Figure 2-47 Profiles at Neerody (CS 07) – Yearly comparison – Fair weather

ASSYSTEM INDIA LIMITED extracted +2m (not extracted at the location where seawall is present), -3m, -4m, -6m, -8m and -10m contours from cross shore profile data at Neerody and below plots are time series of respective contours for two years (2015 and 2022). The time scale is similar. The plots represent the contour distances with respect to an arbitrary

point which is constant for all profiles at a cross section and represent the seasonal variations of erosion and accretion in this stretch.

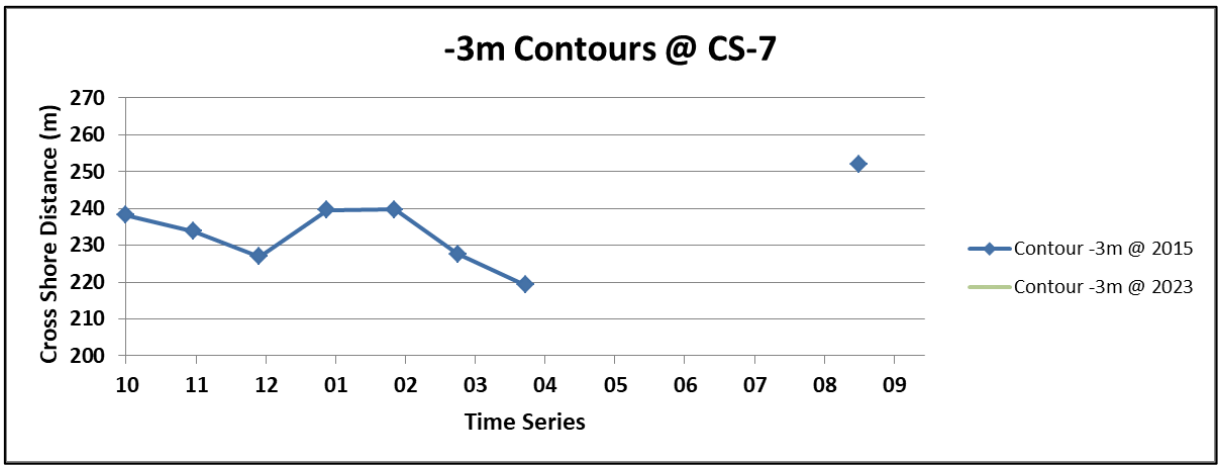


Figure 2-48 Time series of (–) 3 m contour at Neerody (CS 07)

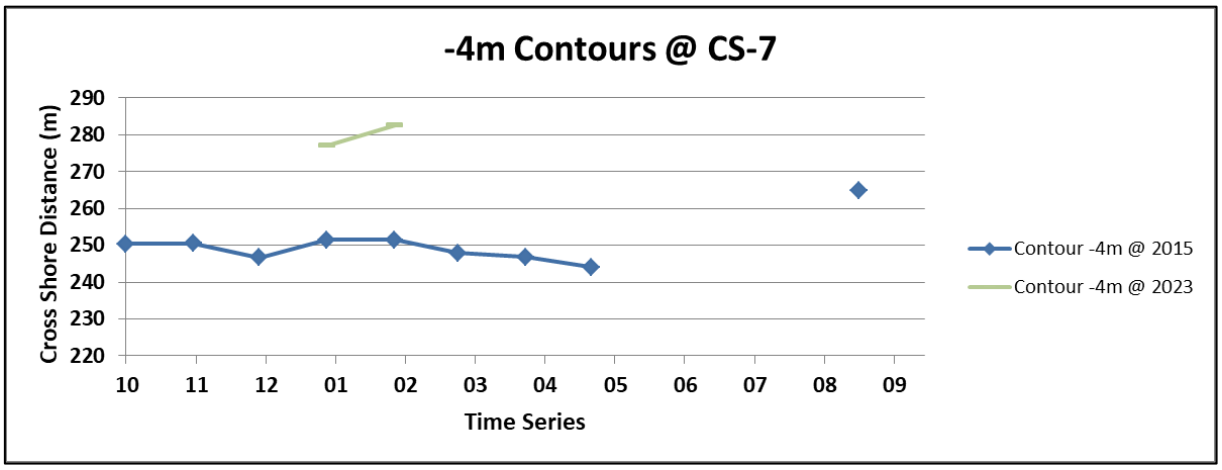


Figure 2-49 Time series of (–) 4 m contour at Neerody (CS 07)

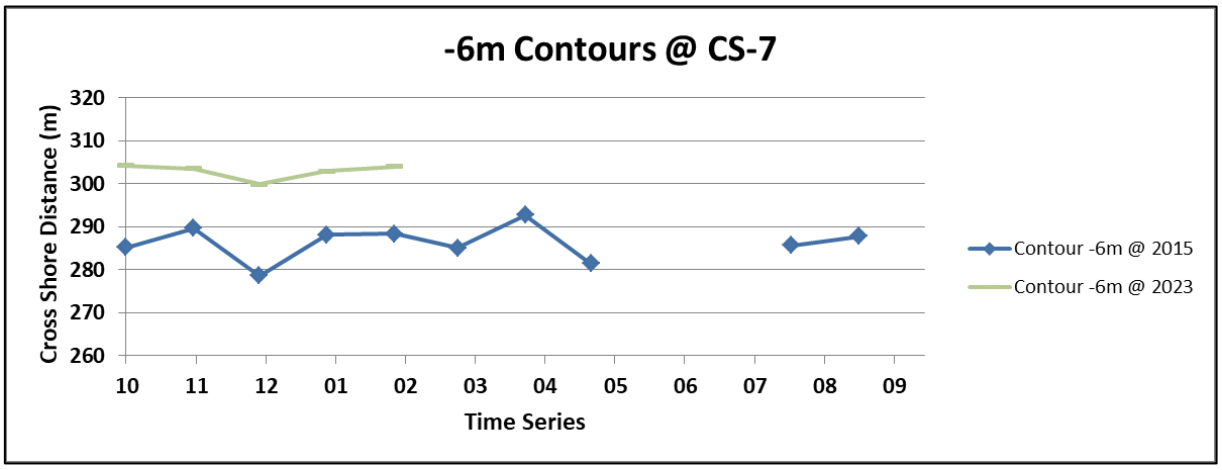


Figure 2-50 Time series of (–) 6 m contour at Neerody (CS 07)

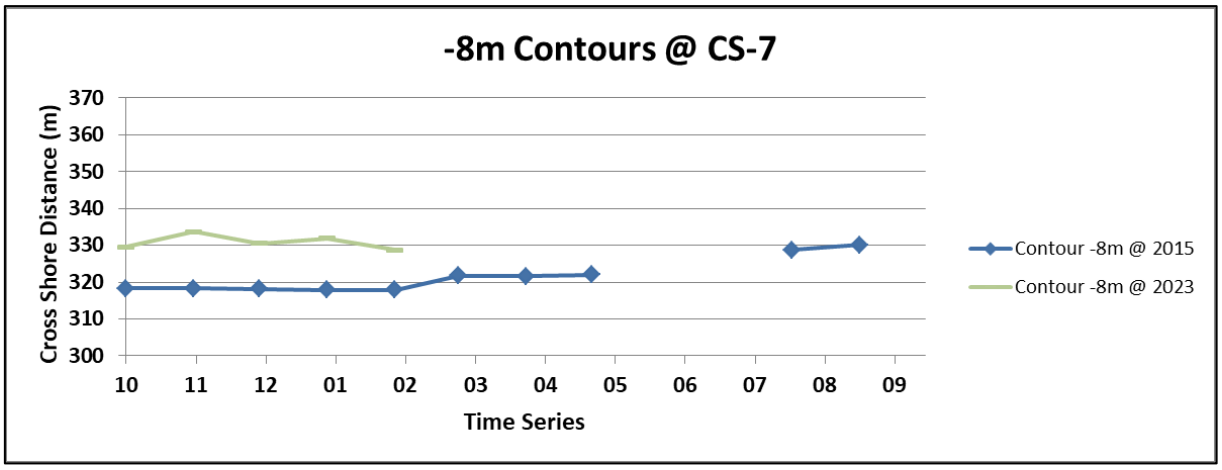


Figure 2-51 Time series of (–) 8 m contour at Neerody (CS 07)

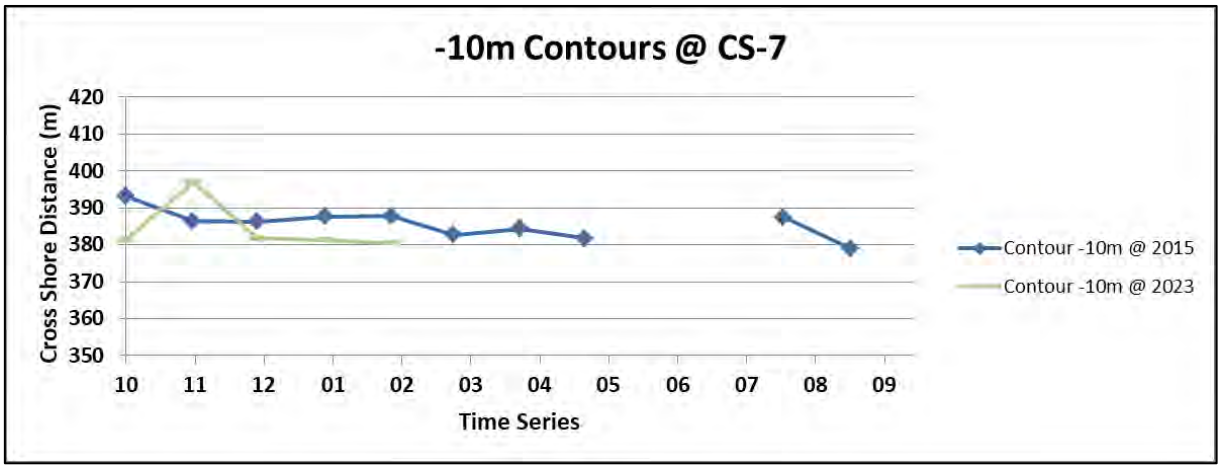


Figure 2-52 Time series of (–) 10 m contour at Neerody (CS 07)

In addition to above, continuous variation of contour distances over 7 years was provided for better clarity as shown in Figure 2-53.

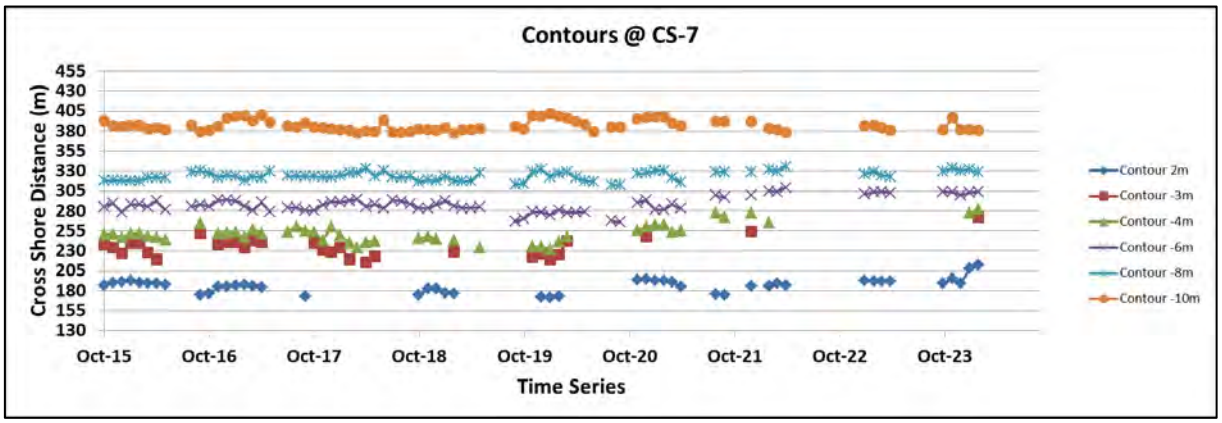


Figure 2-53 Continuous time series of contours at Neerody (CS 07)

2.6.2.2 Stretch 2

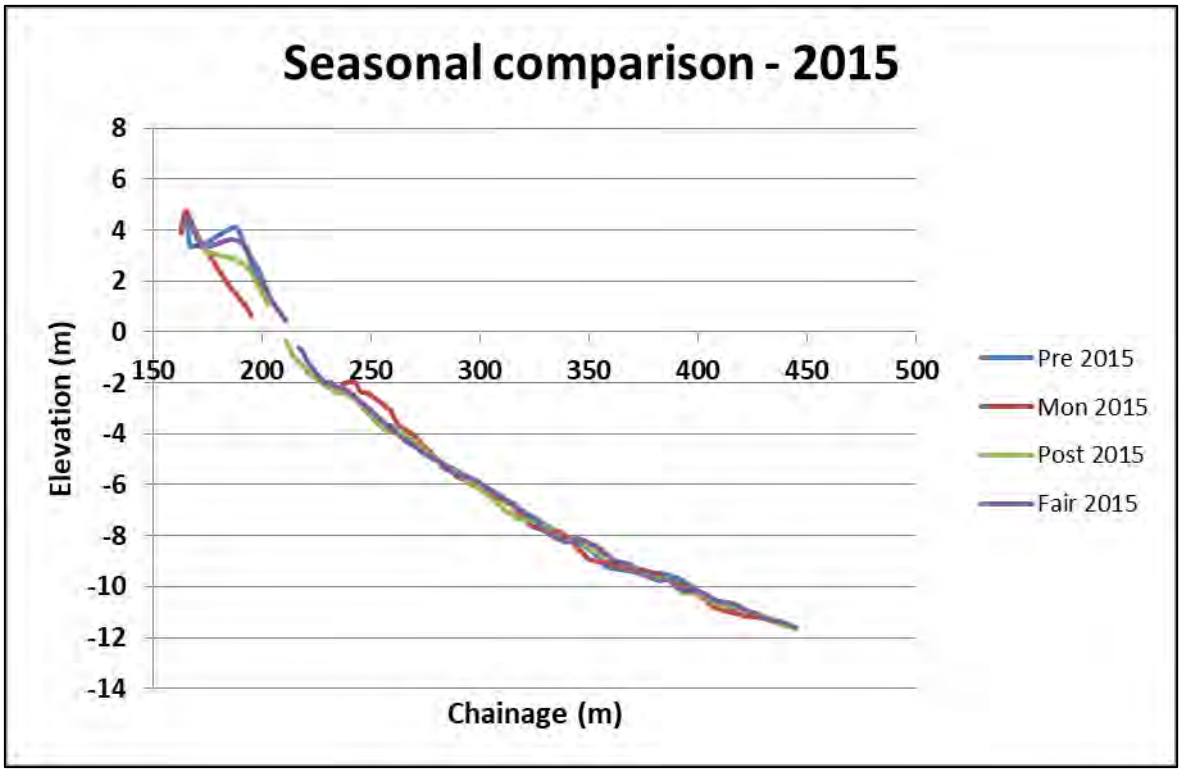


Figure 2-54 Profiles at Pozhiyoor (CS 12) – Seasonal comparison (2015)

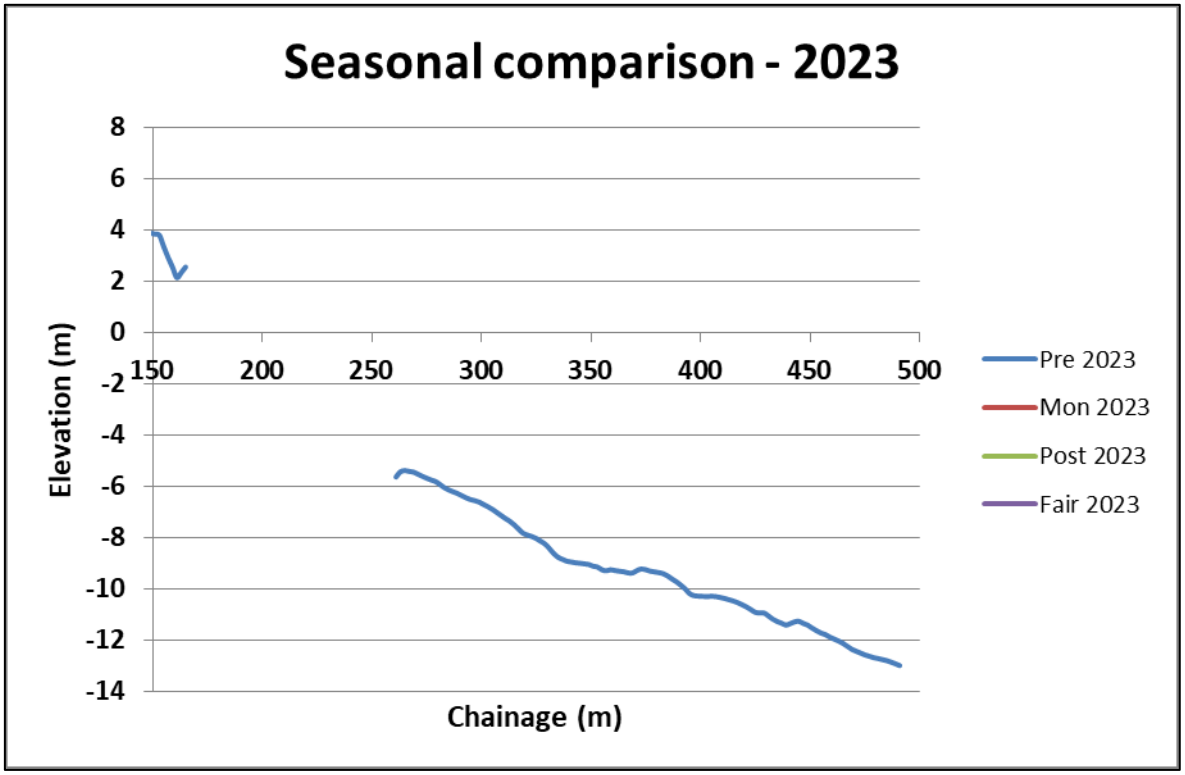


Figure 2-55 Profiles at Pozhiyoor (CS 12) – Seasonal comparison (2023)

From Figure 2-54, it can be noticed that the coast experiences significant seasonal variations over a year. The general trend seems to be that of a stable beach during pre-monsoon seasons, of beach erosion and deposition in offshore region during monsoon seasons and of

gradual beach build up during post monsoon & fair-weather seasons. From **Error! Reference source not found.**, it can be seen that the beach profile remains similar during pre-monsoon 2022 and fair weather 2022.

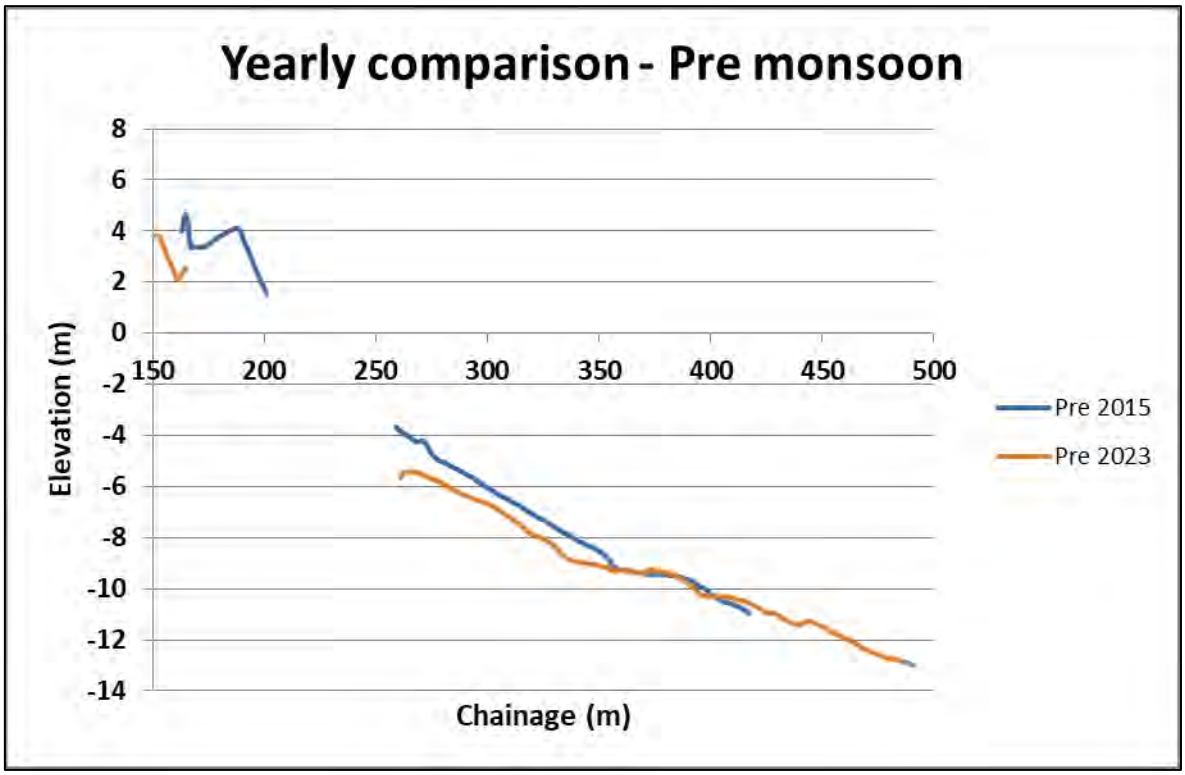


Figure 2-56 Profiles at Pozhiyoor (CS 12) – Yearly comparison – Pre Monsoon

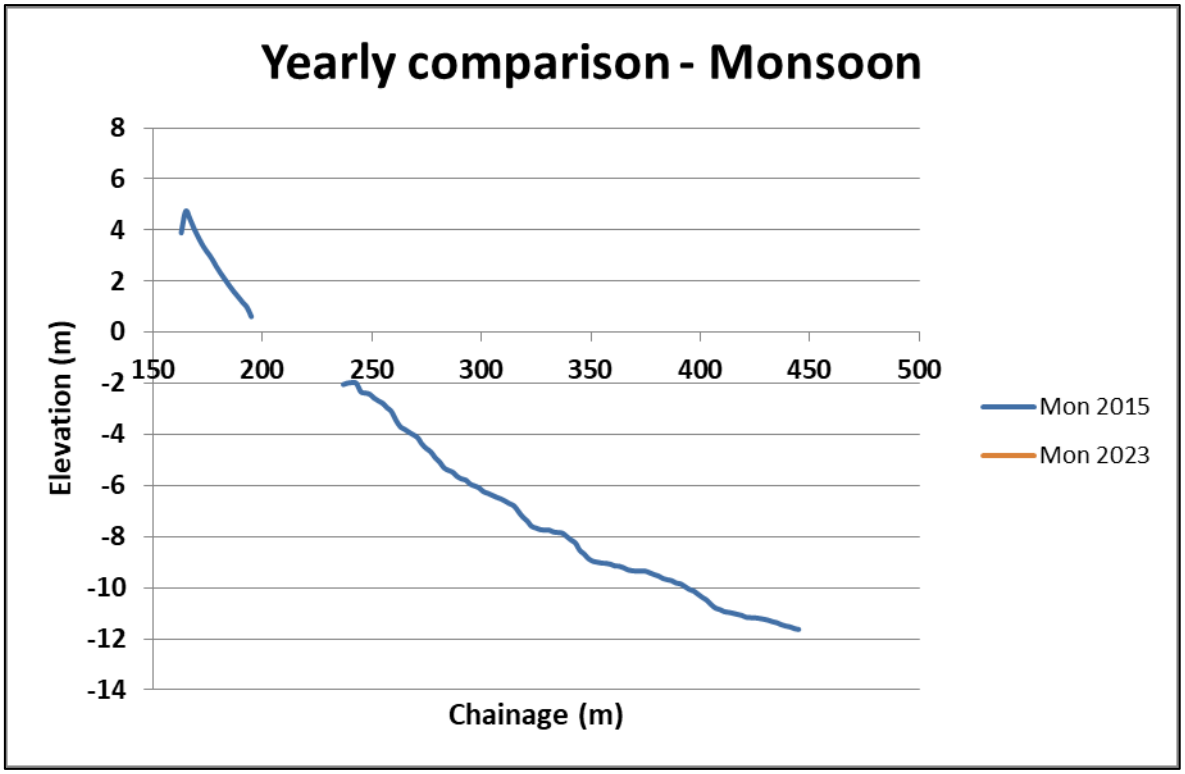


Figure 2-57 Profiles at Pozhiyoor (CS 12) – Yearly comparison – Monsoon

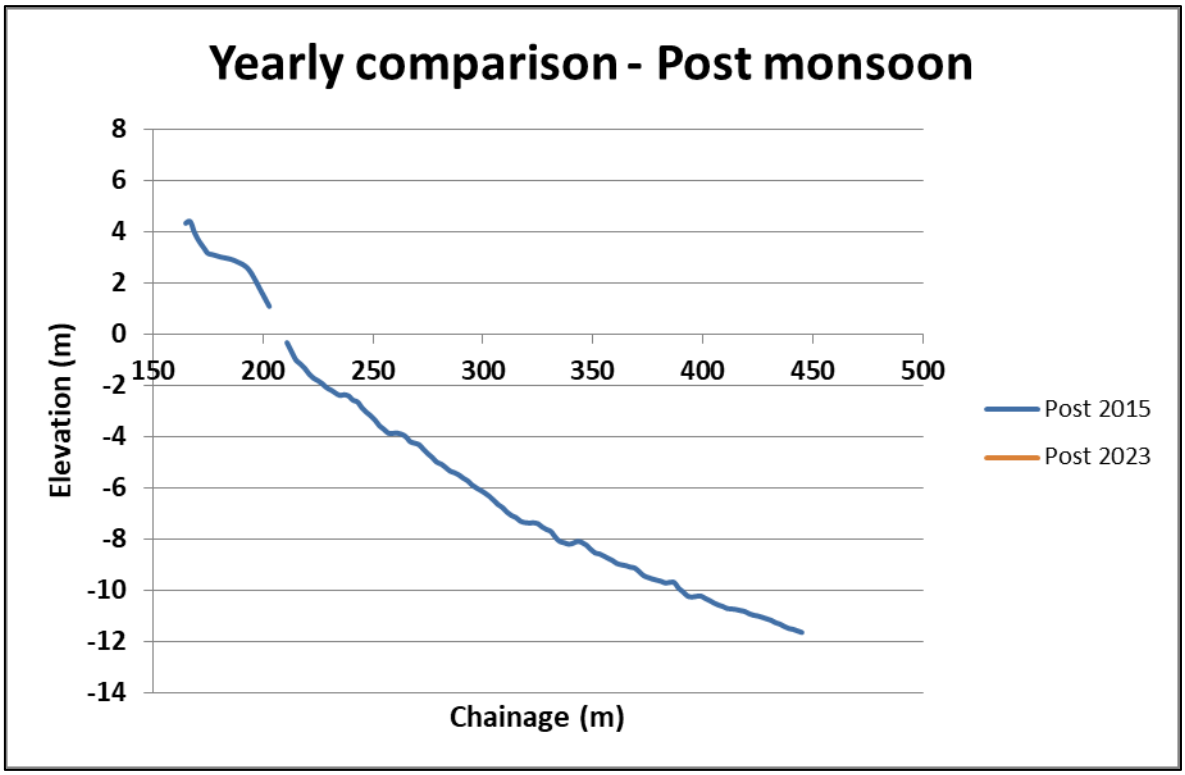


Figure 2-58 Profiles at Pozhiyoor (CS 12) – Yearly comparison – Post Monsoon

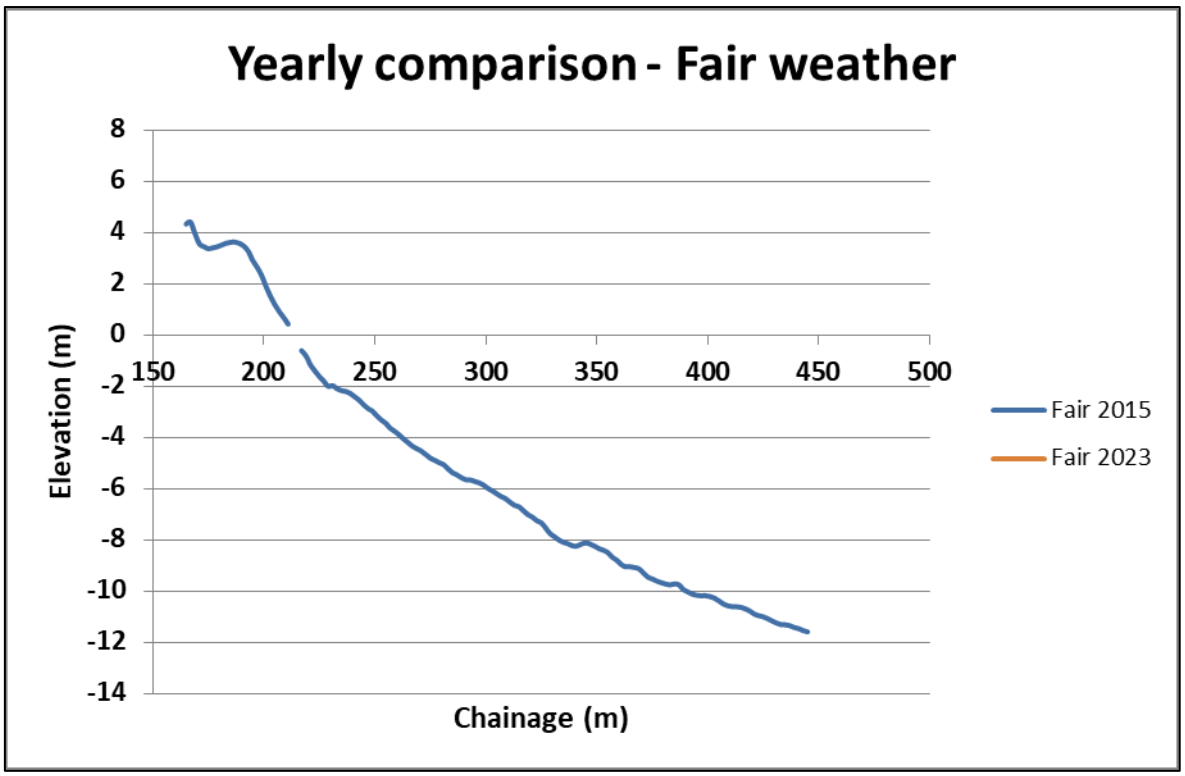


Figure 2-59 Profiles at Pozhiyoor (CS 12) – Yearly comparison – Fair Weather

ASSYSTEM INDIA LIMITED extracted +2m, -3m, -4m, -6m, -8m and -10m contours from cross shore profile data at Pozhiyoor and below plots are time series of contours for two years (2015 and 2022).

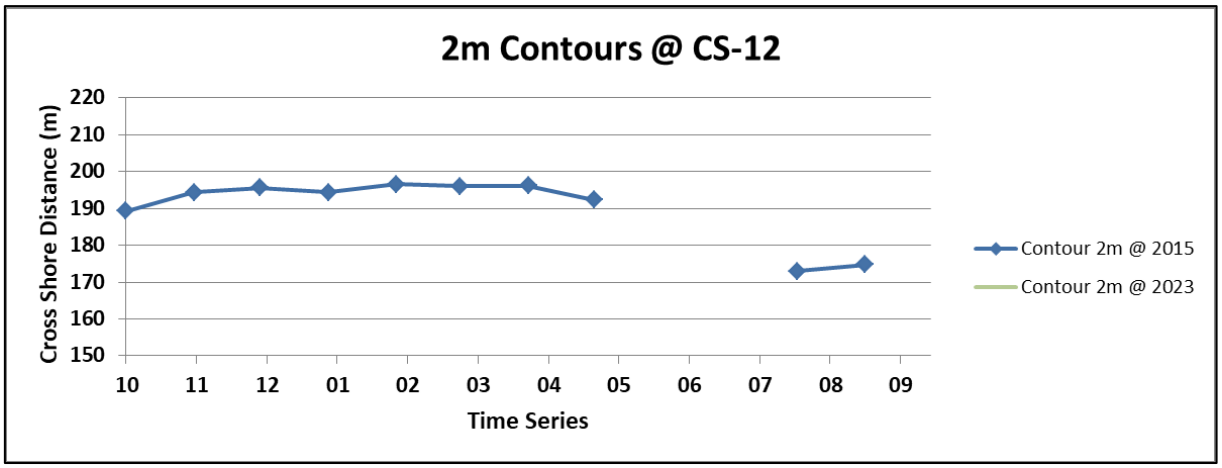


Figure 2-60 Time series of (+) 2 m contour at Pozhiyoor (CS 12)

Figure 2-60 is the time series of (+) 2 m contour data at Pozhiyoor. From this plot it can be noticed that the beach experiences seasonal variations resulting in erosion during monsoon season and accretion during other seasons. During Ockhi the beach was exposed to severe erosion and minimal accretion was noticed during fair weather 2017 and pre-monsoon 2018 in the course of which beach was supposed to build up. In addition, as a result of monsoon 2018 and 2019 the beach further eroded than previous monsoon seasons.

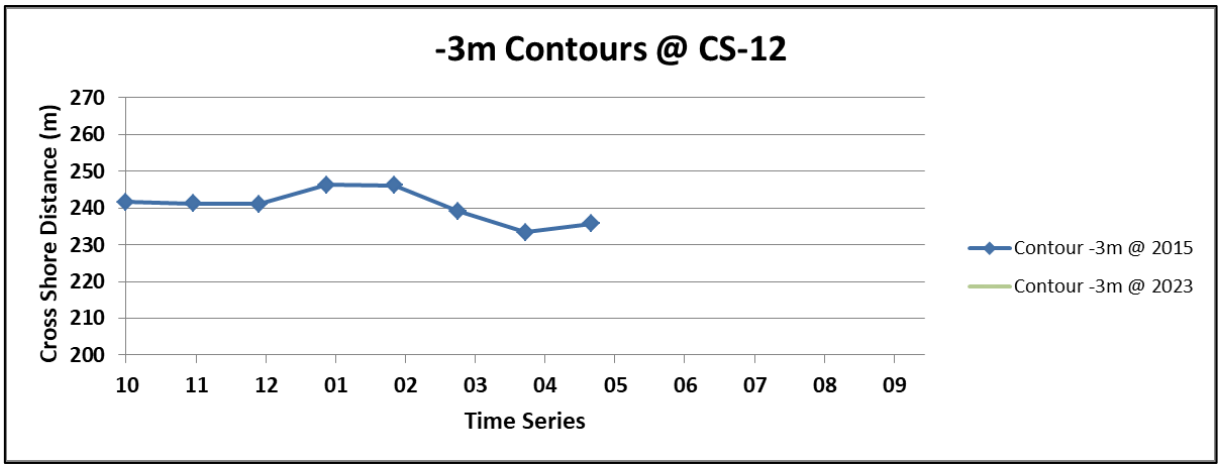


Figure 2-61 Time series of (–) 3 m contour at Pozhiyoor (CS 12)

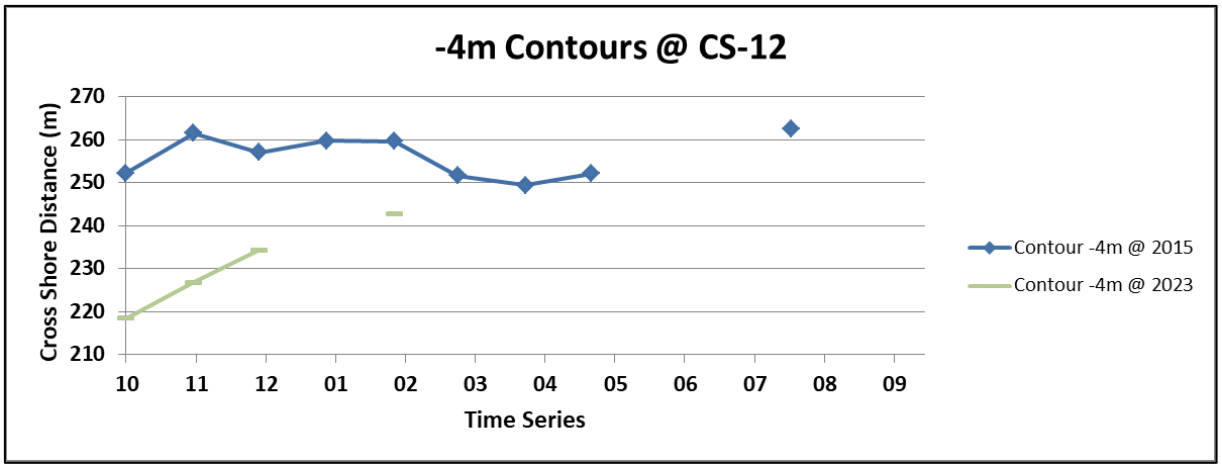


Figure 2-62 Time series of (–) 4 m contour at Pozhiyoor (CS 12)

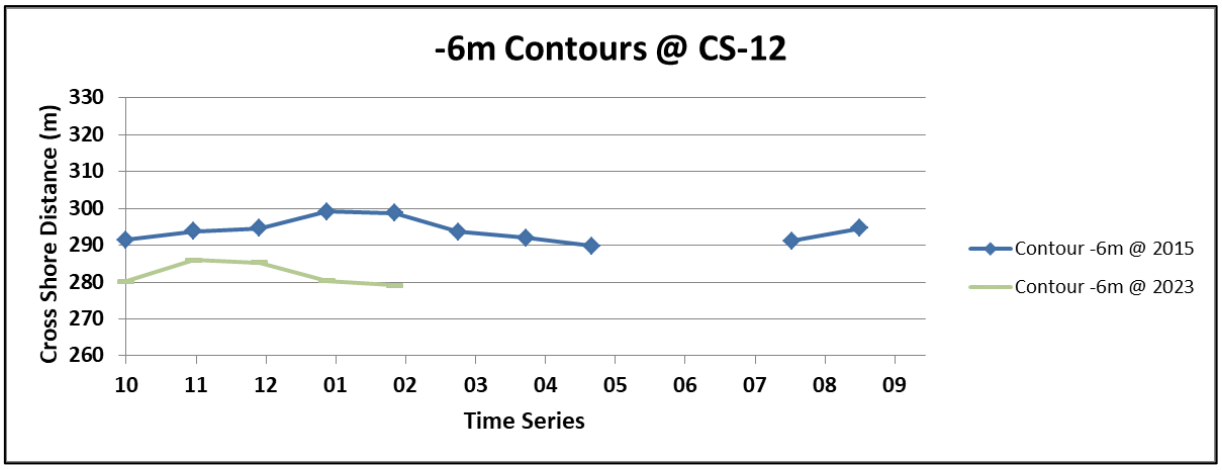


Figure 2-63 Time series of (–) 6 m contour at Pozhiyoor (CS 12)

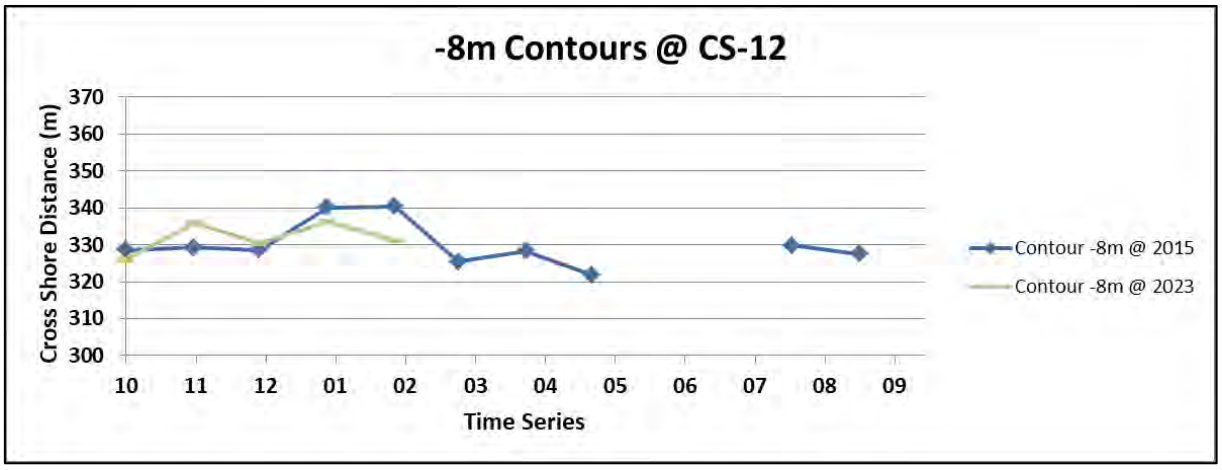


Figure 2-64 Time series of (–) 8 m contour at Pozhiyoor (CS 12)

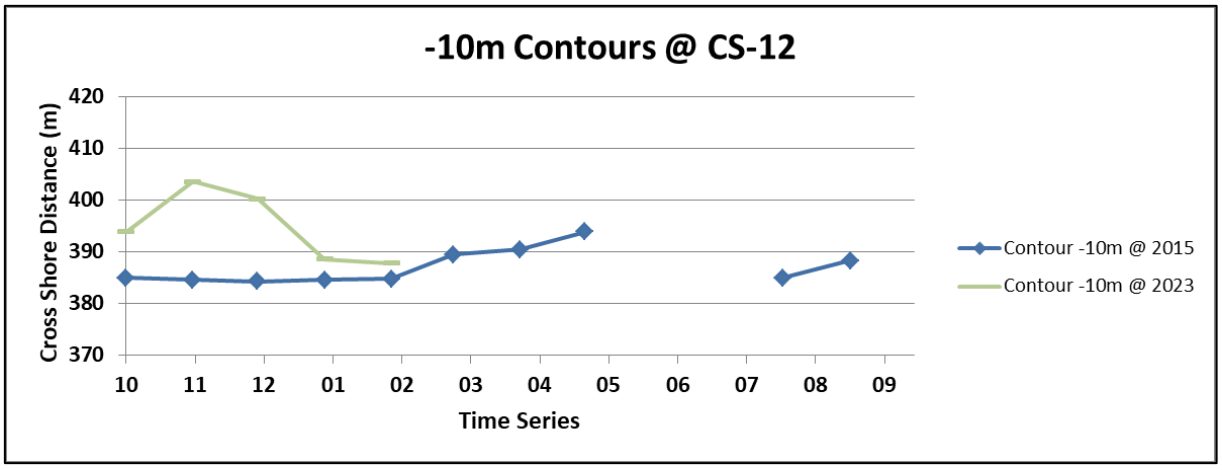


Figure 2-65 Time series of (–) 10 m contour at Pozhiyoor (CS 12)

In addition to above, the +2m, -3m, -4m, -6m, -8m and -10m contours continuous variation of contour distances over 7 years was provided for better clarity as shown in Figure 2-66.

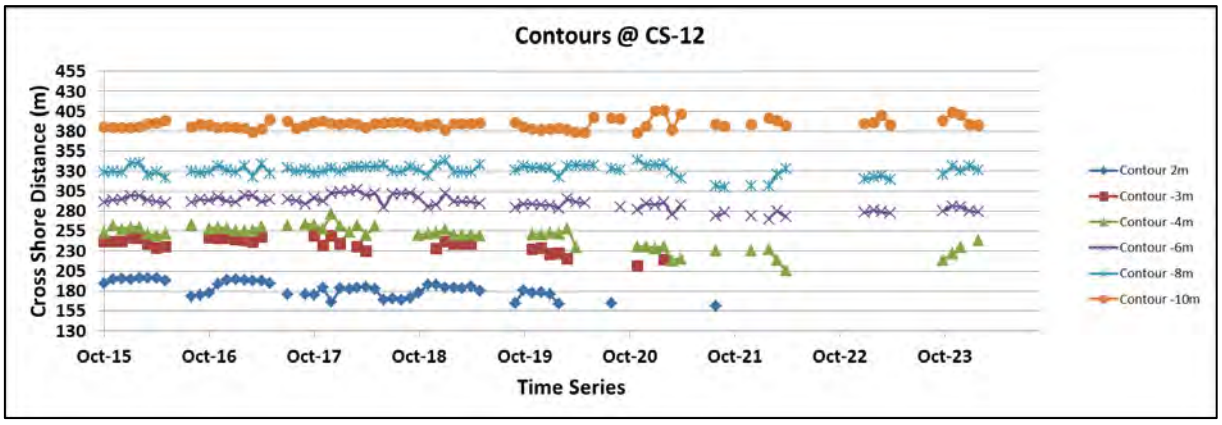


Figure 2-66 Continuous time series of contours at Pozhiyoor (CS 12)

Figure 2-66 shows the variation of contour distances from common arbitrary point on land side. It can be observed that most of the sediment exchange was in between +2m and -3m contours prior to Ockhi i.e. simultaneous erosion on beach side & accretion on sea side and vice versa. Post Ockhi such trend could not be traced due to various reasons such as lack of adequate survey data, construction activities (independent & unrelated to the port) happened to the South of this stretch, and subsequent higher monsoonal events.

2.6.2.3 Stretch 3

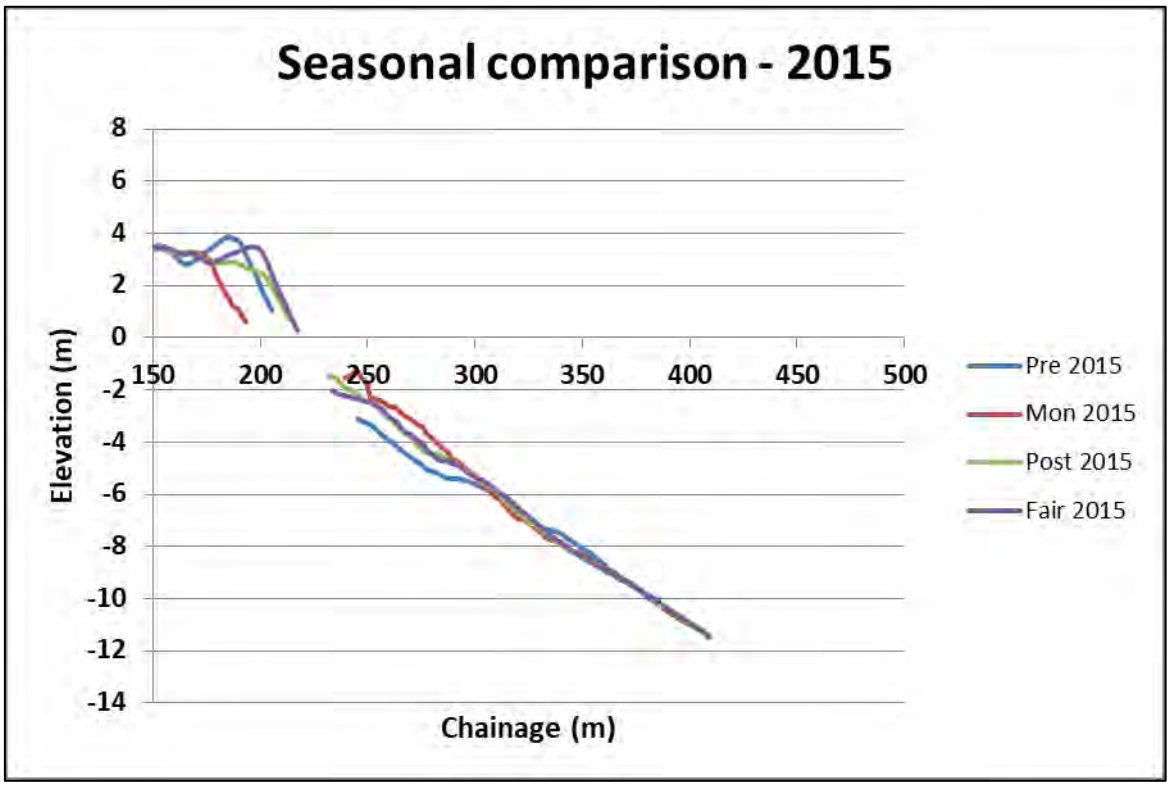


Figure 2-67 Profiles at Karumkulam (CS 26) – Seasonal comparison – (2015)

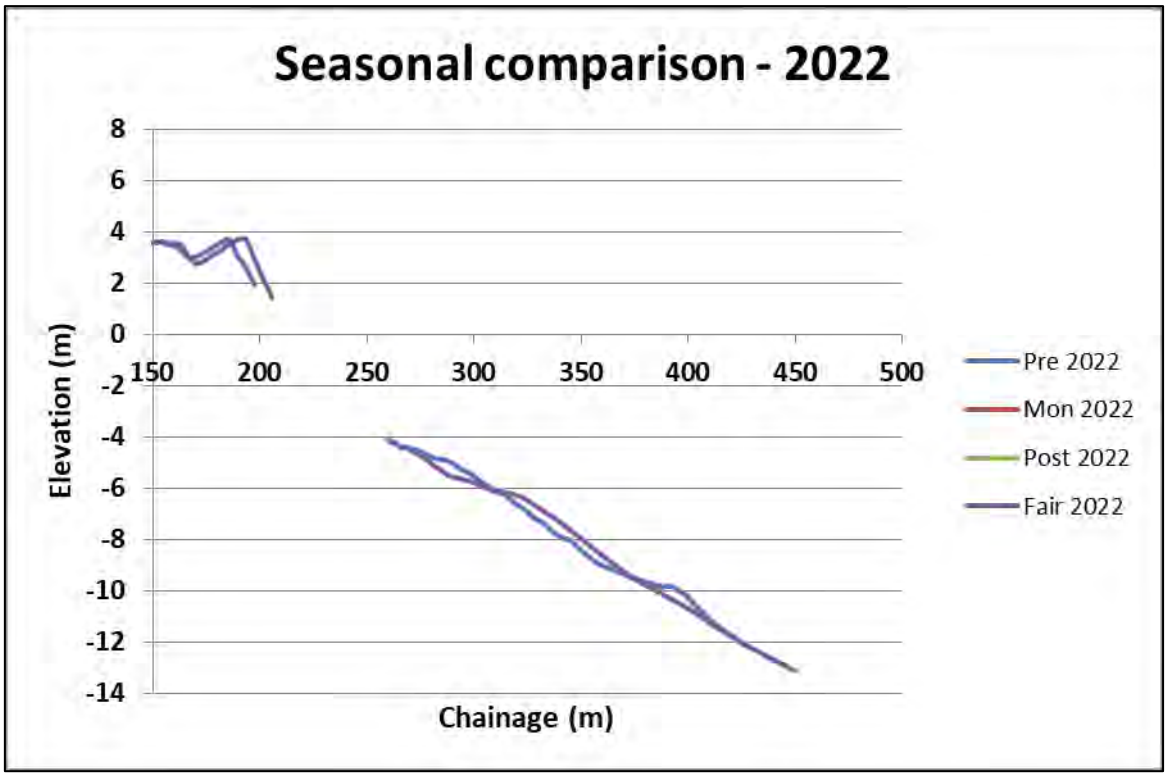


Figure 2-68 Profiles at Karumkulam (CS 26) – Seasonal comparison – (2022)

Beach is present throughout the year in the stretch of CS 18 to CS 34. Among these sections, CS 26 which is at Karumkulam in Thiruvananthapuram district of Kerala was chosen to illustrate the seasonal trends over seven years. From Figure 2-67, it can be noticed that the coast experience seasonal variations over a year. In general, it seems to have a stable beach during pre-monsoon seasons, beach erosion and deposition in offshore region during monsoon seasons and gradual beach build up during post monsoon & fair weather. Whereas in 2017 the coast experienced a very severe cyclonic storm (IMD Classification) named Ockhi (December 2017) during fair weather season and resulted in severe erosion all along the coast. From Figure 2-68, it can be seen that there was better beach build-up during fair weather 2022 when compared to pre monsoon 2022.

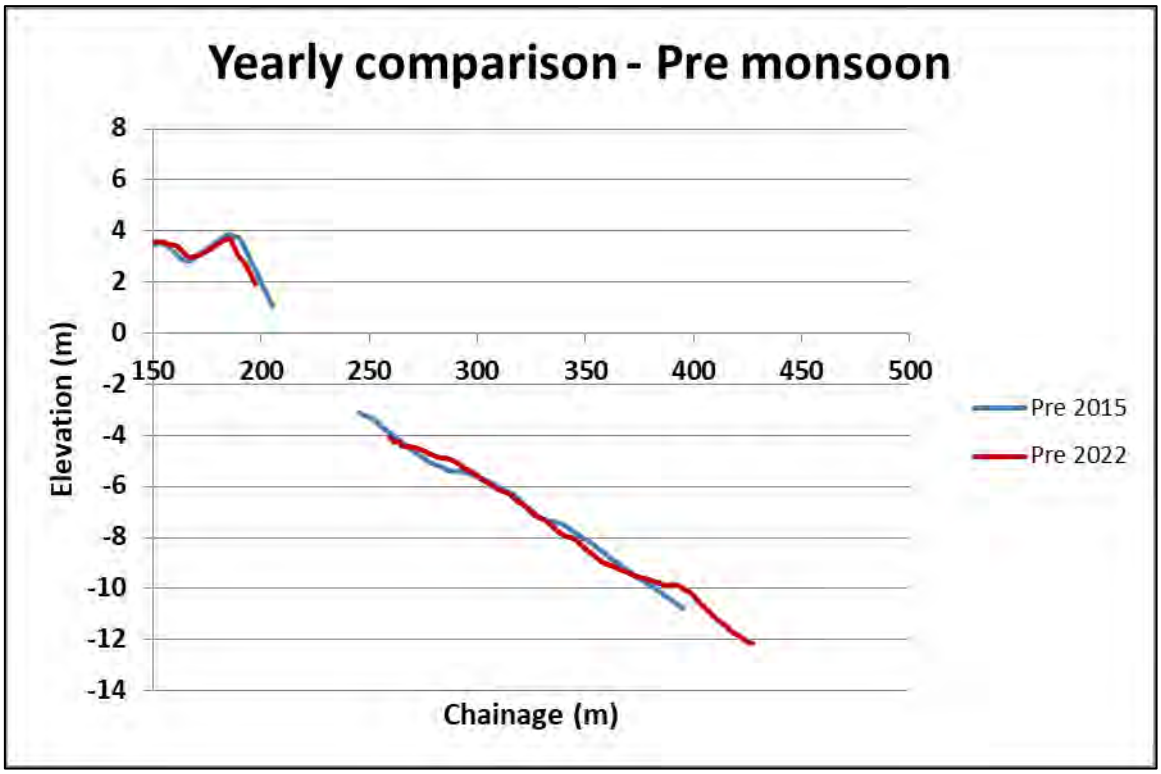


Figure 2-69 Profiles at Karumkulam (CS 26) – Yearly comparison – Pre monsoon

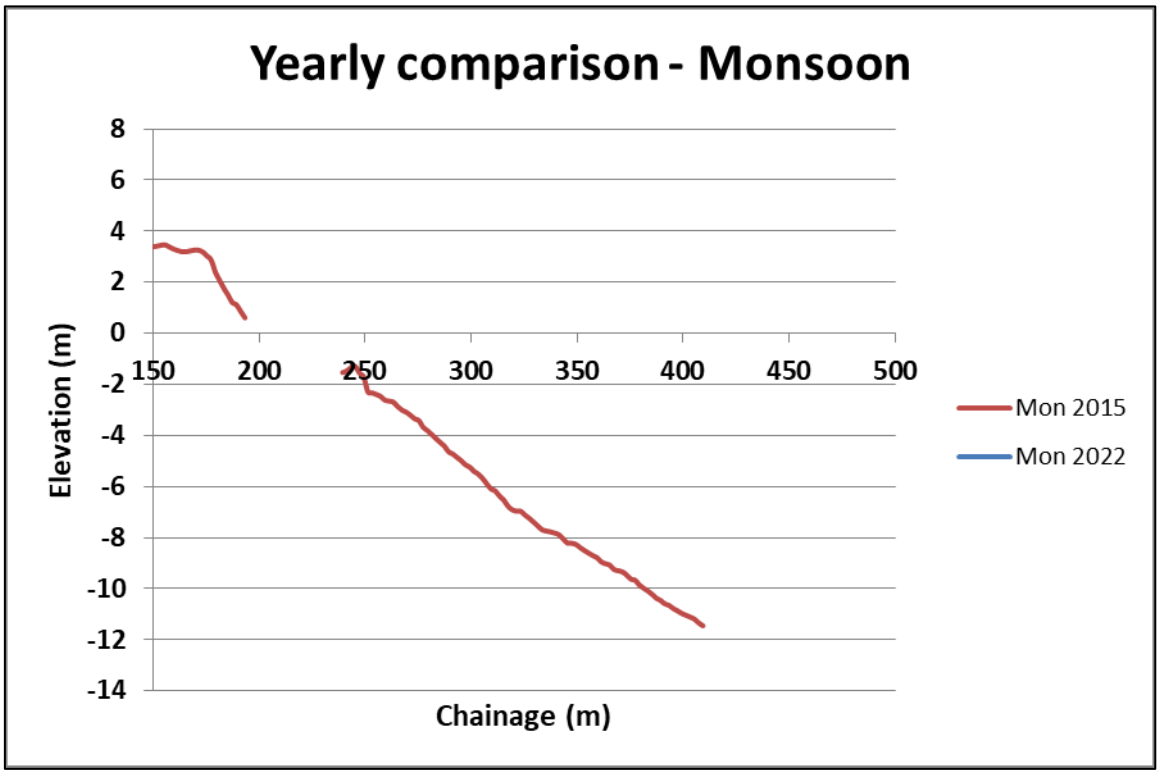


Figure 2-70 Profiles at Karumkulam (CS 26) – Yearly comparison – Monsoon

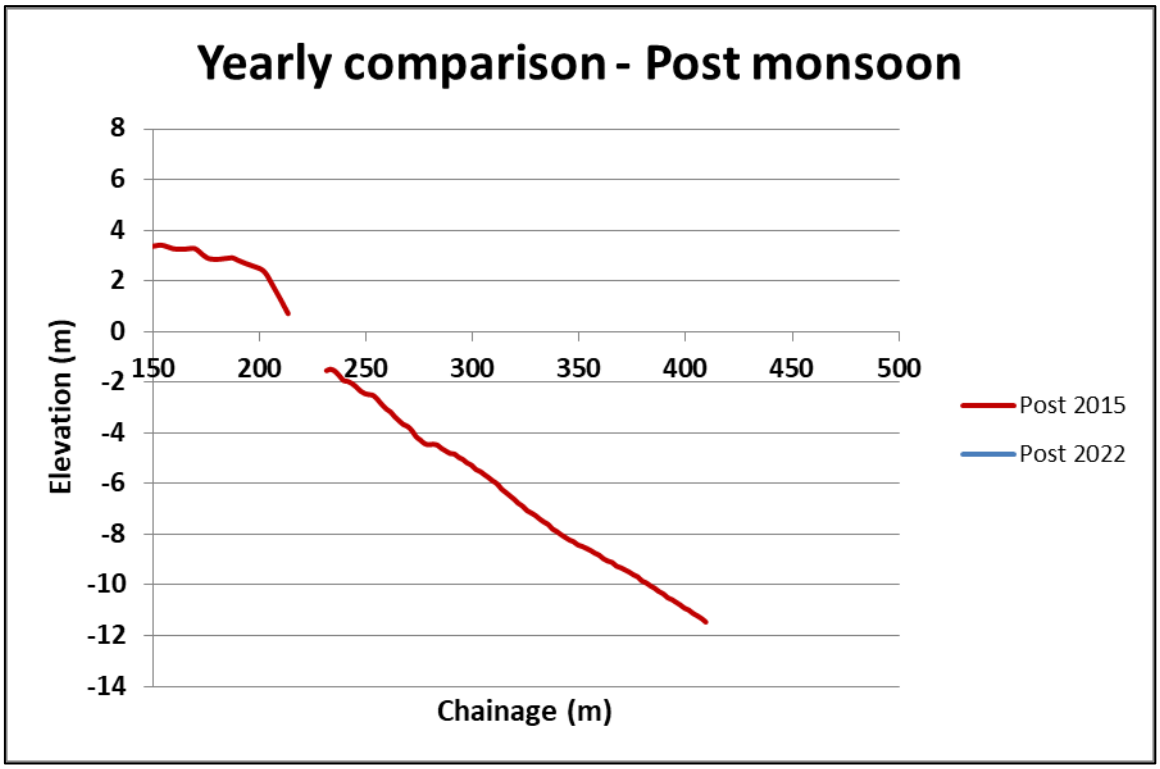


Figure 2-71 Profiles at Karumkulam (CS 26) – Yearly comparison – Post monsoon

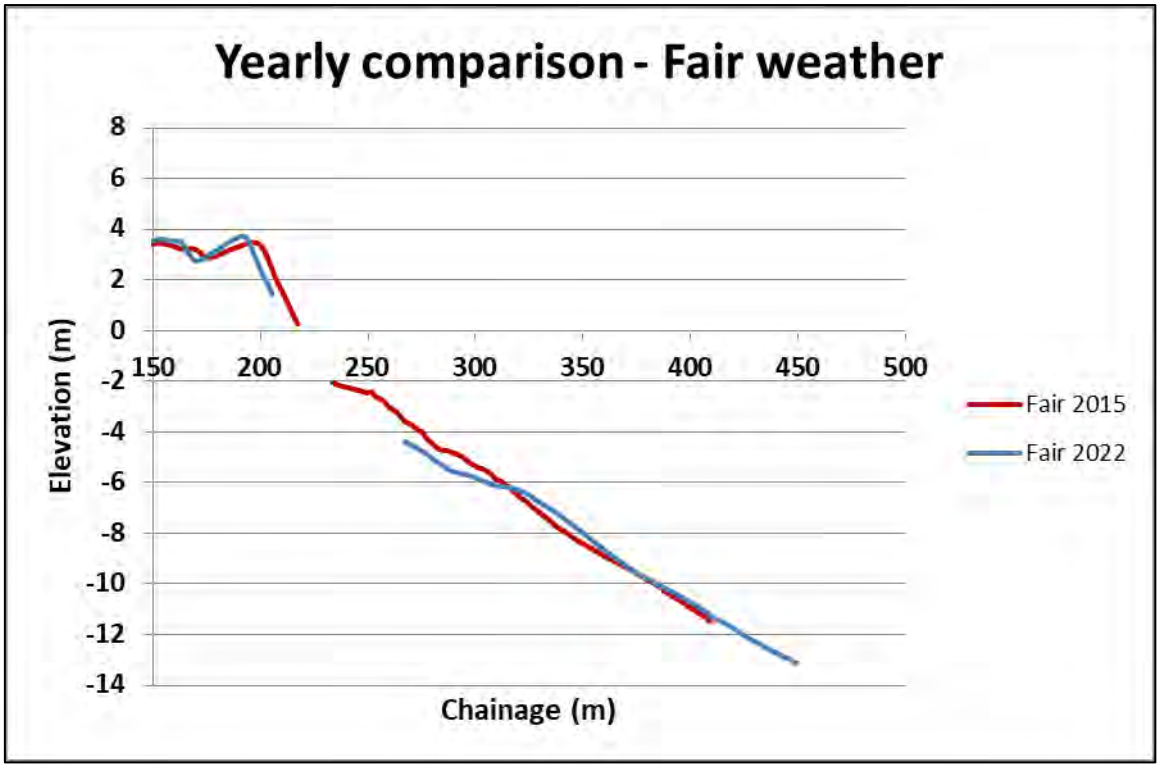


Figure 2-72 Profiles at Karumkulam (CS 26) – Yearly comparison – Fair weather

Figure 2-69 to Figure 2-72 represent comparison of profiles of season for two years (2015 & 2022). The coast is undergoing processes to recover from the Cyclone Ockhi impact, and this can be observed from fair weather seasons comparison plot.

ASSYSTEM INDIA LIMITED extracted +2m, -3m, -4m, -6m, -8m and -10m contours from cross shore profile data at Karumkulam and below plots were time series of respective

contours for two years (2015 and 2022) data with similar time scale. The plots represent the contour distances with respect to an arbitrary point which is constant for all profiles at a cross section and show the monthly variations of erosion (downward drift) and accretion (upward drift) in this stretch.

Figure 2-73 is the time series of (+) 2 m contour at Karumkulam. From this plot it can be noticed that the beach experiences seasonal variation of erosion during monsoon season and accretion during other seasons.

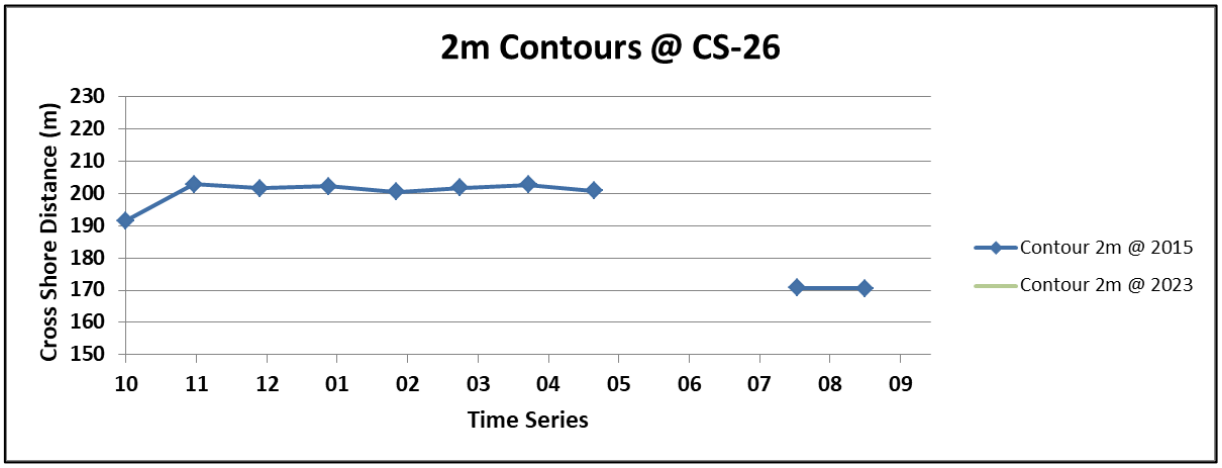


Figure 2-73 Time series of (+) 2 m contour at Karumkulam (CS 26)

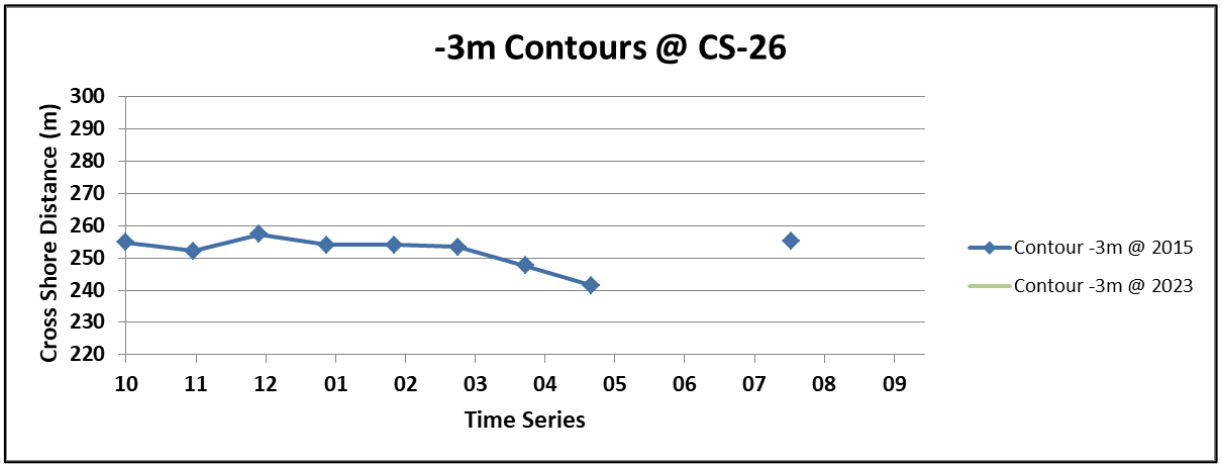


Figure 2-74 Time series of (–) 3 m contour at Karumkulam (CS 26)

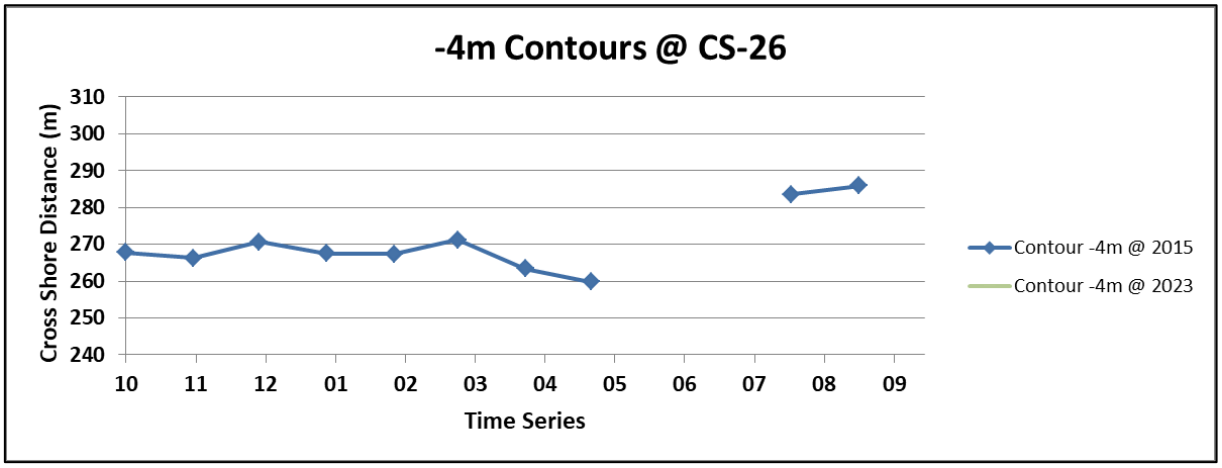


Figure 2-75 Time series of (–) 4 m contour at Karumkulam (CS 26)

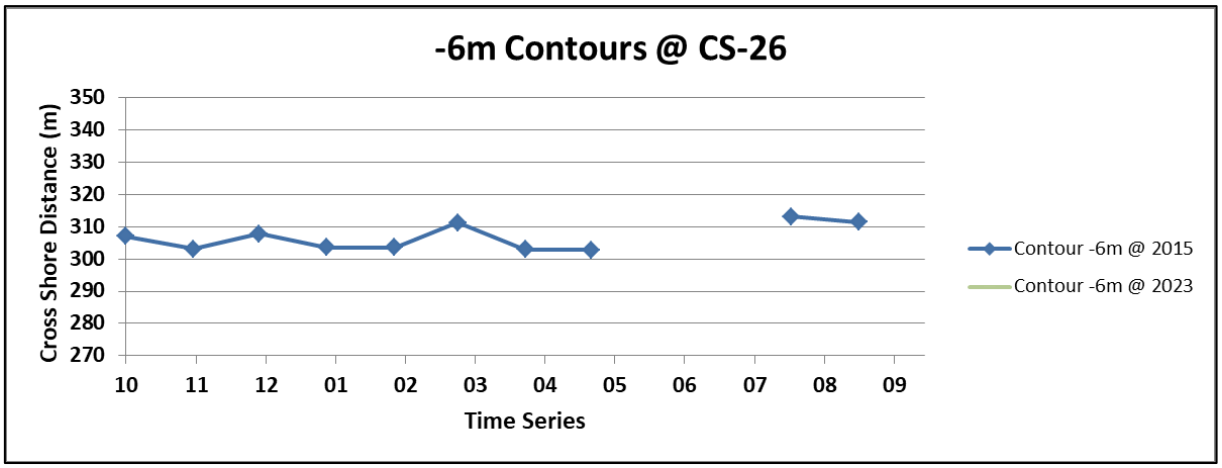


Figure 2-76 Time series of (–) 6 m contour at Karumkulam (CS 26)

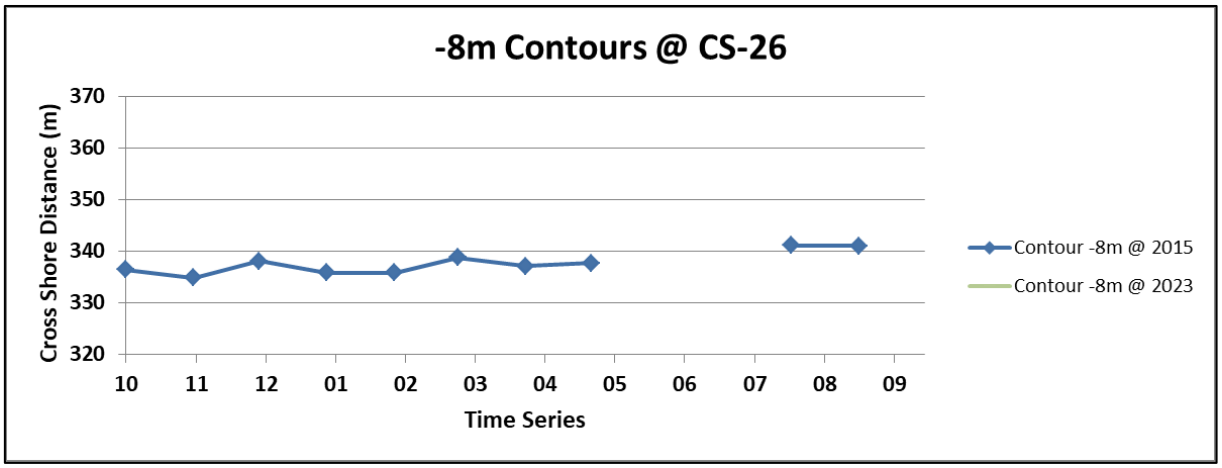


Figure 2-77 Time series of (–) 8 m contour at Karumkulam (CS 26)

In addition to above, the +2m, -3m, -4m, -6m, -8m and -10m contours continuous variation of contour distances over 7 years was provided for better clarity as shown in Figure 2-78.

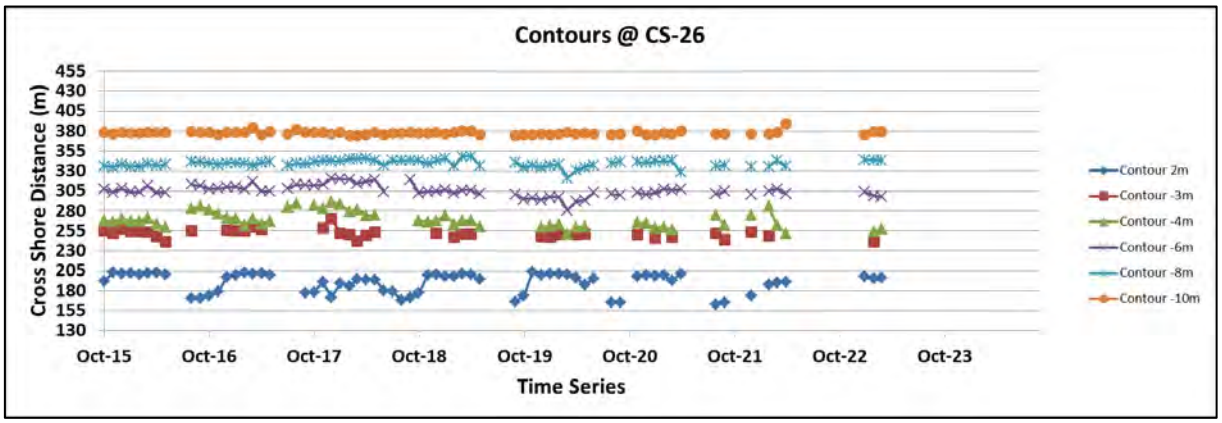


Figure 2-78 Continuous time series of contours at Karumkulam (CS 26)

Figure 2-78 shows the variation of respective contour distances from common arbitrary point on land side. It can be observed that most of the sediment exchange was in between +2m and -3m contours i.e. simultaneous erosion on beach side & accretion on sea side and vice versa.

2.6.2.4 Stretch 4

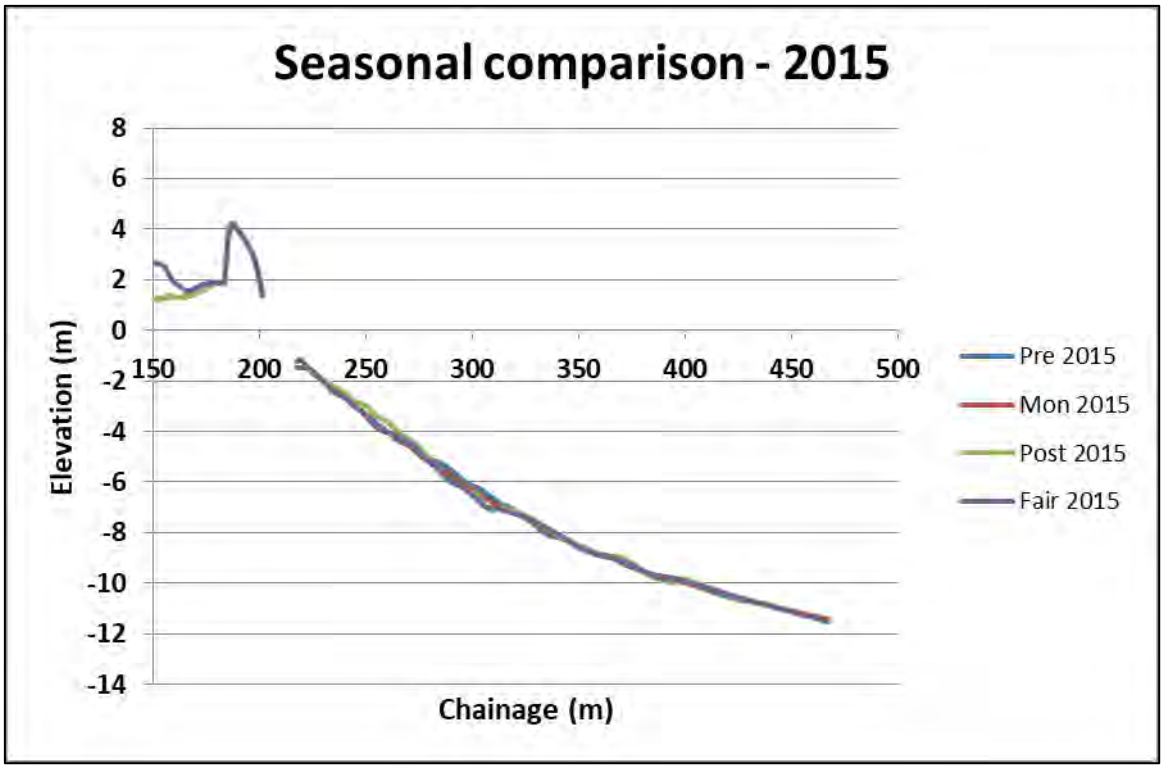


Figure 2-79 Profiles at Panathura (CS 49) – Seasonal comparison (2015)

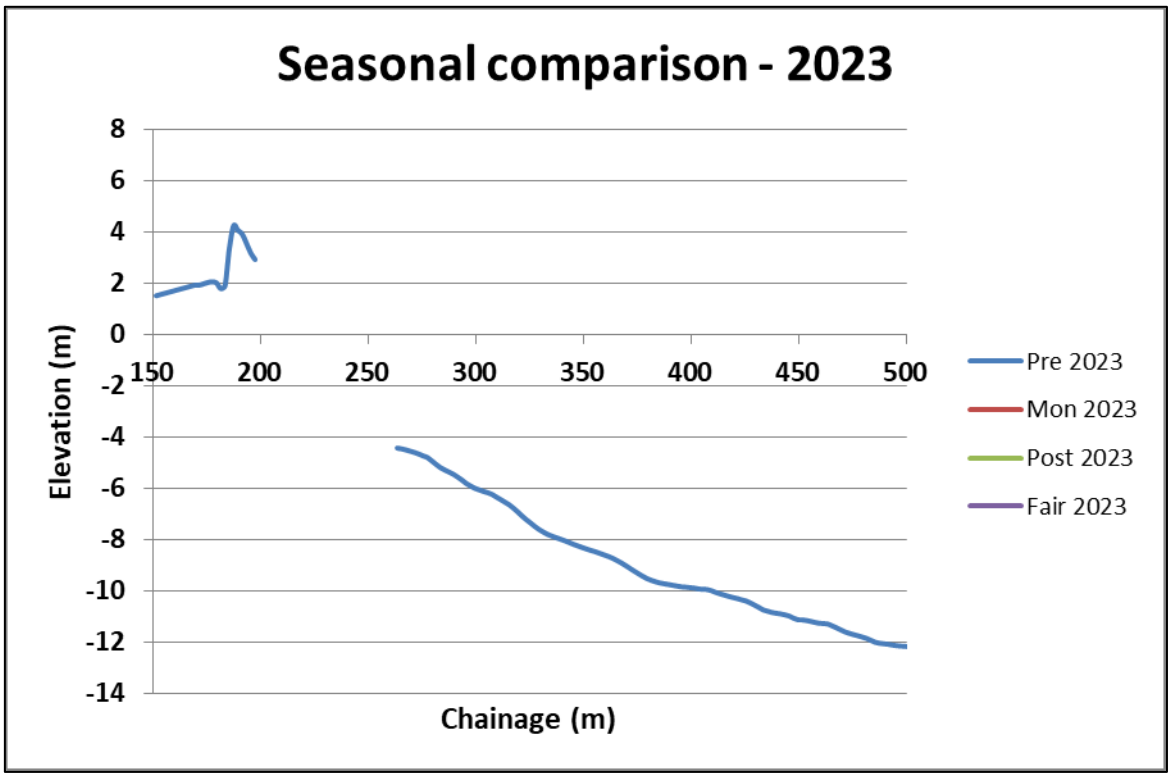


Figure 2-80 Profiles at Panathura (CS 49) – Seasonal comparison (2023)

Seawalls are present in the stretch of CS 47 to CS 52. Among these sections, CS 49 which is at Panathura in Thiruvananthapuram district was chosen to illustrate the seasonal trends over seven years.

From Figure 2-79 and **Error! Reference source not found.**, it can be noticed that the seasonal variations are very minimal. Figure 2-81 to Figure 2-84 represent comparison of profiles of different seasons for two years (2015 and 2022).

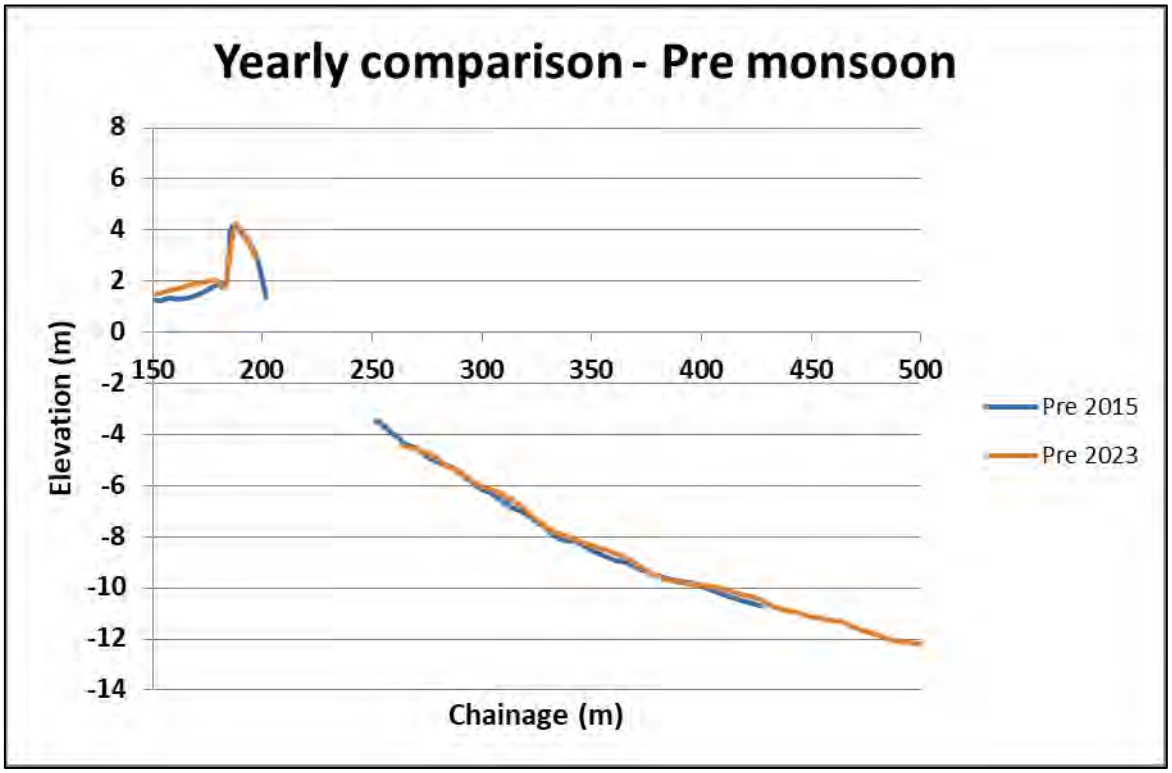


Figure 2-81 Profiles at Panathura (CS 49) – Yearly comparison – Pre monsoon

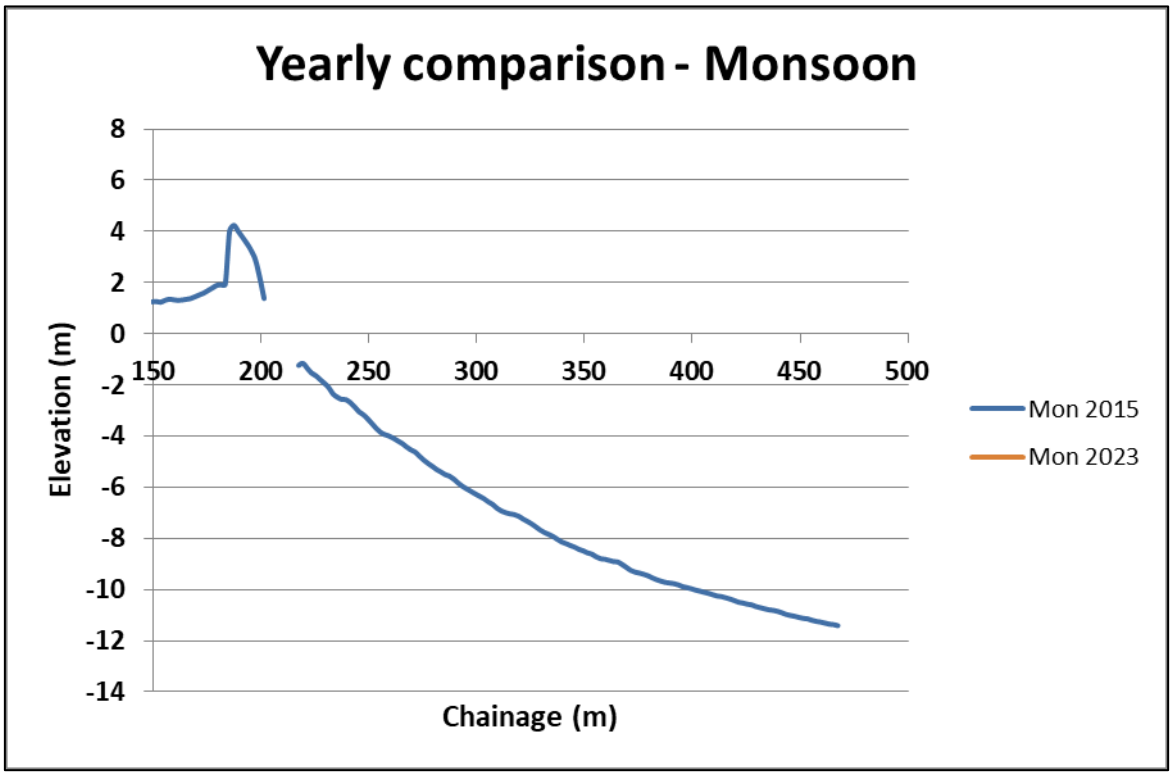


Figure 2-82 Profiles at Panathura (CS 49) – Yearly comparison - Monsoon

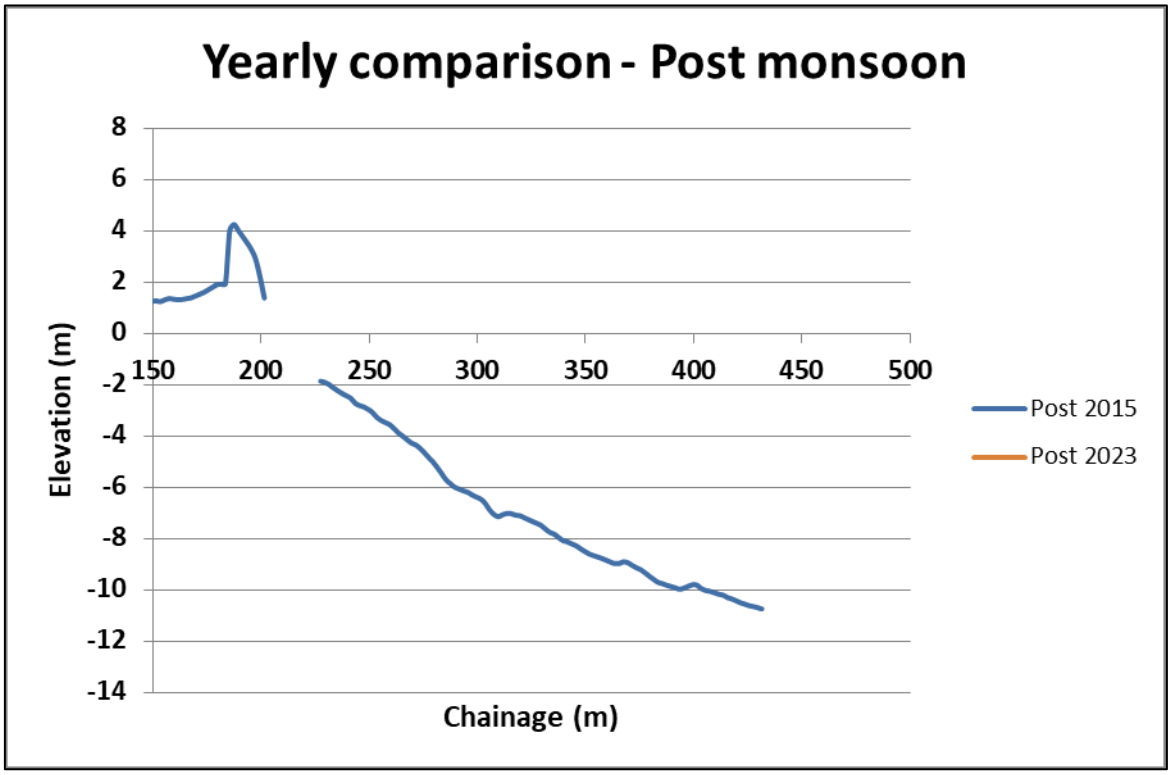


Figure 2-83 Profiles at Panathura (CS 49) – Yearly comparison – Post Monsoon

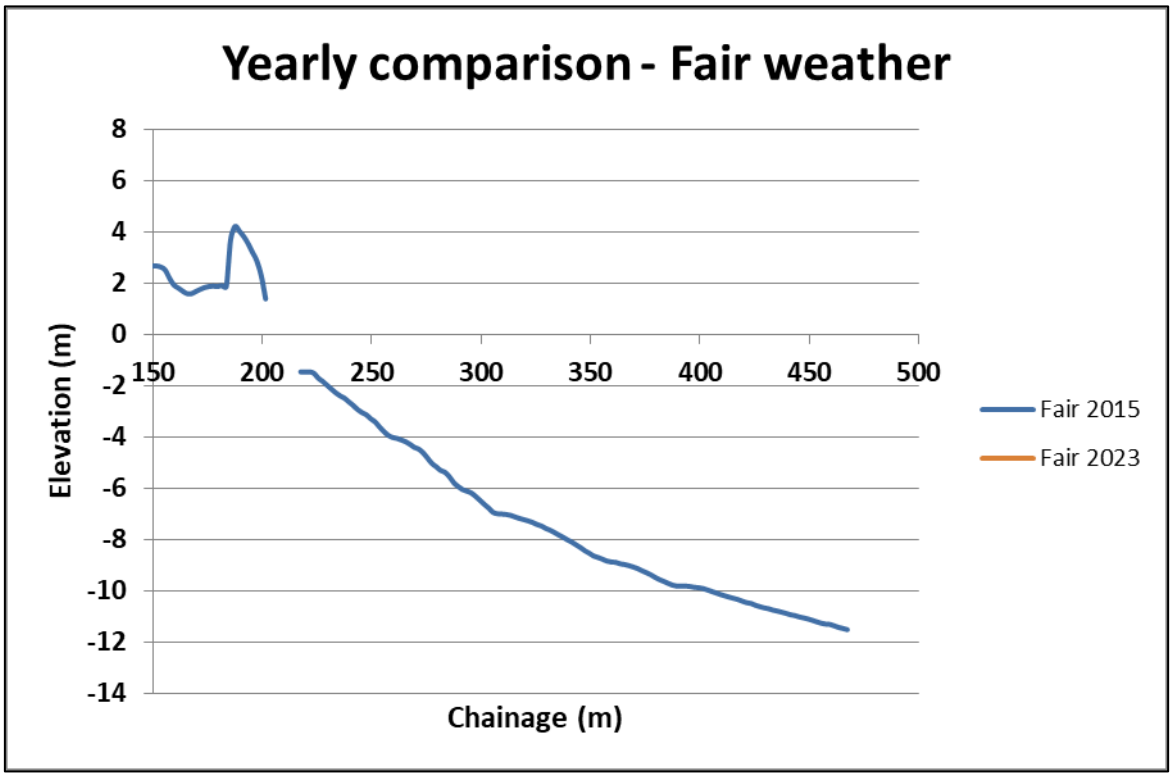


Figure 2-84 Profiles at Panathura (CS 49) – Yearly comparison – Fair weather

ASSYSTEM INDIA LIMITED extracted +2m (not extracted at the location where seawall is present), -3m, -4m, -6m, -8m and -10m contours from cross shore profile data at Panathura and below plots are time series of respective contours over two years(2015 and

2022). The plots represent the contour distances with respect to an arbitrary point which is constant for all profiles at a cross section and show the monthly variations of erosion (downward drift) and accretion (upward drift) in this stretch.

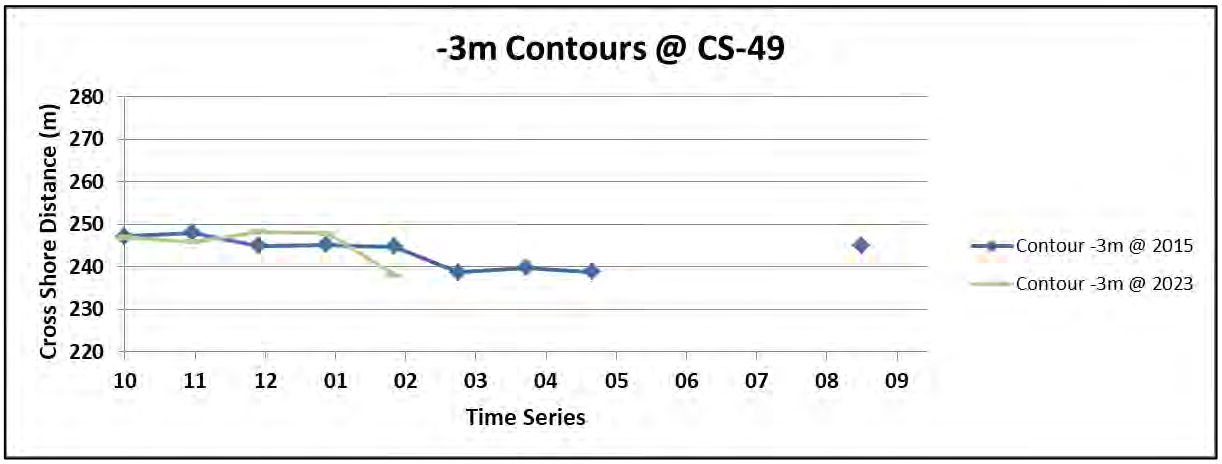


Figure 2-85 Time series of (–) 3 m contour at Panathura (CS 49)

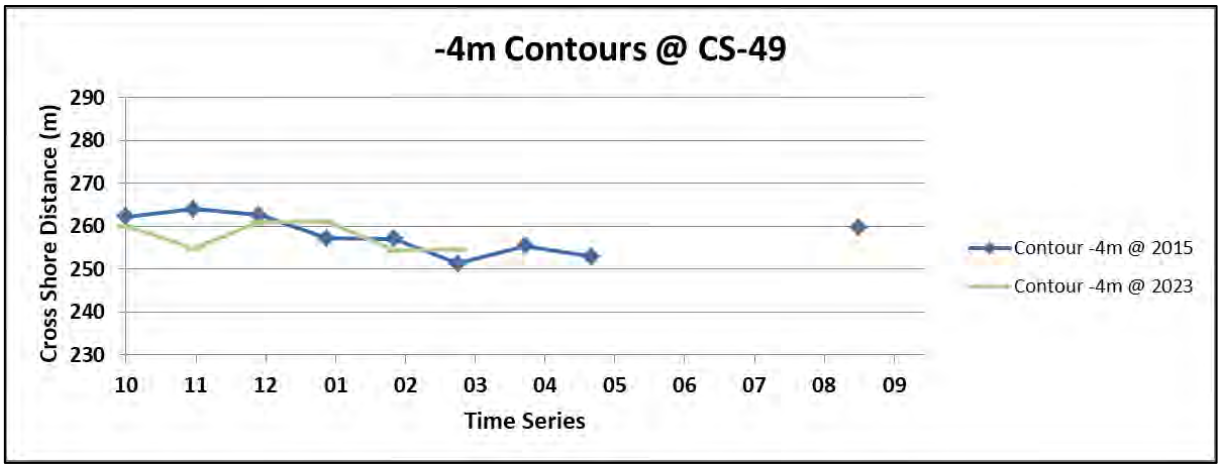


Figure 2-86 Time series of (–) 4 m contour at Panathura (CS 49)

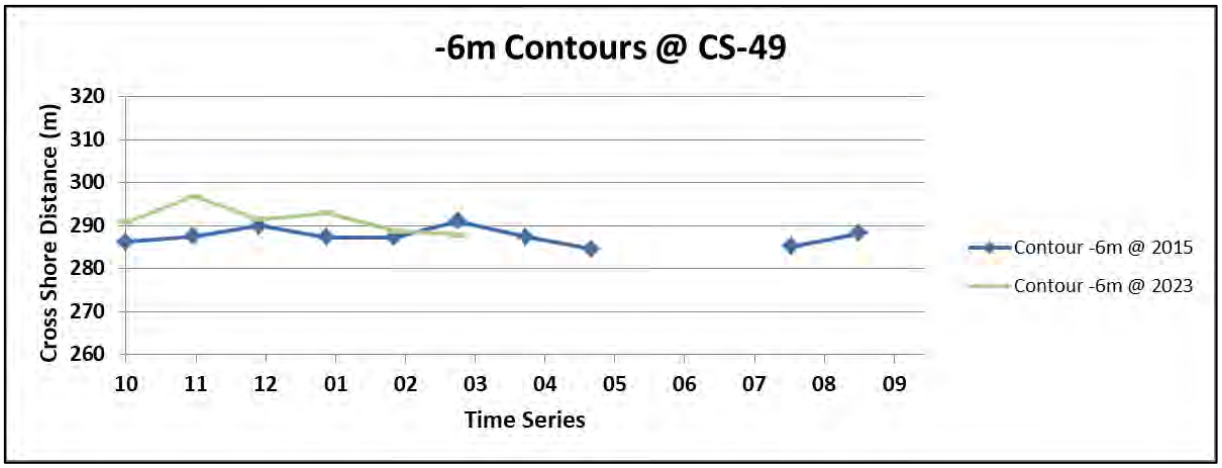


Figure 2-87 Time series of (–) 6 m contour at Panathura (CS 49)

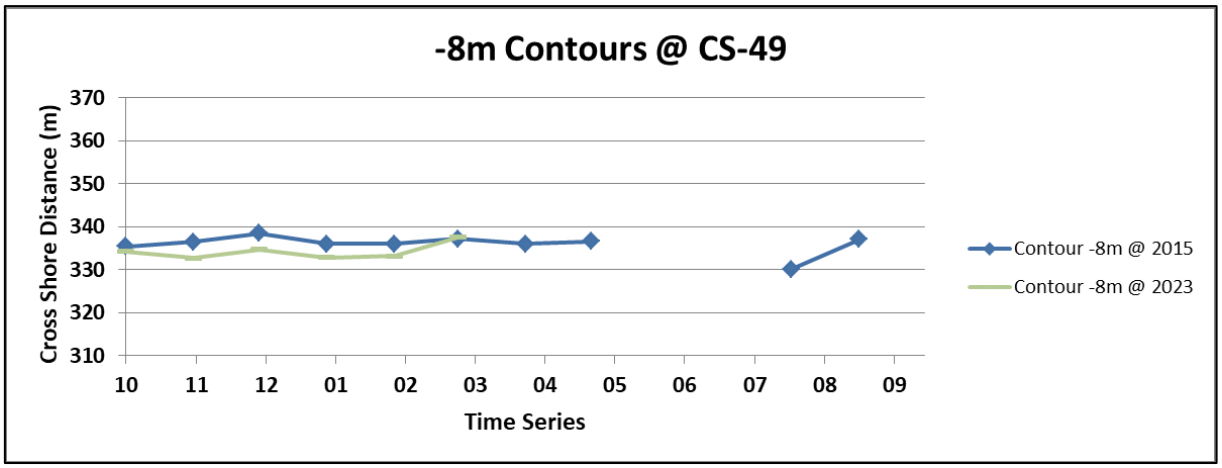


Figure 2-88 Time series of (–) 8 m contour at Panathura (CS 49).

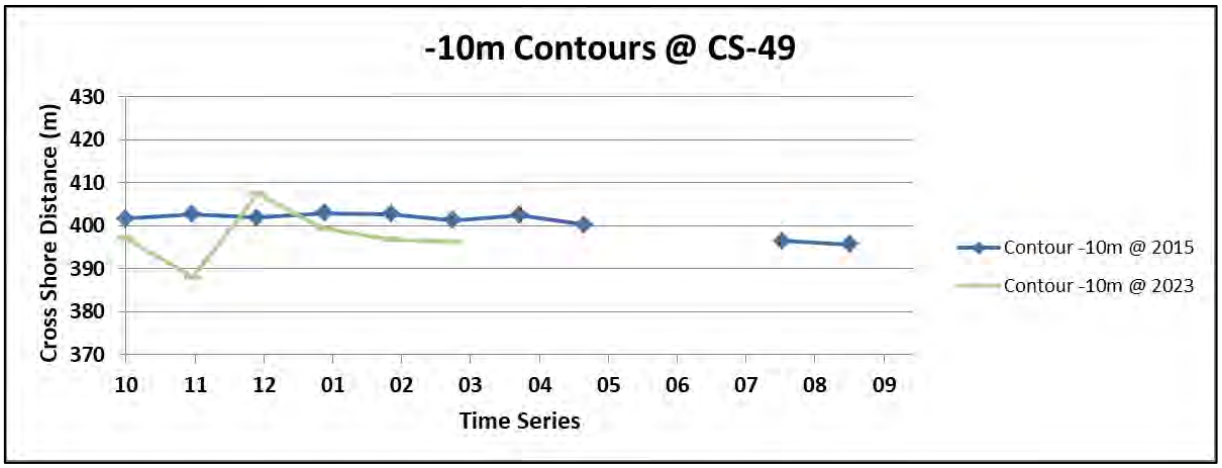


Figure 2-89 Time series of (–) 10 m contour at Panathura (CS 49)

In addition to above, the +2m (not extracted at the location where seawall is present), -3m, -4m, -6m, -8m and -10m contours continuous variation of contour distances over 7 years was provided for better clarity as shown in Figure 2-90.

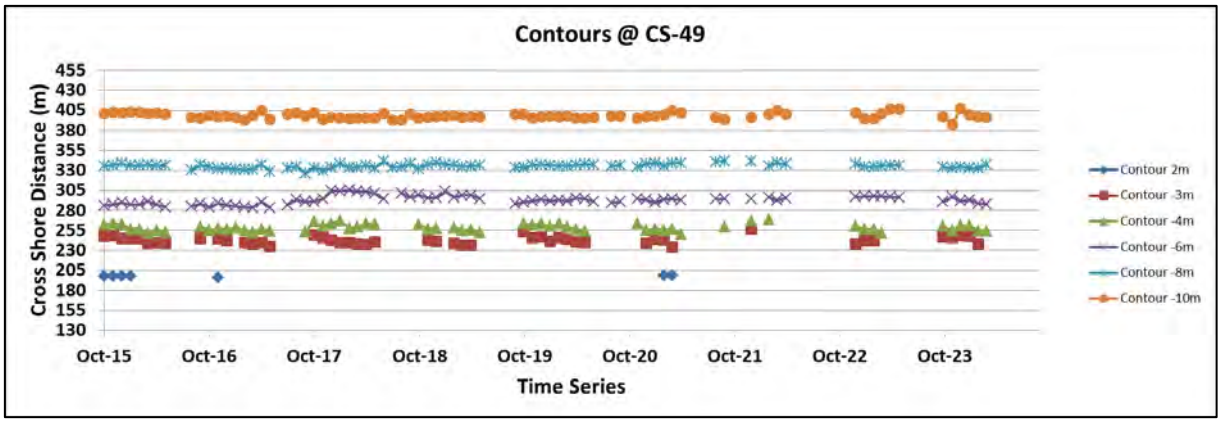


Figure 2-90 Continuous time series of contours at Panathura (CS 49)

2.6.2.5 Stretch 5

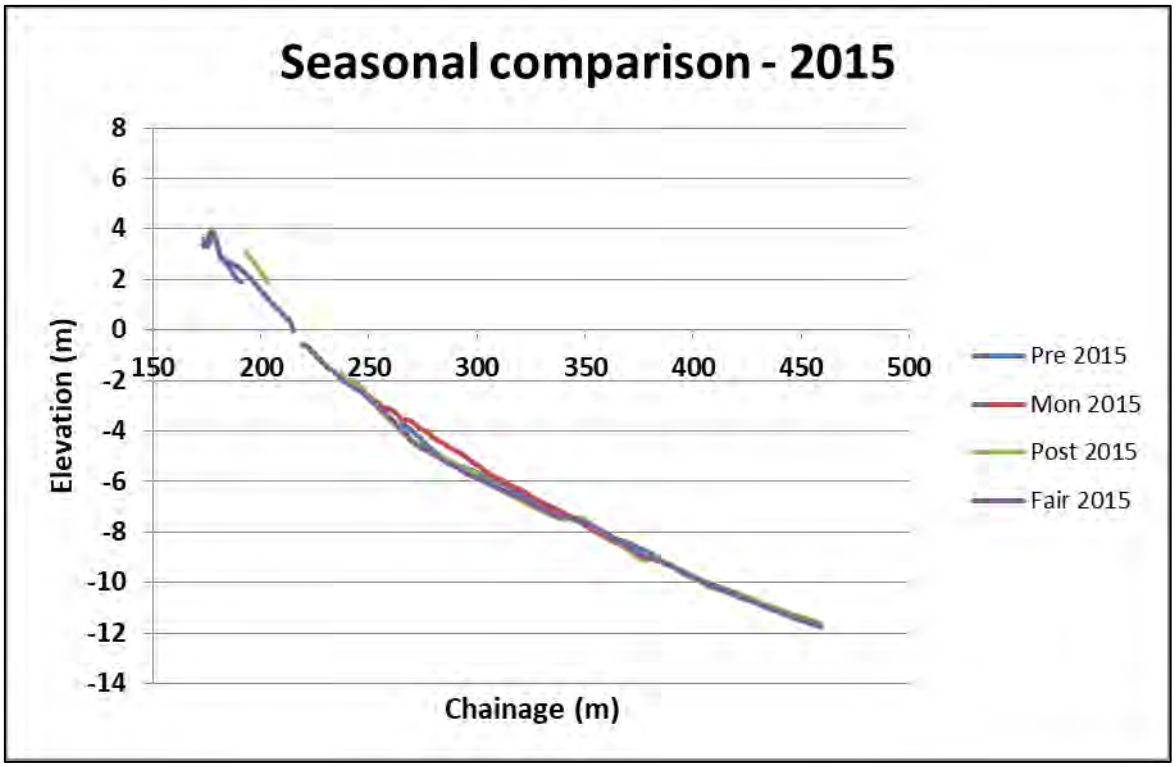


Figure 2-91 Profiles at Beemapally (CS 58) – Seasonal comparison (2015)

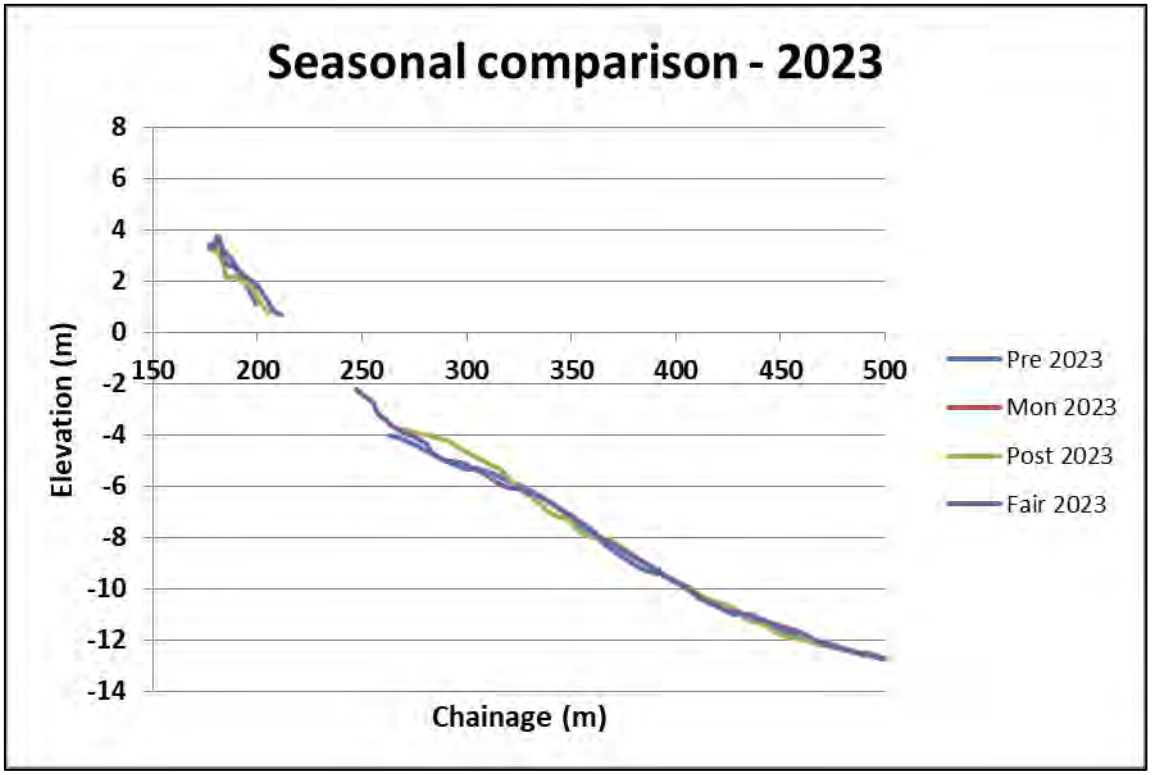


Figure 2-92 Profiles at Beemapally (CS 58) – Seasonal comparison (2023)

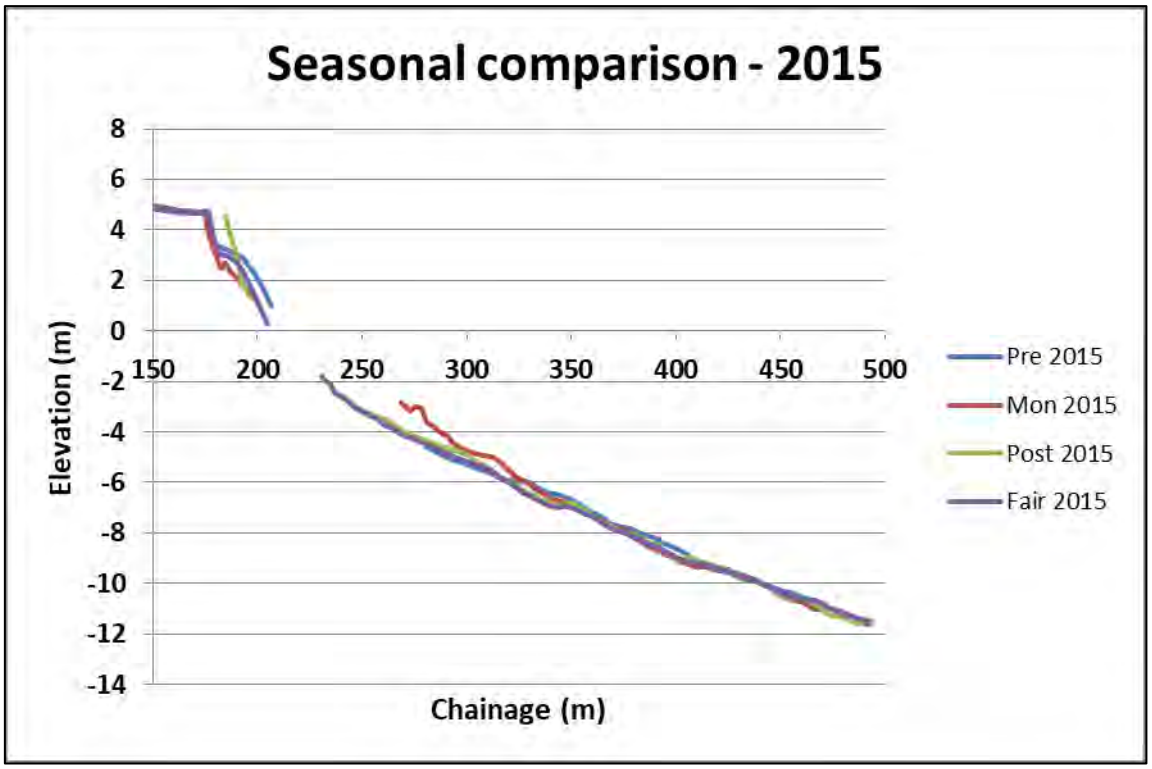


Figure 2-93 Profiles at Cheriyathura (CS 62) – Seasonal comparison (2015)

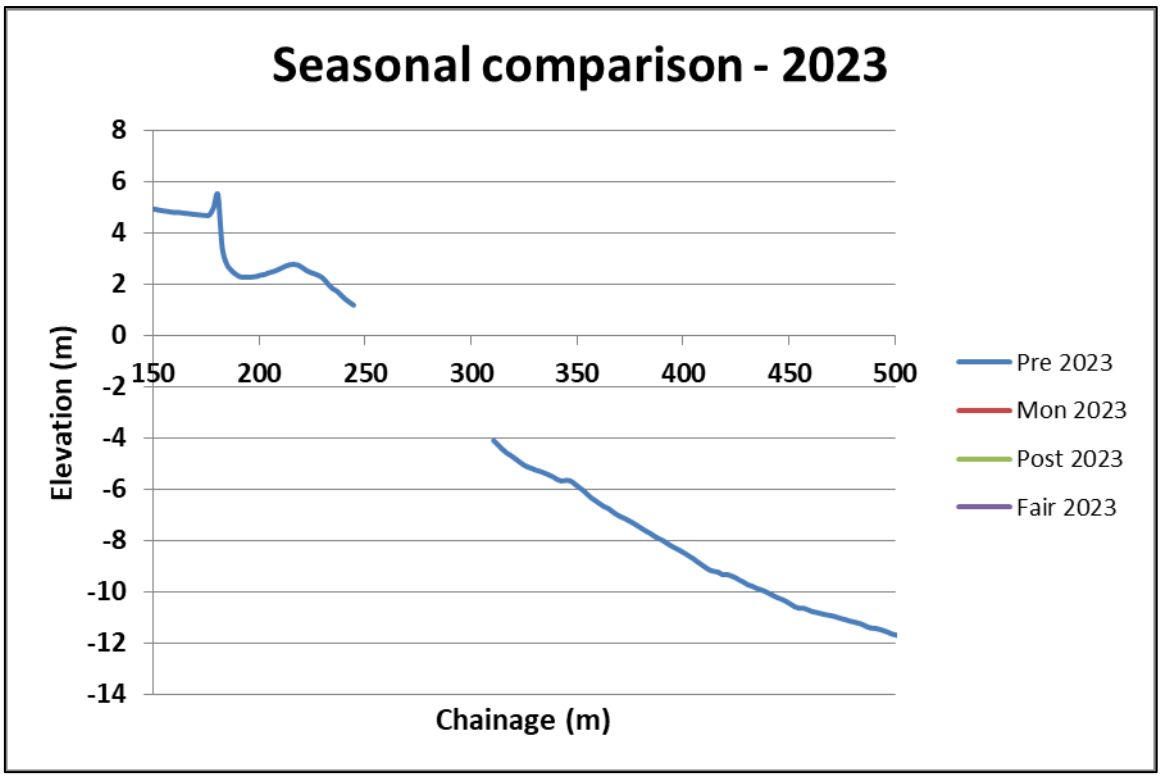


Figure 2-94 Profiles at Cheriyathura (CS 62) – Seasonal comparison (2023)

Seawall along with groynes are present in the stretch of CS 56 to CS 65 out of which CS 56 to CS 59 can be denoted as groyne field 1 (exists from start of survey period) and CS 60 to CS 63 can be denoted as groyne field 2 (since it was constructed after survey commence as shown in Figure 2-95). Among these sections, CS 58 and CS 62 which are at Beemapally and Cheriyathura locations in Thiruvananthapuram district of Kerala state were chosen to

illustrate the seasonal trends over seven years. From Figure 2-91 to Figure 2-94, it can be noticed that the coast experience seasonal variations over a year. The general phenomenon seems to be stable beach during pre-monsoon seasons, beach erosion and deposition in offshore region during monsoon seasons and gradual beach build up during post monsoon & fair weather seasons whereas in 2017 the coast experienced a very severe cyclonic storm (IMD Classification) named Ockhi (December 2017) during fair weather season and resulted in severe erosion all along the coast. After Ockhi the erosion was noticed during fair weather 2017 and pre monsoon 2018 seasons on land side. This has been compounded by the prevalence of the higher events related to storms and construction activities happened in this stretch.

(a) Before construction of groyne field 2 (Source: Google earth – 10/2016)

(b) After construction of groyne field 2 (Source: Google earth – 01/2019)

Figure 2-95 Groyne construction activities after commencement of survey

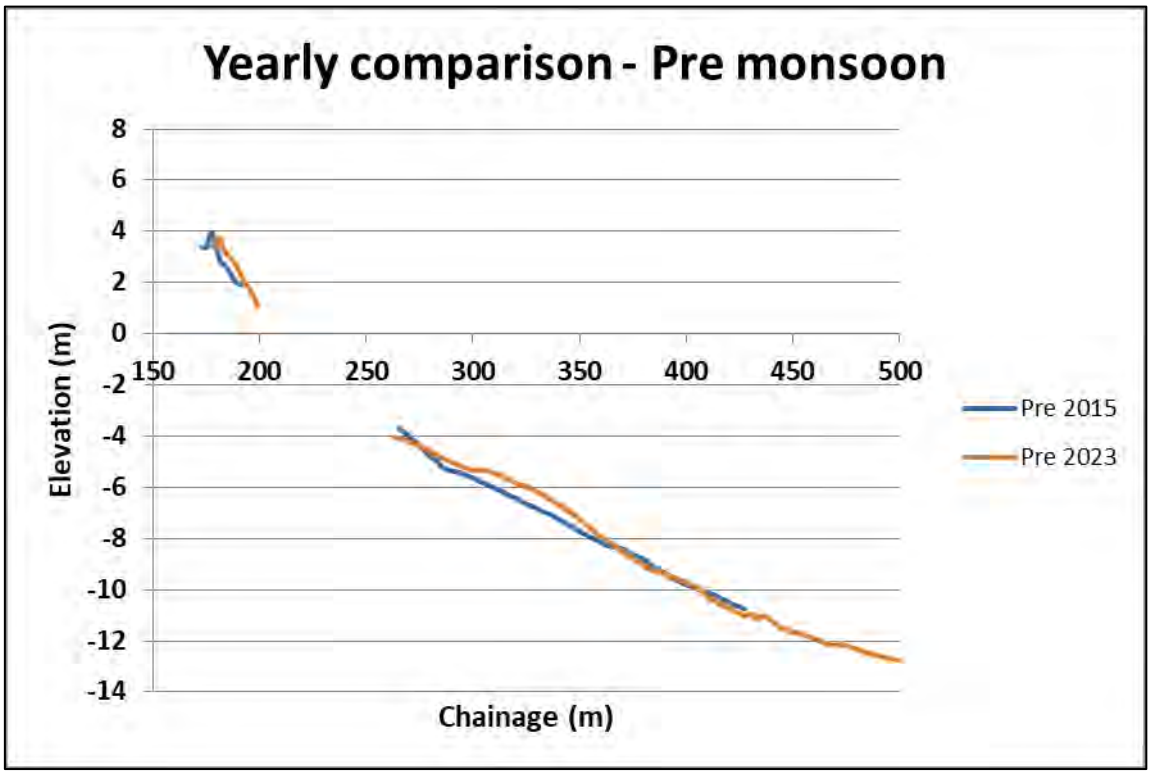


Figure 2-96 Profiles at Beemapally (CS 58) – Yearly comparison – Pre Monsoon

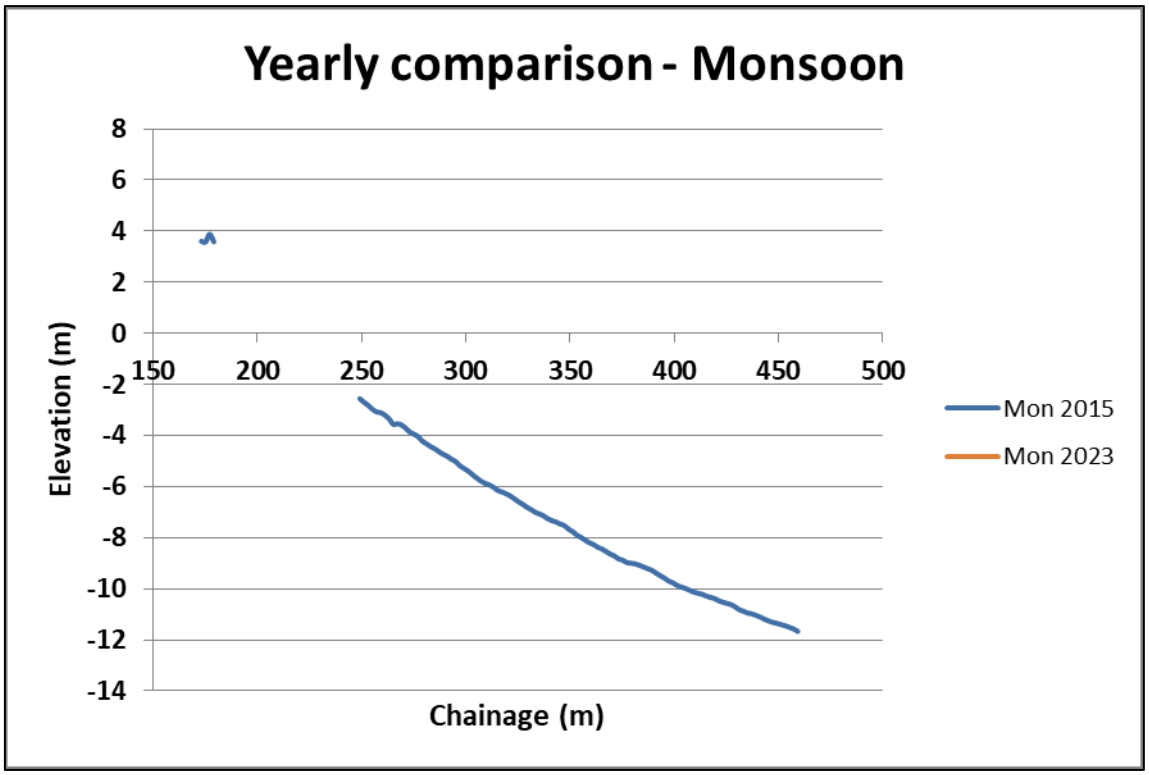


Figure 2-97 Profiles at Beemapally (CS 58) – Yearly comparison - Monsoon

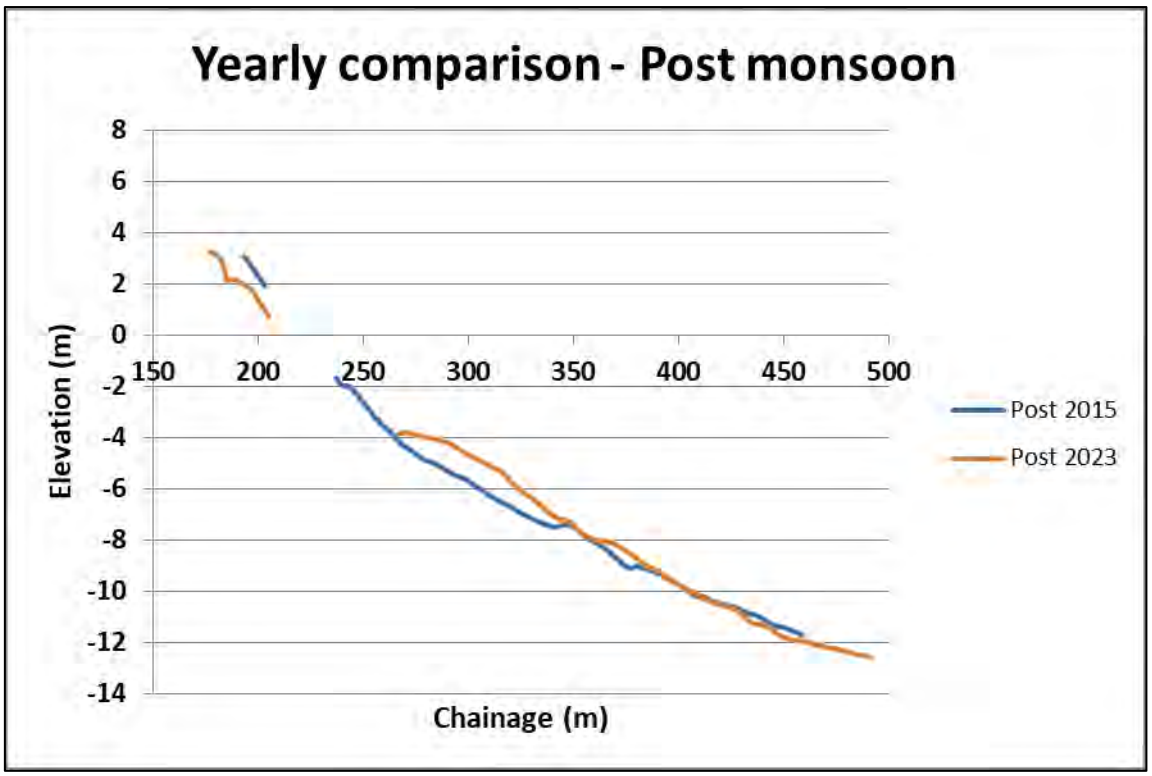


Figure 2-98 Profiles at Beemapally (CS 58) – Yearly comparison – Post Monsoon

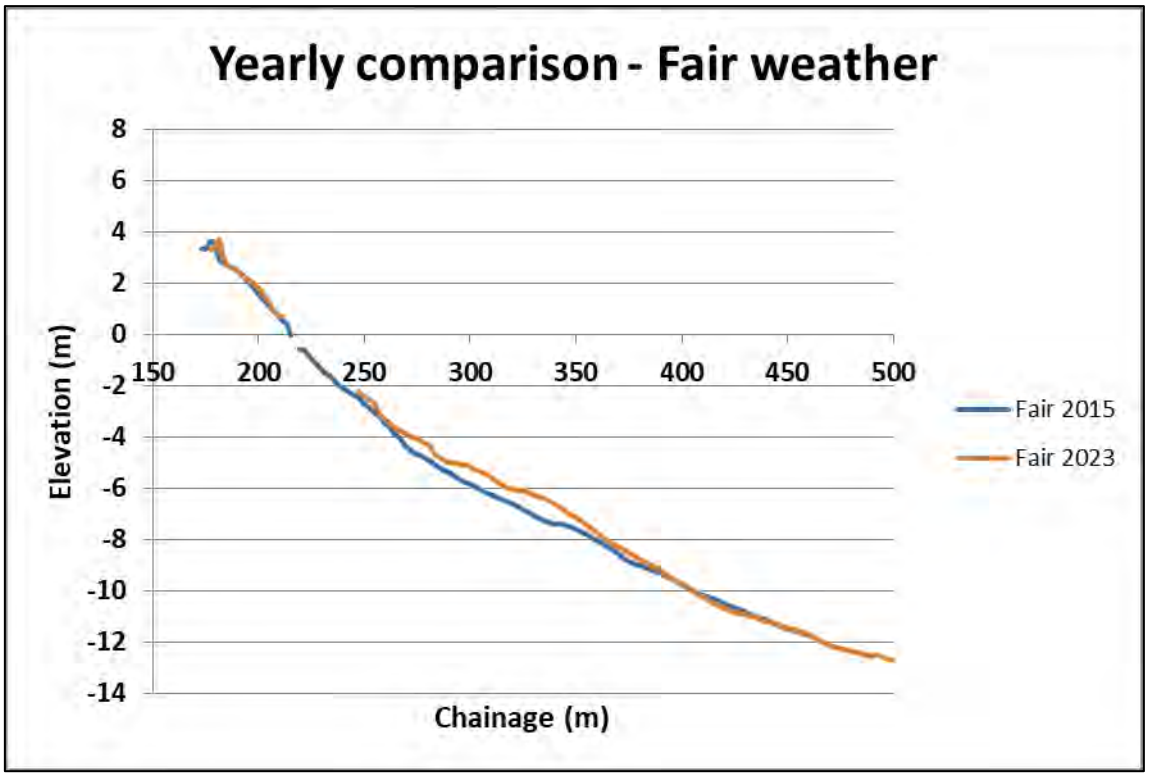


Figure 2-99 Profiles at Beemapally (CS 58) – Yearly comparison – Fair weather

Figure 2-96 to Figure 2-99 plots represent comparison of profiles of a particular season for two years (2015 and 2022).

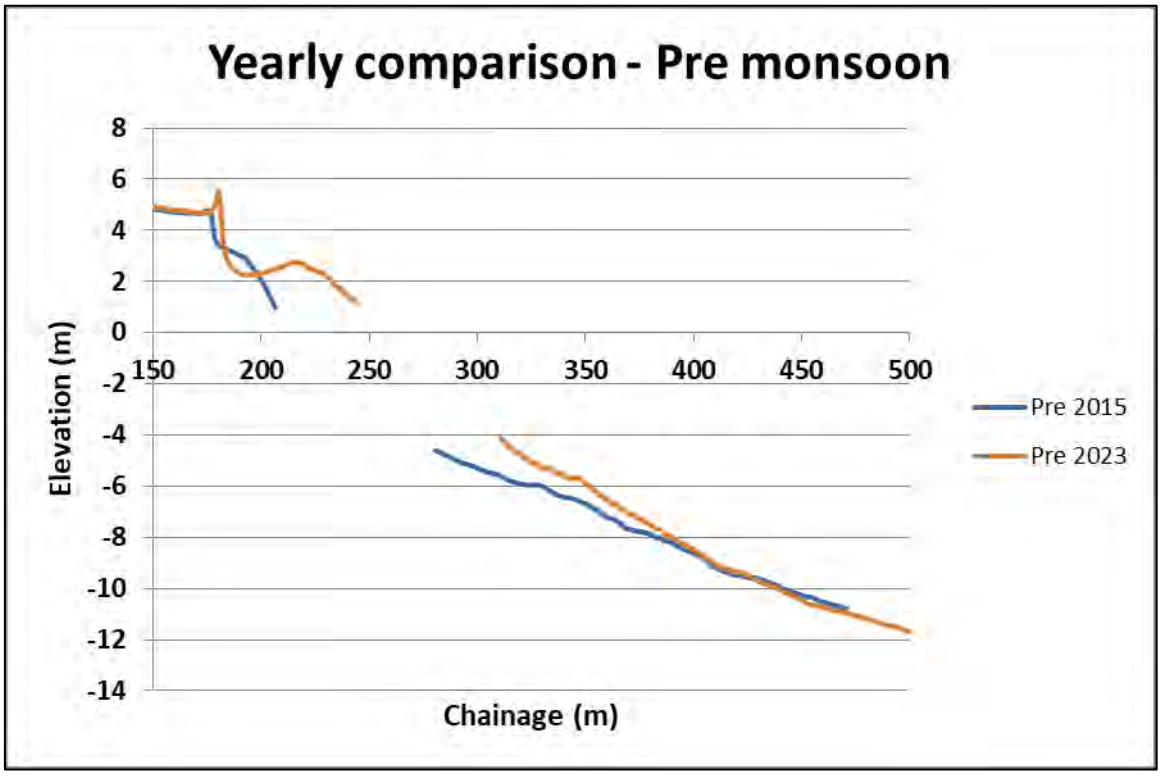


Figure 2-100 Profiles at Cheriyathura (CS 62) – Yearly comparison – Pre monsoon

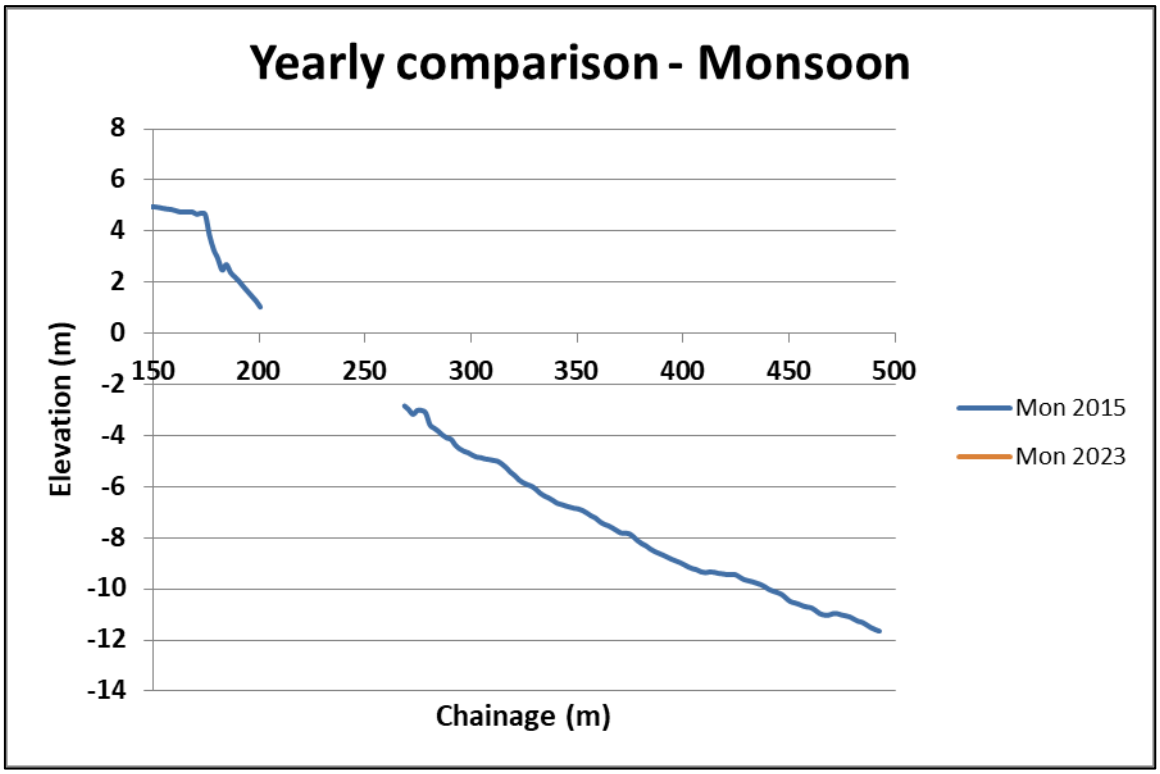


Figure 2-101 Profiles at Cheriyathura (CS 62) – Yearly comparison - Monsoon

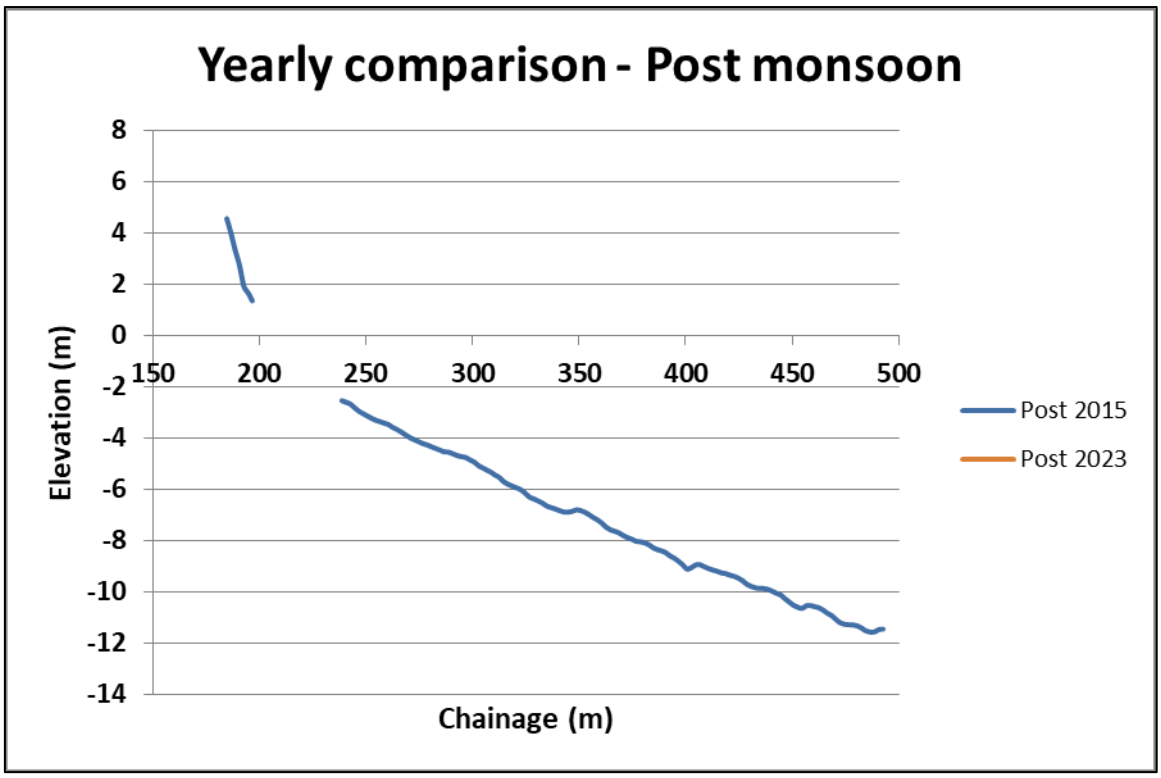


Figure 2-102 Profiles at Cheriyathura (CS 62) – Yearly comparison – Post monsoon

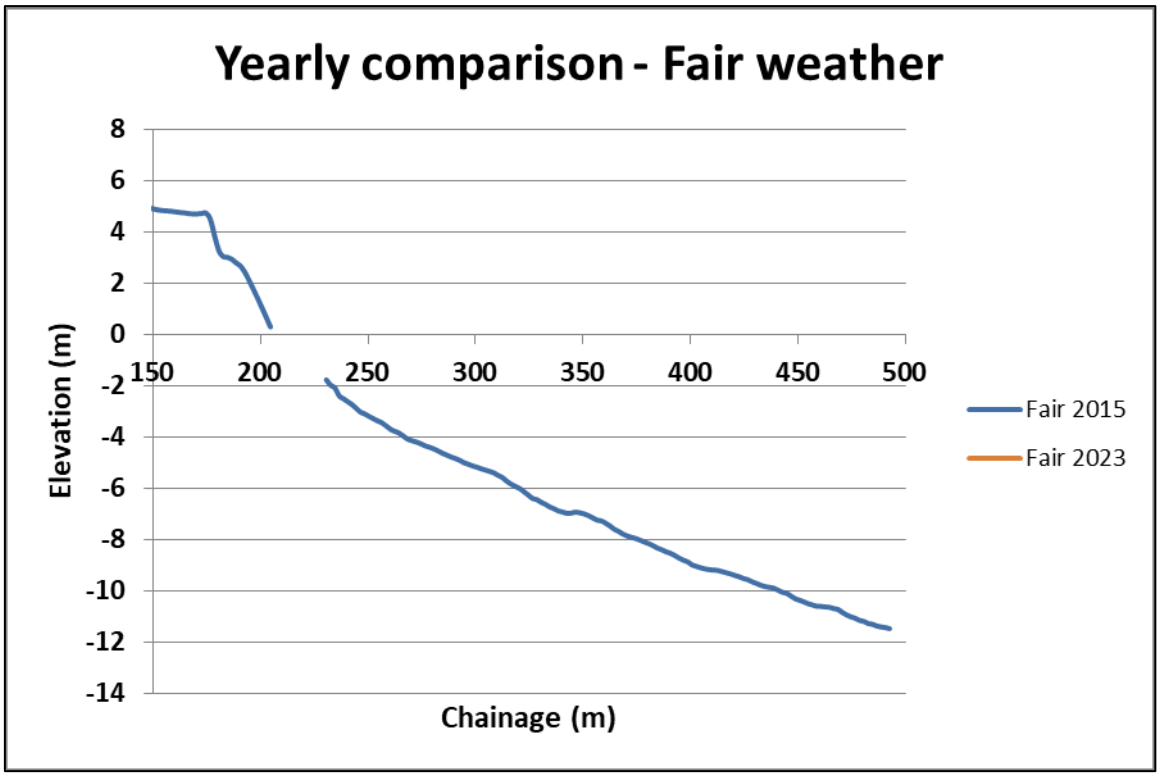
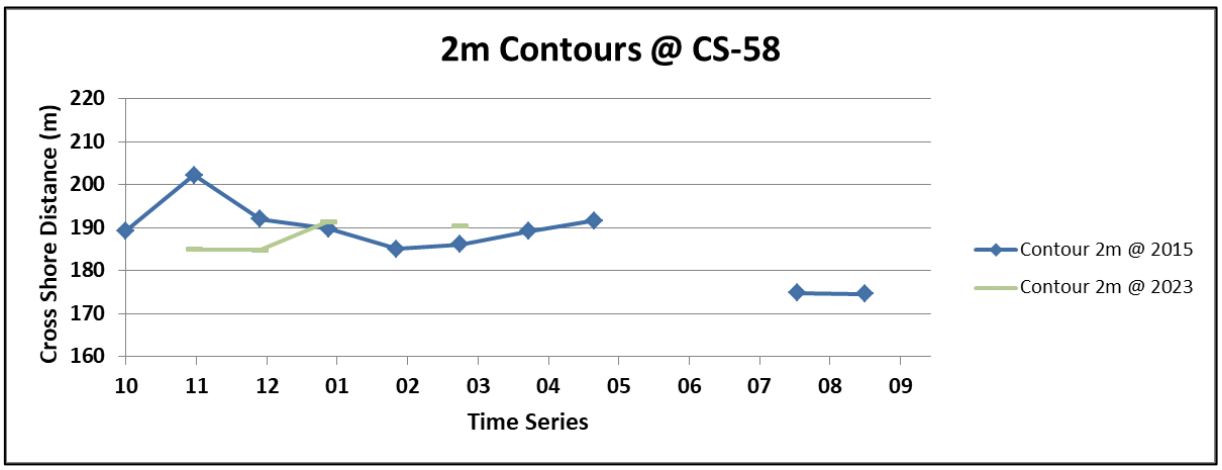


Figure 2-103 Profiles at Cheriyathura (CS 62) – Yearly comparison – Fair weather

Figure 2-100 to Figure 2-103 plots represent comparison of profiles over two years (2015 and 2022). In addition to Ockhi cyclone, some anthropogenic activities such as construction of groyne fields and seawalls by Government of Kerala took place in this stretch. Yearly comparison plots of past years have shown three distinguish set of profiles based on their behaviour after Ockhi and anthropogenic activities compared to initial set.

ASSYSTEM INDIA LIMITED extracted +2m, -3m, -4m, -6m, -8m and -10m contours from cross shore profile data at Beemapally and Cheriyathura locations. Below plots were time series of respective contours over two year data (2015 and 2022) with similar time scale. The plots represent the contour distances with respect to an arbitrary point which is constant for all profiles at a cross section.



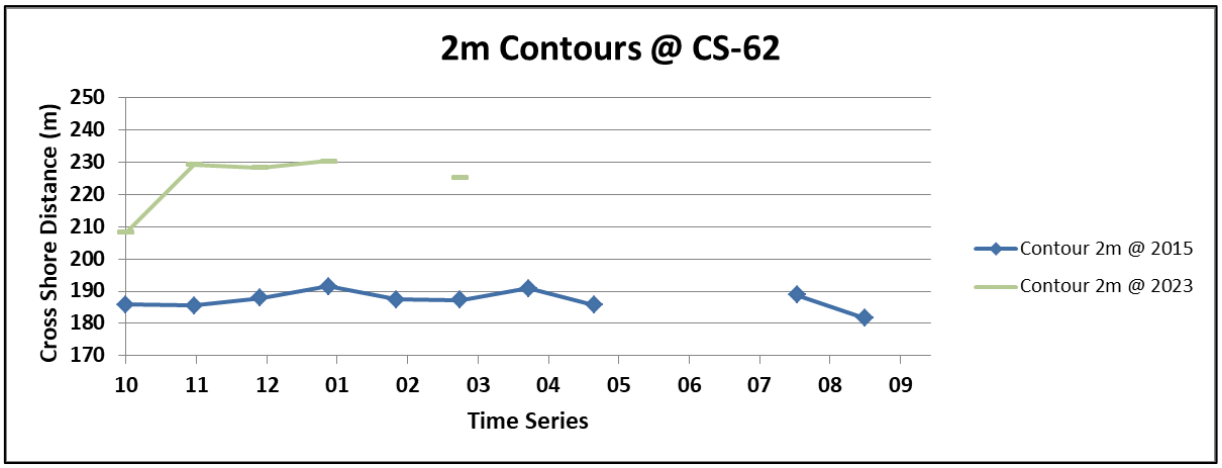
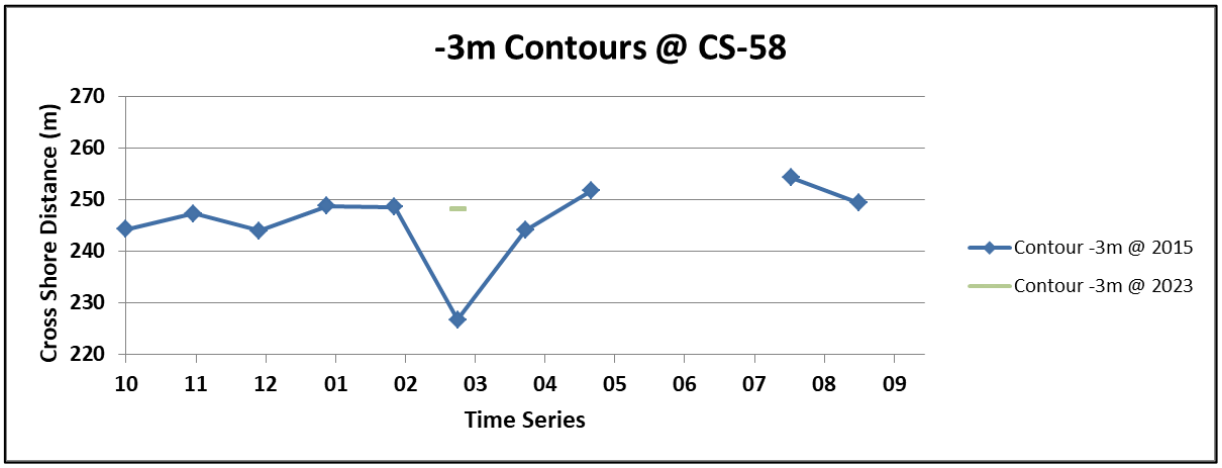


Figure 2-104 Time series of (+) 2 m contour at Beemapally and Cheriyathura (CS 58 & CS 62)



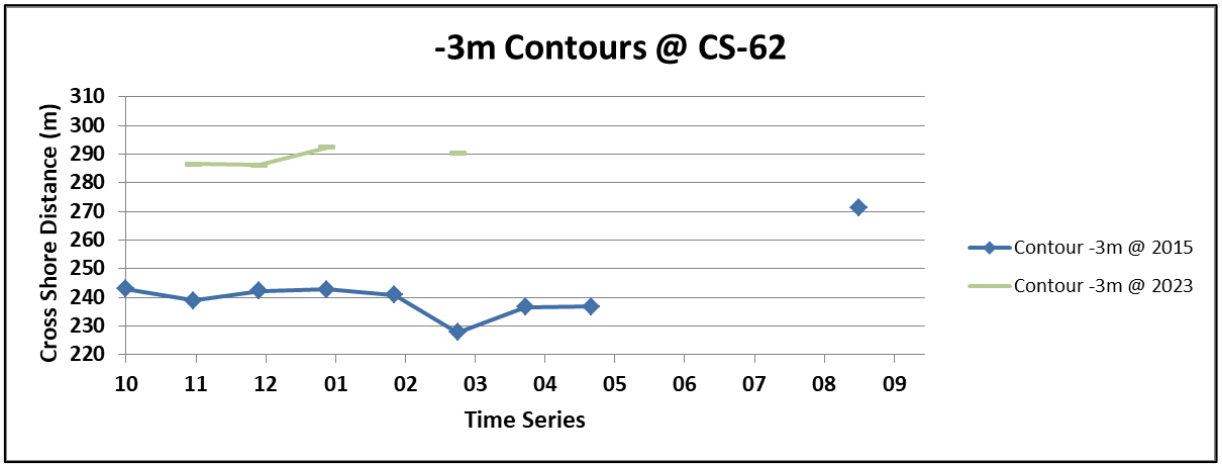


Figure 2-105 Time series of (–) 3 m contour at Beemapally and Cheriyathura (CS 58 & CS 62)

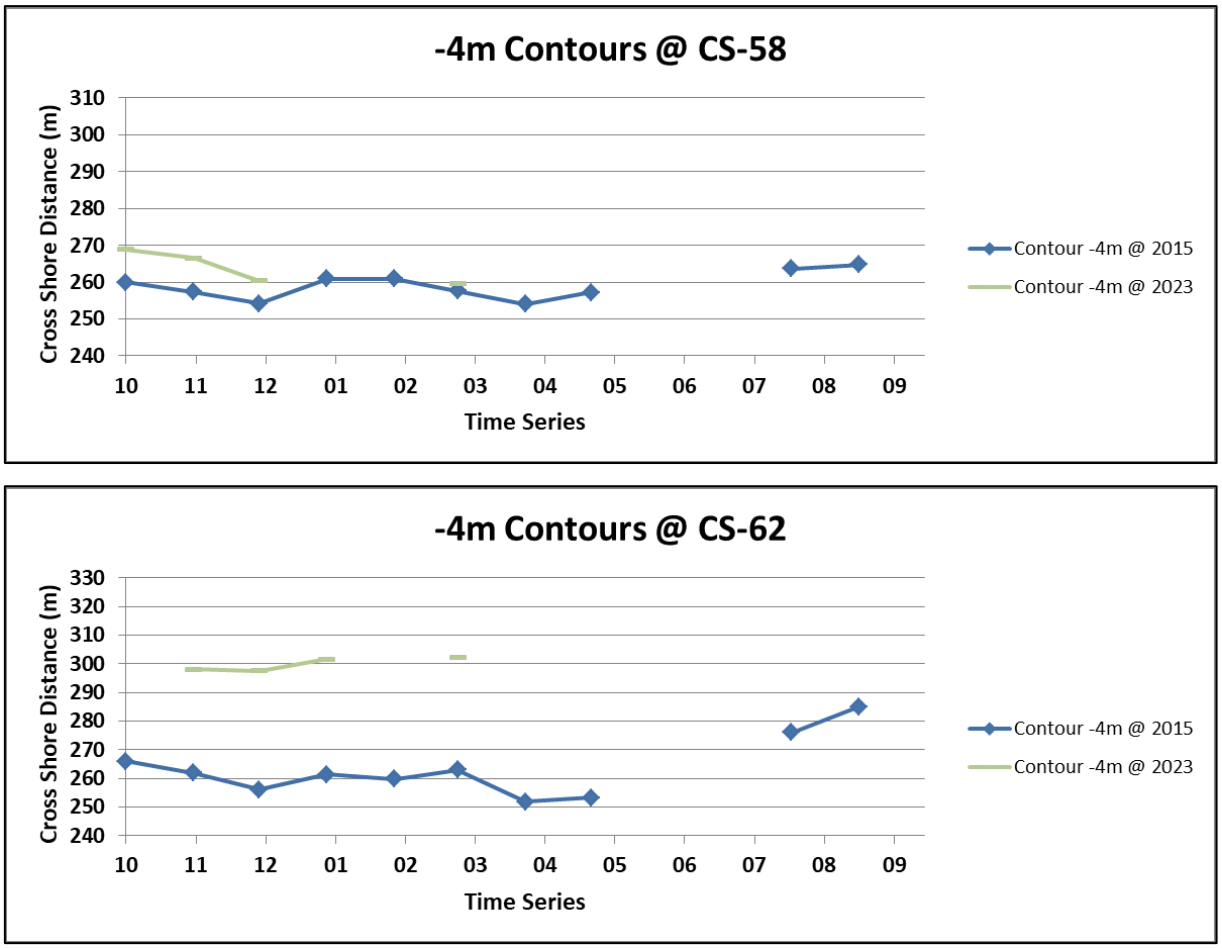


Figure 2-106 Time series of (–) 4 m contour at Beemapally and Cheriyathura (CS 58 & CS 62)

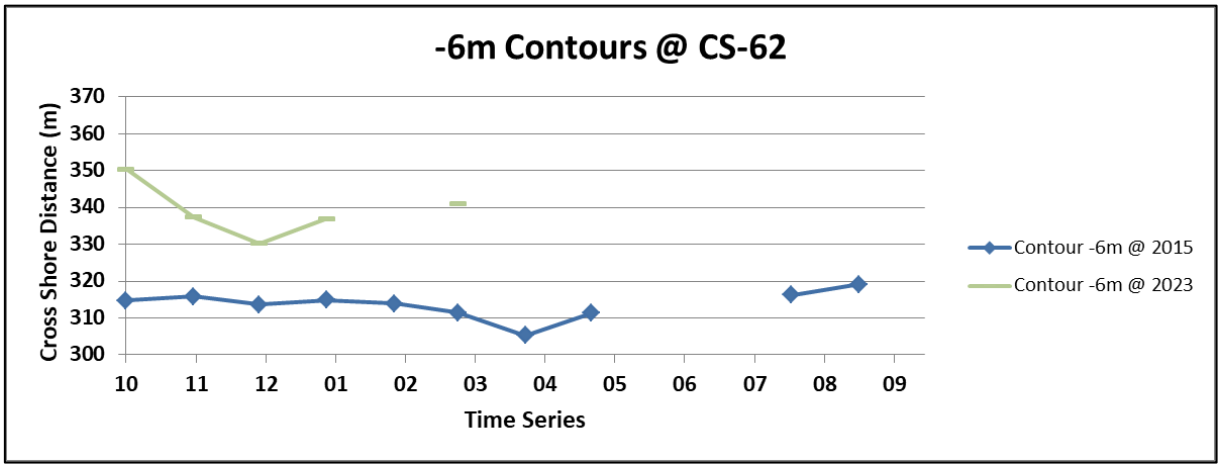


Figure 2-107 Time series of (–) 6 m contour at Beemapally and Cheriyathura (CS 58 & CS 62)

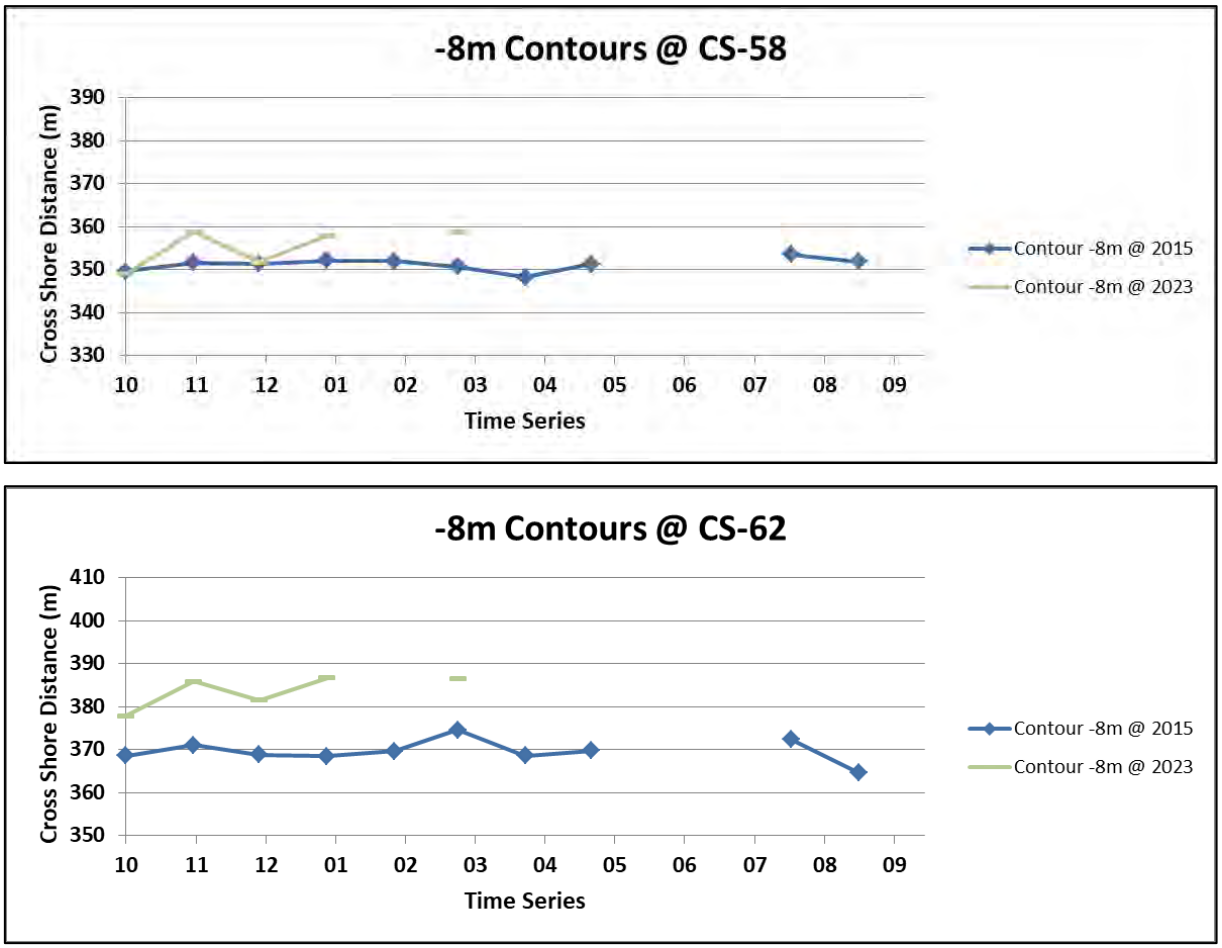
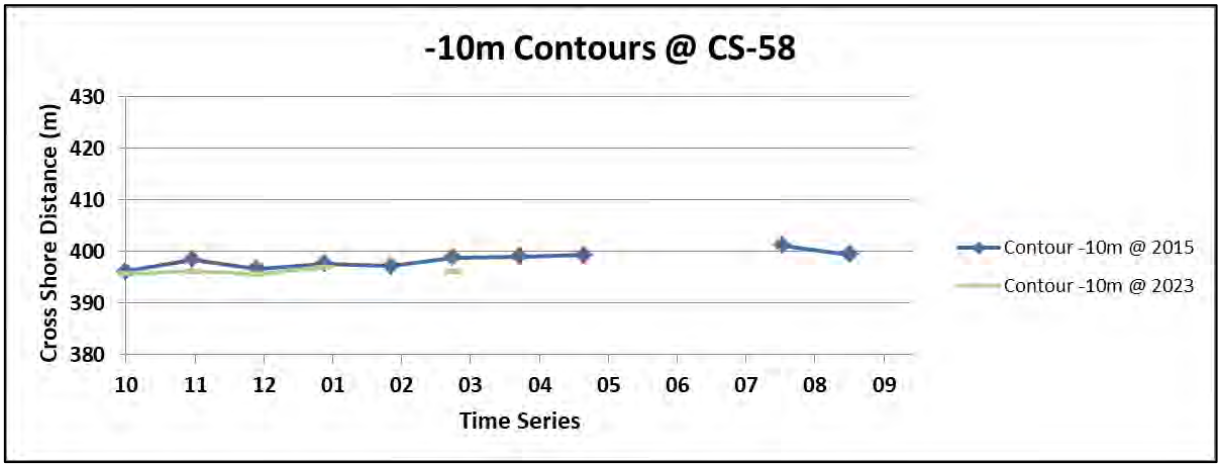


Figure 2-108 Time series of (–) 8 m contour at Beemapally and Cheriyathura (CS 58 & CS 62)



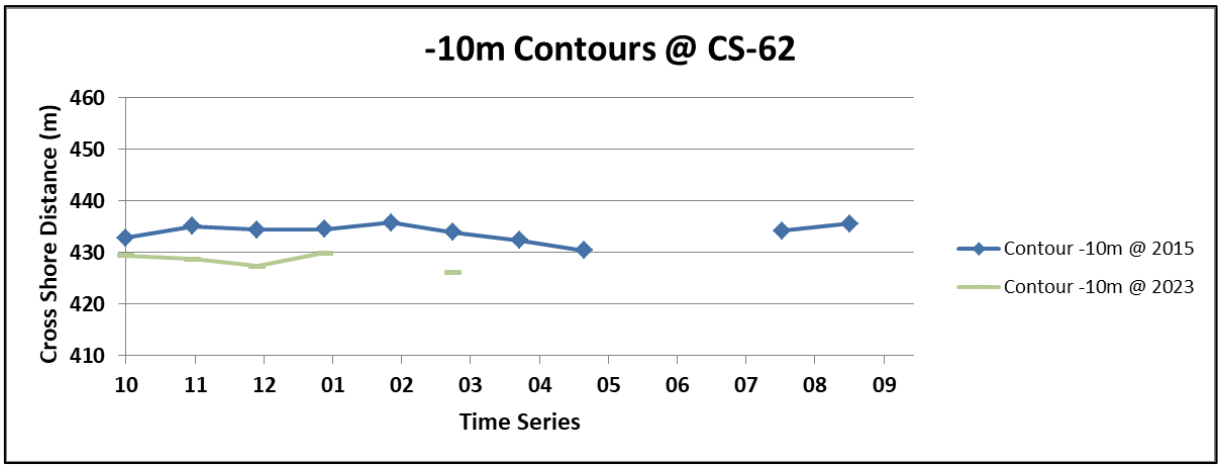


Figure 2-109 Time series of (–) 10 m contour at Beemapally and Cheriyathura (CS 58 & CS 62)

In addition to above, the +2m, -3m, -4m, -6m, -8m and -10m contours continuous variation of contour distances over 7 years was provided for better clarity as shown in Figure 2-110.

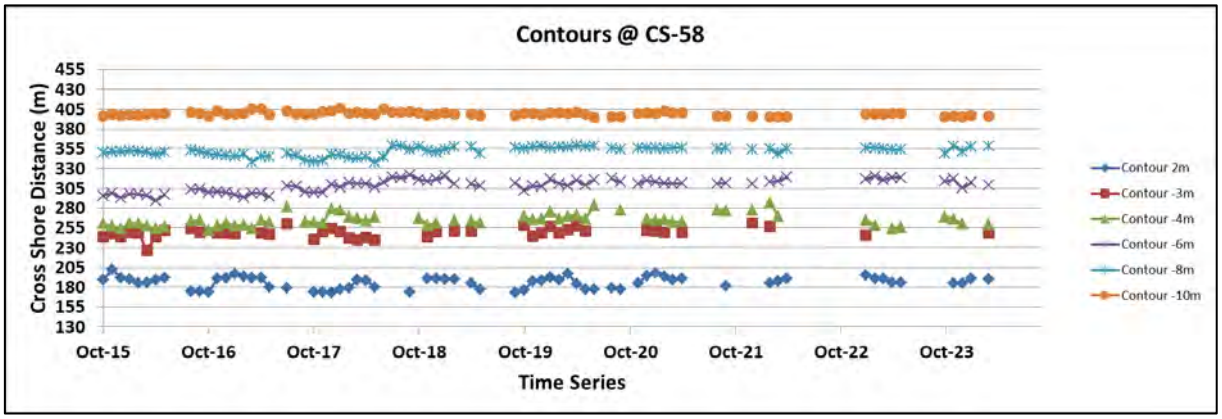


Figure 2-110 Continuous time series of contours at Beemapally and Cheriyathura (CS 58)

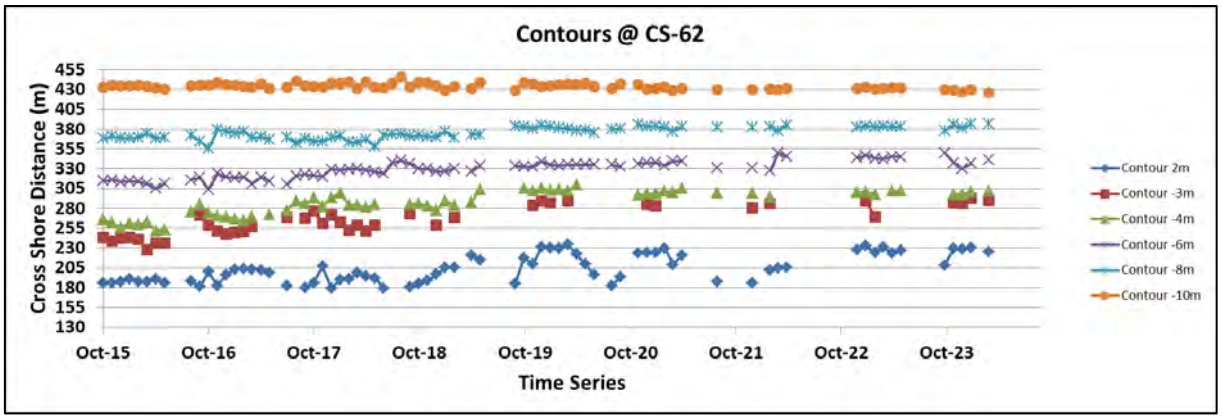


Figure 2-111 Continuous time series of contours at Beemapally and Cheriyathura (CS 62)

2.6.2.6 Stretch 6

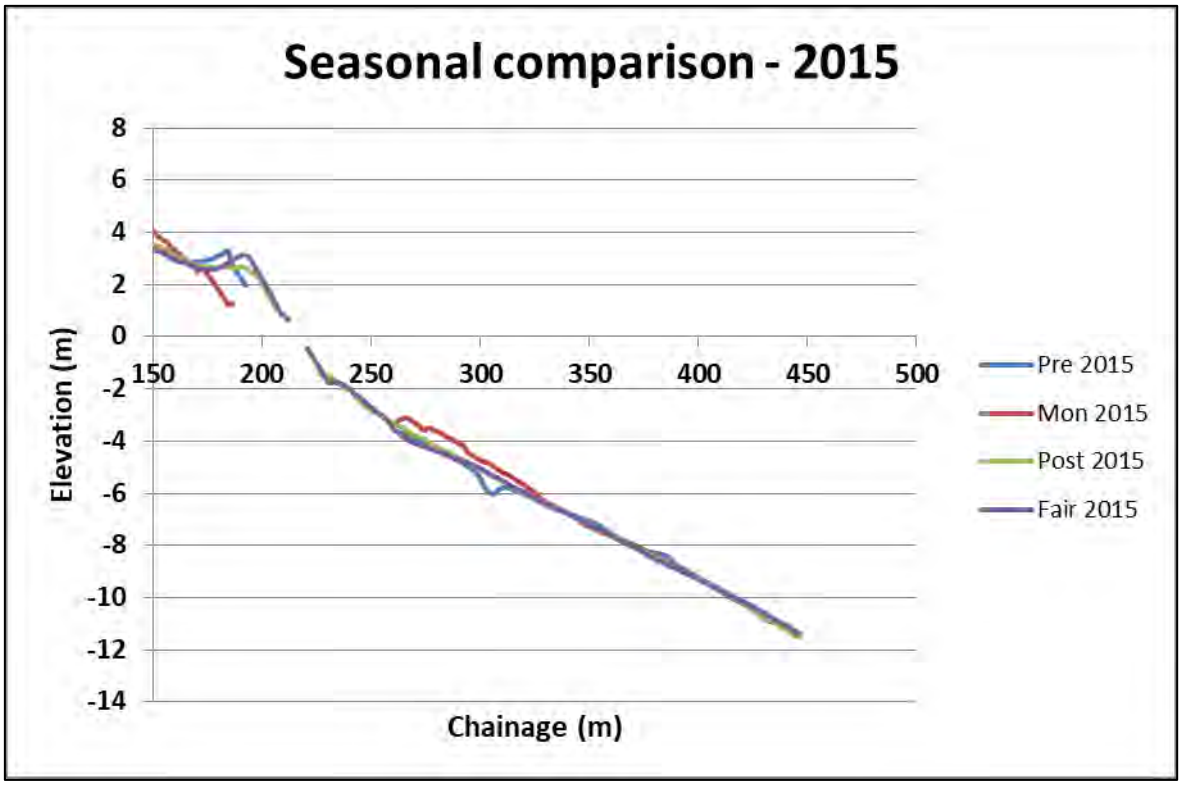


Figure 2-112 Profiles at Vettucaud (CS 74) – Seasonal comparison (2015)

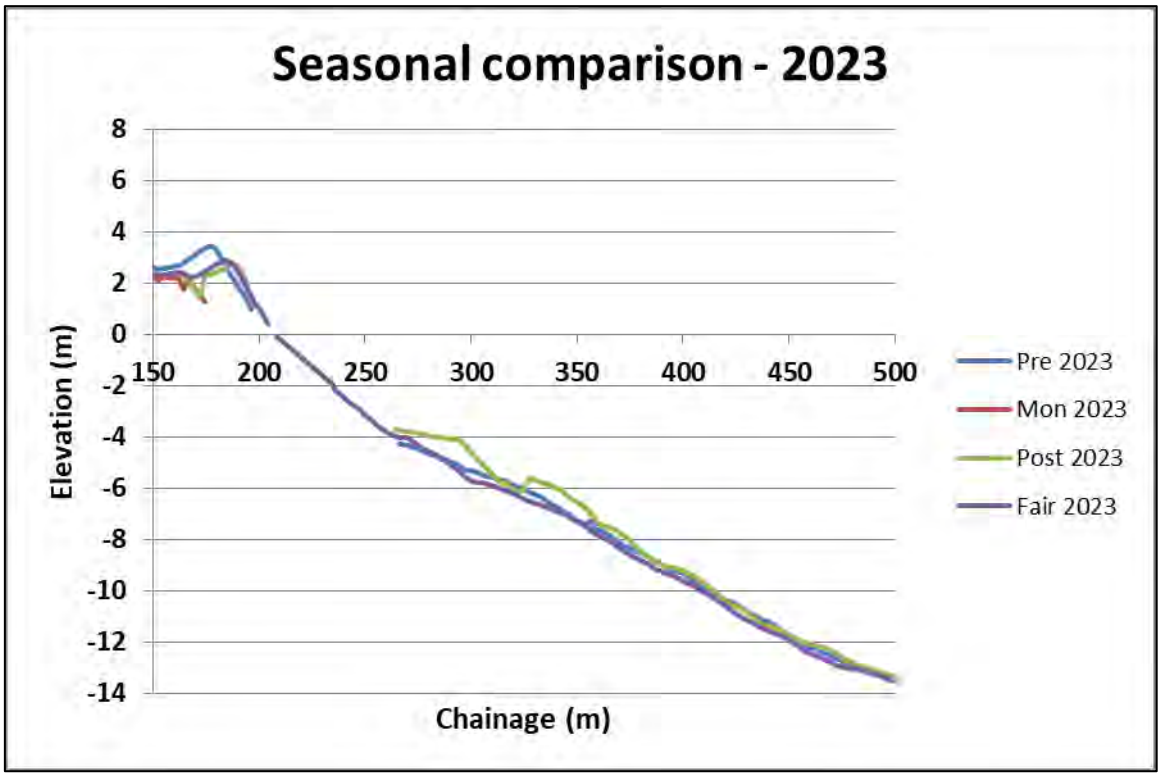


Figure 2-113 Profiles at Vettucaud (CS 74) – Seasonal comparison (2023)

Beach was present throughout the year in the stretch of CS 66 to CS 81. Among these sections, CS 74 which is at Vettucaud in Thiruvananthapuram district was chosen to illustrate the seasonal trends over the years. From Figure 2-112 and **Error! Reference source not found.**, it can be noticed that the coast experience seasonal variations over a year. The general phenomenon seems to be stable beach during pre-monsoon seasons, beach erosion and deposition in offshore region during monsoon seasons and gradual beach build up during post monsoon & fair weather seasons. It can be noticed that there was better beach build-up during fair weather 2022 when compared to pre monsoon 2022.

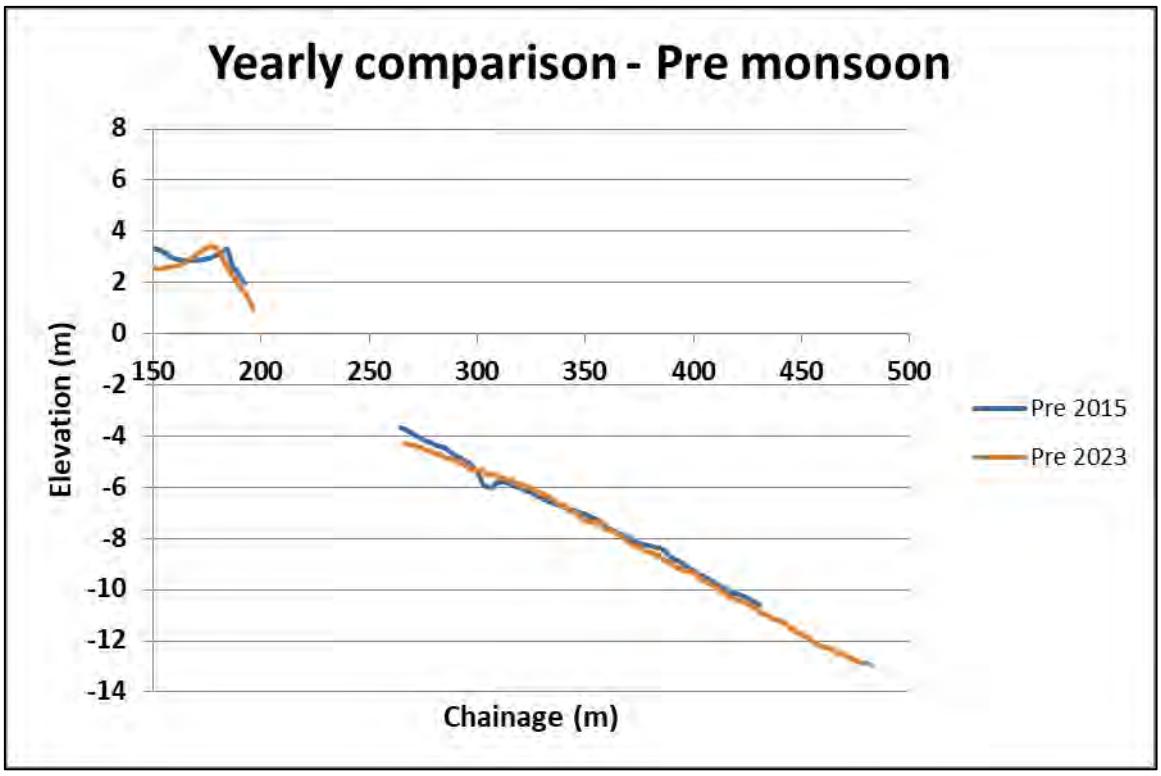


Figure 2-114 Profiles at Vettucaud (CS 74) – Yearly comparison – Pre monsoon

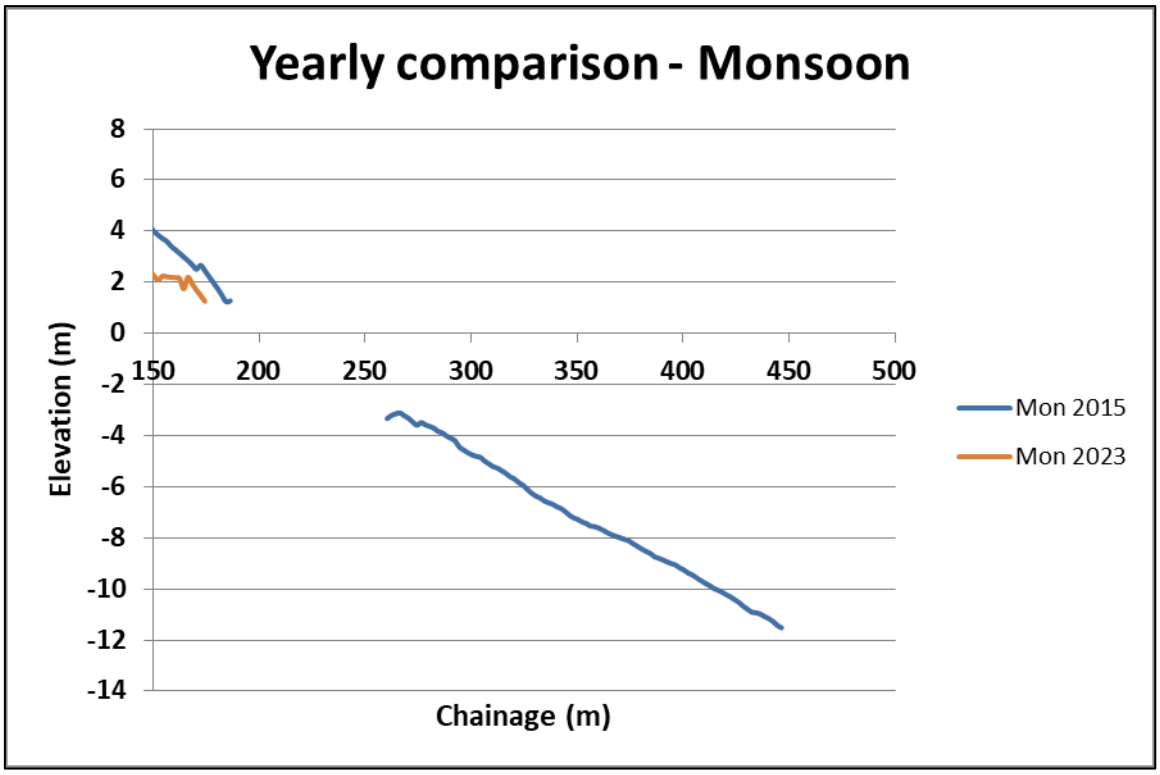


Figure 2-115 Profiles at Vettucaud (CS 74) – Yearly comparison - Monsoon

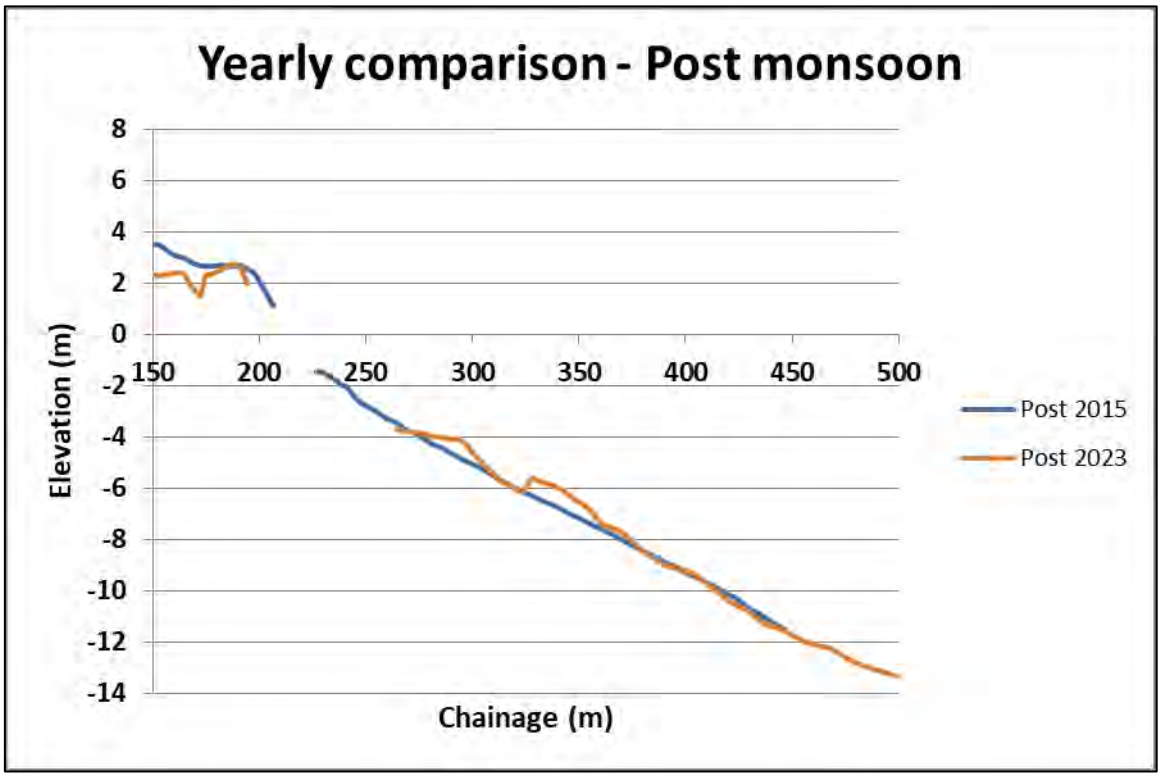


Figure 2-116 Profiles at Vettucaud (CS 74) – Yearly comparison – Post Monsoon

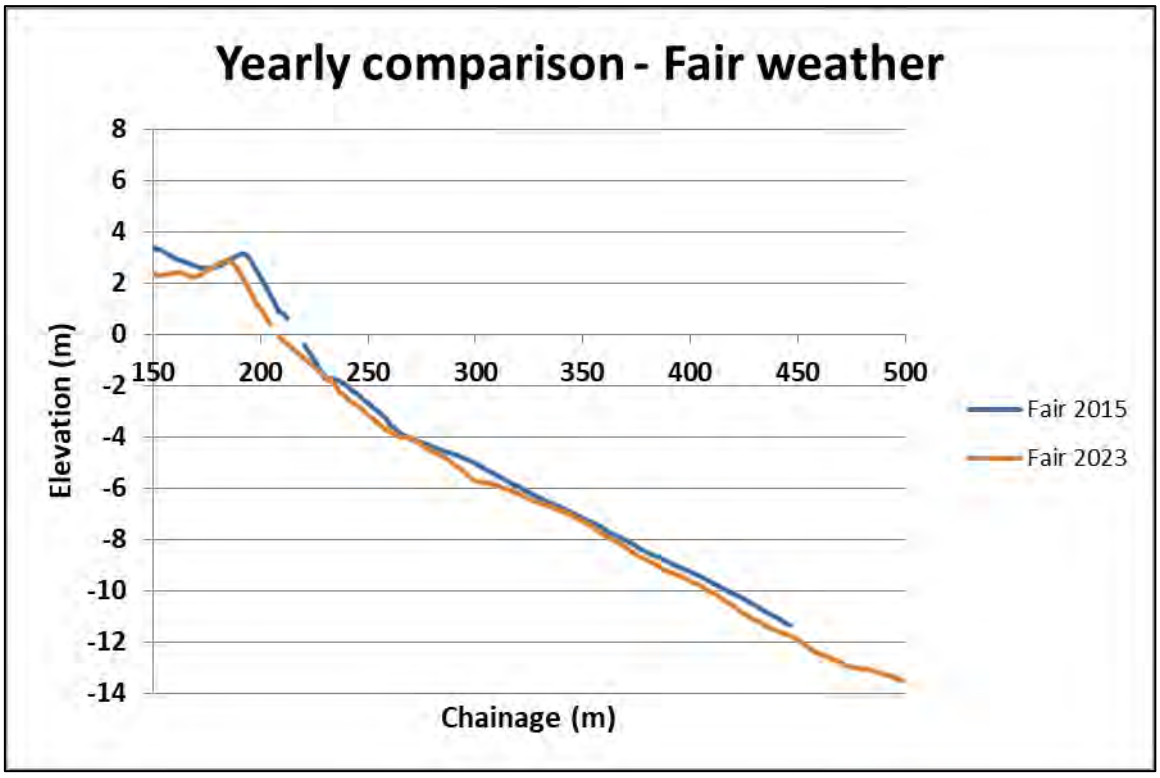


Figure 2-117 Profiles at Vettucaud (CS 74) – Yearly comparison – Fair weather

Figure 2-114 to Figure 2-117 plots represent comparison of profiles of season for two years (2015 and 2022). These plots suggest that the coast is undergoing processes to recover from the Ockhi impact which can be observed from fair weather seasons comparison plot.

ASSYSTEM INDIA LIMITED extracted +2m, -3m, -4m, -6m, -8m and -10m contours from cross shore profile data at Vettucaud and below plots were time series of respective contours for two years (2015 and 2022) data with similar time scale. The plots represent the contour distances with respect to an arbitrary point which is constant for all profiles at a cross section.

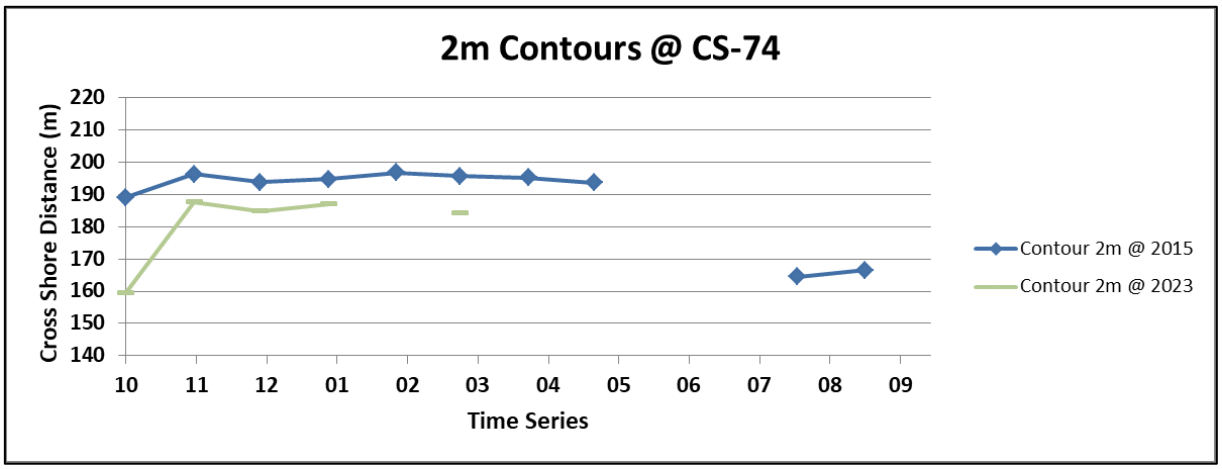


Figure 2-118 Time series of (+) 2 m contour at Vettucaud (CS 74)

Figure 2-118 represents time series of (+) 2 m contour over seven years at Vettucaud with similar time scale. From this plot it can be noticed that the beach experience seasonal variation of erosion during monsoon season and accretion during other seasons. During Ockhi the beach was exposed to severe erosion and minimal accretion was noticed during

fair weather 2017 and pre-monsoon 2018 during which beach was supposed to build up. In addition, because of monsoon 2018 and 2019 the beach further eroded than previous monsoon seasons.

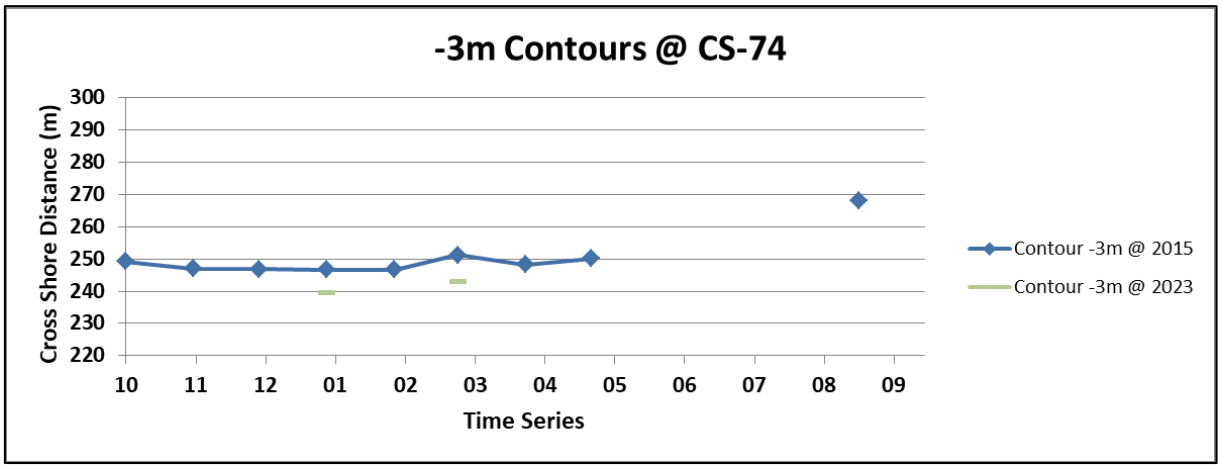


Figure 2-119 Time series of (–) 3 m contour at Vettucaud (CS 74)

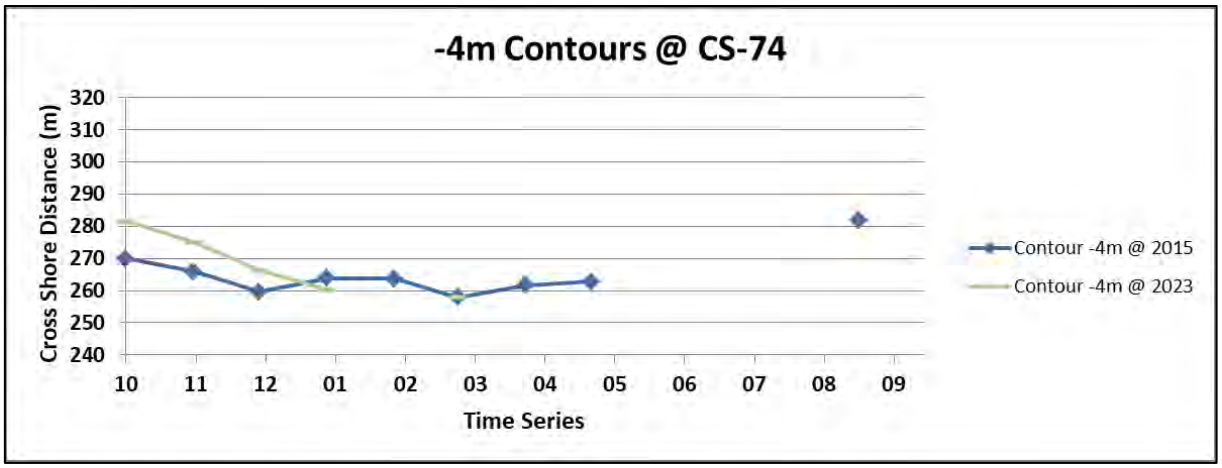


Figure 2-120 Time series of (–) 4 m contour at Vettucaud (CS 74)

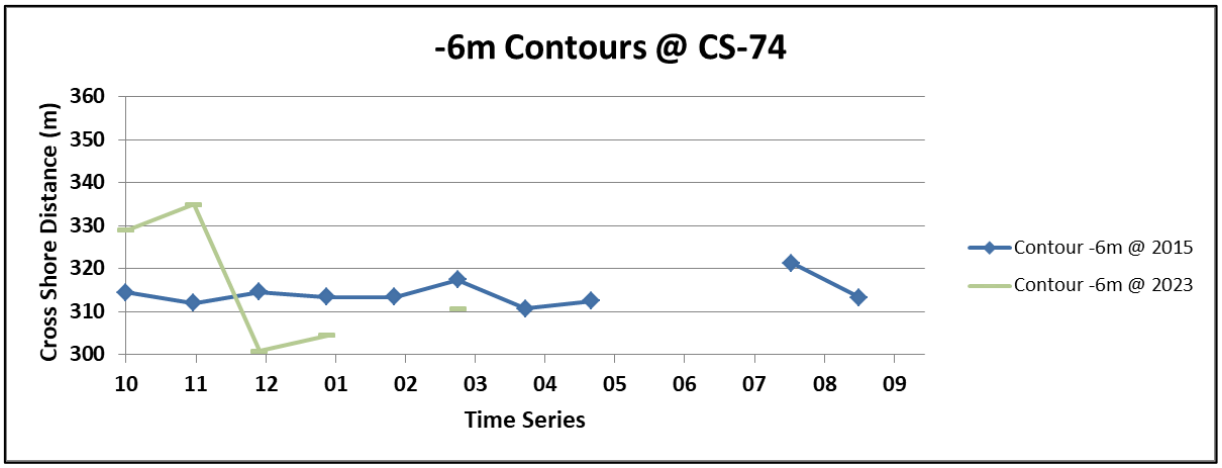


Figure 2-121 Time series of (–) 6 m contour at Vettucaud (CS 74)

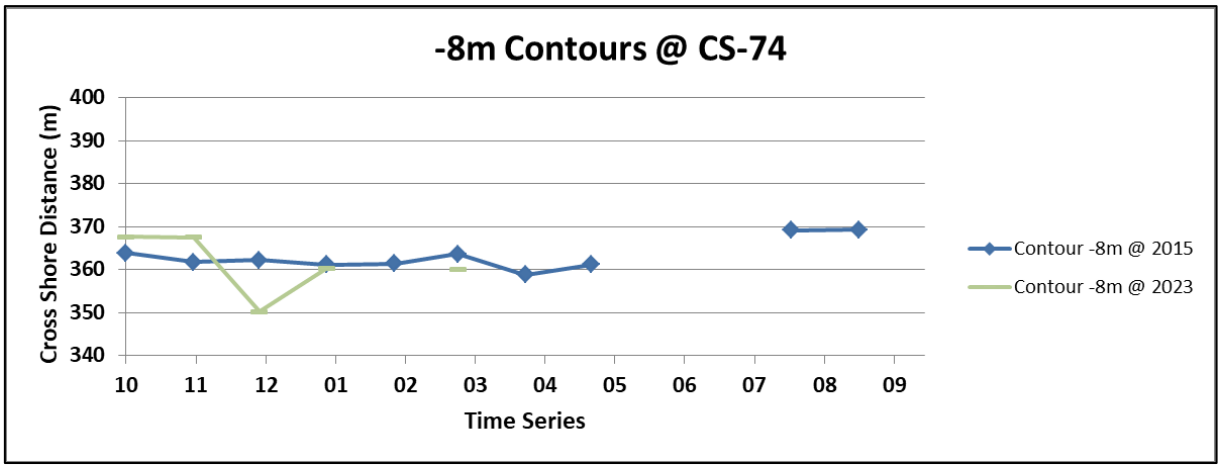


Figure 2-122 Time series of (–) 8 m contour at Vettucaud (CS 74)

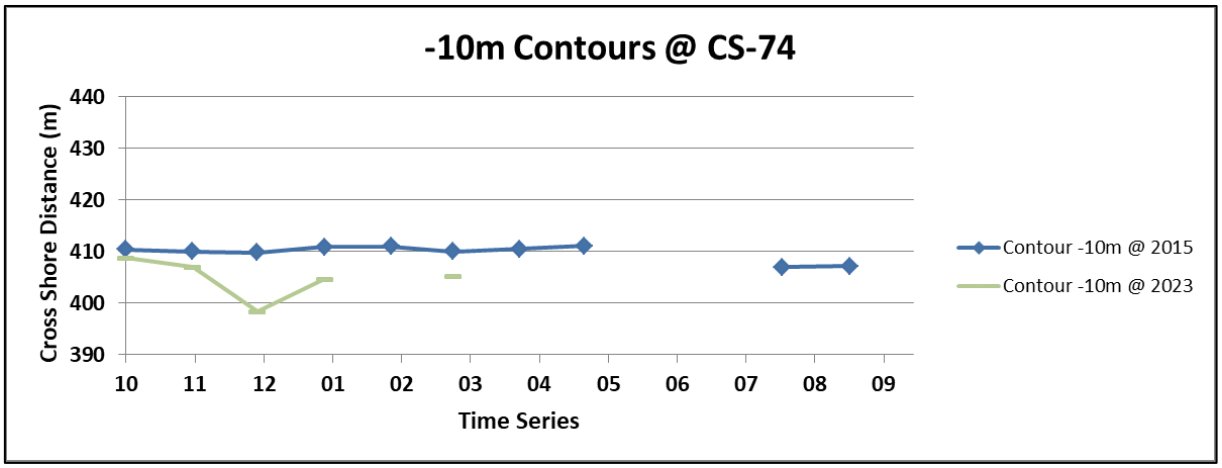


Figure 2-123 Time series of (–) 10 m contour at Vettucaud (CS 74)

In addition to above, the +2m, -3m, -4m, -6m, -8m and -10m contours continuous variation of contour distances over 7 years was provided for better clarity as shown in Figure 2-124.

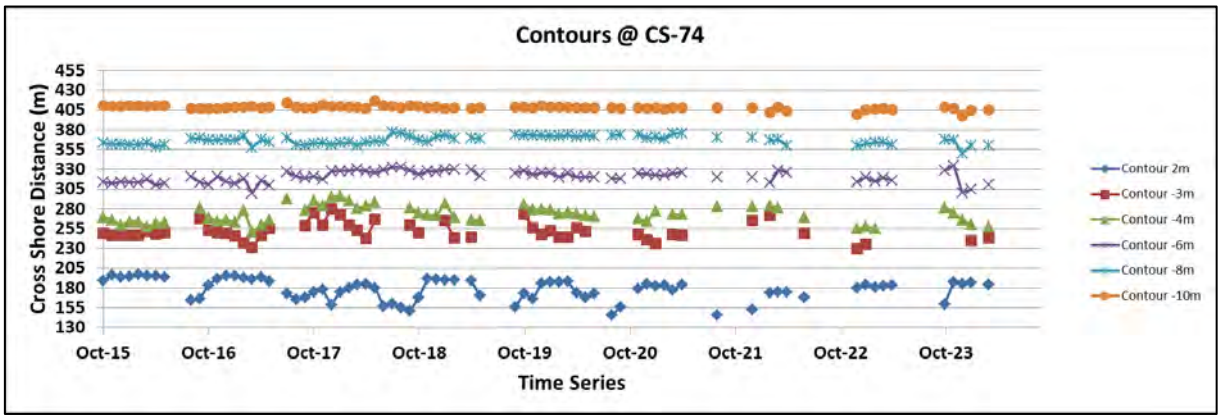


Figure 2-124 Continuous time series of contours at Vettucaud (CS 74)

Figure 2-124 shows the variation of respective contour distances from common arbitrary point on land side. It can be observed that most of the sediment exchange was in between +2m and -3m contours i.e. simultaneous erosion on beach side & accretion on sea side and vice versa.

2.6.3 Analysis of cross shore profiles going up to 20m CD

During the shoreline committee meeting held on 13-03-2019, it was decided that: Only 4 CSP lines needs to be carried out up to a depth of 20 m in the month of January, May, August and October. All other lines, during all months need to be carried up to a depth of 10 m only. Accordingly, two lines were selected (CSP 2 & CSP 35) to south of the port and two more lines (CSP 64 & CSP 74) to north of the port to carry out the survey up to 20m depth.

The data received by ASSYSTEM INDIA LIMITED was analysed by plotting each of the profiles. The aim of this comprehensive exercise was to check the data quality and to compare profiles with surveyed data from different locations which would help to visualise erosion or accretion during different seasons and locations.

2.6.3.1 Edappadu beach (CS02)

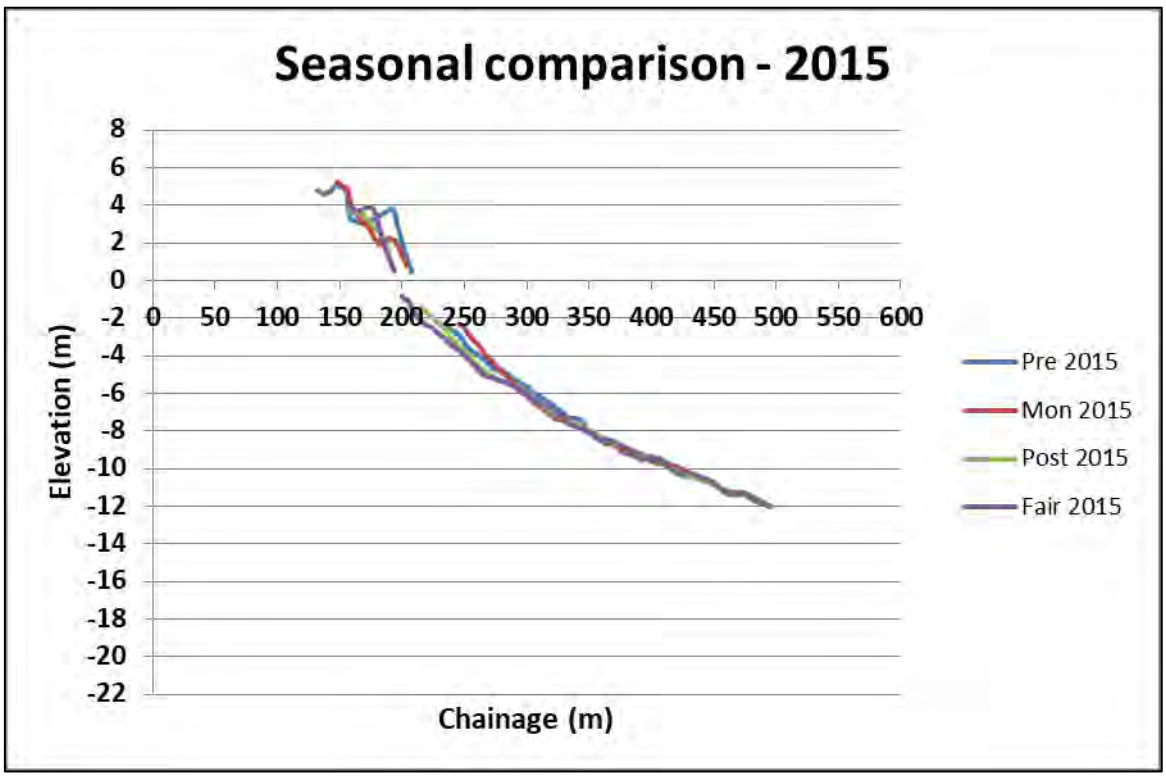


Figure 2-125 Profiles at Edappadu beach (CS 02) – Seasonal comparison – 2015

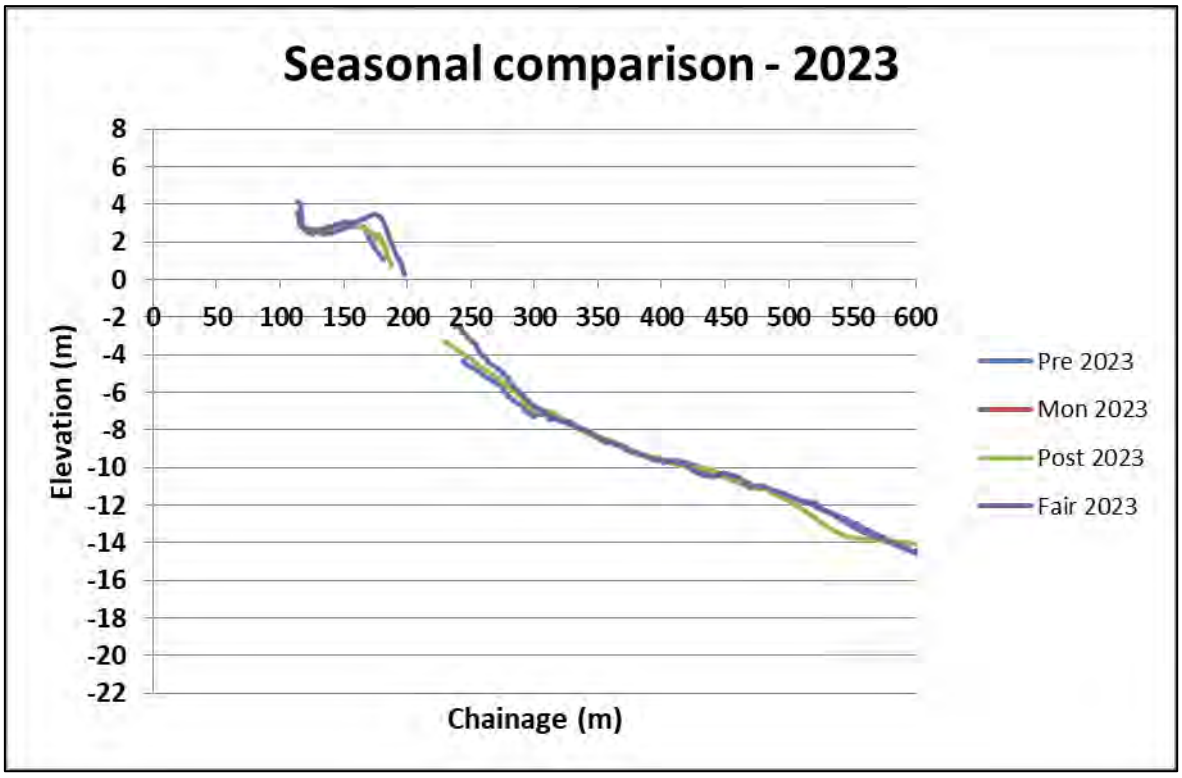


Figure 2-126 Profiles at Edappadu beach (CS 02) – Seasonal comparison – 2023

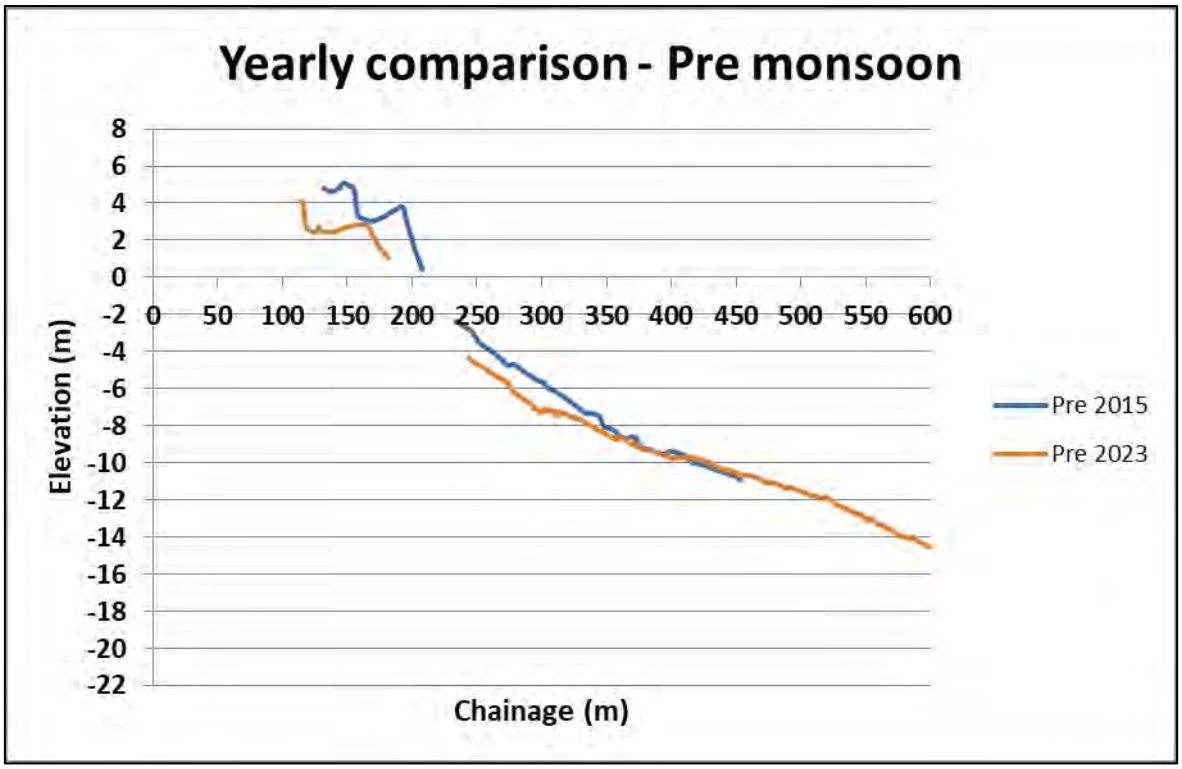


Figure 2-127 Profiles at Edappadu beach (CS 02) – Yearly comparison – Pre Monsoon

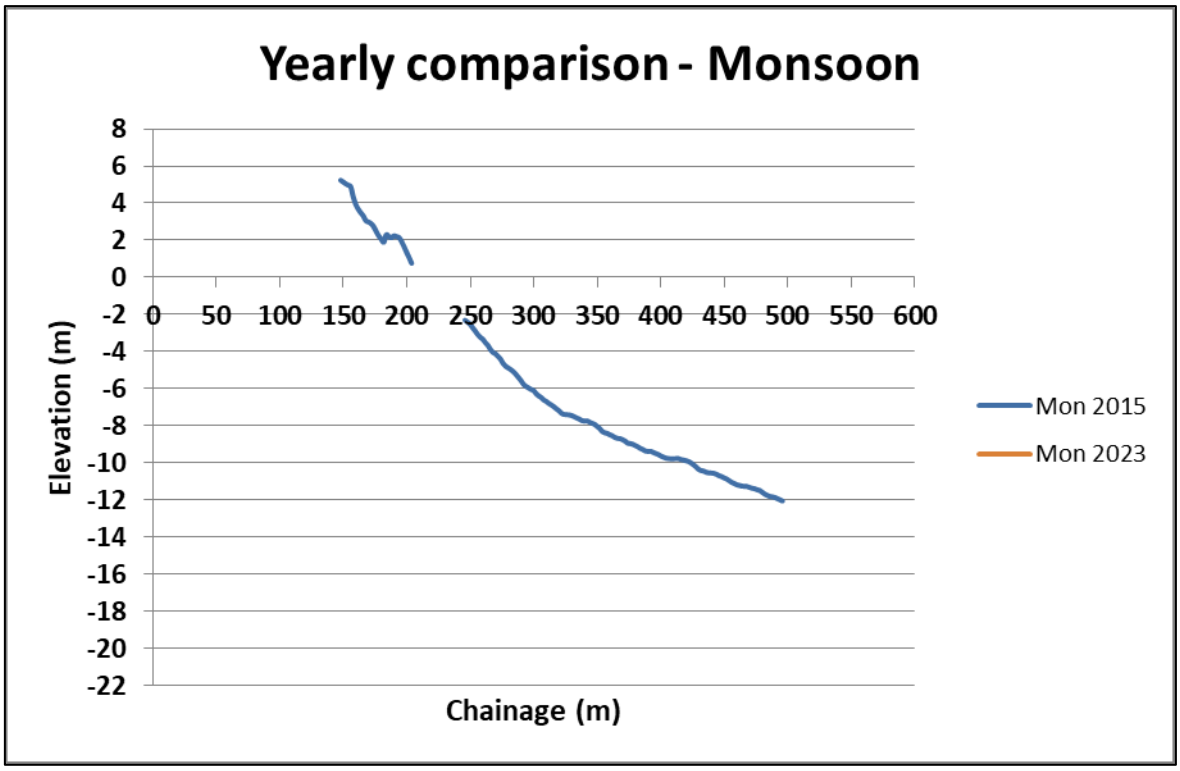


Figure 2-128 Profiles at Edappadu beach (CS 02) – Yearly comparison - Monsoon

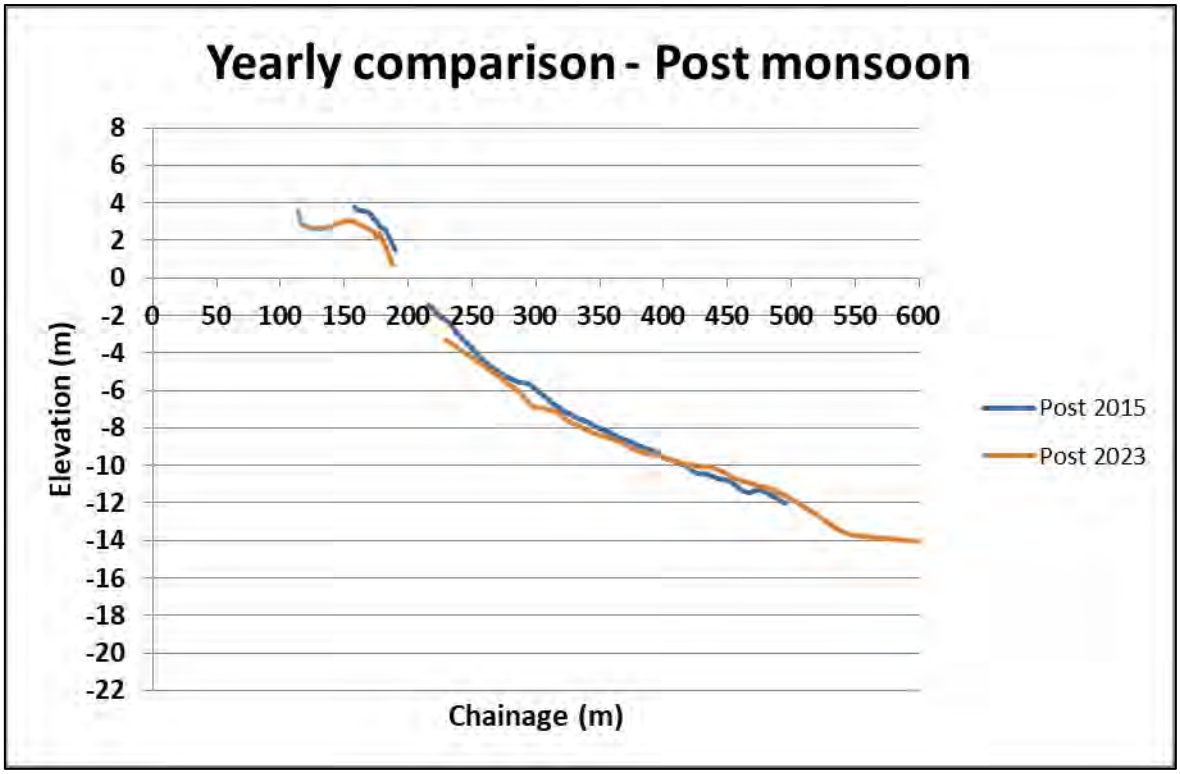


Figure 2-129 Profiles at Edappadu beach (CS 02) – Yearly comparison – Post Monsoon

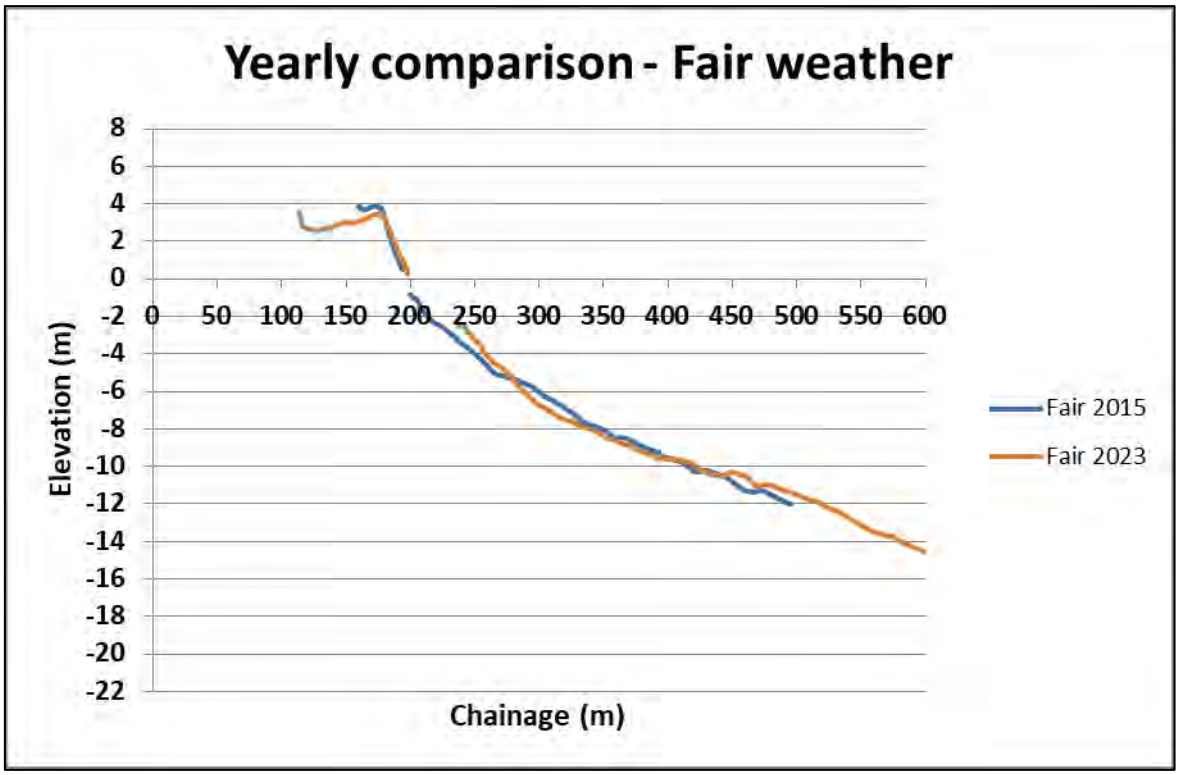


Figure 2-130 Profiles at Edappadu beach (CS 02) – Yearly comparison - Fair Weather

2.6.3.2 Azhimala (CS 35)

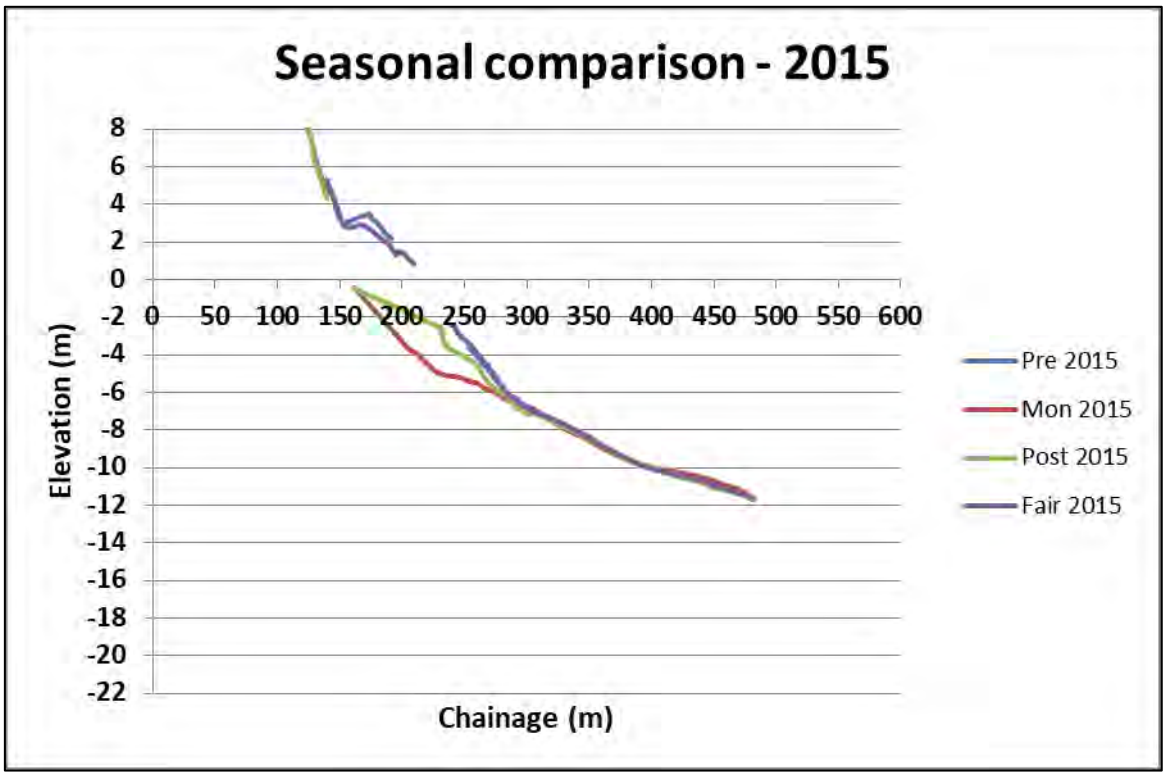


Figure 2-131 Profiles at Azhimala (CS 35) – Seasonal comparison

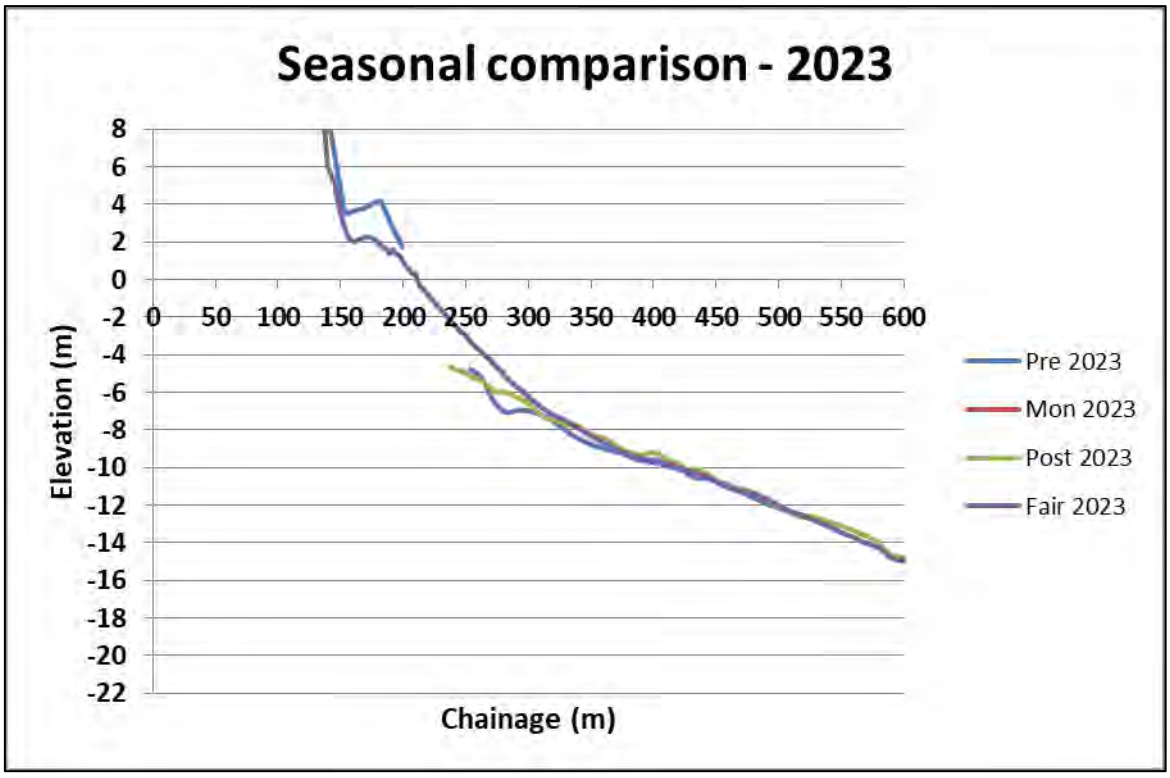


Figure 2-132 Profiles at Azhimala (CS 35) – Seasonal comparison (2023)

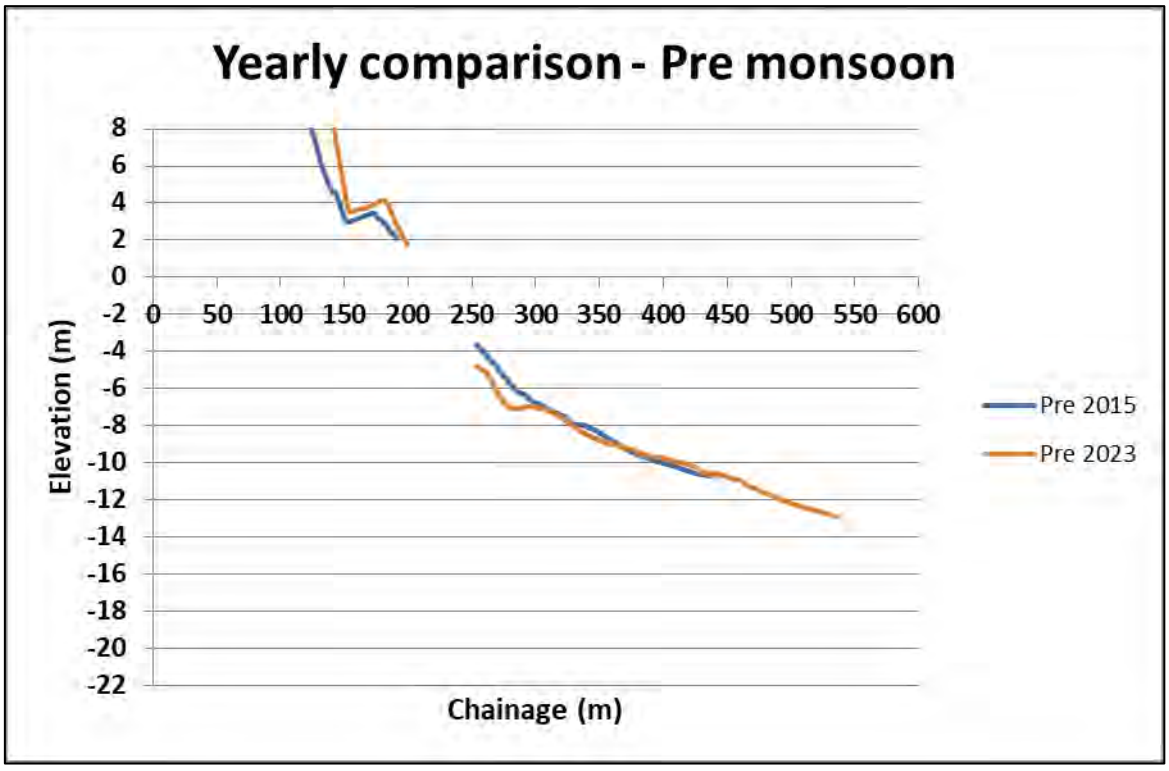


Figure 2-133 Profiles at Azhimala (CS 35) – Yearly comparison – Pre Monsoon

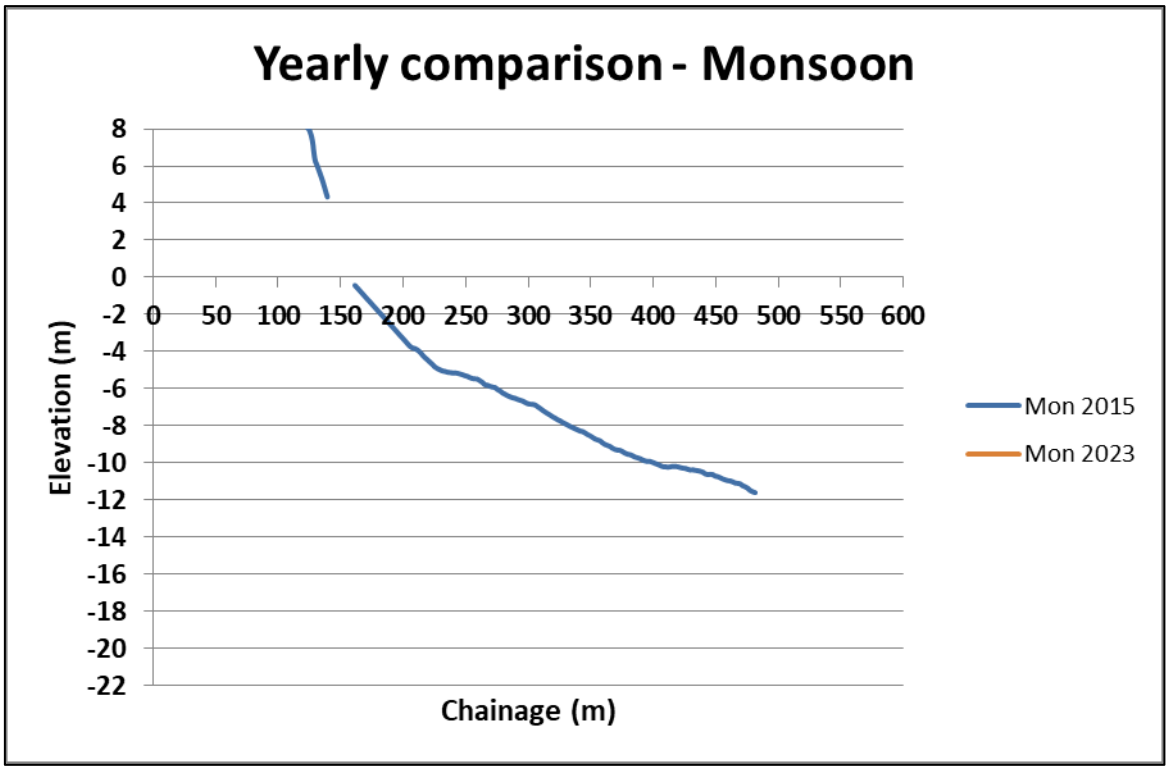


Figure 2-134 Profiles at Azhimala (CS 35) – Yearly comparison - Monsoon

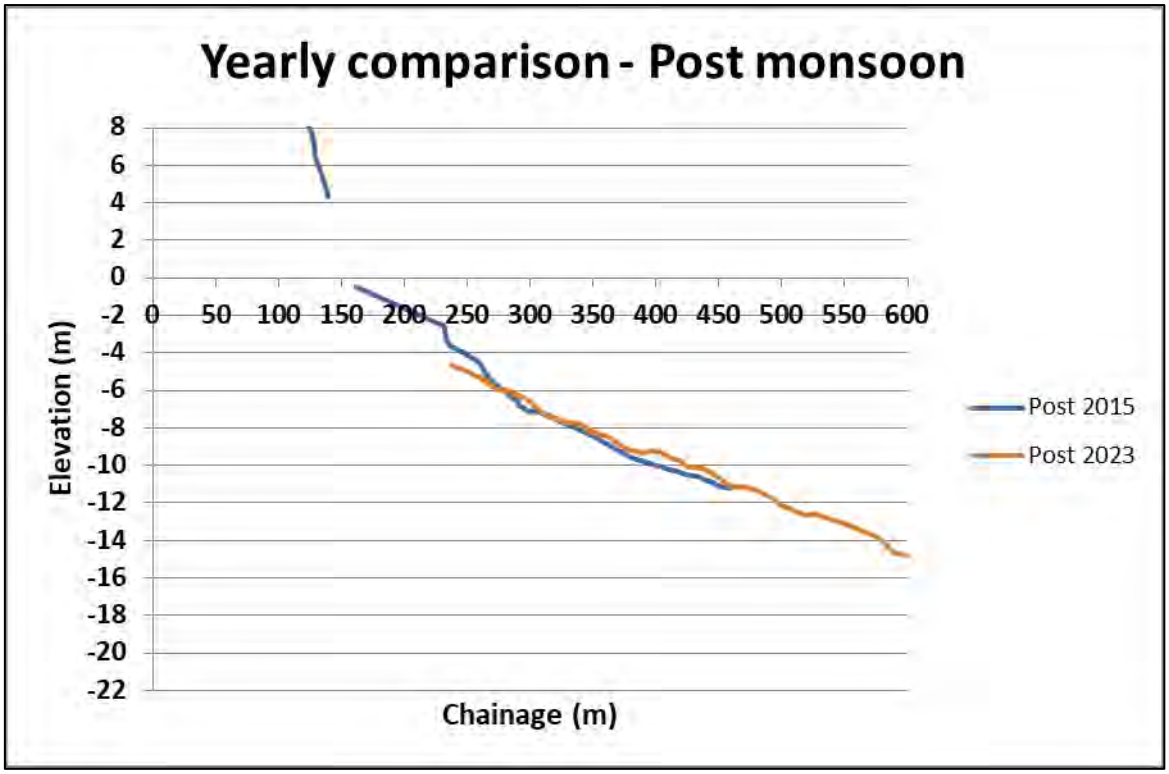


Figure 2-135 Profiles at Azhimala (CS 35) – Yearly comparison – Post Monsoon

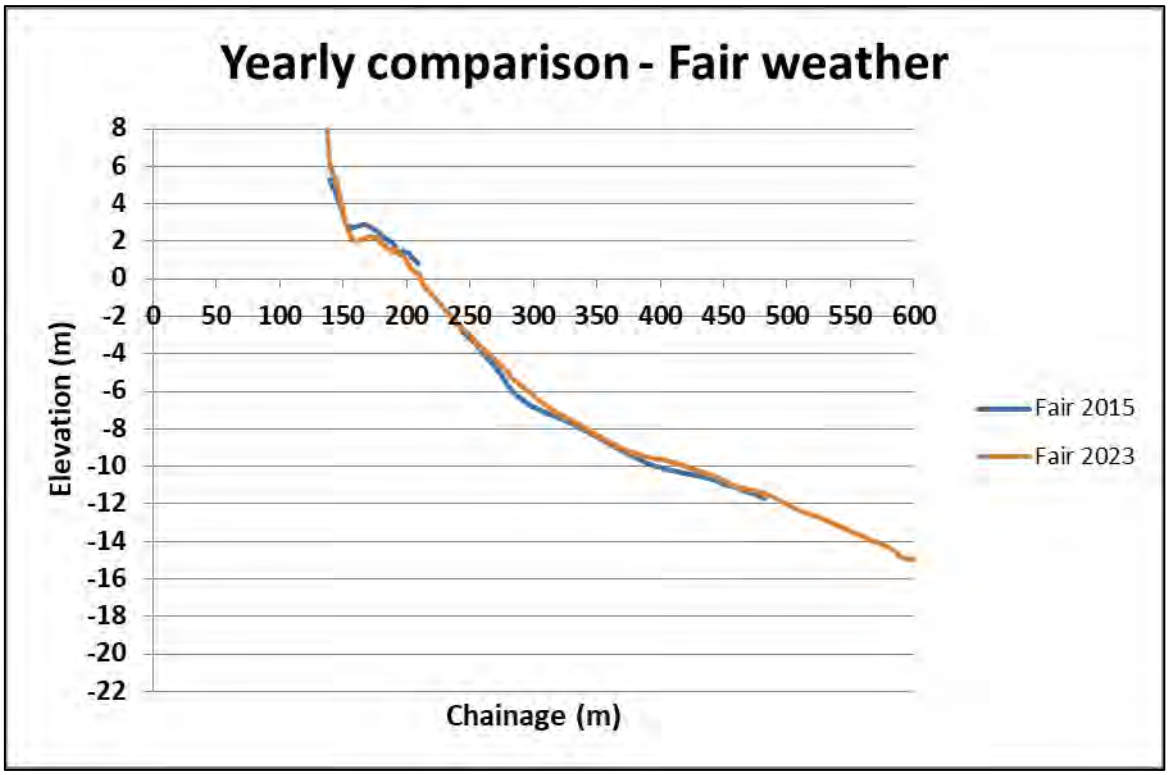


Figure 2-136 Profiles at Azhimala (CS 35) – Yearly comparison – Fair weather

2.6.3.3 Valiyathura (CS 64)

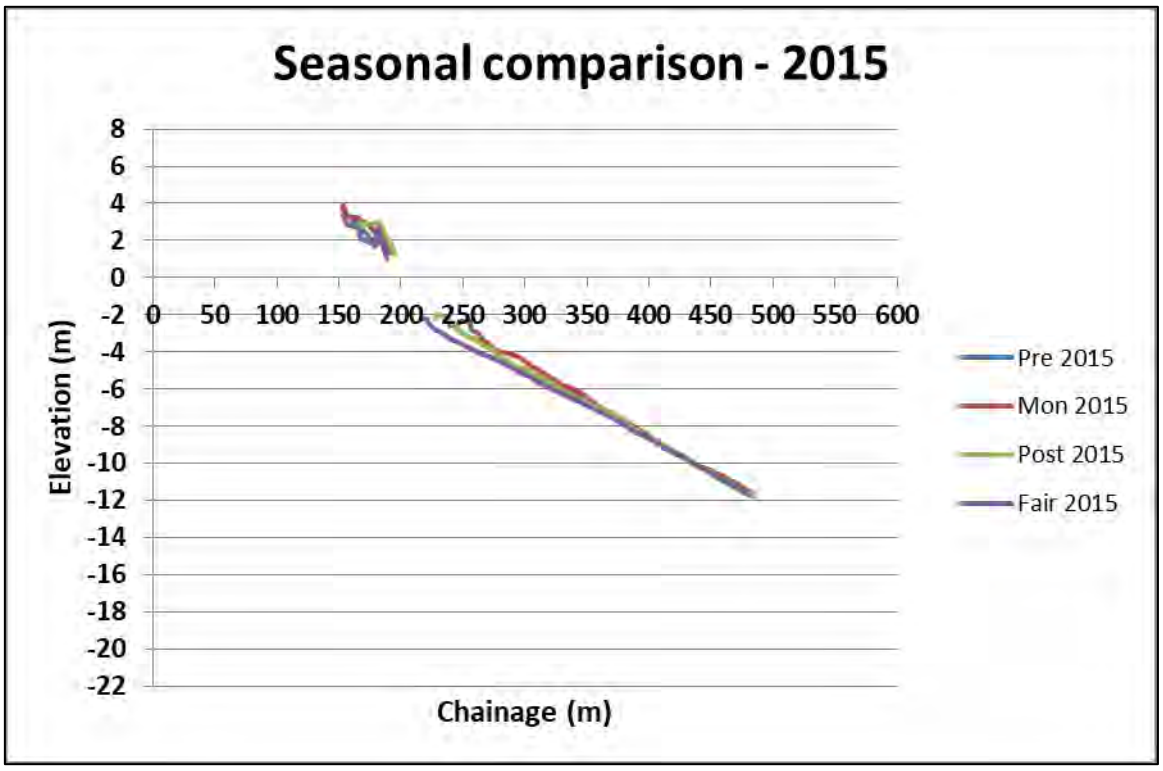


Figure 2-137 Profiles at Valiyathura (CS 64) – Seasonal comparison (2015)

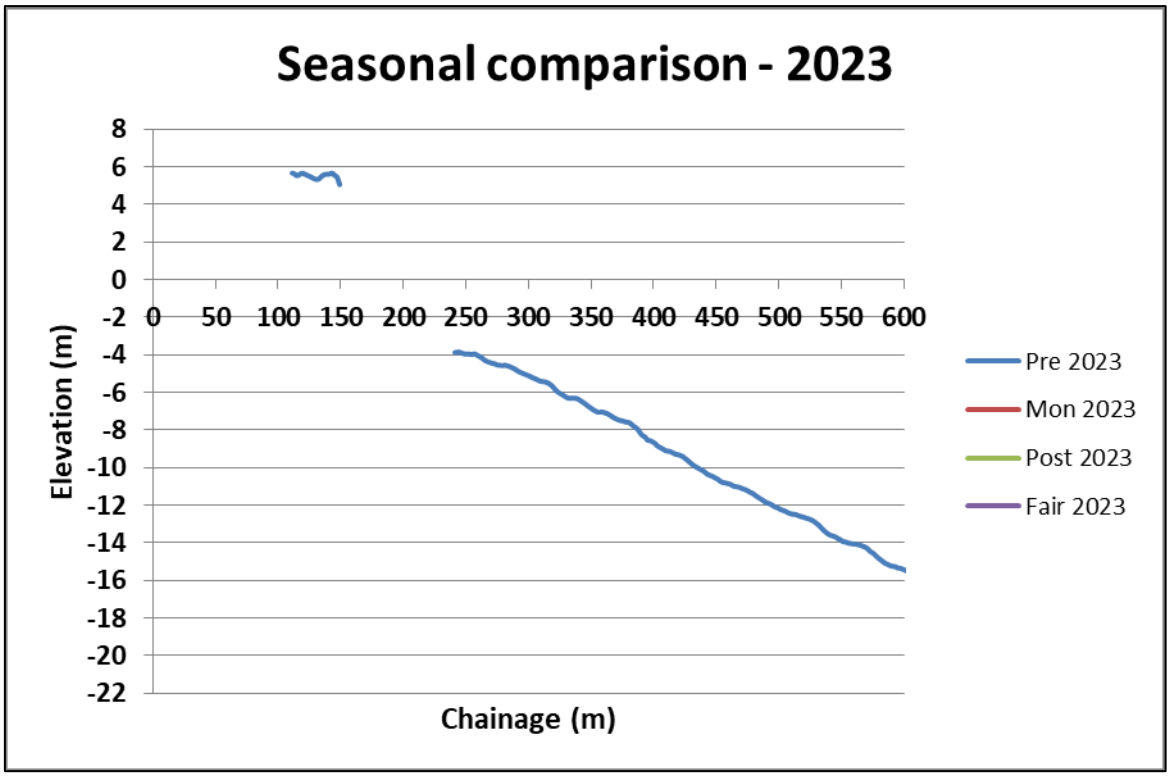


Figure 2-138 Profiles at Valiyathura (CS 64) – Seasonal comparison (2023)

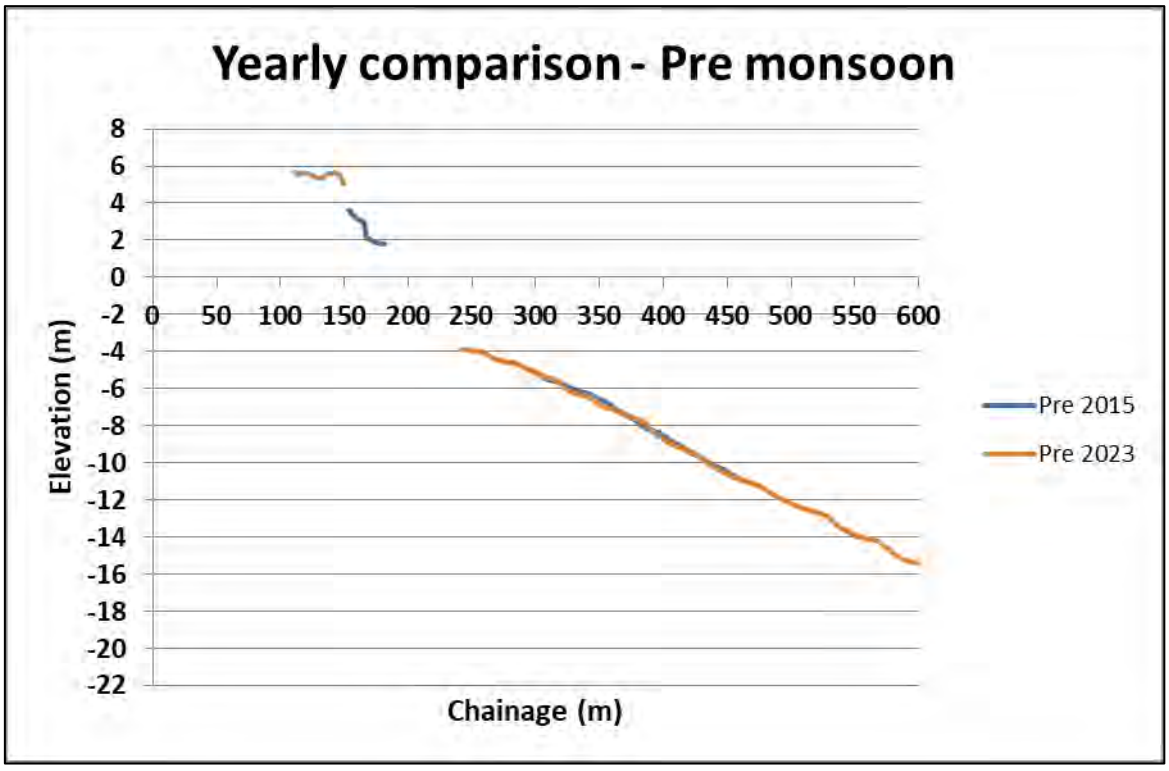


Figure 2-139 Profiles at Valiyathura (CS 64) – Yearly comparison – Pre Monsoon

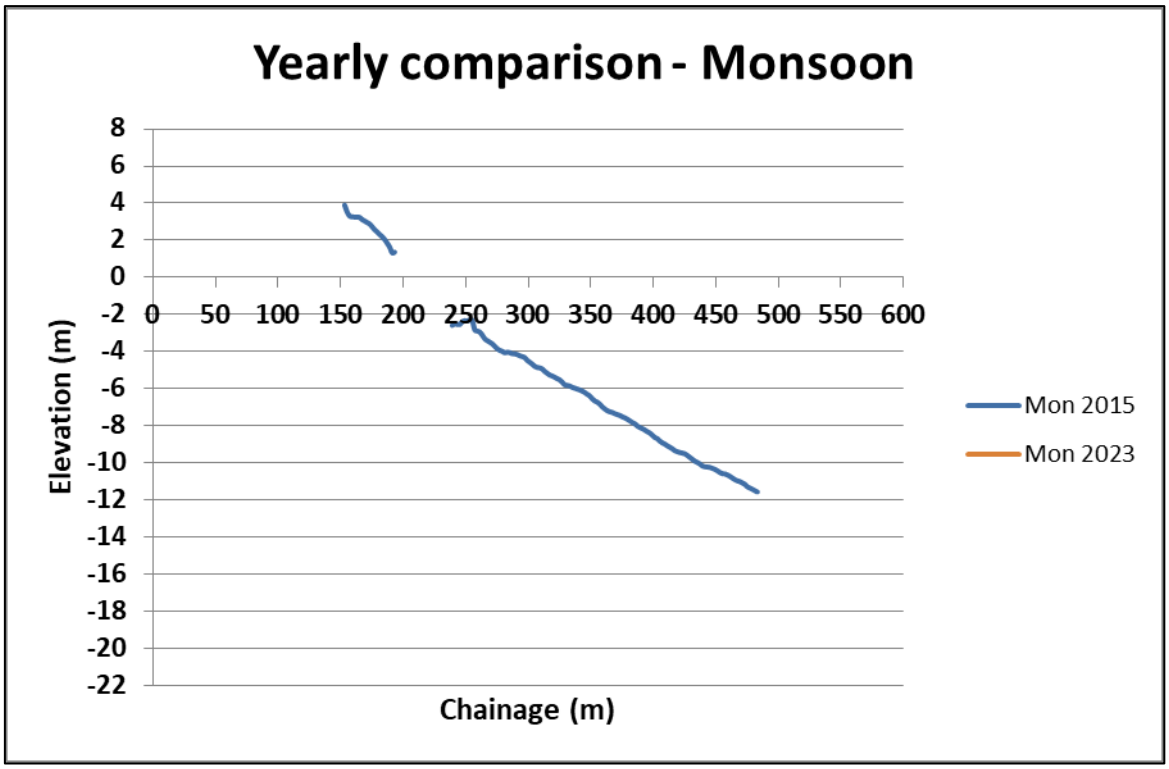


Figure 2-140 Profiles at Valiyathura (CS 64) – Yearly comparison - Monsoon

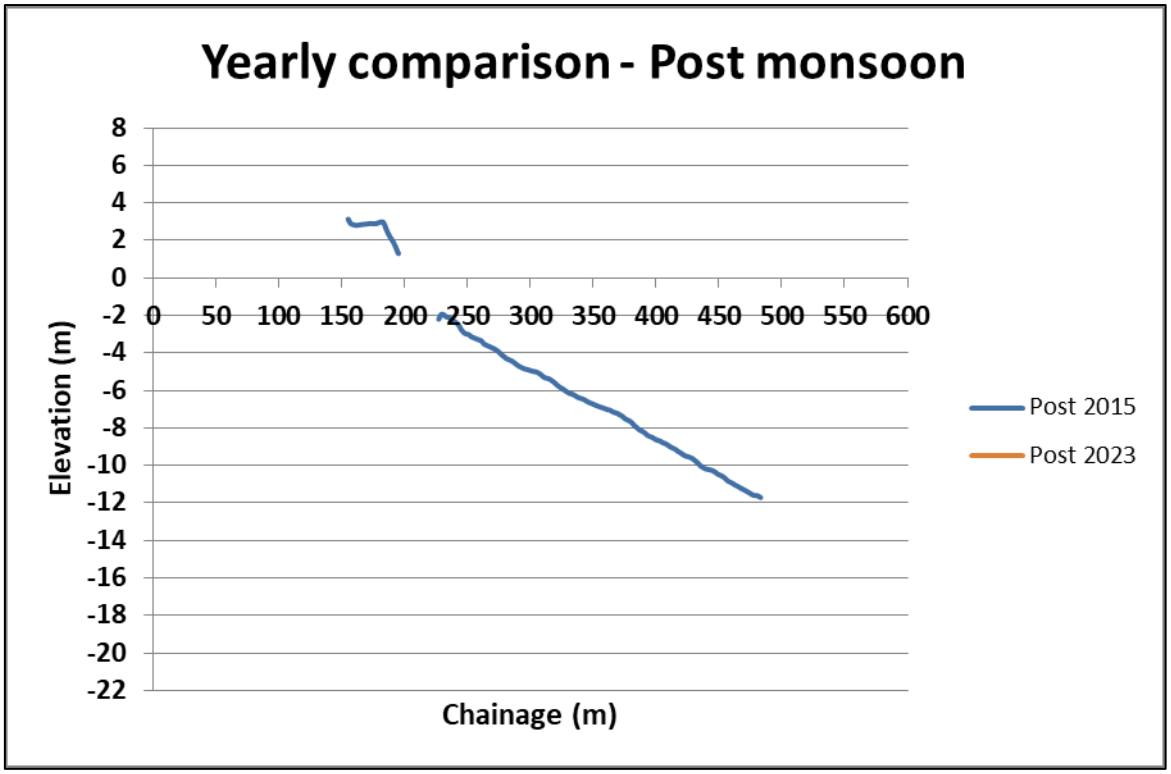


Figure 2-141 Profiles at Valiyathura (CS 64) – Yearly comparison – Post Monsoon

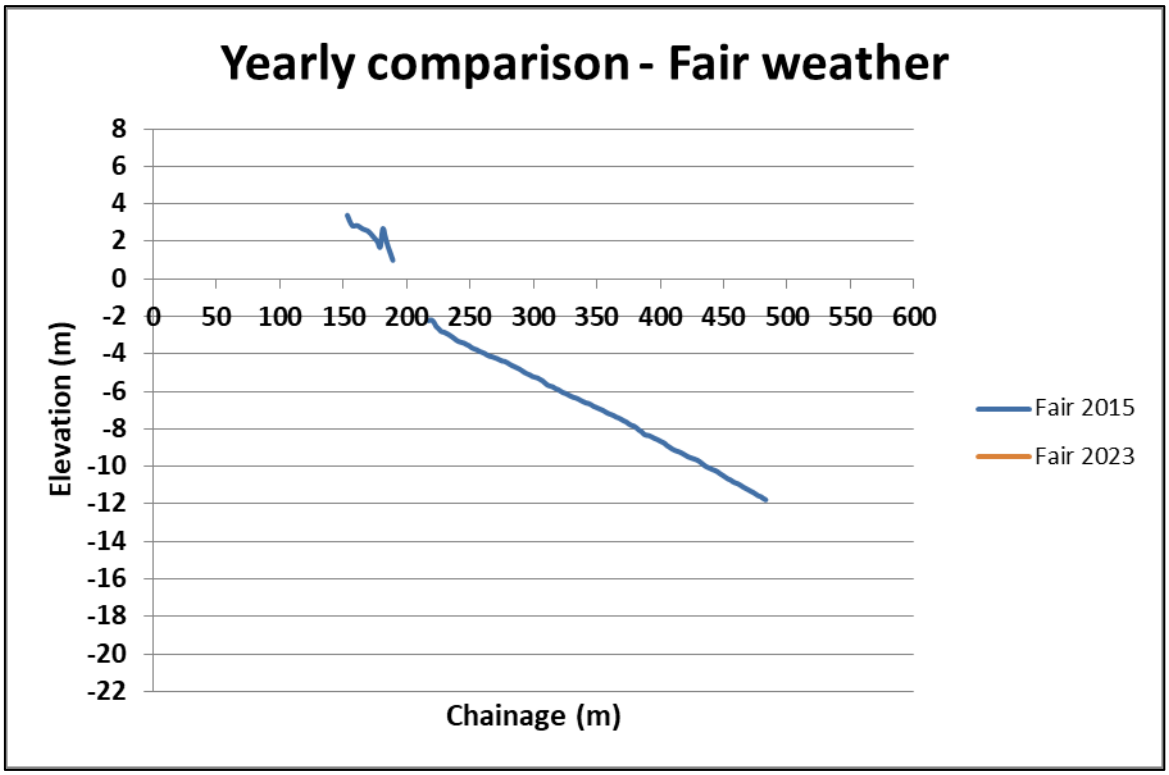


Figure 2-142 Profiles at Valiyathura (CS 64) – Yearly comparison – Fair weather

2.6.3.4 Vettucaud Church (CS 74

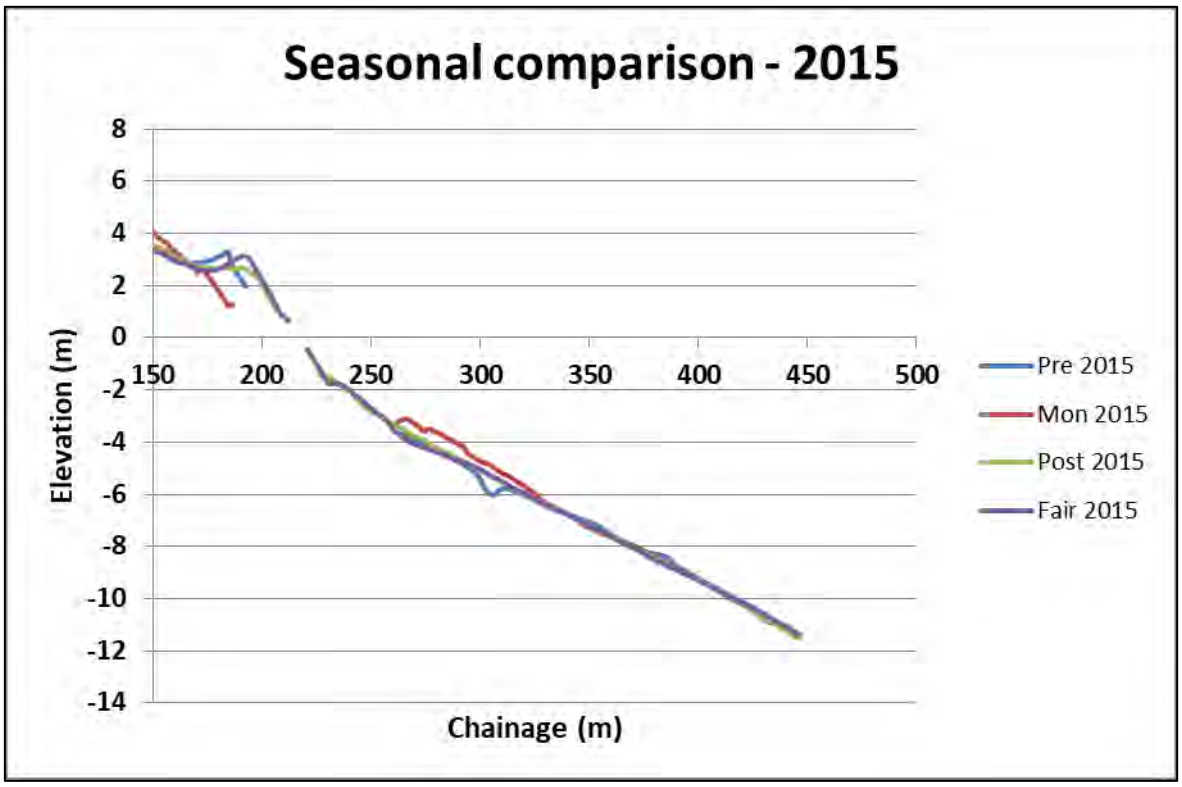


Figure 2-143 Profiles at Vettucaud Church (CS 74) – Seasonal comparison - 2015

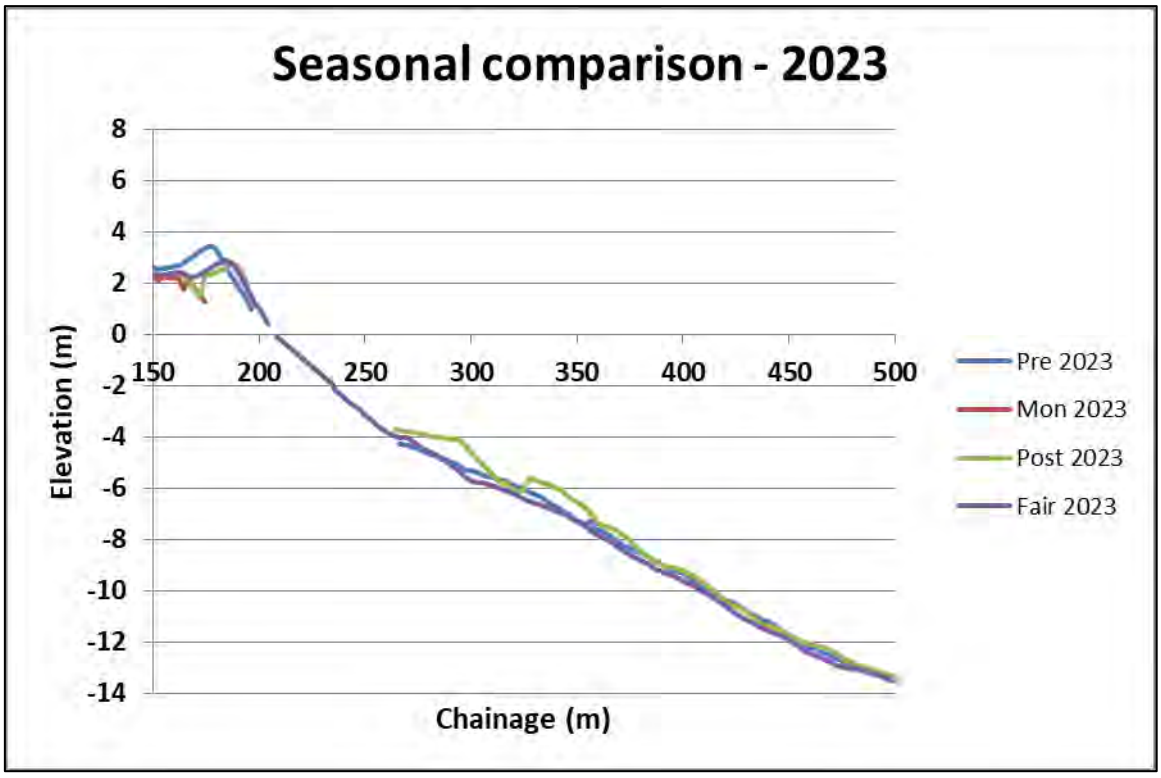


Figure 2-144 Profiles at Vettucaud Church (CS 74) – Seasonal comparison – 2023

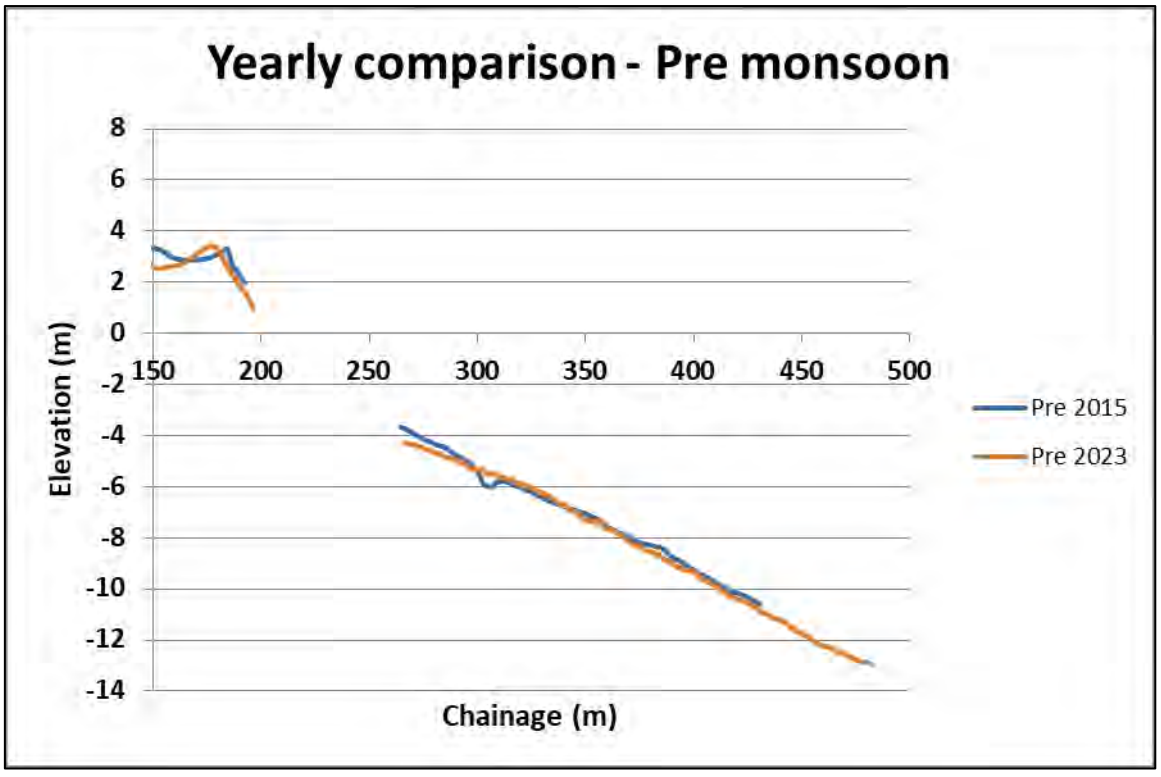


Figure 2-145 Profiles at Vettucaud Church (CS 74) – Yearly comparison – Pre Monsoon

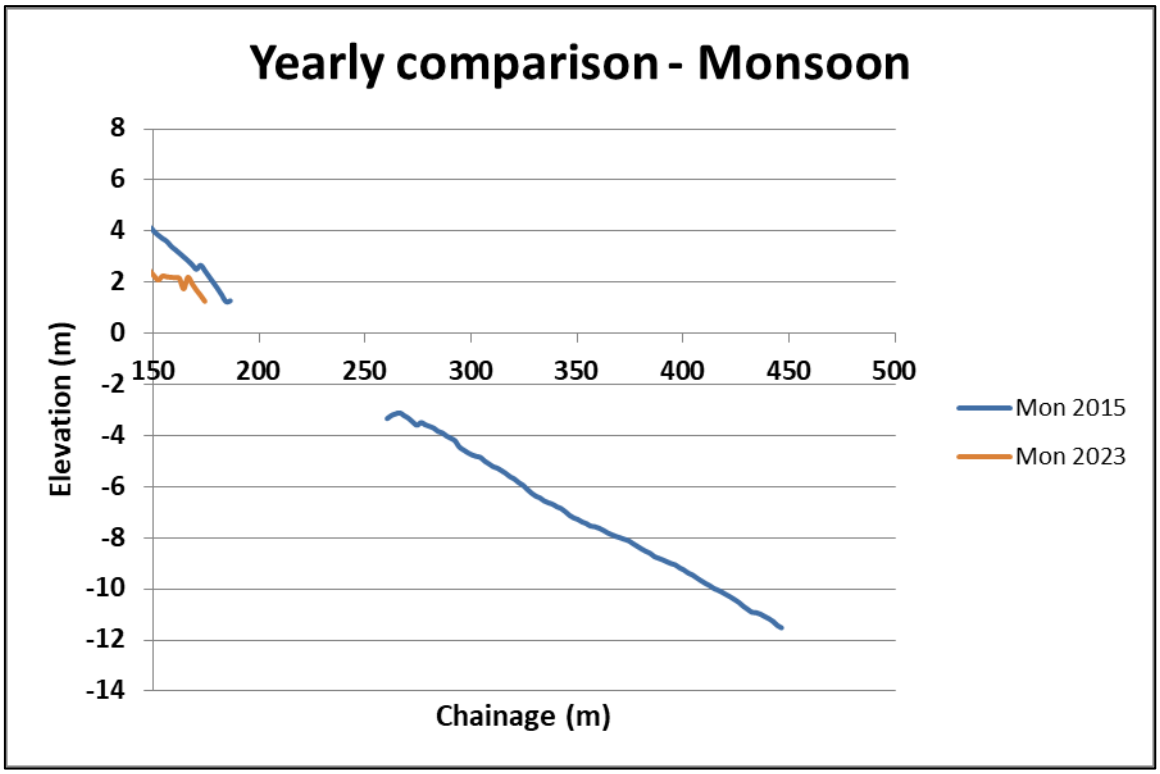


Figure 2-146 Profiles at Vettucaud Church (CS 74) – Yearly comparison – Monsoon

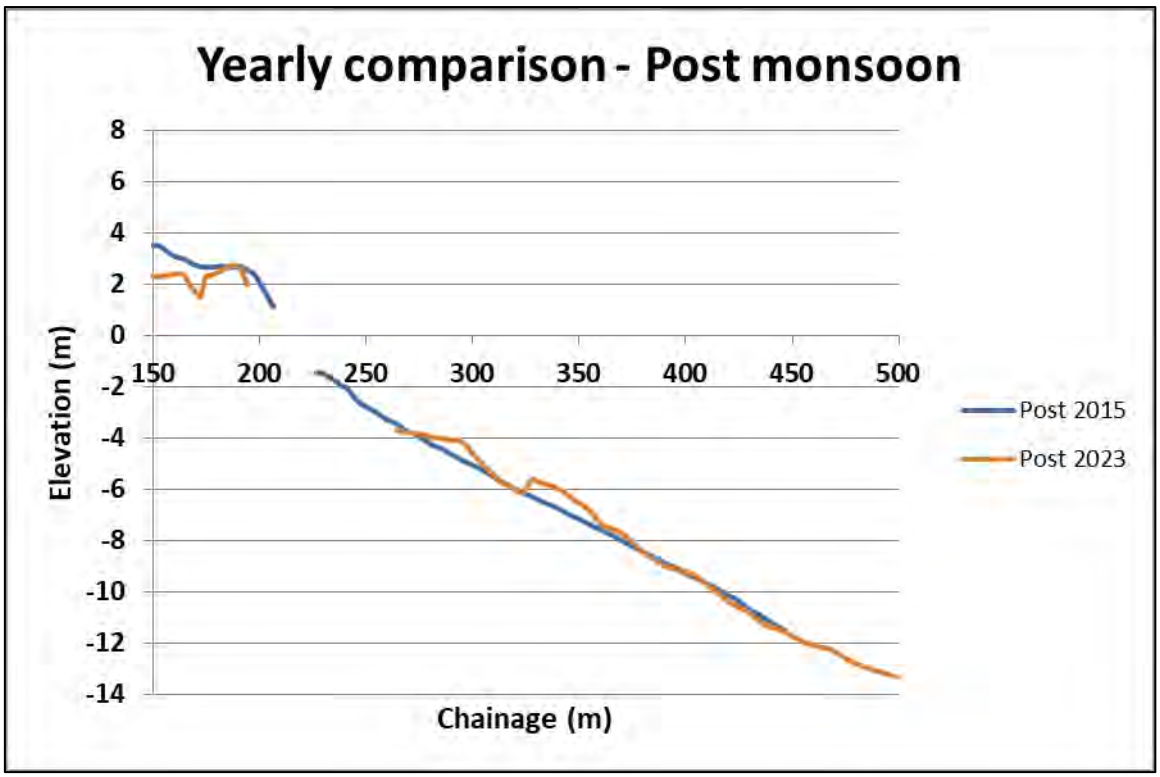


Figure 2-147 Profiles at Vettucaud Church (CS 74) – Yearly comparison – Post Monsoon

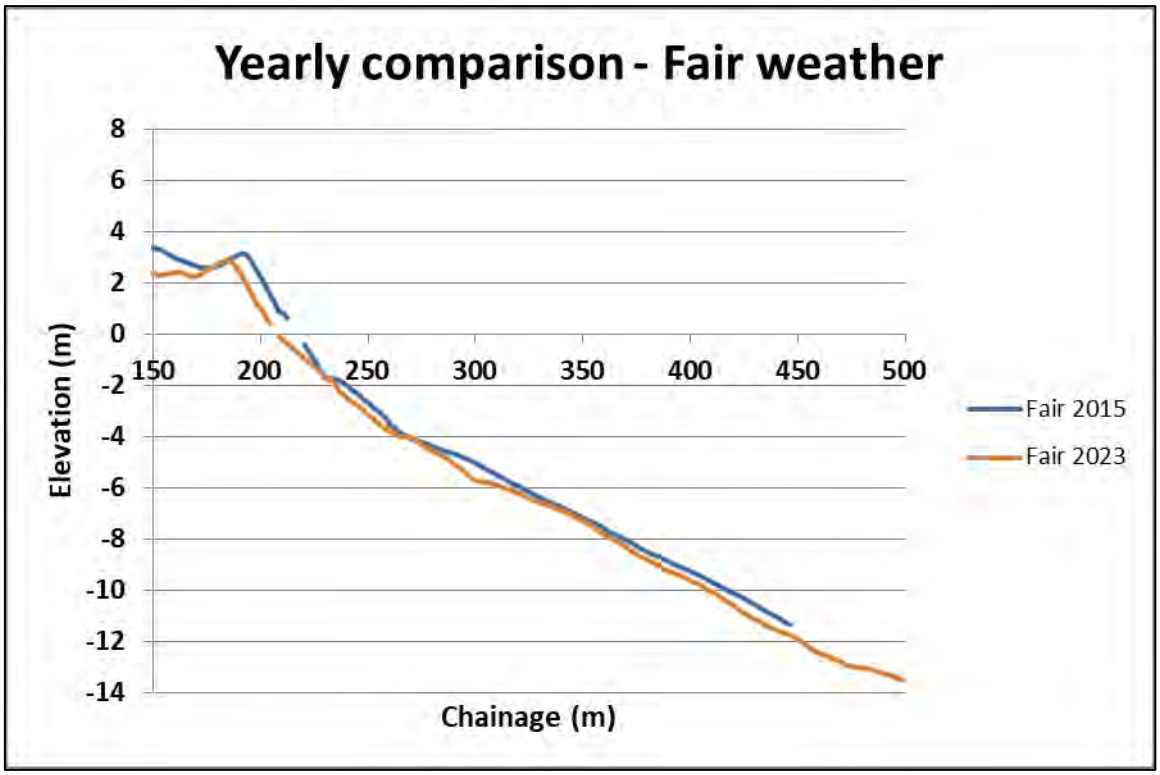
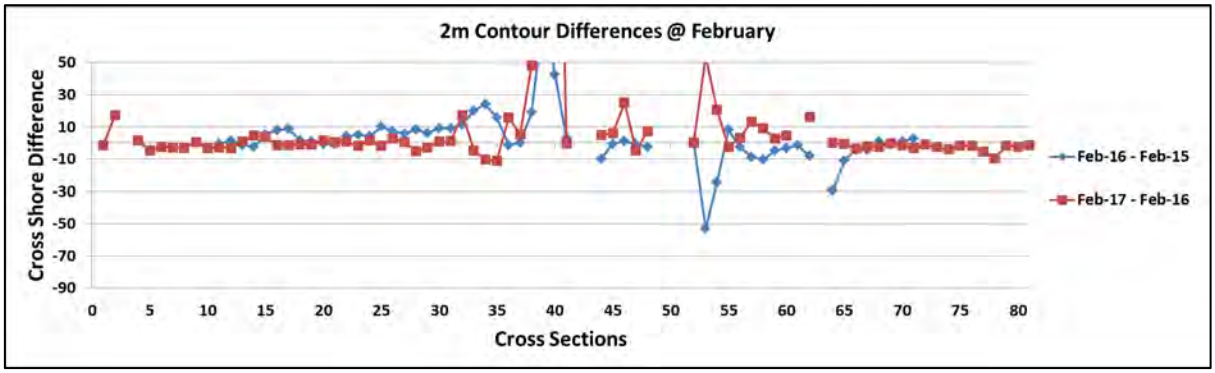


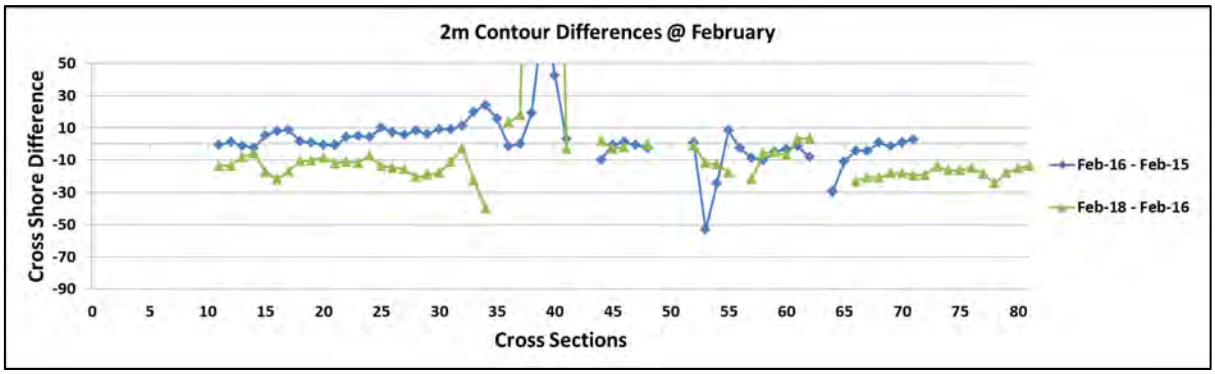
Figure 2-148 Profiles at Vettucaud Church (CS 74) – Yearly comparison – Fair weather

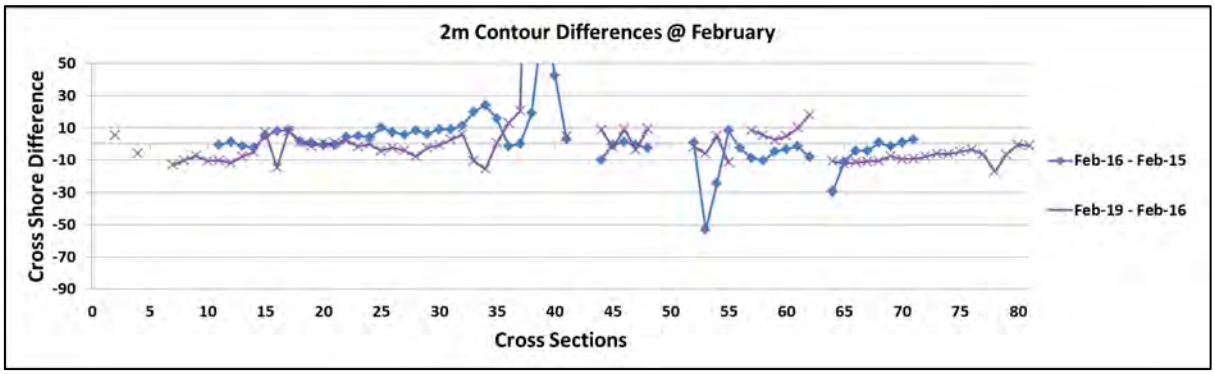
2.6.4 Alongshore comparison of contour differences

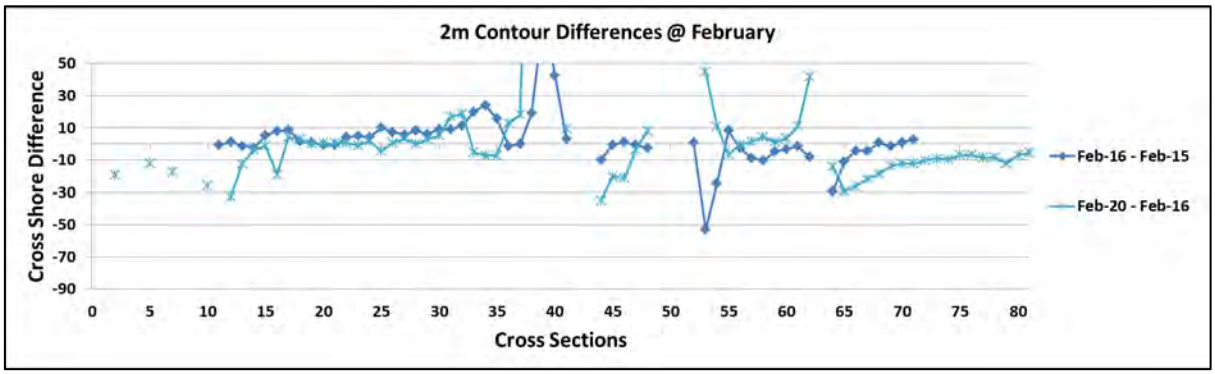
Fair weather season is the best time to compare the coasts as there will not be much cross shore movement and beach will be stable during this period after subjected to seasonal variations. February month of all years was chosen to evaluate the alongshore scenario of the coast.

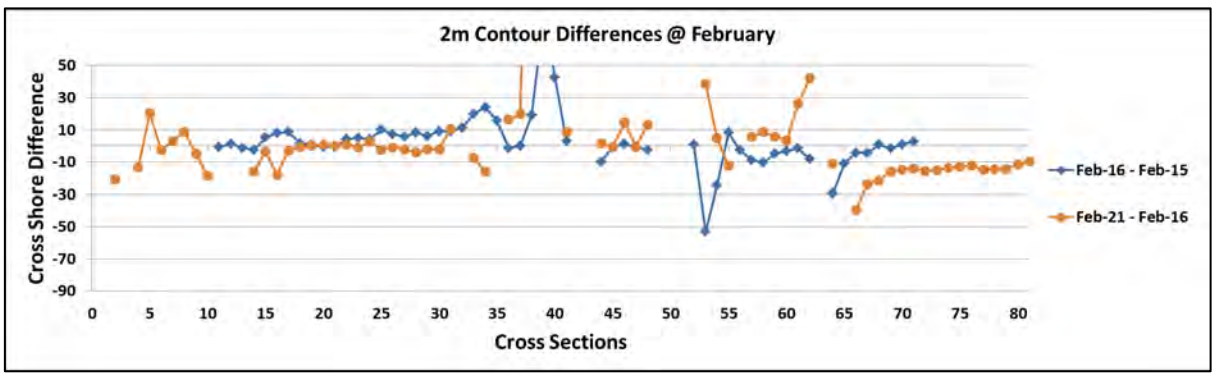
Figure 2-149 to Figure 2-154 show the variation of contours with respect to contours of February 2016. February 2016 was taken as the reference year in this case. Figure 2-155 to Figure 2-160 shows the variation of contours relative to the previous year (yearly rates).




2m Contour Differences @ February
Cross Shore Difference
Cross Sections
Feb-16 - Feb-15
Feb-18 - Feb-16


2m Contour Differences @ February
Cross Shore Difference
Cross Sections
Feb-16 - Feb-15
Feb-19 - Feb-16


2m Contour Differences @ February
Cross Shore Difference
Cross Sections
Feb-16 - Feb-15
Feb-20 - Feb-16


2m Contour Differences @ February
Cross Shore Difference
Cross Sections
Feb-16 - Feb-15
Feb-21 - Feb-16

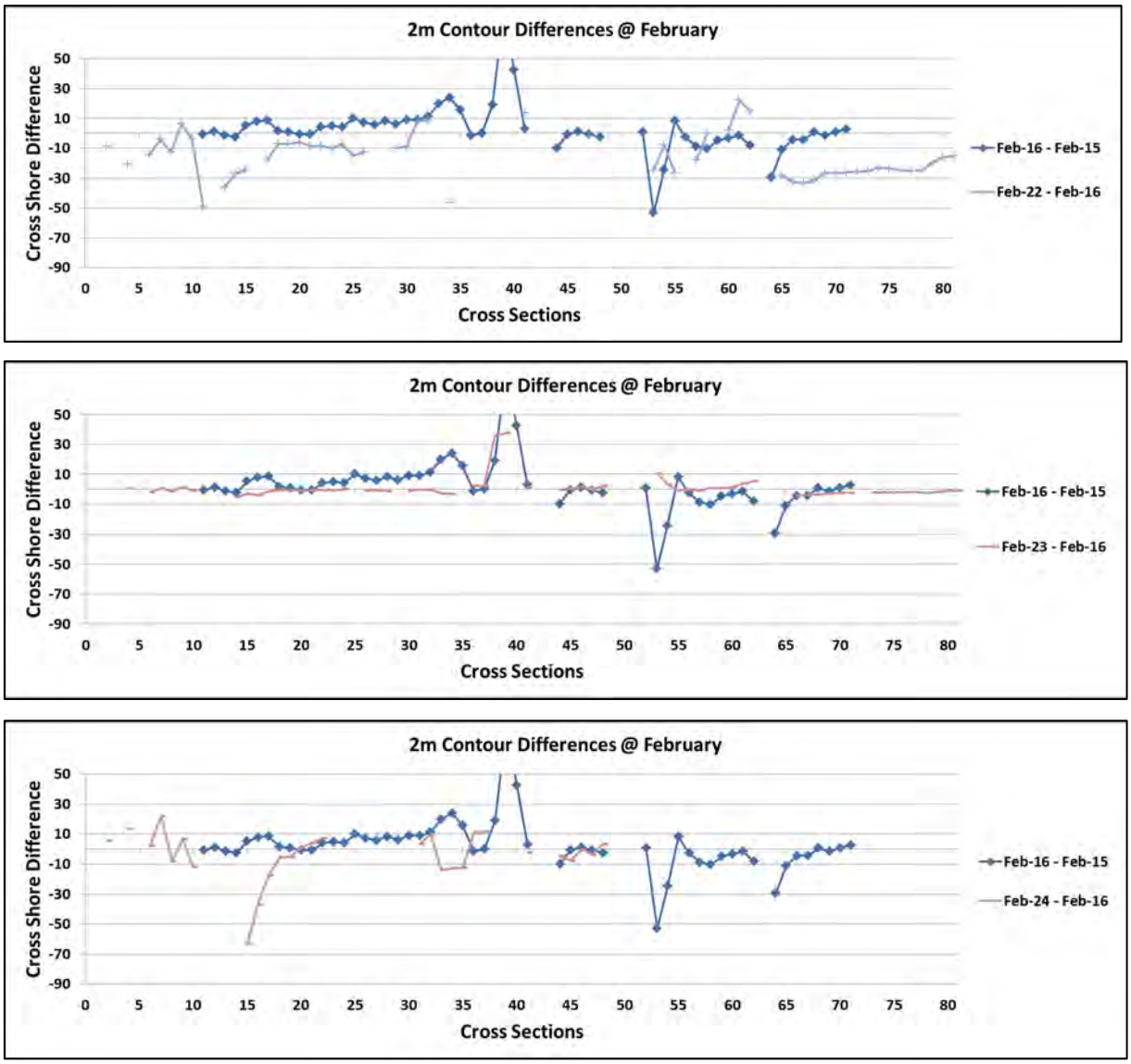


Figure 2-149 Alongshore comparison of (+) 2m contour differences during February

ASSYSTEM INDIA LIMITED extracted (+) 2m contour from February months of cross shore profile data at 81 locations. It was noticed that (+) 2m contour was not available in survey data at some of the cross sections which could be due to inaccessibility or protest and these values were not interpolated and left as such.

Figure 2-149 shows the comparison of difference of (+) 2m contour of February 2016 with reference to February 2015. As February 2015 data consists of 61 locations and there was minimal variation between February 2016 and February 2015 (Blue line), February 2016 was considered as baseline for this analysis and remaining series are comparison of differences of (+) 2m contour of February months with reference to February 2016. Green line represents the alongshore scenario of coast after Ockhi cyclone. It can be seen from this plot that the coast experienced severe erosion. Violet, Cyan and orange lines represent the alongshore scenario of coast post Ockhi cyclone (subsequent years). Light red line represents the alongshore scenario of coast for February 2023. The stretch south of Poovar River mouth is still in transition and stretch north of Poovar River mouth to Adimalathura seems to be recovered from Ockhi cyclone impact. Near Valiyathura pier there was accretion on south of groyne and erosion on north of groyne which seems to be natural phenomenon due to construction of groyne.

Similarly, -3m, -4m, -6m, -8m and -10m contour differences are shown in Figure 2-150 to Figure 2-154.

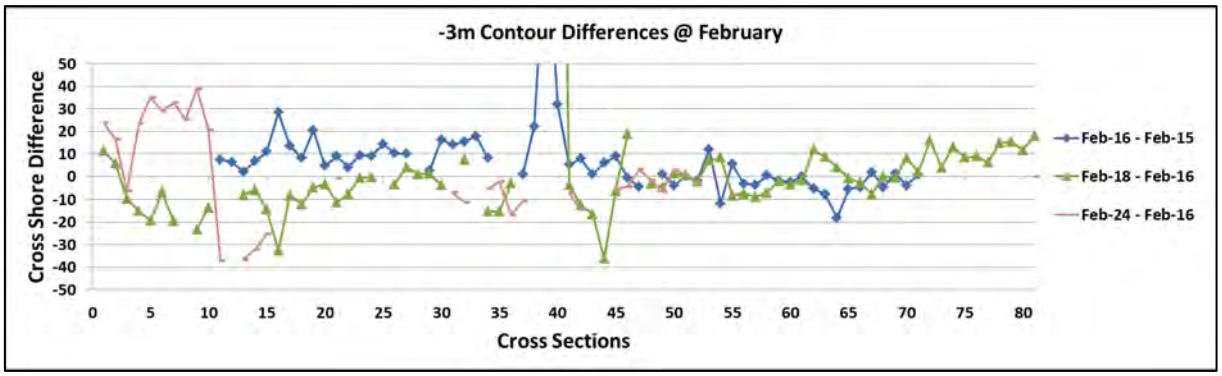


Figure 2-150 Alongshore comparison of (-) 3m contour differences during February

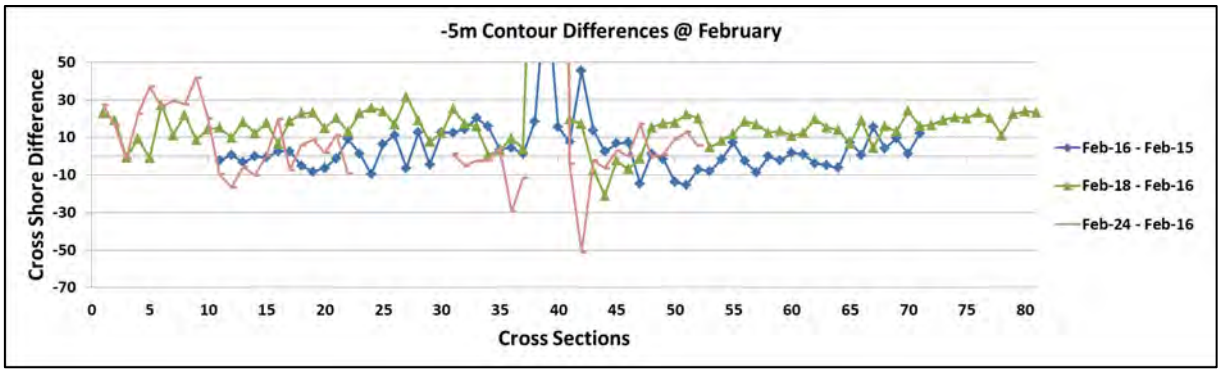


Figure 2-151 Alongshore comparison of (-) 5m contour differences during February

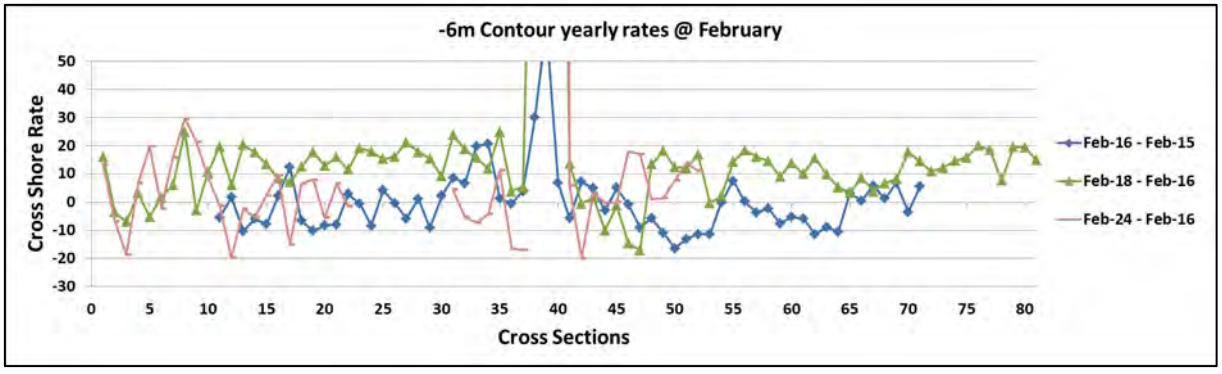


Figure 2-152 Alongshore comparison of (-) 6m contour differences during February

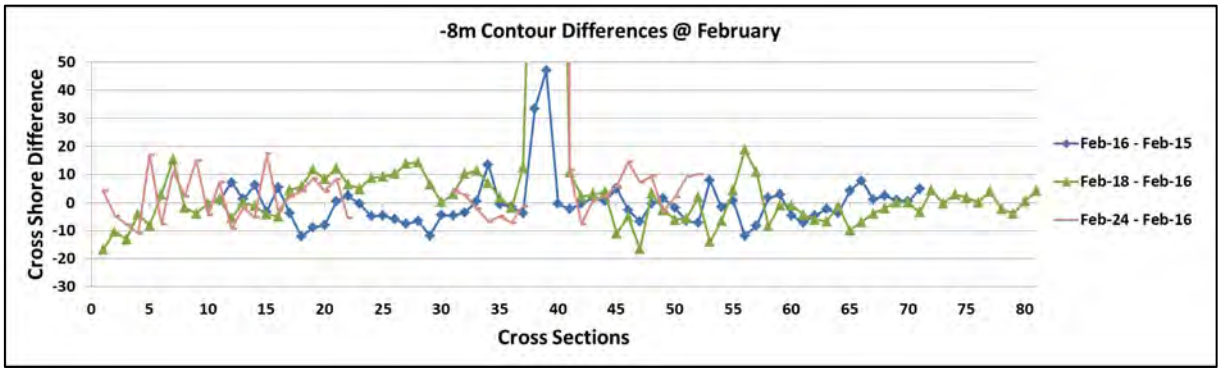


Figure 2-153 Alongshore comparison of (-) 8m contour differences during February

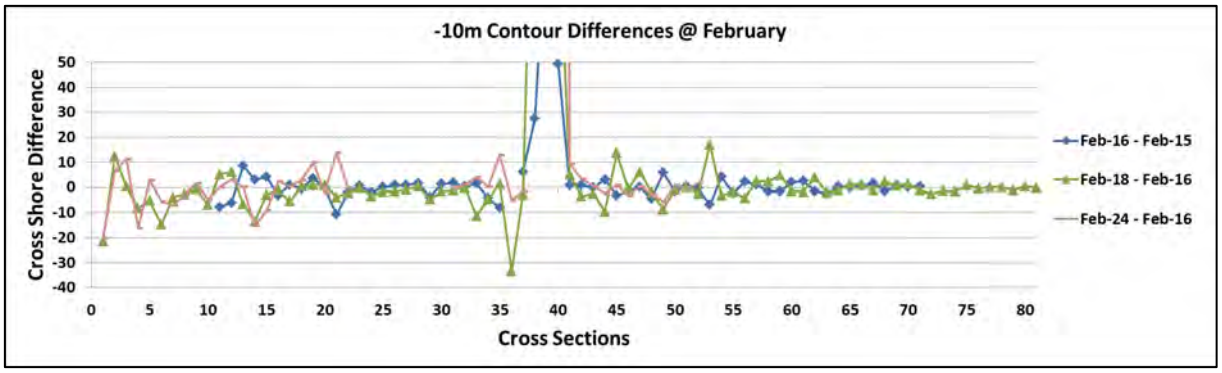


Figure 2-154 Alongshore comparison of (-) 10m contour differences during February

2.6.5 Alongshore comparison of contour yearly rates

ASSYSTEM INDIA LIMITED analysed the yearly rates during February month. Figure 2-155 shows the comparison of yearly rates of (+) 2m contour of February month with reference to previous year February month. After Ockhi almost entire coast experienced severe erosion which can be noticed from Feb-18 – Feb-17 series (Green). Earlier we observed that the yearly rate of 2018-2019 year was high along the coast compared to previous years probably because the coast was in the process to attain its stable or equilibrium position. In the period of March 2019 to February 2021 the rates were almost similar to pre Ockhi scenario and during the period of 2022 – 2023 (Red) the rates were high.

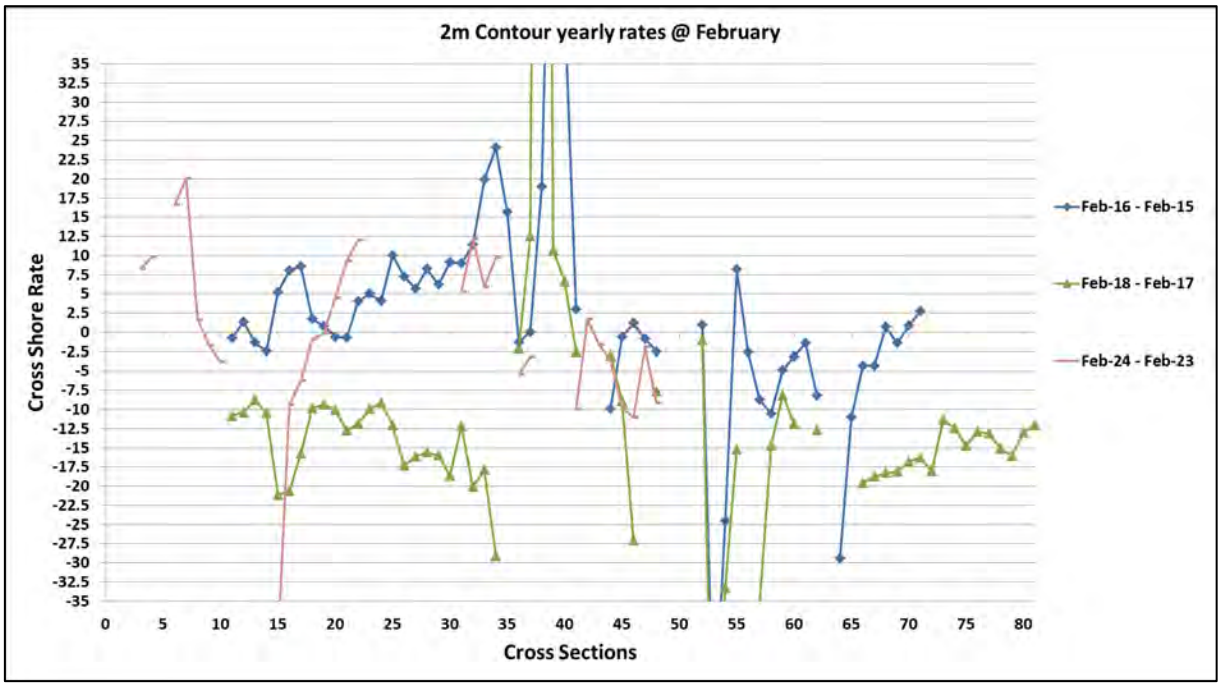


Figure 2-155 Alongshore comparison of (+) 2m contour yearly rates during February

Similarly, -3m, -4m, -6m, -8m and -10m contour differences are shown in Figure 2-156 to Figure 2-160.

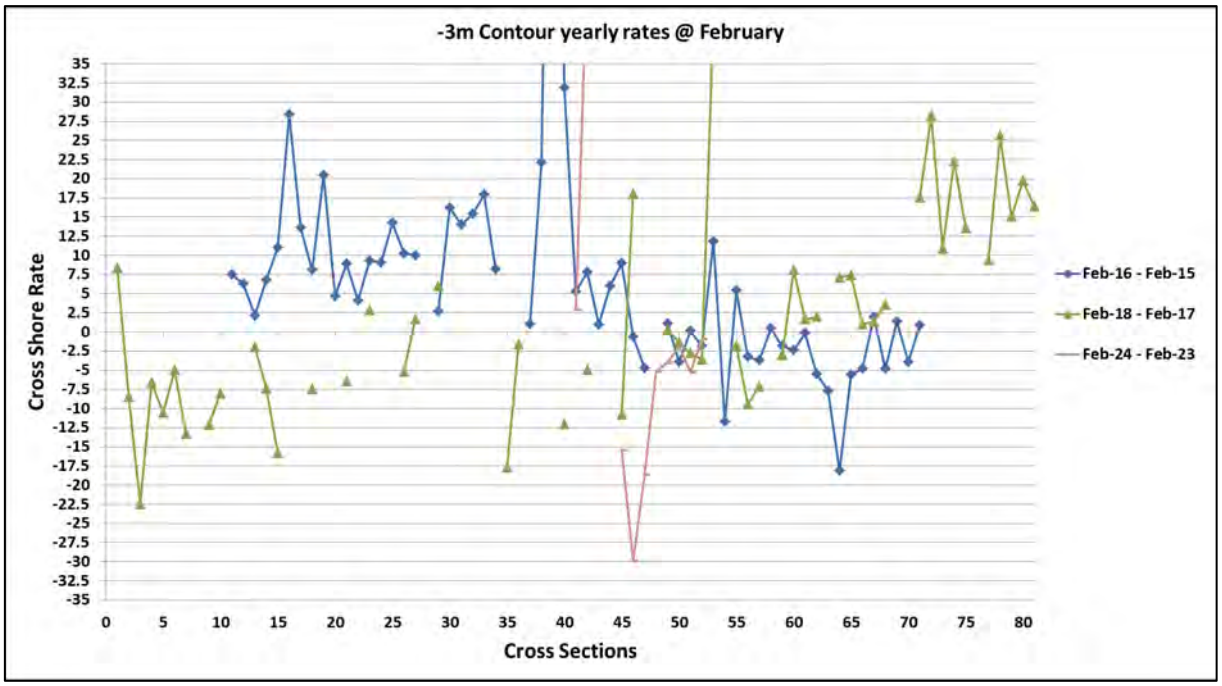


Figure 2-156 Alongshore comparison of (-) 3m contour yearly rates during February

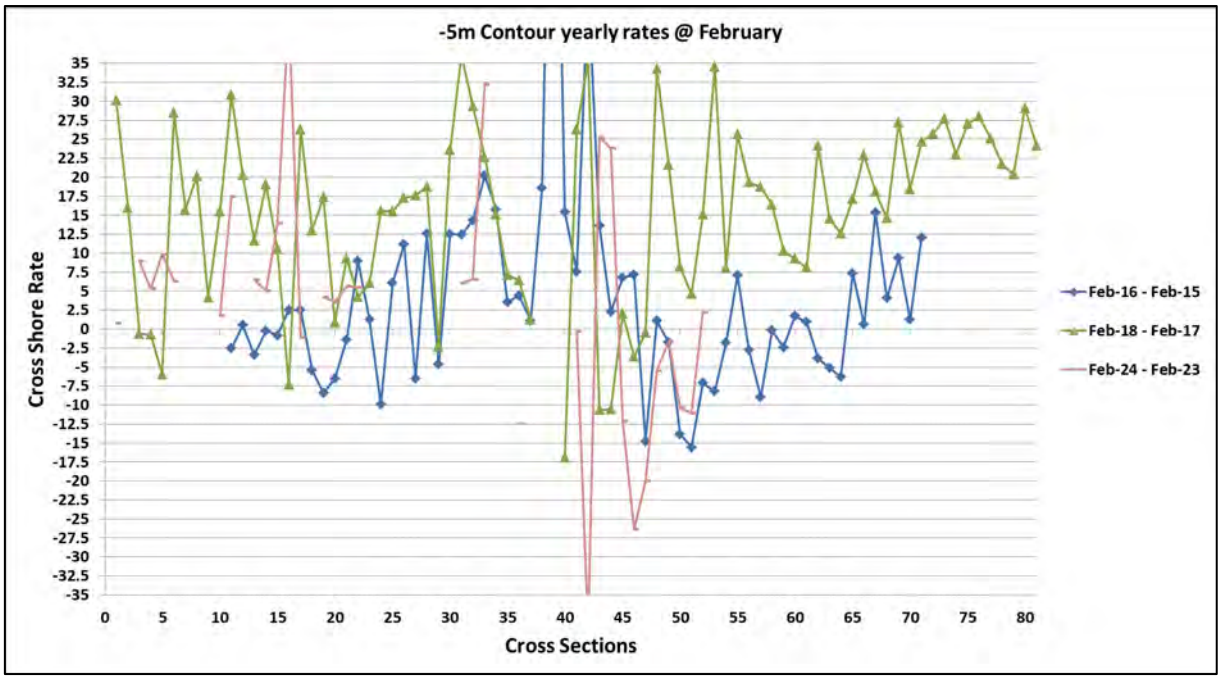


Figure 2-157 Alongshore comparison of (-) 5m contour yearly rates during February

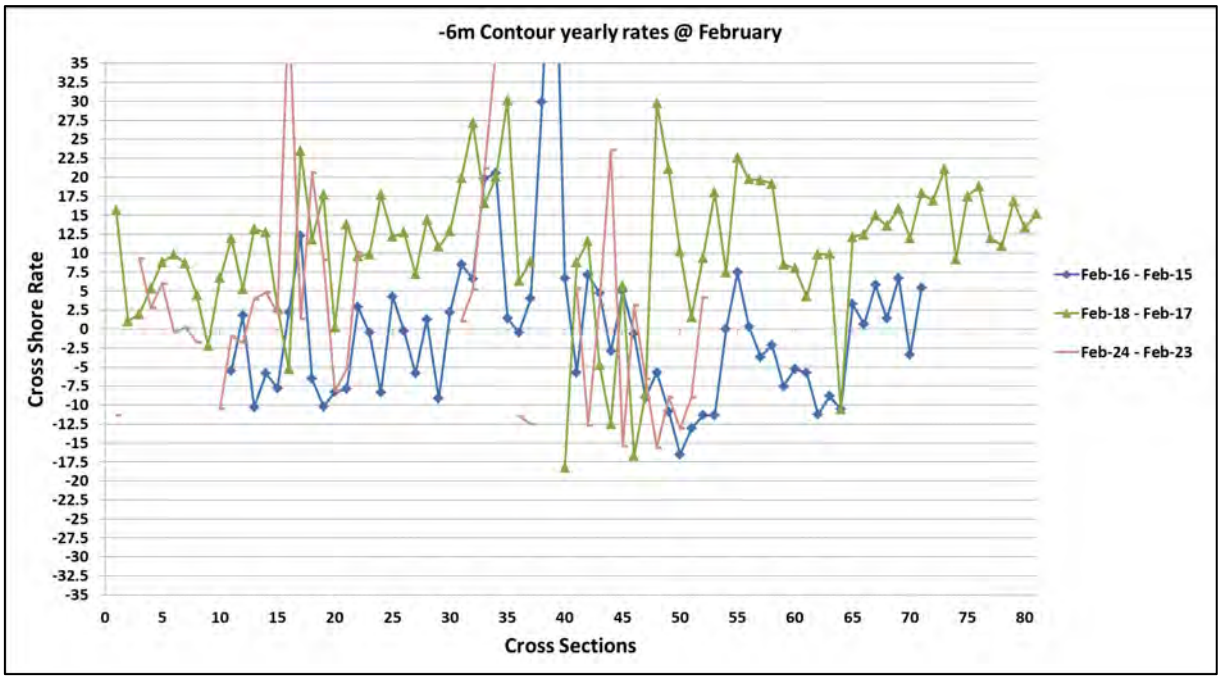


Figure 2-158 Alongshore comparison of (-) 6m contour yearly rates during February

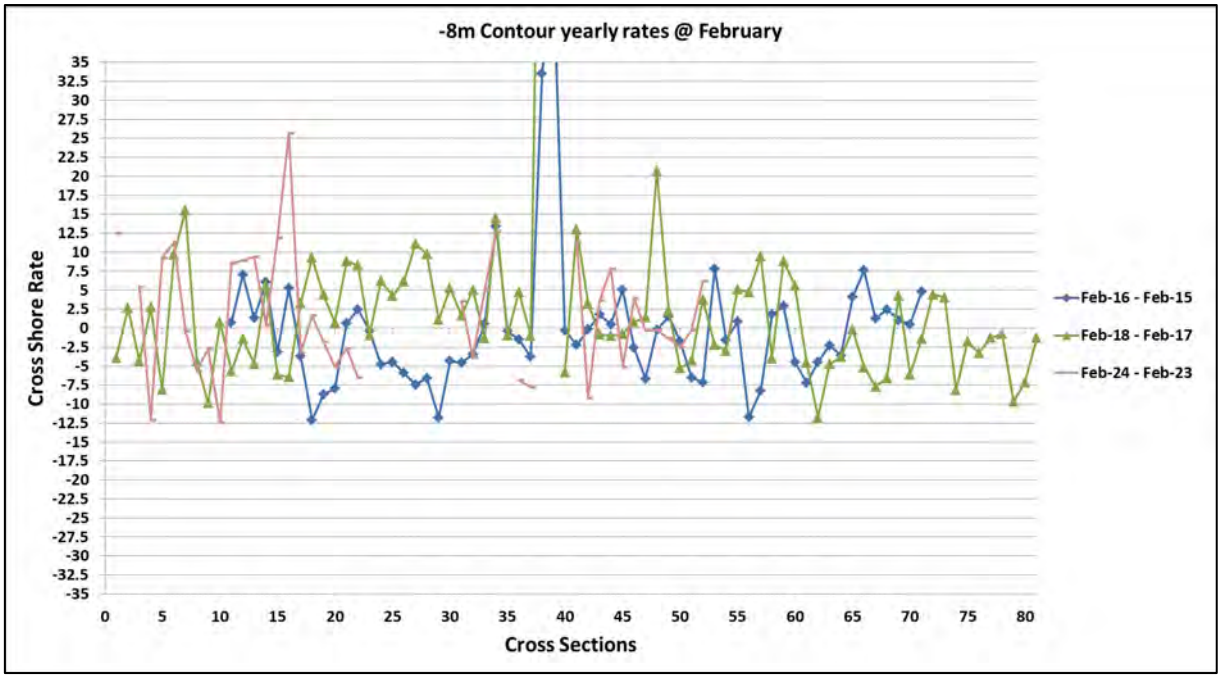


Figure 2-159 Alongshore comparison of (-) 8m contour yearly rates during February

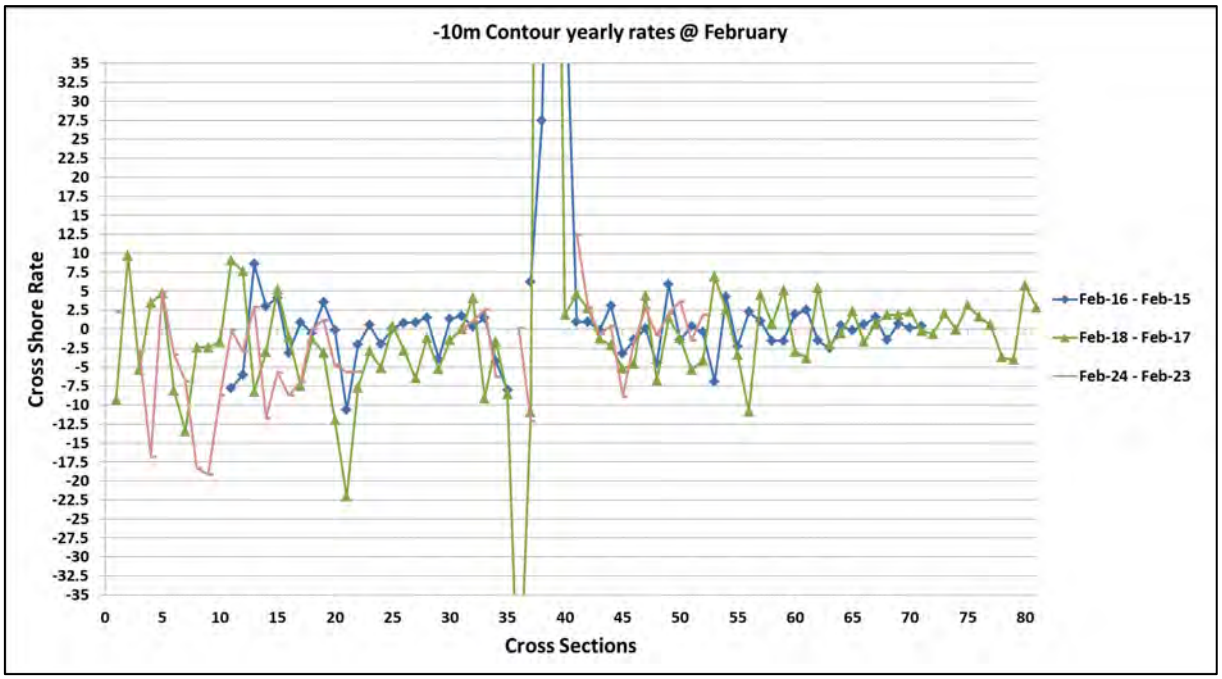


Figure 2-160 Alongshore comparison of (-) 10m contour yearly rates during February

2.6.6 Assessment of depth of closure

The term depth of closure, hereafter DoC, is a fundamental concept used to define the most landward depth of seaward beyond which there is no significant change in bottom elevation and no significant net sediment exchange between nearshore and offshore for a given time interval. The references to this study were taken from publications such as “Morang A., Birkemeier W.A. (2005) Depth of Closure on Sandy Coasts. In: Schwartz M.L. (eds) Encyclopedia of Coastal Science. Encyclopedia of Earth Science Series. Springer, Dordrecht.”

To assess the DoC, the surveyed profiles at a particular location were averaged and standard deviation of profile was derived using statistics. Standard deviation is a measure of the degree of dispersion of points from its mean i.e. lower the dispersion better is the convergence. However, expectation of zero-meter dispersion from its mean may not be realistic approach because there can be chances of survey related errors. Therefore, threshold of 0.3m deviation from its mean was considered as reasonable limit. Another reason for a threshold value of 0.3m is that the survey errors are in the range on 0.3-0.4m and therefore any deviations below this range may confuse between actual change and survey error.

The average profile and the standard deviation of depths were plotted as function of the offshore distance as shown in Figure 2-161 to Figure 2-169. The respective DoCs are shown in plots with dash lines and their intersection points are also shown.

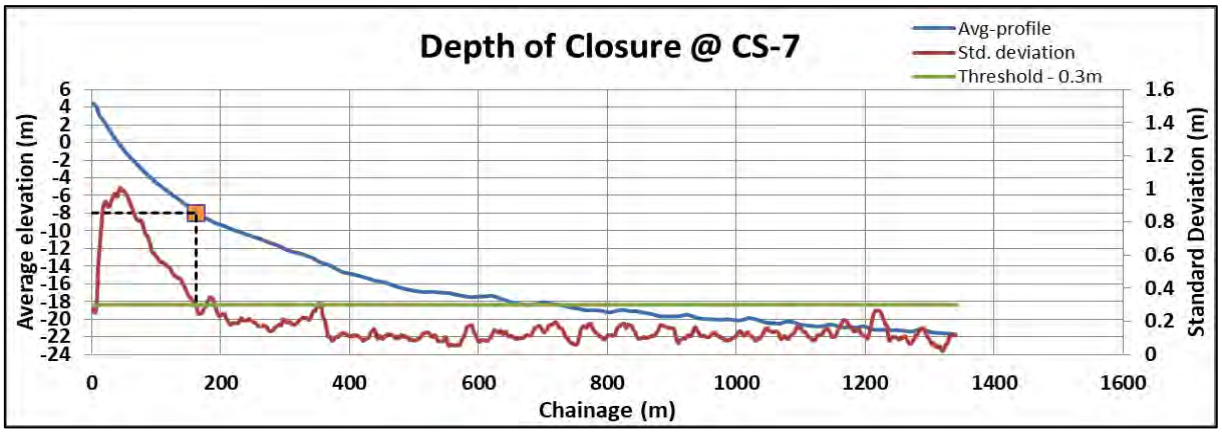


Figure 2-161 Depth of closure at Neerody location (CS 7)

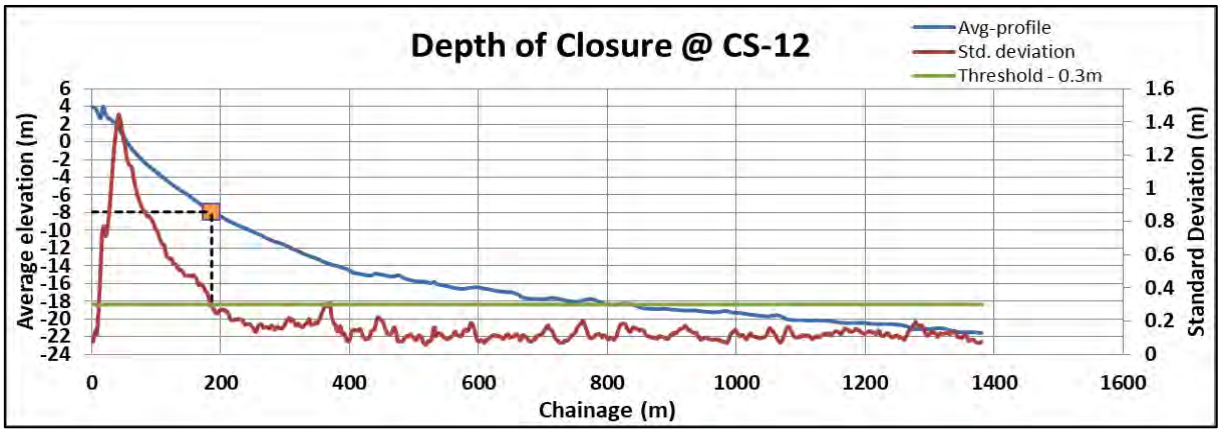


Figure 2-162 Depth of closure at Pozhiyoor location (CS 12)

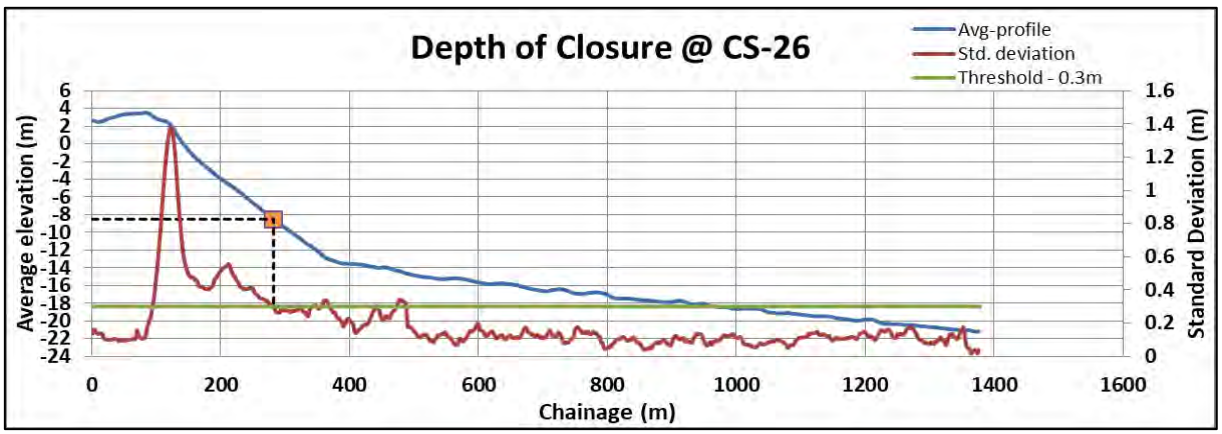


Figure 2-163 Depth of closure at Karumkulam location (CS 26)

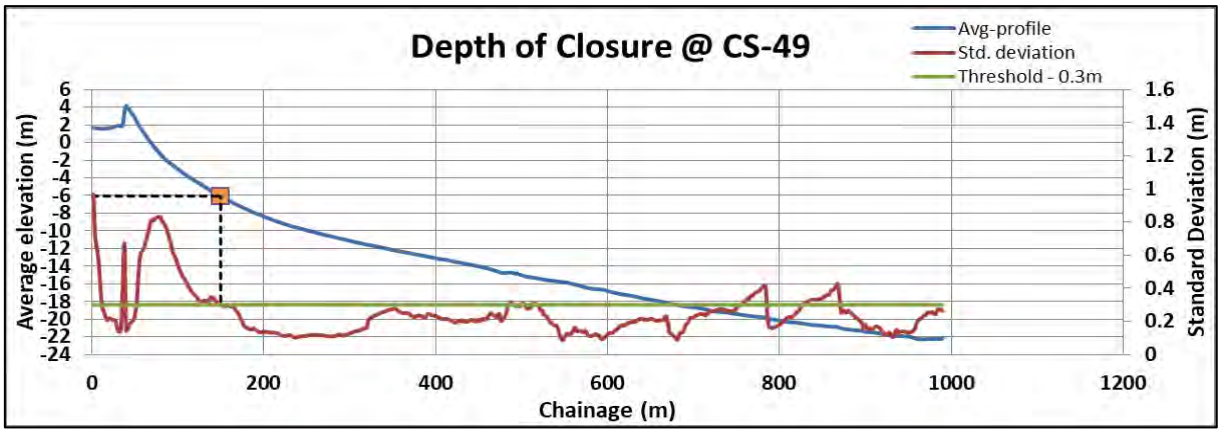


Figure 2-164 Depth of closure at Panathura location (CS 49)

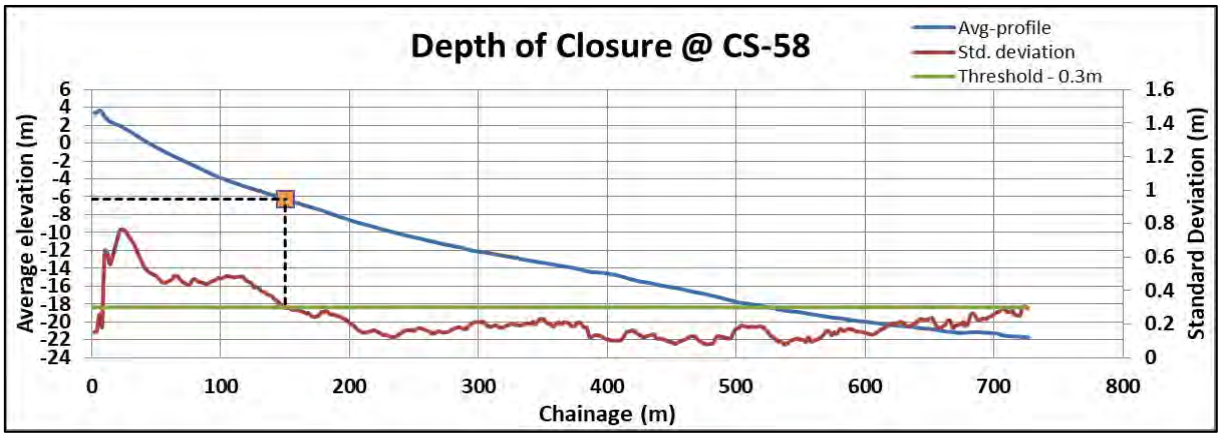


Figure 2-165 Depth of closure at Beemapally location (CS 58)

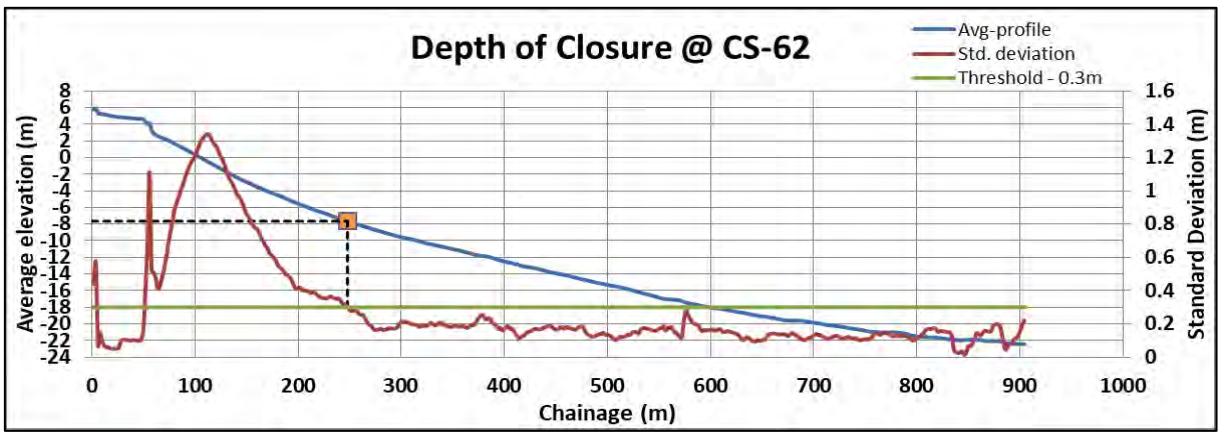


Figure 2-166 Depth of closure at Cheriyathura location (CS 62)

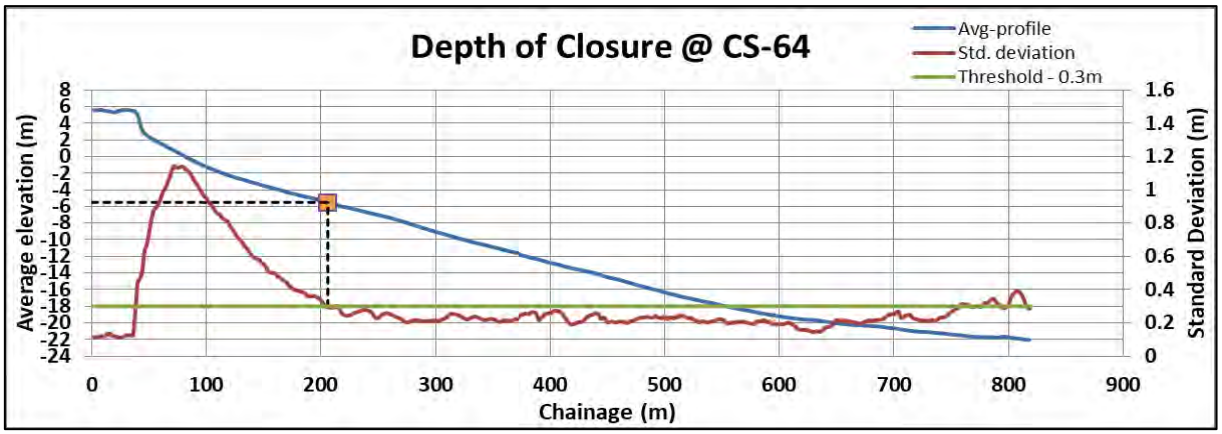


Figure 2-167 Depth of closure at Valiyathura location (CS 64)

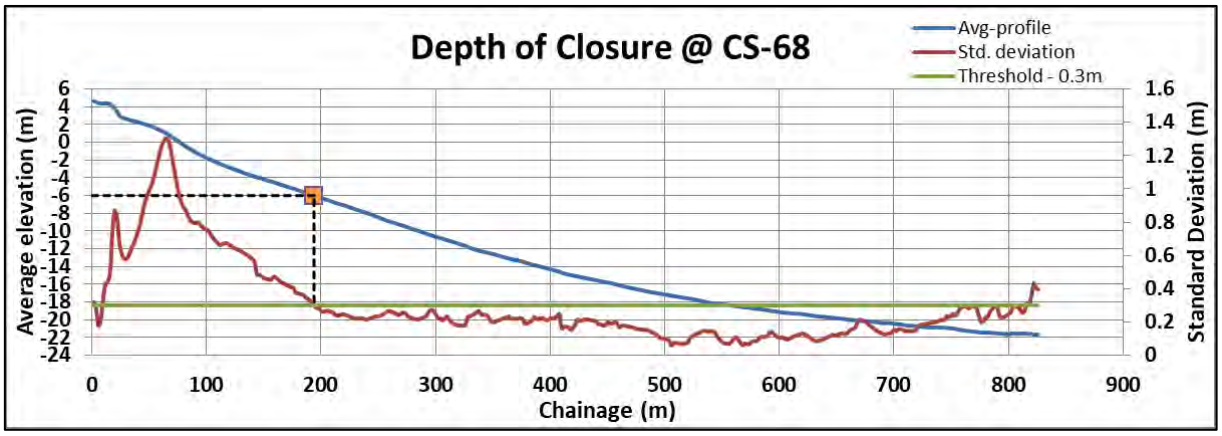


Figure 2-168 Depth of closure at Shangumugham location (CS 68)

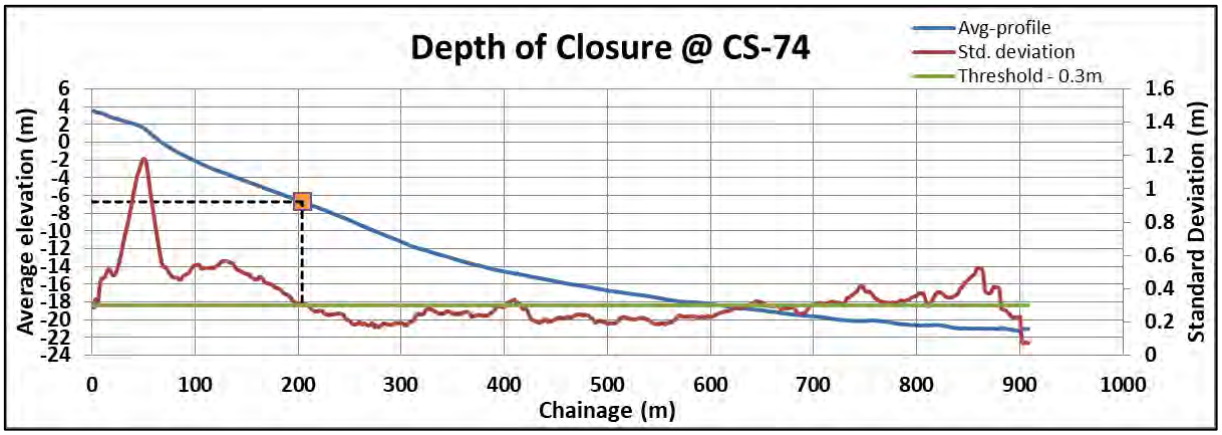


Figure 2-169 Depth of closure at Vettucaud location (CS 74)

2.7 Littoral environment observation

Littoral environment observation (LEO) data was provided by AVPPL at 81 locations. These locations were same as the cross-shore profile locations. In this type of survey, observers obtain monthly visual observations of coastal variables such as current speed, current direction, breaker angle, wave height, wave period and surf zone width.

Analysis was done for the period of February 2015 to September 2024. The focus was given to alongshore current behaviour over the months. Some of the observations are shown in Figure 2-170 to Figure 2-200.

Legend of Leo observation charts

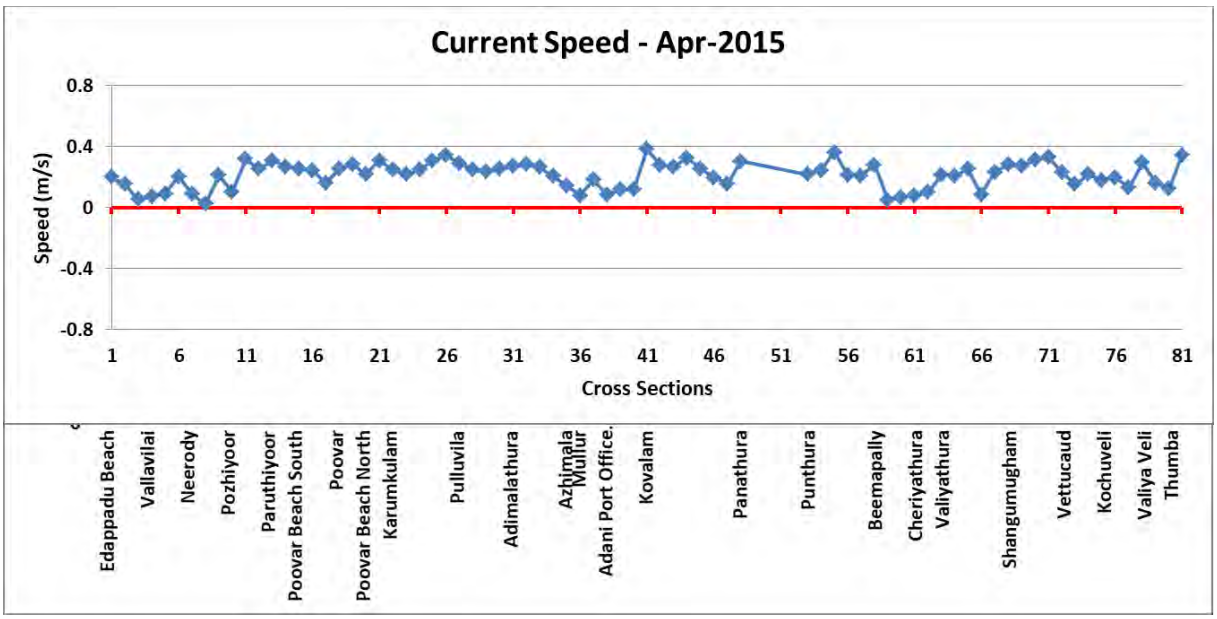


Figure 2-170 Alongshore current speed during April 2015

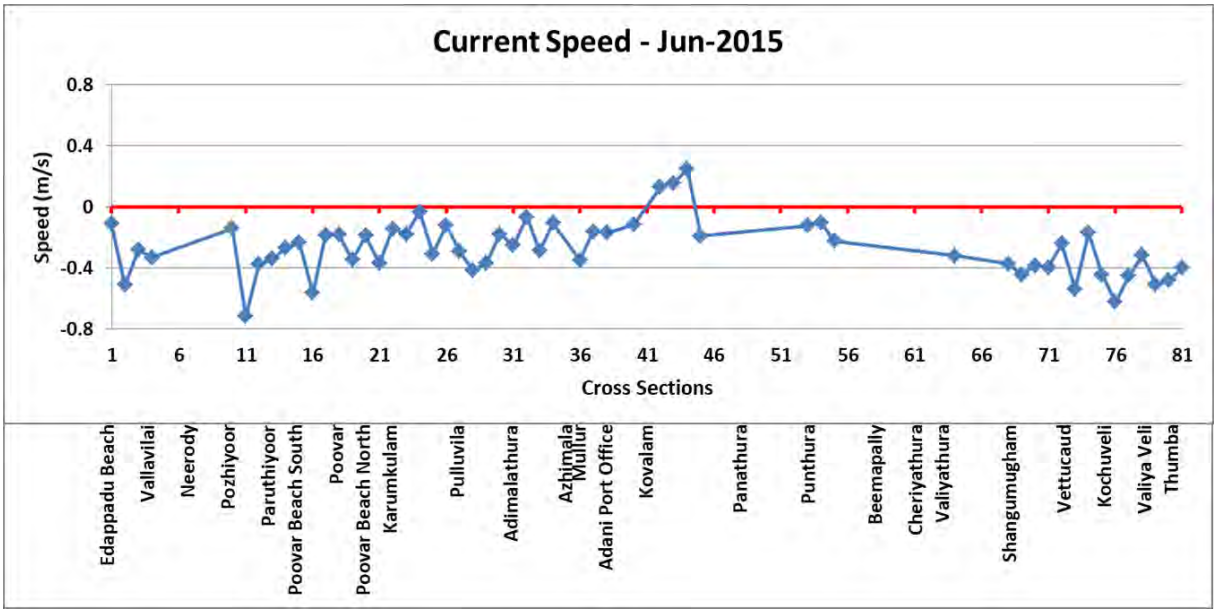


Figure 2-171 Alongshore current speed during June 2015

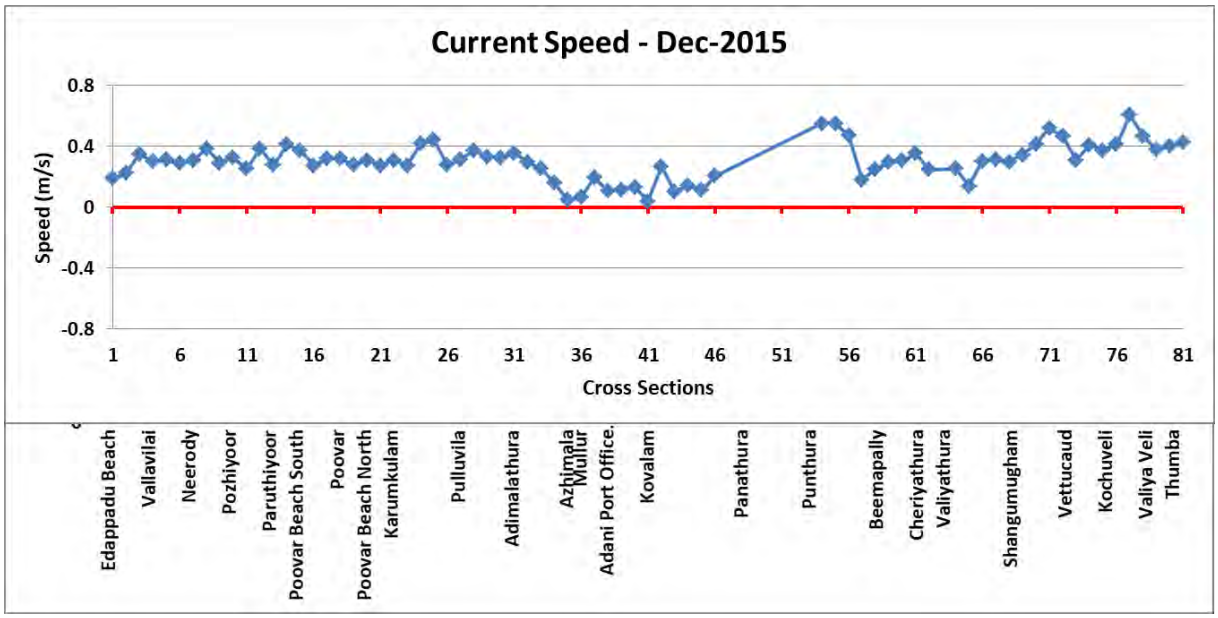


Figure 2-172 Alongshore current speed during December 2015

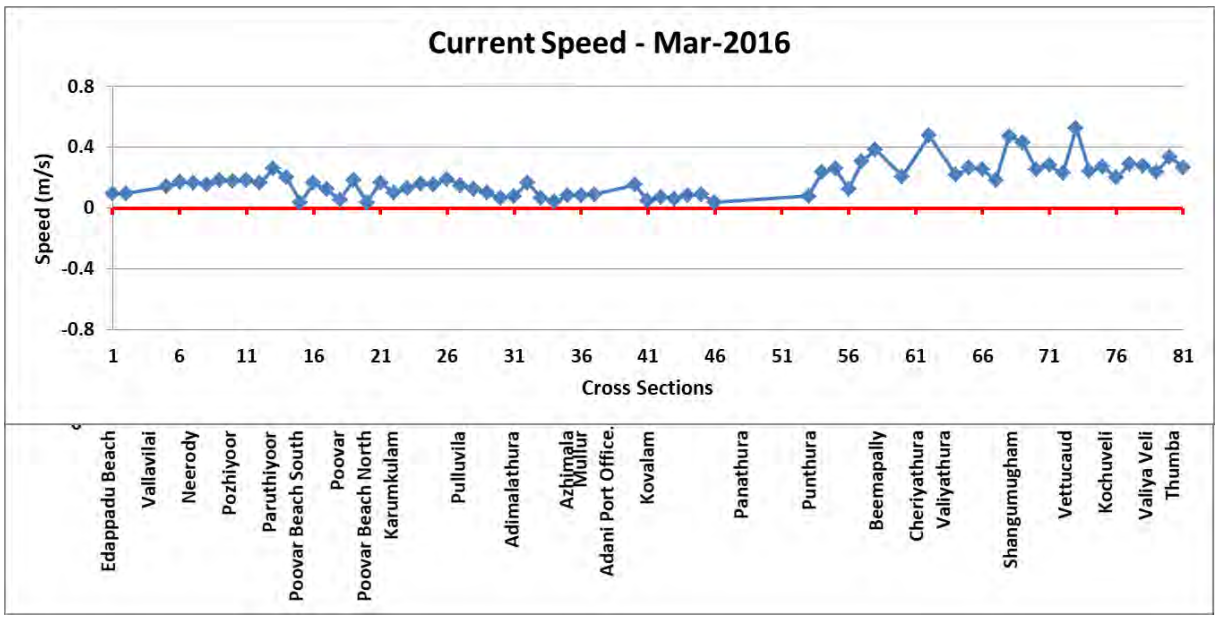


Figure 2-173 Alongshore current speed during March 2016

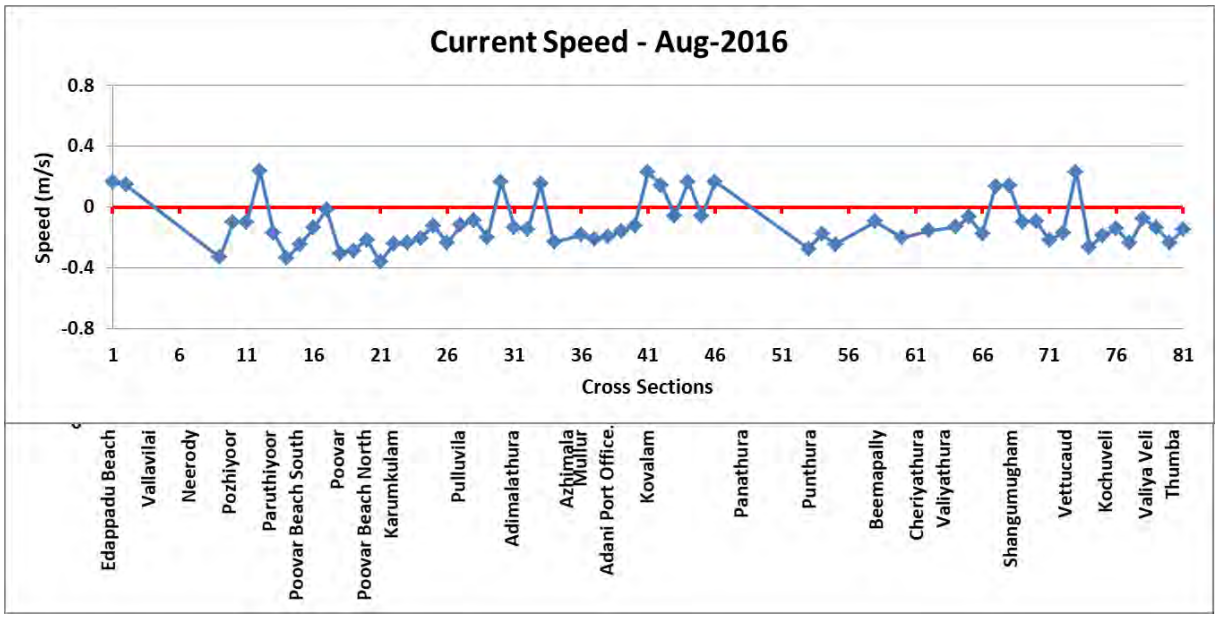


Figure 2-174 Alongshore current speed during August 2016

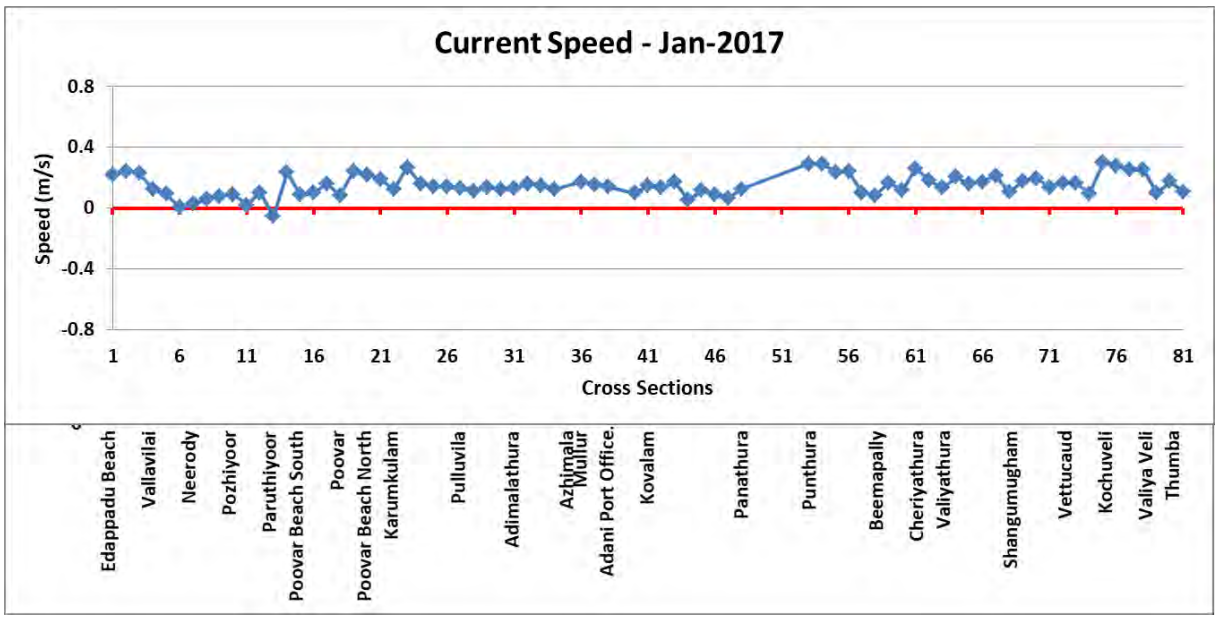


Figure 2-175 Alongshore current speed during January 2017

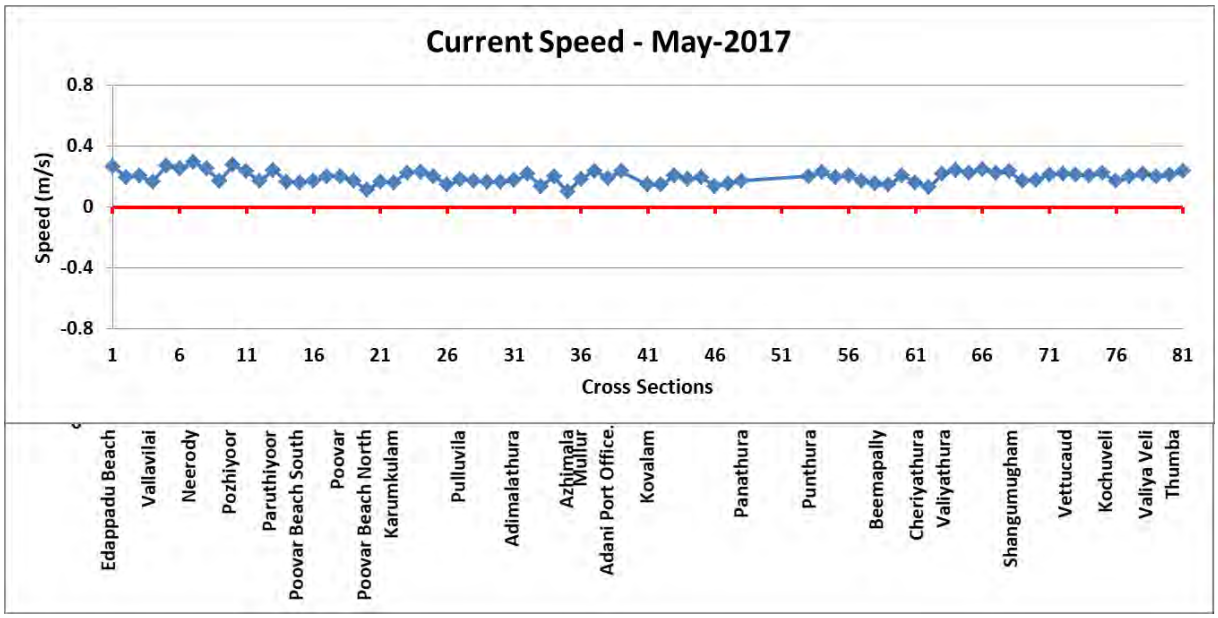


Figure 2-176 Alongshore current speed during May 2017

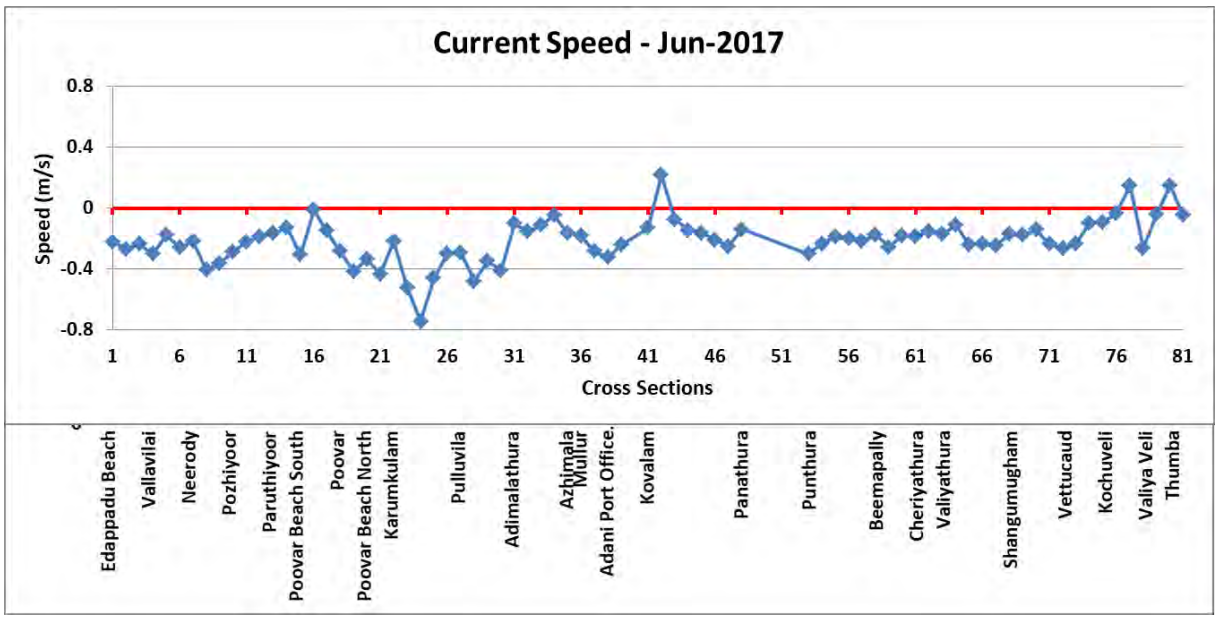


Figure 2-177 Alongshore current speed during June 2017

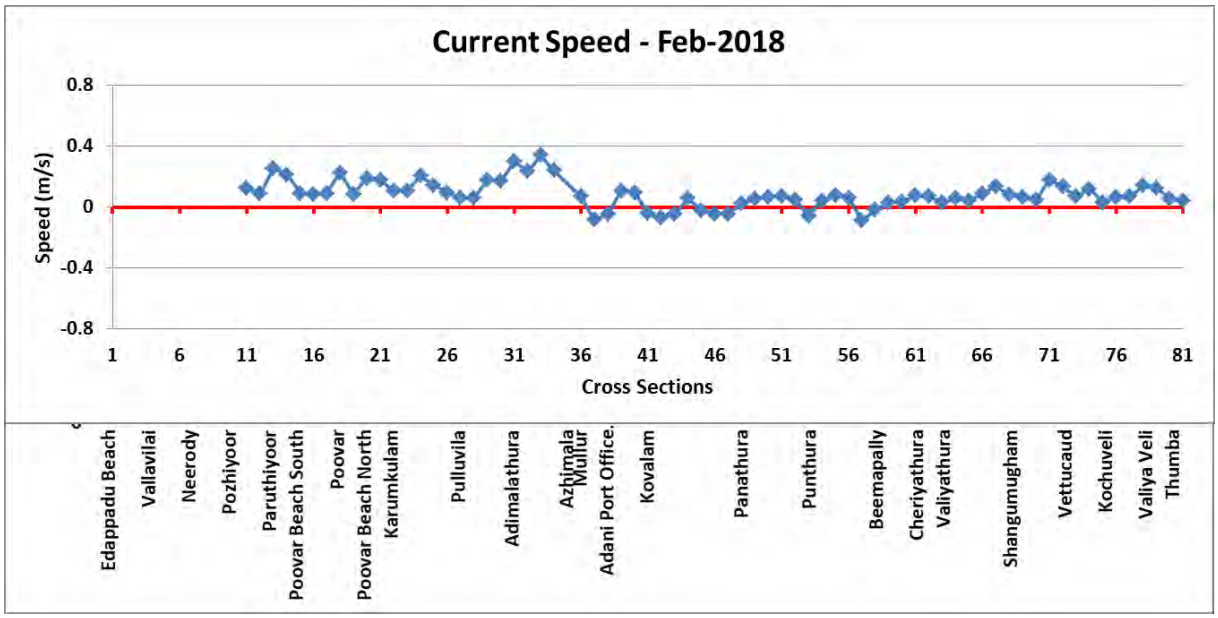


Figure 2-178 Alongshore current speed during February 2018

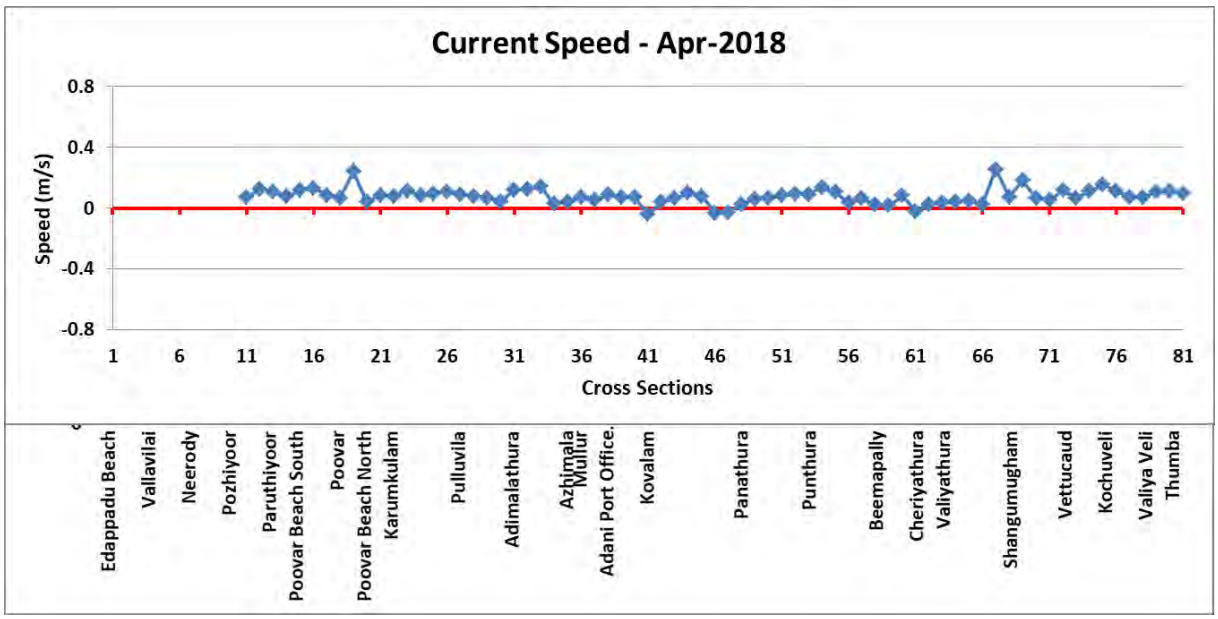


Figure 2-179 Alongshore current speed during April 2018

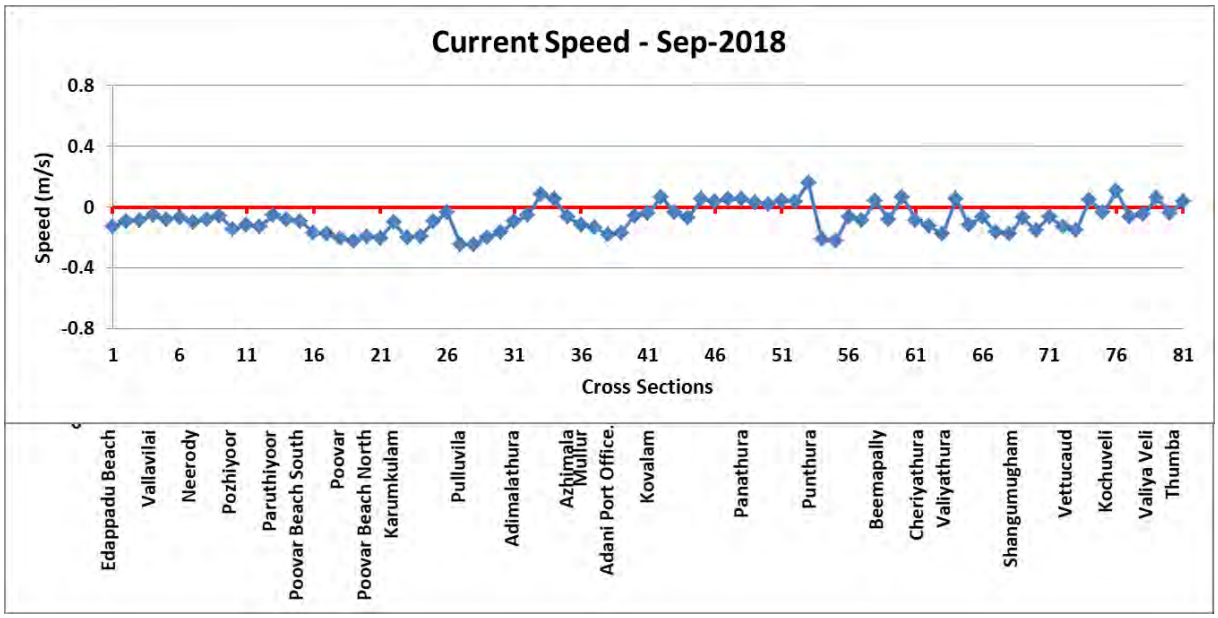


Figure 2-180 Alongshore current speed during September 2018

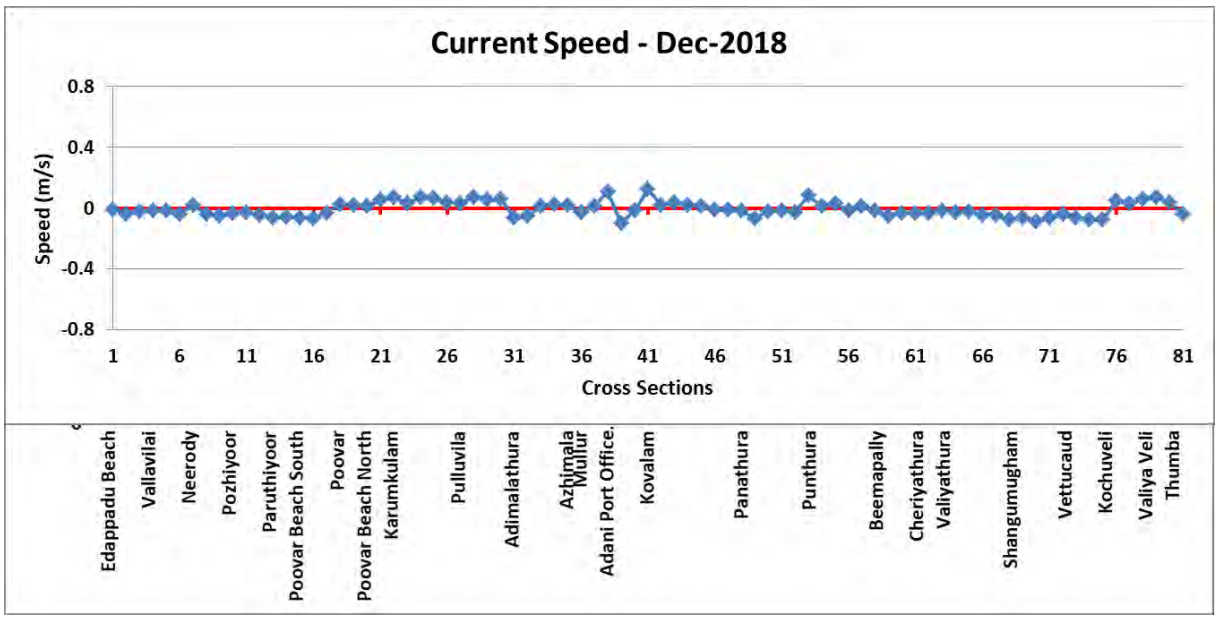


Figure 2-181 Alongshore current speed during December 2018

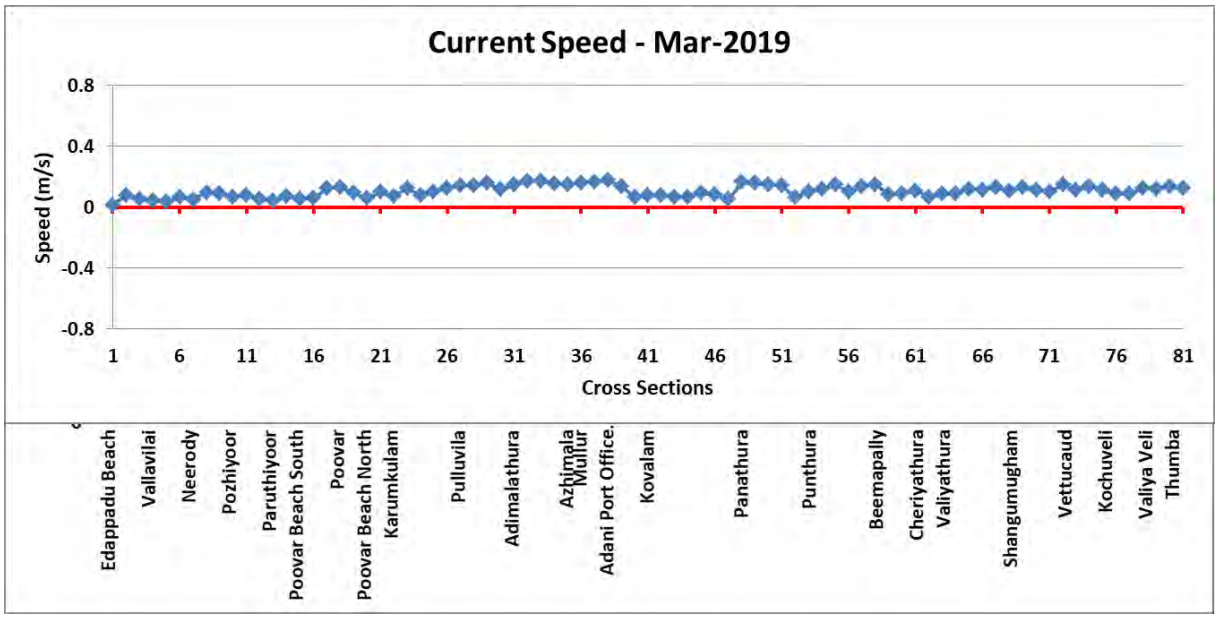


Figure 2-182 Alongshore current speed during March 2019

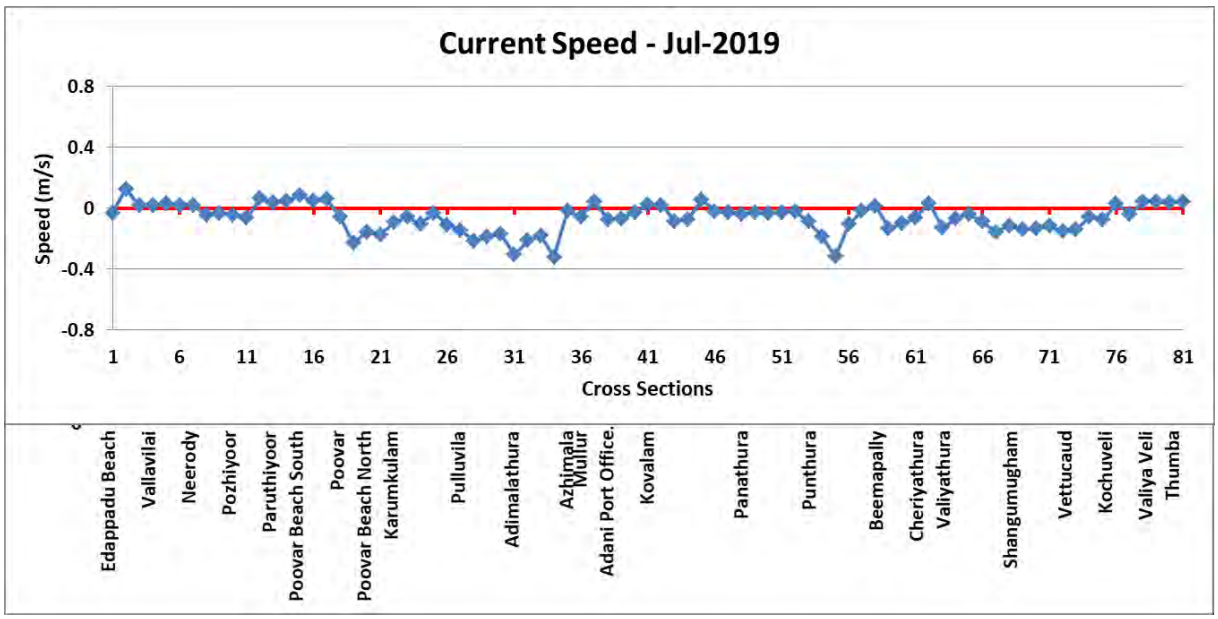


Figure 2-183 Alongshore current speed during July 2019

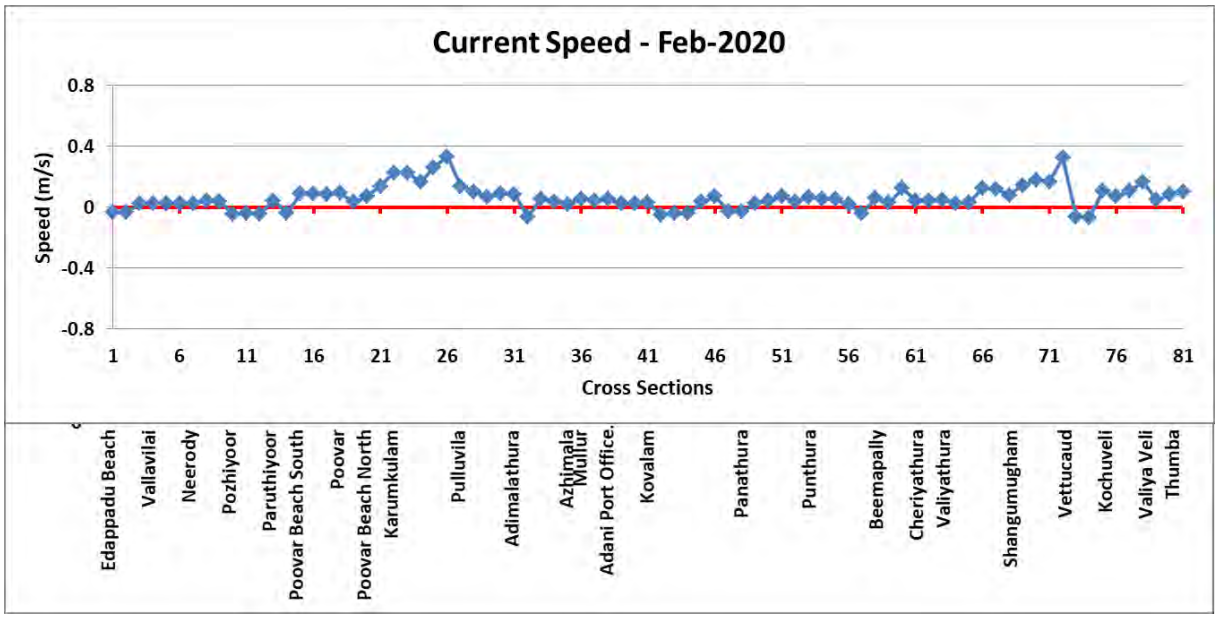


Figure 2-184 Alongshore current speed during February 2020

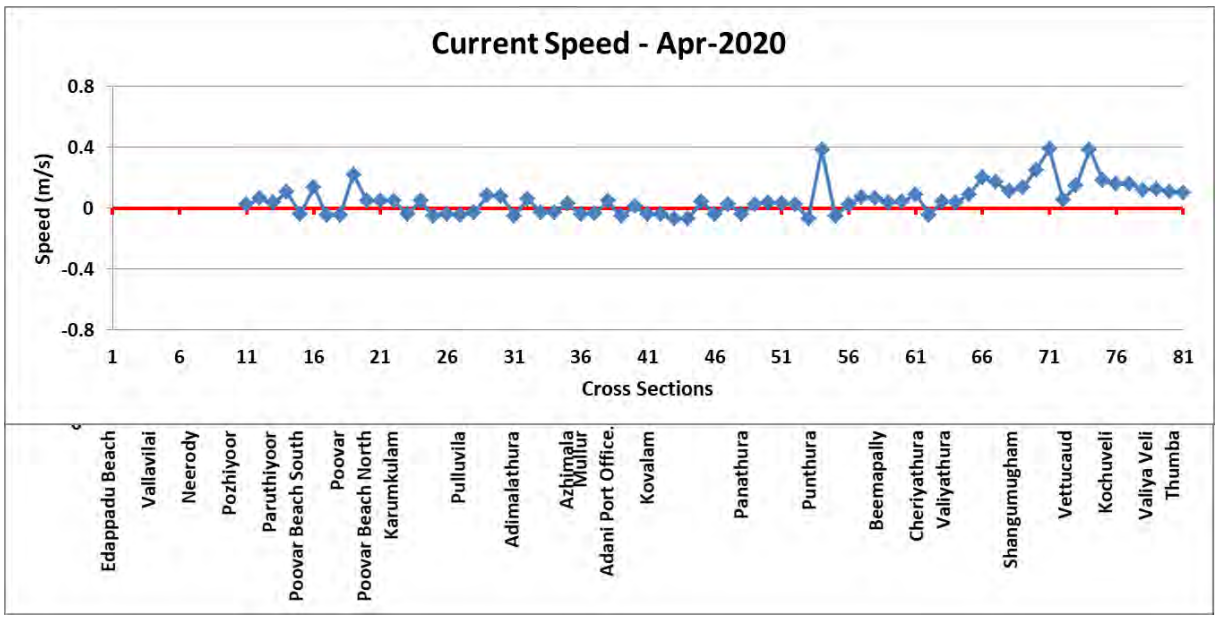


Figure 2-185 Alongshore current speed during April 2020

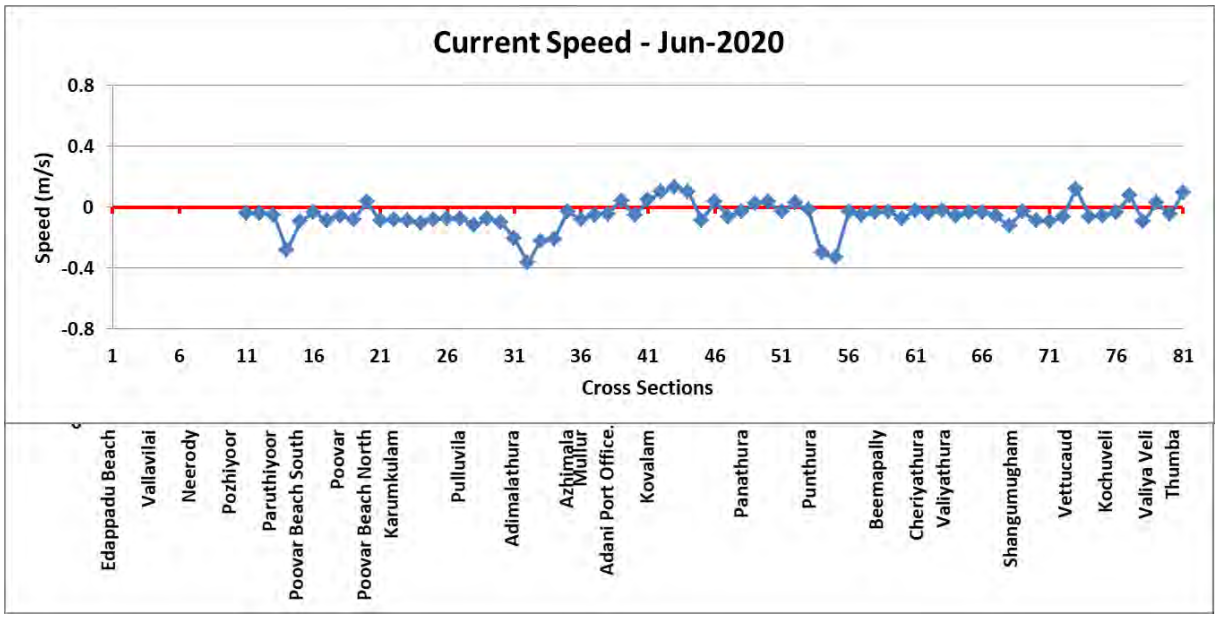


Figure 2-186 Alongshore current speed during June 2020

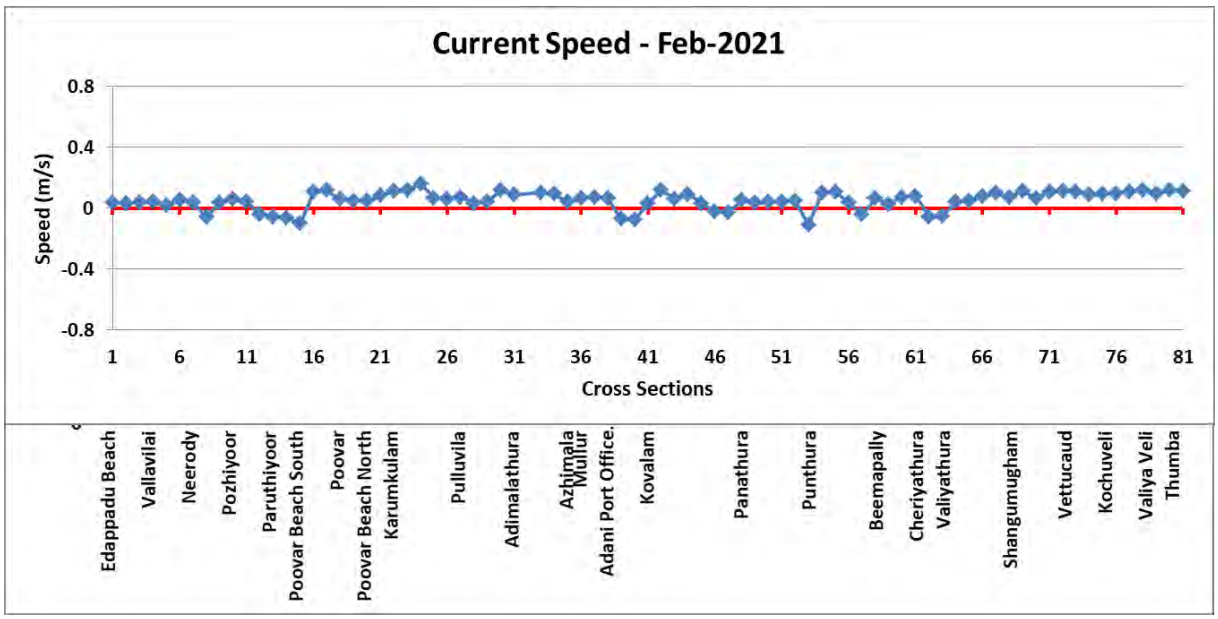


Figure 2-187 Alongshore current speed during February 2021

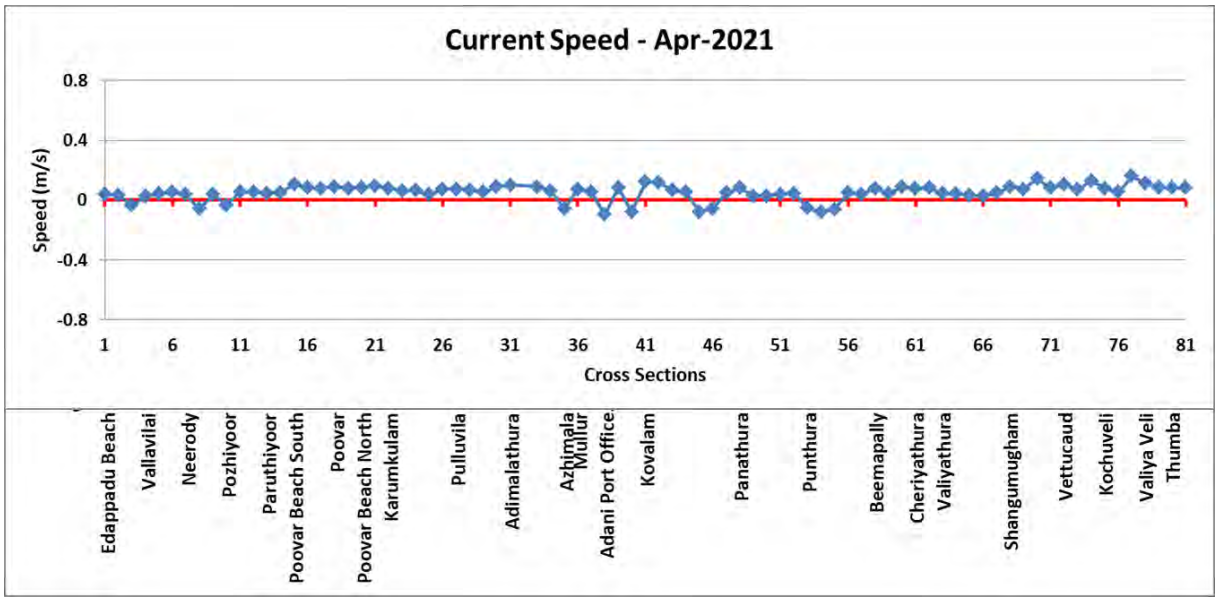


Figure 2-188 Alongshore current speed during April 2021

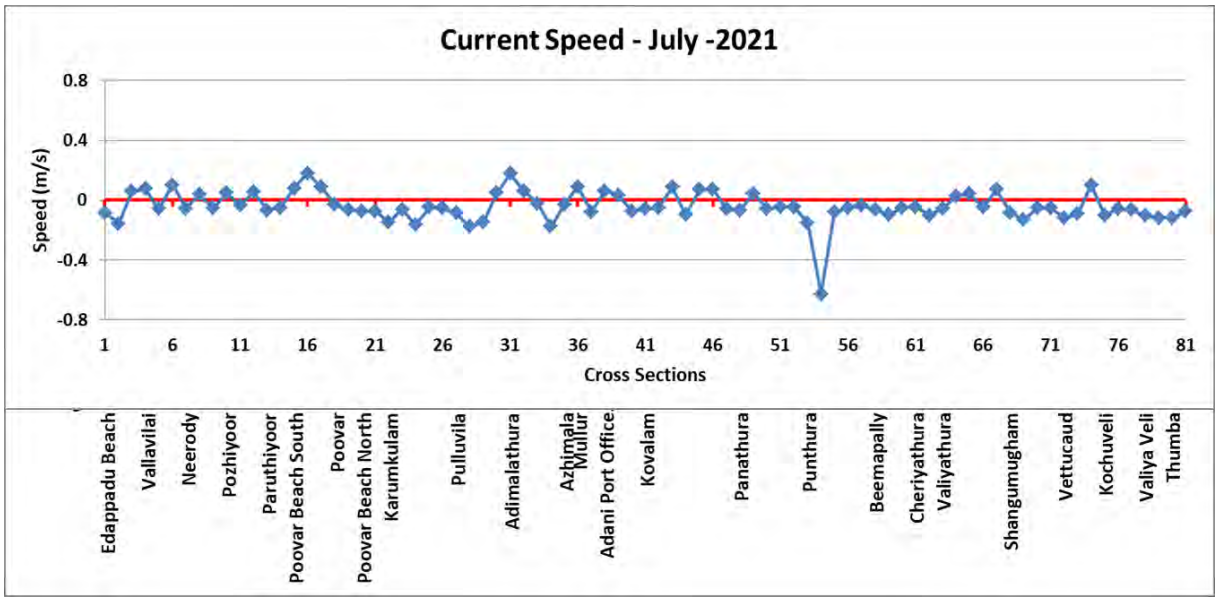


Figure 2-189 Alongshore current speed during July 2021

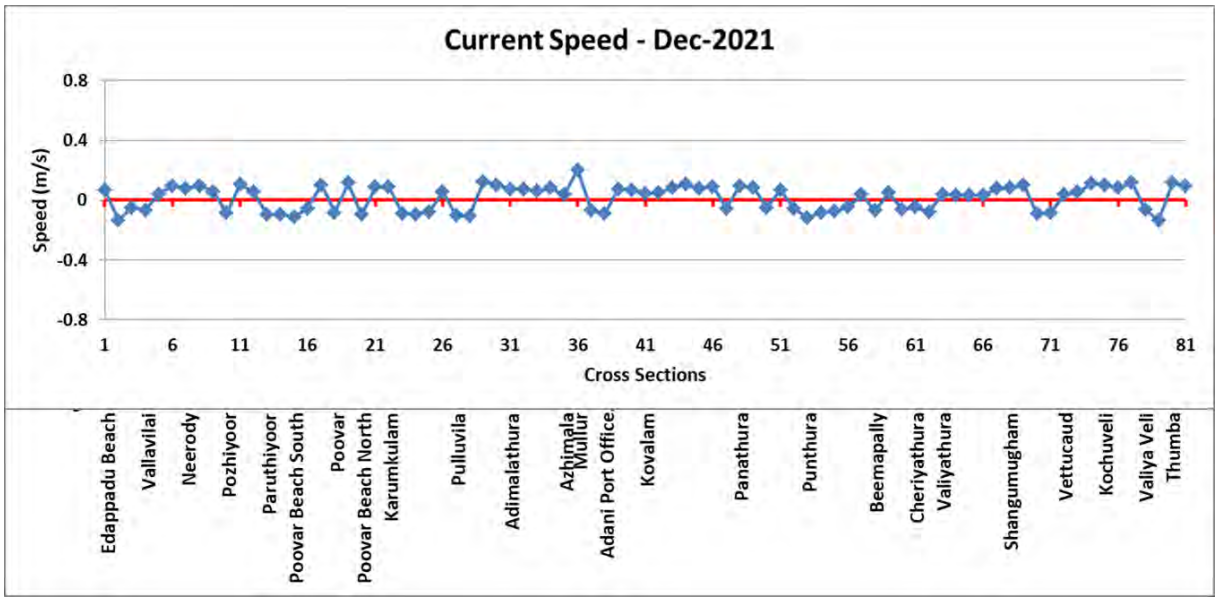


Figure 2-190 Alongshore current speed during December 2021

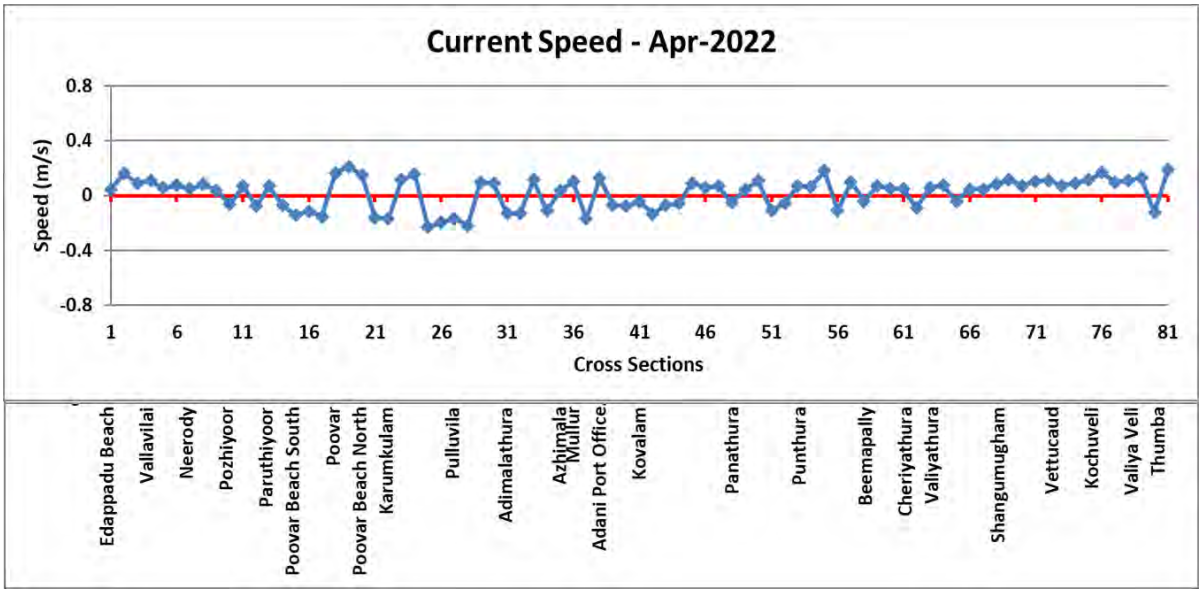


Figure 2-191 Alongshore current speed during April 2022

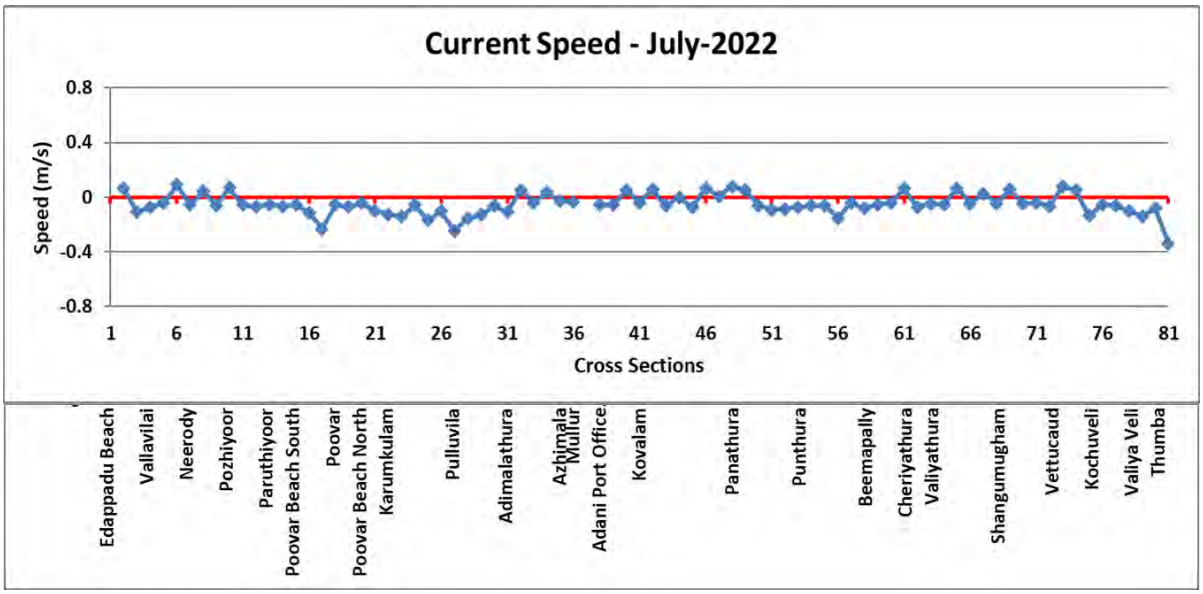


Figure 2-192 Alongshore current speed during July 2022

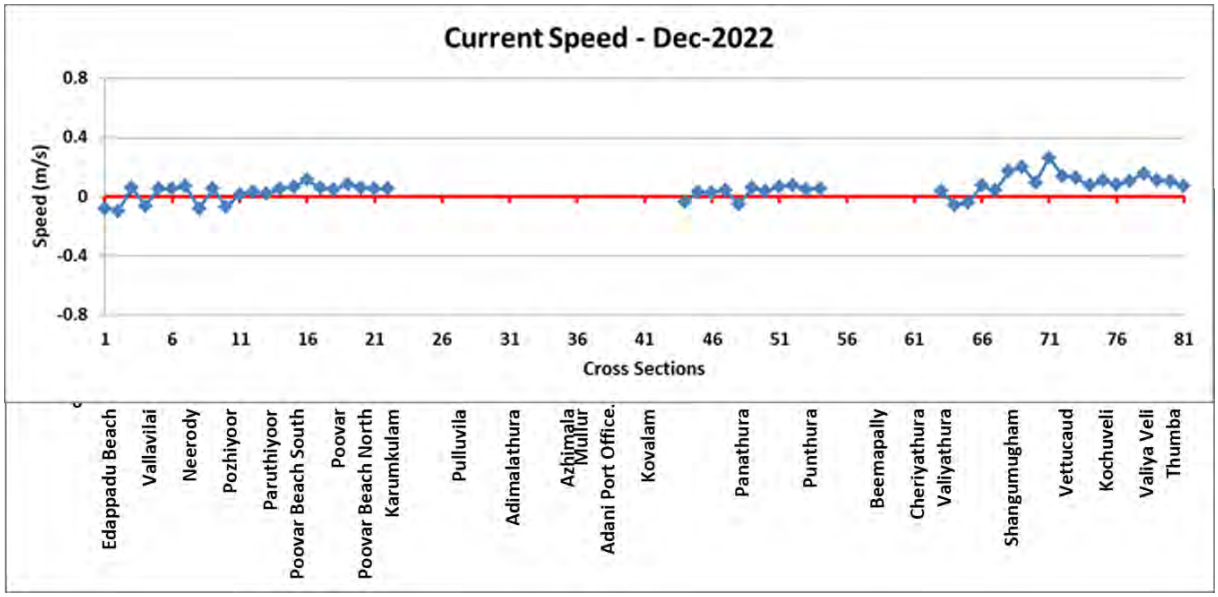


Figure 2-193 Alongshore current speed during December 2022

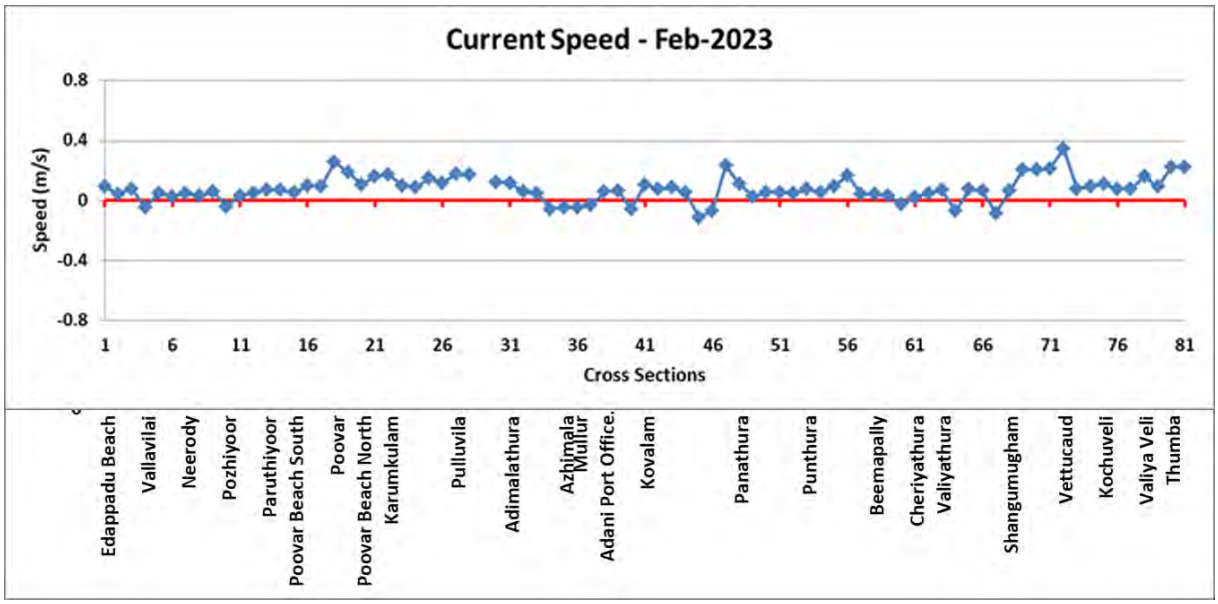


Figure 2-194 Alongshore current speed during February 2023

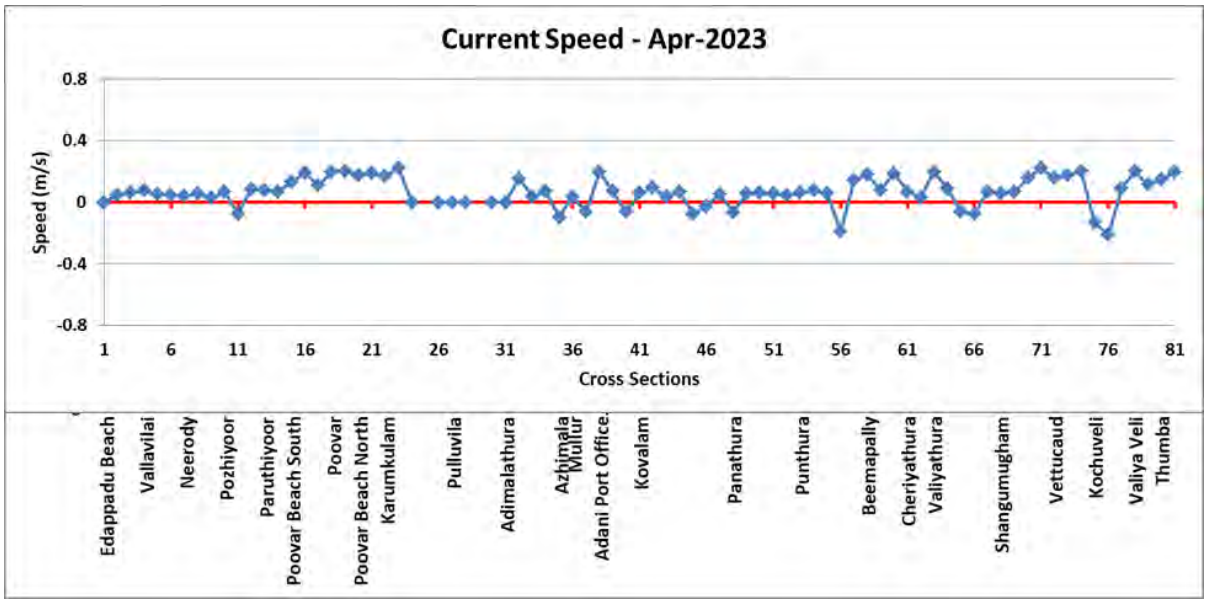


Figure 2-195 Alongshore current speed during April 2023

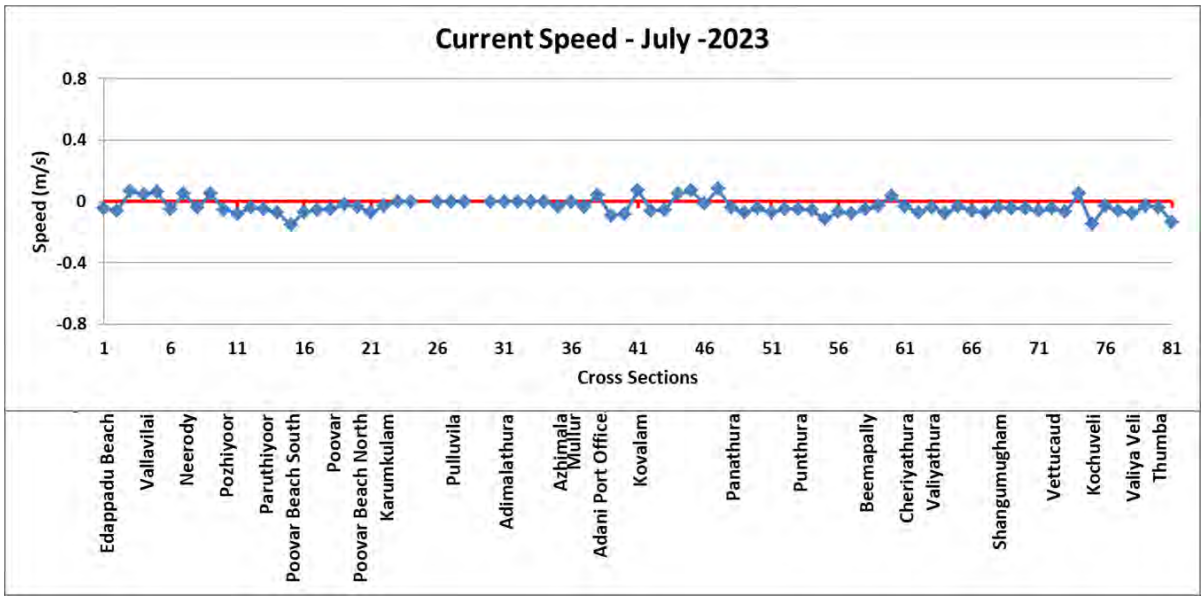


Figure 2-196 Alongshore current speed during July 2023

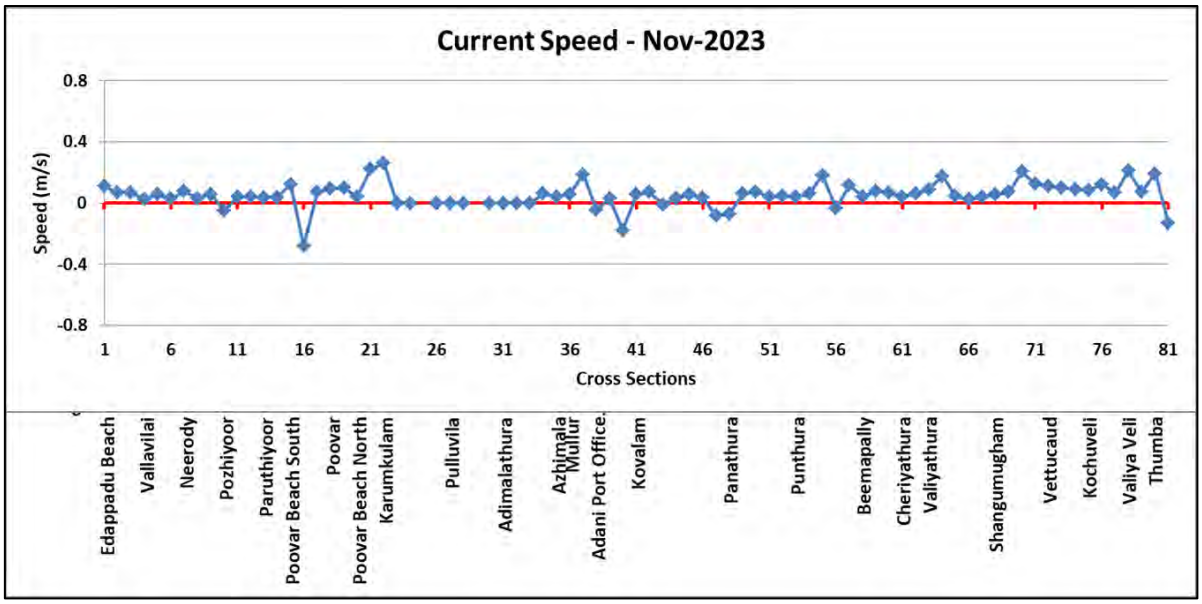


Figure 2-197 Alongshore current speed during November 2023

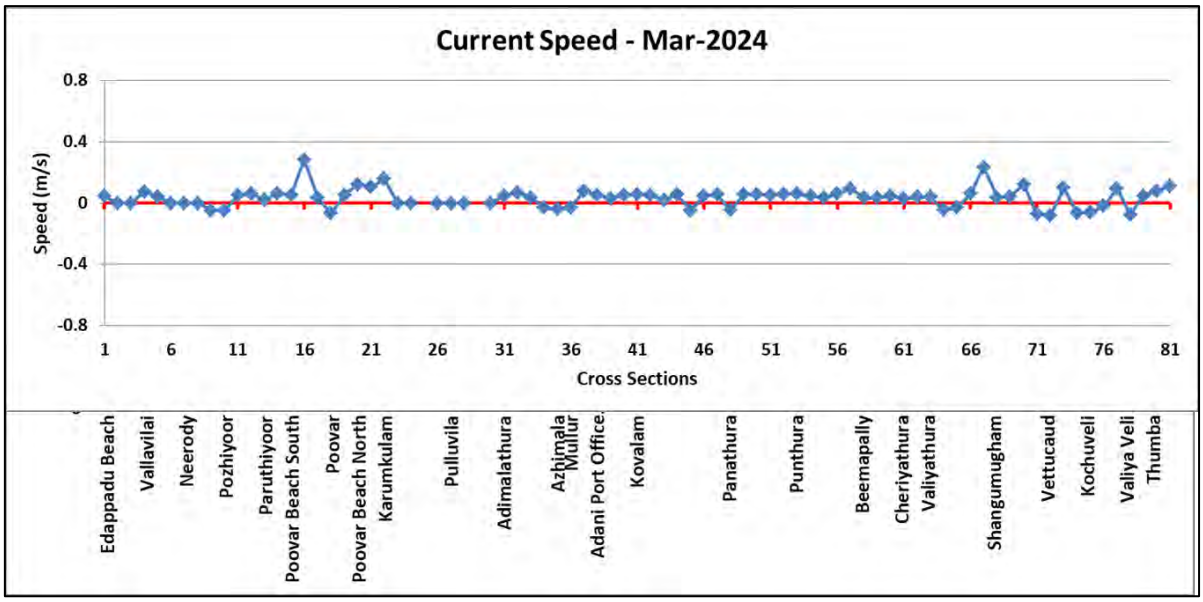


Figure 2-198 Alongshore current speed during March 2024

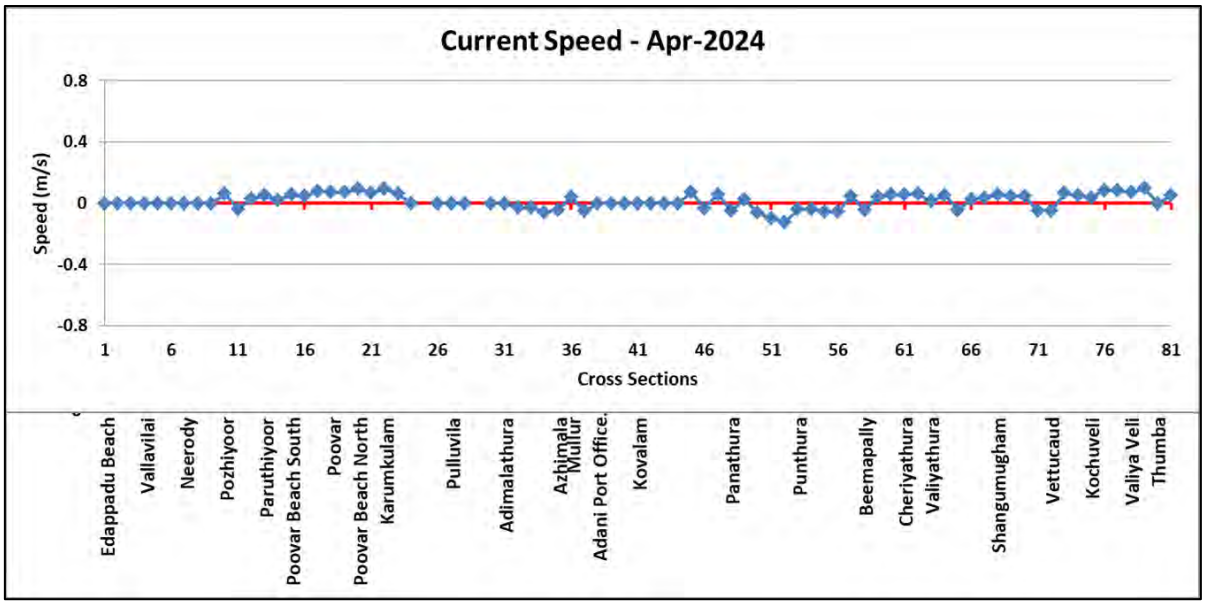


Figure 2-199 Alongshore current speed during April 2024

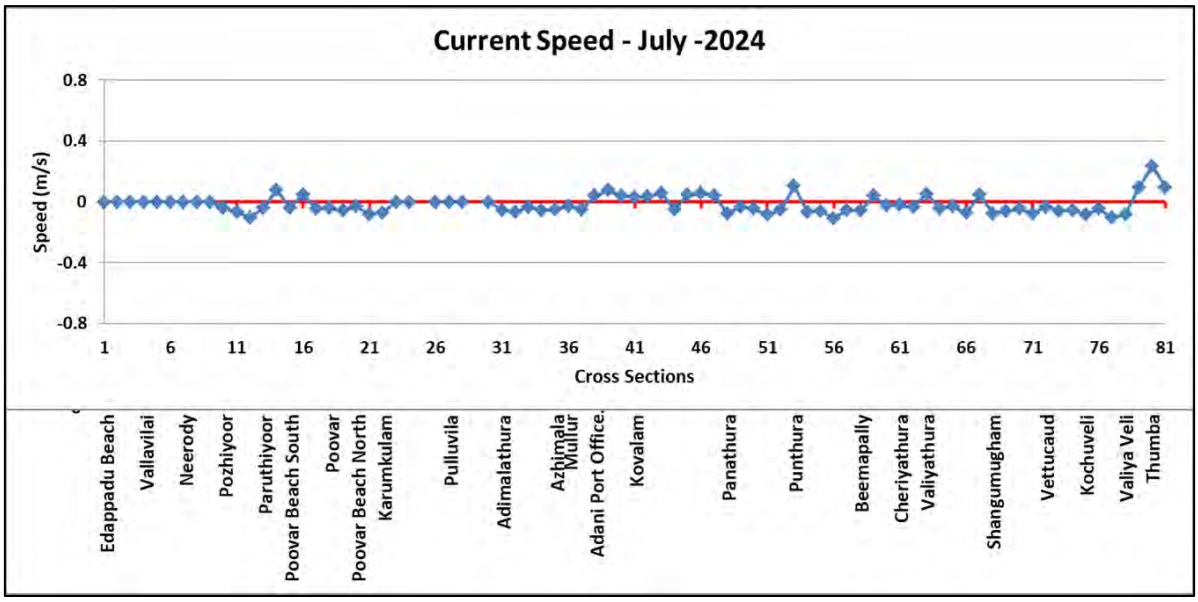


Figure 2-200 Alongshore current speed during July 2024

Figure 2-201 Sign Convention of current speed

The sign convention of current speed is considered positive if an observer stands on the beach facing to sea, notices rightward movement and negative if the movement is leftwards to the same observer. A representation is shown in Figure 2-201.

General trend of current movement towards South is noticed during Monsoon and towards North during other seasons.

The time series for selected sections on North and South side of proposed port are shown from Figure 2-202 to Figure 2-239.

Legend of Leo observation plots at selected CSP

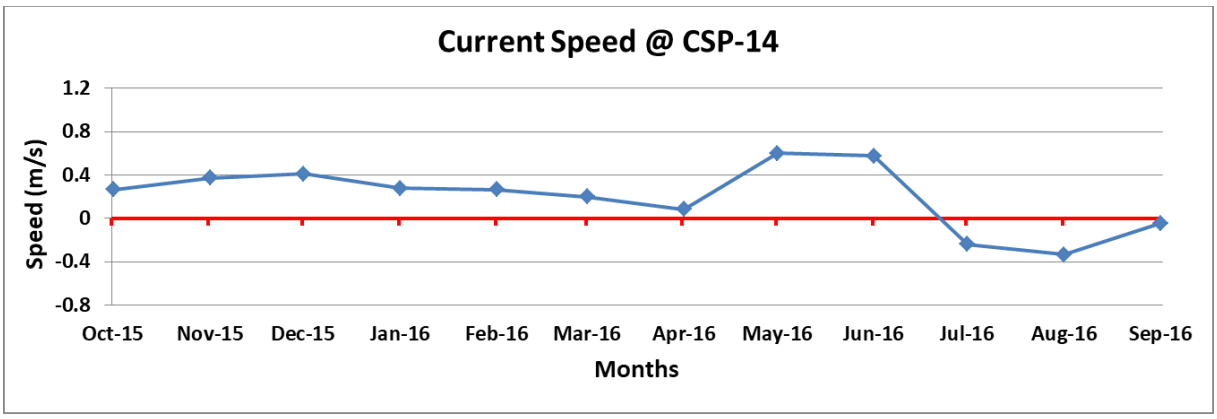


Figure 2-202 Time series of current speed at Paruthiyoor (October 2015 – September 2016)

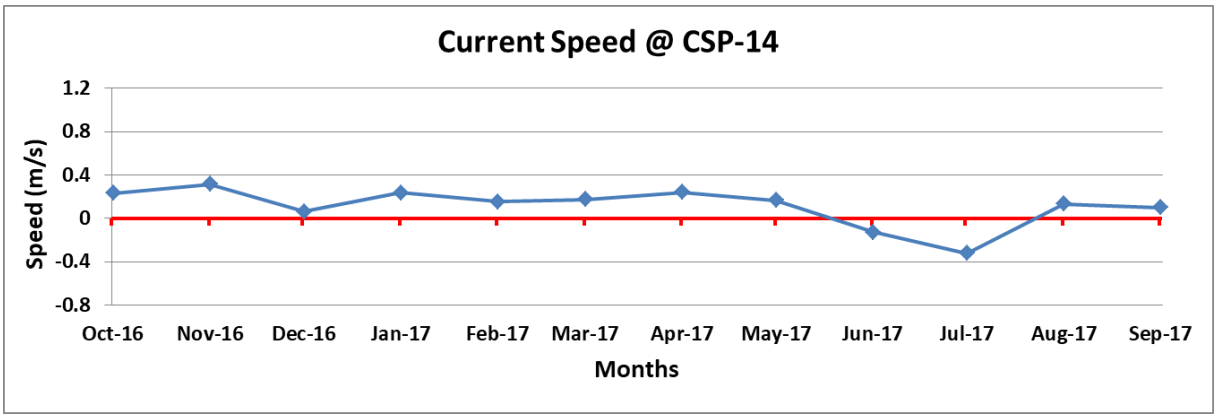


Figure 2-203 Time series of current speed at Paruthiyoor (October 2016 –September 2017)

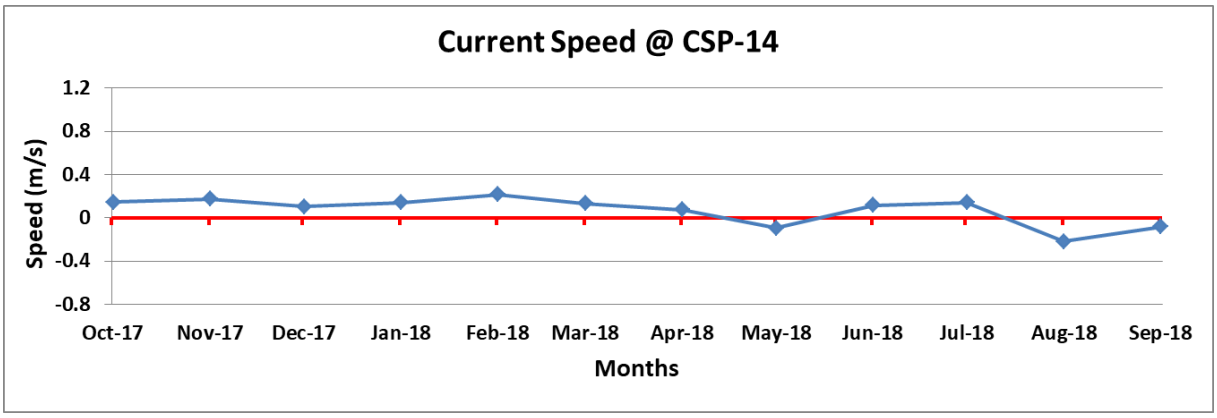


Figure 2-204 Time series of current speed at Paruthiyoor (October 2017 –September 2018)

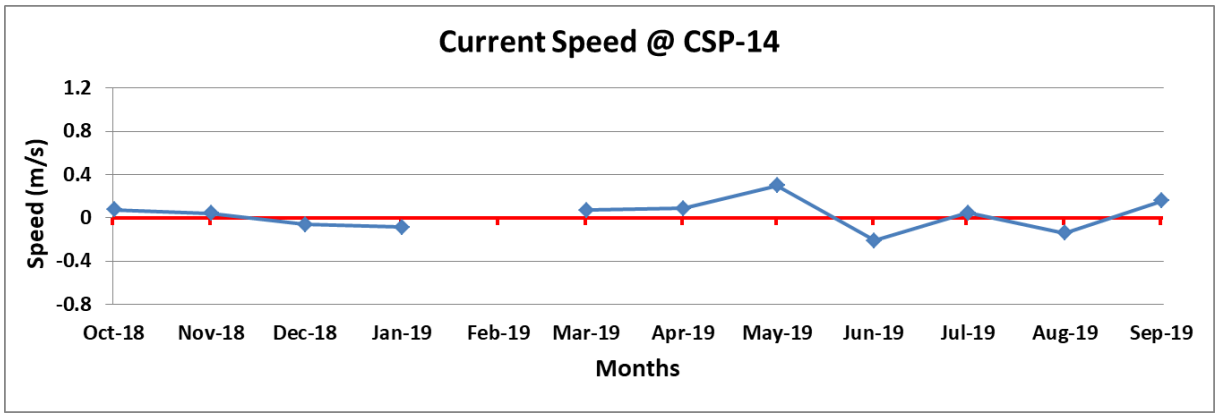


Figure 2-205 Time series of current speed at Paruthiyoor (October 2018 –September 2019)

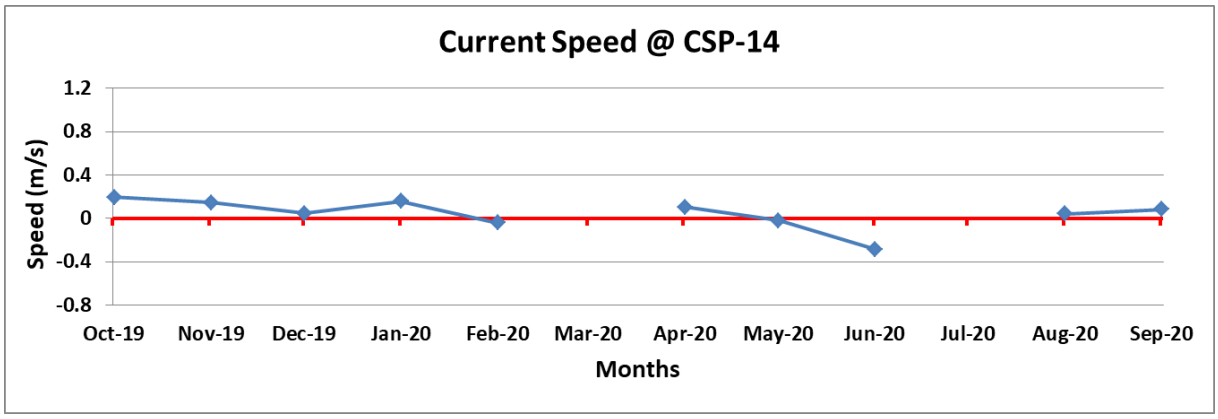


Figure 2-206 Time series of current speed at Paruthiyoor (October 2019 –September 2020)

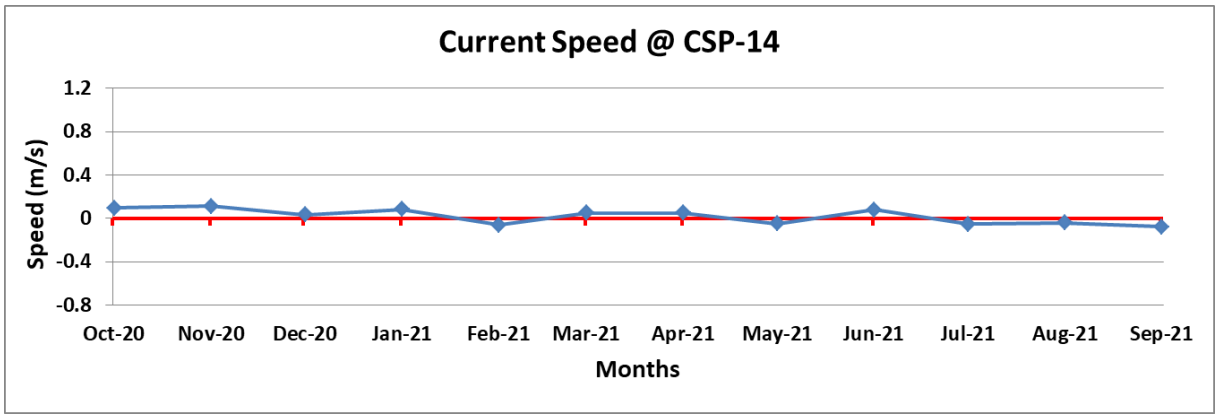


Figure 2-207 Time series of current speed at Paruthiyoor (October 2020 –September 2021)

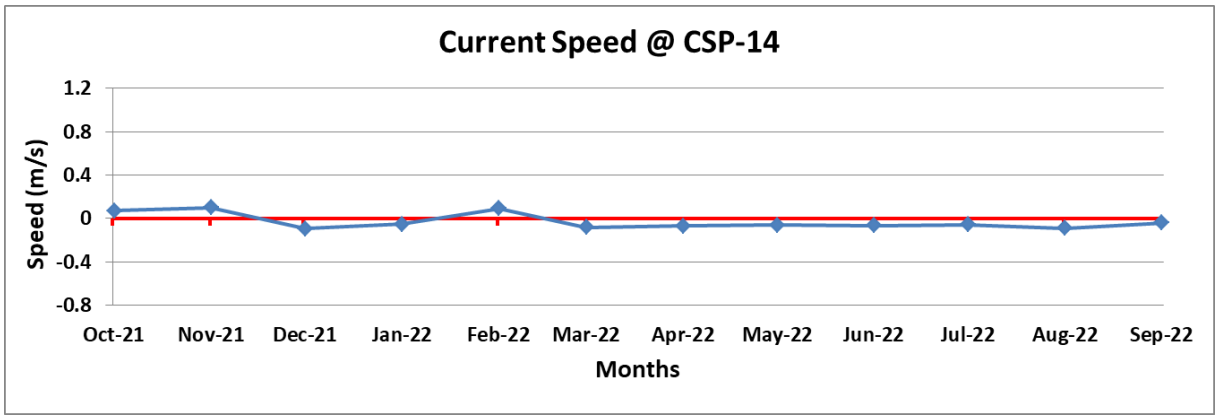


Figure 2-208 Time series of current speed at Paruthiyoor (October 2021 –September 2022)

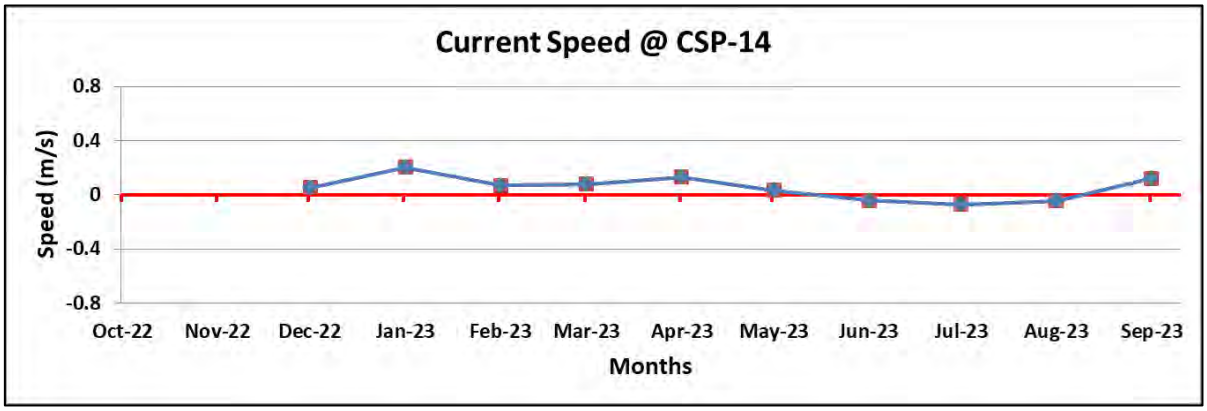


Figure 2-209 Time series of current speed at Paruthiyoor (October 2022 – September 2023)

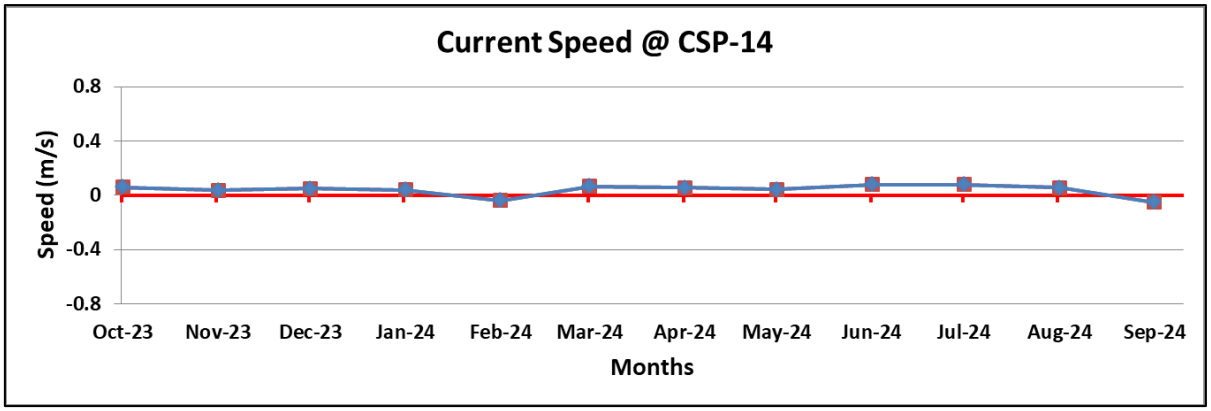


Figure 2-210 Time series of current speed at Paruthiyoor (October 2023 – September 2024)

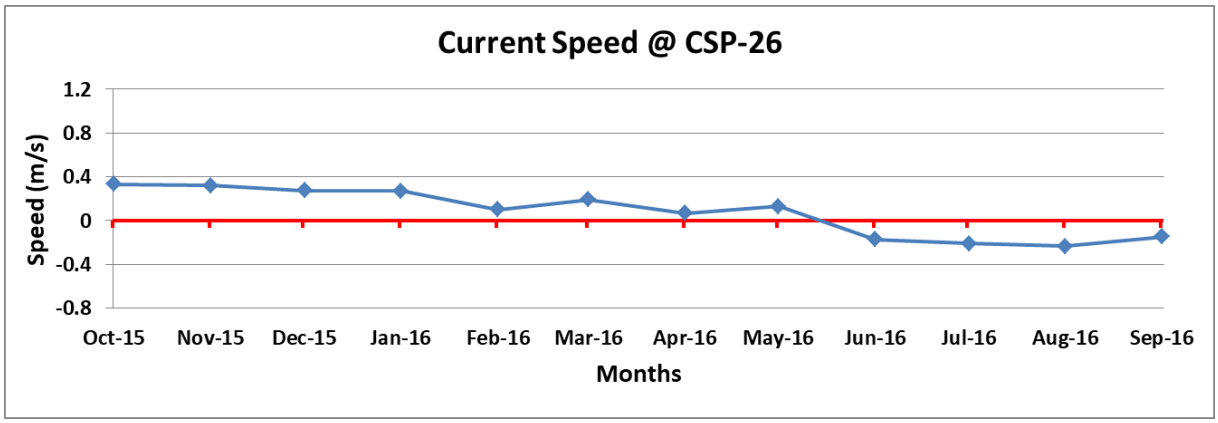


Figure 2-211 Time series of current speed at Karumkulam (October 2015 –September 2016)

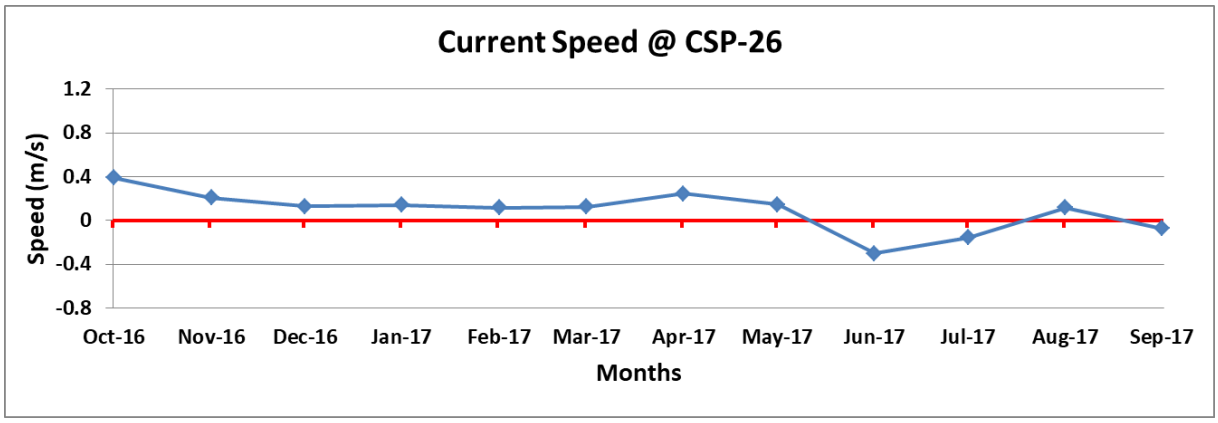


Figure 2-212 Time series of current speed at Karumkulam (October 2016 –September 2017)

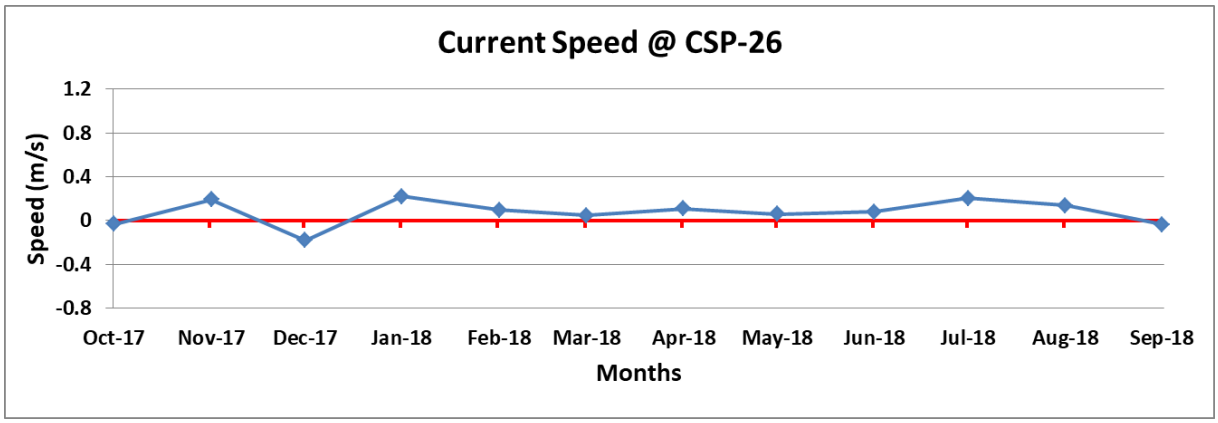


Figure 2-213 Time series of current speed at Karumkulam (October 2017 –September 2018)

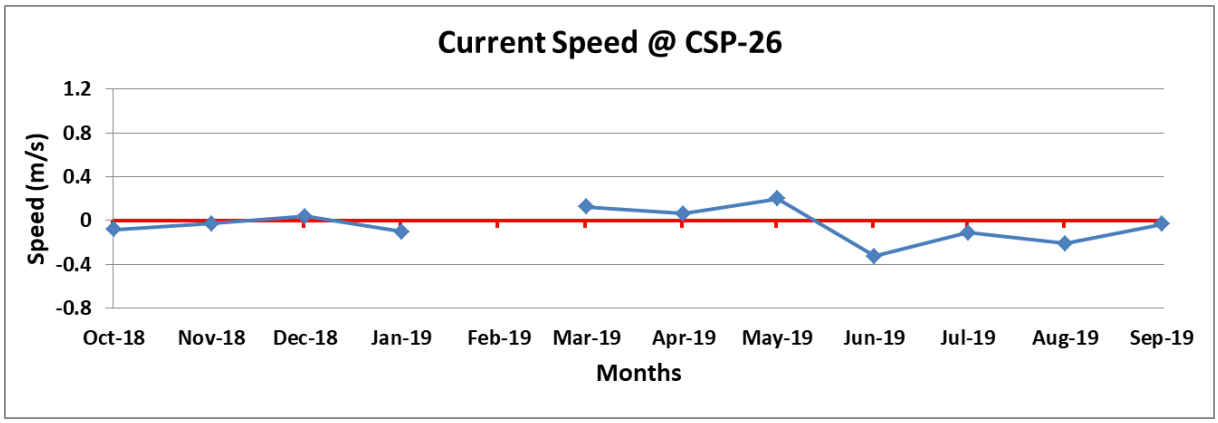


Figure 2-214 Time series of current speed at Karumkulam (October 2018 –September 2019)

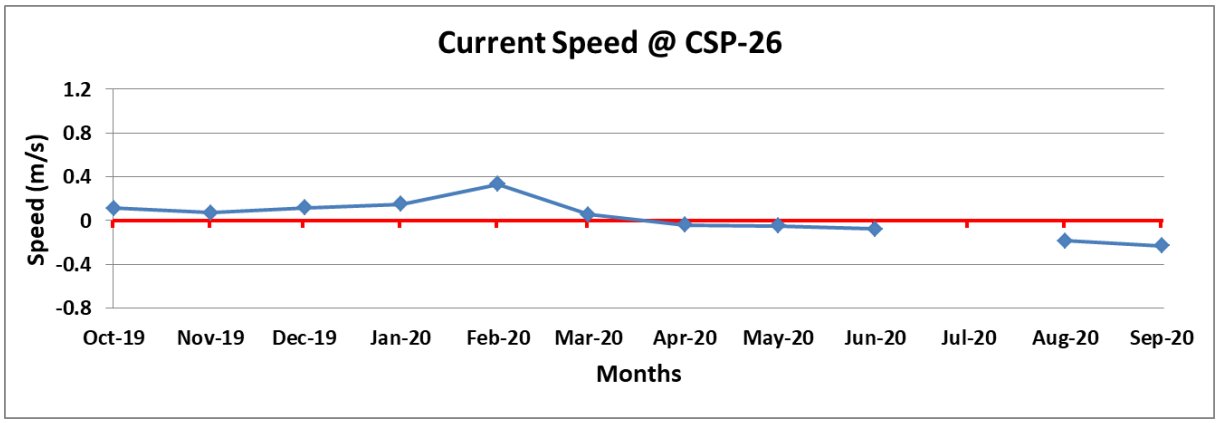


Figure 2-215 Time series of current speed at Karumkulam (October 2019 –September 2020)

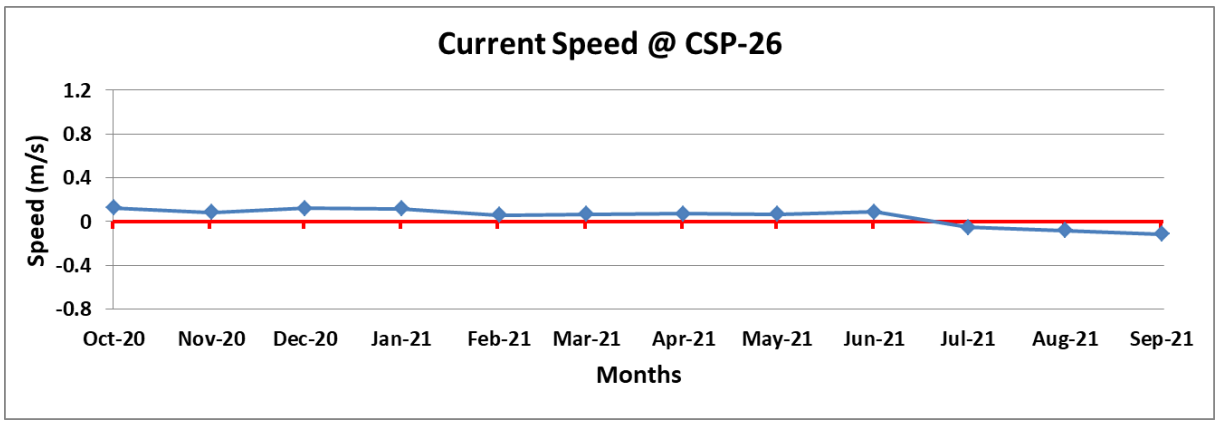


Figure 2-216 Time series of current speed at Karumkulam (October 2020 –September 2021)

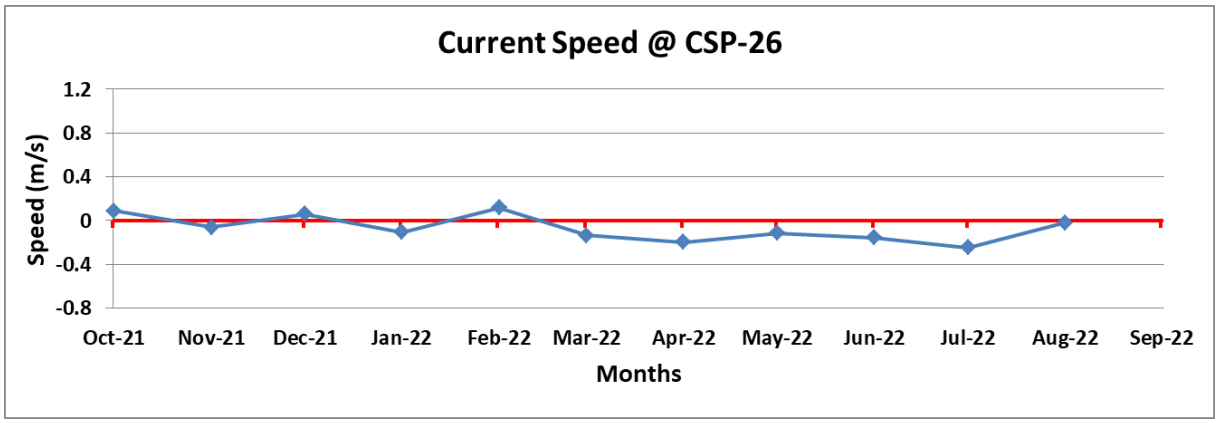


Figure 2-217 Time series of current speed at Karumkulam (October 2021 –September 2022)

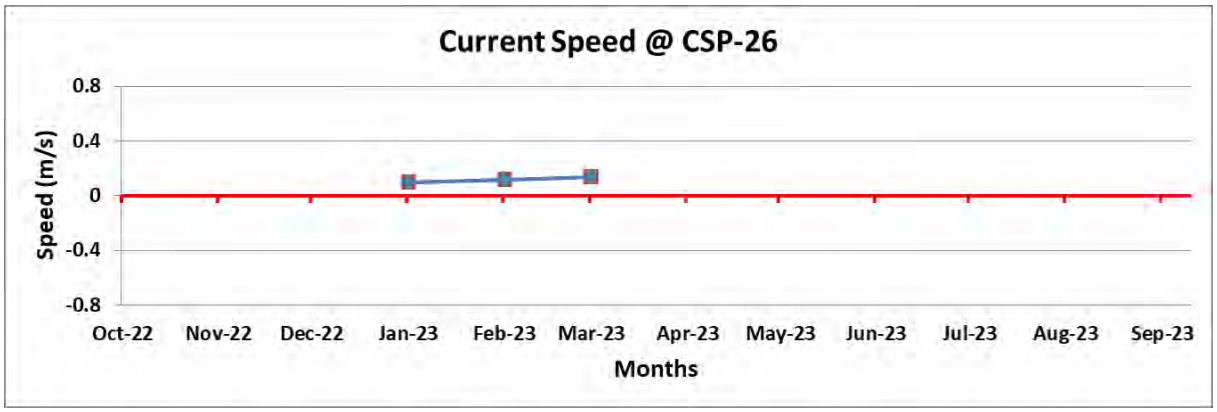


Figure 2-218 Time series of current speed at Karumkulam (October 2022 –March 2023)

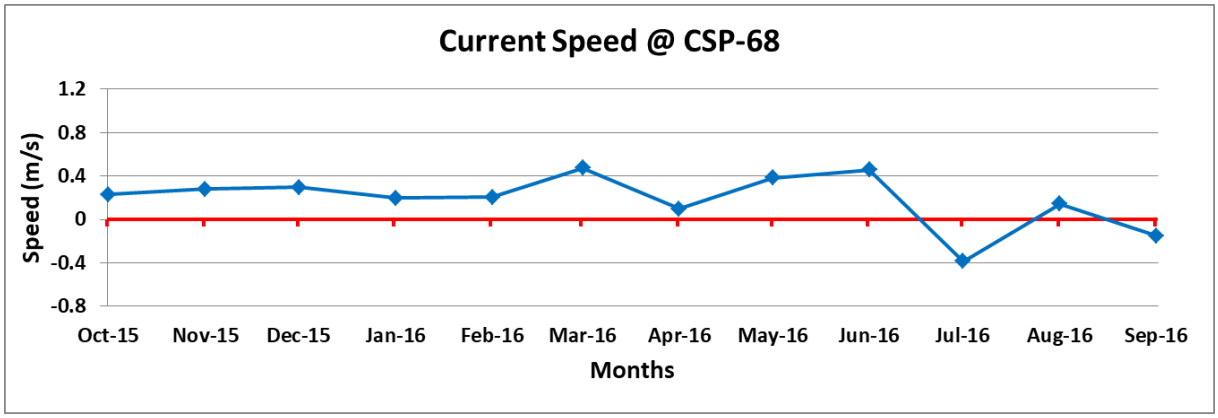


Figure 2-219 Time series of current speed at Shagumugham (October 2015 – September 2016)

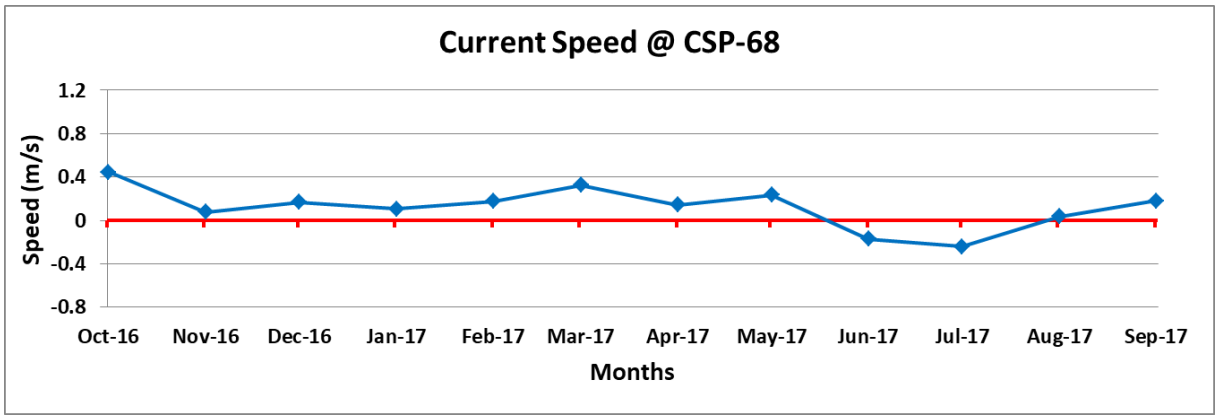


Figure 2-220 Time series of current speed at Shagumugham (October 2016 – September 2017)

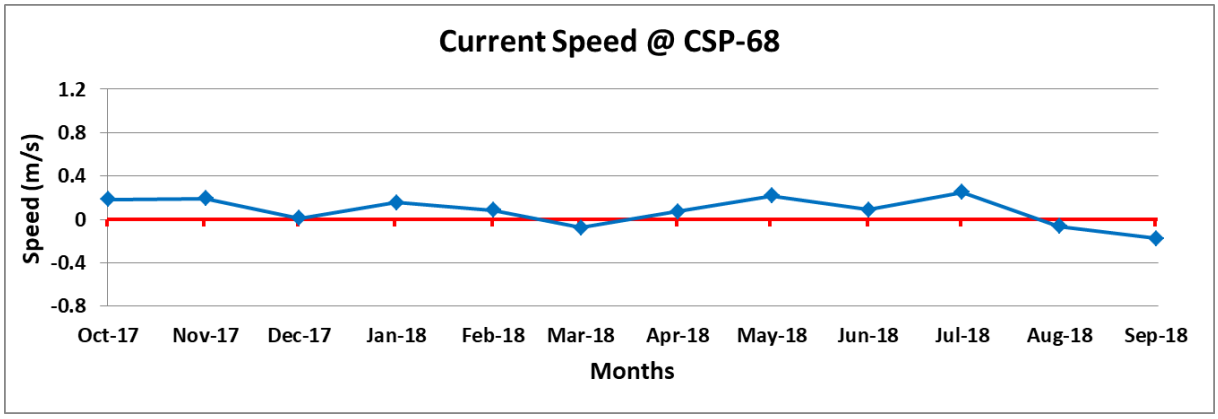


Figure 2-221 Time series of current speed at Shagumugham (October 2017 – September 2018)

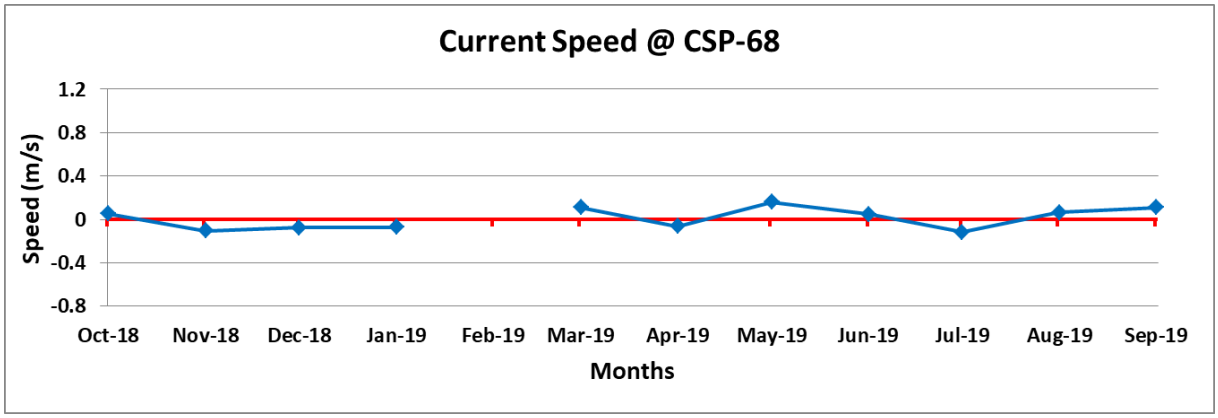


Figure 2-222 Time series of current speed at Shagumugham (October 2018 – September 2019)

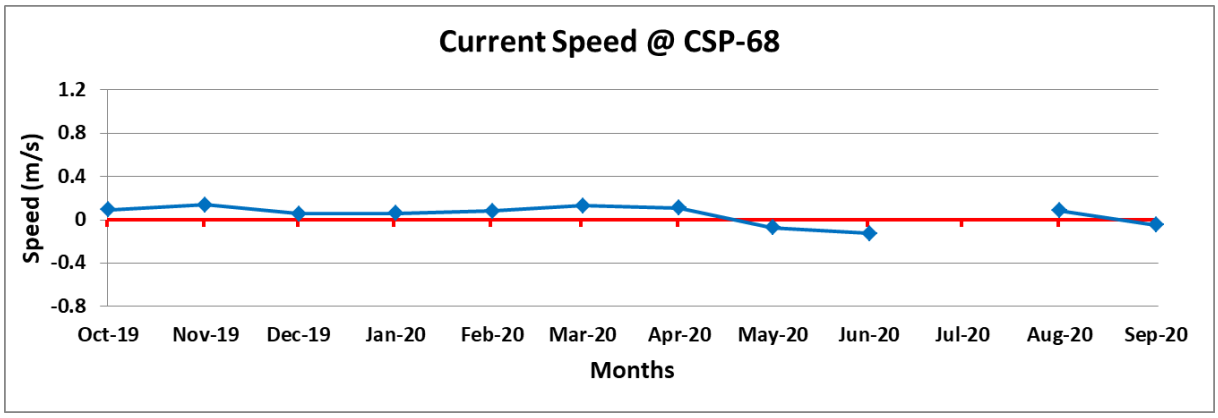


Figure 2-223 Time series of current speed at Shagumugham (October 2019 – September 2020)

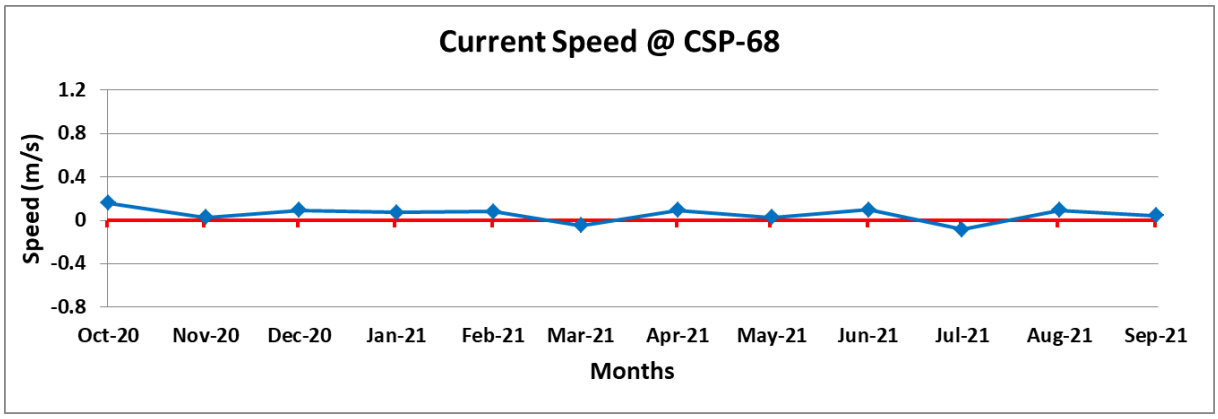


Figure 2-224 Time series of current speed at Shagumugham (October 2020 – September 2021)

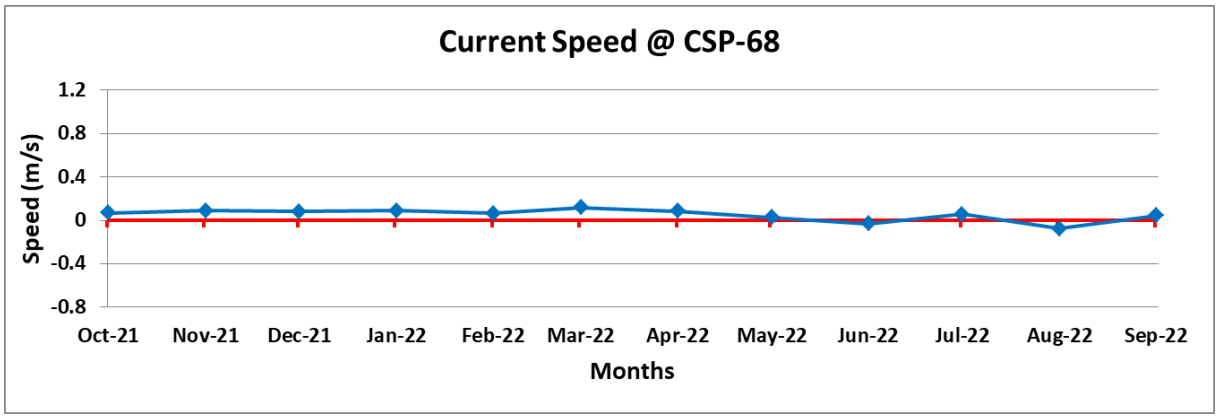


Figure 2-225 Time series of current speed at Shagumugham (October 2021 – September 2022)

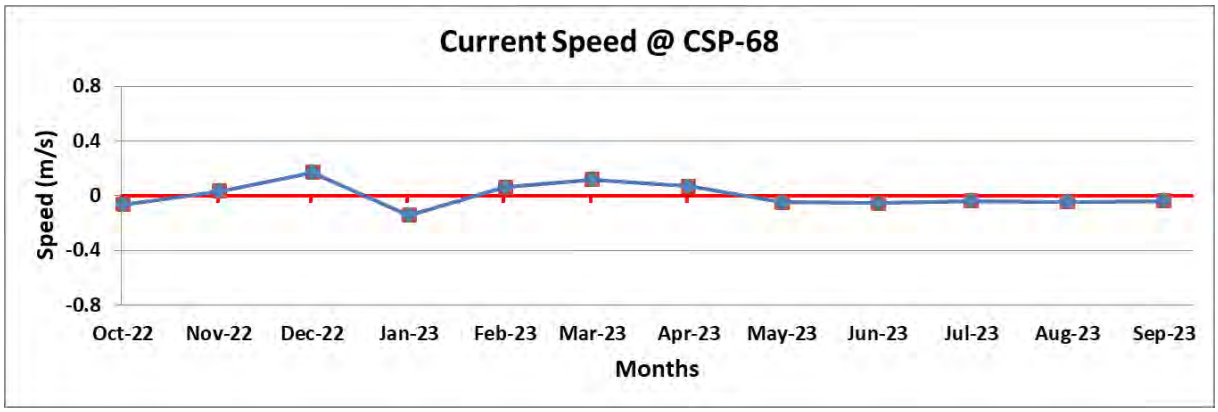


Figure 2-226 Time series of current speed at Shagumugham (October 2022 –March 2023)

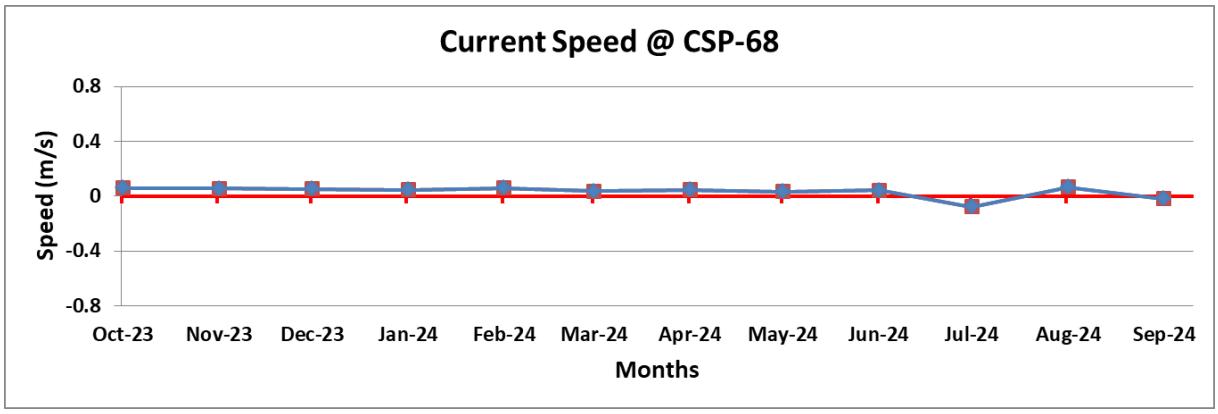


Figure 2-227 Time series of current speed at Shagumugham (October 2023 –March 2024)

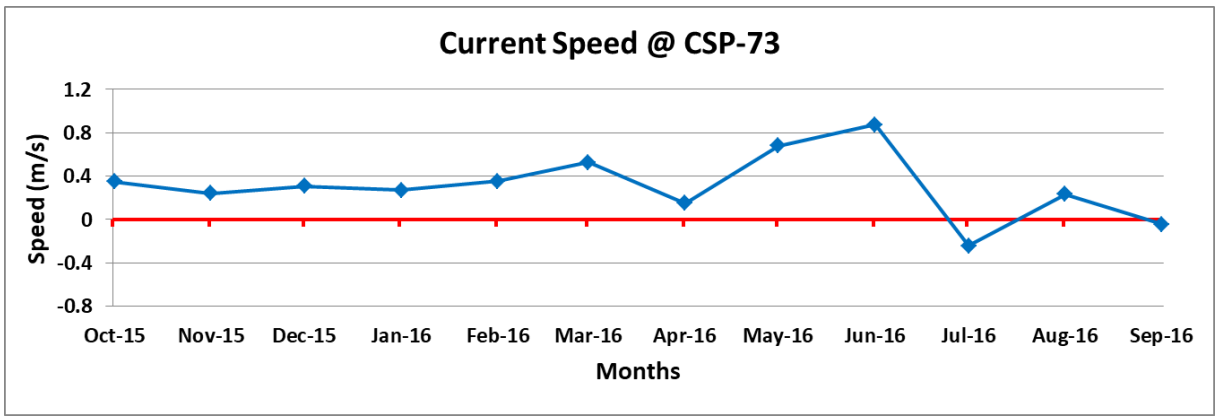


Figure 2-228 Time series of current speed at Vettucaud (October 2015 –September 2016)

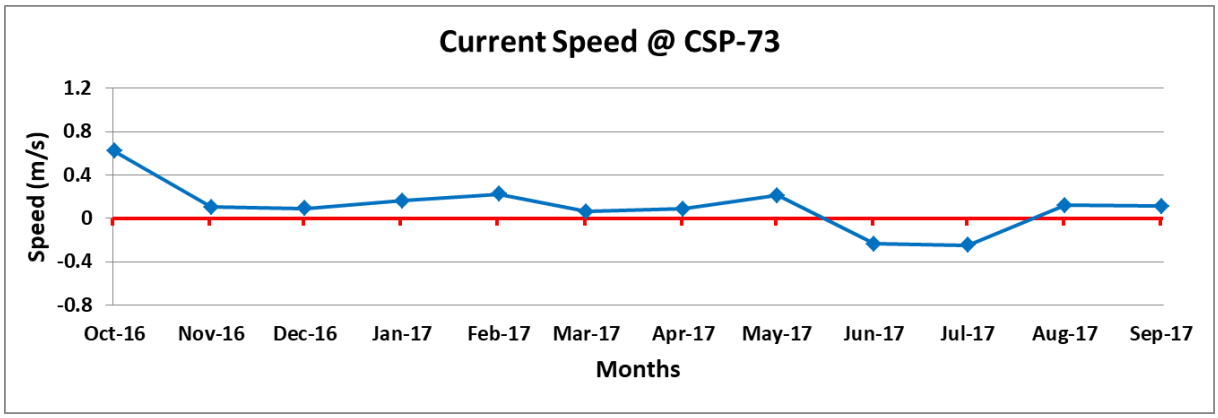


Figure 2-229 Time series of current speed at Vettucaud (October 2016 –September 2017)

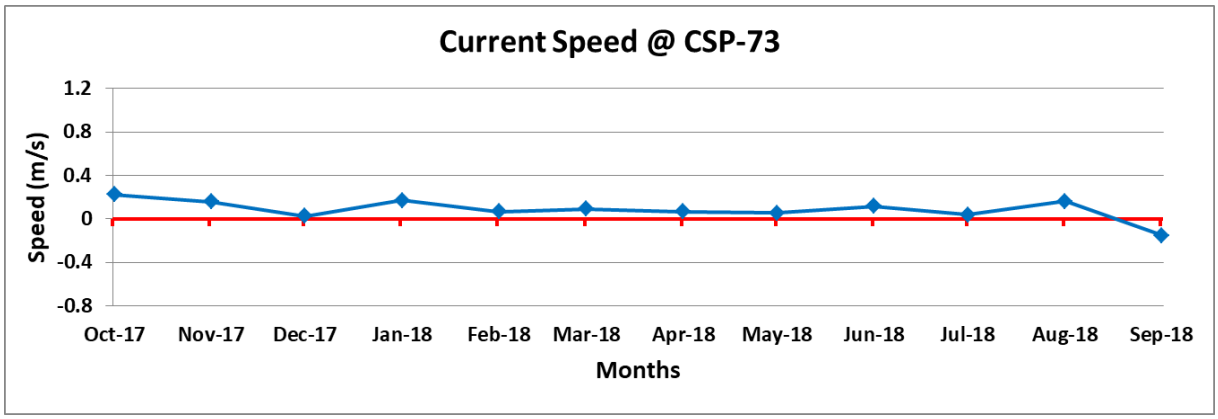


Figure 2-230 Time series of current speed at Vettucaud (October 2017 –September 2018)

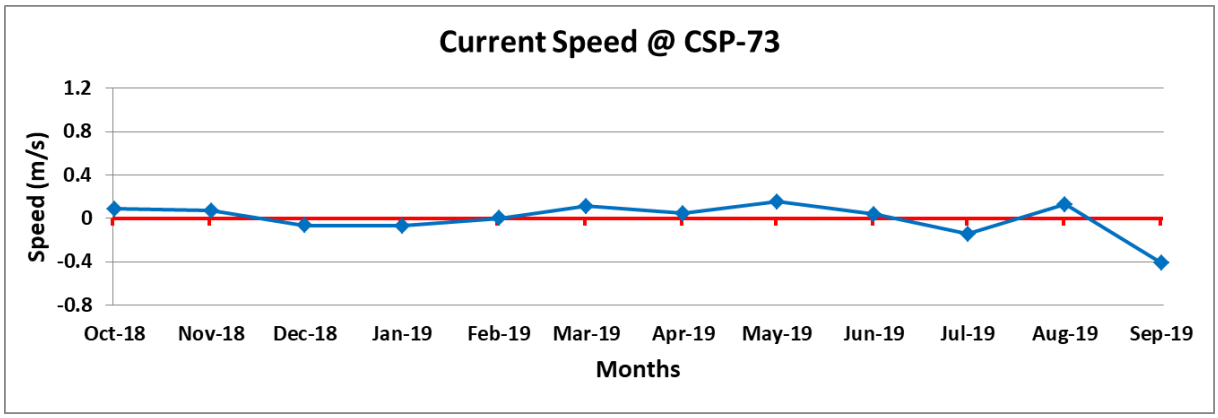


Figure 2-231 Time series of current speed at Vettucaud (October 2018 –September 2019)

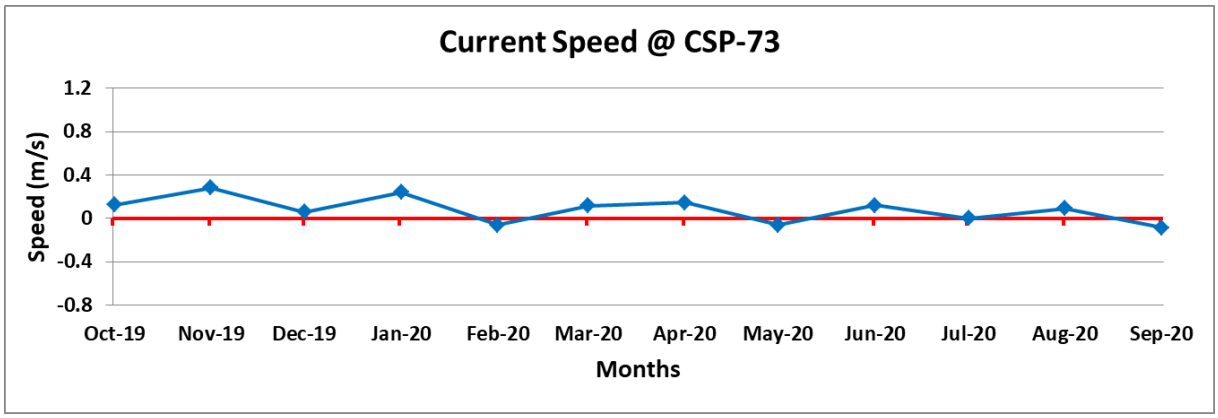


Figure 2-232 Time series of current speed at Vettucaud (October 2019 –September 2020)

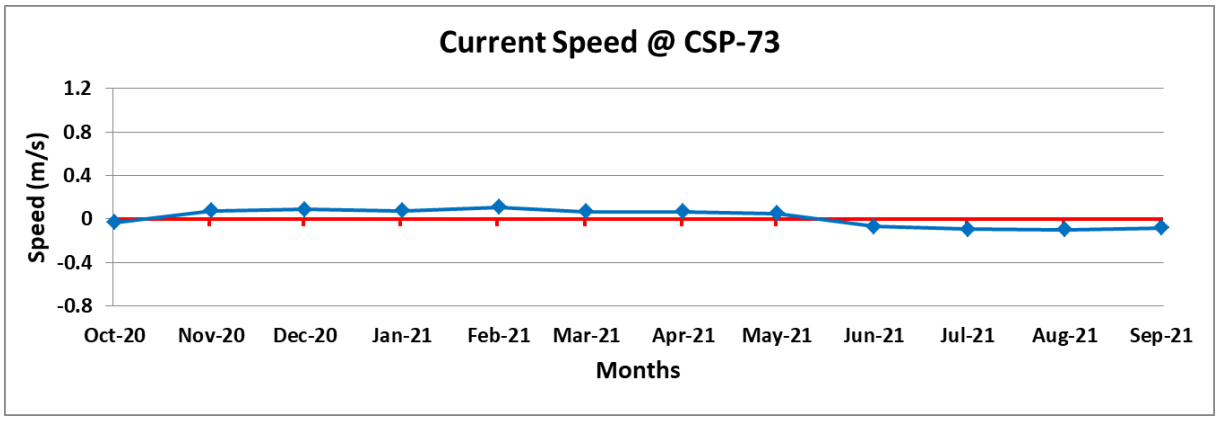


Figure 2-233 Time series of current speed at Vettucaud (October 2020 –September 2021)

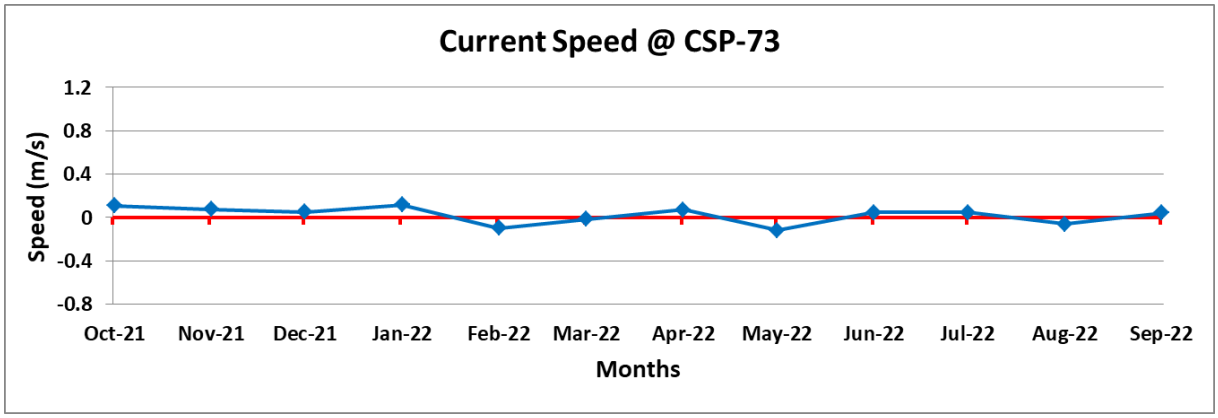


Figure 2-234 Time series of current speed at Vettucaud (October 2021 –September 2022)

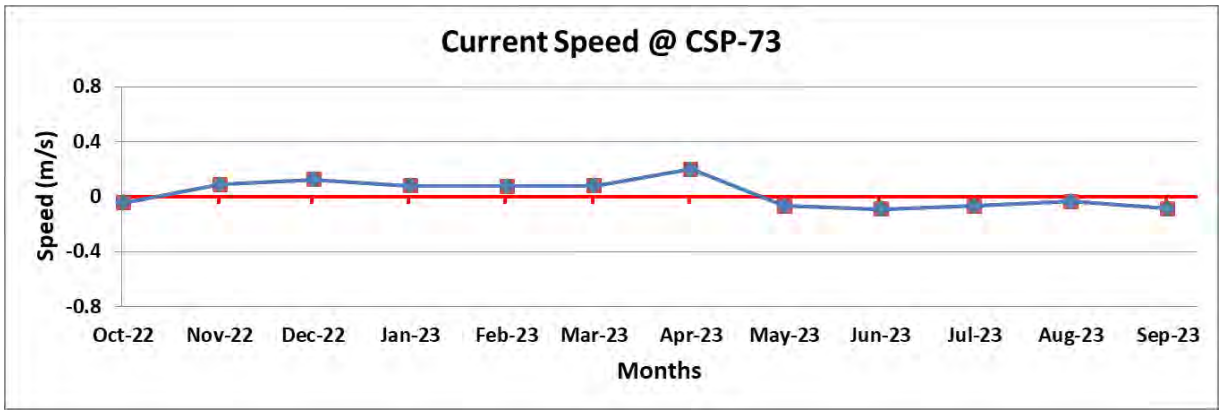


Figure 2-235 Time series of current speed at Vettucaud (October 2022 –September 2023)

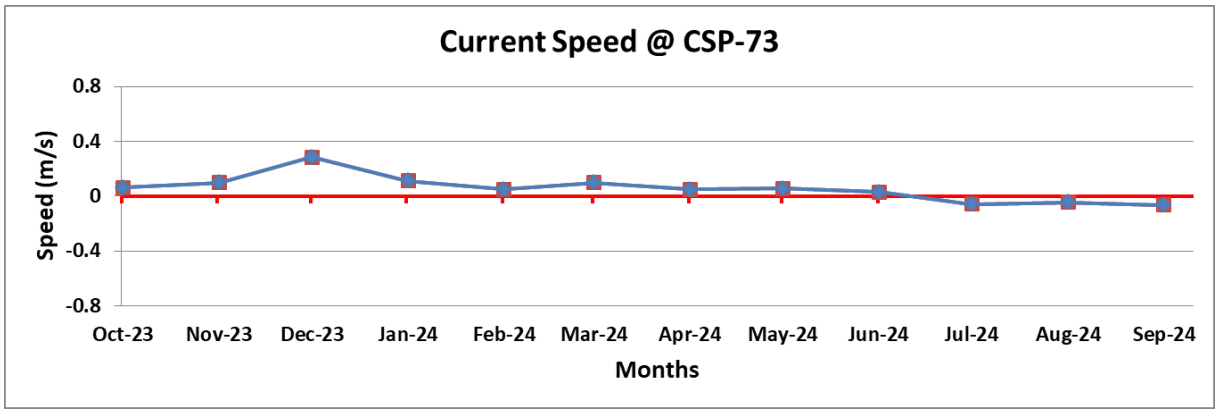
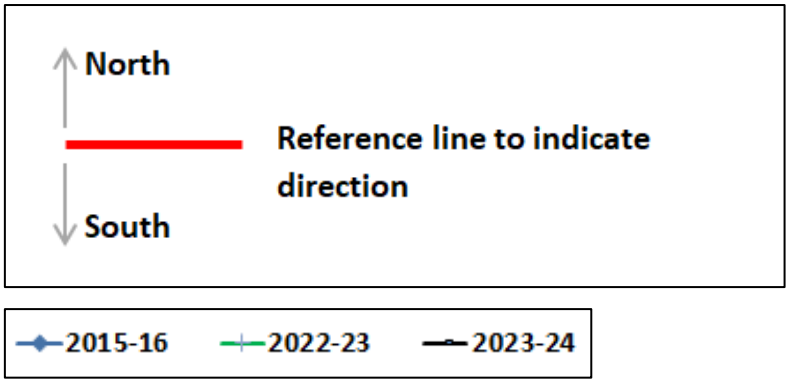


Figure 2-236 Time series of current speed at Vettucaud (October 2023 –September 2024)

Legend of Leo observation charts



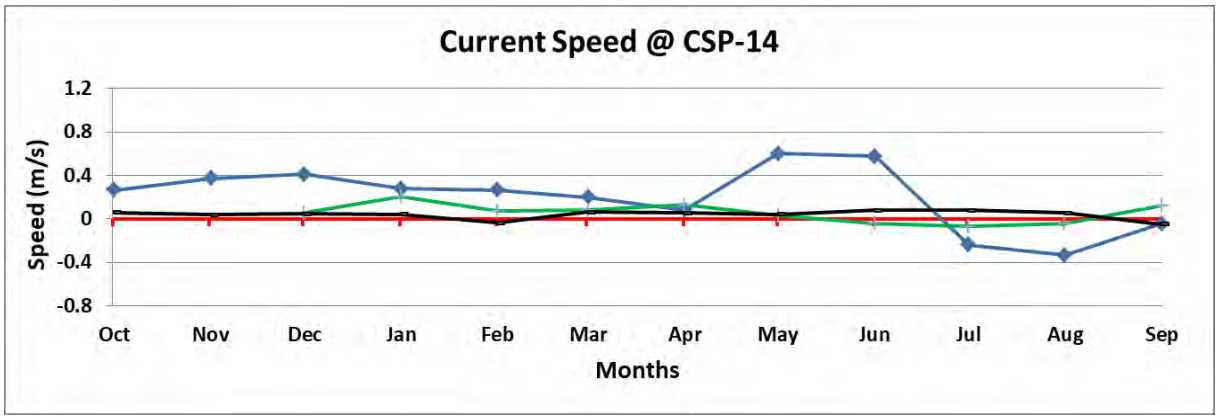


Figure 2-237 Time series of current speed at Paruthiyoor (2015-16, 2022-23 and 2023-24)

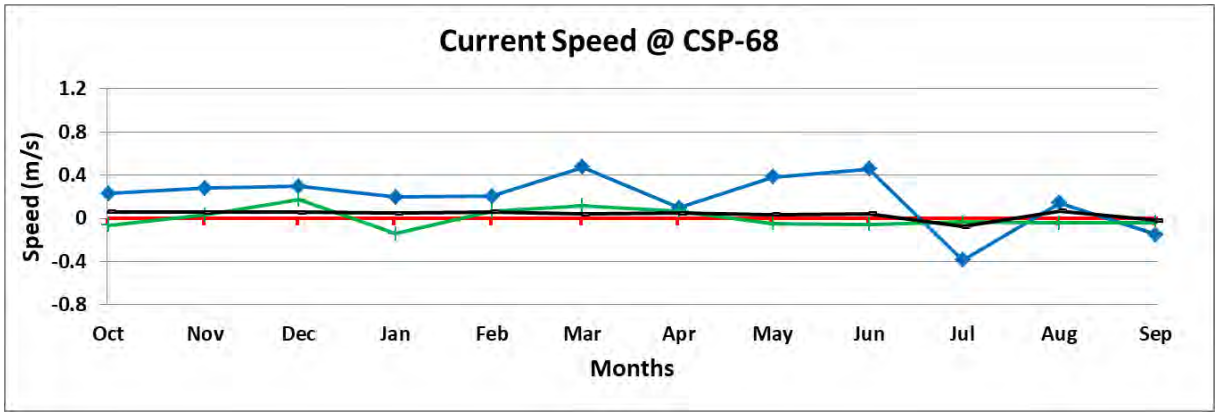


Figure 2-238 Time series of current speed at Shagumugham (2015-16, 2022-23 and 2023-24)

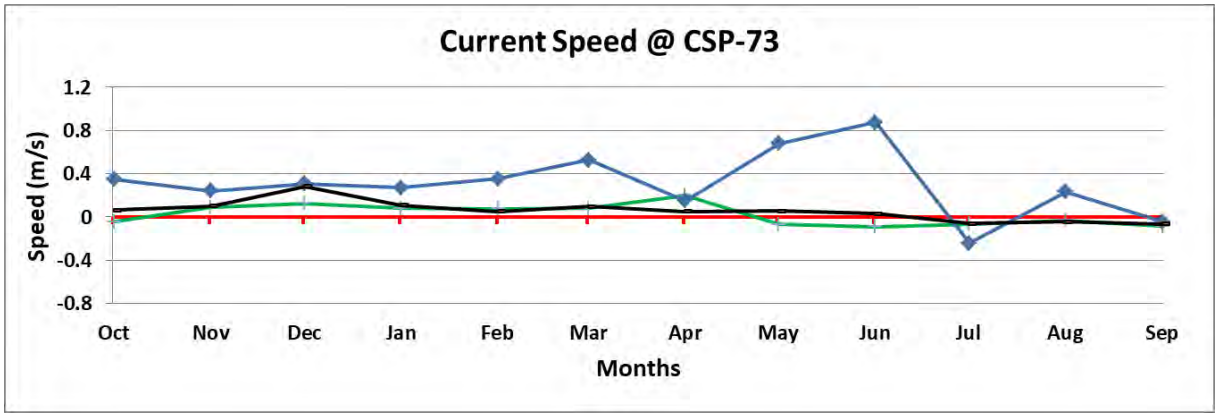


Figure 2-239 Time series of current speed at Vettucaud (2015-16, 2022-23 and 2023-24)

3 Model Studies

3.1 Assessment of hydrodynamics

3.1.1 Introduction

Hydrodynamics is the branch of science which deals with the dynamics of fluid and aims at studying the forces exerted by fluids in motion. For a large water body such as sea, the study

becomes very complex owing to vast number of processes going on simultaneously. Processes such as tides, waves and wind interactions cause motion of fluid which in turn has far reaching effects. The motion of fluid, otherwise called as currents can induce a number of phenomena such as erosion and accretion along shoreline, morphological changes and forces on marine structures.

With development in advanced computing methods, numerical modelling has replaced the earlier methods of study. Various numerical modelling software packages have been developed for this purpose. These have the ability to solve complex equations involved in the study of hydrodynamics in efficient and less time-consuming manner.

Earlier in 2013, ASSYSTEM INDIA LIMITED had comprehensively covered the assessment of hydrodynamics in the port vicinity. To understand the impact of the port construction on the hydrodynamics, ASSYSTEM INDIA LIMITED carried out the assessment of hydrodynamics with the latest surveyed bathymetries. This chapter of the report covers the assessment of hydrodynamics carried out by ASSYSTEM INDIA LIMITED.

In this part of the study, the following tasks were identified:

- Comparison of results from the updated hydrodynamic model with the calibrated hydrodynamic model used in 2013.
- Assessment of the impact of change in bathymetry on prevailing water levels and currents by using the hydrodynamic model.

3.1.2 Model setup using TELEMAC-2D

In this study, the model domain is updated as per the latest shoreline. The region of interest is situated along a coastline which is oriented in NW – SE direction and is straight. The model domain used for the study is almost parallel to the coastline. The model domain covers a region of about 50 X 22 km^2. The mesh size near target location was kept low (restricted to 20m) to resolve the proposed schemes and velocities properly. The mesh near the target location can be viewed in Figure 3-1. The model bathymetry was prepared using the available primary and secondary data and is shown in Figure 3-2. The latest length of breakwater

is included in the model for hydrodynamic modelling.

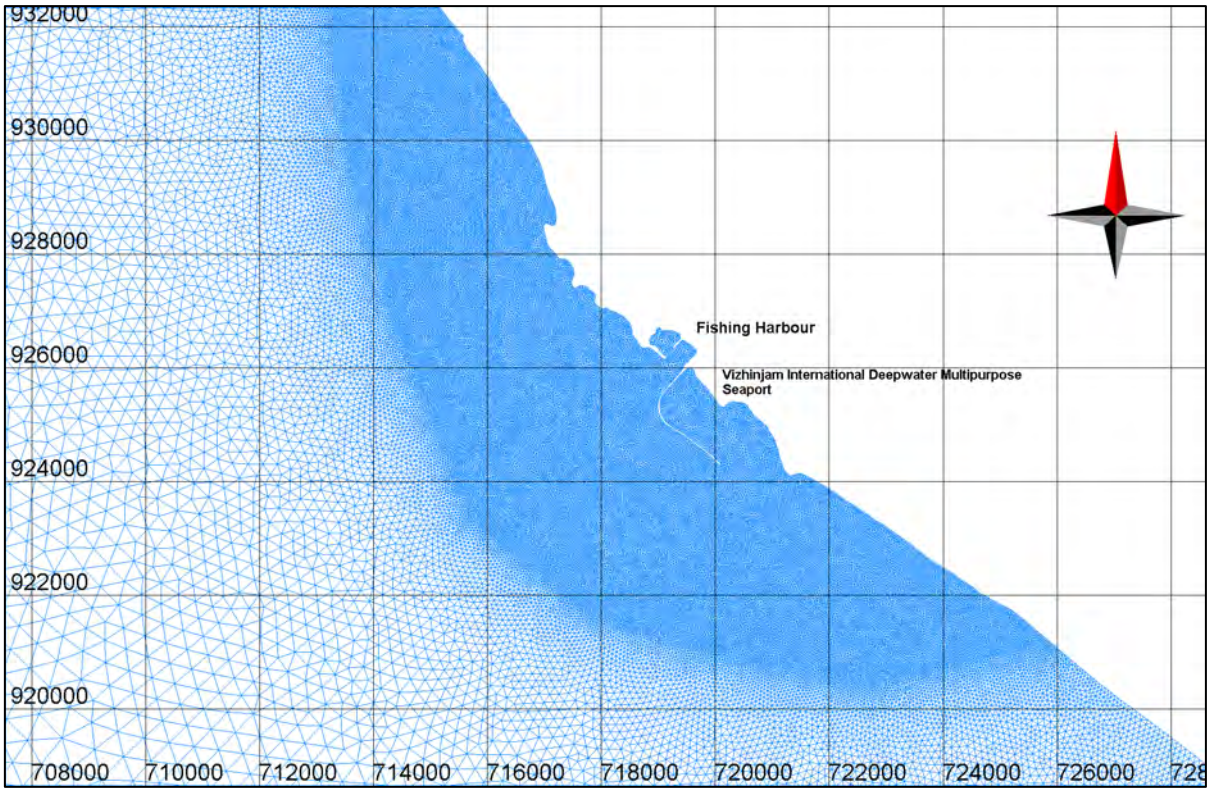


Figure 3-1 Fine mesh near project location

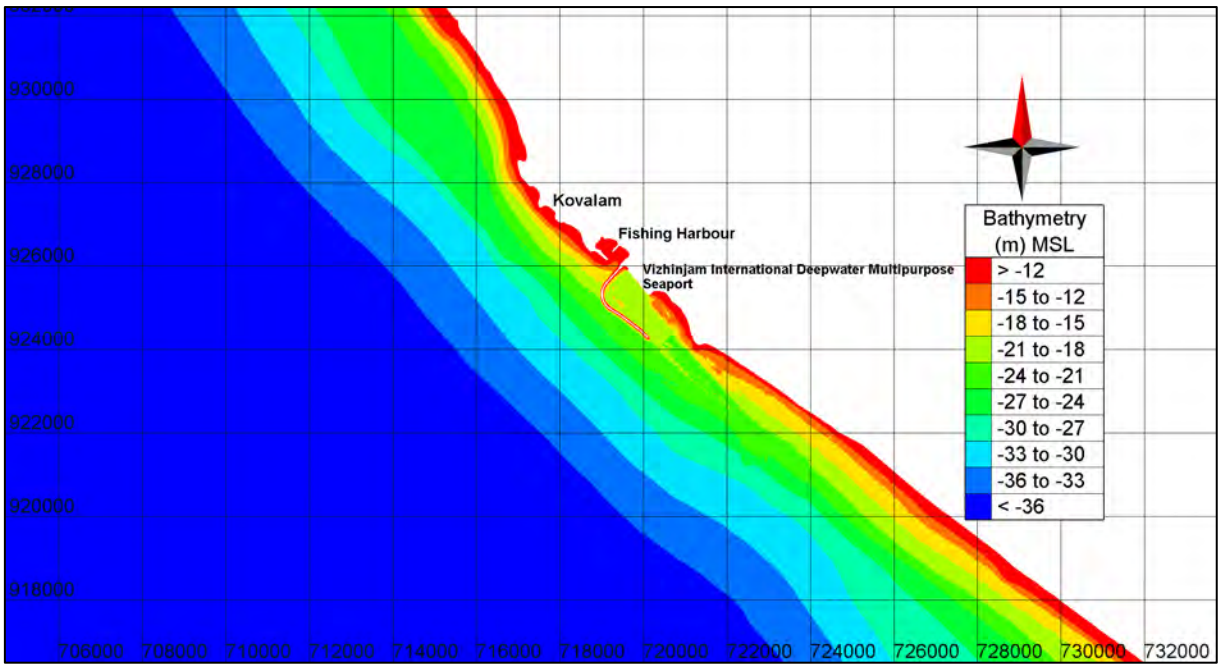


Figure 3-2 Latest bathymetry with respect to MSL

3.1.2.1 Boundary conditions

Tidal levels were applied along the open boundary of the model domain. To set up the model, tidal elevations along the open boundary were predicted using OTPS developed by OSU. The open boundary of the HD model setup is as shown in Figure 3-3.

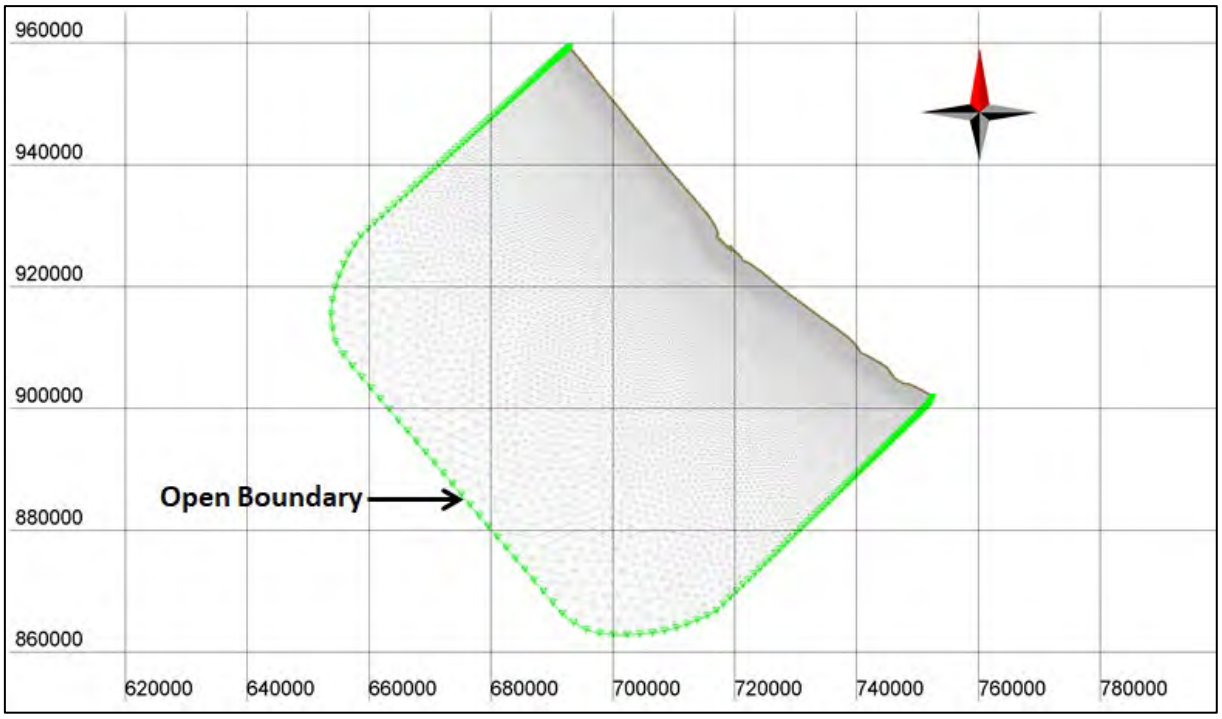


Figure 3-3 Open boundary conditions – HD model

OTPS accomplish 2 tasks:

- Extracting harmonic constants from barotropic tidal solutions in OTIS format at given locations
- Predicting tides at given times and locations

Predictions were based on global and/or regional barotropic inverse tidal solutions obtained with OTIS.

Wind was applied on the model to account for wind driven currents in the model. Time varying wind field was applied for model validation, as the variation in wind speed and direction may lead to change in current speed and direction.

3.1.2.2 Model comparison and validation

The aim of this study is to assess the impact of the change in bathymetry on the hydrodynamics of the region. A calibrated model was achieved and the results from the model were reported in the report of August 2013. In this present study, the model used in 2013 was updated with the pre and post monsoon bathymetries of 2015, 2016, 2017, 2018, 2019, 2020, 2021, 2022, 2023 & pre monsoon 2024 and simulations were carried out with the same parameters used in 2013.

Comparison between the tide and currents simulated by the models were done. Figure 3-4 to Figure 3-7 shows the comparison between the modelled tides put on similar time scales. Tide measurement carried out by AVPPL was also put on the scale. From the comparisons it can be seen that there is a good correlation between all the data which indicates that the change in bathymetry has no effect on the tidal variations.

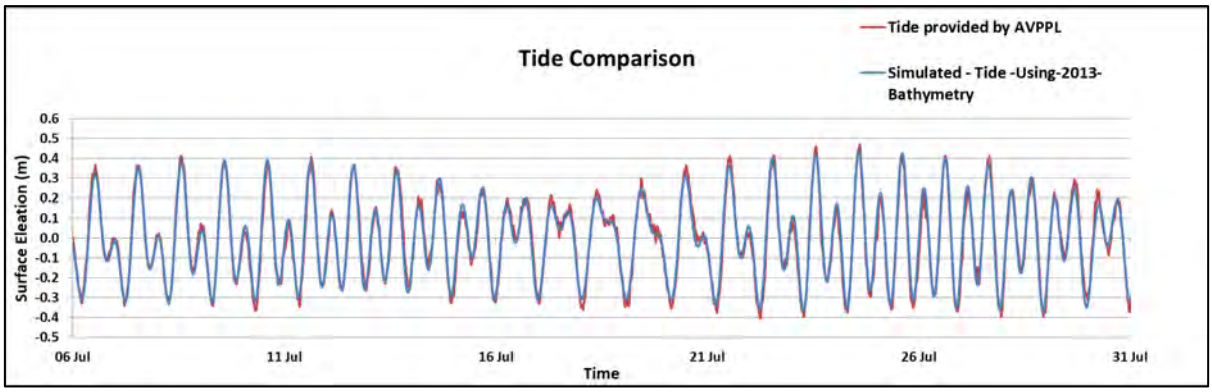


Figure 3-4 Comparison of AVPPL data with simulated tide (2013) (SW Monsoon)

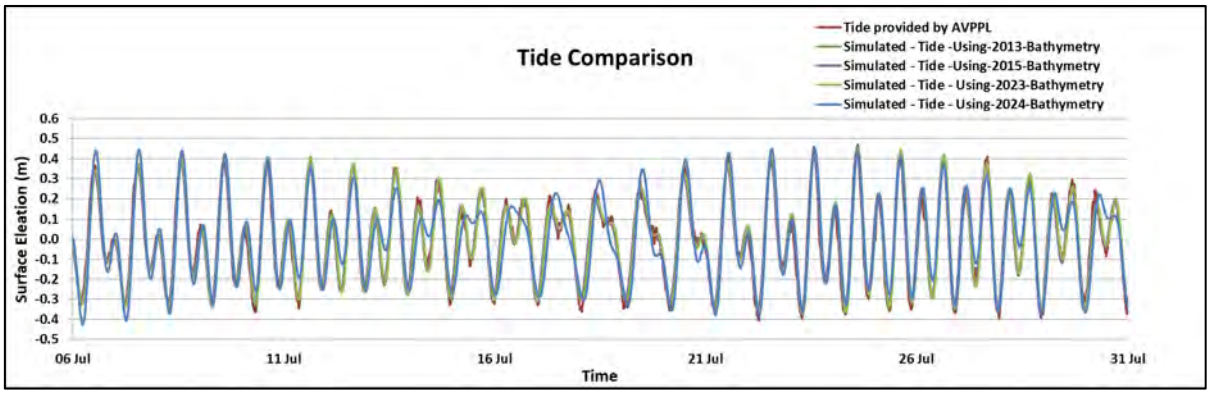
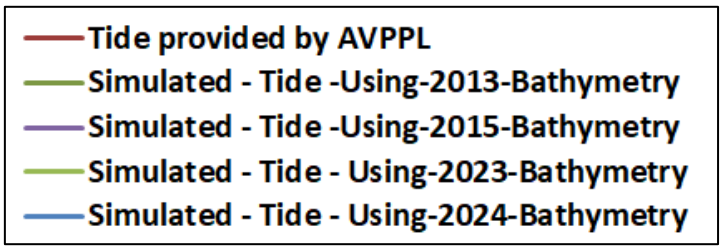
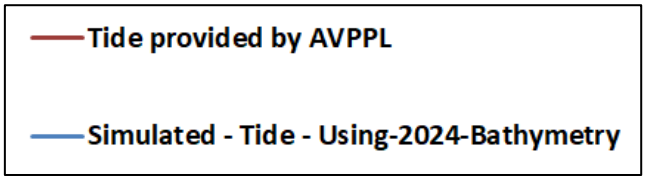


Figure 3-5 Comparison of AVPPL data with simulated tide (SW Monsoon)



Legend of Tide comparison plot



Legend of Tide comparison of AVPPL data (yearly)

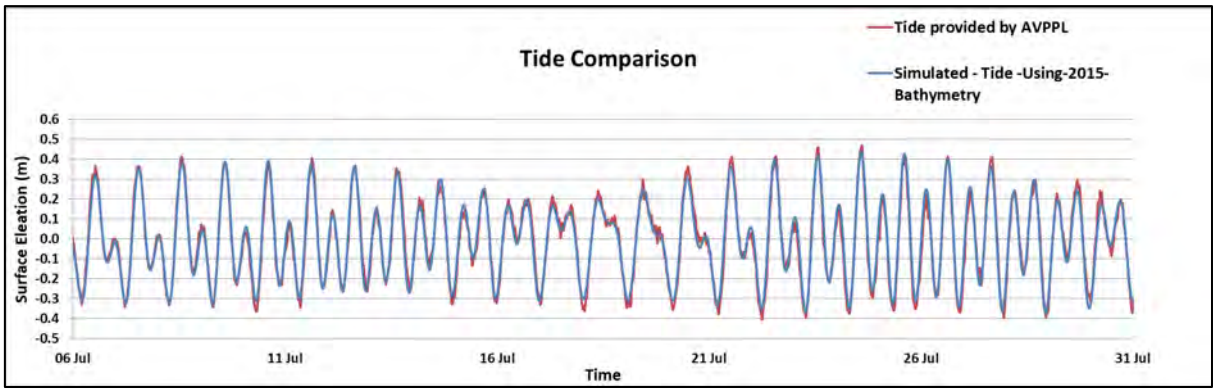


Figure 3-6 Comparison of AVPPL data with simulated tide (2015)(SW Monsoon)

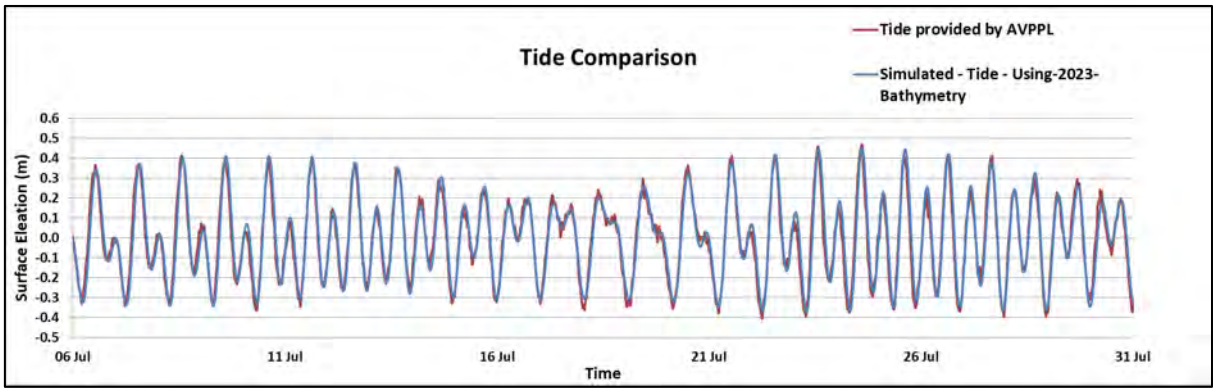


Figure 3-7 Comparison of AVPPL data with simulated tide (2023)(SW Monsoon)

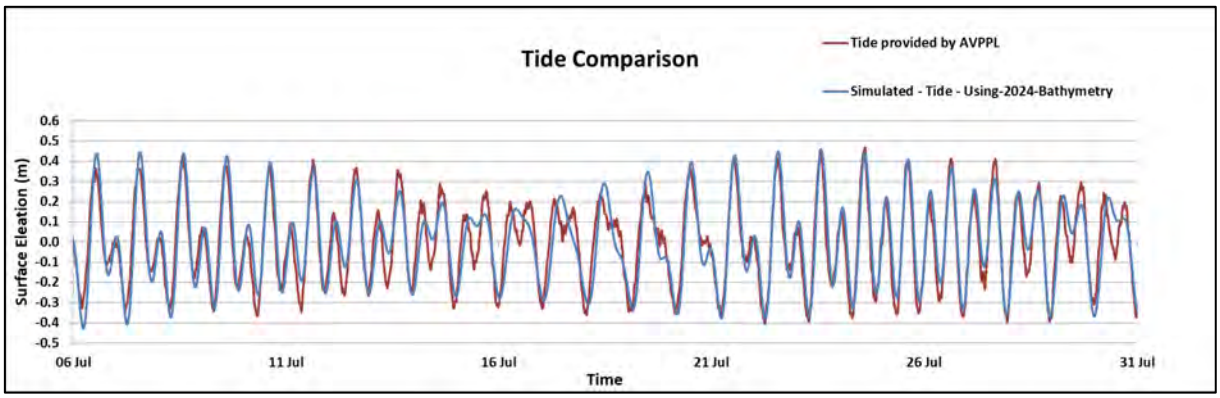


Figure 3-8 Comparison of AVPPL data with simulated tide (2024)(SW Monsoon)

Figure 3-19 to Figure 3-34 shows the comparison of N-S and E-W components of simulated currents at the measurement locations put on a similar time scale.

Simulated currents at CM3 location show good correlation with each other. Since the other locations are shadowed by the progress of breakwater construction (refer Figure 3-10) the current speeds have reduced and it can be noticed from N-S components plots presented below. Since the bathymetry data is not available at CM1 location during pre-monsoon 2023, comparison has not been carried out for pre-monsoon 2023 at this location. Figure 3-35 and Figure 3-36 shows typical plots from the simulation.

Figure 3-9 Current meter locations (2013)

Figure 3-10 Current meter locations (2013) presented over 2022 Google imagery

Table 3-1 Current meter locations – Mulloor (2013)

Name	Depth – CD (m)	Location	UTM – Zone 43 – WGS84	
CM1	13.0	Mulloor	720043 E	925377 N
CM2	18.0		719621 E	925034 N

Name	Depth – CD (m)	Location	UTM – Zone 43 – WGS84	
CM3	24.0		719013 E	924545 N

E-W component of simulated current using 2013 Bathymetry
E-W component of simulated current using 2015 Bathymetry
E-W component of simulated current using 2023 Bathymetry
E-W component of simulated current using 2024 Bathymetry

Legend of Current comparison plot

E-W component of simulated current using 2013 Bathymetry
E-W component of simulated current using 2024 Bathymetry

Legend of Current comparison plot (yearly)

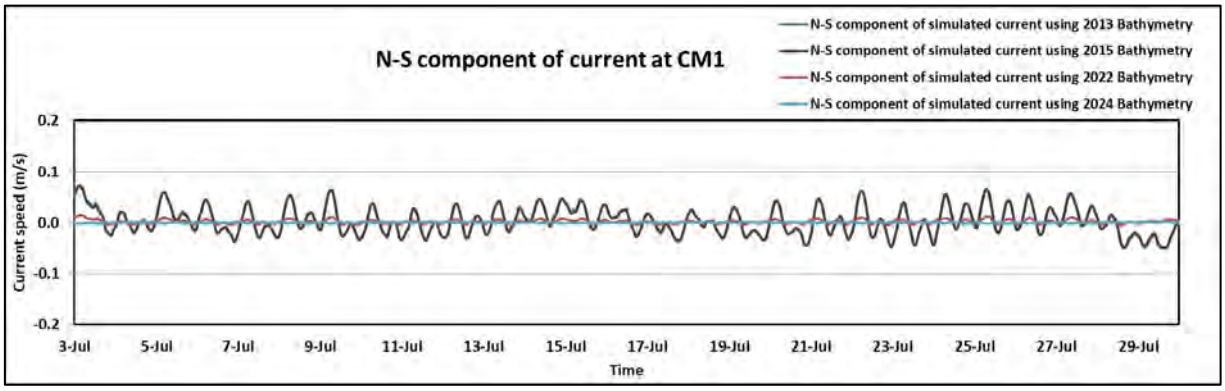


Figure 3-11 Comparison of N-S component of current at CM1

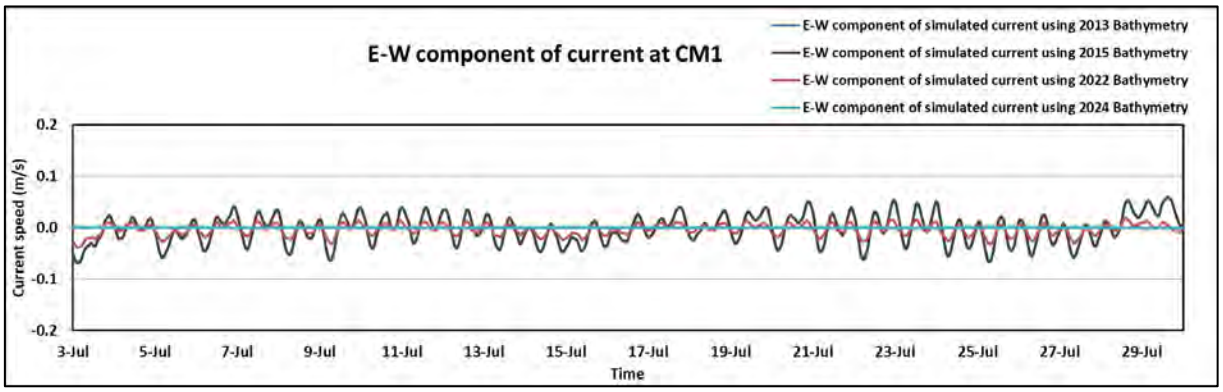


Figure 3-12 Comparison of E-W component of current at CM1

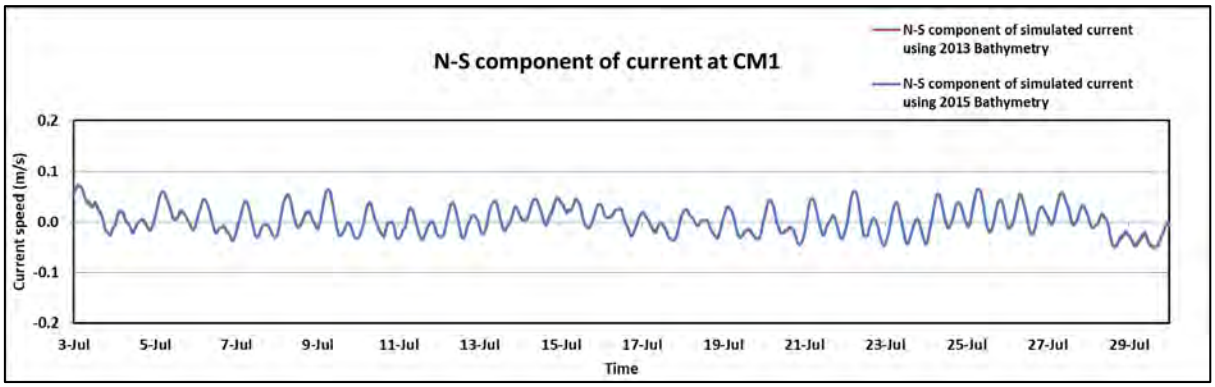


Figure 3-13 Comparison of N-S component of current at CM1 (2013 vs 2015)

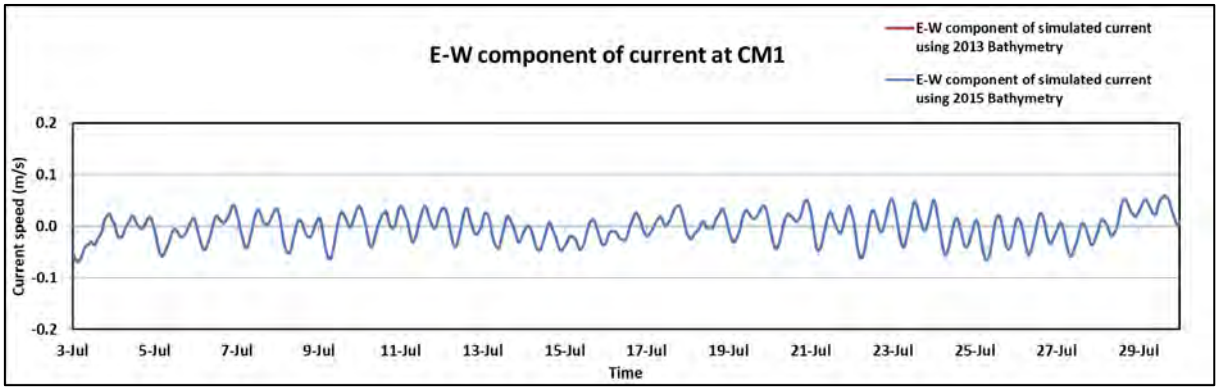


Figure 3-14 Comparison of E-W component of current at CM1 (2013 vs 2015)

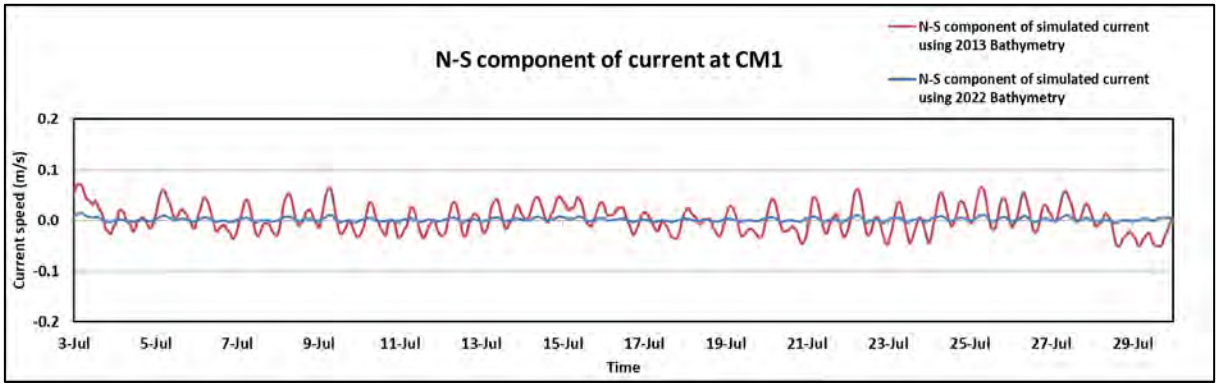


Figure 3-15 Comparison of N-S component of current at CM1 (2013 vs 2022)

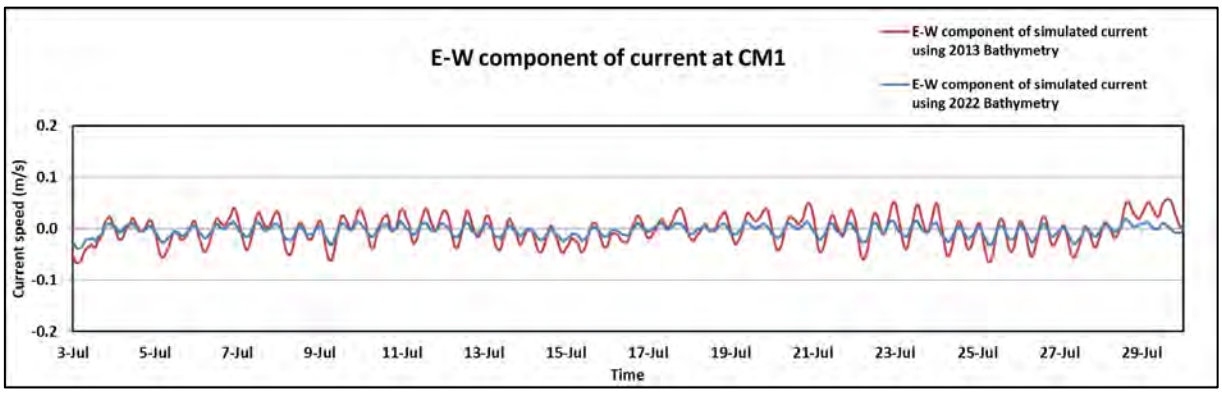


Figure 3-16 Comparison of E-W component of current at CM1 (2013 vs 2022)

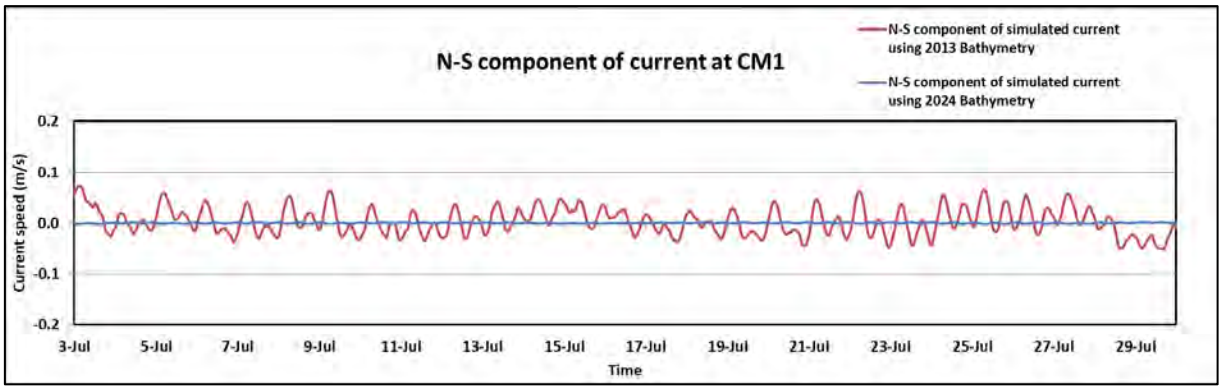


Figure 3-17 Comparison of N-S component of current at CM1 (2013 vs 2024)

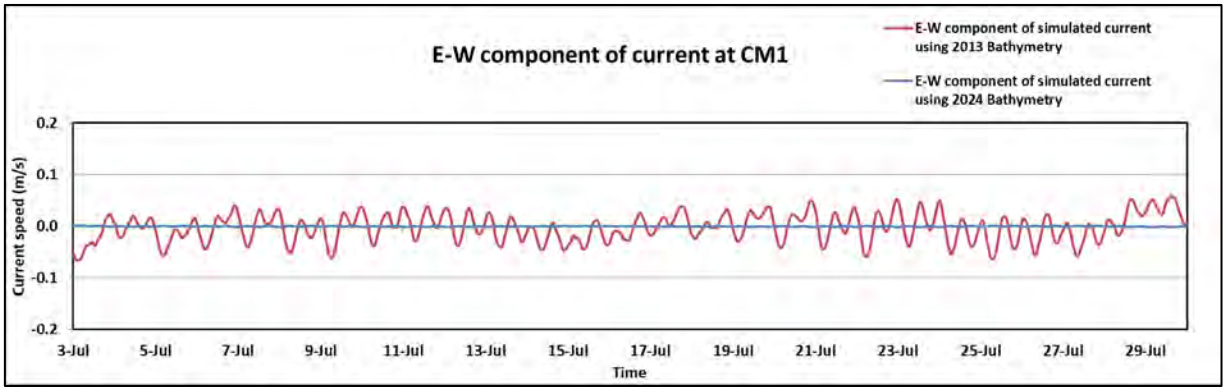


Figure 3-18 Comparison of E-W component of current at CM1 (2013 vs 2024)

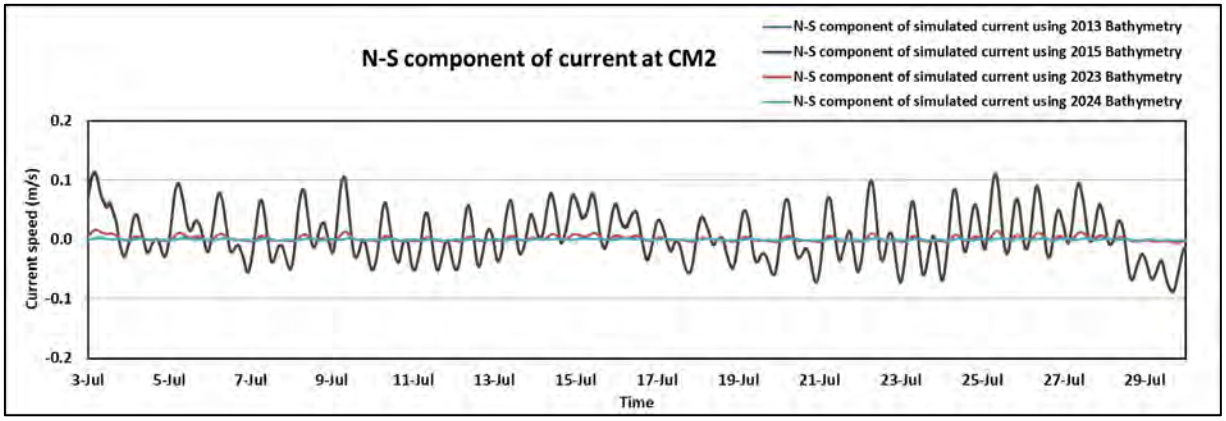


Figure 3-19 Comparison of N-S component of current at CM2

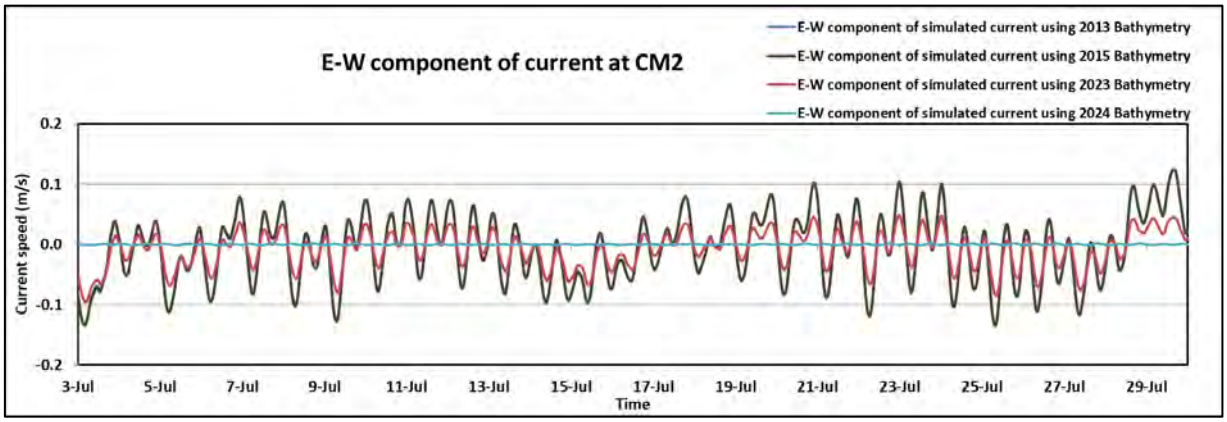


Figure 3-20 Comparison of E-W component of current at CM2

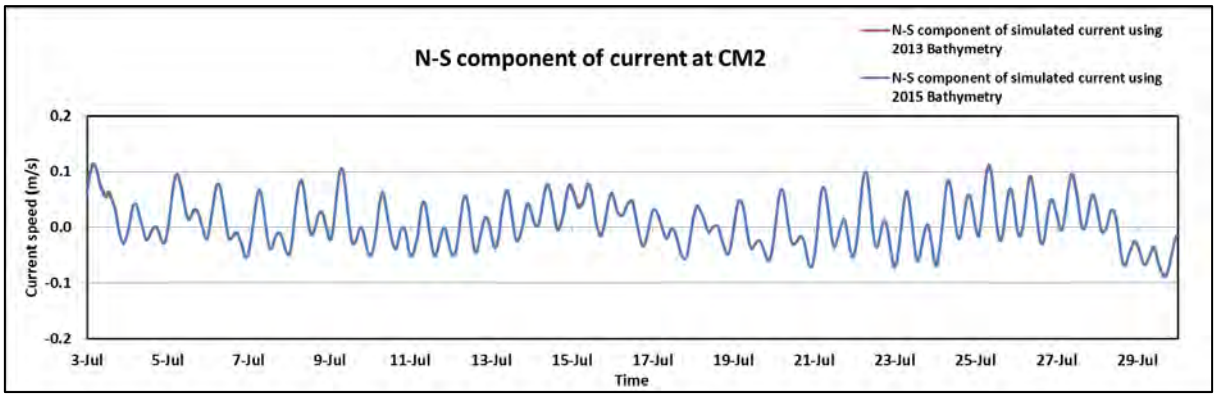


Figure 3-21 Comparison of N-S component of current at CM2 (2013 vs 2015)

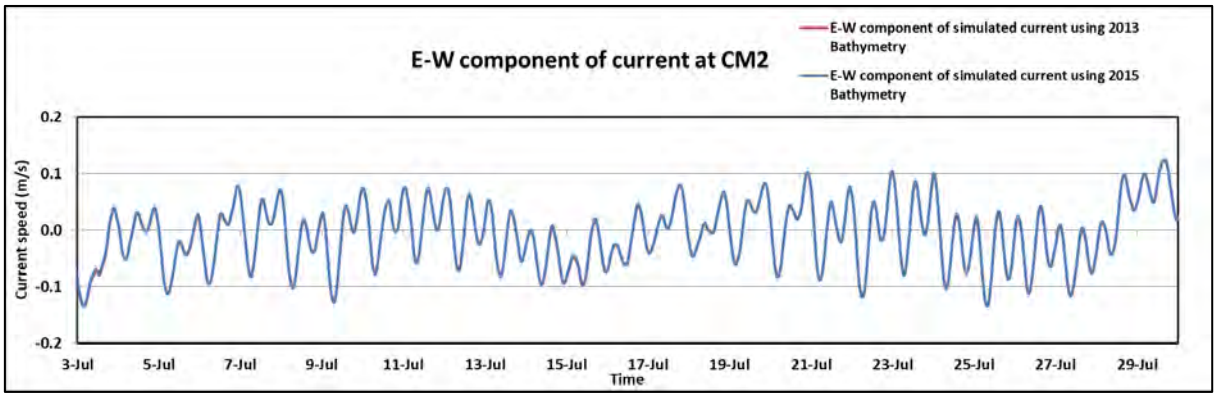


Figure 3-22 Comparison of E-W component of current at CM2 (2013 vs 2015)

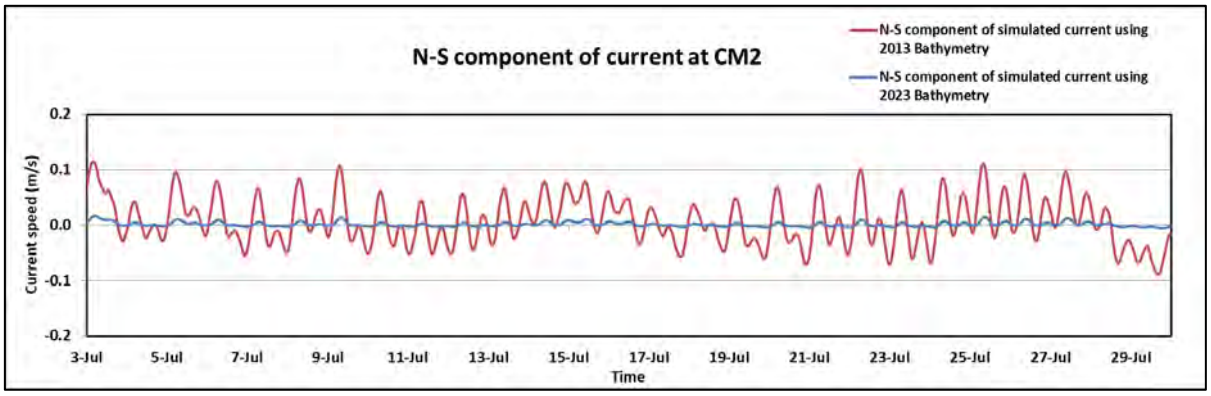


Figure 3-23 Comparison of N-S component of current at CM2 (2013 vs 2023)

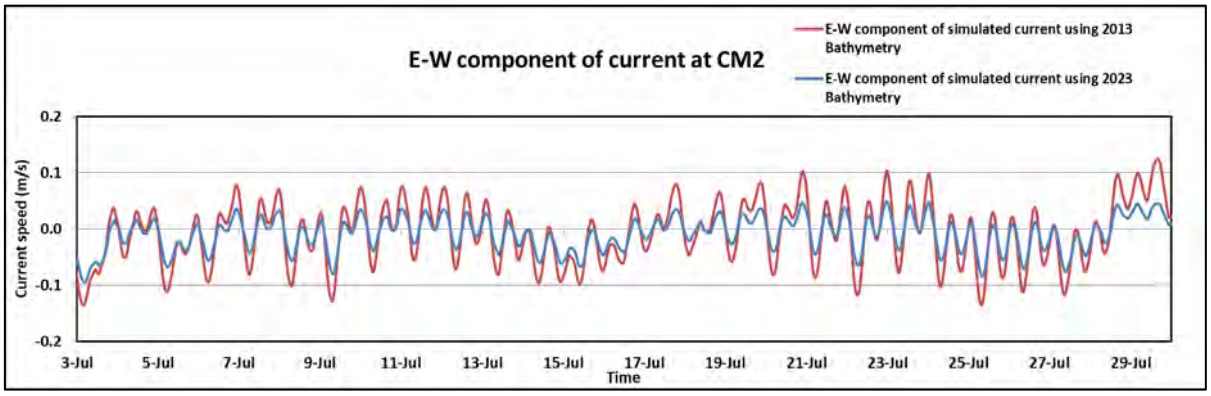


Figure 3-24 Comparison of E-W component of current at CM2 (2013 vs 2023)

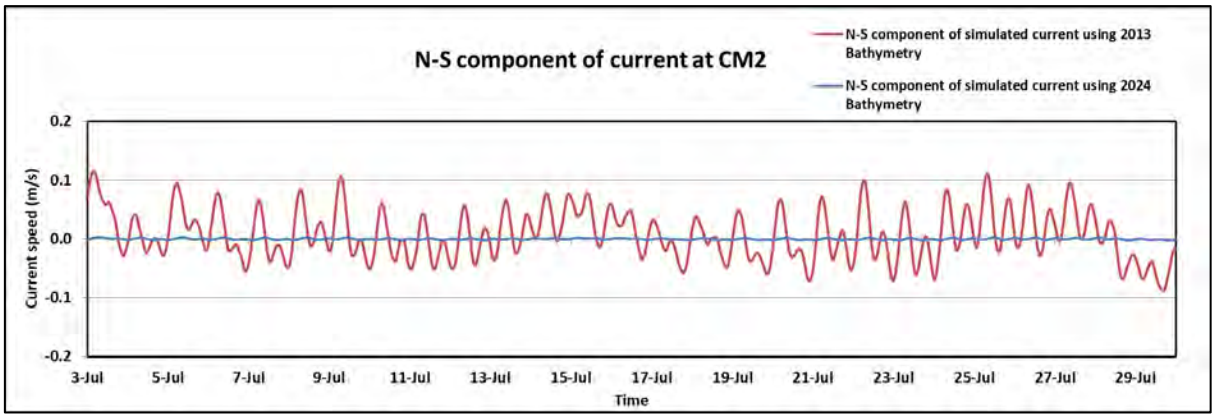


Figure 3-25 Comparison of N-S component of current at CM2 (2013 vs 2024)

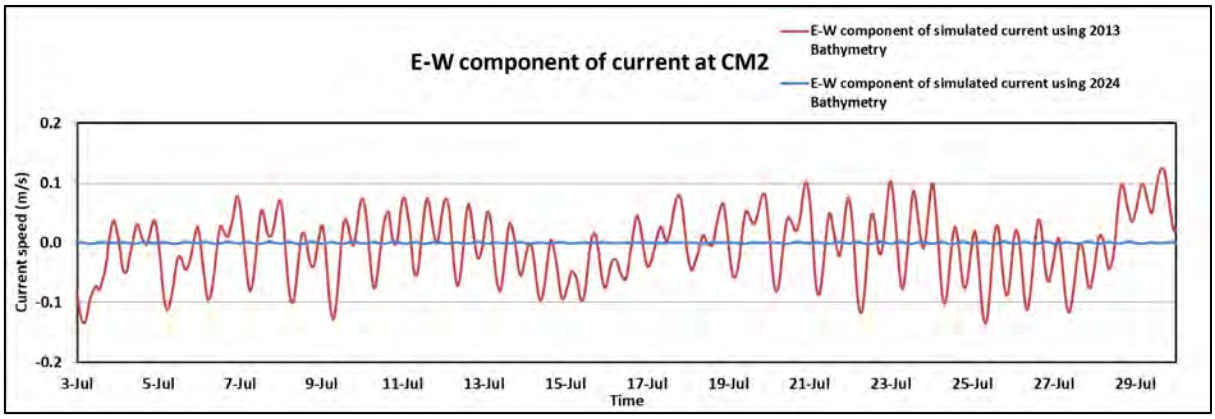


Figure 3-26 Comparison of E-W component of current at CM2 (2013 vs 2024)

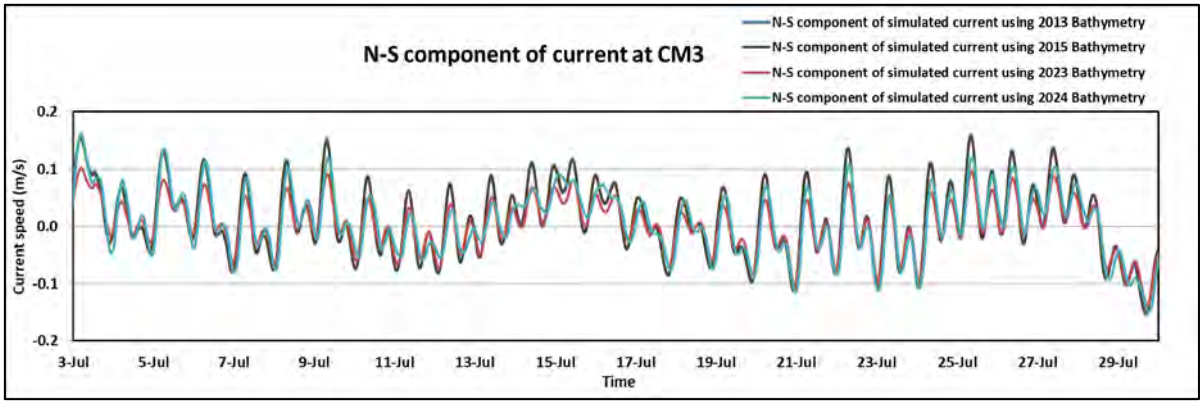


Figure 3-27 Comparison of N-S component of current at CM3

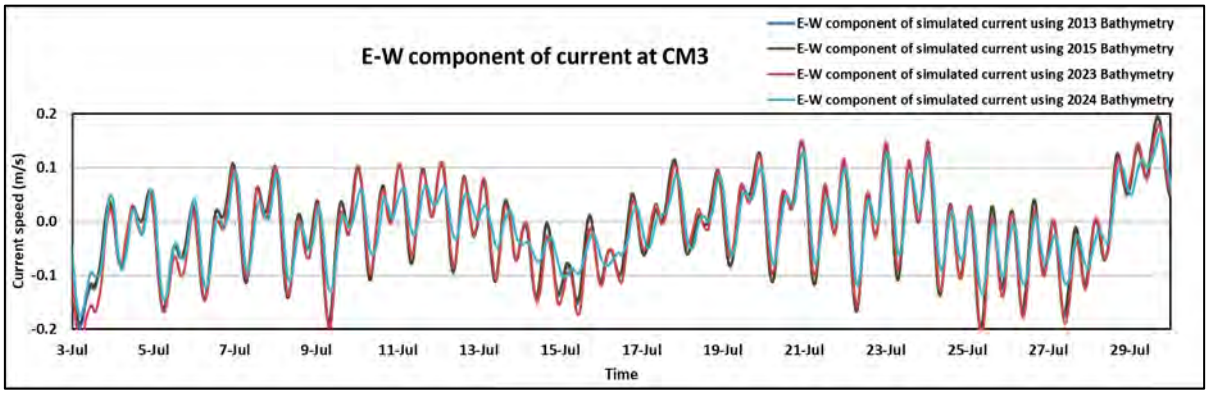


Figure 3-28 Comparison of E-W component of current at CM3

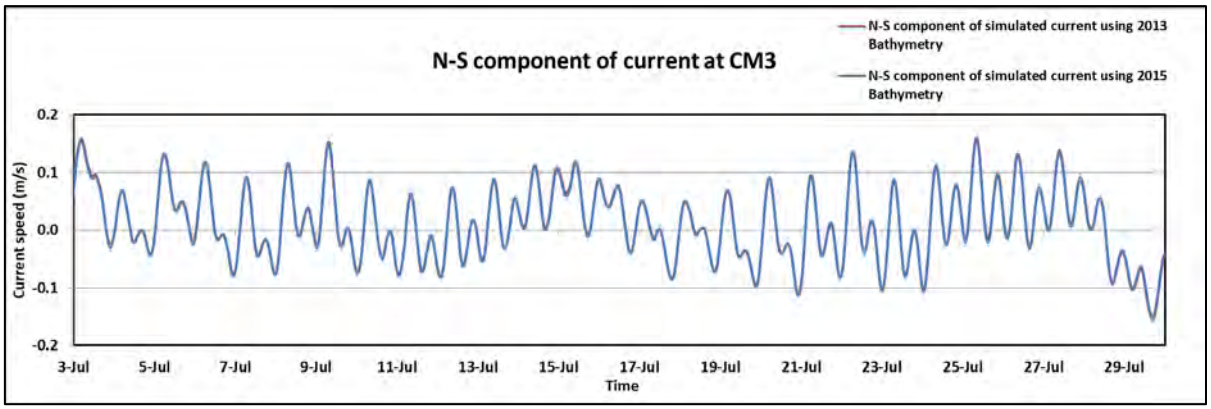


Figure 3-29 Comparison of N-S component of current at CM3 (2013 vs 2015)

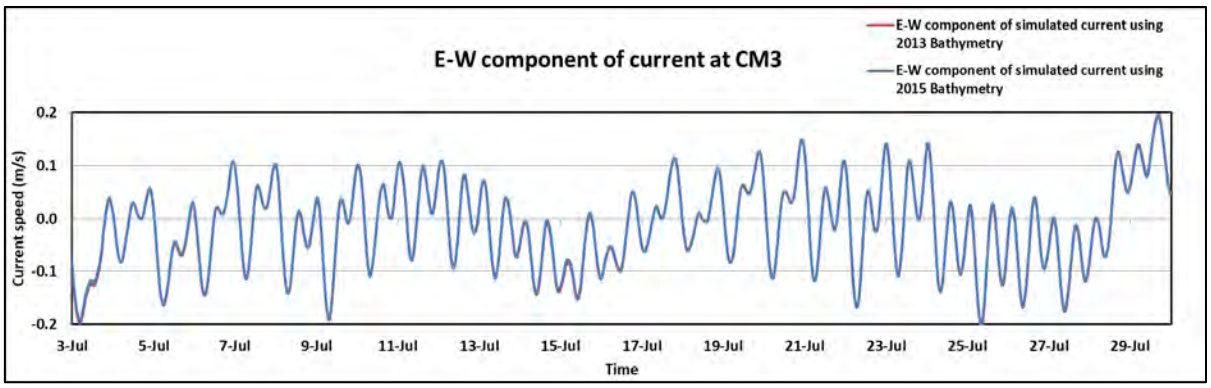


Figure 3-30 Comparison of E-W component of current at CM3 (2013 vs 2015)

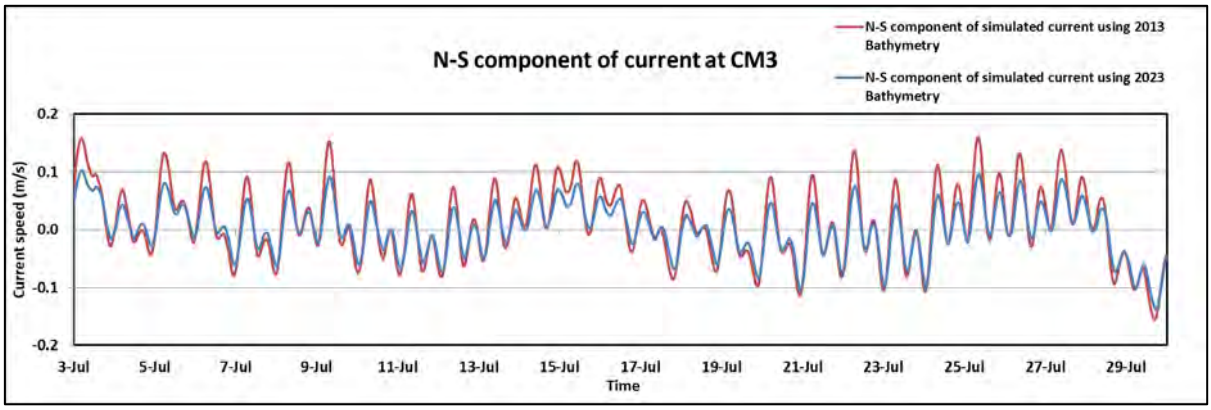


Figure 3-31 Comparison of N-S component of current at CM3 (2013 vs 2023)

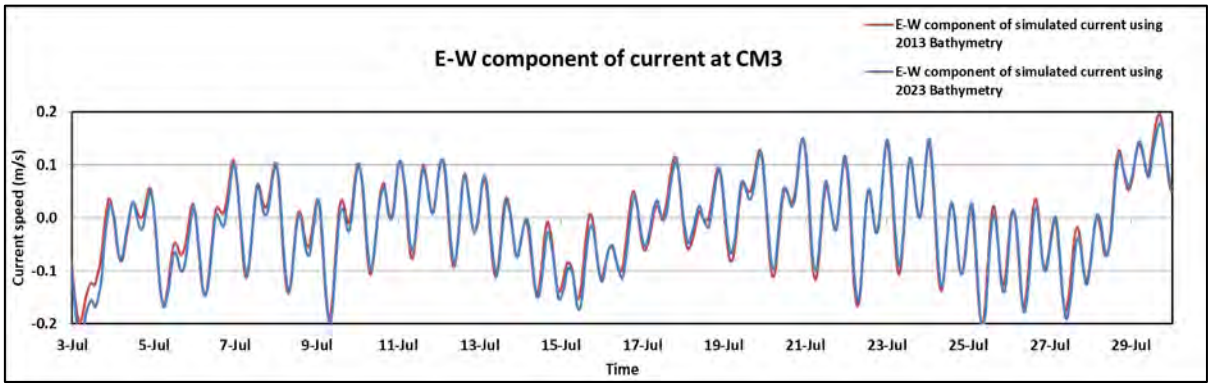


Figure 3-32 Comparison of E-W component of current at CM3 (2013 vs 2023)

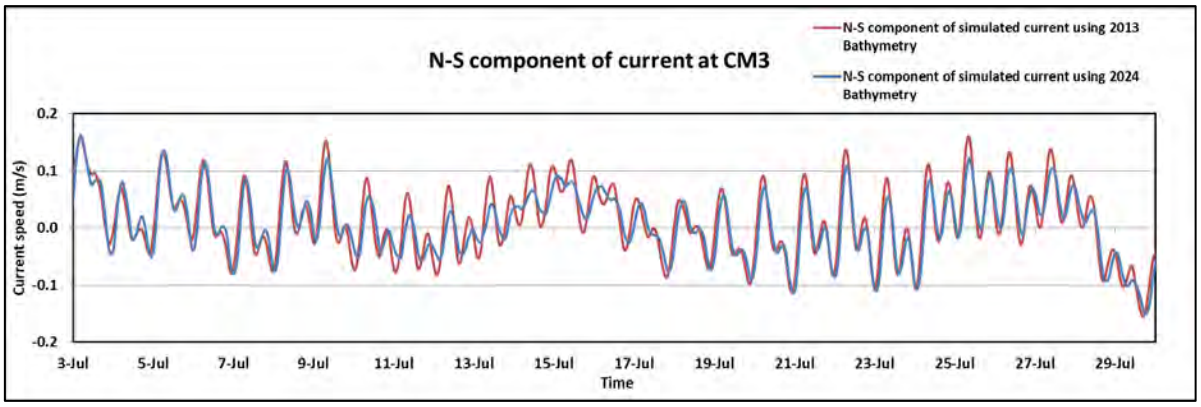


Figure 3-33 Comparison of N-S component of current at CM3 (2013 vs 2024)

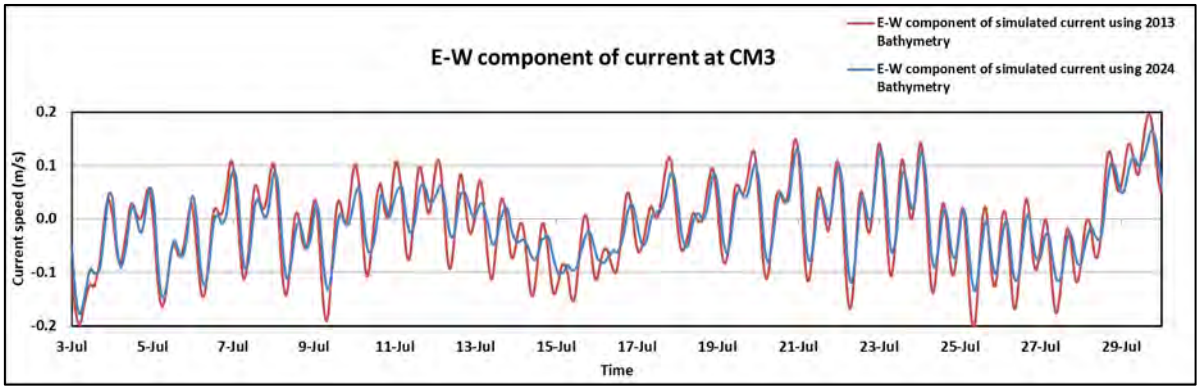


Figure 3-34 Comparison of E-W component of current at CM3 (2013 vs 2024)

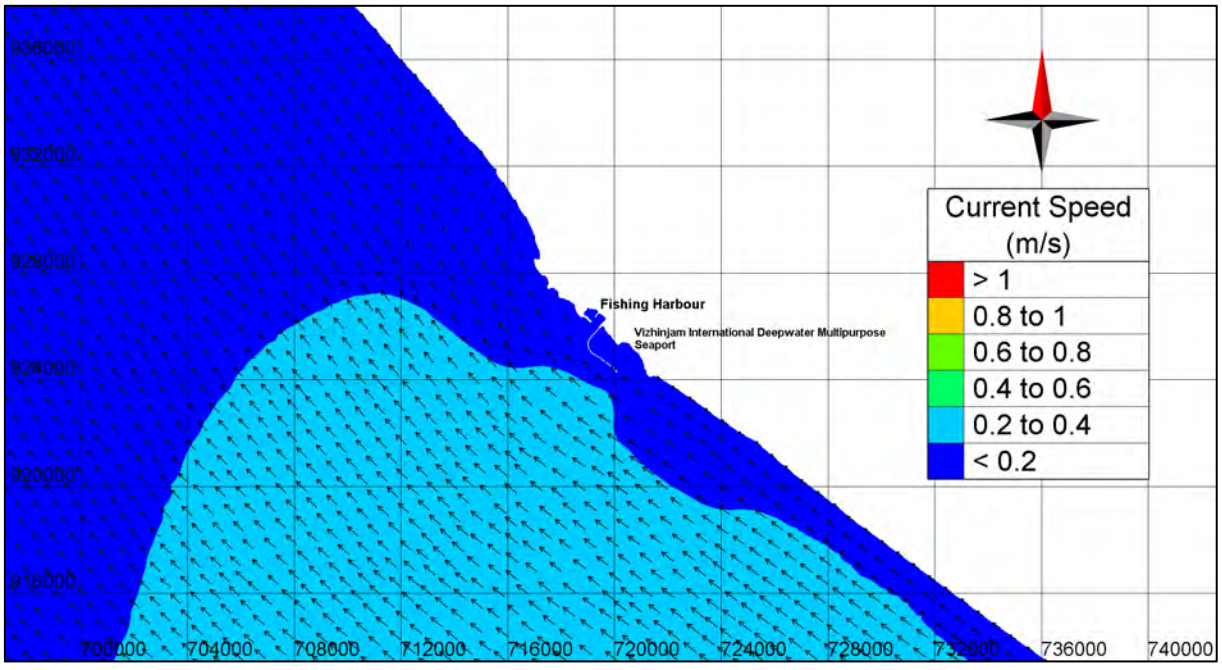


Figure 3-35 Current pattern showing north-westerly flow (typical during monsoon) for pre-monsoon bathymetry

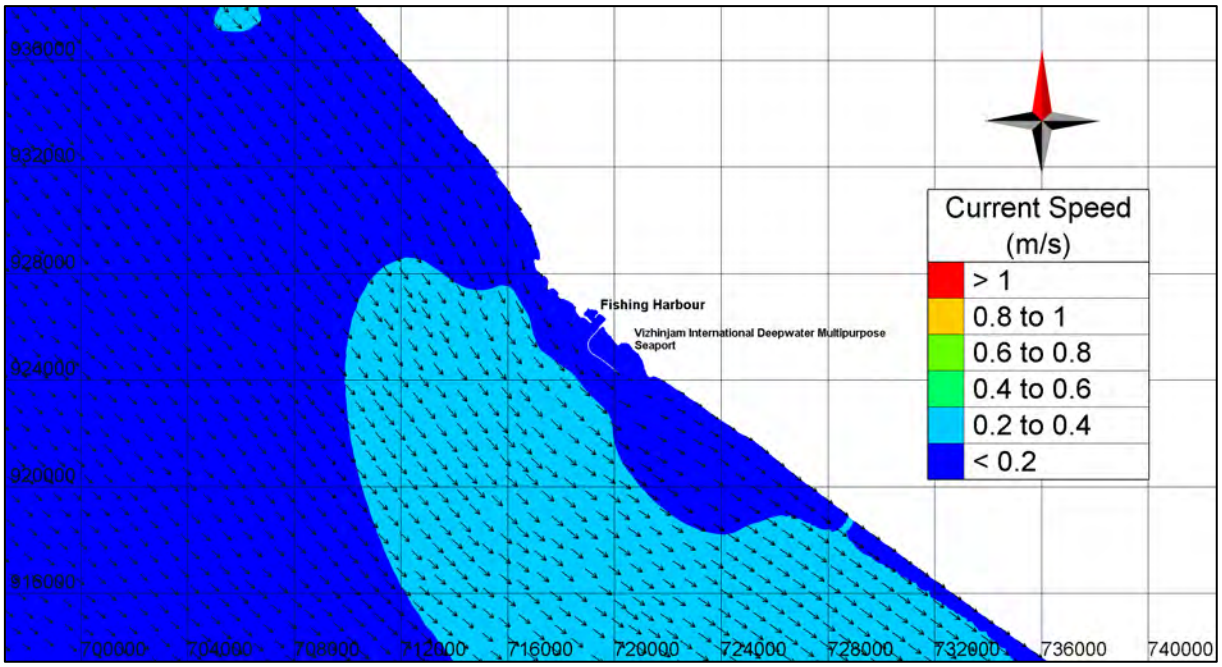


Figure 3-36 Current pattern showing south-easterly flow (typical during monsoon) for pre-monsoon bathymetry

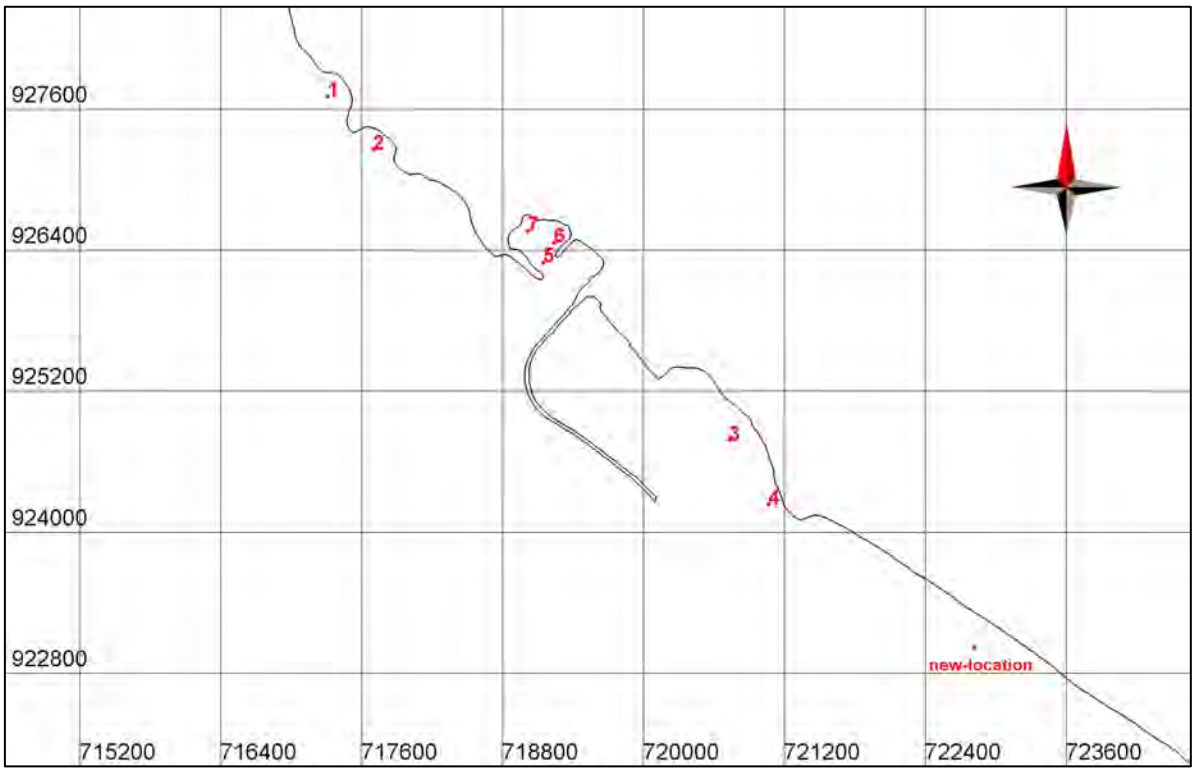
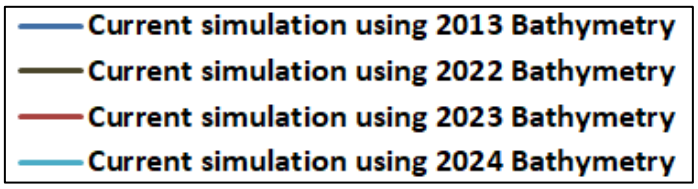


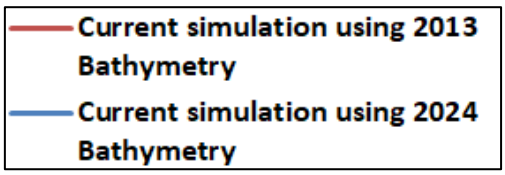
Figure 3-37 Current comparison points location (near shoreline)

Moreover, the current patterns were compared at different locations around the project vicinity at shallow water depth to see if there are any changes in flow pattern. Total 7 points were chosen to cover Fishery harbour, North and South side of proposed port. The points 3 and 4 are screened by the construction of breakwater, so a new point is considered for comparison as shown in Figure 3-37. The current comparison plots were shown in Figure 3-38 to Figure 3-66. From these plots it was observed that there was no significant change in

current speeds. This indicates that the flow pattern at these locations is not influenced by the construction activity.



Legend of Current comparison plot



Legend of Current comparison plot (yearly)

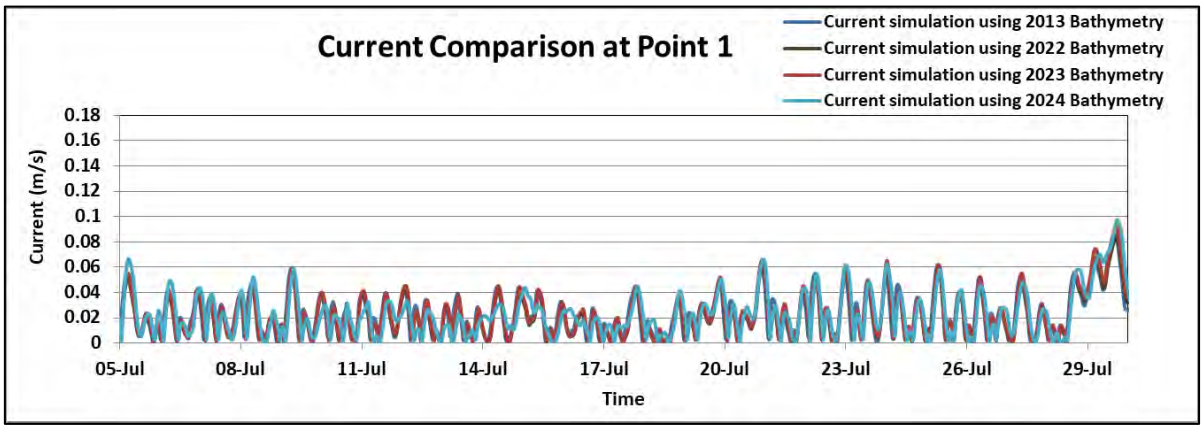


Figure 3-38 Current comparison at point 1

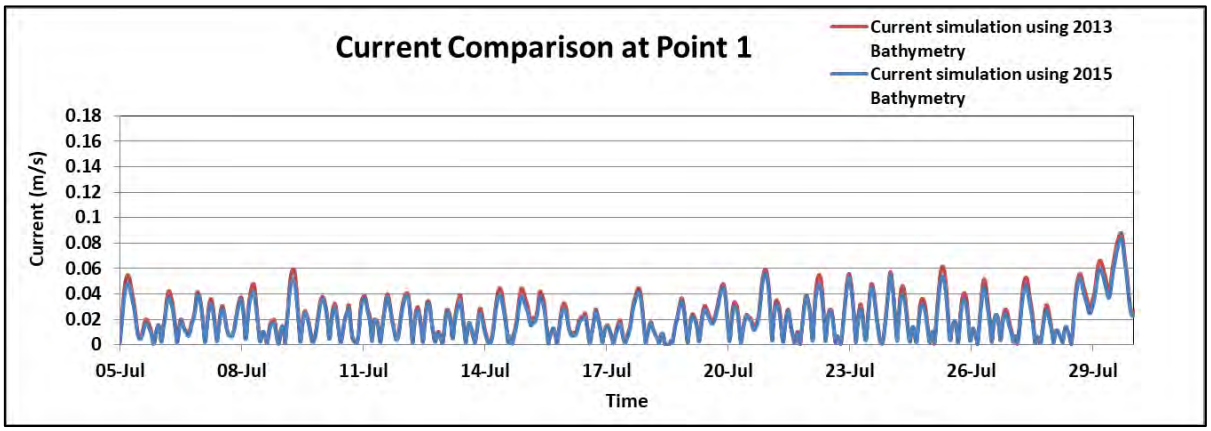


Figure 3-39 Current comparison at point 1 (2013 vs 2015)

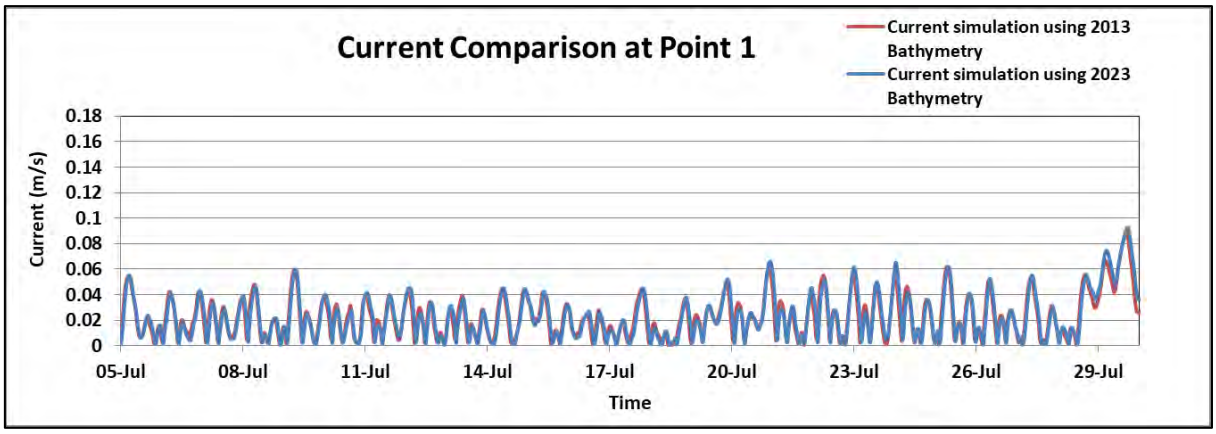


Figure 3-40 Current comparison at point 1 (2013 vs 2023)

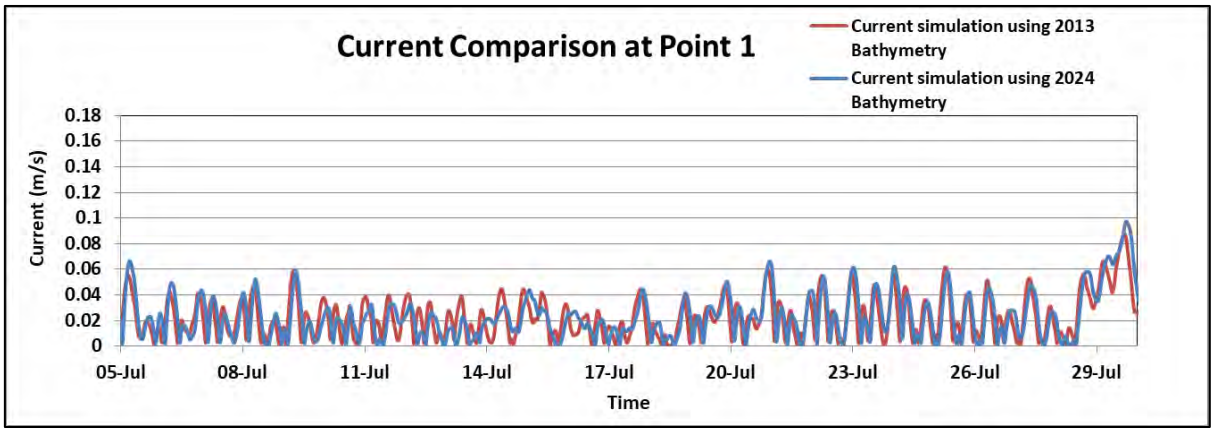


Figure 3-41 Current comparison at point 1 (2013 vs 2024)

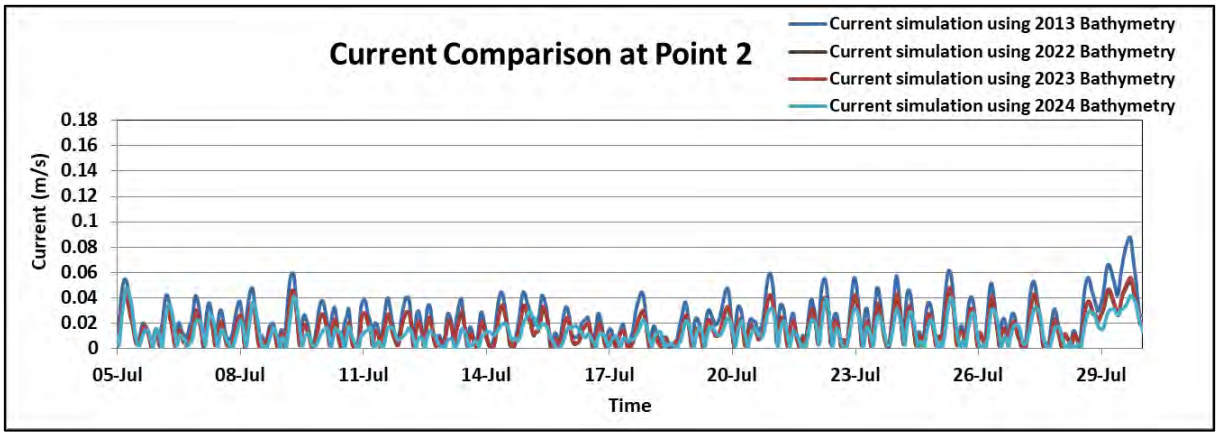


Figure 3-42 Current comparison at point 2

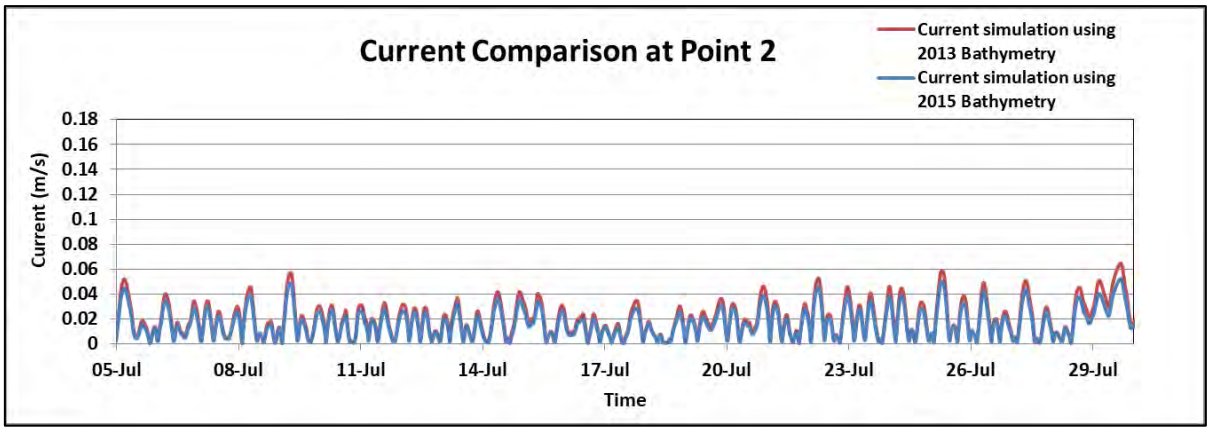


Figure 3-43 Current comparison at point 2 (2013 vs 2015)

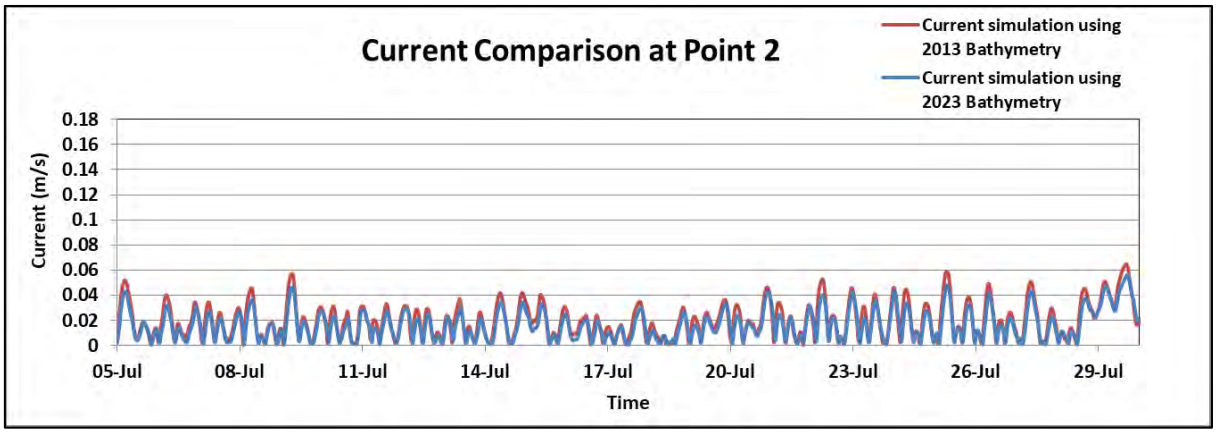


Figure 3-44 Current comparison at point 2 (2013 vs 2023)

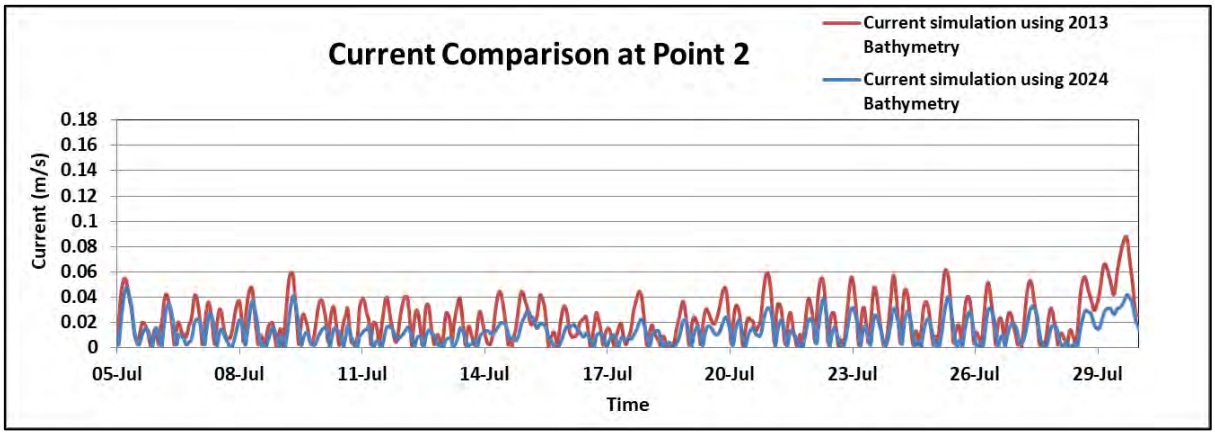


Figure 3-45 Current comparison at point 2 (2013 vs 2024)

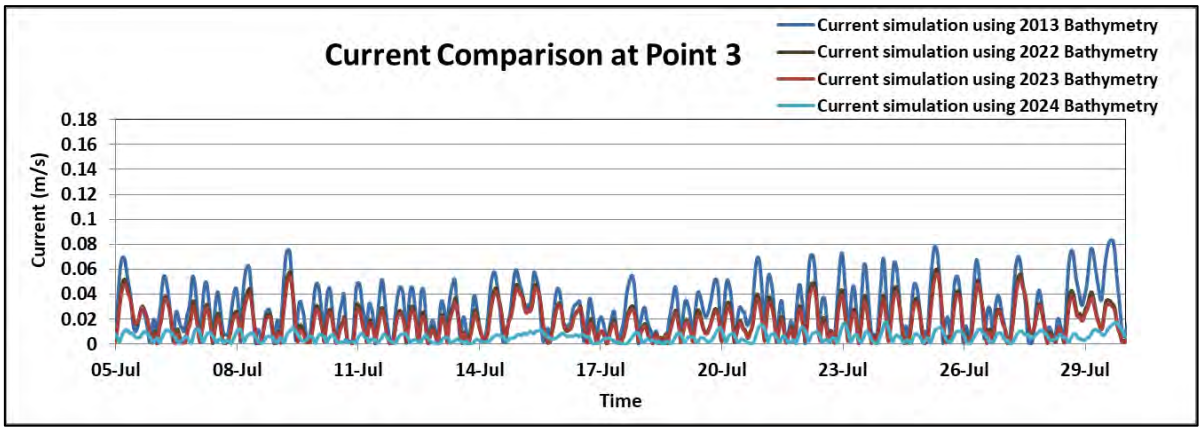


Figure 3-46 Current comparison at point 3

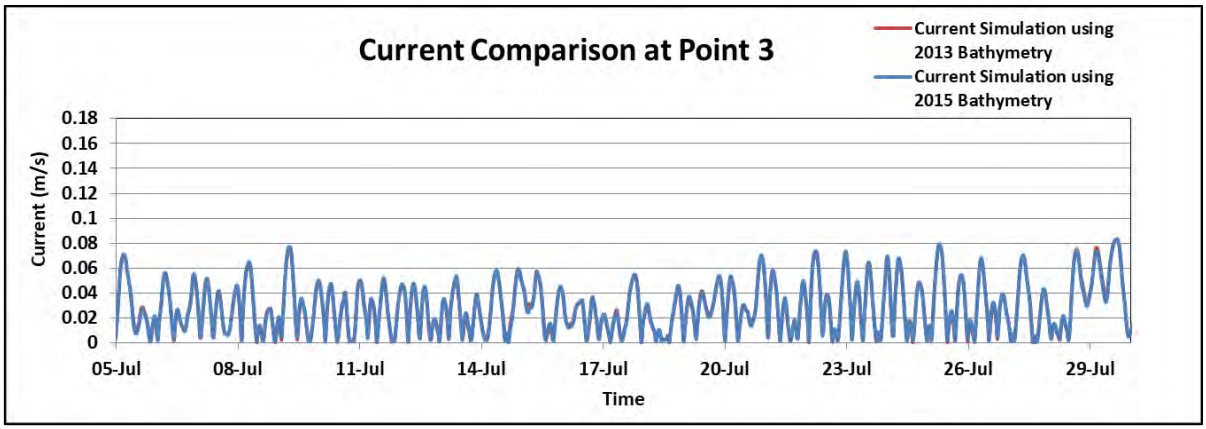


Figure 3-47 Current comparison at point 3 (2013 vs 2015)

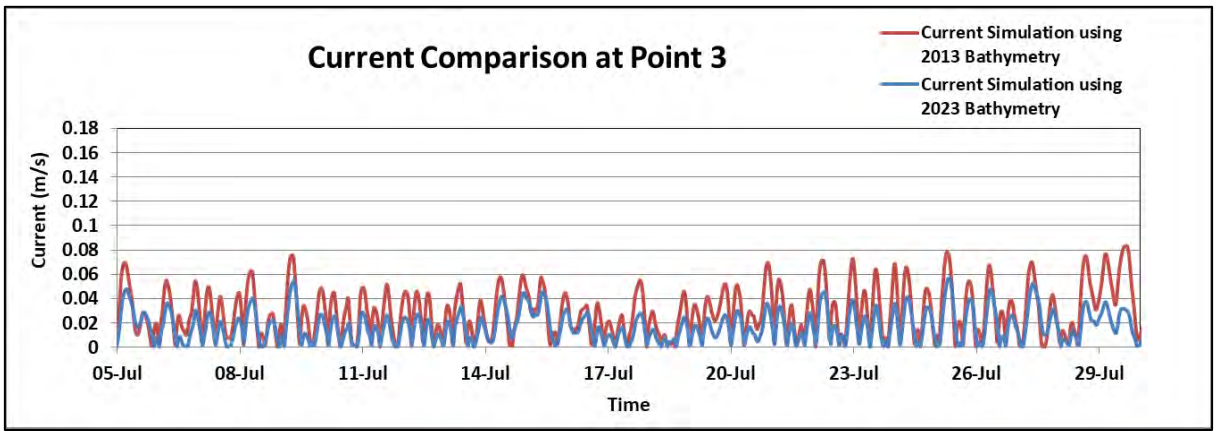


Figure 3-48 Current comparison at point 3 (2013 vs 2023)

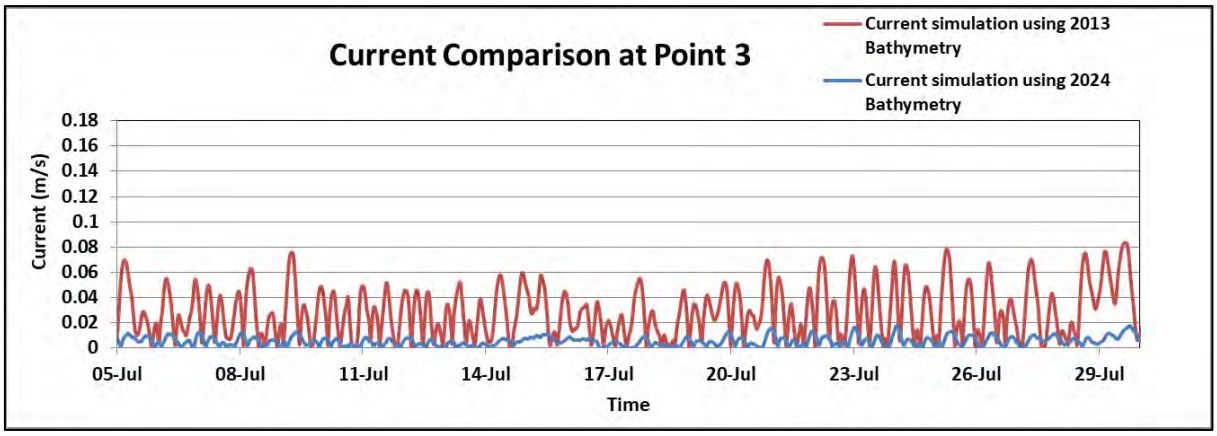


Figure 3-49 Current comparison at point 3 (2013 vs 2024)

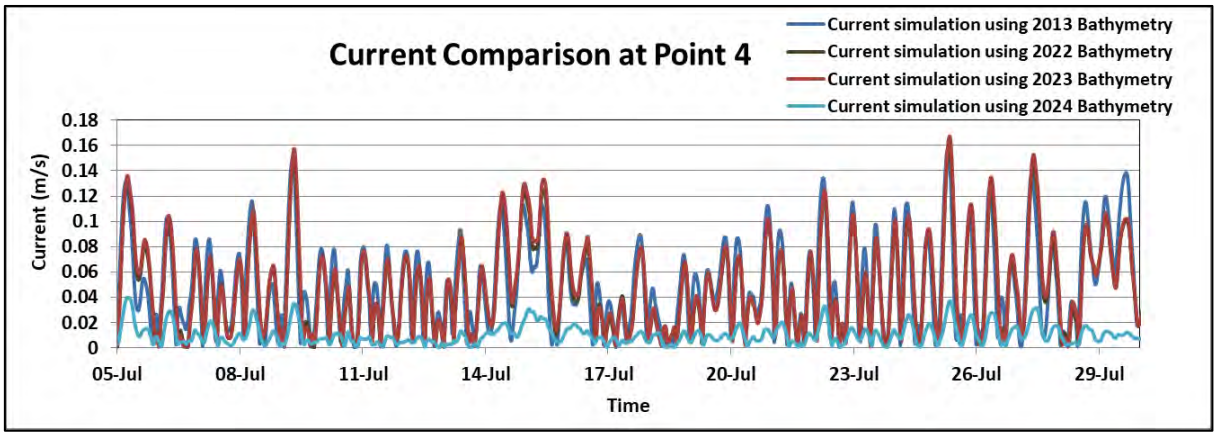


Figure 3-50 Current comparison at point 4

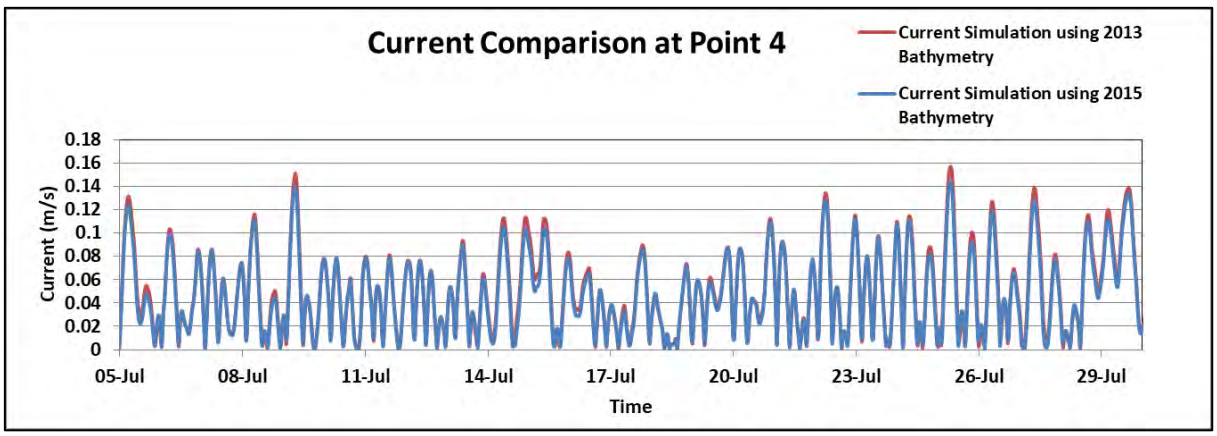


Figure 3-51 Current comparison at point 4 (2013 vs 2015)

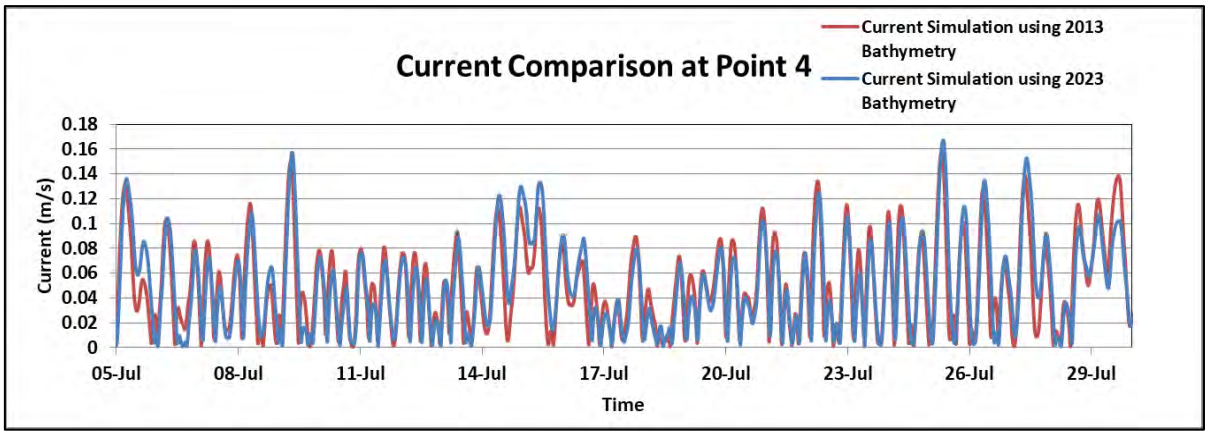


Figure 3-52 Current comparison at point 4 (2013 vs 2023)

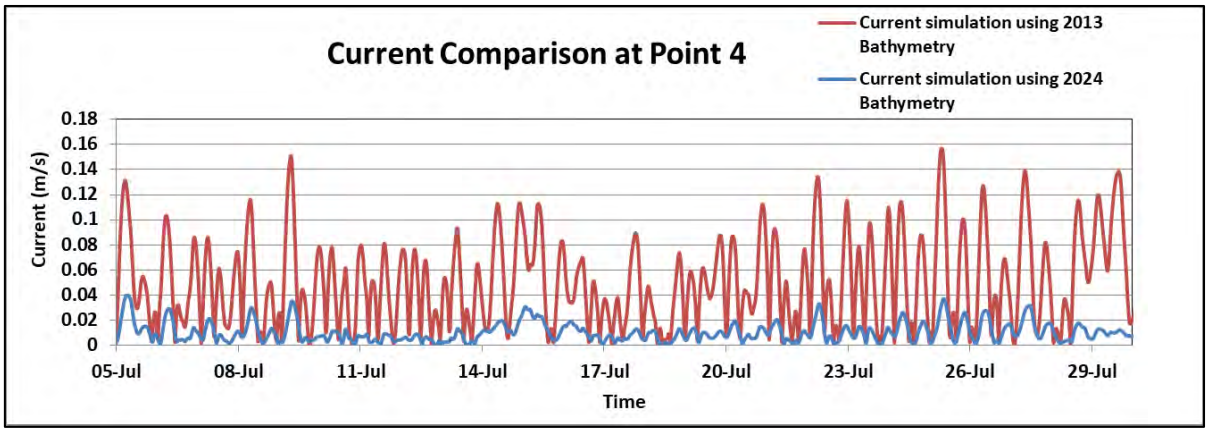


Figure 3-53 Current comparison at point 4 (2013 vs 2024)

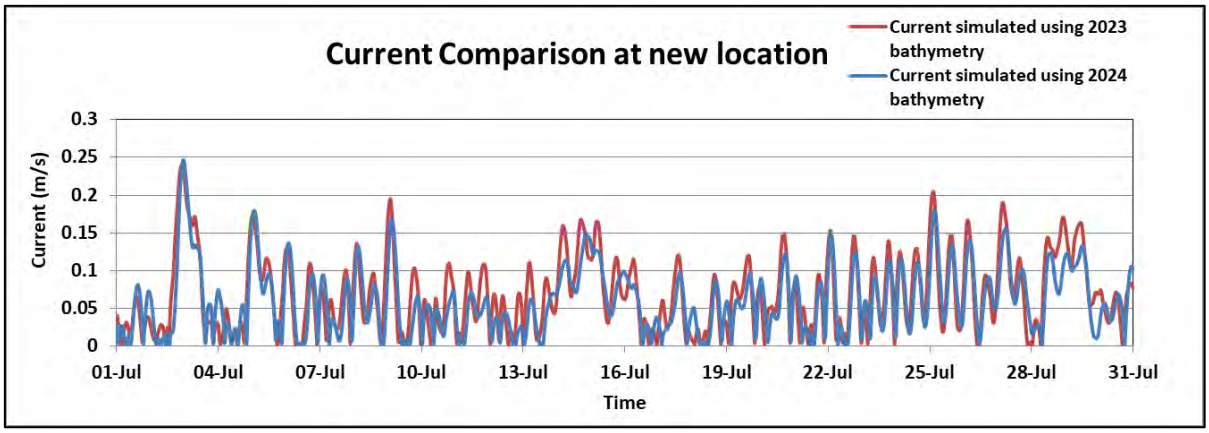


Figure 3-54 Current comparison at new location (2023 vs 2024)

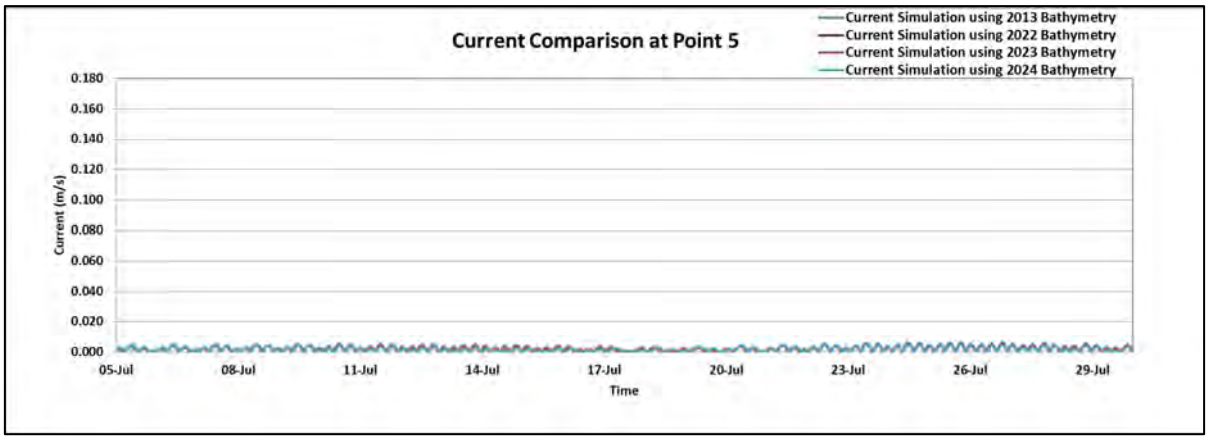


Figure 3-55 Current comparison at point 5

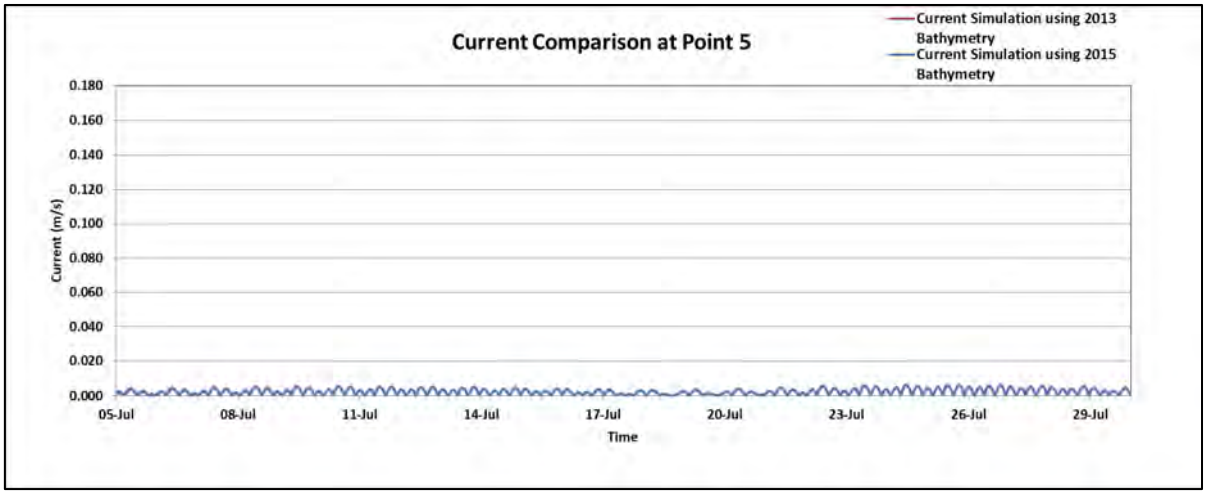


Figure 3-56 Current comparison at point 5 (2013 vs 2015)

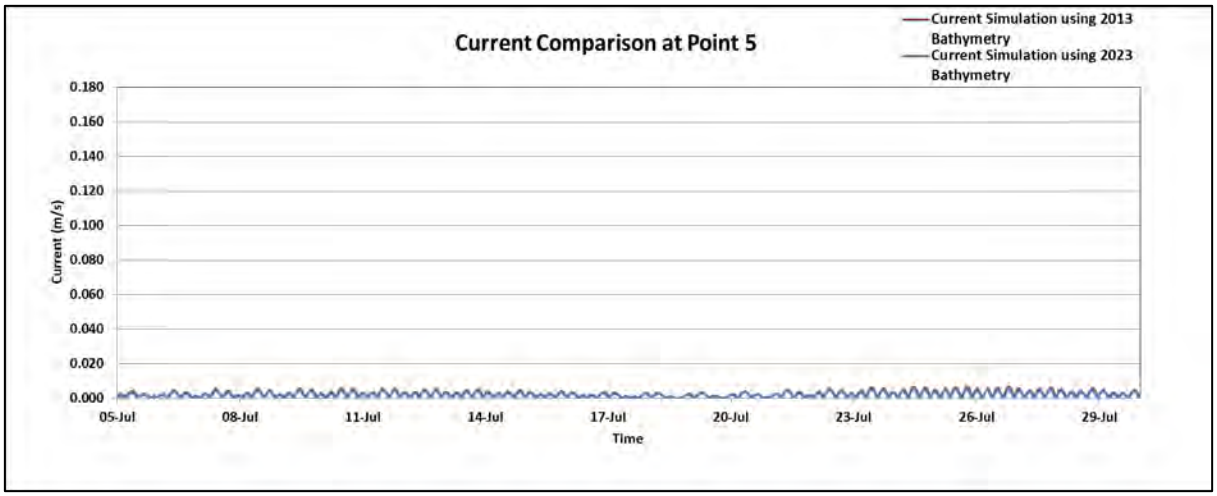


Figure 3-57 Current comparison at point 5 (2013 vs 2023)

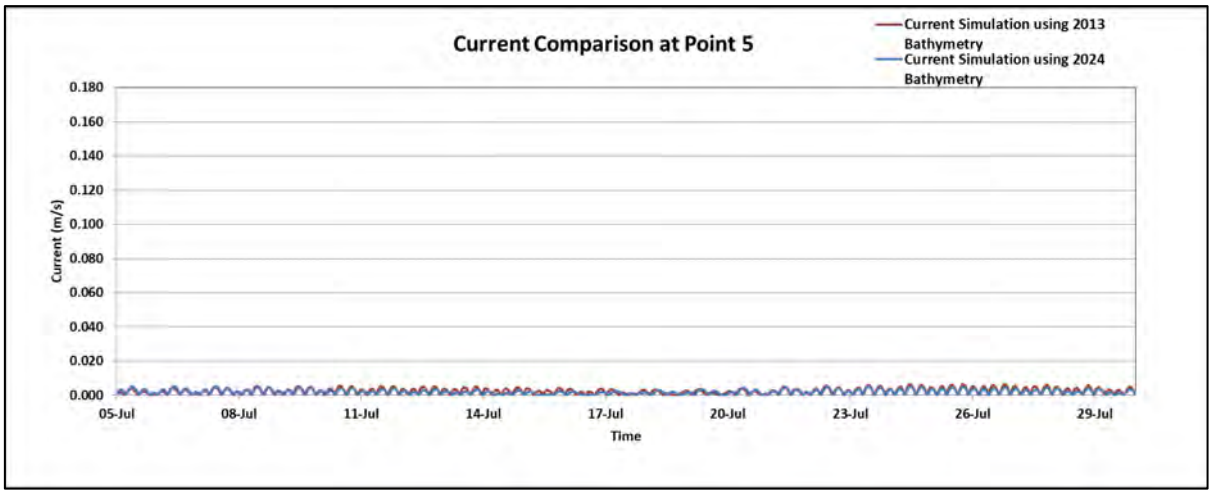


Figure 3-58 Current comparison at point 5 (2013 vs 2024)

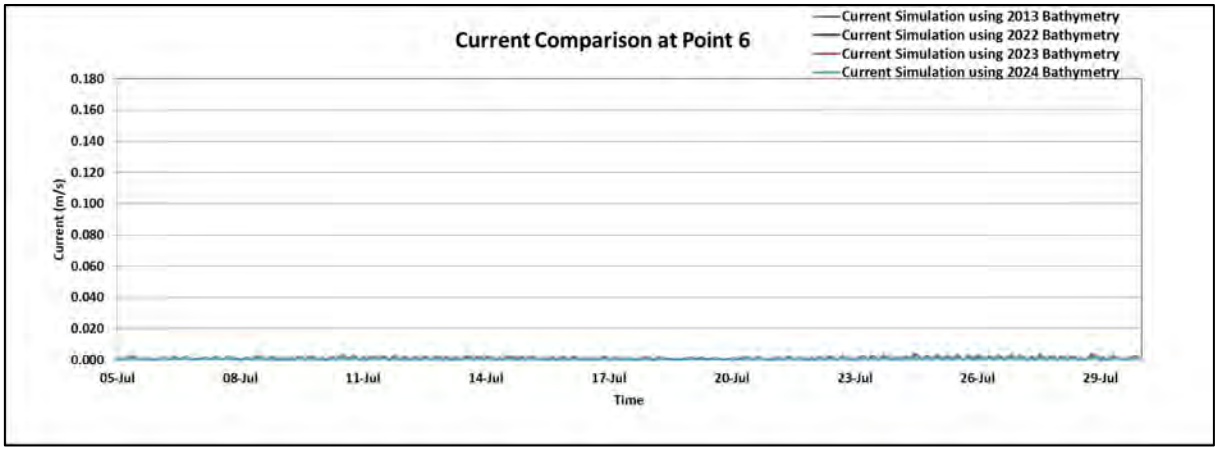


Figure 3-59 Current comparison at point 6

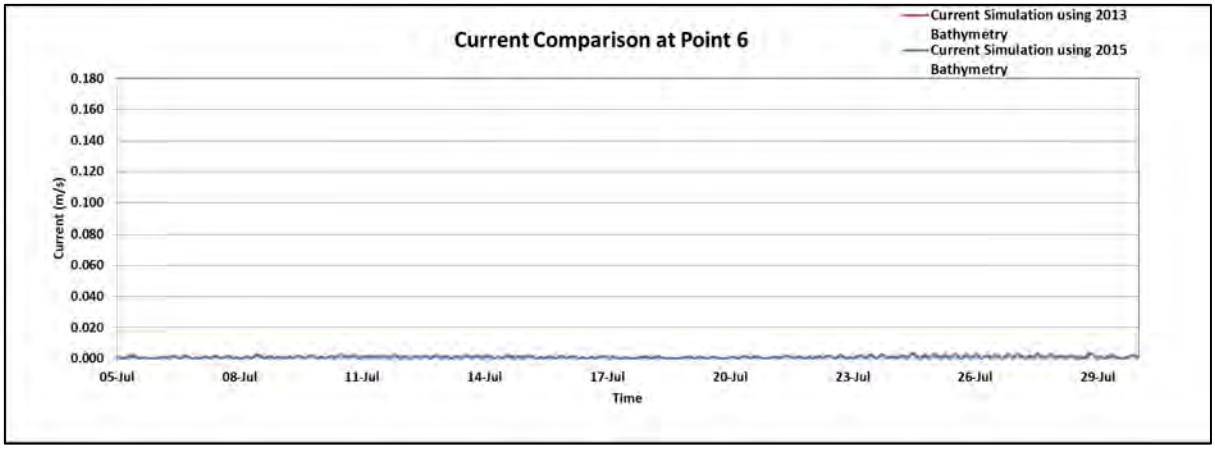


Figure 3-60 Current comparison at point 6 (2013 vs 2015)

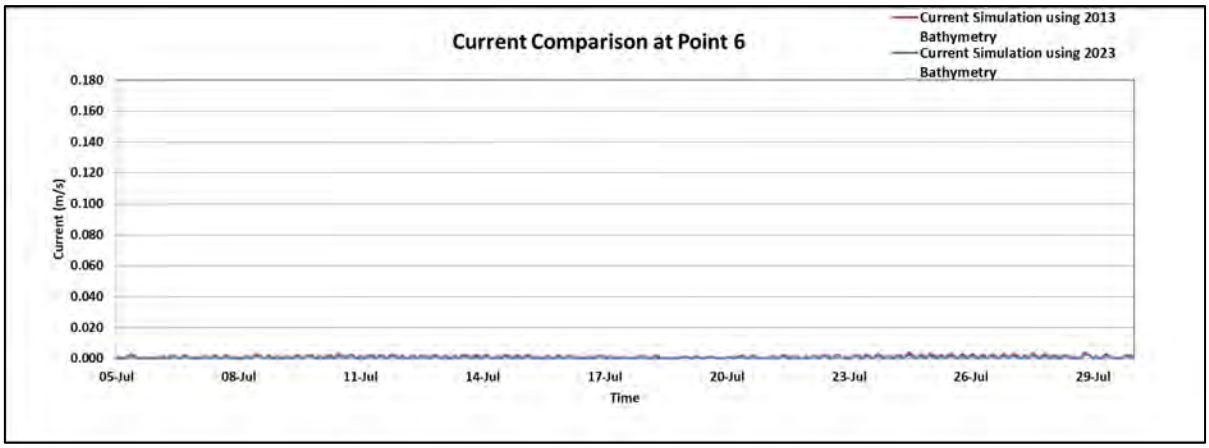


Figure 3-61 Current comparison at point 6 (2013 vs 2023)

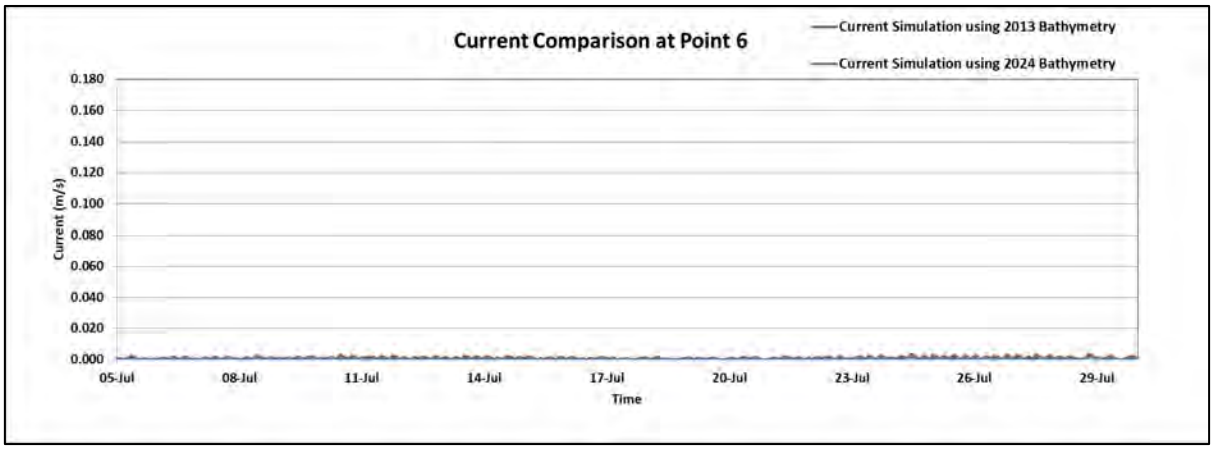


Figure 3-62 Current comparison at point 6 (2013 vs 2024)

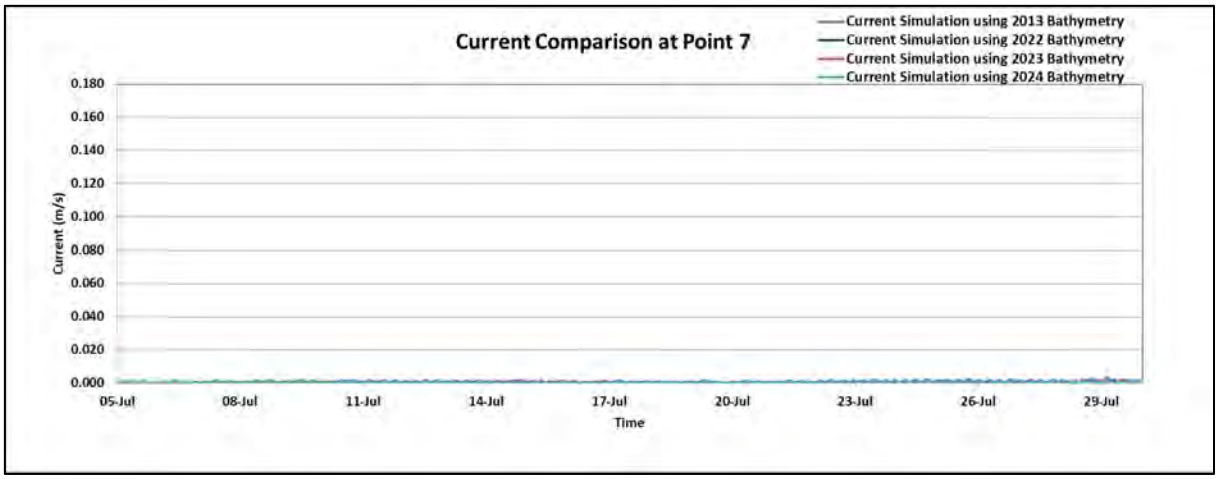


Figure 3-63 Current comparison at point 7

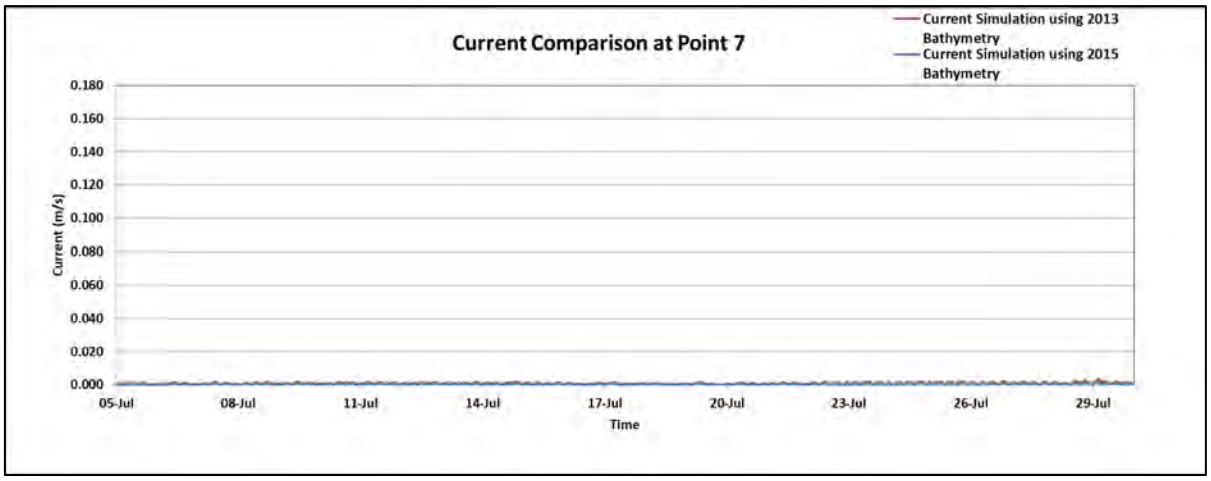


Figure 3-64 Current comparison at point 7 (2013 vs 2015)

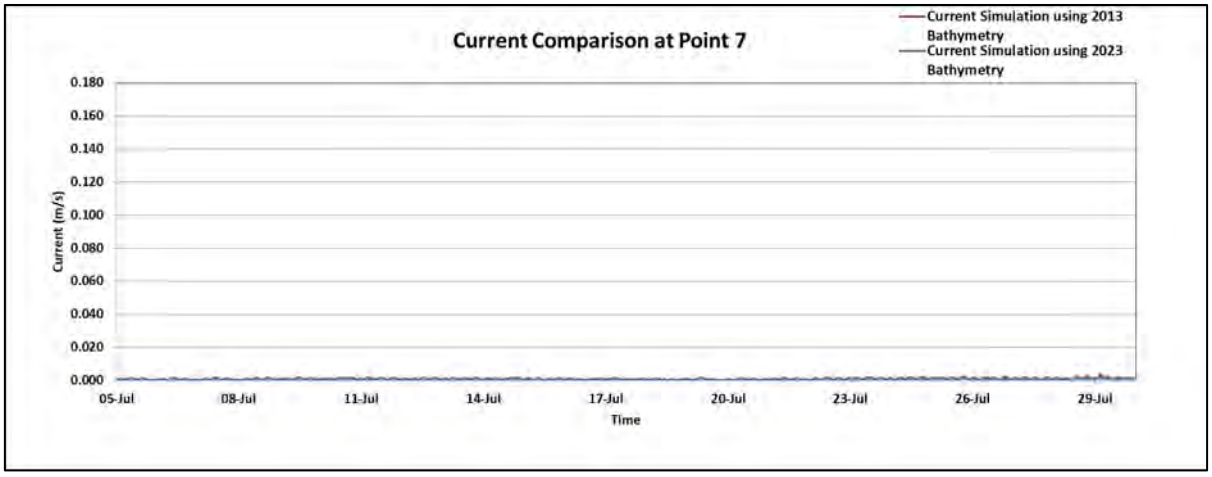


Figure 3-65 Current comparison at point 7 (2013 vs 2023)

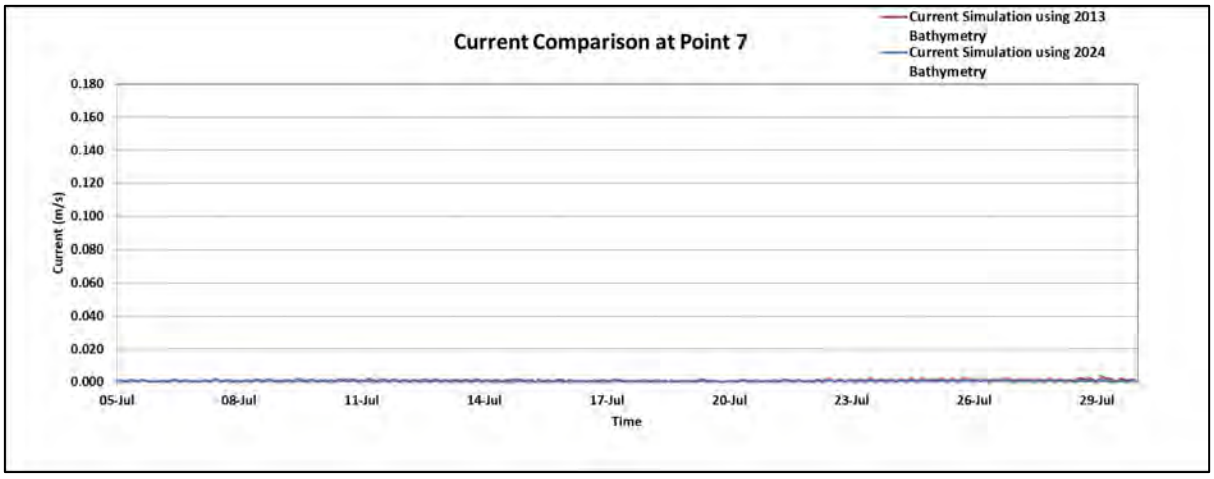
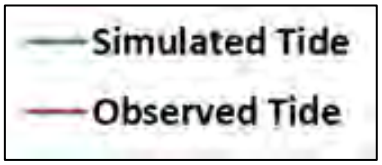


Figure 3-66 Current comparison at point 7 (2013 vs 2024)

Also, model was setup using latest surveyed bathymetry as Post monsoon 2023 and Pre monsoon 2024. The same calibration parameters and boundary conditions as discussed in earlier sections are used to simulate hydrodynamics. The model bathymetry prepared using the available primary and secondary data is shown in Figure 3-2.

Comparison between the simulated and observed tide was done. Since the observed current data is not available, comparison between the simulated and observed currents were not

performed. Figure 3-67 and Figure 3-68 shows the comparison between the modelled tide and observed tide measured by AVPPL. From the comparisons there is a good correlation between simulated and observed data which indicates that the change in bathymetry has no effect on the tidal variations.



Legend of Tide comparison plot

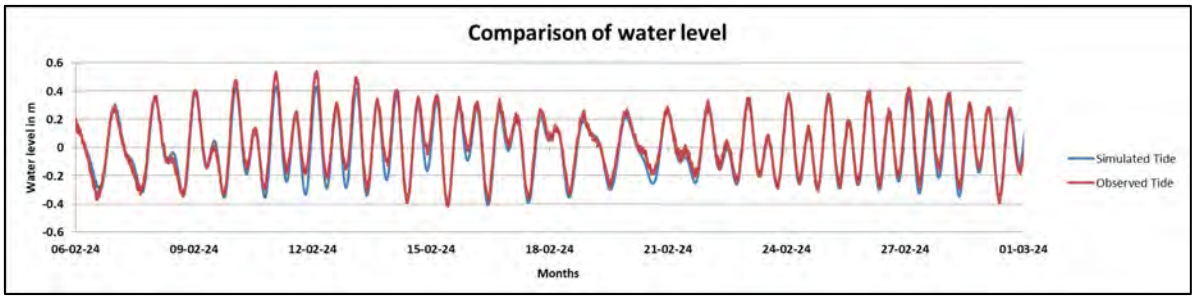


Figure 3-67 Comparison of simulated tide with observed tide (Post Monsoon 2023)

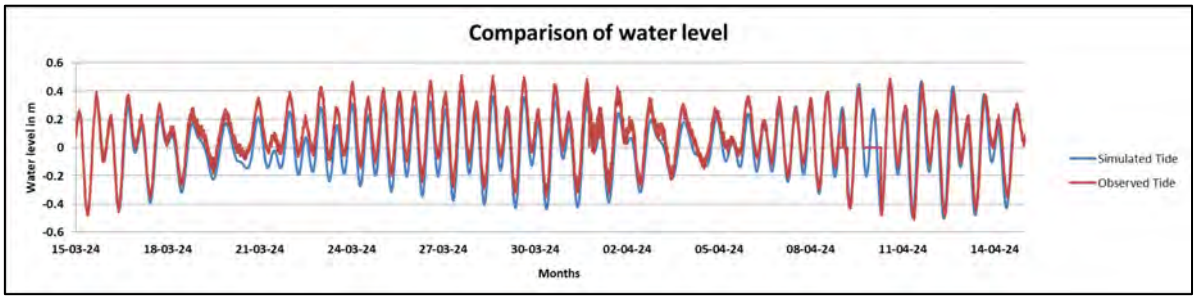


Figure 3-68 Comparison of simulated tide with observed tide (Pre Monsoon 2024)

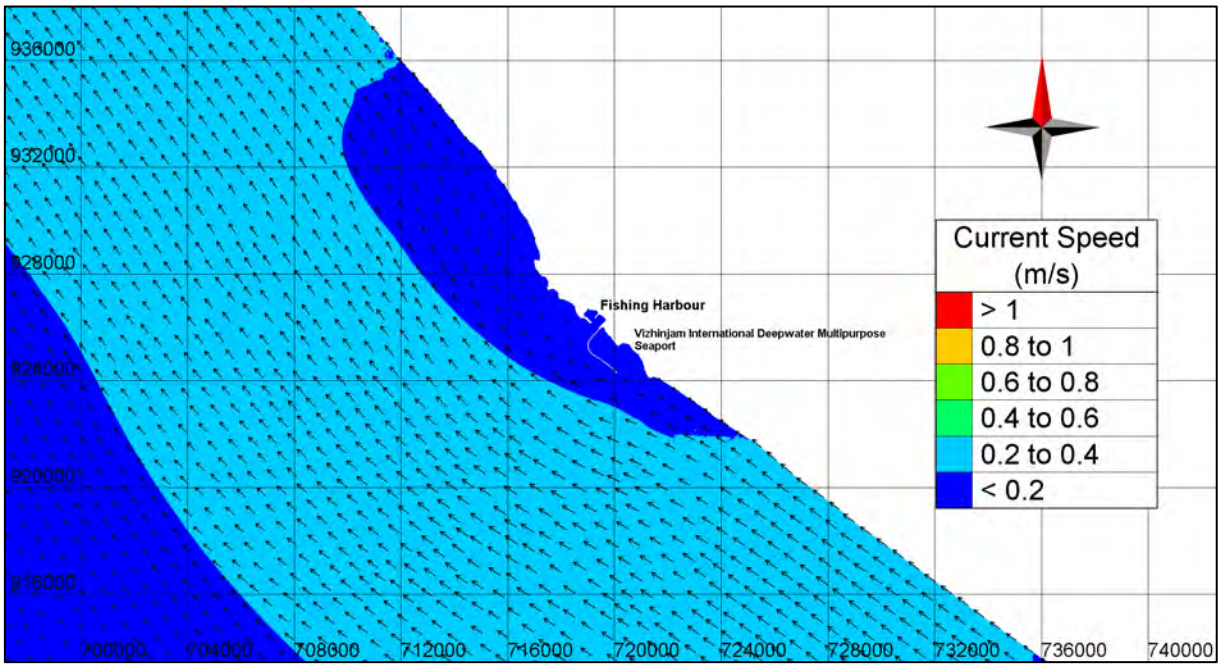


Figure 3-69 Typical plot of current pattern showing north-westerly flow

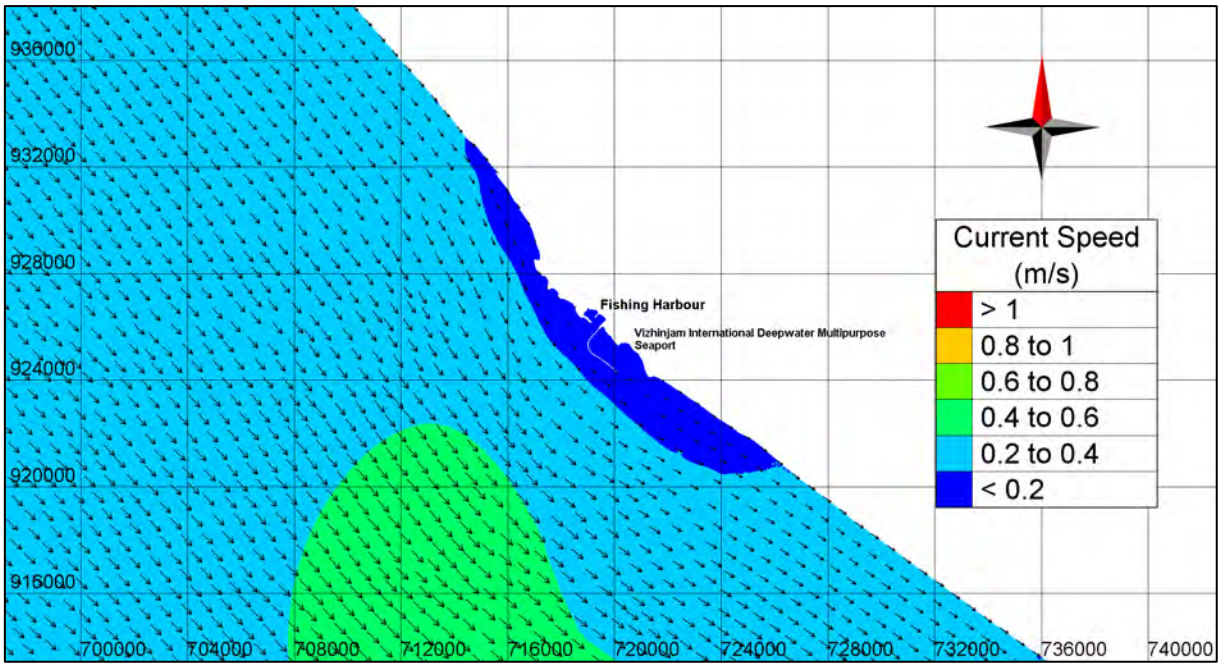


Figure 3-70 Typical plot of current pattern showing south-easterly flow

From the comparison plots it can be noticed that there is a good correlation between simulated and observed tides. Figure 3-69 and Figure 3-70 shows typical plots from simulation. This shows that the model can replicate the actual scenario well.

3.2 Longshore sediment transport

Longshore sediment transport refers to the cumulative movement of beach and near shore material parallel to the shore due to wave induced currents in the surf zone. These forces usually result in an almost continuous movement of material either in suspension or in bed load. The movement of water over the sea bed exerts a tractive force upon the surface particles on the bottom. When the force exerted exceeds the resistance of the particle to movement, transport takes place. The characteristics of transport are dependent principally upon the velocity and direction of water movement, sediment characteristics and upon the slope of the sea bed.

In earlier section, the offshore movement of the sediments were studied in the analysis of the cross shore profiles. The seasonal and annual movement of the shoreline was assessed and the various causes attributing to this movement were noted. However, along with the cross shore sediment transport, it is necessary to study the movement of the shoreline along the coast as well. A study on the same is covered in this section.

The study area extends from Edappadu Beach (CS 01) in the South to Thumba (CS 81) in the North over a stretch of approximately 40km as shown in Figure 3-71. This coast can be distinguished into two subsets depending on the coastal orientation. The shore angle on south side is in the range of 125^0 to 130^0 (True North) and shore angle on north side is in the range of 135^0 to 145^0 (True North). These orientations were shown with green and maroon lines in Figure 3-72. This change in orientation will have effect on long shore sediment transport and its behaviour.

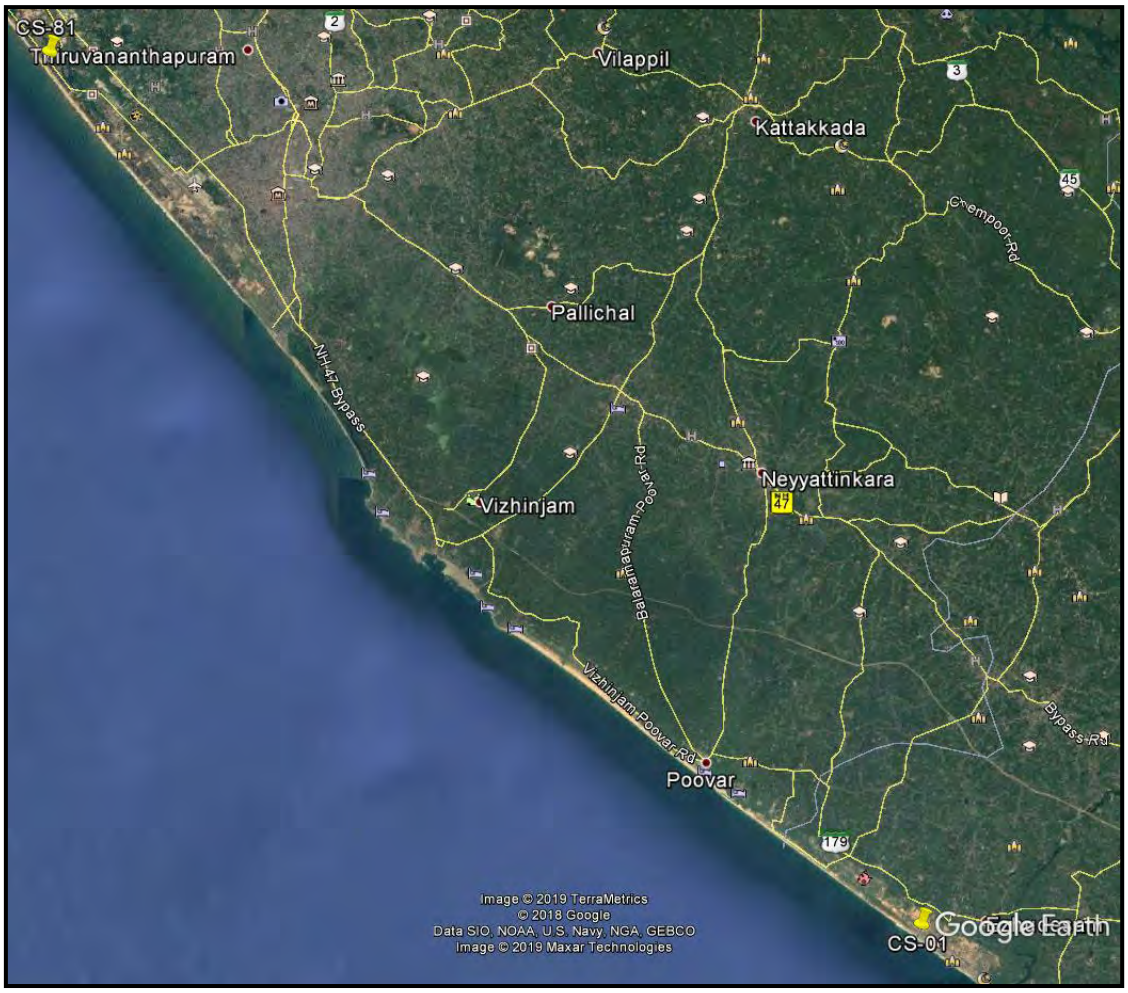
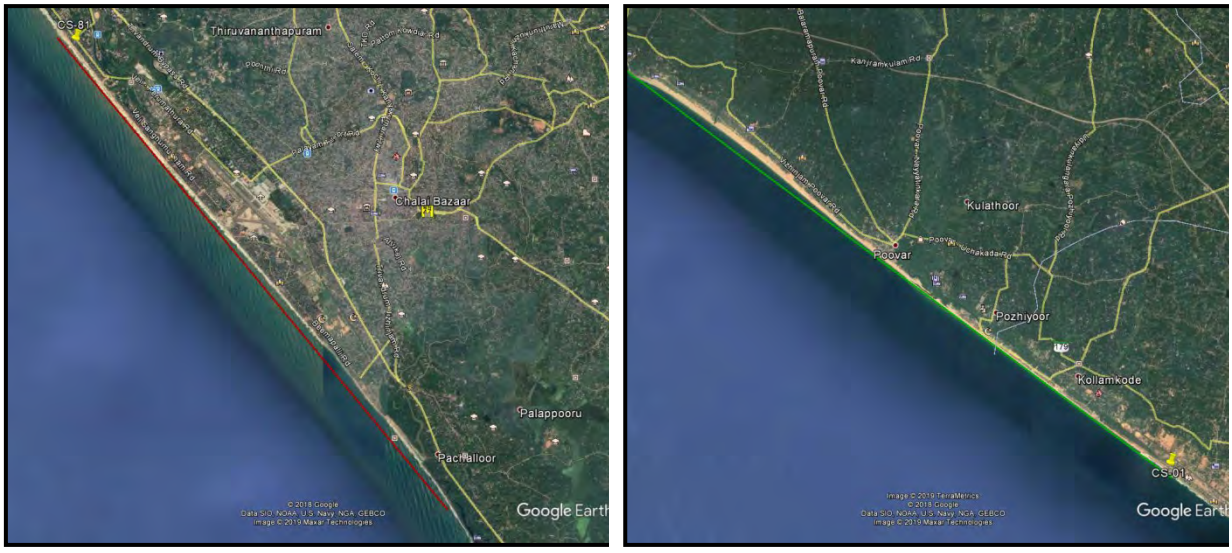


Figure 3-71 Study area



Orientation north of the port **Orientation south of the port**

Figure 3-72 Coast orientations

3.2.1 Longshore sediment transport due to breaking waves

To compute longshore transport rate, breaking parameters need to be estimated first. The breaking parameters such as breaking wave height, breaking depth and breaking angle (shore normal) were calculated using depth limited criterion. This expression includes the influence of beach slope m.

$$\frac{H_{sb}}{d_b} = 0.56\, e^{3.5m}$$

The wave parameters were collected from WRB deployed at 25 m water depth and the breaking characteristics of waves were determined by combining wave refraction and shoaling calculations with the above wave breaking criteria.

The dynamic equation of the long shore transport rate (LSTR), Q is

$$Q = (H^2 C_g)_b [a_1 sin2\Theta_{bs} - a_2 cos\Theta_{bs} \frac{\partial H}{\partial x}]_b$$

$$a_1 = \frac{K_1}{16(s-1)(1-p)(1.416)^{5/2}}$$

$$a_2 = \frac{K_2}{8(s-1)(1-p)tan\beta(1.416)^{7/2}}$$

Where H is the breaking wave height, C_g is the breaking wave group velocity, x is the long shore direction, and θ_{bs} is the angle of breaking waves referenced to the shore perpendicular direction, a_1 and a_2 are the non-dimensional parameters, p is porosity of the sand on the bed, s is ratio of density of sand to density of water and *tan* β is the average near shore bottom slope. The first term considers sediment transport generated by the long shore component of the breaking wave energy flux (similar to CERC formula). The second term modifies the transport rate to account for long shore gradients in breaking wave height $\frac{\partial H}{\partial x}$. K_1 and K_2 are the two dimensionless calibration parameters for controlling the long shore sediment transport and offshore wave breaking.

Following standard convention of longshore transport directed to the right of an observer on the beach facing the sea is positive (Northward transport in this study), and transport toward the left is negative. The long shore transport rates were calculated using dynamic equation at each section and net transport rate was estimated over a year. In LSTR computation, the effect of groins and seawalls was not considered.

As explained earlier, depending on the coast orientation two average LSTR estimates were calculated based on available 9 years data (Feb 2015 – Feb 2024). The northerly and southerly (annual average) longshore sediment movement in south stretch is in the range of 0.16 to 0.17 M m^3/yr (Northwards) and -0.09 to -0.11 M m^3/yr (Southwards). In north stretch, the range is 0.22 to 0.23 M m^3/yr (Northwards) and -0.11 to -0.12 M m^3/yr (Southwards). The net annual average longshore sediment movement in south stretch is in the range of 0.06 to 0.07 M m^3/yr (Northwards) and in north stretch in the range of 0.11 to 0.12 M m^3/yr (Northwards).

4 Impact of breakwater, groynes and seawalls on 12km radius of Vizhinjam port

4.1 Introduction

Shoreline is a fringe of land that represents the dynamic boundary that separates the shoreline from the continual impact of waves, winds, surge, and tides. This boundary evolves over timescales of hours (e.g., changing tides or wave conditions) to decades.

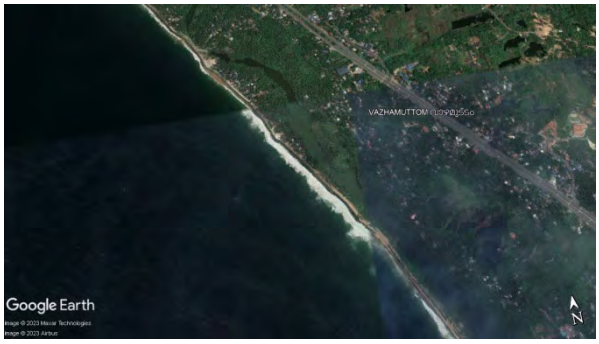
Alongshore sediment transport takes place when waves approach obliquely to the shore and eventually break. The wave breaking releases energy which brings sediment into suspension and alongshore littoral currents transports the sediment. Sediment transport is a cyclic process in which sediments are transported to and from the coast. The cycle of sediment transport by the waves to and from the coast is continuous which has aided in maintaining the equilibrium of the coastline over the geological times. Any change to the sediment transport due to natural and manmade development leads to imbalance in shoreline dynamics leading to accretion/erosion.

The aim of this study is to assess the long-term shoreline behaviour in the area and to assess the shoreline evolution due to the impact of breakwater, groynes and seawalls on 12km radius of Vizhinjam port. The long-term shoreline changes in the study area were studied based on analysis of primary and secondary data. GENESIS shoreline evolution model was setup to study the existing scenario and to study the long-term change due to the proposed port development during different phases of its development.

Coastal structure such as a groyne or a breakwater when introduced into the sea interrupts wave-induced littoral sediment transport in the direction of flow. The obstruction of sediment transport leads to sediment built-up up-drift and erosion down-drift due to deficit in sediment supply due to the obstruction. These aspects are studied individually in the context of proposed developmental activities which is detailed in the following section.

a) 0 - 2 km towards North

b) 2 - 4 km towards North



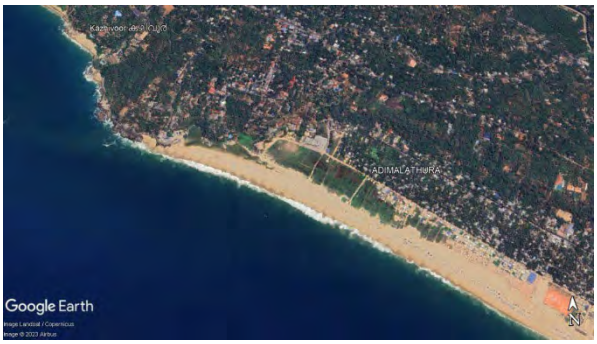
c) 4 - 6 km towards North

d) 6 - 8 km towards North

e) 8 - 10 km towards North

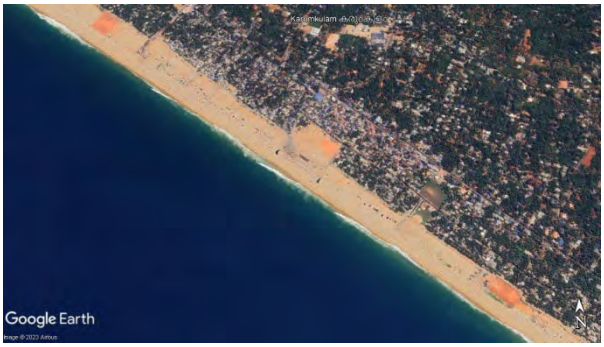
Figure 4-1 Shoreline towards the north of port

a) 0 – 2 km South

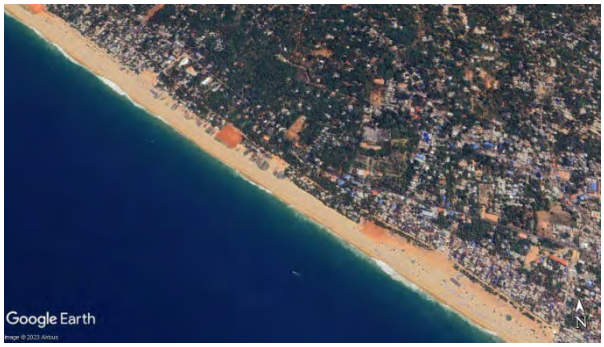


b) 2 – 4 km South

c) 4 – 6 km South



d) 6 – 8 km South



e) 8 – 10 km South

Figure 4-2 Shoreline towards the south of port

Figure 4-3 Groyne fields north of the port

4.2 GENESIS shoreline change model

GENESIS is used to examine long-term shoreline change due to the proposed breakwater. GENESIS is an elaborate one-dimensional numerical model, which simulates changes in shoreline position due to spatial and temporal gradients in longshore sediment transport. The model considers the motion of sediment as uniform over the entire active profile between two well-defined limiting elevations i.e. the top of active berm and the depth of closure (the seaward limit of significant sediment transport). GENESIS can simulate changes in shoreline position due to the presence and combinations of beach fills and nearshore structures such as groyne, jetties, seawalls, and breakwaters. The model allows for sand bypassing around and through groyne and jetties. The model also accommodates wave diffraction by long groins and offshore breakwaters and wave transmission through breakwaters. Wave conditions, which drive the model, consist of wave height, period and direction and can originate from multiple independent generation sources.

GENESIS shoreline change model is suited for coastal stretches where longshore sediment transport is dominant. The shoreline change produced by cross shore sediment transport such as that associated with storm events cannot be simulated. GENESIS is best suited to situations where there is a systematic trend of long term changes in shoreline position such as shoreline regression and advancement due to the coastal structures like groyne, breakwater, seawalls and detached breakwater. The prediction of the GENESIS model is

deterministic, the quality of which depends on the input data and good calibration. The model produces representative values and the accuracy of results is linked to the quality of input data used for calibration.

GENESIS considers longshore sediment transport due to breaking waves. The dynamic equation or the statement of the longshore sand transport rate, Q is

$$Q = (H^2 C_g)_b [a_1 sin2\Theta_{bs} - a_2 cos\Theta_{bs} \frac{\partial H}{\partial x}]_b$$

$$a_1 = \frac{K_1}{16(s-1)(1-p)(1{,}14116)^{5/2}}$$

$$a_2 = \frac{K_2}{8(s-1)(1-p)tan\beta(1{,}14116)^{7/2}}$$

Where H is the breaking wave height, C_g is the breaking wave group velocity, x is the longshore direction, and θ_{bs} is the angle of breaking waves referenced to the shore perpendicular direction, a_1 and a_2 are the non-dimensional parameters, p is porosity of the sand on the bed, s is ratio of density of sand to density of water and *tan* β is the average near shore bottom slope. The first term considers sediment transport generated by the longshore component of the breaking wave energy flux. The second term modifies the transport rate to account for longshore gradients in breaking wave height. K_1 and K_2 are the two dimensionless calibration factor for controlling the longshore sediment transport and offshore wave breaking.

4.2.1 Model inputs

- Bathymetry for the coastal stretch - Bathymetry for the study was prepared using the available primary and secondary data.
- Wave data – The wave data is being recorded continuously off Vizhinjam since early 2015.
- Shoreline data - Initial shoreline position, which is an essential input to simulate shoreline evolution, was extracted from latest Google Earth Imagery of the project site.

4.2.2 Shoreline model simulation

The shoreline evolution model has been set up for existing condition incorporating all the existing coastal features (manmade and natural). A shoreline stretch of 20km evenly distributed near the vicinity of the proposed port has been studied. A grid resolution of 25m×25m was used for the simulation of shoreline evolution using GENESIS.

4.3 Results and discussion

The shoreline evolution model study has been carried out for various phase of breakwater development incorporating all the existing coastal features (manmade and natural). The model considers a 12km coastal stretch for the simulation of shoreline evolution on either side of the port.

a) 2016 b) 2017

c) 2018 d) 2019

e) 2020 f) 2021

g) 2022 h) 2023

Figure 4-4 Different phases of breakwater construction.

The influence of the port development was simulated by introducing the various phase of proposed breakwater and keeping all other parameters same as those used in the existing

condition. The shoreline evolution is presented in Figure 4-5 to Figure 4-7 (scaled up three times for better visualization).

4.3.1 Predicted shoreline evolution accounting different phases of breakwater

The shoreline evolution for different phases of breakwater during the first, fifth and tenth year are presented in Figure 4-5, Figure 4-6, and Figure 4-7 respectively.

From the simulated results it is noticed that the shoreline evolution follows a similar trend as of no breakwater case whilst the introduction of breakwater in the model. The cumulative change per 25m chainage for every 1000m stretch is shown in Table 4-1 to Table 4-4. Shoreline changes are noticed near the groin fields north of the port. However, the changes at north of the port are localised due to the presence of killi river mouth and due to the groyne fields near Beemapally and Valiyathura. Thus, the port has no effect on these changes.

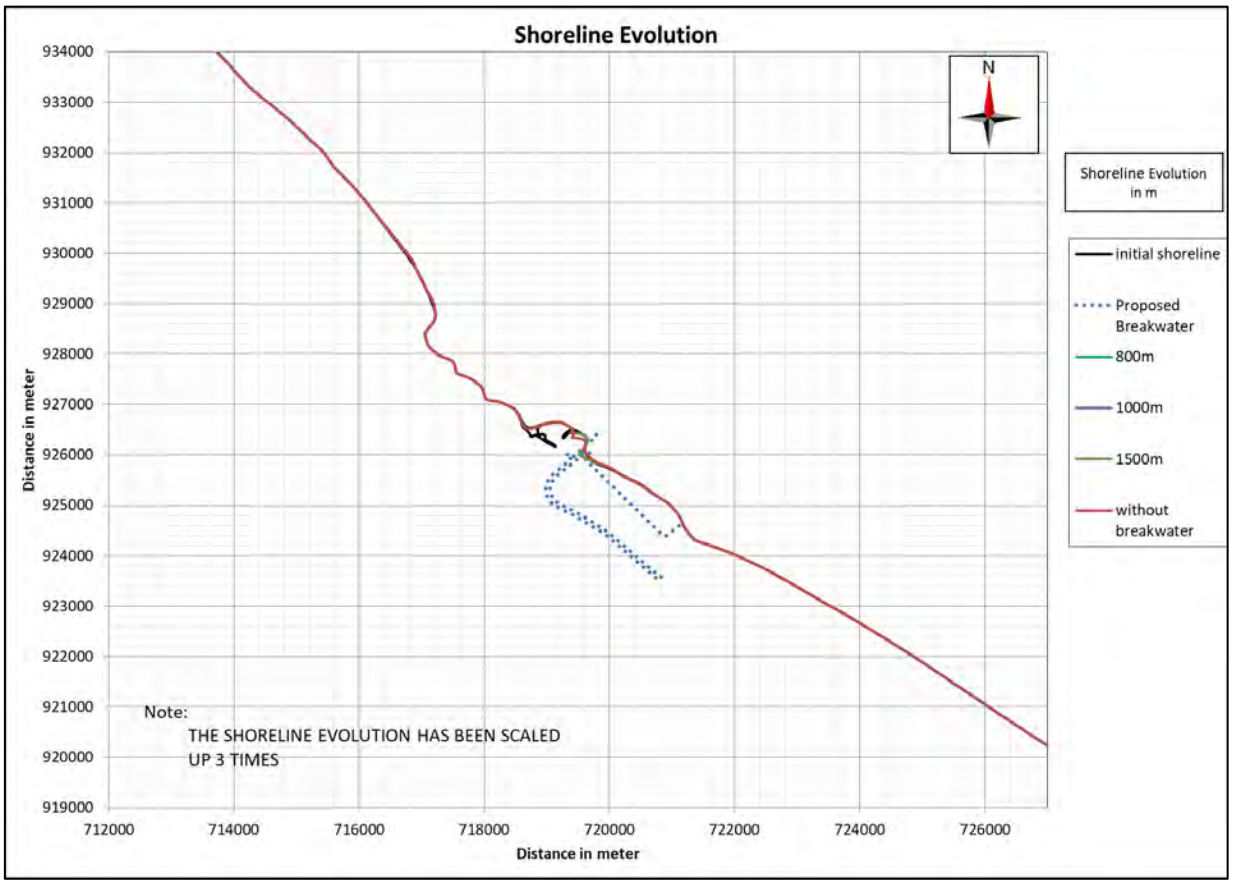


Figure 4-5 Predicted shoreline evolution during 1st year

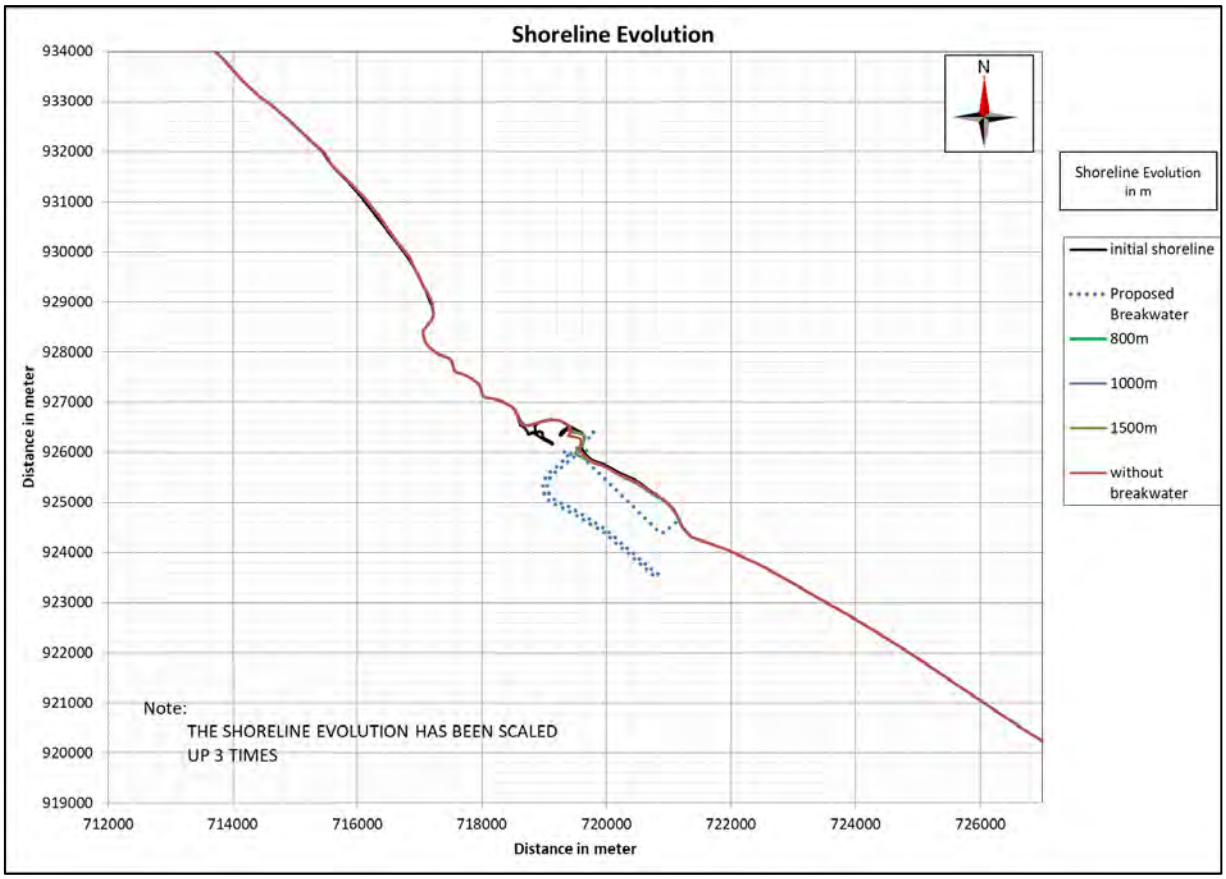


Figure 4-6 Predicted shoreline evolution during 5th year

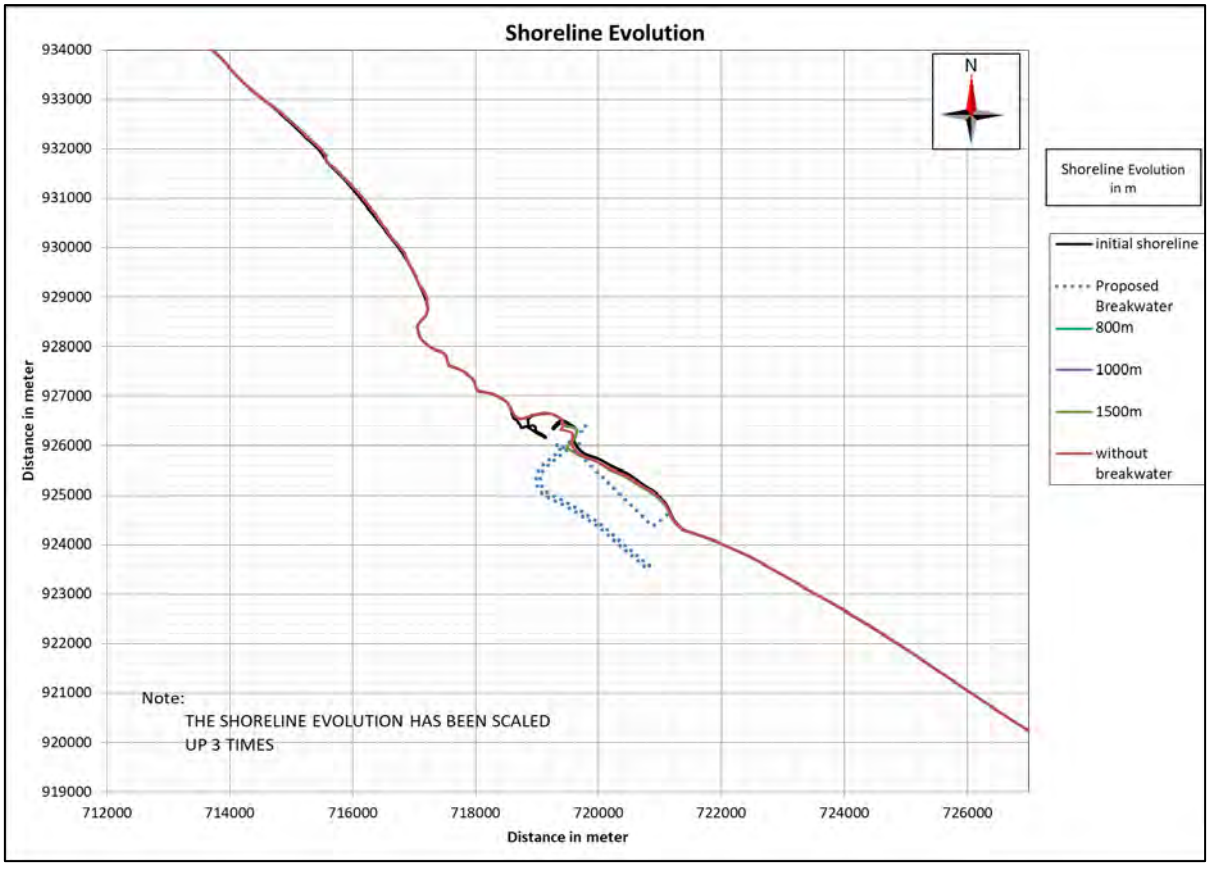


Figure 4-7 Predicted shoreline evolution during 10th year

Table 4-1 Predicted shoreline evolution rate for 800m length breakwater

Chainage in m	Shoreline change in m Co-ordinate at 0m chainage is (X=728102.708,Y=919428.1082,WGS-84,Zone-43)									
	1st yr	2nd yr	3rd yr	4th yr	5th yr	6th yr	7th yr	8th yr	9th yr	10th yr
0-1000	-0.03	-0.02	-0.02	-0.02	-0.01	-0.01	-0.01	-0.01	-0.01	-0.02
1000-2000	0.05	0.06	0.07	0.08	0.08	0.07	0.06	0.05	0.03	0.01
2000-3000	-0.03	-0.04	-0.05	-0.07	-0.11	-0.15	-0.20	-0.26	-0.32	-0.38
3000-4000	-0.01	-0.10	-0.22	-0.34	-0.46	-0.59	-0.71	-0.83	-0.95	-1.06
4000-5000	-0.45	-0.76	-1.01	-1.24	-1.44	-1.63	-1.81	-1.97	-2.13	-2.28
5000-6000	-0.15	-0.34	-0.54	-0.73	-0.92	-1.09	-1.26	-1.41	-1.56	-1.69
6000-7000	-0.05	-0.13	-0.22	-0.32	-0.42	-0.52	-0.59	-0.64	-0.66	-0.64
7000-8000	-0.17	-0.20	-0.23	-0.23	-0.16	-0.01	0.20	0.49	0.83	1.23
8000-9000	-0.03	0.11	0.50	1.11	1.87	2.75	3.72	4.75	5.82	6.92
9000-10000	1.97	3.93	6.11	8.36	10.57	12.74	14.85	16.90	18.89	20.82
10000-11000	3.28	6.52	9.54	11.98	14.11	16.05	17.80	19.41	20.92	22.34
11000-12000	4.67	4.78	4.43	4.36	3.16	2.17	1.34	1.11	1.06	1.02
12000-13000	-0.10	-0.12	-0.10	-0.11	-0.13	-0.14	-0.13	-0.67	-1.01	-1.01
13000-14000	-0.31	-0.31	-0.31	-0.31	-0.31	-0.31	-0.32	-0.32	-0.64	-0.88
14000-15000	-2.34	-2.49	-2.52	-2.55	-2.73	-2.87	-3.01	-3.10	-3.18	-3.55
15000-16000	-4.77	-5.70	-5.81	-5.84	-5.99	-6.07	-6.14	-6.17	-6.20	-6.24
16000-17000	-1.33	-4.56	-7.66	-10.37	-11.52	-11.78	-11.79	-11.79	-11.79	-11.80
17000-18000	0.01	-0.48	-1.79	-3.08	-3.72	-4.72	-5.64	-6.40	-7.08	-7.70
18000-19000	-0.03	0.01	0.02	-0.38	-1.23	-2.58	-4.09	-5.59	-7.02	-8.31
19000-20000	0.01	0.05	0.15	0.28	0.38	0.35	0.15	-0.22	-0.73	-1.44
20000-21000	0.21	0.66	1.12	1.54	1.93	2.26	2.54	2.74	2.86	2.89
21000-22000	1.50	2.27	2.83	3.20	3.49	3.73	3.94	4.11	4.26	4.37
22000-23000	-1.34	-1.97	-2.40	-2.67	-2.88	-3.04	-3.16	-3.27	-3.35	-3.41
23000-24000	-0.38	-0.95	-1.49	-1.95	-2.34	-2.67	-2.94	-3.16	-3.35	-3.50
24000-24725	0.03	-0.03	-0.14	-0.26	-0.36	-0.46	-0.54	-0.61	-0.66	-0.71

Table 4-2 Predicted shoreline evolution rate for 1000m length breakwater

Chainage in m	Shoreline change in m Co-ordinate at 0m chainage is (X=728102.708,Y=919428.1082,WGS-84,Zone-43)									
	1st yr	2nd yr	3rd yr	4th yr	5th yr	6th yr	7th yr	8th yr	9th yr	10th yr
0-1000	-0.03	-0.02	-0.02	-0.02	-0.01	-0.01	-0.01	-0.01	-0.01	-0.02
1000-2000	0.05	0.06	0.07	0.08	0.08	0.07	0.06	0.05	0.03	0.01
2000-3000	-0.03	-0.04	-0.05	-0.07	-0.11	-0.15	-0.20	-0.26	-0.32	-0.38
3000-4000	-0.01	-0.10	-0.22	-0.34	-0.46	-0.59	-0.71	-0.83	-0.95	-1.06
4000-5000	-0.45	-0.76	-1.01	-1.24	-1.44	-1.63	-1.81	-1.97	-2.13	-2.28
5000-6000	-0.15	-0.34	-0.54	-0.73	-0.92	-1.09	-1.26	-1.41	-1.56	-1.68
6000-7000	-0.05	-0.13	-0.22	-0.32	-0.42	-0.52	-0.59	-0.64	-0.65	-0.64
7000-8000	-0.17	-0.20	-0.23	-0.23	-0.16	-0.01	0.21	0.49	0.84	1.24
8000-9000	-0.03	0.11	0.50	1.11	1.88	2.77	3.74	4.78	5.86	6.97
9000-10000	1.98	3.95	6.15	8.41	10.64	12.82	14.95	17.01	19.02	20.97
10000-11000	3.29	6.54	9.55	11.99	14.11	16.04	17.78	19.38	20.89	22.30

11000-12000	4.65	4.75	4.39	4.32	3.11	2.11	1.27	1.04	0.98	0.93
12000-13000	-0.10	-0.12	-0.10	-0.11	-0.13	-0.13	-0.13	-0.69	-1.01	-1.01
13000-14000	-0.31	-0.31	-0.31	-0.31	-0.31	-0.31	-0.32	-0.32	-0.65	-0.88
14000-15000	-2.34	-2.49	-2.52	-2.55	-2.73	-2.87	-3.01	-3.10	-3.18	-3.57
15000-16000	-4.77	-5.70	-5.81	-5.84	-5.99	-6.07	-6.14	-6.17	-6.20	-6.24
16000-17000	-1.33	-4.56	-7.66	-10.38	-11.52	-11.78	-11.79	-11.79	-11.79	-11.80
17000-18000	0.01	-0.48	-1.79	-3.08	-3.72	-4.73	-5.65	-6.41	-7.09	-7.71
18000-19000	-0.03	0.01	0.02	-0.39	-1.23	-2.59	-4.11	-5.60	-7.03	-8.33
19000-20000	0.01	0.05	0.15	0.28	0.37	0.35	0.15	-0.22	-0.74	-1.44
20000-21000	0.21	0.66	1.12	1.54	1.93	2.26	2.54	2.74	2.86	2.89
21000-22000	1.50	2.27	2.83	3.20	3.49	3.73	3.94	4.11	4.26	4.37
22000-23000	-1.34	-1.97	-2.40	-2.67	-2.88	-3.04	-3.16	-3.27	-3.35	-3.41
23000-24000	-0.38	-0.95	-1.49	-1.95	-2.34	-2.67	-2.94	-3.16	-3.35	-3.50
24000-24725	0.03	-0.03	-0.14	-0.26	-0.36	-0.46	-0.54	-0.61	-0.66	-0.71

Table 4-3 Predicted shoreline evolution rate for 1500m length breakwater

Chainage in m	Shoreline change in m Co-ordinate at 0m chainage is (X=728102.708,Y=919428.1082,WGS-84,Zone-43)									
	1st yr	2nd yr	3rd yr	4th yr	5th yr	6th yr	7th yr	8th yr	9th yr	10th yr
0-1000	-0.03	-0.02	-0.02	-0.02	-0.01	-0.01	-0.01	-0.01	-0.01	-0.02
1000-2000	0.05	0.06	0.07	0.08	0.08	0.07	0.06	0.05	0.03	0.01
2000-3000	-0.03	-0.04	-0.05	-0.07	-0.11	-0.15	-0.20	-0.26	-0.32	-0.38
3000-4000	-0.01	-0.10	-0.22	-0.34	-0.46	-0.59	-0.71	-0.83	-0.95	-1.06
4000-5000	-0.45	-0.76	-1.01	-1.24	-1.44	-1.63	-1.81	-1.97	-2.13	-2.28
5000-6000	-0.15	-0.34	-0.54	-0.73	-0.92	-1.09	-1.26	-1.41	-1.56	-1.68
6000-7000	-0.05	-0.13	-0.22	-0.32	-0.42	-0.52	-0.59	-0.64	-0.65	-0.64
7000-8000	-0.17	-0.20	-0.23	-0.23	-0.16	-0.01	0.21	0.49	0.84	1.24
8000-9000	-0.03	0.11	0.50	1.11	1.88	2.77	3.74	4.78	5.86	6.97
9000-10000	1.98	3.95	6.15	8.41	10.64	12.82	14.95	17.01	19.02	20.97
10000-11000	3.29	6.54	9.55	11.99	14.11	16.04	17.78	19.38	20.89	22.30
11000-12000	4.65	4.75	4.39	4.32	3.11	2.11	1.27	1.04	0.98	0.93
12000-13000	-0.10	-0.12	-0.10	-0.11	-0.13	-0.13	-0.13	-0.69	-1.01	-1.01
13000-14000	-0.31	-0.31	-0.31	-0.31	-0.31	-0.31	-0.32	-0.32	-0.65	-0.88
14000-15000	-2.34	-2.49	-2.52	-2.55	-2.73	-2.87	-3.01	-3.10	-3.18	-3.57
15000-16000	-4.77	-5.70	-5.81	-5.84	-5.99	-6.07	-6.14	-6.17	-6.20	-6.24
16000-17000	-1.33	-4.56	-7.66	-10.38	-11.52	-11.78	-11.79	-11.79	-11.79	-11.80
17000-18000	0.01	-0.48	-1.79	-3.08	-3.72	-4.73	-5.65	-6.41	-7.09	-7.71
18000-19000	-0.03	0.01	0.02	-0.39	-1.23	-2.59	-4.11	-5.60	-7.03	-8.33
19000-20000	0.01	0.05	0.15	0.28	0.37	0.35	0.15	-0.22	-0.74	-1.44
20000-21000	0.21	0.66	1.12	1.54	1.93	2.26	2.54	2.74	2.86	2.89
21000-22000	1.50	2.27	2.83	3.20	3.49	3.73	3.94	4.11	4.26	4.37
22000-23000	-1.34	-1.97	-2.40	-2.67	-2.88	-3.04	-3.16	-3.27	-3.35	-3.41
23000-24000	-0.38	-0.95	-1.49	-1.95	-2.34	-2.67	-2.94	-3.16	-3.35	-3.50
24000-24725	0.03	-0.03	-0.14	-0.26	-0.36	-0.46	-0.54	-0.61	-0.66	-0.71

Table 4-4 Predicted shoreline evolution rate for without breakwater condition

Chainage in m	Shoreline change in m Co-ordinate at 0m chainage is (X=728102.708,Y=919428.1082,WGS-84,Zone-43)									
	1st yr	2nd yr	3rd yr	4th yr	5th yr	6th yr	7th yr	8th yr	9th yr	10th yr
0-1000	-0.03	-0.02	-0.02	-0.02	-0.01	-0.01	-0.01	-0.01	-0.01	-0.02
1000-2000	0.05	0.06	0.07	0.08	0.08	0.07	0.06	0.05	0.03	0.01
2000-3000	-0.03	-0.04	-0.05	-0.07	-0.11	-0.15	-0.20	-0.26	-0.32	-0.38
3000-4000	-0.01	-0.10	-0.22	-0.34	-0.46	-0.59	-0.71	-0.83	-0.95	-1.06
4000-5000	-0.45	-0.76	-1.01	-1.24	-1.44	-1.63	-1.81	-1.97	-2.13	-2.29
5000-6000	-0.15	-0.34	-0.54	-0.73	-0.91	-1.09	-1.26	-1.42	-1.57	-1.72
6000-7000	-0.05	-0.12	-0.21	-0.32	-0.42	-0.53	-0.64	-0.75	-0.84	-0.90
7000-8000	-0.12	-0.19	-0.25	-0.29	-0.33	-0.36	-0.35	-0.27	-0.12	0.08
8000-9000	-0.02	-0.04	-0.05	-0.02	0.26	0.70	1.29	1.98	2.74	3.55
9000-10000	0.23	0.52	1.79	3.50	5.29	7.11	8.90	10.64	12.31	13.93
10000-11000	2.42	6.75	10.38	13.27	15.80	18.06	20.08	21.95	23.71	25.36
11000-12000	7.13	7.42	7.13	7.00	6.60	5.27	4.42	3.67	3.02	3.00
12000-13000	-0.10	-0.12	-0.10	-0.11	-0.13	-0.14	-0.15	-0.15	-0.16	-0.72
13000-14000	-0.31	-0.31	-0.31	-0.31	-0.31	-0.31	-0.31	-0.32	-0.32	-0.32
14000-15000	-2.34	-2.47	-2.50	-2.53	-2.65	-2.77	-2.90	-3.01	-3.09	-3.15
15000-16000	-4.75	-5.66	-5.78	-5.82	-5.93	-6.02	-6.08	-6.14	-6.17	-6.19
16000-17000	-1.31	-4.20	-6.99	-9.18	-11.17	-11.71	-11.78	-11.79	-11.79	-11.79
17000-18000	0.01	-0.42	-1.50	-2.80	-3.44	-4.02	-4.93	-5.70	-6.36	-6.93
18000-19000	-0.03	0.01	0.02	-0.29	-0.84	-1.78	-3.03	-4.36	-5.67	-6.90
19000-20000	0.01	0.05	0.15	0.28	0.39	0.43	0.34	0.11	-0.26	-0.74
20000-21000	0.21	0.66	1.12	1.54	1.93	2.26	2.54	2.77	2.93	3.01
21000-22000	1.50	2.27	2.83	3.20	3.49	3.73	3.94	4.11	4.26	4.38
22000-23000	-1.34	-1.97	-2.40	-2.67	-2.88	-3.04	-3.16	-3.27	-3.35	-3.41
23000-24000	-0.38	-0.95	-1.49	-1.95	-2.34	-2.67	-2.94	-3.16	-3.35	-3.50
24000-24725	0.03	-0.03	-0.14	-0.26	-0.36	-0.46	-0.54	-0.61	-0.66	-0.71

The shoreline evolution with breakwater and without breakwater condition is presented in Figure 4-8 and the difference in shoreline evolution with and without breakwater is presented in Figure 4-9.

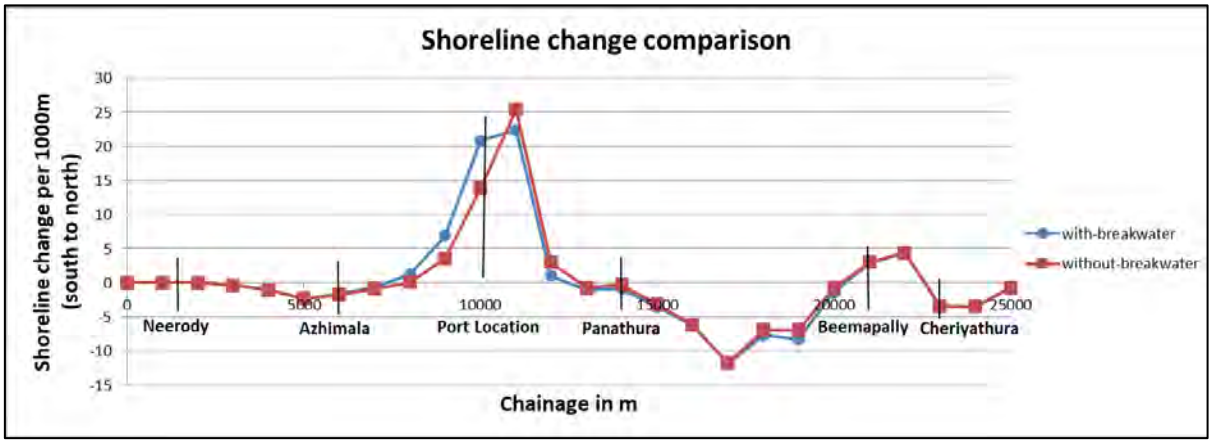


Figure 4-8 Shoreline change comparison

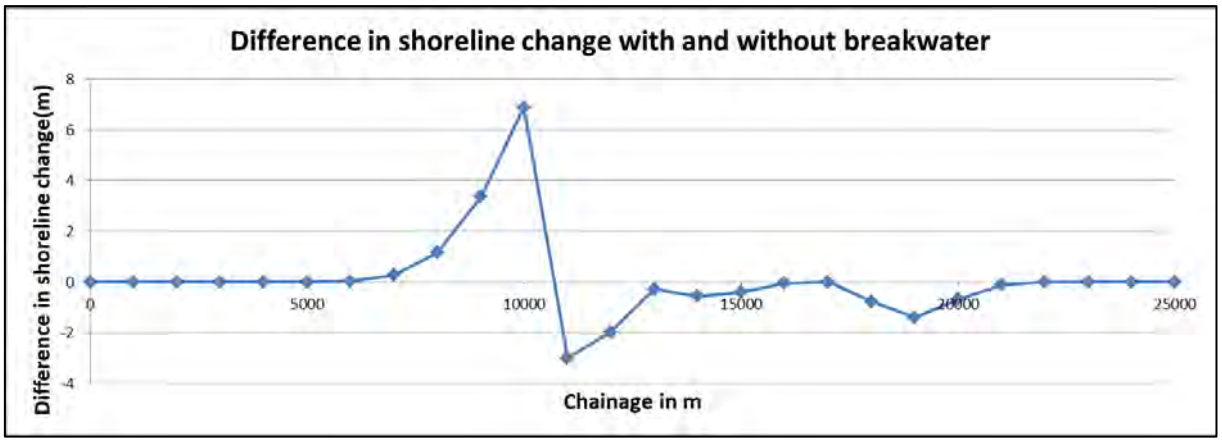


Figure 4-9 Difference in shoreline change with and without breakwater

The absence of any adverse effect on the shoreline towards north-west side of the proposed port can be attributed to many factors including the presence of headlands, the low longshore sediment transport rates and relatively high cross-shore sediment transport, and presence of distinct sediment cells. Various literatures suggests that considerable cross-shore sediment transport and relatively low longshore sediment movement. During the monsoon the accreted sediments are picked up by waves and transported offshore which gets trapped in the offshore bar and gradually returns to the shore during non-monsoon period. The same is also noticed in Cross Shore Profile analysis i.e. sediments from beach are taken to the offshore bar during monsoon months and the beaches rebuild gradually during non-monsoon months. This cycle was hampered during Cyclone Ockhi in December 2017. After Ockhi, erosion was noticed during fair weather 2017 and pre monsoon 2018 seasons in the course of which beach was supposed to build up. In addition, as a result of monsoon 2018 and 2019 the beach further eroded than previous monsoon seasons which are evident at Shangumugham and Valiyathura locations.

As the cross shore sediment transport is perpendicular to the coast, only a shore parallel structure will significantly affect the process in the areas leeward of those structures. The proposed development will not influence the cross-shore sediment transport in the adjoining stretches as it will not alter the wave fields beyond the existing fishing harbour towards north. As stated earlier, the headlands are already blocking the northerly longshore sediment transport and the introduction of proposed breakwater will not have any impact towards north of these headlands.

5 Conclusion

Following are the summary of the work carried out by ASSYSTEM INDIA LIMITED:

1) Data Analysis

- The bathymetry analysis has been carried out to check whether any changes occurred in the sea water depth due to the upcoming port. Analysis was carried out by considering seven transect lines perpendicular to the shore; four on the North of port, two on the South of port and one near the port. Post-monsoon 2023 and pre-monsoon 2024 bathymetric cross sections were compared to post-monsoon 2015 and pre-monsoon 2015. There is erosion at Shanghumugham and Valiyathura, but there is accretion at Panathura, Adimalathura, and Poovar Beach North.
- An analysis and comparison are made between the observed wave data from October 2023 to September 2024 provided by AVPPL and the observed wave data

from October 2015 to September 2016. The majority of the waves that are seen at the project site are between 0.5 and 1.5 metres in height. Additionally, a comparison between the wave data from 2015 and 2024 is made. From these comparisons, the variability of wave heights and directions are within expected ranges.

- The current data was provided at one location. Analysis has been carried out to check if there are any changes in the trend of current components from the previous years due to the construction of breakwater. It can be noticed that the current speed in the region is in the range of 0.1 to 0.4 m/s. However, occasionally maximum current speed observed during all the seasons is in the range of 0.6 to 0.9 m/s.
- ASSYSTEM INDIA LIMITED extracted +2m, -3m, -4m, -6m, -8m and -10m contours from cross shore profile data and time series plots of respective contours over two-year data are shown at Neerody, Pozhiyoor, Karumkulam, Panathura, Beemapally and Vettucaud locations. From this plot it can be noticed that the beach undergoes seasonal variation of erosion on monsoon season and accretion on other seasons.
- From the LEO data, it can be observed that the current movement is towards the south during the monsoon, and from the model studies, it is evident that the tide and current pattern at several locations follow trends set in the previous years. This indicates that transport of sand during the monsoon season is towards the south.

2) Model Studies

a) Assessment of Hydrodynamics

- Earlier in 2013, ASSYSTEM INDIA LIMITED had comprehensively covered the assessment of hydrodynamics in the port vicinity. To understand the impact of the port construction on the hydrodynamics, ASSYSTEM INDIA LIMITED carried out the assessment of hydrodynamics with the latest surveyed bathymetries.
- From the assessment of hydrodynamics, it was found that current speeds prevailing near the project location over past years (2013, 2023 and 2024) were identical. In addition, the model was also calibrated using the latest data. From the model studies it was found that the tide and current pattern at several locations follow trends set in the previous years.

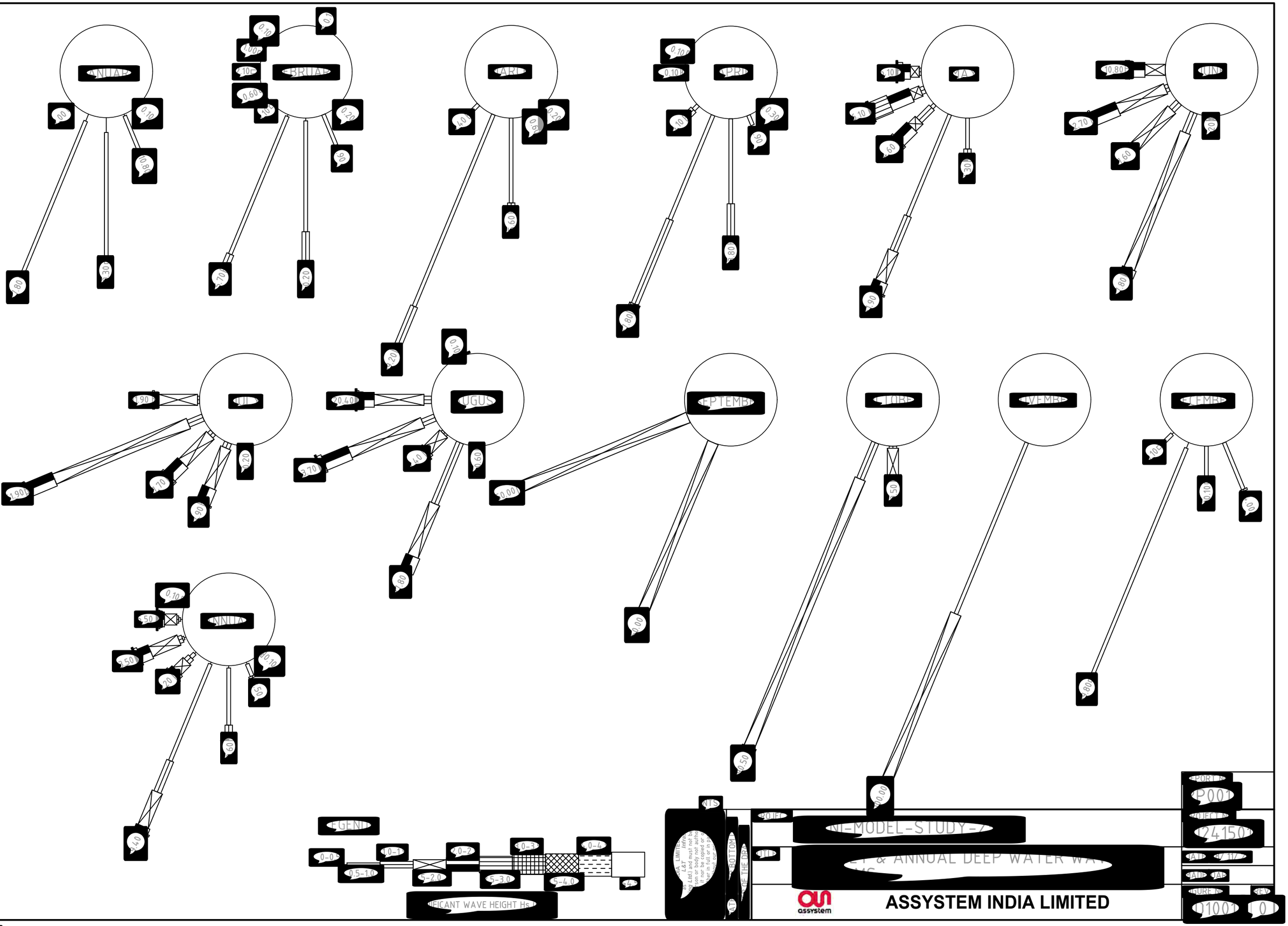
b) Long shore sediment transport

- Long shore sediment transport refers to the cumulative movement of beach and near shore material parallel to the shore by the combined action of tides, wind, waves and the shore-parallel currents produced by them.
- The study area extends from Edappadu Beach (CS 01) in the South to Thumba (CS 81) in the North over a stretch of approximately 40km. This coast can be distinguished into two subsets depending on the coastal orientation. The shore angle on south side is in the range of 125^0 to 130^0 (True North) and shore angle on north side is in the range of 135^0 to 145^0 (True North). This change in orientation will have effect on long shore sediment transport and its behaviour.
- To compute longshore transport rate, breaking parameters need to be estimated first. The breaking parameters such as breaking wave height, breaking depth and breaking angle (shore normal) were calculated using depth limited criterion. The wave parameters were collected from WRB and the breaking characteristics of waves were determined by combining wave refraction and shoaling calculations with wave breaking criteria.
- Depending on the coast orientation two average LSTR estimates were calculated based on available 7 years data (Feb 2015 – Feb 2024), Feb-Feb is considered since

most beach profiles have built up. The northerly and southerly (annual average) longshore sediment movement in south stretch is in the range of 0.16 to 0.17 M m^3/yr (Northwards) and -0.09 to -0.11 M m^3/yr (Southwards). In north stretch, the range is 0.22 to 0.23 M m^3/yr (Northwards) and -0.11 to -0.12 M m^3/yr (Southwards). The net annual average longshore sediment movement in south stretch is in the range of 0.06 to 0.07 M m^3/yr (Northwards) and in north stretch in the range of 0.11 to 0.12 M m^3/yr (Northwards).

c) Impact of breakwater, groynes and seawalls on 12km radius of Vizhinjam port

- The shoreline evolution model study has been carried out for various phase of breakwater development incorporating all the existing coastal features (manmade and natural). The model considers a 12km coastal stretch for the simulation of shoreline evolution on either side of the port. All the groynes and seawalls present within this area were included in the model.
- From the simulated results it is noticed that the shoreline evolution follows a similar trend as of no breakwater case whilst the introduction of breakwater in the model. Shoreline changes are noticed near the groin fields north of the port which were constructed by Government of Kerala. However, the changes around groin fields are localised and the port has no effect on these changes.
- The shoreline change study was carried out using GENESIS. It is evident from the plot of shoreline evolution with and without breakwater (Figure 4.8) that the construction of breakwater has minimal effects on shoreline changes
- The absence of any adverse effect on the shoreline towards north-west side of the proposed port can be attributed to many factors including the presence of headlands, the low longshore sediment transport rates and relatively high cross-shore sediment transport, and presence of distinct sediment cells.



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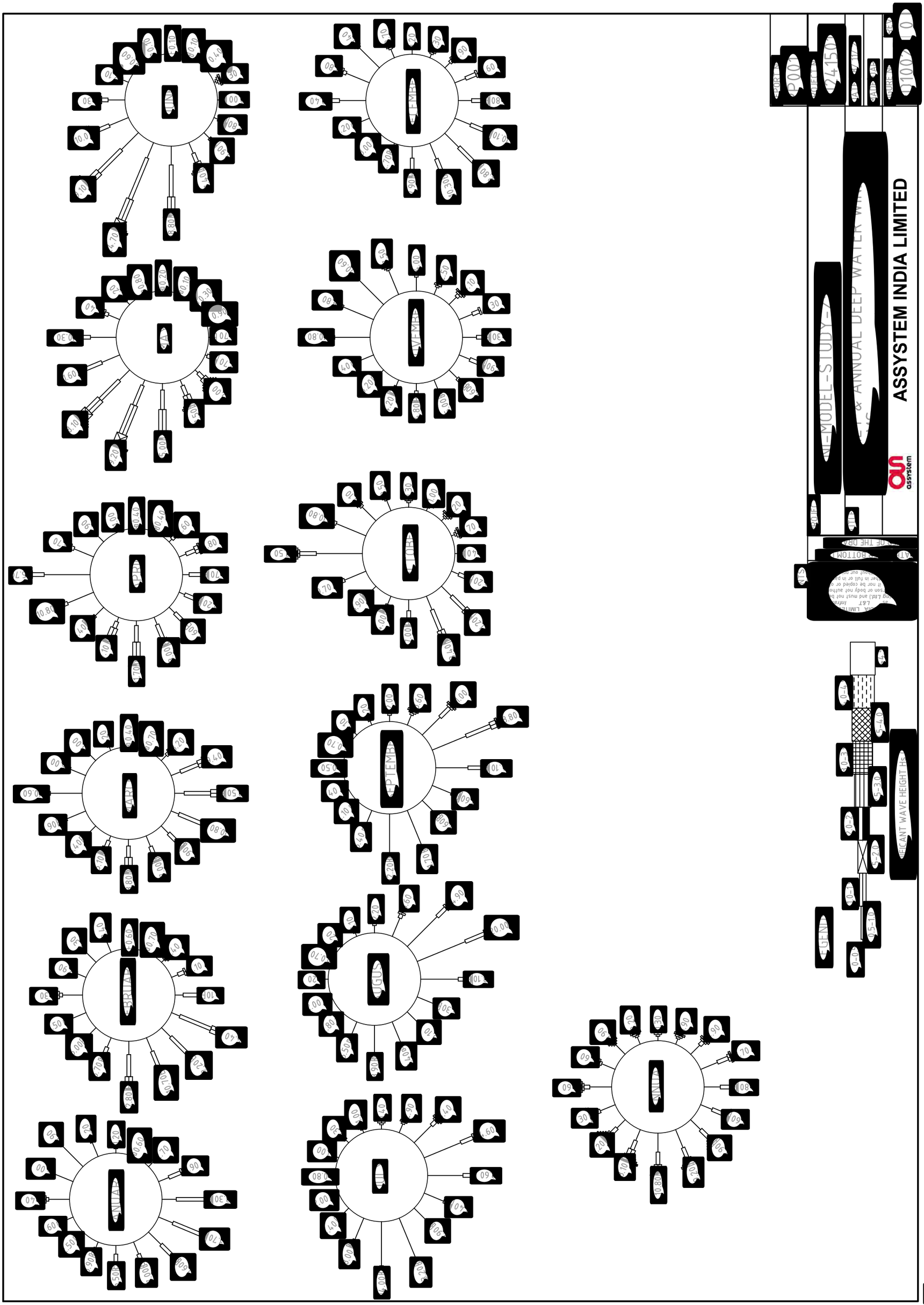


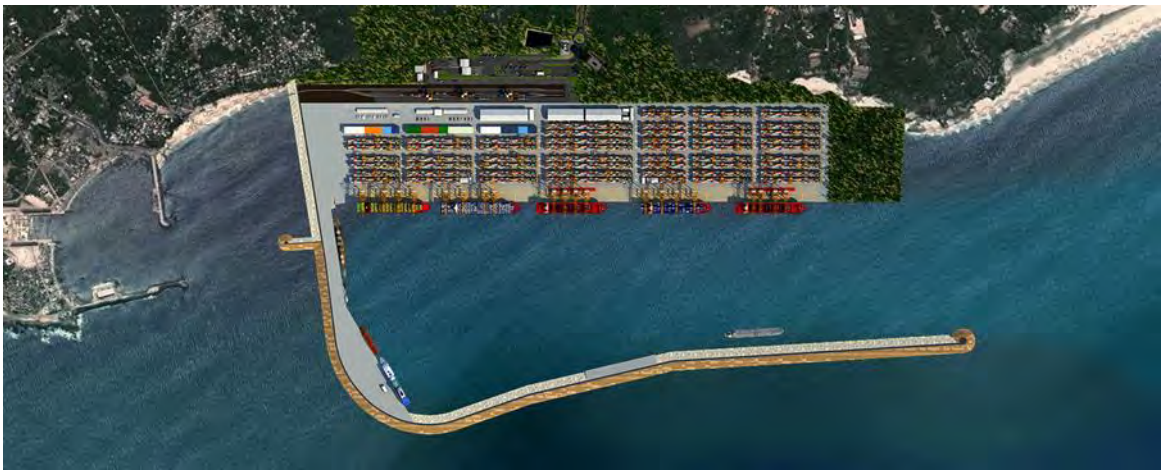
Annexure III

Environment Monitoring Report

(April 2024 to September 2024)

HALF-YEARLY ENVIRONMENT MONITORING REPORT

FOR THE PERIOD APRIL 2024 TO SEPTEMBER 2024



ADANI VIZHINJAM PORT PVT. LTD. VIZHINJAM, KERALA

Report No.: SEAAL/EMR-AVPPL-2425HY-I

Report Date: 25th OCTOBER, 2024

This Report presents the discussion and the results of Environmental Monitoring at Adani Vizhinjam Port. The monitoring has been conducted and the report has been prepared & issued by Standards Environmental & Analytical Laboratories, Ernakulum-683110 to M/s Adani Vizhinjam Port Pvt Limited, Thiruvananthapuram-695 014

HYR-A	Table of Contents

HYR-1	Introduction

Standards Environmental & Analytical Laboratories is an organization providing Testing Services, Technical Consultancy for Environmental Pollution Control, Designing, Commissioning & Operation of Effluent & Sewage Treatment Plants to clients of various industries, Hotels, Hospitals & Building Apartments. It provides various training for industries and for budding scientists.

Standards Environmental & Analytical Laboratories was established in 2013 at K.J. Tower, Pathalam, Udhyogamandal, Ernakulam – 683501. The Lab has built a state of art building of 7000 sq. Ft. with fully furnished at 'Standards', Building No. 338/A, B, C, D, E, (Behind BPCL Petrol Pump), Edayar, Muppathadam, P.O., Ernakulam – 683110. The lab is relocated to the new building in June 2023. The Lab is equipped with sophisticated instruments such as GC-MS, AAS, UV Spectrophotometer, Flame Photometer and other Supporting Instruments with required accuracy & precision.

Standards Laboratory is guided and lead by highly qualified scientists with rich experiences. Its technical personnel are well trained and competent and dedicated.

Standards Laboratory is accredited as per ISO/IEC 17025:2017 vide Certificate No. TC-12939 by NABL for testing of Food & Agricultural Products, Water and Environmental Samples, Medical Accessories under Chemical & Biological Disciplines. Standards Laboratory is an MoEF (Ministry of Environment & Forest) recognized Environmental Laboratory under the Environmental (Protection) Act, 1986. It is also an "A" Grade laboratory certified by Kerala State Pollution Control Board (KSPCB). It delivers reliable testing services on time to the customers after ensuring the compliance of each stage of the testing activities to the stringent Quality Control and Quality Assurance Criteria established by international forums.

Standards gives Technical Consultancy in the field of Water & Wastewater Treatment and has completed several Turn-Key projects to solve the water

pollution issues for different clients and make them compliant to the statutory requirements.

Standards had been engaged by Adani Vizhinjam Port Pvt. Ltd. (AVPPL) for performing Environmental Monitoring as per the Plan mentioned in EIA and EC. AVPPL issued Service Order vide email dated 11-07-2022 which mentions the matrix, parameters, and frequency of environmental monitoring. Standards carried out said environmental monitoring strictly as per the above-mentioned service order, viz. Ambient Air Monitoring (twice in a week), Ambient Noise Monitoring (fortnightly), Marine Ecological Survey including marine water, sediment, phytoplankton, and zooplankton analysis (monthly), Ground Water and Surface Water Analysis (monthly), Soil Analysis (yearly).

Standards submits monthly reports of Environmental Monitoring which include details of sampling locations, methodology used, analytical results and summary of reports. The monthly environmental monitoring report provides information about the present environmental status as per terms and conditions mentioned in service order.

This present report is the consolidated half yearly report over the period from April 2024 to September 2024.

HYR-2	Quality Assurance & Quality Control

The quality assurance and quality control plan include following elements:

- Monitoring and Collection, Preservation &Transportation of samples;
- Sample Registration, Chain of Custody & Report Preparation;
- Laboratory Analysis& Review of Results; and
- Validation of Technical Activities.

HYR-2.1. Monitoring and Collection, Preservation & Transportation of samples:

The authorized Laboratory Sampling Team prepares the checklist for the required Sampling Kits, other auxiliary equipment and Sampling Procedures including Datasheets. The team collects the required items as per the list and visits the sampling site.

The team identifies the appropriate monitoring location as per the agreement and keeps the sampling kits at the identified location. The team notes down the environmental conditions of the site in the sampling data sheets and all other required information. Then the team starts the monitoring activity.

Periodically the team inspects the status of the conditions of the sampling kits and records the necessary data on the sampling data sheet as per the requirements.

After the completion of monitoring as per PCB standards, the team collects the samples and preserves them safely and securely in an appropriately labelled container as per the procedure to prevent contamination and deterioration.

Then the team returns to the laboratory and takes due care to maintain the integrity of the samples during transport. The team submits the samples and sampling data sheets to the Executives - Sample Registration.

HYR-2.2. Sample Registration, Chain of Custody& Report Preparation:

After receiving the samples, the Executive - Sample Registration examines the sample conditions and the sampling data sheets along with the agreement as per the Checklist and records the findings.

The executive registers the samples for testing in the Sample Entry Register and assigns the unique Sample Code for each sample only if all the criteria are fulfilled. The Executive prepares the Job Card for each sample as per the agreement and enters the allotted Sample Code in the Job Card and on the Test Item. The Test Item is identified throughout its life in the laboratory only by the unique Sample Code.

The executive then delivers the sample to the respective section of the Laboratory and the Job Card along with the necessary sampling details required for performing the analysis excluding the details of the origin of the samples. The delivery is recorded in the Sample Delivery Register and the same is acknowledged by the Laboratory Technical personnel.

The information available in the Job Card are the test parameters to be performed, test method to be adopted, units in which the analytical results to be expressed, the due date for completion of analysis and the details about sample storage and retention conditions.

The executive submits the other Customer information and Sample details to the Reporting Section for preparing the Test Reports.

After completion of analysis, the technical personnel enter all the results and dates of analysis in the Job Card and submit the same to Reporting Section.

The Reporting Executive decodes the Job Card with the Test Request details, prepares the Draft Report as per the respective report format and submits the draft report to the Authorized Signatory. This draft report is verified and returned to the Reporting Section for making the final report. Final reports are prepared by

the Reporting Executive with necessary corrections if any and authorized by the Authorized Signatory. Then the Final Test Report is delivered to the customer.

HYR-2.3. Laboratory Analysis& Review of Test Results:

After receiving the Test Items along with the Job Card, the Technical Manager allots the Job to the authorized Technical Personnel. The assigned Technical Personnel performs the allotted tests as per the method mentioned in the Job Card as well as the required Quality Control Checks (QC) and submits the results to the Technical Manger. The Technical Personnel confirms that all the required calibration status of the equipment is valid and the Certified Reference Material are valid. Also, the Technical Personnel ensures that the results of daily verification conform to the specified criteria.

The Technical Manager reviews the results of samples & QC checks and approves the results only if the results of QC checks are compliance to the Acceptance Criteria. Then the Job Card is submitted to the Reporting Section.

HYR-2.4. Validation of Technical Activities:

For the validation of Technical Activities, the laboratory performs Internal Quality Assurance Check, Proficiency Testing and Inter Laboratory Comparison. The Quality Assurance Team prepares Annual Internal Quality Assurance Check (IQC) Plan, Inter laboratory Comparison (ILC)/ Proficiency Testing (PT) Plan.

As per the IQA plan, Quality Assurance Team prepare and send the Test Items to the respective section of the Laboratory. After getting the results, Quality Assurance team evaluates the results against the predefined criteria. The results of evaluation are submitted and discussed during Management Review meeting.

Quality Assurance Team identify and register the suitable PT Scheme authorized by NABL. Also, Quality Assurance Team identifies suitable ILC or conducts by covering at least five NABL accredited Laboratories.

If the QA team conducts ILC, then they evaluate the performance and calculate the Z-score after getting the results of the participating laboratories.

The acceptance criteria for the ILC/PT is ±2. The summary of the PT/ILC is prepared and discussed during the Management Review Meeting.

The Quality Assurance Team monitors the performance of the Laboratory activities by conducting Internal Quality Audits and Vertical Audit periodically. The Audit reports are prepared and discussed during the Management Review Meeting.

HYR-3	Ambient Air Quality Monitoring

HYR-3.1. Ambient Air Quality Monitoring location details:

This section describes the sampling location, methodology adopted for monitoring and analysis of Ambient Air Quality. The prime objective of environment monitoring with respect to Ambient Air Quality is to establish the air quality of present condition and its conformity to Applicable Standards. Ambient Air quality monitoring was carried out at Five (05) locations including Venganoor, Port Site, Proposed Port Estate Area, Chani and Balarampuram from April 2024 to September 2024.

Table 3.1: Coordinates of Ambient Air Quality Monitoring Locations

Location	Legend	Latitude	Longitude
Venganoor	A1	8°23'55.10"N	77°00'12.19"E
Port Site	A2	8°22'13.73"N	77°00'08.39"E
Proposed Port Estate Area	A3	8°22'41.37"N	77°01'03.17"E
Chani	A4	8°21'02.11"N	77°03'16.59"E
		8°20'53.49"N	77°03'18.76"E
Balarampuram	A5	8°25'43.73"N	77°02'39.99"E

Figure 3.1: Google Earth View of Ambient Air Quality Monitoring Locations

HYR-3.2. Methodology of Sampling and Analysis:

Table 3.2: Ambient Air Quality Monitoring Methodology

Sl. No.	Parameter	Unit	Detection Limit	Method Reference
1.	Particulate Matter (size less than 10 µm) or PM_{10}	µg/m³	5.0	IS 5182 (Part 23) : 2006
2.	Particulate Matter (size less than 2.5 µm) or $PM_{2.5}$	µg/m³	2.0	IS 5182 (Part 24): 2019
3.	Sulphur Dioxide (SO_2)	µg/m³	2.0	IS 5182 Part 2: 2001 RA 2017
4.	Nitrogen Dioxide (NO_2)	µg/m³	2.0	IS 5182 Part 6: 2006 RA 2017
5.	Carbon Monoxide (CO)	mg/m³	1.15	IS 5182: Part 10:1999 (NDIR Method)
6.	Hydrocarbon (HC)	ppm	0.0003	IS 5182 Part 17: 1979

HYR-3.3. National Ambient Air Quality Standards (NAAQS):

Table 3.3: National Ambient Air Quality Standards dated 16th November 2009

Sl. No.	Pollutant, Unit	Time Weighted Average	Concentration in Ambient Air	
			Industrial, Residential, Rural & other areas	Ecologically Sensitive Areas
1.	Sulphur dioxide (SO_2), µg/m³	Annual	50	20
		24 h	80	80
2.	Nitrogen Dioxide (NO_2), µg/m³	Annual	40	30
		24 h	80	80
3.	Particulate matter (size less than 10µm) or PM_{10}, µg/m³	Annual	60	60
		24 h	100	100
4.	Particulate matter (size less than 2.5µm) or $PM_{2.5}$, µg/m³	Annual	40	40
		24 h	60	60
5.	Carbon Monoxide (CO), mg/m³	8 h	02	02
		1 h	04	04
6.	Hydrocarbon (HC), ppm	-	-	-

HYR-3.4. Ambient Air Quality Monitoring Results for the period from April 2024 to September 2024:

Table 3.4: Location – Venganoor (A1)

Venganoor (A1)						
Date	Parameters					
	PM_{10}	$PM_{2.5}$	SO_2	NO_2	CO	HC
	µg/m³	µg/m³	µg/m³	µg/m³	mg/m³	ppm
01-04-2024	53.5	25.6	4.62	5.13	BDL	BDL
04-04-2024	56.2	27.5	4.75	5.34	BDL	BDL
08-04-2024	48.4	21.5	4.31	5.41	BDL	BDL
11-04-2024	55.3	25.8	4.53	5.01	BDL	BDL
15-04-2024	50.6	24.9	4.12	4.23	BDL	BDL
18-04-2024	47.1	23.1	4.20	4.63	BDL	BDL
22-04-2024	42.8	20.6	4.05	4.26	BDL	BDL
25-04-2024	43.5	21.2	4.11	4.85	BDL	BDL
29-04-2024	52.4	26.9	4.52	5.15	BDL	BDL
02-05-2024	40.2	19.5	4.11	4.52	BDL	BDL
06-05-2024	41.2	20.3	4.18	4.67	BDL	BDL
09-05-2024	43.5	21.7	4.32	4.73	BDL	BDL
13-05-2024	41.2	19.8	4.15	4.22	BDL	BDL
16-05-2024	42.6	20.3	4.24	4.31	BDL	BDL
20-05-2024	38.5	18.1	4.35	4.76	BDL	BDL
23-05-2024	40.8	20.9	4.13	4.89	BDL	BDL
27-05-2024	42.7	21.8	4.26	4.88	BDL	BDL
30-05-2024	44.3	21.2	4.29	4.97	BDL	BDL
03-06-2024	40.1	20.3	4.11	4.69	BDL	BDL
06-06-2024	38.5	19.8	4.36	4.78	BDL	BDL
10-06-2024	36.1	17.6	4.10	4.49	BDL	BDL
13-06-2024	40.5	20.5	4.28	4.62	BDL	BDL
17-06-2024	41.6	20.3	4.19	4.55	BDL	BDL
20-06-2024	43.7	17.1	4.22	4.60	BDL	BDL
24-06-2024	40.5	19.5	4.15	4.45	BDL	BDL
27-06-2024	42.3	21.7	4.24	4.70	BDL	BDL
01-07-2024	38.6	18.5	4.28	4.73	BDL	BDL

Venganoor (A1)						
Date	Parameters					
	PM_{10}	$PM_{2.5}$	SO_2	NO_2	CO	HC
	µg/m³	µg/m³	µg/m³	µg/m³	mg/m³	ppm
04-07-2024	35.8	18.8	4.08	4.62	BDL	BDL
08-07-2024	42.7	21.5	4.53	5.11	BDL	BDL
11-07-2024	43.3	22.4	4.10	4.68	BDL	BDL
15-07-2024	39.5	17.5	4.06	4.63	BDL	BDL
18-07-2024	39.2	19.6	4.30	4.78	BDL	BDL
22-07-2024	42.8	20.3	4.10	4.60	BDL	BDL
25-07-2024	39.7	18.8	4.13	4.52	BDL	BDL
29-07-2024	44.5	21.9	4.63	5.12	BDL	BDL
01-08-2024	45.6	23.2	4.55	4.86	BDL	BDL
05-08-2024	43.2	22.1	4.38	4.63	BDL	BDL
08-08-2024	40.9	18.6	4.29	4.53	BDL	BDL
12-08-2024	42.8	20.1	4.33	4.59	BDL	BDL
15-08-2024	44.9	24.2	4.35	4.72	BDL	BDL
19-08-2024	41.0	20.9	4.45	4.78	BDL	BDL
22-08-2024	36.8	15.3	4.32	4.54	BDL	BDL
26-08-2024	40.6	19.5	4.21	4.49	BDL	BDL
29-08-2024	46.2	25.2	4.20	4.60	BDL	BDL
02-09-2024	53.5	25.3	4.35	4.99	BDL	BDL
05-09-2024	49.7	24.5	4.21	4.86	BDL	BDL
09-09-2024	52.9	23.9	4.46	5.11	BDL	BDL
12-09-2024	50.4	24.2	4.39	4.91	BDL	BDL
16-09-2024	46.8	22.4	4.19	4.80	BDL	BDL
19-09-2024	49.7	24.7	4.53	5.13	BDL	BDL
23-09-2024	51.8	26.8	4.55	4.97	BDL	BDL
26-09-2024	45.9	22.5	4.19	4.76	BDL	BDL
30-09-2024	50.6	25.8	4.33	5.18	BDL	BDL
NAAQS 2009 Limits	**100**	**60**	**80**	**80**	**4**	**-**

BDL: Below Detectable Limit

Table 3.5: Location – Project Site (A2)

Project Site (A2)						
Date	Parameters					
	PM_{10}	$PM_{2.5}$	SO_2	NO_2	CO	HC
	µg/m³	µg/m³	µg/m³	µg/m³	mg/m³	ppm
01-04-2024	76.5	38.9	4.63	5.58	BDL	BDL
04-04-2024	79.5	39.2	4.75	5.99	BDL	BDL
08-04-2024	69.5	34.7	4.52	5.43	BDL	BDL
11-04-2024	85.1	42.7	5.28	6.75	BDL	BDL
15-04-2024	65.7	31.6	4.96	5.52	BDL	BDL
18-04-2024	70.3	34.5	5.15	5.88	BDL	BDL
22-04-2024	65.2	33.7	5.36	6.31	BDL	BDL
25-04-2024	72.5	35.4	4.69	5.26	BDL	BDL
29-04-2024	80.5	39.5	5.12	6.00	BDL	BDL
02-05-2024	73.5	36.2	5.08	6.24	BDL	BDL
06-05-2024	71.8	34.1	5.16	6.11	BDL	BDL
09-05-2024	74.6	35.3	5.22	5.78	BDL	BDL
13-05-2024	72.4	34.1	4.87	6.43	BDL	BDL
16-05-2024	70.8	33.9	5.18	6.41	BDL	BDL
20-05-2024	73.5	36.1	5.27	6.14	BDL	BDL
23-05-2024	69.4	32.6	5.08	5.98	BDL	BDL
27-05-2024	67.5	32.8	5.19	6.17	BDL	BDL
30-05-2024	70.2	33.4	5.22	6.54	BDL	BDL
03-06-2024	59.5	25.4	4.32	4.98	BDL	BDL
06-06-2024	52.5	21.8	4.18	4.75	BDL	BDL
10-06-2024	55.9	23.9	4.39	4.89	BDL	BDL
13-06-2024	58.6	24.8	4.25	4.88	BDL	BDL
17-06-2024	49.7	23.9	4.11	4.80	BDL	BDL
20-06-2024	54.5	21.9	4.18	4.73	BDL	BDL
24-06-2024	48.6	24.5	4.35	4.81	BDL	BDL
27-06-2024	50.2	23.8	4.20	4.83	BDL	BDL
01-07-2024	66.8	31.4	4.59	5.37	BDL	BDL
04-07-2024	58.5	27.1	4.22	4.99	BDL	BDL
08-07-2024	65.1	32.3	4.43	4.95	BDL	BDL
11-07-2024	69.3	34.6	4.45	4.96	BDL	BDL

Project Site (A2)						
Date	Parameters					
	PM_{10}	$PM_{2.5}$	SO_2	NO_2	CO	HC
	µg/m³	µg/m³	µg/m³	µg/m³	mg/m³	ppm
15-07-2024	56.5	27.3	4.26	4.90	BDL	BDL
18-07-2024	60.4	30.1	4.42	4.98	BDL	BDL
22-07-2024	51.8	25.6	4.40	4.86	BDL	BDL
25-07-2024	53.4	26.4	4.52	4.93	BDL	BDL
29-07-2024	50.6	22.5	4.35	4.78	BDL	BDL
01-08-2024	74.3	38.8	4.63	5.22	BDL	BDL
05-08-2024	65.4	32.1	4.51	5.14	BDL	BDL
08-08-2024	78.6	39.4	4.69	5.48	BDL	BDL
12-08-2024	72.4	35.1	4.35	5.19	BDL	BDL
15-08-2024	75.6	37.3	4.61	5.63	BDL	BDL
19-08-2024	69.7	33.4	4.25	5.47	BDL	BDL
22-08-2024	70.5	36.4	4.36	5.38	BDL	BDL
26-08-2024	66.2	32.9	4.32	4.99	BDL	BDL
29-08-2024	71.5	35.2	4.53	5.69	BDL	BDL
02-09-2024	80.5	40.8	4.86	5.38	BDL	BDL
05-09-2024	72.4	35.9	4.34	4.98	BDL	BDL
09-09-2024	84.6	41.8	4.55	5.14	BDL	BDL
12-09-2024	81.5	39.7	4.69	5.24	BDL	BDL
16-09-2024	85.4	43.5	4.84	5.52	BDL	BDL
19-09-2024	78.5	38.1	4.63	5.31	BDL	BDL
23-09-2024	80.9	39.8	4.79	5.23	BDL	BDL
26-09-2024	75.6	35.6	4.39	4.99	BDL	BDL
30-09-2024	82.7	40.2	4.63	5.43	BDL	BDL
NAAQS 2009 Limits	**100**	**60**	**80**	**80**	**4**	**-**

BDL: Below Detectable Limit

Table 3.6: Location – Proposed Port Estate Area (A3)

Proposed Port Estate Area (A3)						
Date	Parameters					
	PM_{10}	$PM_{2.5}$	SO_2	NO_2	CO	HC
	µg/m³	µg/m³	µg/m³	µg/m³	mg/m³	ppm
01-04-2024	45.4	22.6	4.45	5.15	BDL	BDL

Proposed Port Estate Area (A3)						
Date	Parameters					
	PM_{10}	$PM_{2.5}$	SO_2	NO_2	CO	HC
	µg/m³	µg/m³	µg/m³	µg/m³	mg/m³	ppm
04-04-2024	36.0	19.5	4.30	4.86	BDL	BDL
08-04-2024	49.8	24.1	4.51	5.14	BDL	BDL
11-04-2024	42.5	20.8	4.16	4.99	BDL	BDL
15-04-2024	45.6	21.5	4.20	4.78	BDL	BDL
18-04-2024	56.8	26.8	4.68	5.35	BDL	BDL
22-04-2024	50.4	24.1	4.25	5.05	BDL	BDL
25-04-2024	38.8	16.9	4.09	4.81	BDL	BDL
29-04-2024	44.0	22.5	4.16	4.93	BDL	BDL
02-05-2024	45.3	21.6	4.18	4.68	BDL	BDL
06-05-2024	43.6	19.8	4.32	5.02	BDL	BDL
09-05-2024	51.8	25.4	4.21	4.86	BDL	BDL
13-05-2024	48.3	24.8	4.33	4.79	BDL	BDL
16-05-2024	41.8	39.3	4.25	5.05	BDL	BDL
20-05-2024	39.9	37.5	4.04	4.63	BDL	BDL
23-05-2024	45.7	22.7	4.49	5.27	BDL	BDL
27-05-2024	42.6	18.2	4.37	5.14	BDL	BDL
30-05-2024	37.6	16.4	4.15	4.67	BDL	BDL
03-06-2024	43.5	20.1	4.25	4.76	BDL	BDL
06-06-2024	46.2	23.2	4.31	4.59	BDL	BDL
10-06-2024	42.6	20.5	4.18	4.63	BDL	BDL
13-06-2024	39.8	18.9	BDL	4.30	BDL	BDL
17-06-2024	40.5	19.7	4.21	4.56	BDL	BDL
20-06-2024	43.6	21.9	4.11	4.50	BDL	BDL
24-06-2024	37.3	18.0	BDL	4.43	BDL	BDL
27-06-2024	42.1	20.8	4.19	4.62	BDL	BDL
01-07-2024	45.2	22.9	4.30	4.48	BDL	BDL
04-07-2024	49.5	26.8	4.52	5.34	BDL	BDL
08-07-2024	44.1	23.6	4.35	4.89	BDL	BDL
11-07-2024	44.9	22.4	4.42	4.76	BDL	BDL
15-07-2024	43.2	21.4	4.36	4.73	BDL	BDL
18-07-2024	42.7	20.5	4.26	4.79	BDL	BDL
22-07-2024	40.7	19.8	4.13	4.69	BDL	BDL

Proposed Port Estate Area (A3)						
Date	Parameters					
	PM_{10}	$PM_{2.5}$	SO_2	NO_2	CO	HC
	µg/m³	µg/m³	µg/m³	µg/m³	mg/m³	ppm
25-07-2024	39.5	18.5	4.12	4.53	BDL	BDL
29-07-2024	43.2	21.5	4.22	4.78	BDL	BDL
01-08-2024	52.3	25.3	4.12	4.75	BDL	BDL
05-08-2024	45.6	21.3	4.22	4.61	BDL	BDL
08-08-2024	55.3	28.4	4.29	4.59	BDL	BDL
12-08-2024	50.2	25.9	4.19	4.55	BDL	BDL
15-08-2024	46.8	23.2	4.25	4.63	BDL	BDL
19-08-2024	49.7	24.9	4.11	4.71	BDL	BDL
22-08-2024	48.3	25.8	4.32	4.80	BDL	BDL
26-08-2024	46.5	23.5	4.21	4.73	BDL	BDL
29-08-2024	48.3	25.1	4.10	4.65	BDL	BDL
02-09-2024	48.7	24.6	4.28	4.98	BDL	BDL
05-09-2024	53.2	26.7	4.37	5.11	BDL	BDL
09-09-2024	45.2	22.3	4.53	5.23	BDL	BDL
12-09-2024	46.9	23.7	4.41	4.99	BDL	BDL
16-09-2024	51.9	25.2	4.57	5.38	BDL	BDL
19-09-2024	43.2	22.4	4.26	4.89	BDL	BDL
23-09-2024	49.7	24.1	4.35	5.18	BDL	BDL
26-09-2024	45.6	21.9	4.19	4.99	BDL	BDL
30-09-2024	52.5	26.8	4.45	5.22	BDL	BDL
NAAQS 2009 Limits	**100**	**60**	**80**	**80**	**4**	**-**

BDL: Below Detectable Limit

Table 3.7: Location – Chani (A4)

Chani (A4)						
Date	Parameters					
	PM_{10}	$PM_{2.5}$	SO_2	NO_2	CO	HC
	µg/m³	µg/m³	µg/m³	µg/m³	mg/m³	ppm
01-04-2024	42.3	20.6	4.23	4.69	BDL	BDL
04-04-2024	46.5	23.4	4.52	4.95	BDL	BDL
08-04-2024	43.2	20.9	4.39	4.72	BDL	BDL
11-04-2024	52.7	25.6	4.46	4.99	BDL	BDL

Chani (A4)						
Date	Parameters					
	PM_{10}	$PM_{2.5}$	SO_2	NO_2	CO	HC
	µg/m³	µg/m³	µg/m³	µg/m³	mg/m³	ppm
15-04-2024	46.5	22.5	4.28	4.62	BDL	BDL
18-04-2024	51.9	24.6	4.85	5.35	BDL	BDL
22-04-2024	45.6	23.4	4.33	4.91	BDL	BDL
25-04-2024	42.1	20.5	4.50	5.05	BDL	BDL
29-04-2024	46.8	22.9	4.31	4.89	BDL	BDL
02-05-2024	44.7	21.4	4.65	5.28	BDL	BDL
06-05-2024	47.8	23.6	4.72	5.17	BDL	BDL
09-05-2024	43.6	20.2	4.63	5.14	BDL	BDL
13-05-2024	50.3	24.1	4.79	5.22	BDL	BDL
16-05-2024	49.8	23.4	4.68	5.26	BDL	BDL
20-05-2024	37.5	16.4	4.49	5.13	BDL	BDL
23-05-2024	39.6	21.2	4.52	5.04	BDL	BDL
27-05-2024	47.2	23.6	4.76	5.18	BDL	BDL
30-05-2024	40.3	19.4	4.26	4.58	BDL	BDL
03-06-2024	41.6	19.5	4.12	4.59	BDL	BDL
06-06-2024	43.5	21.9	4.20	4.68	BDL	BDL
10-06-2024	40.5	18.9	4.16	4.48	BDL	BDL
13-06-2024	42.4	20.5	4.25	4.60	BDL	BDL
17-06-2024	40.9	19.8	BDL	4.45	BDL	BDL
20-06-2024	44.1	22.4	4.33	4.73	BDL	BDL
24-06-2024	43.9	21.6	4.29	4.62	BDL	BDL
27-06-2024	41.2	20.7	4.11	4.55	BDL	BDL
01-07-2024	45.9	22.9	4.19	4.48	BDL	BDL
04-07-2024	46.3	23.1	4.25	4.56	BDL	BDL
08-07-2024	41.2	20.6	4.20	4.50	BDL	BDL
11-07-2024	44.8	22.4	4.29	4.72	BDL	BDL
15-07-2024	41.5	22.7	4.35	4.69	BDL	BDL
18-07-2024	42.8	20.8	4.37	4.79	BDL	BDL
22-07-2024	40.5	18.6	4.12	4.55	BDL	BDL
25-07-2024	42.3	21.1	4.28	4.76	BDL	BDL
29-07-2024	45.1	23.5	4.53	5.12	BDL	BDL
01-08-2024	50.8	24.3	4.32	4.60	BDL	BDL

Chani (A4)						
Date	Parameters					
	PM_{10}	$PM_{2.5}$	SO_2	NO_2	CO	HC
	µg/m³	µg/m³	µg/m³	µg/m³	mg/m³	ppm
05-08-2024	55.3	27.4	4.20	4.75	BDL	BDL
08-08-2024	53.2	25.3	4.15	4.61	BDL	BDL
12-08-2024	50.4	23.4	4.10	4.50	BDL	BDL
15-08-2024	48.6	20.6	4.22	4.58	BDL	BDL
19-08-2024	50.9	24.1	4.13	4.42	BDL	BDL
22-08-2024	53.8	26.2	4.25	4.63	BDL	BDL
26-08-2024	51.6	23.5	4.32	4.80	BDL	BDL
29-08-2024	47.6	21.1	4.11	4.45	BDL	BDL
02-09-2024	44.8	25.6	4.19	4.97	BDL	BDL
05-09-2024	49.6	26.7	4.38	5.16	BDL	BDL
09-09-2024	51.9	25.8	4.21	5.25	BDL	BDL
12-09-2024	46.8	21.8	4.19	4.89	BDL	BDL
16-09-2024	53.5	25.5	4.35	4.96	BDL	BDL
19-09-2024	49.2	24.1	4.22	5.12	BDL	BDL
23-09-2024	55.8	27.6	4.49	5.33	BDL	BDL
26-09-2024	47.5	23.8	4.25	4.98	BDL	BDL
30-09-2024	50.9	24.7	4.36	5.14	BDL	BDL
NAAQS 2009 Limits	**100**	**60**	**80**	**80**	**4**	**-**

BDL: Below Detectable Limit

Table 3.8: Location – Balarampuram (A5)

Balarampuram (A5)						
Date	Parameters					
	PM_{10}	$PM_{2.5}$	SO_2	NO_2	CO	HC
	µg/m³	µg/m³	µg/m³	µg/m³	mg/m³	ppm
01-04-2024	72.6	35.1	4.72	5.36	BDL	BDL
04-04-2024	68.9	33.1	4.50	5.01	BDL	BDL
08-04-2024	70.5	32.9	4.25	5.51	BDL	BDL
11-04-2024	65.9	31.5	4.38	5.20	BDL	BDL
15-04-2024	71.6	33.6	4.50	5.06	BDL	BDL
18-04-2024	77.3	36.7	4.41	4.98	BDL	BDL
22-04-2024	63.5	30.5	4.52	5.28	BDL	BDL

Balarampuram (A5)						
Date	Parameters					
	PM_{10}	$PM_{2.5}$	SO_2	NO_2	CO	HC
	µg/m³	µg/m³	µg/m³	µg/m³	mg/m³	ppm
25-04-2024	66.8	32.8	4.48	5.20	BDL	BDL
29-04-2024	70.6	34.6	4.75	5.42	BDL	BDL
02-05-2024	70.6	33.9	5.01	6.17	BDL	BDL
06-05-2024	68.5	32.4	5.04	5.99	BDL	BDL
09-05-2024	71.4	34.3	5.11	5.43	BDL	BDL
13-05-2024	63.8	32.1	4.73	5.89	BDL	BDL
16-05-2024	65.1	31.9	5.03	6.37	BDL	BDL
20-05-2024	70.9	33.4	5.12	6.02	BDL	BDL
23-05-2024	61.4	30.5	4.88	5.92	BDL	BDL
27-05-2024	63.8	29.8	5.07	6.05	BDL	BDL
30-05-2024	66.4	31.7	4.68	5.57	BDL	BDL
03-06-2024	55.1	23.5	4.19	4.59	BDL	BDL
06-06-2024	48.6	21.5	4.18	4.46	BDL	BDL
10-06-2024	43.2	19.5	4.21	4.58	BDL	BDL
13-06-2024	40.8	15.6	4.05	4.50	BDL	BDL
17-06-2024	45.7	16.9	4.09	4.49	BDL	BDL
20-06-2024	43.5	14.8	4.11	4.62	BDL	BDL
24-06-2024	46.8	18.5	4.15	4.57	BDL	BDL
27-06-2024	47.5	17.6	4.22	4.68	BDL	BDL
01-07-2024	62.3	31.2	4.53	5.16	BDL	BDL
04-07-2024	55.6	28.8	4.49	4.99	BDL	BDL
08-07-2024	50.3	25.1	4.46	5.21	BDL	BDL
11-07-2024	48.8	24.1	4.21	4.75	BDL	BDL
15-07-2024	60.2	30.1	4.15	4.53	BDL	BDL
18-07-2024	50.9	25.9	4.39	4.78	BDL	BDL
22-07-2024	56.1	29.1	4.48	4.87	BDL	BDL
25-07-2024	52.2	27.2	4.25	4.68	BDL	BDL
29-07-2024	58.9	29.8	4.43	5.38	BDL	BDL
01-08-2024	70.5	35.6	4.83	5.53	BDL	BDL
05-08-2024	62.1	33.2	4.63	5.12	BDL	BDL
08-08-2024	56.3	28.3	4.52	5.32	BDL	BDL
12-08-2024	60.9	31.6	4.46	4.99	BDL	BDL

Balarampuram (A5)						
Date	Parameters					
	PM_{10}	$PM_{2.5}$	SO_2	NO_2	CO	HC
	µg/m³	µg/m³	µg/m³	µg/m³	mg/m³	ppm
15-08-2024	58.6	28.3	4.38	4.75	BDL	BDL
19-08-2024	55.6	27.4	4.53	5.17	BDL	BDL
22-08-2024	63.3	32.5	4.41	5.10	BDL	BDL
26-08-2024	60.7	29.2	4.38	4.95	BDL	BDL
29-08-2024	66.8	35.4	4.62	5.42	BDL	BDL
02-09-2024	75.9	38.4	4.96	5.61	BDL	BDL
05-09-2024	72.1	35.6	4.51	5.45	BDL	BDL
09-09-2024	63.4	31.8	4.26	5.12	BDL	BDL
12-09-2024	67.2	33.6	4.39	5.25	BDL	BDL
16-09-2024	62.9	30.7	4.44	5.11	BDL	BDL
19-09-2024	69.2	34.8	4.29	4.99	BDL	BDL
23-09-2024	75.3	36.2	4.56	5.28	BDL	BDL
26-09-2024	71.4	35.1	4.38	5.10	BDL	BDL
30-09-2024	73.5	37.9	4.51	5.42	BDL	BDL
NAAQS 2009 Limits	**100**	**60**	**80**	**80**	**4**	**-**

BDL: Below Detectable Limit

HYR-3.5. Monthly Average Results of Ambient Air Quality Monitoring (April 2024 to September 2024)

Table 3.9: Monthly Average Results

Parameter, Unit	NAAQS 2009 Limits	Month	Venganoor (A1)			Port Site (A2)			Proposed Port Estate Area (A3)			Chani (A4)			Balarampuram (A5)		
			Max	Avg	Min	Max	Avg	Min	Max	Avg	Min	Max	Avg	Min	Max	Avg	Min
Particulate matter (size less than 10µm) or PM_{10}, µg/m³	100	Apr-24	56.2	50.0	42.8	85.1	73.9	65.2	56.8	45.5	36.0	52.7	46.4	42.1	77.3	69.7	63.5
		May-24	44.3	41.7	38.5	74.6	71.5	67.5	51.8	44.1	37.6	50.3	44.5	37.5	71.4	66.9	61.4
		Jun-24	43.7	40.4	36.1	59.5	53.7	48.6	46.2	42.0	37.3	44.1	42.3	40.5	55.1	46.4	40.8
		Jul-24	44.5	40.7	35.8	69.3	59.2	50.6	49.5	43.7	39.5	46.3	43.4	40.5	62.3	55.0	48.8
		Aug-24	46.2	42.4	36.8	78.6	71.6	65.4	55.3	49.2	45.6	55.3	51.4	47.6	70.5	61.6	55.6
		Sep-24	53.5	50.1	45.9	85.4	80.2	72.4	53.2	48.5	43.2	55.8	50.0	44.8	75.9	70.1	62.9
		HY	**56.2**	**44.2**	**35.8**	**85.4**	**68.3**	**48.6**	**56.8**	**45.5**	**36.0**	**55.8**	**46.3**	**37.5**	**77.3**	**61.6**	**40.8**
Particulate matter (size less than 2.5µm) or PM $_{2.5}$, µg/m³	60	Apr-24	27.5	24.1	20.6	42.7	36.7	31.6	26.8	22.1	16.9	25.6	22.7	20.5	36.7	33.4	30.5
		May-24	21.8	20.4	18.1	36.2	34.3	32.6	39.3	25.1	16.4	24.1	21.5	16.4	34.3	32.2	29.8
		Jun-24	21.7	19.6	17.1	25.4	23.8	21.8	23.2	20.4	18.0	22.4	20.7	18.9	23.5	18.5	14.8
		Jul-24	22.4	19.9	17.5	34.6	28.6	22.5	26.8	21.9	18.5	23.5	21.7	18.6	31.2	27.9	24.1
		Aug-24	25.2	21.0	15.3	39.4	35.6	32.1	28.4	24.8	21.3	27.4	24.0	20.6	35.6	31.3	27.4
		Sep-24	26.8	24.5	22.4	43.5	39.5	35.6	26.8	24.2	21.9	27.6	25.1	21.8	38.4	34.9	30.7
		HY	**27.5**	**21.6**	**15.3**	**43.5**	**33.1**	**21.8**	**39.3**	**23.1**	**16.4**	**27.6**	**22.6**	**16.4**	**38.4**	**29.7**	**14.8**
Sulphur dioxide (SO_2), µg/m³	80	Apr-24	4.75	4.36	4.05	5.36	4.94	4.52	4.68	4.31	4.09	4.85	4.43	4.23	4.75	4.50	4.25
		May-24	4.35	4.23	4.11	5.27	5.14	4.87	4.49	4.26	4.04	4.79	4.61	4.26	5.12	4.96	4.68
		Jun-24	4.36	4.21	4.10	4.39	4.25	4.11	4.31	4.21	BDL	4.33	4.21	BDL	4.22	4.15	4.05
		Jul-24	4.63	4.25	4.06	4.59	4.40	4.22	4.52	4.30	4.12	4.53	4.29	4.12	4.53	4.38	4.15
		Aug-24	4.55	4.34	4.20	4.69	4.47	4.25	4.32	4.20	4.10	4.32	4.20	4.10	4.83	4.53	4.38
		Sep-24	4.55	4.36	4.19	4.86	4.64	4.34	4.57	4.38	4.19	4.49	4.29	4.19	4.96	4.48	4.26
		HY	**4.75**	**4.29**	**4.05**	**5.36**	**4.64**	**4.11**	**4.68**	**4.28**	**BDL**	**4.85**	**4.34**	**BDL**	**5.12**	**4.50**	**4.05**
Oxides of	80	Apr-24	5.41	4.89	4.23	6.75	5.86	5.26	5.35	5.01	4.78	5.35	4.91	4.62	5.51	5.22	4.98

Parameter, Unit	NAAQS 2009 Limits	Month	Venganoor (A1)			Port Site (A2)			Proposed Port Estate Area (A3)			Chani (A4)			Balarampuram (A5)		
			Max	Avg	Min	Max	Avg	Min	Max	Avg	Min	Max	Avg	Min	Max	Avg	Min
Nitrogen (NO_x), µg/m^3		May-24	4.97	4.66	4.22	6.54	6.20	5.78	5.27	4.90	4.63	5.28	5.11	4.58	6.37	5.93	5.43
		Jun-24	4.78	4.61	4.45	4.98	4.83	4.73	4.76	4.55	4.30	4.73	4.59	4.45	4.68	4.56	4.46
		Jul-24	5.12	4.75	4.52	5.37	4.97	4.78	5.34	4.78	4.48	5.12	4.69	4.48	5.38	4.93	4.53
		Aug-24	4.86	4.64	4.49	5.69	5.35	4.99	4.80	4.67	4.55	4.80	4.59	4.42	5.53	5.15	4.75
		Sep-24	5.18	4.97	4.76	5.52	5.25	4.98	5.38	5.11	4.89	5.33	5.09	4.89	5.61	5.26	4.99
		HY	**5.41**	**4.75**	**4.22**	**6.75**	**5.41**	**4.73**	**5.38**	**4.83**	**4.30**	**5.35**	**4.83**	**4.42**	**6.37**	**5.18**	**4.46**
Carbon Monoxide (CO), mg/m^3	4	Apr-24	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
		May-24	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
		Jun-24	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
		Jul-24	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
		Aug-24	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
		Sep-24	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
		HY	**--**	**BDL**	**--**	**--**	**BDL**	**--**	**--**	**BDL**	**--**	**--**	**BDL**	**--**	**--**	**BDL**	**--**
Hydrocarbon (HC), ppm	-	Apr-24	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
		May-24	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
		Jun-24	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
		Jul-24	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
		Aug-24	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
		Sep-24	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
		HY	**--**	**BDL**	**--**	**--**	**BDL**	**--**	**--**	**BDL**	**--**	**--**	**BDL**	**--**	**--**	**BDL**	**--**

***HY- Half Yearly**

HYR-3.6. Graphical representation of Half-Yearly Results (April-2024 to September-2024)

Figure 3.2: Respirable Particulate Matter (PM10)

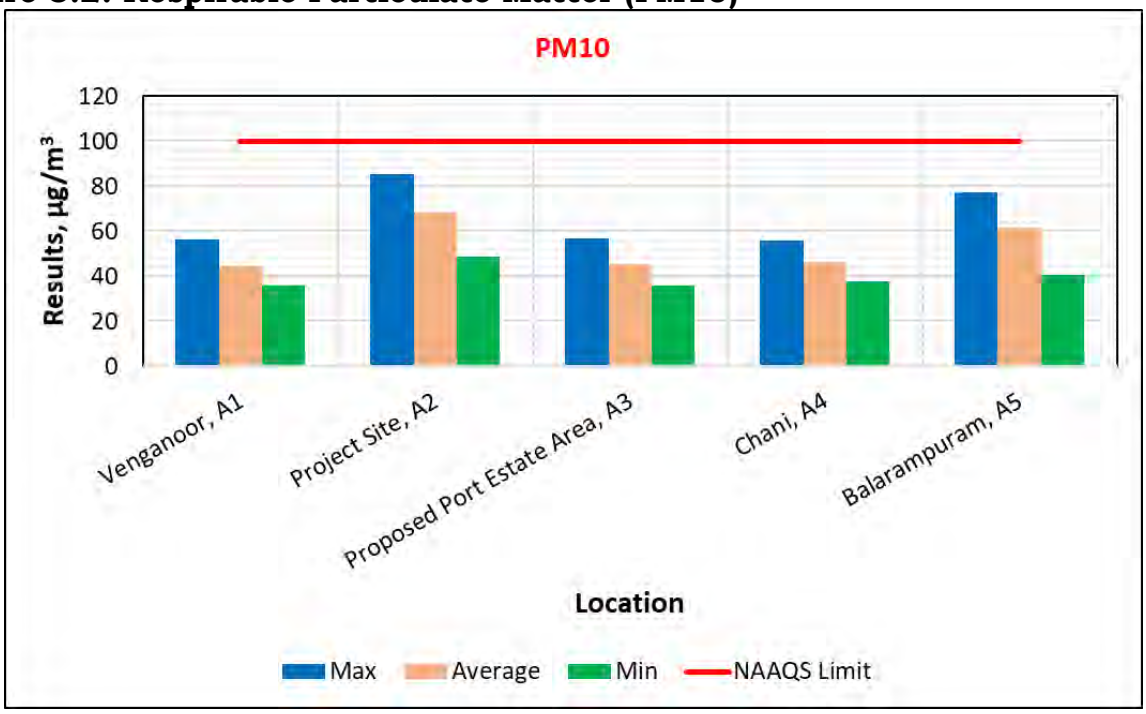


Figure 3.3: Fine Particulate matter (PM2.5)

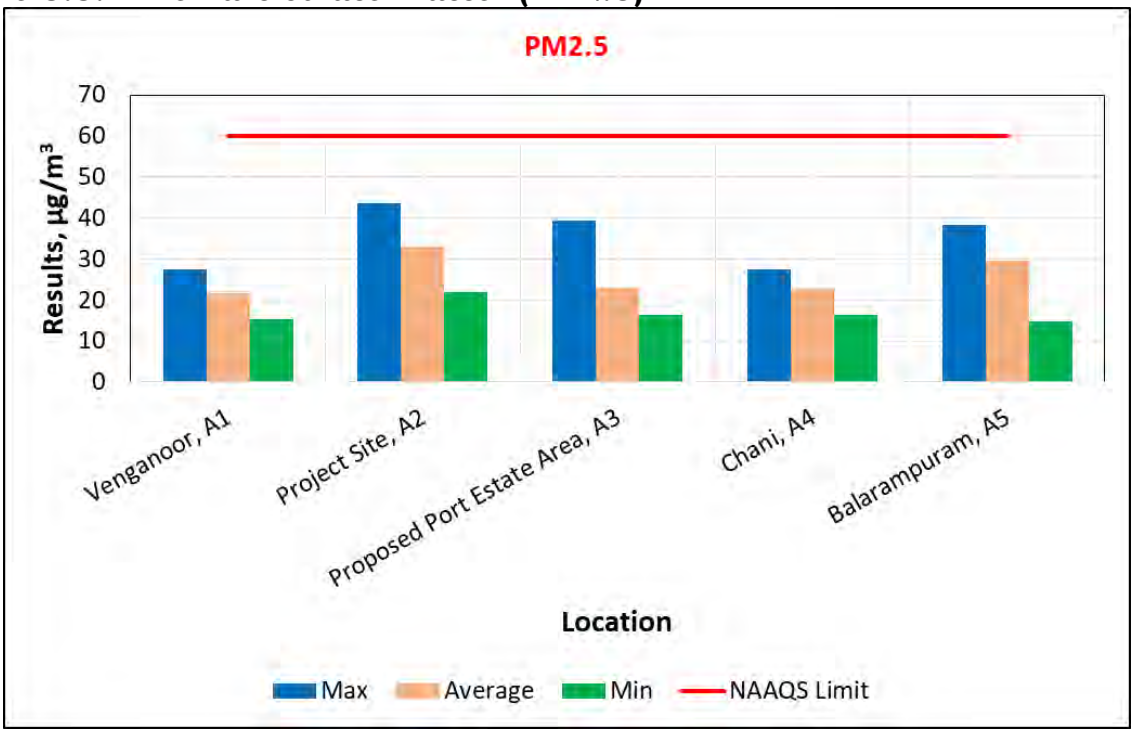


Figure 3.4: Sulphur Dioxide as SO_2

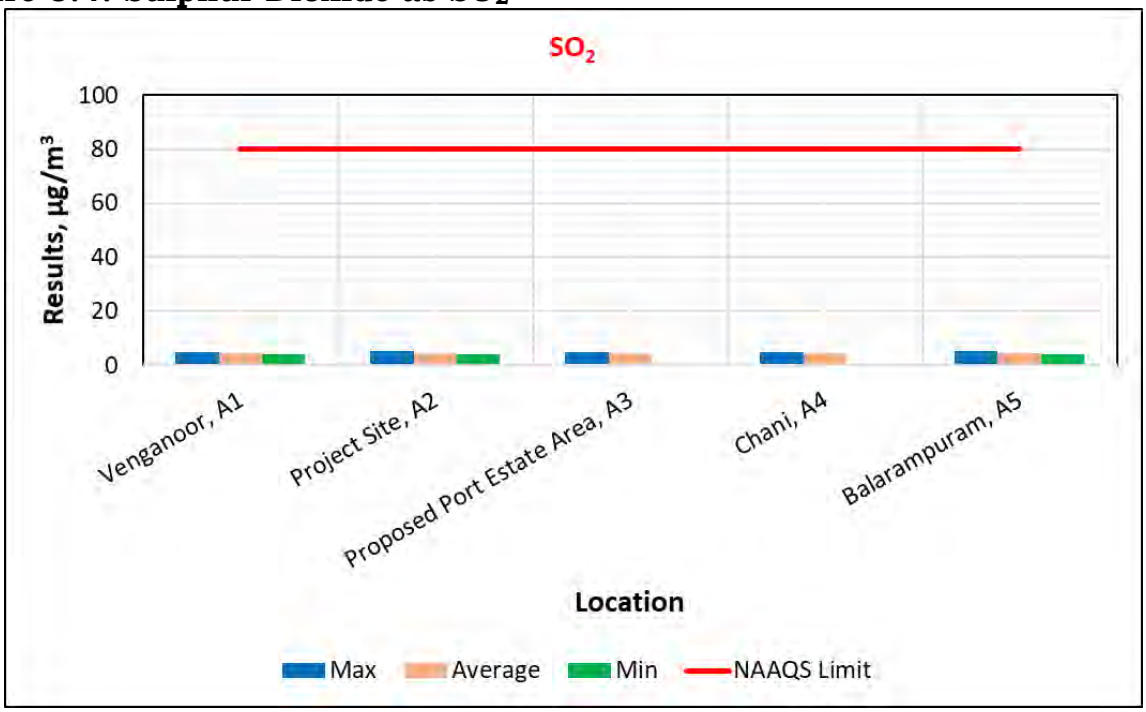
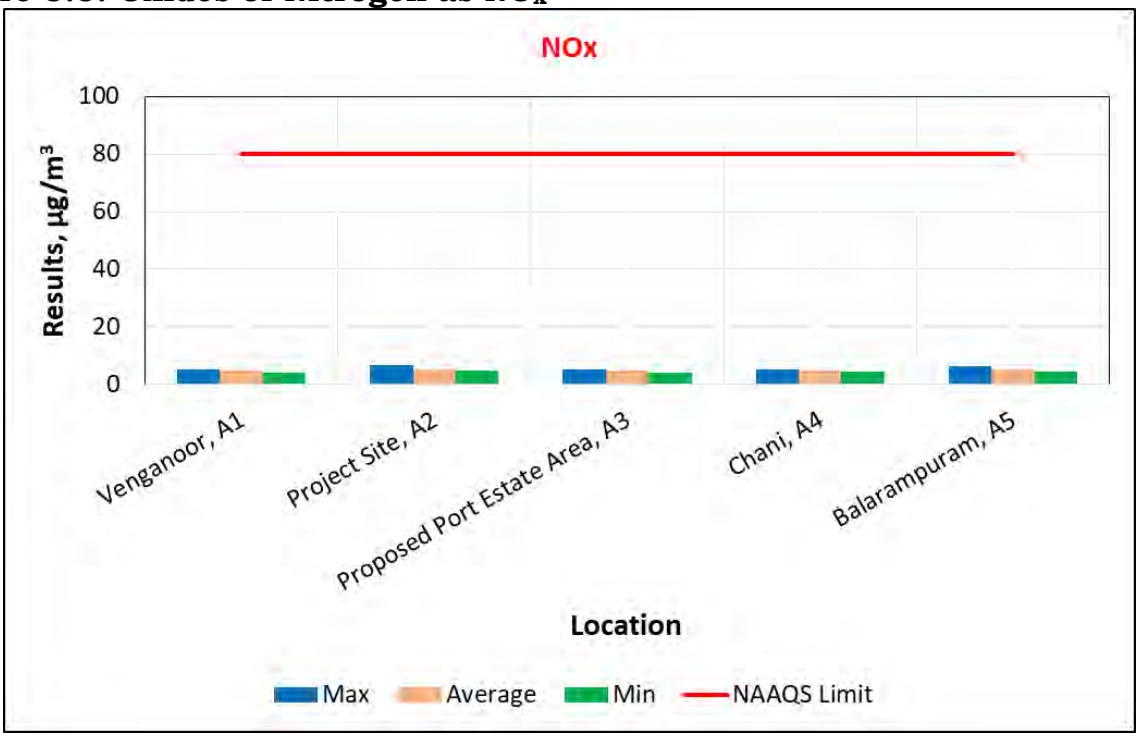


Figure 3.5: Oxides of Nitrogen as NO_x



HYR-3.7. Summary - Ambient Air Quality

During the period of April 2024 to September 2024, the following is the summary of ambient air quality results:

a) At the location **Venganoor**:
- PM_{10} was observed in the range between 35.8-56.2 µg/m³ with an average of 44.2 µg/m³
- $PM_{2.5}$ was observed in the range between 15.3-27.5 µg/m³ with an average of 21.6 µg/m³
- SO_2 was observed in the range between 4.05-4.75 µg/m³ with an average of 4.29 µg/m³
- NO_2 was observed in the range between 4.22-5.41 µg/m³ with an average of 4.75 µg/m³
- CO & HC were observed below detectable limits.

b) At the location **Port Site**:
- PM_{10} was observed in the range between 48.6-85.4 µg/m³ with an average of 68.3 µg/m³
- $PM_{2.5}$ was observed in the range between 21.8-43.5 µg/m³ with an average of 33.1 µg/m³
- SO_2 was observed in the range between 4.11-5.36 µg/m³ with an average of 4.64 µg/m³
- NO_2 was observed in the range between 4.73-6.75 µg/m³ with an average of 5.41 µg/m³
- CO & HC were observed below detectable limits.

c) At the location **Proposed Port Area**:
- PM_{10} was observed in the range between 36.0-56.8 µg/m³ with an average of 45.5 µg/m³
- $PM_{2.5}$ was observed in the range between 16.4-39.3 µg/m³ with an average of 23.1 µg/m³

- SO_2 was observed in the range between BDL-4.68 µg/m³ with an average of 4.28 µg/m³
- NO_2 was observed in the range between 4.30-5.38 µg/m³ with an average of 4.83 µg/m³
- CO & HC were observed below detectable limits.

d) At the location **Chani**:

- PM_{10} was observed in the range between 37.5-55.8 µg/m³ with an average of 46.3 µg/m³
- $PM_{2.5}$ was observed in the range between 16.4-27.6 µg/m³ with an average of 22.6 µg/m³
- SO_2 was observed in the range between BDL-4.85 µg/m³ with an average of 4.34 µg/m³
- NO_2 was observed in the range between 4.42-5.35 µg/m³ with an average of 4.83 µg/m³
- CO & HC were observed below detectable limits.

e) At the location **Balarampuram**:

- PM_{10} was observed in the range between 40.8-77.3 µg/m³ with an average of 61.6 µg/m³
- $PM_{2.5}$ was observed in the range between 14.8-38.4 µg/m³ with an average of 29.7 µg/m³
- SO_2 was observed in the range between 4.05-5.12 µg/m³ with an average of 4.50 µg/m³
- NO_2 was observed in the range between 4.46-6.37 µg/m³ with an average of 5.18 µg/m³
- CO & HC were observed below detectable limits.

f) Overall Comparison of Results from **all Locations**:

- PM_{10} was observed with a maximum of 85.4 µg/m³ at Port Site and a minimum of 35.8 µg/m³ at Venganoor. The overall average of all locations is 53.2 µg/m³

- $PM_{2.5}$ was observed with a maximum of 43.5 µg/m³ at Port site and a minimum of 14.8 µg/m³ at Balaramapuram. The overall average of all locations is 26.0 µg/m³
- SO_2 was observed with a maximum of 5.36 µg/m³ at Port Site and a minimum of BDL at Proposed Port Area & Chani. The overall average of all locations is 4.41 µg/m³
- NO_2 was observed with a maximum of 6.75 µg/m³ at Port Site and a minimum of 4.22 µg/m³ at Venganoor. The overall average of all locations is 5.00 µg/m³
- CO & HC were always observed below detectable limits at all locations.

The obtained results were compared with National Ambient Air Quality Standards (NAAQS), 2009. The results were well within the limits on all monitoring days at all 5 locations during the monitoring months (from April 2024 to September 2024).

Table 3.10: Overall Summary of Results from all Locations

Parameter	Unit	NAAQS 2009 Limits	Max	Avg.	Min
PM10	µg/m³	100	85.4	53.2	35.8
PM 2.5	µg/m³	60	43.5	26.0	14.8
SO2	µg/m³	80	5.36	4.41	BDL
NOx	µg/m³	80	6.75	5.00	4.22
CO	mg/m³	4	BDL	BDL	BDL
HC	ppm	--	BDL	BDL	BDL

HYR-4	Ambient Noise Monitoring

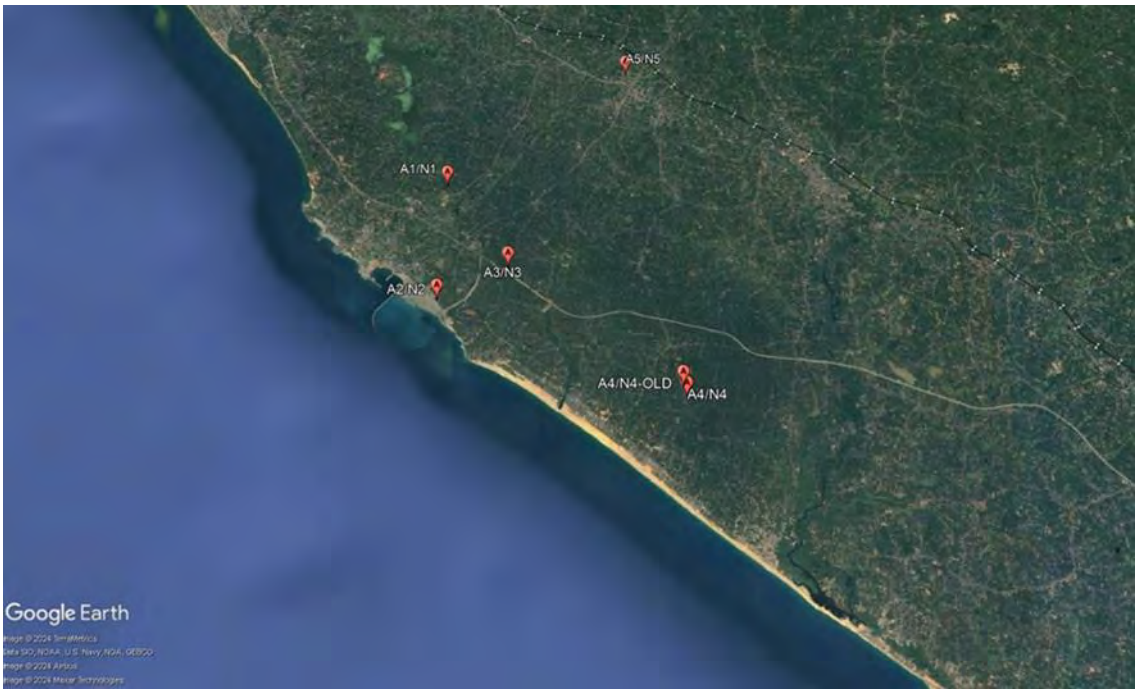
HYR-4.1. Ambient Noise Monitoring location details

This section describes the sampling location, methodology adopted for monitoring ambient noise and analysis of monitored results. Ambient Noise Monitoring during April 2024 to September 2024 was carried out at Venganoor, Port Site, Proposed Port Estate Area, Chani and Balarampuram. Classification of locations as per the Noise Pollution (Regulation & Control) Rules, 2000 (Rules 3 (1) and 4(1)) are as below.

Table 4.1: Coordinates of Ambient Noise Monitoring Locations

Location	Legend	Area Type	Latitude	Longitude
Venganoor	N1	Residential	8°23'55.10"N	77°00'12.19"E
Port Site	N2	Industrial	8°22'13.73"N	77°00'08.39"E
Proposed Port Estate Area	N3	Residential	8°22'41.37"N	77°01'03.17"E
Chani	N4	Residential	8°21'02.11"N	77°03'16.59"E
			8°20'53.49"N	77°03'18.76"E
Balarampuram	N5	Commercial	8°25'43.73"N	77°02'39.99"E

Figure 4.1: Google Earth View of Ambient Noise Monitoring Locations



HYR-4.2. Methodology of Sampling

Ambient Noise Monitoring is being carried out as per IS 9989:1981.

HYR-4.3. Ambient Noise Standards

The results obtained were compared with the standards as per the Noise Pollution (Regulation & Control) Rules, 2000 (Rules 3 (1) and 4(1)) given in Table 4.2.

Table 4.2: Ambient Noise Standard

Area Code	Area Type	Limits in dB (A) Leq	
		Day (6 a.m. to 10 p.m.)	Night (10 p.m. to 6 a.m.)
A	Industrial	75	70
B	Commercial	65	55
C	Residential	55	45

HYR-4.4. Ambient Noise Monitoring Results for the period from April 2024 to September 2024.

Table 4.3: Location –Venganoor, N1 - (Residential Area)

Month	Date	L_{max} Day time	L_{max} Night time	L_{min} Day time	L_{min} Night time	L_{eq} Day time	L_{eq} Night time
		dB (A)					
Apr-24	05-04-2024	88.5	65.0	44.4	43.0	54.7	43.9
	19-04-2024	91.3	68.6	41.5	40.2	54.5	44.3
May-24	03-05-2024	80.7	57.5	30.2	29.3	45.4	38.8
	14-05-2024	89.5	83.5	44.5	43.9	53.2	44.3
Jun-24	04-06-2024	82.6	74.3	34.7	34.9	50.7	42.9
	18-06-2024	86.4	75.2	39.1	37.4	54.4	44.0
Jul-24	02-07-2024	73.2	61.2	40.1	39.6	53.6	43.8
	16-07-2024	81.2	70.3	41.1	38.5	51.9	43.7
Aug-24	02-08-2024	82.6	74.2	36.0	34.2	52.1	43.9

Month	Date	L_{max} Day time	L_{max} Night time	L_{min} Day time	L_{min} Night time	L_{eq} Day time	L_{eq} Night time
		dB (A)					
	16-08-2024	81.0	53.0	36.8	35.3	53.6	44.2
Sep-24	03-09-2024	84.6	74.5	46.1	32.5	54.2	43.1
	17-09-2024	76.2	65.3	43.2	38.6	53.2	41.8
As per the Noise Pollution (Regulation & Control) Rules, 2000 [Rules 3 (1) and 4(1)]						**55**	**45**

Table 4.4: Location –Port Site, N2 - (Industrial Area)

Month	Date	L_{max} Day time	L_{max} Night time	L_{min} Day time	L_{min} Night time	L_{eq} Day time	L_{eq} Night time
		dB (A)					
Apr-24	06-04-2024	91.0	85.5	45.0	44.5	63.6	59.4
	20-04-2024	98.8	88.2	46.9	45.2	69.7	59.5
May-24	04-05-2024	88.5	60.0	38.1	35.7	55.7	48.4
	15-05-2024	91.0	85.5	45.0	44.5	58.9	50.6
Jun-24	05-06-2024	97.2	82.9	44.7	47.9	70.0	59.9
	19-06-2024	87.7	86.4	43.1	43.7	62.1	56.2
Jul-24	03-07-2024	81.6	78.4	42.8	41.6	59.3	52.5
	17-07-2024	95.0	82.5	43.8	42.7	70.0	55.8
Aug-24	06-08-2024	88.7	84.9	42.0	41.8	62.1	59.3
	20-08-2024	92.9	85.9	46.2	43.2	68.2	61.4
Sep-24	04-09-2024	88.2	83.6	47.9	46.0	60.0	54.7
	18-09-2024	86.7	79.0	43.0	41.0	59.7	52.7
As per the Noise Pollution (Regulation & Control) Rules, 2000 [Rules 3 (1) and 4(1)]						**75**	**70**

Table 4.5: Location –Proposed Port Estate Area, N3 - (Residential Area)

Month	Date	L_{max} Day time	L_{max} Night time	L_{min} Day time	L_{min} Night time	L_{eq} Day time	L_{eq} Night time
		dB (A)					
Apr-24	07-04-2024	99.5	68.1	40.1	36.5	70.9	43.6
	21-04-2024	104.8	82.4	36.0	34.5	74.8	44.3
May-24	07-05-2024	82.0	71.0	46.0	43.4	64.6	50.1
	21-05-2024	87.4	74.7	44.6	40.2	62.4	54.5
Jun-24	07-06-2024	84.0	75.2	39.8	36.2	53.0	44.5
	21-06-2024	90.2	77.5	37.9	34.9	52.0	44.7
Jul-24	05-07-2024	81.3	70.9	38.6	38.0	52.4	40.6
	19-07-2024	82.1	70.9	39.1	38.4	51.5	41.6
Aug-24	07-08-2024	78.2	50.5	37.5	32.8	52.7	43.1
	21-08-2024	79.2	70.3	37.4	31.9	51.9	41.6
Sep-24	06-09-2024	83.1	82.7	38.9	37.9	53.7	42.6
	20-09-2024	81.2	73.4	37.3	35.4	52.9	42.1
As per the Noise Pollution (Regulation & Control) Rules, 2000 [Rules 3 (1) and 4(1)]						**55**	**45**

Table 4.6: Location –Chani, N4 - (Residential Area)

Month	Date	L_{max} Day time	L_{max} Night time	L_{min} Day time	L_{min} Night time	L_{eq} Day time	L_{eq} Night time
		dB (A)					
Apr-24	09-04-2024	95.3	83.8	38.0	33.5	54.9	43.7
	23-04-2024	90.3	77.9	48.8	47.3	53.5	43.9
May-24	08-05-2024	81.9	51.8	35.9	43.2	49.6	44.2
	24-05-2024	94.1	76.6	42.1	37.6	61.1	51.1
Jun-24	11-06-2024	83.2	71.9	40.1	39.6	54.2	44.2
	25-06-2024	89.0	75.4	43.3	38.3	53.6	43.5
Jul-24	09-07-2024	81.6	69.8	39.5	36.7	54.1	41.1

Month	Date	L_{max} Day time	L_{max} Night time	L_{min} Day time	L_{min} Night time	L_{eq} Day time	L_{eq} Night time
		dB (A)					
	23-07-2024	76.9	70.5	39.4	38.9	48.1	40.6
Aug-24	09-08-2024	75.8	71.2	38.2	35.1	50.3	41.8
	23-08-2024	78.6	76.6	37.2	35.6	53.2	42.7
Sep-24	10-09-2024	83.8	76.0	36.8	34.9	52.5	42.3
	24-09-2024	84.3	76.9	38.5	35.7	51.7	42.1
As per the Noise Pollution (Regulation & Control) Rules, 2000 [Rules 3 (1) and 4(1)]						**55**	**45**

Table 4.7: Location –Balarampuram, N5 - (Commercial Area)

Month	Date	L_{max} Day time	L_{max} Night time	L_{min} Day time	L_{min} Night time	L_{eq} Day time	L_{eq} Night time
		dB (A)					
Apr-24	12-04-2024	97.9	85.3	42.9	42.6	70.5	52.3
	26-04-2024	91.5	84.8	42.3	41.3	61.1	50.9
May-24	10-05-2024	93.6	82.4	39.9	41.8	59.7	54.1
	28-05-2024	94.7	81.2	37.2	36.6	67.7	52.5
Jun-24	14-06-2024	93.8	83.8	37.6	37.6	70.7	63.1
	28-06-2024	92.9	83.5	38.6	35.5	61.2	53.9
Jul-24	12-07-2024	83.2	71.9	40.1	39.6	54.2	44.2
	26-07-2024	91.5	76.5	34.2	40.5	59.3	54.1
Aug-24	13-08-2024	89.0	79.5	38.6	33.1	57.8	53.7
	27-08-2024	83.3	79.3	36.4	33.1	57.3	54.7
Sep-24	13-09-2024	86.7	81.6	38.9	38.0	58.3	53.1
	27-09-2024	85.4	81.6	40.5	38.0	59.8	53.2
As per the Noise Pollution (Regulation & Control) Rules, 2000 [Rules 3 (1) and 4(1)]						**65**	**55**

HYR-4.5. Half Yearly Average Results of Ambient Noise Monitoring (April-2024 to September-2024)

Table 4.8: Half Yearly Average Results

Parameter		Venganoor (N1)	Proposed Port Estate Area (N3)	Chani (N4)	Port Site (N2)	Balarampuram (N5)
		Residential	Residential	Residential	Industrial	Commercial
L_{max} Day time dB (A)	Max	91.3	104.8	95.3	98.8	97.9
	Min	73.2	78.2	75.8	81.6	71.9
	Avg.	83.1	86.1	84.6	90.6	85.6
L_{max} Night time dB (A)	Max	83.5	82.7	83.8	88.2	85.3
	Min	53.0	50.5	51.8	60.0	71.9
	Avg.	68.5	72.3	73.2	81.9	80.9
L_{min} Day time dB (A)	Max	46.1	46.0	48.8	47.9	42.9
	Min	30.2	36.0	35.9	38.1	34.2
	Avg.	39.8	39.4	39.8	44.0	38.9
L_{min} Night time dB (A)	Max	43.9	43.4	47.3	47.9	42.6
	Min	29.3	31.9	33.5	35.7	33.1
	Avg.	37.3	36.7	38.0	43.2	38.1
Leq Day time dB (A)	Max	54.7	74.8	61.1	70.0	70.7
	Min	45.4	51.5	48.1	55.7	54.2
	Avg.	**52.6**	**57.7**	**53.1**	**63.3**	**61.5**
	Limit	**55**	**55**	**55**	**75**	**65**
Leq Night time dB (A)	Max	44.3	54.5	51.1	61.4	63.1
	Min	38.8	40.6	40.6	48.4	44.2
	Avg.	**43.2**	**44.4**	**43.4**	**55.9**	**53.3**
	Limit	**45**	**45**	**45**	**70**	**55**

HYR-4.6. Graphical Representation of Half Yearly Results (April-2024 to September-2024)

Figure 4.2: Residential Area Noise Level

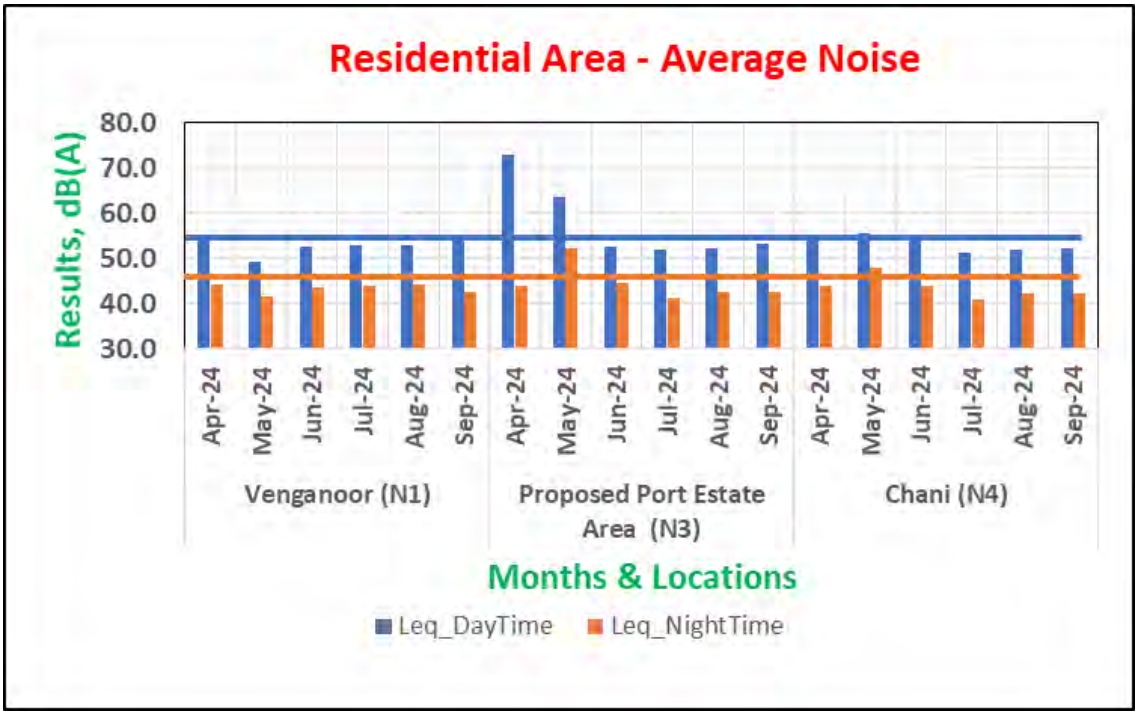


Figure 4.3: Industrial Area Noise Level

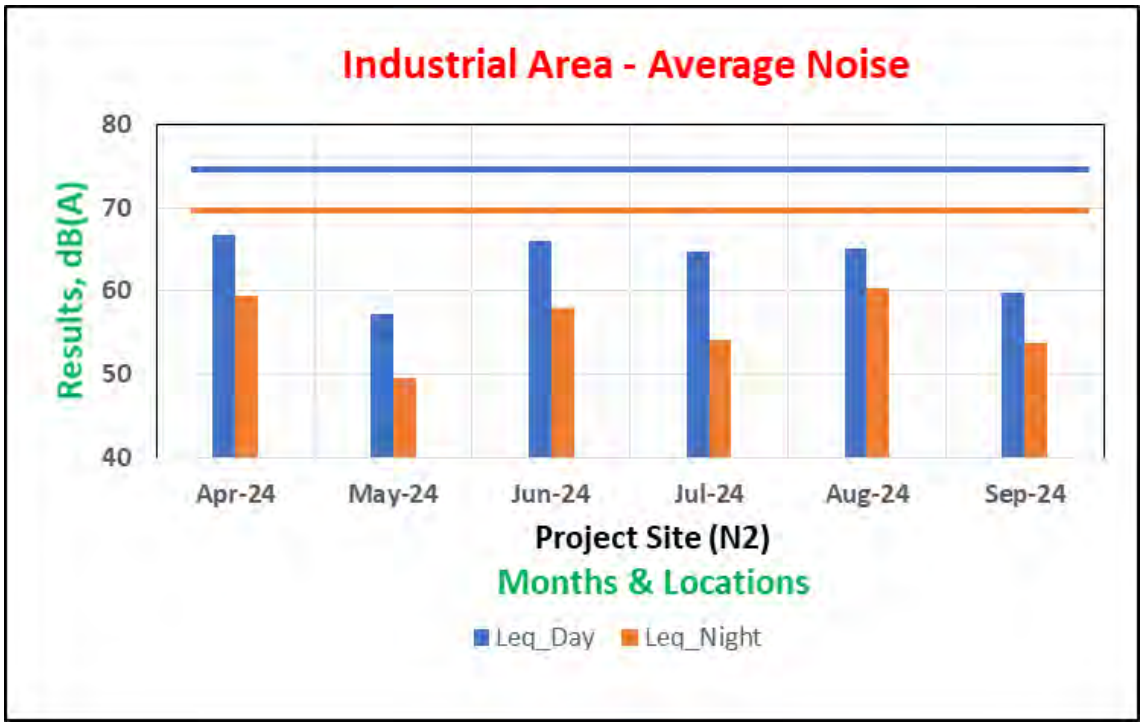
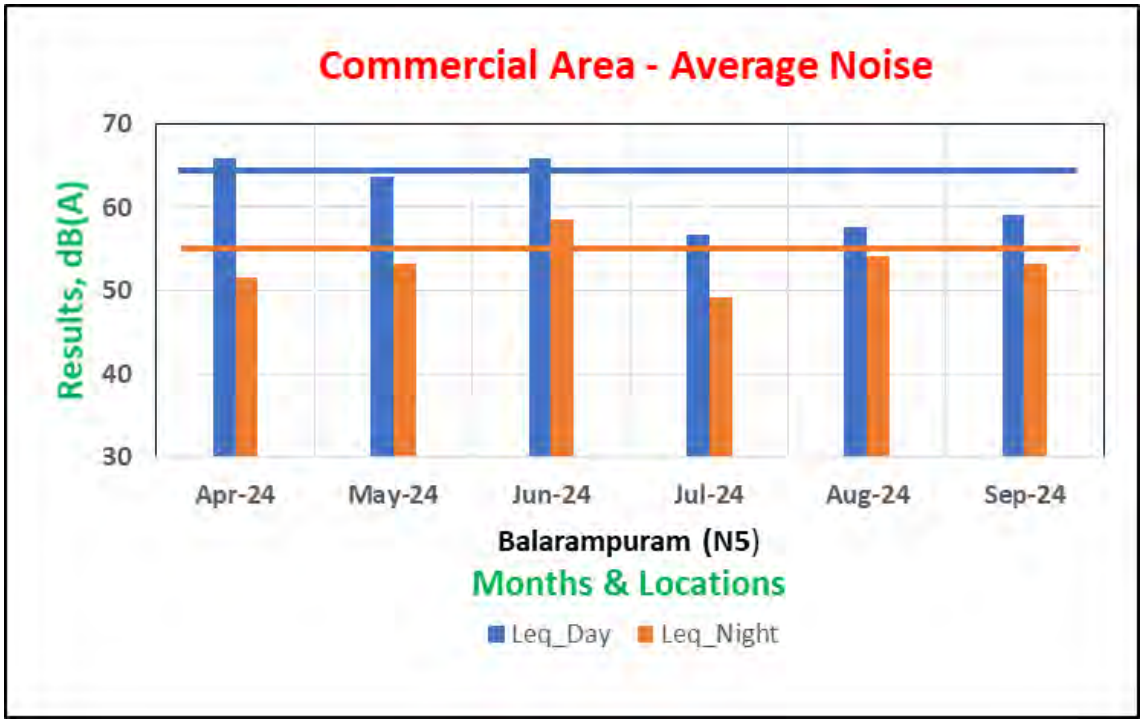


Figure 4.4: Commercial Area Noise Level



HYR-4.7. Summary - Ambient Noise Monitoring

During the period from April 2024 to September 2024, the following is the average noise levels observed.

Table 4.9: Summary - Ambient Noise Monitoring

Parameter		Venganoor (N1)	Proposed Port Estate Area (N3)	Chani (N4)	Port Site (N2)	Balarampuram (N5)
		Residential	Residential	Residential	Industrial	Commercial
		Daytime (Limit: 55) Nighttime (Limit: 45)			Daytime (Limit: 75) Nighttime (Limit: 70)	Daytime (Limit: 65) Nighttime (Limit: 55)
Leq Day time dB (A)	Avg	52.6	57.7	53.1	63.3	61.5
Leq Nighttime dB (A)	Avg	43.2	44.4	43.4	55.9	53.3

- The average Leq values observed at daytime and nighttime are 52.6 dB(A) and 43.2 dB(A) respectively at Venganoor
- The average Leq values observed at daytime and nighttime are 63.3 dB(A) and 55.9 dB(A) respectively at Port Site
- The average Leq values observed at daytime and nighttime are 57.7 dB(A) and 44.4 dB(A) respectively at Proposed Port Estate Area
- The average Leq values observed at daytime and nighttime are 53.1 dB(A) and 43.4 dB(A) respectively at Chani
- The average Leq values observed at daytime and nighttime are 61.5 dB(A) and 53.3 dB(A) respectively at Balarampuram.

The results obtained were compared with Noise Pollution (Regulation & Control) Rule, 2000 (Rule 3(1) and 4(1)) and it is observed that noise readings were within limits during the monitoring months (from April 2024 to September 2024) except the following

- Proposed Port Estate on 07-04-2024 & 21-04-2024 during Day time and 07-05-2024 during both Day Time and Night Time due to the noise from the Loud Speaker played nearby Temple on account of “Ulsavam”, also on 21-05-2024 during both Day Time and Night Time due to Heavy rainfall with Thundering.
- Chani on 24-05-2024 during both Day and Night time due to Heavy rainfall with Thundering.
- Balaramapuram on 12-04-2024 during Day time and on 14-06-2024 during both Day time and Night time due to noise played from the Loud Speaker from the nearby Temple on account of “Ulsavam”.

HYR-5	Marine Water & Sediment Analysis

HYR-5.1. Marine Water and Sediment Sampling Location Details:

This section describes the sampling location, methodology adopted for analysis and the analysis of monitored data for Marine Water and Sediment. Sampling and analysis of marine water at high tide and low tide during from April 2024 to September 2024 carried out at different locations such as Near Kovalam Beach, Proposed Dredging site, South of Break Water, Port Basin, Inner Approach Channel and Kovalam Beach.

Table 5.1: Coordinates of Marine Water and Sediment Sampling Locations

Location	Legend	Latitude	Longitude
Near Kovalam Beach	M1/MS1	8°22'49.29"N	76°58'40.77"E
Proposed Dredging Site	M2/MS2	8°22'31.11"N	76°58'57.92"E
Port Basin	M3/MS3	8°22'06.96"N	76°59'27.85"E
South of Breakwater	M4/MS4	8°21'51.07"N	77°00'00.21"E
Inner Approach Channel	M5/MS5	8°21'12.68"N	77°00'35.14"E
Kovalam Beach	M6/MS6	8°23'08.16"N	76°58'26.09"E

Figure 5.1: Google earth view of Marine Water and Sediment Sampling Locations

HYR-5.2. Methodology of Sampling and Analysis

Table 5.2: Sampling and Analysis Methodology

Sr. No.	Parameter	Unit	Detection Limit	Method Reference
Marine Water Analysis				
1.	Temperature	°C	1	IS 3025 (Part 9): 2023
2.	pH Value	-	1	IS 3025 (Part 11): 2022
3.	Turbidity	N.T.U.	0.1	IS 3025 (Part 10) : 2023
4.	Electrical Conductivity (at 25°C)	µmho/cm	1	IS 3025 Part 14: 2013
5.	Total Suspended Solids	mg/L	1	IS 3025 (Part 17): 2022
6.	Total Dissolved Solids	mg/L	1	IS 3025 (Part 16): 2023
7.	Dissolved Oxygen	mg/L	0.2	IS 3025 Part 38 : 1989
8.	Biochemical Oxygen Demand (3 days, 27°C)	mg/L	2	IS 3025 (Part 44): 2023
9.	Floating Materials – Oil, Grease and Scum (Including Petroleum Products)	mg/L	1	IS 3025 Part 39: 2021
10.	Nitrite (as NO_2)	mg/L	0.02	IS 3025 Part 34: 1998
11.	Nitrate (as NO_3)	mg/L	1	APHA (24th Edn) -4500 - NO3- B : 2023
12.	Phenolic Compounds (as C_6H_5OH)	mg/L	0.001	APHA (24th Edn) 5530 - B,C,D: 202319
13.	Ammonical Nitrogen (as NH_3-N)	mg/L	1	IS 3025 Part 34 : 1988
14.	Total Nitrogen (as N)	mg/L	1	IS 3025 Part 34 : 1988
15.	Total Phosphorous (as P)	mg/L	0.01	IS 3025 (Part 31/Sec 1): 2022
16.	Reactive Phosphorous	mg/L	0.01	IS 3025 (Part 31/Sec 1): 2022
17.	Polycyclic Aromatic Hydrocarbon	mg/L	0.000005	SEAAL/INS/SOP/7.2/05
18.	Salinity	ppt	0.0036	APHA (24th Edn) 2520 - B: 2023
19.	Total Chlorophyll	mg/m^3	0.1	APHA 24th Edn:10200. H
20.	Total Coliforms	MPN/100 ml	2	IS 1622: 1981
21.	Faecal Coliforms	MPN /100ml	2	IS 1622: 1981
22.	Phytoplankton	No./100ml	--	APHA 24th Edn:10200. F
23.	Zooplanktons	No./100ml	--	APHA 24th Edn:10200. G
Sediment Analysis				
1.	Texture	-	--	SEAAL/CHL/SOP/7.2/21
2.	Organic Matter	%	0.1	IS 2720 Part 22:1972
3.	Total Phosphorus (as P)	mg/kg	10	IS 10158: 1982

Sr. No.	Parameter	Unit	Detection Limit	Method Reference
4.	Aluminium (as Al)	mg/kg	5	USEPA 7000B: 2017
5.	Chromium (as Cr)	mg/kg	5	USEPA 7000B: 2007
6.	Copper (as Cu)	mg/kg	1.5	USEPA 7000B: 2007
7.	Iron (as Fe)	mg/kg	2.5	USEPA 7000B: 2007
8.	Lead (as Pb)	mg/kg	5	USEPA 7000B: 2007
9.	Manganese (as Mn)	mg/kg	1.5	USEPA 7000B: 2007
10.	Mercury (as Hg)	mg/kg	0.10	SEAAL/CHL/SOP/7.2/19
11.	Zinc (as Zn)	mg/kg	1	USEPA 7000B: 2007
12.	Nickel (as Ni)	mg/kg	2.5	USEPA 7000B: 2007
13.	Benthic Organism	No./m^2	1	APHA 24th Edn:10750. B

HYR-5.3. Marine Water Standards

As per the Environment (Protection) Rules, 1986 Schedule I.

Table 5.3: Marine Water Standard

Parameter	Unit	# E(P)A Rules, 1986
pH Value	-	6.5-9.0
Dissolved Oxygen	mg/L	3.0 mg/L or 40% saturation value; whichever is higher
Colour and Odour	-	No visible colour or offensive odour
Floating Materials (Oil, Grease and Scum) (Including Petroleum Products)	mg/L	*Max.* 10
Faecal Coliforms	MPN/100ml	*Max.* 500
Biochemical Oxygen Demand (3 days, 27°C)	mg/L	*Max.* 5
#: Environment (Protection) Rules, 1986, Schedule I, Table 1.4, Primary Water Quality Criteria for Class – IV Water (For Harbour Waters).		

HYR-5.4. Marine Water Analysis Results for the period from April 2024 to September 2024.

Table 5.4: Marine Water Analysis Results

Sl. No.	Parameter /unit	Month/Tide		Near Kovalam Beach (M1)	Proposed Dredging Site (M2)	Port Basin (M3)	South of Break Water (M4)	Inner Approach Channel (M5)	Kovalam Beach (M6)
1	Temperature (°C)	Apr-24	High Tide	28.4	28.1	28.9	28.3	27.9	27.6
			Low Tide	27.9	27.2	27.5	27.4	26.8	26.7
		May-24	High Tide	28.1	28.3	28.5	27.9	28.7	27.7
			Low Tide	27.6	27.9	27.2	26.8	27.3	27.2
		Jun-24	High Tide	28.6	28.7	28.7	28.0	28.0	28.5
			Low Tide	28.2	28.1	27.9	27.1	26.9	27.6
		Jul-24	High Tide	28.9	28.1	28.4	27.8	27.5	27.4
			Low Tide	28.7	27.9	27.8	27.2	27.3	27.2
		Aug-24	High Tide	28.1	28.5	27.9	28.6	28.4	27.9
			Low Tide	27.8	27.4	27.6	27.3	28.1	28.2
		Sep-24	High Tide	27.9	28.1	28.3	28.3	27.8	28.6
			Low Tide	27.3	27.6	27.4	27.9	27.5	27.9
2	Colour	Apr-24	High Tide	1	1	1	1	1	1
			Low Tide	1	1	1	1	1	1
		May-24	High Tide	1	1	1	1	1	1
			Low Tide	1	1	1	1	1	1
		Jun-24	High Tide	1	1	1	1	1	1
			Low Tide	1	1	1	1	1	1
		Jul-24	High Tide	1	1	1	1	1	1
			Low Tide	1	1	1	1	1	1
		Aug-24	High Tide	1	1	1	1	1	1

Sl. No.	Parameter /unit	Month/Tide		Near Kovalam Beach (M1)	Proposed Dredging Site (M2)	Port Basin (M3)	South of Break Water (M4)	Inner Approach Channel (M5)	Kovalam Beach (M6)
			Low Tide	1	1	1	1	1	1
		Sep-24	High Tide	1	1	1	1	1	1
			Low Tide	1	1	1	1	1	1
3	pH Value	Apr-24	High Tide	8.15	8.34	8.40	8.32	8.36	8.40
			Low Tide	8.27	8.35	8.37	8.39	8.42	8.42
		May-24	High Tide	7.84	7.94	7.81	7.90	7.87	7.80
			Low Tide	7.92	7.95	7.96	7.98	7.92	7.84
		Jun-24	High Tide	8.01	7.88	7.81	8.02	7.99	7.96
			Low Tide	8.02	7.96	7.96	8.04	8.05	7.98
		Jul-24	High Tide	7.57	7.77	7.90	7.59	7.70	7.62
			Low Tide	7.76	7.73	7.95	7.62	7.75	7.70
		Aug-24	High Tide	7.31	7.67	7.37	7.62	7.45	7.21
			Low Tide	7.40	7.75	7.54	7.68	7.58	7.39
		Sep-24	High Tide	7.20	7.55	7.42	7.72	7.70	7.81
			Low Tide	7.55	7.81	7.88	7.75	7.92	7.85
4	Turbidity (N.T.U.)	Apr-24	High Tide	BDL	BDL	BDL	BDL	BDL	BDL
			Low Tide	BDL	BDL	BDL	BDL	BDL	BDL
		May-24	High Tide	BDL	BDL	BDL	BDL	BDL	BDL
			Low Tide	BDL	BDL	BDL	BDL	BDL	BDL
		Jun-24	High Tide	1.2	1.0	1.2	BDL	2.1	0.3
			Low Tide	0.7	BDL	0.7	BDL	BDL	BDL
		Jul-24	High Tide	1.3	1.0	1.0	BDL	1.5	0.3
			Low Tide	0.6	BDL	0.5	BDL	BDL	BDL
		Aug-24	High Tide	0.6	1.0	1.0	BDL	1.0	0.2
			Low Tide	0.4	BDL	0.5	BDL	BDL	BDL

Sl. No.	Parameter /unit	Month/Tide		Near Kovalam Beach (M1)	Proposed Dredging Site (M2)	Port Basin (M3)	South of Break Water (M4)	Inner Approach Channel (M5)	Kovalam Beach (M6)
		Sep-24	High Tide	0.9	0.8	0.2	BDL	0.7	0.9
			Low Tide	0.7	0.6	0.3	BDL	BDL	0.6
5	Electrical Conductivity (at 25°C) (µmho/cm)	Apr-24	High Tide	52810	53480	52008	51890	53120	52660
			Low Tide	51225	52010	51505	51265	52110	51540
		May-24	High Tide	52400	53200	51800	51500	52900	52100
			Low Tide	51320	51900	51200	51250	52400	51105
		Jun-24	High Tide	51900	52900	52100	52400	53100	52800
			Low Tide	51200	51400	51400	51950	52850	52100
		Jul-24	High Tide	49900	50150	50400	50700	50750	50850
			Low Tide	49600	49850	50250	50400	50550	50300
		Aug-24	High Tide	51500	51690	51900	51900	51800	50250
			Low Tide	50950	51250	51500	51400	51400	50100
		Sep-24	High Tide	52900	52400	52750	52750	52100	52450
			Low Tide	52500	52150	52400	52480	51850	52200
6	Total Suspended Solids (mg/L)	Apr-24	High Tide	BDL	BDL	BDL	BDL	BDL	BDL
			Low Tide	BDL	BDL	BDL	BDL	BDL	BDL
		May-24	High Tide	BDL	BDL	BDL	BDL	BDL	BDL
			Low Tide	BDL	BDL	BDL	BDL	BDL	BDL
		Jun-24	High Tide	BDL	BDL	BDL	BDL	BDL	BDL
			Low Tide	BDL	BDL	BDL	BDL	BDL	BDL
		Jul-24	High Tide	BDL	BDL	BDL	BDL	BDL	BDL
			Low Tide	BDL	BDL	BDL	BDL	BDL	BDL
		Aug-24	High Tide	BDL	BDL	BDL	BDL	BDL	BDL
			Low Tide	BDL	BDL	BDL	BDL	BDL	BDL
		Sep-24	High Tide	BDL	BDL	BDL	BDL	BDL	BDL

Sl. No.	Parameter /unit	Month/Tide		Near Kovalam Beach (M1)	Proposed Dredging Site (M2)	Port Basin (M3)	South of Break Water (M4)	Inner Approach Channel (M5)	Kovalam Beach (M6)
			Low Tide	BDL	BDL	BDL	BDL	BDL	BDL
7	Total Dissolved Solids (mg/L)	Apr-24	High Tide	33798	34227	33285	33209	33996	33702
			Low Tide	32784	33286	32963	32810	33350	32986
		May-24	High Tide	33536	34050	33152	32960	33856	33344
			Low Tide	32845	33216	32768	32800	33536	32707
		Jun-24	High Tide	33216	33856	33344	33536	33984	33792
			Low Tide	32768	32896	32896	33248	33824	33344
		Jul-24	High Tide	31936	32096	32256	32448	32480	32544
			Low Tide	31744	31904	32160	32255	32352	32192
		Aug-24	High Tide	32960	33082	33216	33216	33152	32160
			Low Tide	32608	32800	32960	32896	32890	32065
		Sep-24	High Tide	33856	33536	33760	33760	33344	33568
			Low Tide	33600	33376	33536	33587	33184	33408
8	Dissolved Oxygen (mg/L)	Apr-24	High Tide	7.1	6.8	6.9	6.8	6.8	6.9
			Low Tide	7.1	7.0	7.1	7.0	7.2	7.1
		May-24	High Tide	6.9	6.9	6.8	6.9	6.9	7.1
			Low Tide	7.2	7.1	6.9	6.9	7.1	7.2
		Jun-24	High Tide	7.1	6.8	6.9	6.8	7.1	6.8
			Low Tide	7.1	6.9	7.1	7.0	7.2	6.9
		Jul-24	High Tide	6.9	6.9	6.8	7.0	6.9	7.0
			Low Tide	7.1	7.1	6.9	7.1	7.1	7.1
		Aug-24	High Tide	7.0	7.0	7.0	6.8	6.8	6.9
			Low Tide	7.2	7.1	7.1	6.9	6.9	7.2
		Sep-24	High Tide	6.8	6.8	6.9	7.0	6.9	6.8
			Low Tide	6.9	7.0	6.9	7.1	7.1	6.9

Sl. No.	Parameter /unit	Month/Tide		Near Kovalam Beach (M1)	Proposed Dredging Site (M2)	Port Basin (M3)	South of Break Water (M4)	Inner Approach Channel (M5)	Kovalam Beach (M6)
9	Biochemical Oxygen Demand (3 days, 27°C) (mg/L)	Apr-24	High Tide	BDL	BDL	BDL	BDL	BDL	BDL
			Low Tide	BDL	BDL	BDL	BDL	BDL	BDL
		May-24	High Tide	BDL	BDL	BDL	BDL	BDL	BDL
			Low Tide	BDL	BDL	BDL	BDL	BDL	BDL
		Jun-24	High Tide	BDL	BDL	BDL	BDL	BDL	BDL
			Low Tide	BDL	BDL	BDL	BDL	BDL	BDL
		Jul-24	High Tide	BDL	BDL	BDL	BDL	BDL	BDL
			Low Tide	BDL	BDL	BDL	BDL	BDL	BDL
		Aug-24	High Tide	BDL	BDL	BDL	BDL	BDL	BDL
			Low Tide	BDL	BDL	BDL	BDL	BDL	BDL
		Sep-24	High Tide	BDL	BDL	BDL	BDL	BDL	BDL
			Low Tide	BDL	BDL	BDL	BDL	BDL	BDL
10	Floating Materials (Oil, Grease and Scum) (Including Petroleum Products) (mg/L)	Apr-24	High Tide	BDL	BDL	BDL	BDL	BDL	BDL
			Low Tide	BDL	BDL	BDL	BDL	BDL	BDL
		May-24	High Tide	BDL	BDL	BDL	BDL	BDL	BDL
			Low Tide	BDL	BDL	BDL	BDL	BDL	BDL
		Jun-24	High Tide	BDL	BDL	BDL	BDL	BDL	BDL
			Low Tide	BDL	BDL	BDL	BDL	BDL	BDL
		Jul-24	High Tide	BDL	BDL	BDL	BDL	BDL	BDL
			Low Tide	BDL	BDL	BDL	BDL	BDL	BDL
		Aug-24	High Tide	BDL	BDL	BDL	BDL	BDL	BDL
			Low Tide	BDL	BDL	BDL	BDL	BDL	BDL
		Sep-24	High Tide	BDL	BDL	BDL	BDL	BDL	BDL
			Low Tide	BDL	BDL	BDL	BDL	BDL	BDL
11	Nitrite (as	Apr-24	High Tide	0.025	0.028	0.026	0.022	BDL	0.025

Sl. No.	Parameter /unit	Month/Tide		Near Kovalam Beach (M1)	Proposed Dredging Site (M2)	Port Basin (M3)	South of Break Water (M4)	Inner Approach Channel (M5)	Kovalam Beach (M6)
	NO_2) (mg/L)		Low Tide	0.036	0.037	0.038	0.031	BDL	0.036
		May-24	High Tide	0.028	0.027	0.024	0.027	BDL	0.024
			Low Tide	0.035	0.034	0.035	0.036	BDL	0.032
		Jun-24	High Tide	0.025	0.022	0.029	0.024	BDL	0.029
			Low Tide	0.033	0.038	0.034	0.039	BDL	0.032
		Jul-24	High Tide	0.022	0.026	0.024	0.029	BDL	0.022
			Low Tide	0.036	0.039	0.033	0.036	BDL	0.035
		Aug-24	High Tide	0.026	0.028	0.026	0.024	BDL	0.025
			Low Tide	0.040	0.042	0.034	0.032	BDL	0.036
		Sep-24	High Tide	0.029	0.034	0.025	0.032	BDL	0.022
			Low Tide	0.038	0.048	0.034	0.045	BDL	0.042
12	Nitrate (as NO_3) (mg/L)	Apr-24	High Tide	BDL	BDL	BDL	BDL	BDL	BDL
			Low Tide	BDL	BDL	BDL	BDL	BDL	BDL
		May-24	High Tide	BDL	BDL	BDL	BDL	BDL	BDL
			Low Tide	BDL	BDL	BDL	BDL	BDL	BDL
		Jun-24	High Tide	BDL	BDL	BDL	BDL	BDL	BDL
			Low Tide	BDL	BDL	BDL	BDL	BDL	BDL
		Jul-24	High Tide	BDL	BDL	BDL	BDL	BDL	BDL
			Low Tide	BDL	BDL	BDL	BDL	BDL	BDL
		Aug-24	High Tide	BDL	BDL	BDL	BDL	BDL	BDL
			Low Tide	BDL	BDL	BDL	BDL	BDL	BDL
		Sep-24	High Tide	BDL	BDL	BDL	BDL	BDL	BDL
			Low Tide	BDL	BDL	BDL	BDL	BDL	BDL
13	Phenolic Compounds	Apr-24	High Tide	BDL	BDL	BDL	BDL	BDL	BDL
			Low Tide	BDL	BDL	BDL	BDL	BDL	BDL

Sl. No.	Parameter /unit	Month/Tide		Near Kovalam Beach (M1)	Proposed Dredging Site (M2)	Port Basin (M3)	South of Break Water (M4)	Inner Approach Channel (M5)	Kovalam Beach (M6)
	(as C_6H_5OH) (mg/L)	May-24	High Tide	BDL	BDL	BDL	BDL	BDL	BDL
			Low Tide	BDL	BDL	BDL	BDL	BDL	BDL
		Jun-24	High Tide	BDL	BDL	BDL	BDL	BDL	BDL
			Low Tide	BDL	BDL	BDL	BDL	BDL	BDL
		Jul-24	High Tide	BDL	BDL	BDL	BDL	BDL	BDL
			Low Tide	BDL	BDL	BDL	BDL	BDL	BDL
		Aug-24	High Tide	BDL	BDL	BDL	BDL	BDL	BDL
			Low Tide	BDL	BDL	BDL	BDL	BDL	BDL
		Sep-24	High Tide	BDL	BDL	BDL	BDL	BDL	BDL
			Low Tide	BDL	BDL	BDL	BDL	BDL	BDL
14	Ammonical Nitrogen (as NH_3-N) (mg/L)	Apr-24	High Tide	BDL	BDL	BDL	BDL	BDL	BDL
			Low Tide	BDL	BDL	BDL	BDL	BDL	BDL
		May-24	High Tide	BDL	BDL	BDL	BDL	BDL	BDL
			Low Tide	BDL	BDL	BDL	BDL	BDL	BDL
		Jun-24	High Tide	BDL	BDL	BDL	BDL	BDL	BDL
			Low Tide	BDL	BDL	BDL	BDL	BDL	BDL
		Jul-24	High Tide	BDL	BDL	BDL	BDL	BDL	BDL
			Low Tide	BDL	BDL	BDL	BDL	BDL	BDL
		Aug-24	High Tide	BDL	BDL	BDL	BDL	BDL	BDL
			Low Tide	BDL	BDL	BDL	BDL	BDL	BDL
		Sep-24	High Tide	BDL	BDL	BDL	BDL	BDL	BDL
			Low Tide	BDL	BDL	BDL	BDL	BDL	BDL
15	Total Nitrogen (as N)	Apr-24	High Tide	BDL	BDL	BDL	BDL	BDL	BDL
			Low Tide	BDL	BDL	BDL	BDL	BDL	BDL
		May-24	High Tide	BDL	BDL	BDL	BDL	BDL	BDL

Sl. No.	Parameter /unit	Month/Tide		Near Kovalam Beach (M1)	Proposed Dredging Site (M2)	Port Basin (M3)	South of Break Water (M4)	Inner Approach Channel (M5)	Kovalam Beach (M6)
	(mg/L)		Low Tide	BDL	BDL	BDL	BDL	BDL	BDL
		Jun-24	High Tide	BDL	BDL	BDL	BDL	BDL	BDL
			Low Tide	BDL	BDL	BDL	BDL	BDL	BDL
		Jul-24	High Tide	BDL	BDL	BDL	BDL	BDL	BDL
			Low Tide	BDL	BDL	BDL	BDL	BDL	BDL
		Aug-24	High Tide	BDL	BDL	BDL	BDL	BDL	BDL
			Low Tide	BDL	BDL	BDL	BDL	BDL	BDL
		Sep-24	High Tide	BDL	BDL	BDL	BDL	BDL	BDL
			Low Tide	BDL	BDL	BDL	BDL	BDL	BDL
16	Total Phosphorous (as P) (mg/L)	Apr-24	High Tide	BDL	BDL	BDL	BDL	BDL	BDL
			Low Tide	BDL	BDL	BDL	BDL	BDL	BDL
		May-24	High Tide	BDL	BDL	BDL	BDL	BDL	BDL
			Low Tide	BDL	BDL	BDL	BDL	BDL	BDL
		Jun-24	High Tide	BDL	BDL	BDL	BDL	BDL	BDL
			Low Tide	BDL	BDL	BDL	BDL	BDL	BDL
		Jul-24	High Tide	BDL	BDL	BDL	BDL	BDL	BDL
			Low Tide	BDL	BDL	BDL	BDL	BDL	BDL
		Aug-24	High Tide	BDL	BDL	BDL	BDL	BDL	BDL
			Low Tide	BDL	BDL	BDL	BDL	BDL	BDL
		Sep-24	High Tide	BDL	BDL	BDL	BDL	BDL	BDL
			Low Tide	BDL	BDL	BDL	BDL	BDL	BDL
17	Reactive Phosphorous (mg/L)	Apr-24	High Tide	BDL	BDL	BDL	BDL	BDL	BDL
			Low Tide	BDL	BDL	BDL	BDL	BDL	BDL
		May-24	High Tide	BDL	BDL	BDL	BDL	BDL	BDL
			Low Tide	BDL	BDL	BDL	BDL	BDL	BDL

Sl. No.	Parameter /unit	Month/Tide		Near Kovalam Beach (M1)	Proposed Dredging Site (M2)	Port Basin (M3)	South of Break Water (M4)	Inner Approach Channel (M5)	Kovalam Beach (M6)
		Jun-24	High Tide	BDL	BDL	BDL	BDL	BDL	BDL
			Low Tide	BDL	BDL	BDL	BDL	BDL	BDL
		Jul-24	High Tide	BDL	BDL	BDL	BDL	BDL	BDL
			Low Tide	BDL	BDL	BDL	BDL	BDL	BDL
		Aug-24	High Tide	BDL	BDL	BDL	BDL	BDL	BDL
			Low Tide	BDL	BDL	BDL	BDL	BDL	BDL
		Sep-24	High Tide	BDL	BDL	BDL	BDL	BDL	BDL
			Low Tide	BDL	BDL	BDL	BDL	BDL	BDL
18	Polycyclic Aromatic Hydrocarbon (mg/L)	Apr-24	High Tide	BDL	BDL	BDL	BDL	BDL	BDL
			Low Tide	BDL	BDL	BDL	BDL	BDL	BDL
		May-24	High Tide	BDL	BDL	BDL	BDL	BDL	BDL
			Low Tide	BDL	BDL	BDL	BDL	BDL	BDL
		Jun-24	High Tide	BDL	BDL	BDL	BDL	BDL	BDL
			Low Tide	BDL	BDL	BDL	BDL	BDL	BDL
		Jul-24	High Tide	BDL	BDL	BDL	BDL	BDL	BDL
			Low Tide	BDL	BDL	BDL	BDL	BDL	BDL
		Aug-24	High Tide	BDL	BDL	BDL	BDL	BDL	BDL
			Low Tide	BDL	BDL	BDL	BDL	BDL	BDL
		Sep-24	High Tide	BDL	BDL	BDL	BDL	BDL	BDL
			Low Tide	BDL	BDL	BDL	BDL	BDL	BDL
19	Salinity (ppt)	Apr-24	High Tide	34.311	34.802	33.725	33.639	34.538	34.201
			Low Tide	33.154	33.726	33.358	33.183	33.799	33.383
		May-24	High Tide	34.013	34.597	33.576	33.358	34.378	33.794
			Low Tide	33.227	33.649	33.140	33.176	34.013	33.071
		Jun-24	High Tide	33.646	34.377	33.792	34.011	34.523	34.303

Sl. No.	Parameter /unit	Month/Tide		Near Kovalam Beach (M1)	Proposed Dredging Site (M2)	Port Basin (M3)	South of Break Water (M4)	Inner Approach Channel (M5)	Kovalam Beach (M6)
			Low Tide	33.136	33.281	33.281	33.682	34.340	33.792
		Jul-24	High Tide	33.304	33.492	33.680	33.905	33.943	34.018
			Low Tide	33.079	33.266	33.567	33.680	33.793	33.604
		Aug-24	High Tide	34.434	34.577	34.736	34.736	34.660	33.495
			Low Tide	34.020	34.246	34.434	34.459	34.359	33.382
		Sep-24	High Tide	34.851	34.480	34.740	34.740	34.551	34.813
			Low Tide	34.554	34.295	34.480	34.540	34.364	34.626
20	Total Chlorophyll (mg/m^3)	Apr-24	High Tide	0.5	0.5	0.4	0.5	0.4	0.5
			Low Tide	0.7	0.6	0.6	0.7	0.5	0.6
		May-24	High Tide	0.4	0.4	0.5	0.4	0.5	0.05
			Low Tide	0.5	0.5	0.7	0.5	0.6	0.6
		Jun-24	High Tide	0.5	0.5	0.4	0.5	0.4	0.4
			Low Tide	0.6	0.6	0.5	0.7	0.6	0.5
		Jul-24	High Tide	0.4	0.4	0.5	0.4	0.4	0.5
			Low Tide	0.5	0.6	0.6	0.5	0.5	0.6
		Aug-24	High Tide	0.5	0.5	0.4	0.5	0.5	0.4
			Low Tide	0.7	0.6	0.7	0.6	0.6	0.5
		Sep-24	High Tide	0.4	0.4	0.5	0.4	0.4	0.6
			Low Tide	0.5	0.6	0.6	0.5	0.7	0.7
21	Total Coliforms (MPN Index/100 mL)	Apr-24	High Tide	BDL	BDL	BDL	BDL	BDL	BDL
			Low Tide	BDL	BDL	BDL	BDL	BDL	BDL
		May-24	High Tide	BDL	BDL	BDL	BDL	BDL	BDL
			Low Tide	BDL	BDL	BDL	BDL	BDL	BDL
		Jun-24	High Tide	BDL	BDL	BDL	BDL	BDL	BDL
			Low Tide	BDL	BDL	BDL	BDL	BDL	BDL

Sl. No.	Parameter /unit	Month/Tide		Near Kovalam Beach (M1)	Proposed Dredging Site (M2)	Port Basin (M3)	South of Break Water (M4)	Inner Approach Channel (M5)	Kovalam Beach (M6)
		Jul-24	High Tide	BDL	BDL	BDL	BDL	BDL	BDL
			Low Tide	BDL	BDL	BDL	BDL	BDL	BDL
		Aug-24	High Tide	BDL	BDL	BDL	BDL	BDL	BDL
			Low Tide	BDL	BDL	BDL	BDL	BDL	BDL
		Sep-24	High Tide	BDL	BDL	BDL	BDL	BDL	BDL
			Low Tide	BDL	BDL	BDL	BDL	BDL	BDL
22	Faecal Coliforms (MPN Index/100 mL)	Apr-24	High Tide	BDL	BDL	BDL	BDL	BDL	BDL
			Low Tide	BDL	BDL	BDL	BDL	BDL	BDL
		May-24	High Tide	BDL	BDL	BDL	BDL	BDL	BDL
			Low Tide	BDL	BDL	BDL	BDL	BDL	BDL
		Jun-24	High Tide	BDL	BDL	BDL	BDL	BDL	BDL
			Low Tide	BDL	BDL	BDL	BDL	BDL	BDL
		Jul-24	High Tide	BDL	BDL	BDL	BDL	BDL	BDL
			Low Tide	BDL	BDL	BDL	BDL	BDL	BDL
		Aug-24	High Tide	BDL	BDL	BDL	BDL	BDL	BDL
			Low Tide	BDL	BDL	BDL	BDL	BDL	BDL
		Sep-24	High Tide	BDL	BDL	BDL	BDL	BDL	BDL
			Low Tide	BDL	BDL	BDL	BDL	BDL	BDL

HYR-5.5. Graphical representation of Results for marine water

Figure 5.2: Marine Water Analysis for Temperature

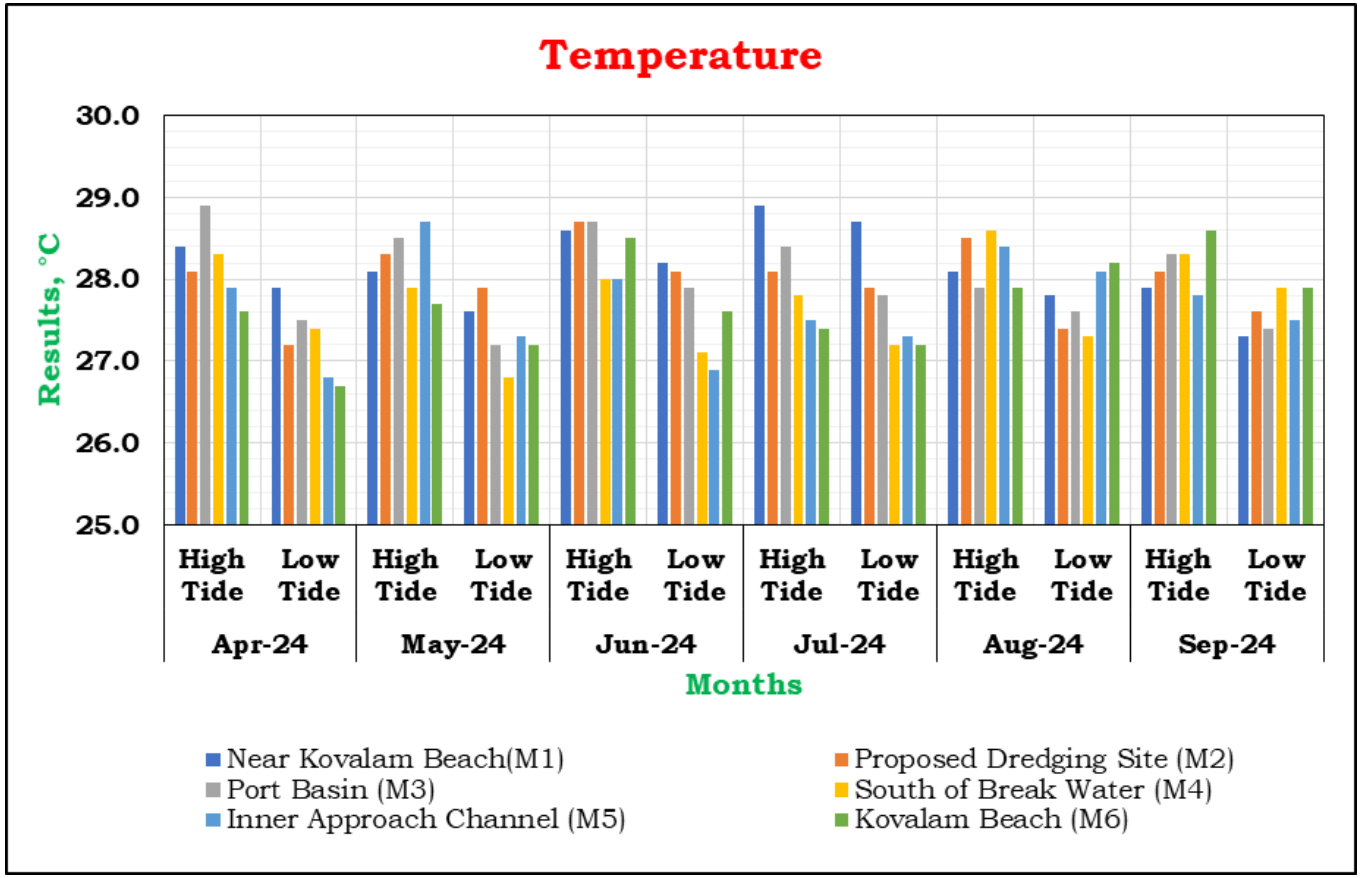


Figure 5.3: Marine Water Analysis for pH

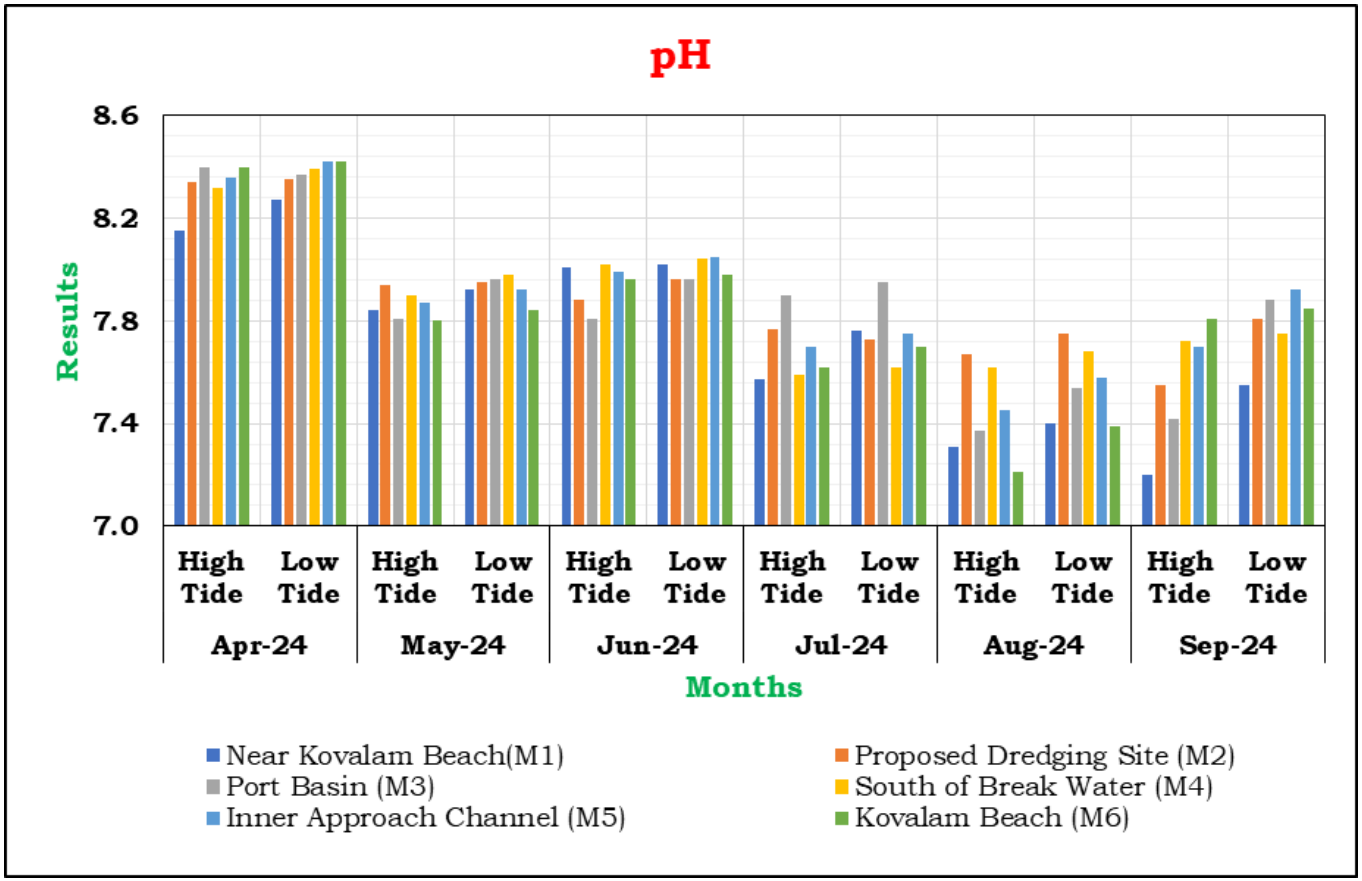


Figure 5.4: Marine Water Analysis for Electrical Conductivity

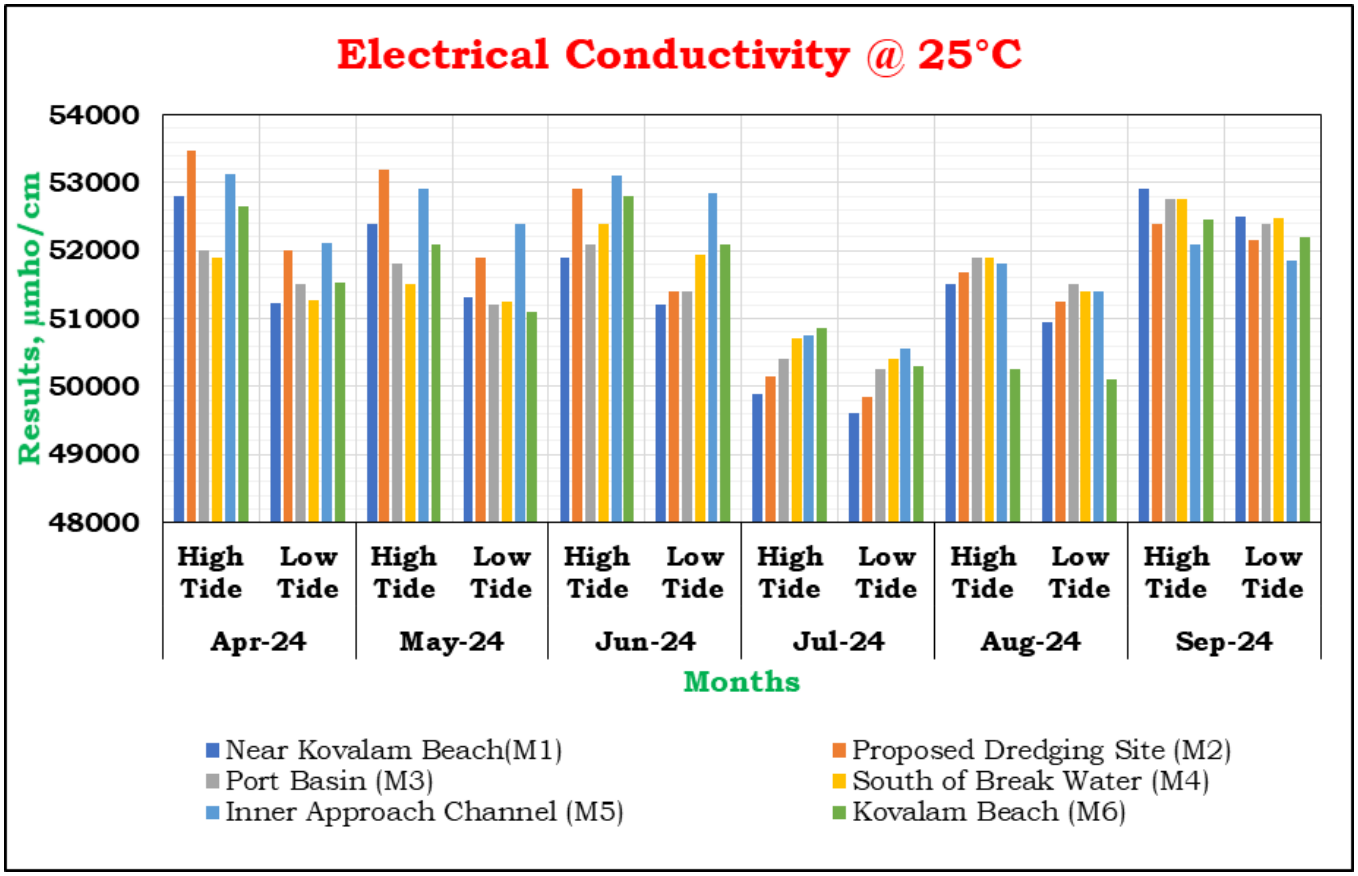


Figure 5.5: Marine Water Analysis for Turbidity

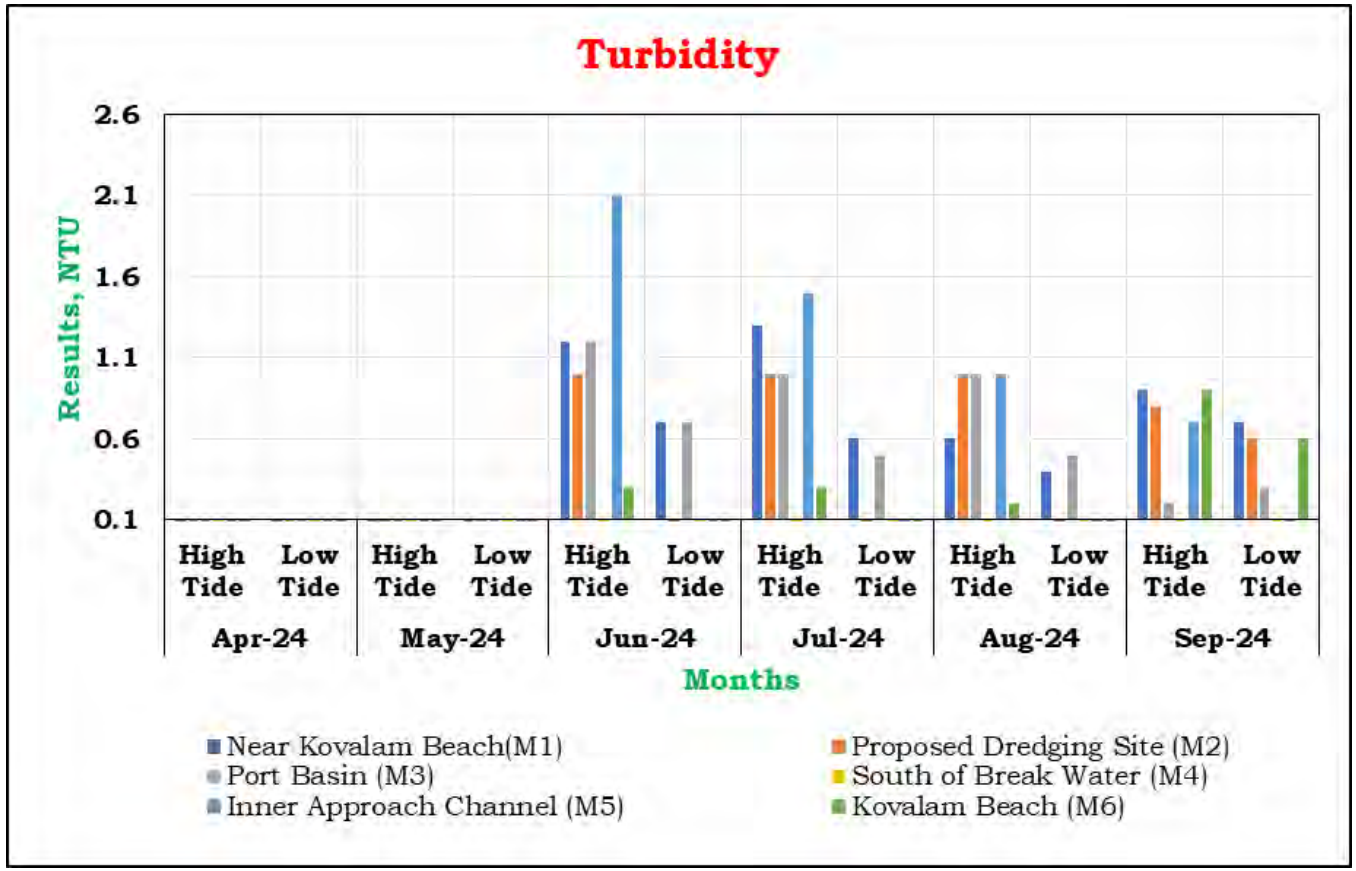


Figure 5.6: Marine Water Analysis for Total Dissolved Solids

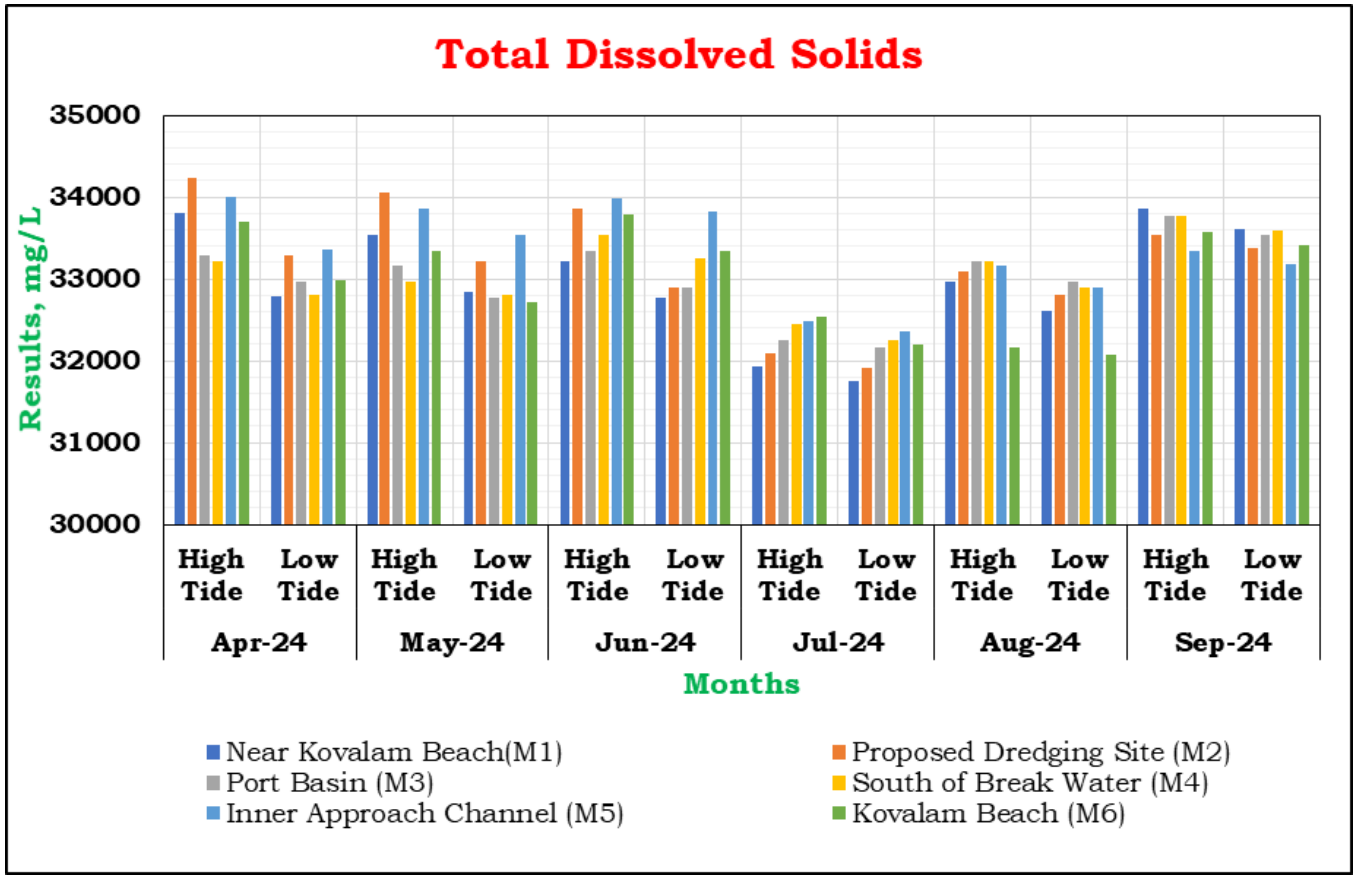


Figure 5.7: Marine Water Analysis for Dissolved Oxygen

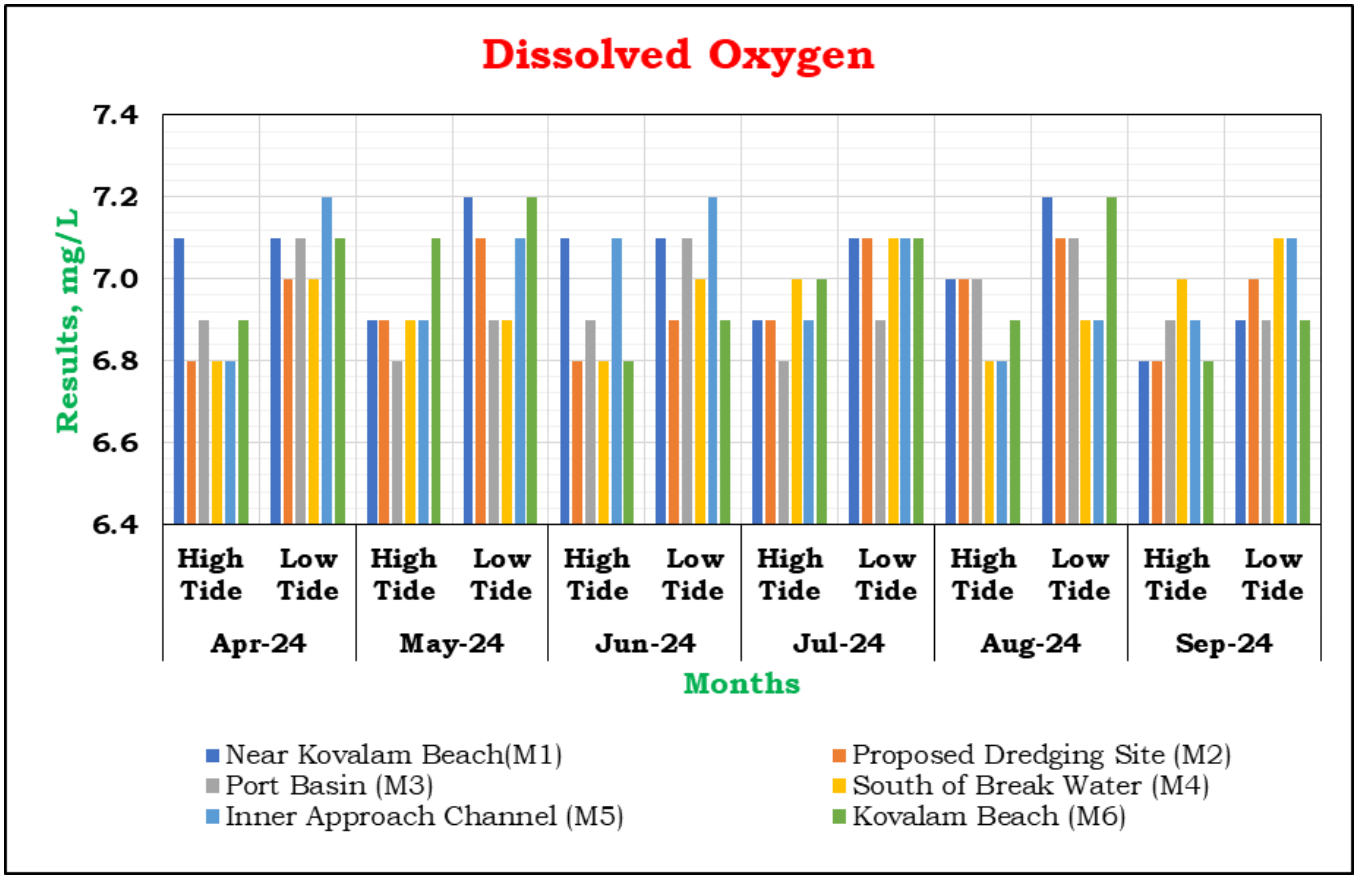


Figure 5.8: Marine Water Analysis for Nitrite as NO_2

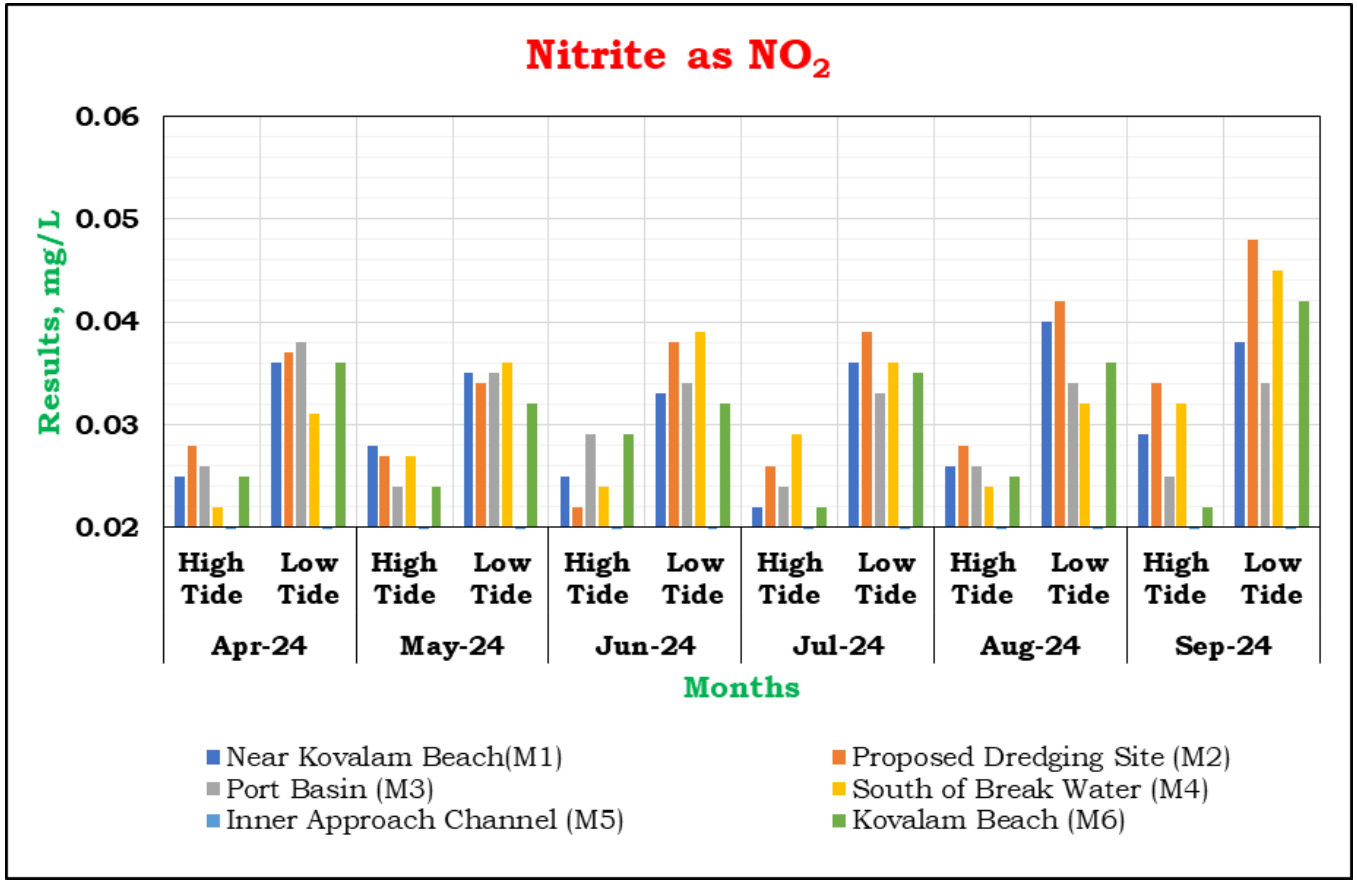


Figure 5.9: Marine Water Analysis for Salinity

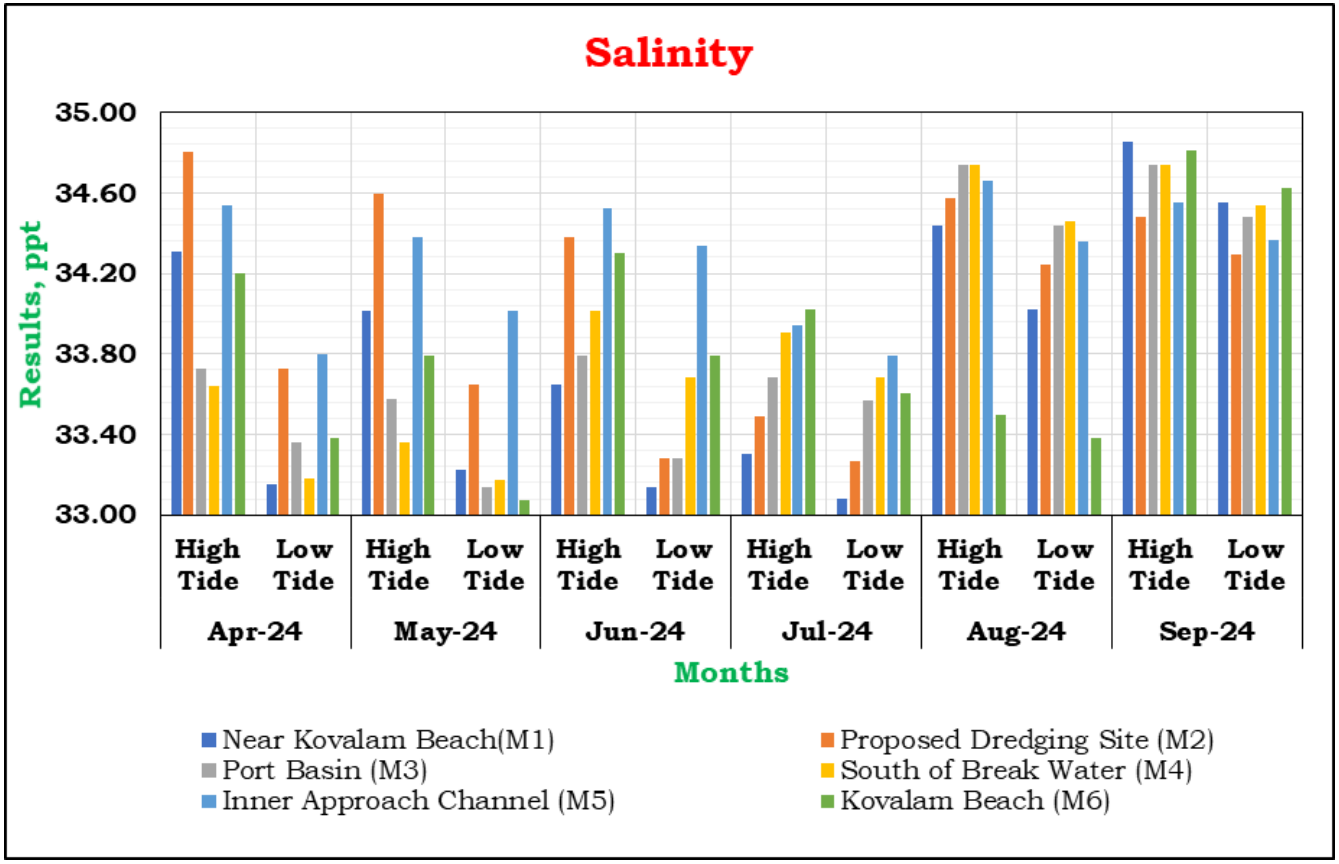
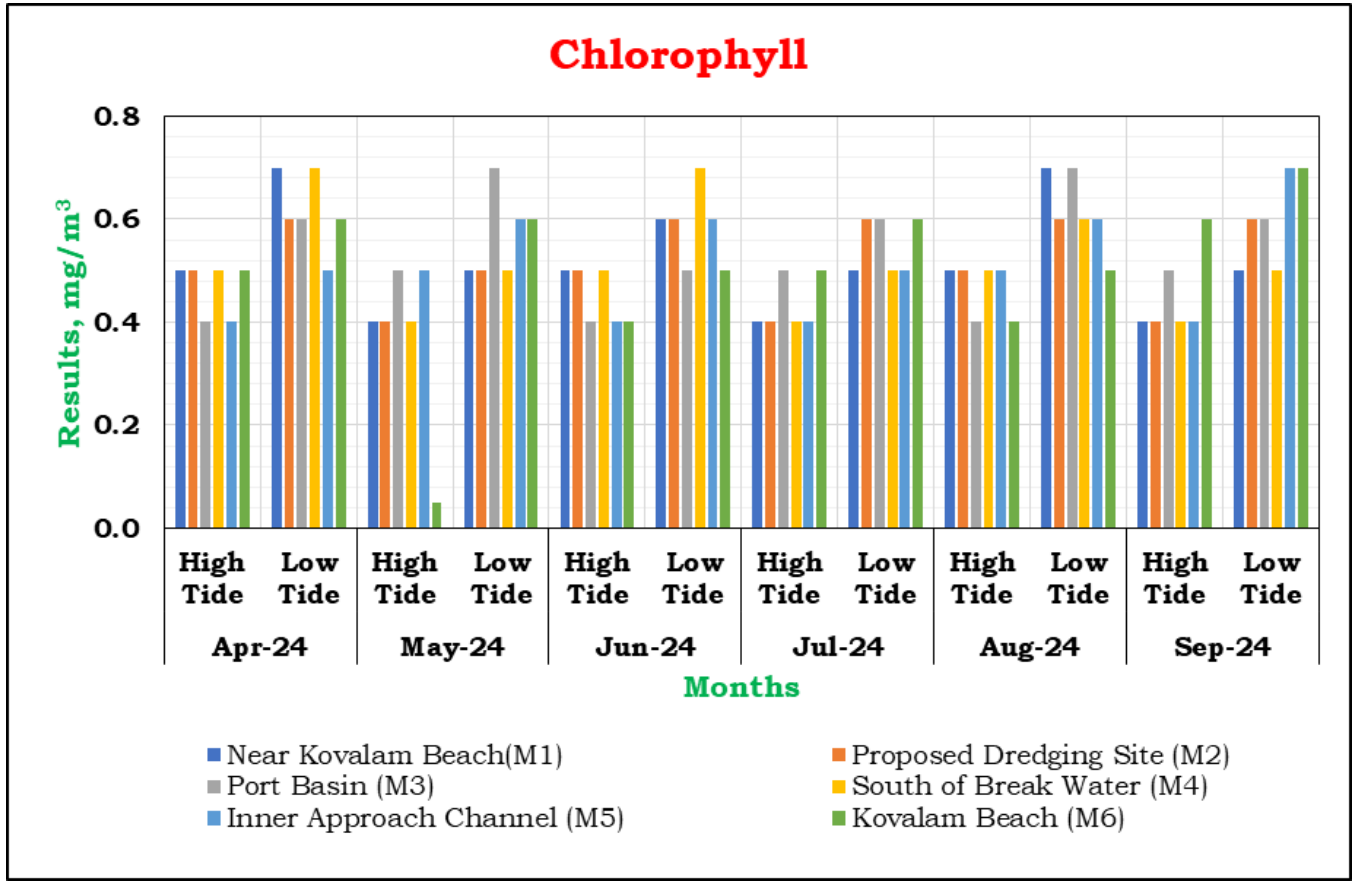


Figure 5.10: Marine Water Analysis for Chlorophyll



HYR-5.6. Summary - Marine water analysis:

During the months from April 2024 to September 2024, the following is the summary of the marine water analysis:

a) At the location **Near Kovalam Beach** (low tide & high tide),

- Temperature was observed in the range from 27.3 to 28.9 °C
- No visible colour was observed
- pH was observed in the range from 7.2 to 8.27
- Turbidity was observed in the range from 0.4 to 1.3 NTU
- Electrical Conductivity (at 25°C) was observed in the range from 49600 to 52900 µmho/cm
- Total Dissolved Solids were observed in the range from 31744 to 33856 mg/L
- Dissolved Oxygen was observed in the range from 6.8 to 7.2 mg/L
- Nitrite (as NO_2) was observed in the range from 0.022 to 0.04 mg/L
- Salinity was observed in the range from 33.079 to 34.851 ppt
- Total Chlorophyll was observed in the range from 0.4 to 0.7 mg/m^3
- Total Suspended Solids, Nitrate (as NO_3), Total Nitrogen (as N), Total Phosphorous (as P), Reactive Phosphorous, Biological Oxygen Demand, Floating materials, Phenolic Compounds (as C_6H_5OH), Ammonical Nitrogen (as NH_3-N), Polycyclic Aromatic Hydrocarbon, Total Coliforms and Faecal Coliforms were observed below the detection limits.

b) At the location **Proposed Dredging Site** (low tide & high tide),

- Temperature was observed in the range from 27.2 to 28.7°C
- No visible colour was observed
- pH was observed in the range from 7.55 to 8.35
- Turbidity was observed in the range from 0.6 to 1.0 NTU
- Electrical Conductivity (at 25°C) was observed in the range from 49850 to 53480 µmho/cm

- Total Dissolved Solids were observed in the range from 31904 to 34227 mg/L
- Dissolved Oxygen was observed in the range from 6.8 to 7.1 mg/L
- Nitrite (as NO_2) was observed in the range from 0.022 to 0.048 mg/L
- Salinity was observed in the range from 33.266 to 34.802 ppt
- Total Chlorophyll was observed in the range from 0.4 to 0.6 mg/m^3
- Total Suspended Solids, Nitrate (as NO_3), Total Nitrogen (as N), Total Phosphorous (as P), Reactive Phosphorous, Biological Oxygen Demand, Floating materials, Phenolic Compounds (as C_6H_5OH), Ammonical Nitrogen (as NH_3-N), Polycyclic Aromatic Hydrocarbon, Total Coliforms and Faecal Coliforms were observed below the detection limits.

c) At the location **Port basin** (low tide & high tide),

- Temperature was observed in the range from 27.2 to 28.9°C
- No visible colour was observed
- pH was observed in the range from 7.37 to 8.4
- Turbidity was observed in the range from 0.2 to 1.2 NTU
- Electrical Conductivity (at 25°C) was observed in the range from 50250 to 52750 µmho/cm
- Total Dissolved Solids were observed in the range from 32160 to 33760 mg/L
- Dissolved Oxygen was observed in the range from 6.8 to 7.1 mg/L
- Nitrite (as NO_2) was observed in the range from 0.024 to 0.038 mg/L
- Salinity was observed in the range from 33.14 to 34.74 ppt
- Total Chlorophyll was observed in the range from 0.4 to 0.7 mg/m^3
- Total Suspended Solids, Nitrate (as NO_3), Total Nitrogen (as N), Total Phosphorous (as P), Reactive Phosphorous, Biological Oxygen Demand, Floating materials, Phenolic Compounds (as C_6H_5OH), Ammonical Nitrogen (as NH_3-N), Polycyclic Aromatic Hydrocarbon, Total Coliforms and Faecal Coliforms were observed below the detection limits.

d) At the location **South of Break Water** (low tide & high tide),

- Temperature was observed in the range from 26.8 to 28.6°C
- No visible colour was observed
- pH was observed in the range from 7.59 to 8.39
- Electrical Conductivity (at 25°C) was observed in the range from 50400 to 52750 µmho/cm
- Total Dissolved Solids were observed in the range from 32255 to 33760 mg/L
- Dissolved Oxygen was observed in the range from 6.8 to 7.1 mg/L
- Nitrite (as NO_2) was observed in the range from 0.022 to 0.045 mg/L
- Salinity was observed in the range from 33.176 to 34.74 ppt
- Total Chlorophyll was observed in the range from 0.4 to 0.7 mg/m^3
- Turbidity, Total Suspended Solids, Nitrate (as NO_3), Total Nitrogen (as N), Total Phosphorous (as P), Reactive Phosphorous, Biological Oxygen Demand, Floating materials, Phenolic Compounds (as C_6H_5OH), Ammonical Nitrogen (as NH_3-N), Polycyclic Aromatic Hydrocarbon, Total Coliforms and Faecal Coliforms were observed below the detection limits.

e) At the location **Inner Approach Channel** (low tide & high tide),

- Temperature was observed in the range from 26.8 to 28.7°C
- No visible colour was observed
- pH was observed in the range from 7.45 to 8.42
- Turbidity was observed in the range from 0.7 to 2.1 NTU
- Electrical Conductivity (at 25°C) was observed in the range from 50550 to 53120 µmho/cm
- Total Dissolved Solids were observed in the range from 32352 to 33996 mg/L
- Dissolved Oxygen was observed in the range from 6.8 to 7.2 mg/L
- Salinity was observed in the range from 33.793 to 34.66 ppt
- Total Chlorophyll was observed in the range from 0.4 to 0.7 mg/m^3
- Total Suspended Solids, Nitrite (as NO_2), Nitrate (as NO_3), Total Nitrogen (as N), Total Phosphorous (as P), Reactive Phosphorous, Biological Oxygen Demand, Floating materials, Phenolic Compounds

(as C_6H_5OH), Ammonical Nitrogen (as NH_3-N), Polycyclic Aromatic Hydrocarbon, Total Coliforms and Faecal Coliforms were observed below the detection limits.

f) At the location **Kovalam Beach** (low tide & high tide),

- Temperature was observed in the range from 26.7 to 28.6°C
- No visible colour was observed
- pH was observed in the range from 7.21 to 8.42
- Turbidity was observed in the range from 0.2 to 0.9 NTU
- Electrical Conductivity (at 25°C) was observed in the range from 50100 to 52800 µmho/cm
- Total Dissolved Solids were observed in the range from 32065 to 33792 mg/L
- Dissolved Oxygen was observed in the range from 6.8 to 7.2 mg/L
- Nitrite (as NO_2) was observed in the range from 0.022 to 0.042 mg/L
- Salinity was observed in the range from 33.071 to 34.813 ppt
- Total Chlorophyll was observed in the range from 0.1 to 0.7 mg/m^3
- Total Suspended Solids, Nitrate (as NO_3), Total Nitrogen (as N), Total Phosphorous (as P), Reactive Phosphorous, Biological Oxygen Demand, Floating materials, Phenolic Compounds (as C_6H_5OH), Ammonical Nitrogen (as NH_3-N), Polycyclic Aromatic Hydrocarbon, Total Coliforms and Faecal Coliforms were observed below the detection limits.

g) Summary – Comparison of Results of **All Locations,**

- Maximum Temperature observed was 28.9 °C at Near Kovalam Beach
- No visible colour was observed in all locations
- Maximum pH observed was 8.42 at Inner Approach Channel and Kovalam Beach
- Maximum Turbidity observed was 2.1 NTU at Inner Approach Channel
- Maximum value of Electrical Conductivity (at 25°C) observed was 53480 µmho/cm at Proposed Dredging site
- Maximum value of Total Dissolved Solids observed was 34227 mg/L at Proposed Dredging site

- Maximum value of Dissolved Oxygen observed was 7.2 mg/L at Near Kovalam Beach, Inner Approach Channel and Kovalam Beach
- Maximum value of Nitrite (as NO_2) observed was 0.05 mg/L at Proposed Dredging Site and South of Break water
- Maximum value of Salinity observed was 34.851 ppt at Near Kovalam Beach
- Maximum Value of Total Chlorophyll observed was 0.7 mg/m^3 at Near Kovalam Beach, Port Basin, South of Break water, Inner Approach Channel and Kovalam Beach.
- Total Suspended Solids, Nitrate (as NO_3), Total Nitrogen (as N), Total Phosphorous (as P), Reactive Phosphorous, Biological Oxygen Demand, Floating materials, Phenolic Compounds (as C_6H_5OH), Ammonical Nitrogen (as NH_3-N), Polycyclic Aromatic Hydrocarbon, Total Coliforms and Faecal Coliforms were observed below the detection limits in all locations.

HYR-5.7. Maximum Values observed - Marine water analysis:

During the period from April 2024 to September 2024, the following is the maximum value observed.

Table 5.5: Maximum Values observed

Sl. No.	Parameter /unit	Near Kovalam Beach (M1)	Proposed Dredging Site (M2)	Port Basin (M3)	South of Break Water (M4)	Inner Approach Channel (M5)	Kovalam Beach (M6)
1	Temperature (°C)	28.9	28.7	28.9	28.6	28.7	28.6
2	Colour	1	1	1	1	1	1
3	pH Value	8.27	8.35	8.40	8.39	8.42	8.42
4	Turbidity (N.T.U.)	1.3	1	1.2	0	2.1	0.9
5	Electrical Conductivity (at 25°C) (µmho/cm)	52900	53480	52750	52750	53120	52800
6	Total Suspended Solids (mg/L)	BDL	BDL	BDL	BDL	BDL	BDL
7	Total Dissolved Solids (mg/L)	33856	34227	33760	33760	33996	33792
8	Dissolved Oxygen (mg/L)	7.2	7.1	7.1	7.1	7.2	7.2
9	Biochemical Oxygen Demand (3 days, 27°C) (mg/L)	BDL	BDL	BDL	BDL	BDL	BDL
10	Floating Materials (Oil, Grease and Scum) (Including Petroleum Products) (mg/L)	BDL	BDL	BDL	BDL	BDL	BDL
11	Nitrite (as NO_2) (mg/L)	0.04	0.05	0.04	0.05	0.00	0.04
12	Nitrate (as NO_3) (mg/L)	BDL	BDL	BDL	BDL	BDL	BDL

Sl. No.	Parameter /unit	Near Kovalam Beach (M1)	Proposed Dredging Site (M2)	Port Basin (M3)	South of Break Water (M4)	Inner Approach Channel (M5)	Kovalam Beach (M6)
13	Phenolic Compounds (as C_6H_5OH) (mg/L)	BDL	BDL	BDL	BDL	BDL	BDL
14	Ammonical Nitrogen (as NH_3-N) (mg/L)	BDL	BDL	BDL	BDL	BDL	BDL
15	Total Nitrogen (as N) (mg/L)	BDL	BDL	BDL	BDL	BDL	BDL
16	Total Phosphorous (as P) (mg/L)	BDL	BDL	BDL	BDL	BDL	BDL
17	Reactive Phosphorous (mg/L)	BDL	BDL	BDL	BDL	BDL	BDL
18	Polycyclic Aromatic Hydrocarbon (mg/L)	BDL	BDL	BDL	BDL	BDL	BDL
19	Salinity (ppt)	34.851	34.802	34.740	34.740	34.660	34.813
20	Total Chlorophyll (mg/m^3)	0.7	0.6	0.7	0.7	0.7	0.7
21	Total Coliforms (MPN Index/100 mL)	BDL	BDL	BDL	BDL	BDL	BDL
22	Faecal Coliforms (MPN Index/100 mL)	BDL	BDL	BDL	BDL	BDL	BDL

HYR-5.8. Sediment Analysis Results

Table 5.6: Sediment Analysis Results

Sl. No.	Parameter	Unit	Month	Near Kovalam Beach (MS1)	Proposed Dredging Site (MS2)	Port Basin (MS3)	South of Break Water (MS4)	Inner Approach Channel (MS5)	Kovalam Beach (MS6)
1	Texture	-	Apr-24	Sandy	Sandy	Sandy Loam	Sandy	Sandy	Sandy
			May-24	Sandy	Sandy	Sandy Loam	Sandy	Sandy	Sandy
			Jun-24	Sandy	Sandy	Sandy Loam	Sandy	Sandy	Sandy
			Jul-24	Sandy	Sandy	Sandy Loam	Sandy	Sandy	Sandy
			Aug-24	Sandy	Sandy	Sandy Loam	Sandy	Sandy	Sandy
			Sep-24	Sandy	Sandy	Sandy Loam	Sandy	Sandy	Sandy
2	Organic Matter	%	Apr-24	0.34	0.38	0.41	0.28	0.34	0.30
			May-24	0.42	0.32	0.38	0.36	0.39	0.32
			Jun-24	0.33	0.38	0.41	0.32	0.45	0.38
			Jul-24	0.38	0.28	0.37	0.36	0.45	0.29
			Aug-24	0.42	0.38	0.45	0.36	0.38	0.36
			Sep-24	0.35	0.42	0.39	0.40	0.35	0.32
3	Total Phosphorus (as P)	mg/kg	Apr-24	245	325	164	125	173	498
			May-24	210	363	185	135	192	524
			Jun-24	245	370	210	152	205	706
			Jul-24	210	325	185	126	245	542
			Aug-24	185	225	140	185	220	452
			Sep-24	220	280	190	165	280	548
4	Aluminium (as Al)	mg/kg	Apr-24	1026	1210	1290	1350	310	1520
			May-24	1050	1089	1036	1254	205	1868
			Jun-24	1125	1010	1163	1054	252	1458
			Jul-24	1080	956	1045	1152	1002	1263

Sl. No.	Parameter	Unit	Month	Near Kovalam Beach (MS1)	Proposed Dredging Site (MS2)	Port Basin (MS3)	South of Break Water (MS4)	Inner Approach Channel (MS5)	Kovalam Beach (MS6)
			Aug-24	1125	1020	1436	1256	1965	1052
			Sep-24	1265	1036	1356	1185	1798	1140
5	Chromium (as Cr)	mg/kg	Apr-24	BDL	BDL	BDL	BDL	BDL	BDL
			May-24	BDL	BDL	BDL	BDL	BDL	BDL
			Jun-24	BDL	BDL	BDL	BDL	BDL	BDL
			Jul-24	BDL	BDL	BDL	BDL	BDL	BDL
			Aug-24	BDL	BDL	BDL	BDL	BDL	BDL
			Sep-24	BDL	BDL	BDL	BDL	BDL	BDL
6	Copper (as Cu)	mg/kg	Apr-24	BDL	BDL	BDL	BDL	BDL	BDL
			May-24	BDL	BDL	BDL	BDL	BDL	BDL
			Jun-24	BDL	BDL	BDL	BDL	BDL	BDL
			Jul-24	BDL	BDL	BDL	BDL	BDL	BDL
			Aug-24	BDL	BDL	BDL	BDL	BDL	BDL
			Sep-24	BDL	BDL	BDL	BDL	BDL	BDL
7	Iron (as Fe)	mg/kg	Apr-24	4125	1865	5296	1998	1240	756
			May-24	5016	1562	5022	2015	1089	840
			Jun-24	4625	1830	5218	2059	1110	745
			Jul-24	3560	1568	3569	1856	1010	596
			Aug-24	3125	1460	3265	1465	925	452
			Sep-24	3346	1652	3562	1652	1020	510
8	Lead (as Pb)	mg/kg	Apr-24	BDL	BDL	BDL	BDL	BDL	BDL
			May-24	BDL	BDL	BDL	BDL	BDL	BDL
			Jun-24	BDL	BDL	BDL	BDL	BDL	BDL
			Jul-24	BDL	BDL	BDL	BDL	BDL	BDL
			Aug-24	BDL	BDL	BDL	BDL	BDL	BDL

Sl. No.	Parameter	Unit	Month	Near Kovalam Beach (MS1)	Proposed Dredging Site (MS2)	Port Basin (MS3)	South of Break Water (MS4)	Inner Approach Channel (MS5)	Kovalam Beach (MS6)
			Sep-24	BDL	BDL	BDL	BDL	BDL	BDL
9	Manganese (as Mn)	mg/kg	Apr-24	1.96	2.52	2.46	1.88	1.10	1.32
			May-24	2.11	1.88	2.10	1.96	1.63	1.89
			Jun-24	2.36	2.15	2.50	2.10	1.10	1.45
			Jul-24	2.11	1.85	1.90	1.75	1.20	1.35
			Aug-24	2.25	2.11	2.09	2.13	1.45	1.63
			Sep-24	2.63	2.45	2.36	2.45	1.92	1.88
10	Mercury (as Hg)	mg/kg	Apr-24	BDL	BDL	BDL	BDL	BDL	BDL
			May-24	BDL	BDL	BDL	BDL	BDL	BDL
			Jun-24	BDL	BDL	BDL	BDL	BDL	BDL
			Jul-24	BDL	BDL	BDL	BDL	BDL	BDL
			Aug-24	BDL	BDL	BDL	BDL	BDL	BDL
			Sep-24	BDL	BDL	BDL	BDL	BDL	BDL
11	Zinc (as Zn)	mg/kg	Apr-24	1.08	1.60	1.44	1.83	1.47	1.98
			May-24	1.45	2.10	1.26	2.06	1.88	2.55
			Jun-24	1.10	1.85	1.63	1.56	1.74	1.96
			Jul-24	1.05	1.20	1.26	1.12	1.45	1.55
			Aug-24	1.12	1.32	1.55	1.25	1.65	1.85
			Sep-24	1.43	1.60	1.85	1.78	1.66	1.60
12	Nickel (as Ni)	mg/kg	Apr-24	BDL	BDL	BDL	BDL	BDL	BDL
			May-24	BDL	BDL	BDL	BDL	BDL	BDL
			Jun-24	BDL	BDL	BDL	BDL	BDL	BDL
			Jul-24	BDL	BDL	BDL	BDL	BDL	BDL
			Aug-24	BDL	BDL	BDL	BDL	BDL	BDL
			Sep-24	BDL	BDL	BDL	BDL	BDL	BDL

Sl. No.	Parameter	Unit	Month	Near Kovalam Beach (MS1)	Proposed Dredging Site (MS2)	Port Basin (MS3)	South of Break Water (MS4)	Inner Approach Channel (MS5)	Kovalam Beach (MS6)
Benthic Organism									
13	Micro Benthic Organism	No./m^2	Apr-24	64878	61591	59108	59619	61245	63587
			May-24	67845	64127	61987	62789	63214	66482
			Jun-24	65215	66126	59289	62897	61968	65867
			Jul-24	66034	67398	61321	64978	62759	67214
			Aug-24	65127	66021	60378	63789	61237	66258
			Sep-24	63896	65123	58279	61578	59768	64298
14	Macro Benthic Organism	No./m^2	Apr-24	61985	58634	51986	55106	55987	59875
			May-24	64054	60582	56781	57895	59874	62547
			Jun-24	62286	61479	58971	59874	60248	64248
			Jul-24	62789	62089	59124	60198	61467	65217
			Aug-24	60973	61278	58934	59345	59241	64987
			Sep-24	59378	60425	56128	58975	58024	62987
15	Total Benthos	No./m^2	Apr-24	126863	120225	111094	114725	117232	123462
			May-24	131899	124709	118768	120684	123088	129029
			Jun-24	127501	127605	118260	122771	122216	130115
			Jul-24	128823	129487	120445	125176	124226	132431
			Aug-24	126100	127299	119312	123134	120478	131245
			Sep-24	123274	125548	114407	120553	117792	127285

HYR-5.9. Graphical representation of Results for Sediment analysis

Figure 5.10: Sediment Analysis for Organic Matter

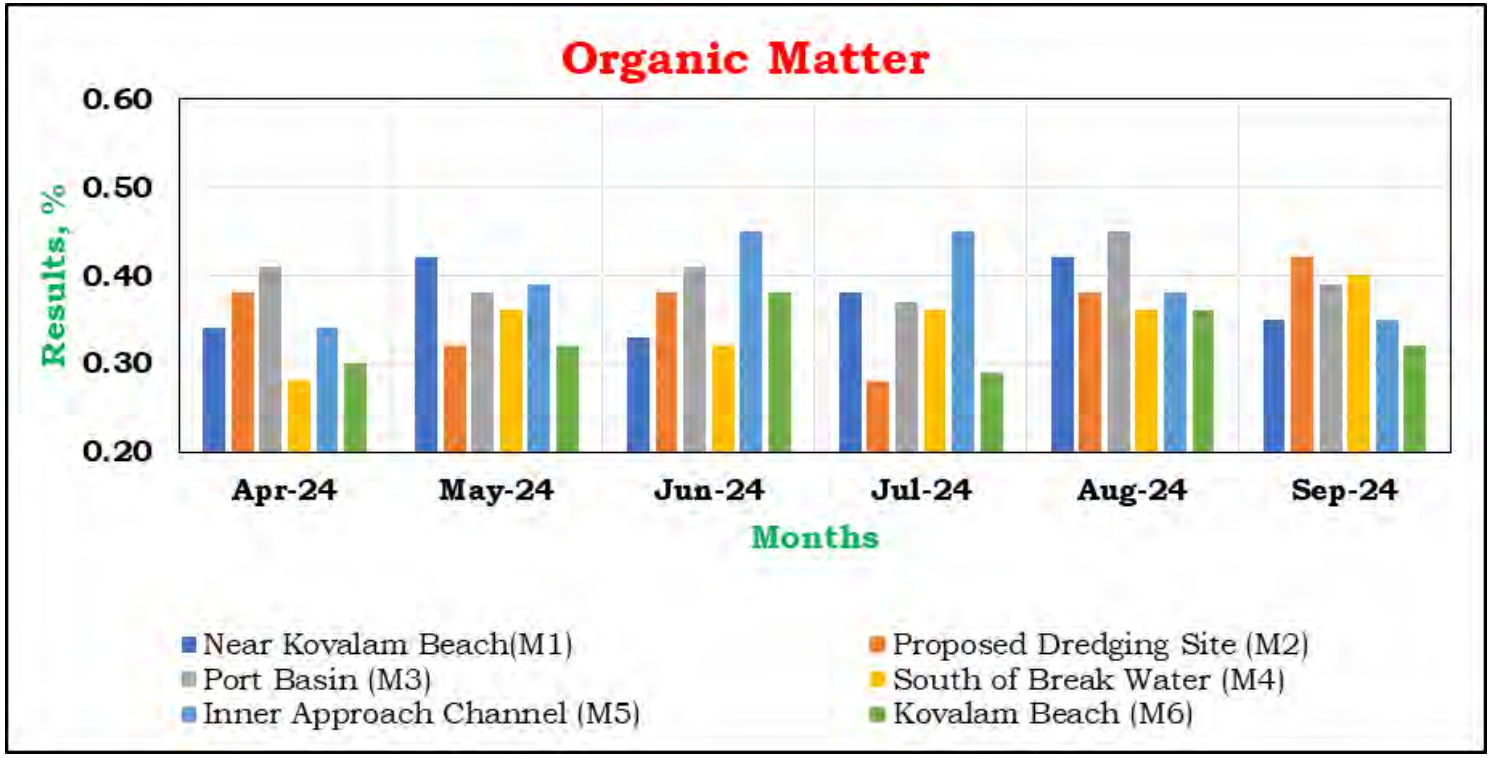


Figure 5.11: Sediment Analysis for Total Phosphorous as P

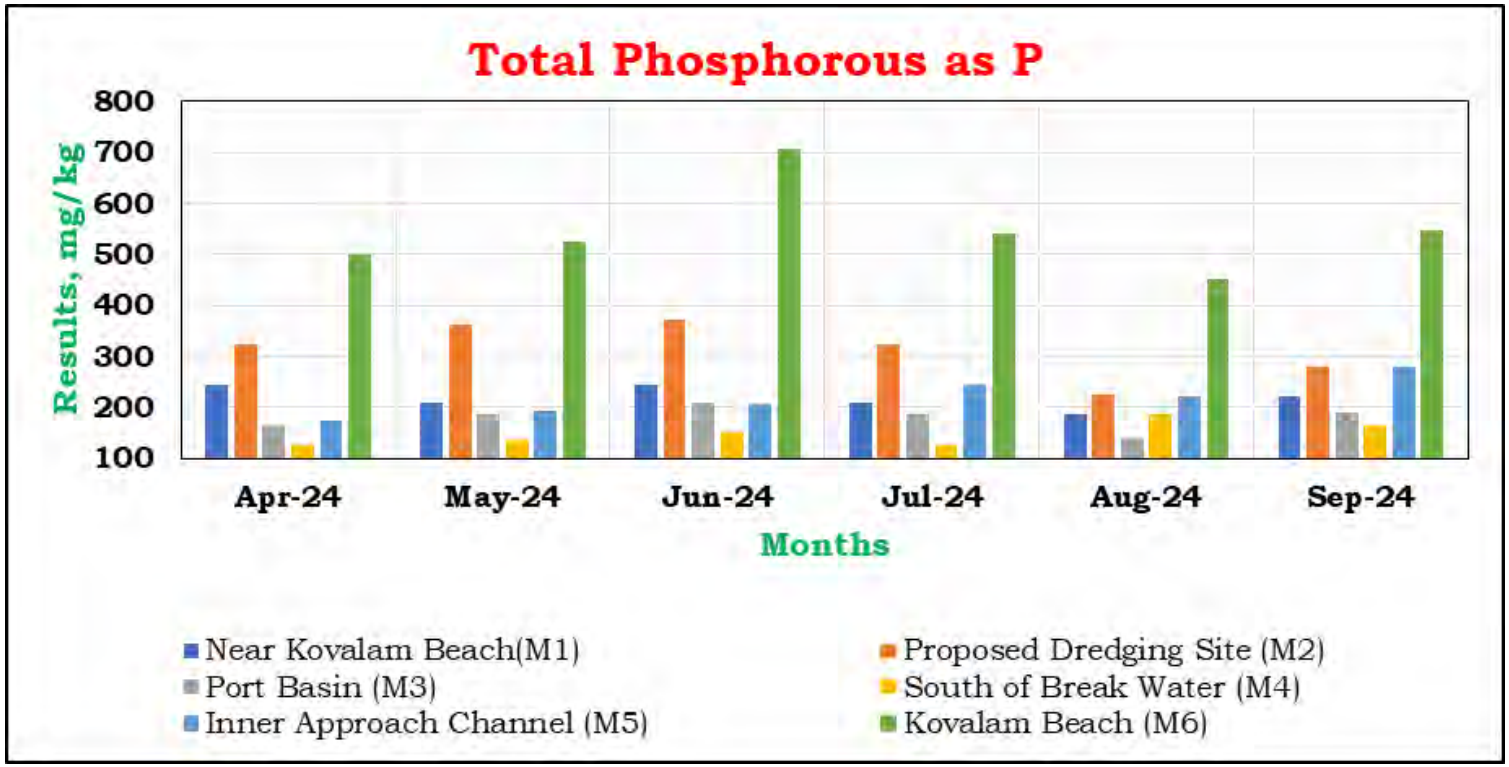


Figure 5.12: Sediment Analysis for Aluminium as Al

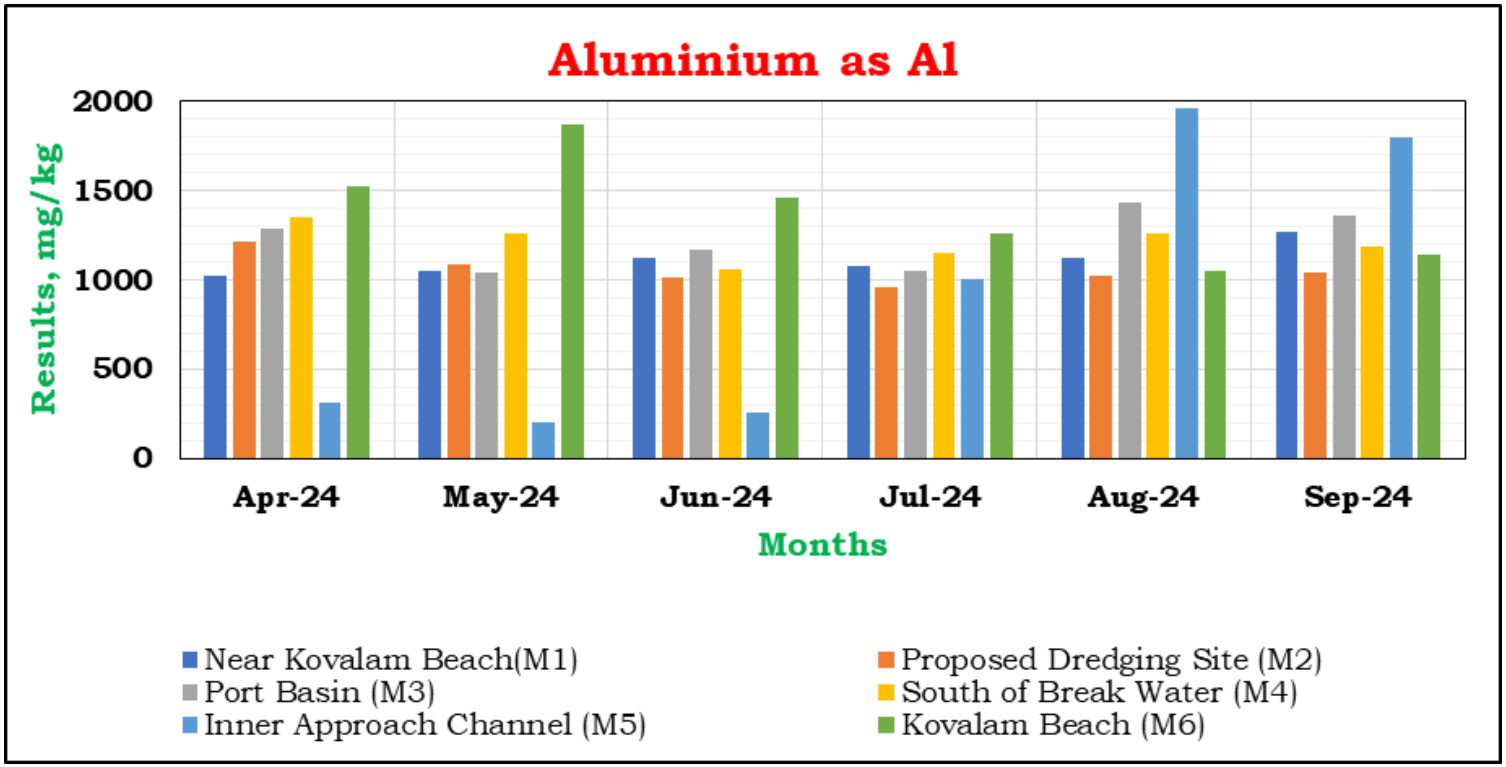


Figure 5.13: Sediment Analysis for Iron as Fe

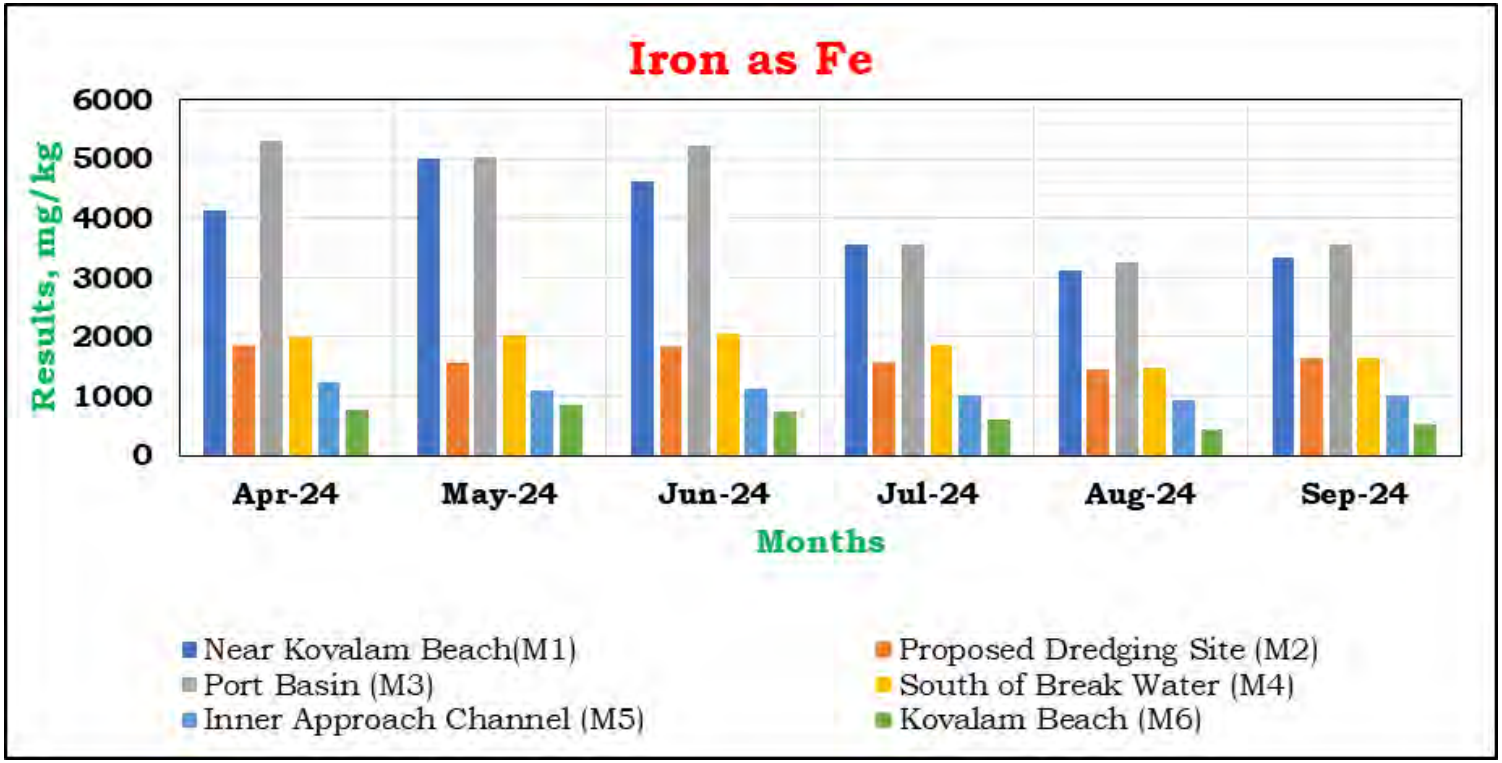


Figure 5.14: Sediment Analysis for Manganese as Mn

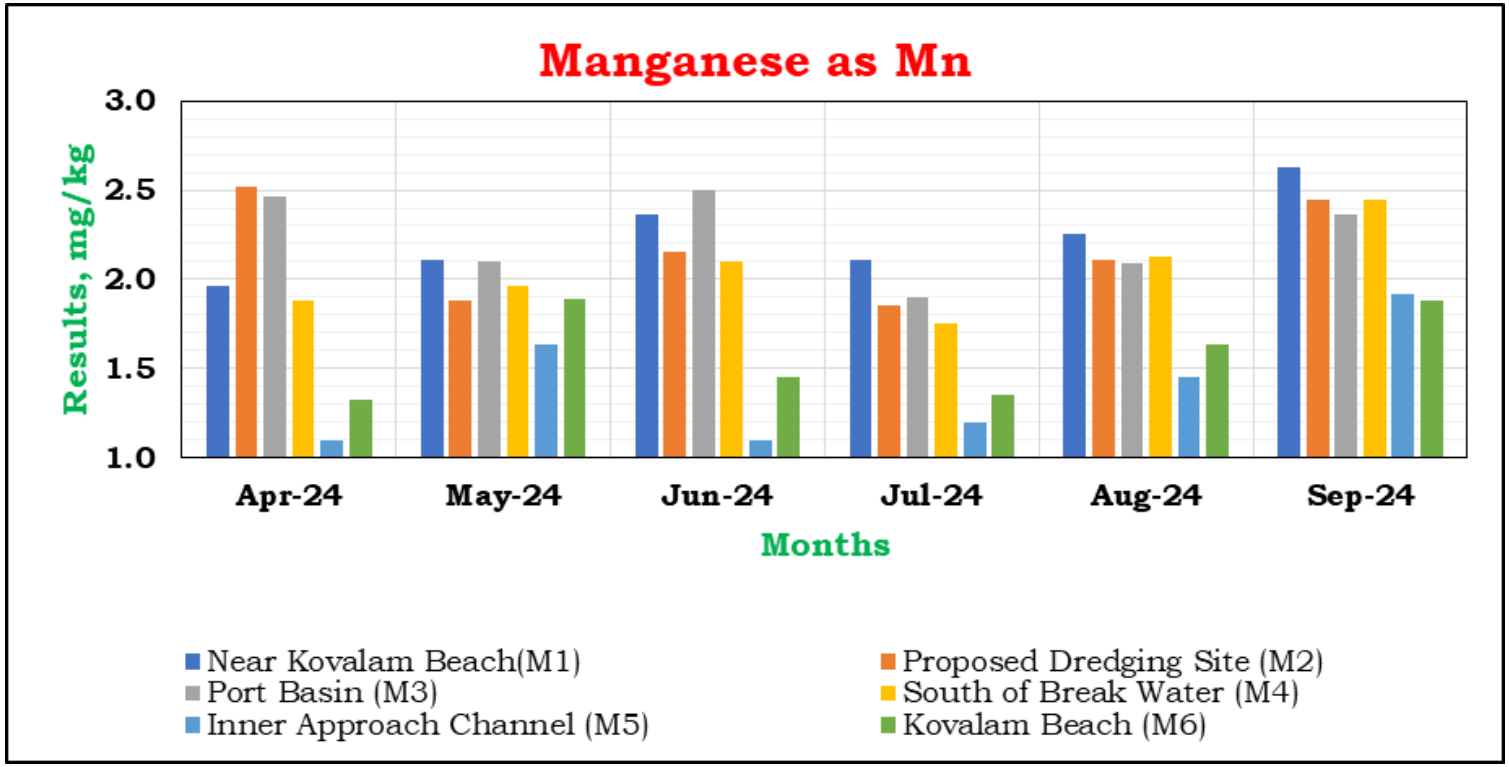


Figure 5.15: Sediment Analysis for Zinc as Zn

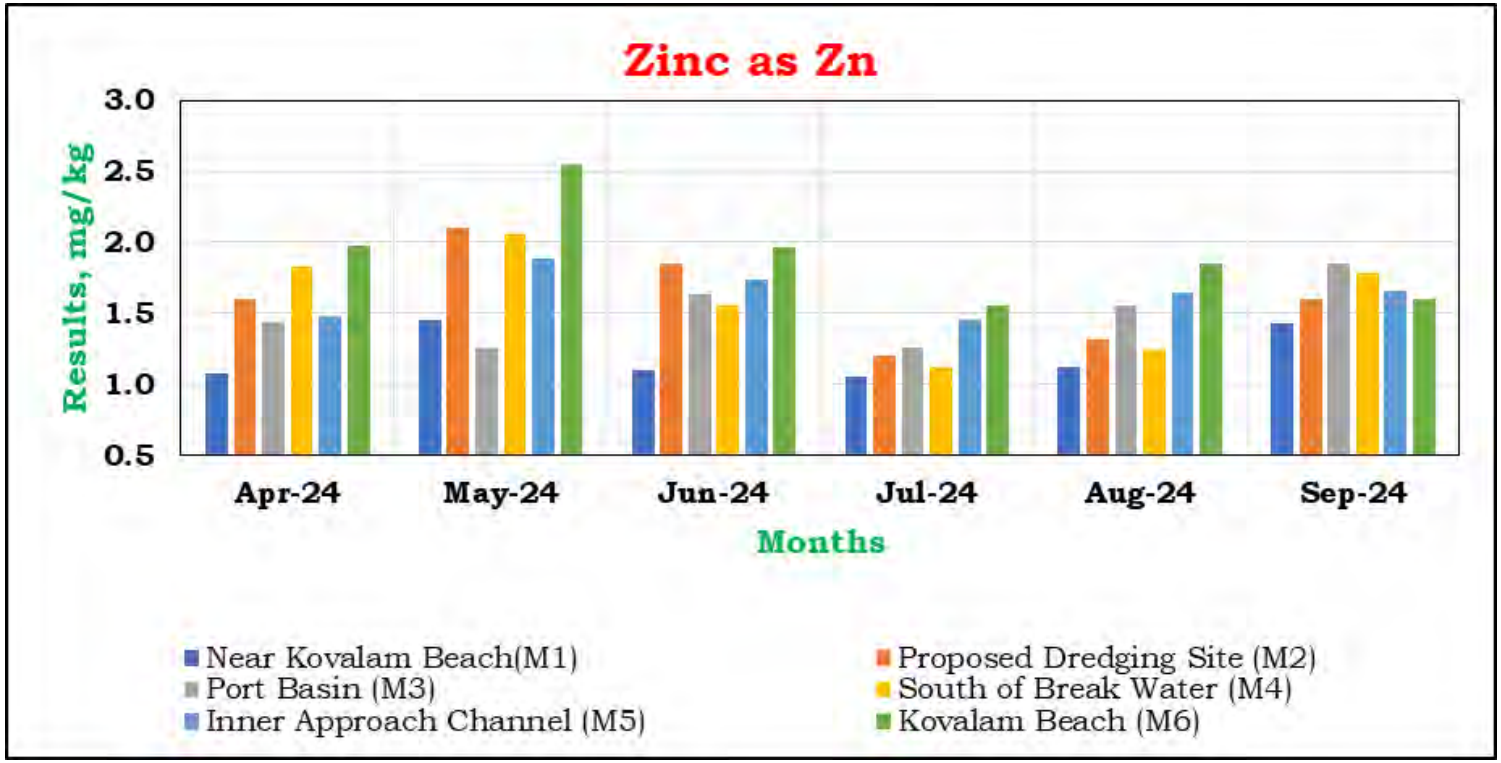
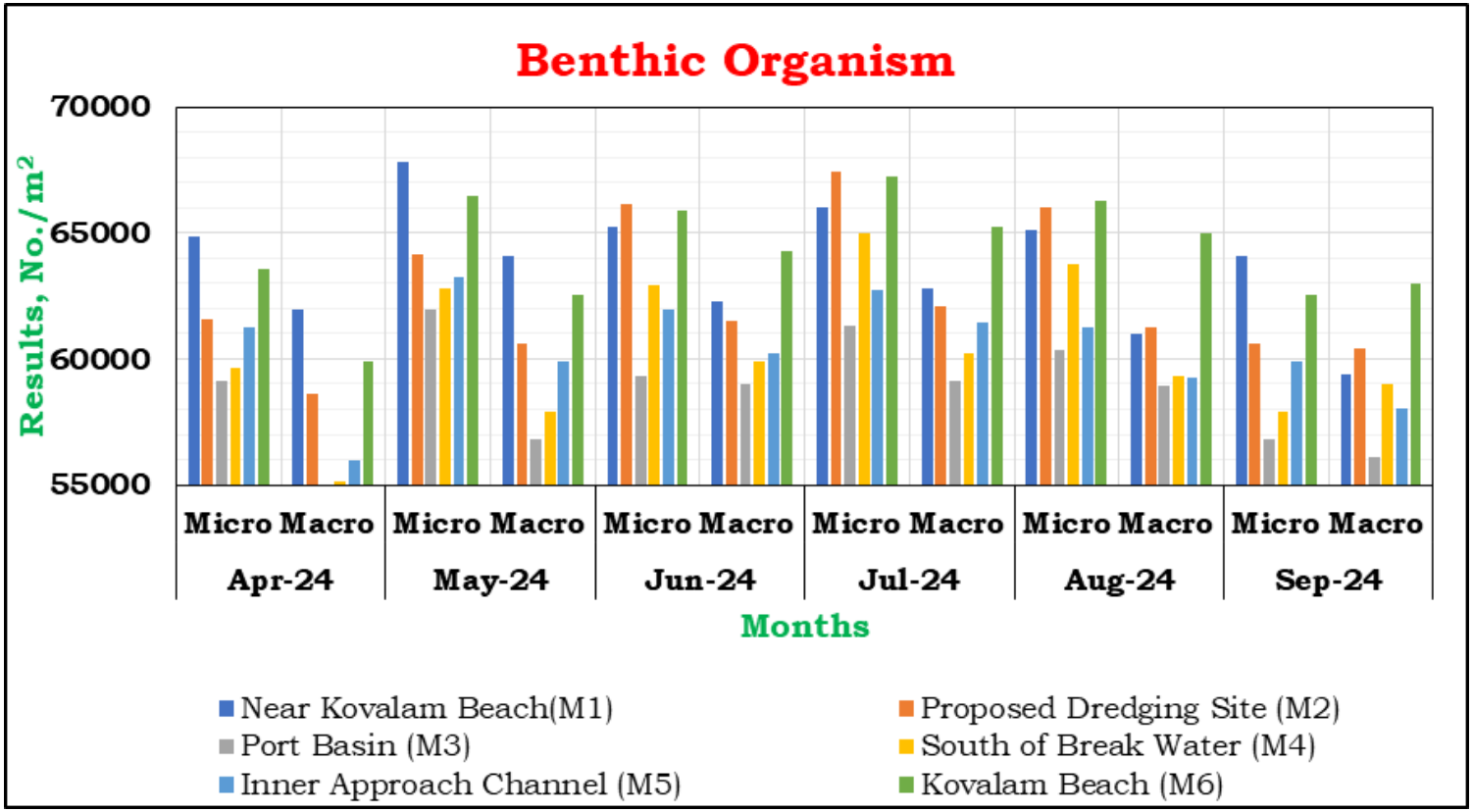


Figure 5.16: Sediment Analysis for Benthic Organism



HYR-5.10. Summary - Sediment Analysis:

During the months from April 2024 to September 2024, the following is the summary of sediment analysis:

a) At the location **Near Kovalam Beach**,

- The observed texture was sandy
- Organic matter was observed in the range from 0.33 to 0.42%
- Total Phosphorus (as P) was observed in the range from 185 to 245 mg/kg
- Aluminium (as Al) was observed in the range from 1026 to 1265 mg/kg
- Iron (as Fe) was observed in the range from 3125 to 5016 mg/kg
- Manganese (as Mn) was observed in the range from1.96 to 2.63 mg/kg
- Zinc (as Zn) was observed in the range from 1.05 to 1.45 mg/kg
- Chromium (as Cr), Copper (as Cu), Lead (as Pb), Mercury (as Hg) and Nickel (as Ni) were observed below the detection limits
- Micro benthic organisms were observed in the range from 63896 to 67845/m^2
- Macro benthic organisms were observed in the range from 59378 to 64054/m^2.

b) At the location **Proposed Dredging Site**,

- The observed texture was sandy
- Organic matter was observed in the range from 0.28 to 0.42%
- Total Phosphorus (as P) was observed in the range from 225 to 370 mg/kg
- Aluminium (as Al) was observed in the range from 956 to 1210 mg/kg
- Iron (as Fe) was observed in the range from 1460 to 1865 mg/kg
- Manganese (as Mn) was observed in the range from 1.85 to 2.52 mg/kg
- Zinc (as Zn) was observed in the range from 1.20 to 2.10 mg/kg
- Chromium (as Cr), Copper (as Cu), Lead (as Pb), Mercury (as Hg) and Nickel (as Ni) were observed below the detection limits
- Micro benthic organisms were observed in the range from 61591 to 67398/m^2

- Macro benthic organisms were observed in the range from 58634 to 62089/m^2.

c) At the location **Port Basin**,

- The observed texture was sandy loam
- Organic matter was observed in the range from 0.37 to 0.45%
- Total Phosphorus (as P) was observed in the range from 140 to 210 mg/kg
- Aluminium (as Al) was observed in the range from 1036 to 1436 mg/kg
- Iron (as Fe) was observed in the range from 3265 to 5296 mg/kg
- Manganese (as Mn) was observed in the range from 1.90 to 2.50 mg/kg
- Zinc (as Zn) was observed in the range from 1.26 to 1.85 mg/kg
- Chromium (as Cr), Copper (as Cu), Lead (as Pb), Mercury (as Hg) and Nickel (as Ni) were observed below the detection limits
- Micro benthic organisms were observed in the range from 58279 to 61987/m^2
- Macro benthic organisms were observed in the range from 51986 to 59124/m^2.

d) At the location **South of Break Water**,

- The observed texture was sandy
- Organic matter was observed in the range from 0.28 to 0.40%
- Total Phosphorus (as P) was observed in the range from 125 to 185 mg/kg
- Aluminium (as Al) was observed in the range from 1054 to 1350 mg/kg
- Iron (as Fe) was observed in the range from 1465 to 2059 mg/kg
- Manganese (as Mn) was observed in the range from 1.75 to 2.45 mg/kg
- Zinc (as Zn) was observed in the range from 1.12 to 2.06 mg/kg
- Chromium (as Cr), Copper (as Cu), Lead (as Pb), Mercury (as Hg) and Nickel (as Ni) were observed below the detection limits
- Micro benthic organisms were observed in the range from 59619 to 64978/m^2
- Macro benthic organisms were observed in the range from 55106 to 60198/m^2.

e) At the location **Inner Approach Channel**,

- The observed texture was sandy
- Organic matter was observed in the range from 0.34 to 0.45%
- Total Phosphorus (as P) was observed in the range from 173 to 280 mg/kg
- Aluminium (as Al) was observed in the range from 205 to 1965 mg/kg
- Iron (as Fe) was observed in the range from 925 to 1240 mg/kg
- Manganese (as Mn) was observed in the range from 1.10 to 1.92 mg/kg
- Zinc (as Zn) was observed in the range from 1.45 to 1.88 mg/kg
- Chromium (as Cr), Copper (as Cu), Lead (as Pb), Mercury (as Hg) and Nickel (as Ni) were observed below the detection limits
- Micro benthic organisms were observed in the range from 59768 to 63214/m^2
- Macro benthic organisms were observed in the range from 55987 to 61467/m^2.

f) At the location **Kovalam Beach**,

- The observed texture was sandy
- Organic matter was observed in the range from 0.29 to 0.38%
- Total Phosphorus (as P) was observed in the range from 452 to 706 mg/kg
- Aluminium (as Al) was observed in the range from 1052 to 1868 mg/kg
- Iron (as Fe) was observed in the range from 452 to 840 mg/kg
- Manganese (as Mn) was observed in the range from 1.32 to 1.89 mg/kg
- Zinc (as Zn) was observed in the range from 1.55 to 2.55 mg/kg
- Chromium (as Cr), Copper (as Cu), Lead (as Pb), Mercury (as Hg) and Nickel (as Ni) were observed below the detection limits
- Micro benthic organisms were observed in the range from 63587 to 67214/m^2
- Macro benthic organisms were observed in the range from 59875 to 65217/m^2.

g) Summary – Comparison of Results of **All Locations**,

- The observed texture was sandy in all locations except Port Basin which was sandy loam
- Maximum value of Organic matter observed was 0.45% at Port Basin
- Maximum value of Total Phosphorus (as P) observed was 706 mg/kg at Kovalam Beach
- Maximum value of Aluminium (as Al) observed was 1965 mg/kg at Inner Approach channel
- Maximum value of Iron (as Fe) observed was 5296 mg/kg at Port Basin
- Maximum value of Manganese (as Mn) observed was 2.63 mg/kg at Near Kovalam Beach
- Maximum value of Zinc (as Zn) observed was 2.55 mg/kg at Kovalam Beach
- Chromium (as Cr), Copper (as Cu), Lead (as Pb), Mercury (as Hg) and Nickel (as Ni) were observed below the detection limits at all locations
- Maximum value of Micro benthic organisms observed was 67845/m^2 at Near Kovalam Beach
- Maximum value of Macro benthic organisms observed was 65217/m^2 at Kovalam Beach.

HYR-5.11. Marine Water Analysis for Phytoplankton and Zooplankton

Table 5.7: Total Phytoplankton and Zooplankton Results

Parameter	Month	Near Kovalam Beach (M1)	Proposed Dredging Site (M2)	Port Basin (M3)	South of Break water (M4)	Inner Approach Channel (M5)	Kovalam Beach (M6)
Total Phytoplankton No/100 mL	Apr-24	76851	75890	68114	67722	66308	61186
	May-24	82733	81313	76860	73986	71302	67649
	Jun-24	74350	72799	71920	69416	65673	64193
	Jul-24	76450	74559	73091	71818	67979	66837
	Aug-24	74138	72078	68363	66390	62892	61022
	Sep-24	76750	74669	70538	68991	64794	63041
Total Zooplankton No/100 mL	Apr-24	12969	9382	11256	12668	10194	10456
	May-24	14807	10880	13565	14223	11181	12615
	Jun-24	14054	10334	13189	13659	11039	12757
	Jul-24	13087	9939	12581	12785	11364	12323
	Aug-24	12144	8972	11669	12022	10564	11563
	Sep-24	13106	9617	12554	12900	11378	12119

HYR-5.12. Graphical representation of Results for Marine Phytoplankton and Zooplankton

Figure 5.17: Marine Water Analysis for Total Phytoplankton

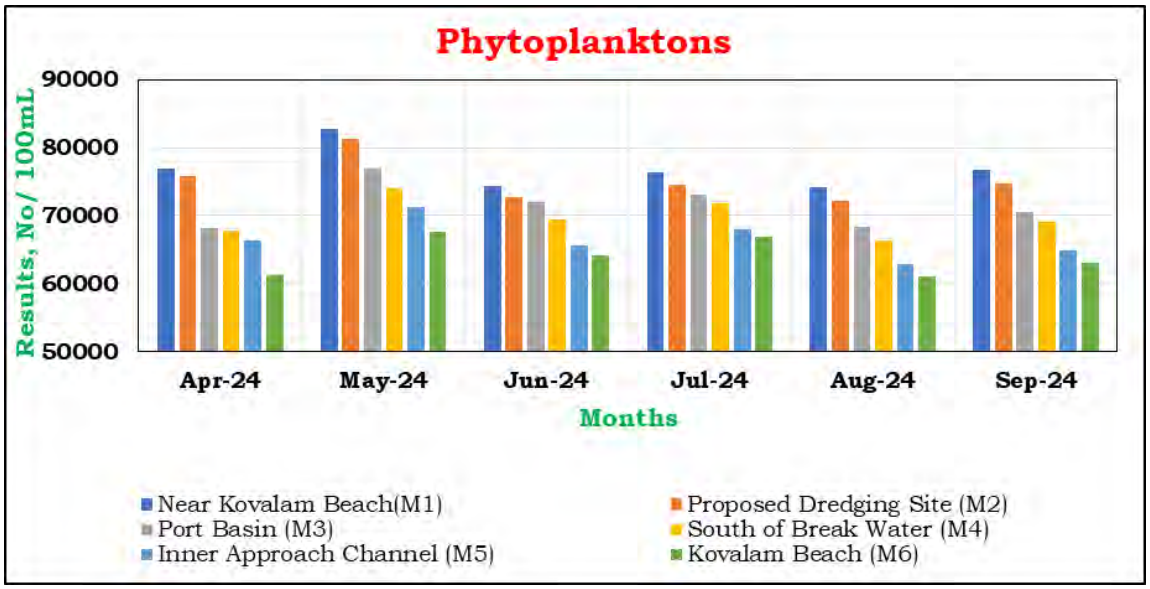
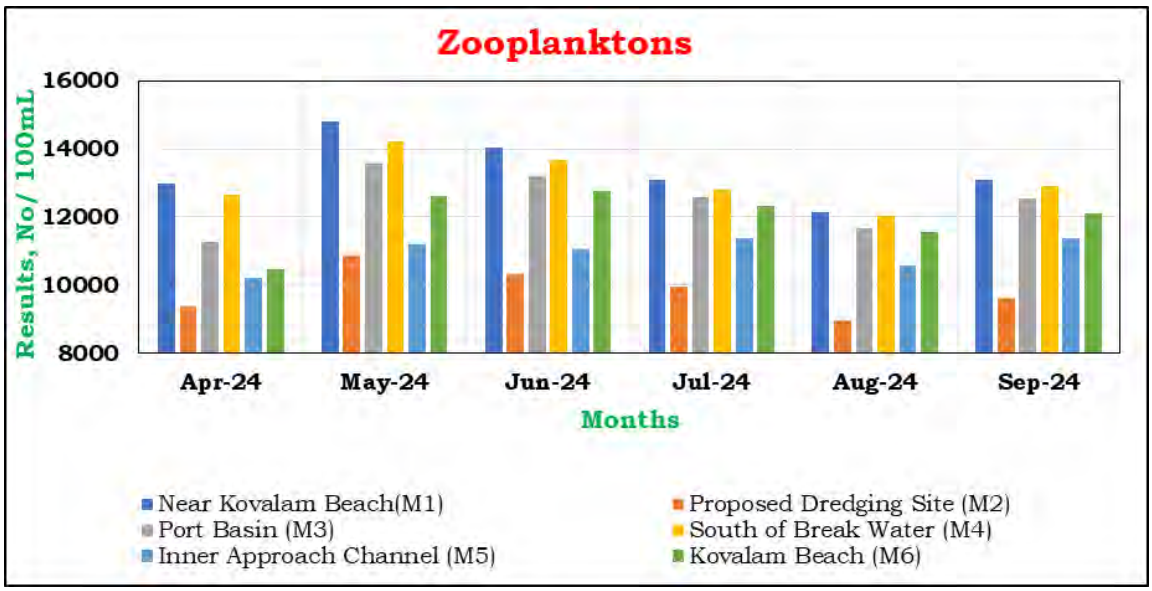


Figure 5.18: Marine Water Analysis for Total Zooplankton



HYR-5.13. Summary-Marine Water Analysis for Phytoplankton and Zooplankton

During the months from April 2024 to September 2024, following is the summary of Marine Water Analysis for Phytoplankton and Zooplankton:

Table 5.8: Summary-Marine Water Analysis for Phytoplankton and Zooplankton Results

Parameter	Range	Near Kovalam Beach (M1)	Proposed Dredging Site (M2)	Port Basin (M3)	South of Break water (M4)	Inner Approach Channel (M5)	Kovalam Beach (M6)
Total Phytoplankton No/100 mL	From	74138	72078	68114	66390	62892	61022
	To	82733	81313	76860	73986	71302	67649
Total Zooplankton No/100 mL	From	12144	8972	11256	12022	10194	10456
	To	14807	10880	13565	14223	11378	12757

a) At the location **Near Kovalam Beach**,
- Total Phytoplankton were observed in the range from 74138 to 82733 No/100 mL
- Total Zooplankton were observed in the range from 12144 to 14807 No/100 mL

b) At the location **Proposed Dredging Site**,
- Total Phytoplankton were observed in the range from 72078 to 81313 No/100 mL
- Total Zooplankton were observed in the range from 8972 to 10880 No/100 mL

c) At the location **Port Basin**,
- Total Phytoplankton were observed in the range from 68114 to 76860 No/100 mL
- Total Zooplankton were observed in the range from 11256 to 13565 No/100 mL

d) At the location **South of Break Water**,

- Total Phytoplankton were observed in the range from 66390 to 73986 No/100 mL
- Total Zooplankton were observed in the range from 12022 to 14223 No/100 mL

e) At the location **Inner Approach Channel**,

- Total Phytoplankton were observed in the range from 62892 to 71302 No/100 mL
- Total Zooplankton were observed in the range from 10194 to 11378 No/100 mL

f) At the location **Kovalam Beach**,

- Total Phytoplankton were observed in the range from 61022 to 67649 No/100 mL
- Total Zooplankton were observed in the range from 10456 to 12757 No/100 mL

g) Summary – Comparison of Results of **All Locations**,

- Maximum value of Total Phytoplankton observed was 82733 No/100 mL at Near Kovalam Beach
- Maximum value of Total Zooplankton observed was 14807 No/100 mL at Near Kovalam Beach.

HYR-6	Ground Water & Surface Water Analysis

HYR-6.1. Ground Water & Surface Water Location Details:

This section describes the sampling location, methodology adopted for analysis and analysis results of Ground Water and Surface Water during the period from April 2024 to September 2024.

Ground water sampling was carried out at three locations including Port Site, PAF Area and Proposed Port Estate Area.

Surface water sampling was carried out at three locations including Poovar West Canal, Vizhinjam Branch Canal and Vellayani Lake.

Table 6.1: Coordinates of Ground Water Location

Location	Legend	Latitude	Longitude
Project Site	G1	8°22'03.72"N	77°00'16.92"E
Proposed Port Estate Area	G2	8°22'24.96"N	77°00'45.84"E
PAF Area	G3	8°22'17.60"N	77°00'11.12"E

Table 6.2: Coordinates of Surface Water Location

Location	Legend	Latitude	Longitude
Poovar West Canal	S1	8°19'22.66"N	77°04'31.70"E
Vizhinjam Branch Canal	S2	8°22'55.59"N	76°59'36.29"E
Vellayani Lake	S3	8°25'31.91"N	76°59'37.10"E
Poovar Estuary	S4	8°18'30.71"N	77°04'36.95"E

Figure 6.1: Google earth views of Ground Water & Surface Water Sampling Locations

HYR-6.2. Methodology of Sampling and Analysis:

Table 6.3: Ground Water & Surface Water Methodology

Sr. No.	Parameter	Unit	Detection Limit	Method Reference
Surface and Ground Water Analysis				
1.	Colour	Hazen Units	1	IS 3025 (Part 4): 2021
2.	Odour	-	--	IS 3025 (Part 5): 2018
3.	pH Value	-	1	IS 3025 (Part 11): 2022
4.	Turbidity	N.T.U.	0.1	IS 3025 (Part 10): 2023
5.	Electrical Conductivity (at 25°C)	µmho/cm	0.001	IS 3025 (Part 14): 2013
6.	Total Dissolved Solids	mg/L	1	IS 3025 (Part 16): 2023
7.	Dissolved Oxygen	mg/L	0.2	IS 3025 (Part 38) : 1989
8.	Biochemical Oxygen Demand (3 days, 27°C)	mg/L	2	IS 3025 (Part 44) : 2023
9.	Oil & Grease	mg/L	1	IS 3025 Part 39: 2021

Sr. No.	Parameter	Unit	Detection Limit	Method Reference
10.	Aluminium (as Al)	mg/L	0.03	IS 3025 Part 55:2003
11.	Ammonia (as NH_3- N)	mg/L	1	IS 3025 (Part 34): 1998
12.	Anionic Detergents (as MBAS) Calculated as LAS mol.wt. 288.38	mg/L	0.01	IS 13428 Annex K:2005
13.	Barium (as Ba)	mg/L	0.17	APHA (24th Edn) 3111-D : 2023
14.	Boron (as B)	mg/L	0.2	IS 3025 (Part 57): 2021
15.	Calcium (as Ca)	mg/L	1	IS 3025 Part 40: 1991
16.	Chloramines (as Cl_2)	mg/L	1	APHA (24th Edn) 4500-Cl G : 2023
17.	Chloride (as Cl)	mg/L	1	IS 3025 Part 32: 1988
18.	Copper (as Cu)	mg/L	0.016	IS 3025 Part 42: 1992
19.	Fluoride (as F)	mg/L	0.1	APHA (24th Edn) 4500-F- B, D: 2023
20.	Iron (as Fe)	mg/L	0.1	IS 3025 Part 53: 2003
21.	Magnesium (as Mg)	mg/L	1	IS 3025 (Part 46): 2023
22.	Manganese (as Mn)	mg/L	0.016	IS 3025 Part 59: 2006 RA 2017
23.	Mineral Oil	mg/L	0.50	IS 3025 Part 39: 1991 RA 2019
24.	Nitrate (as NO_3)	mg/L	1	APHA (24th Edn) 4500-NO3 B: 2023
25.	Phenolic Compounds (as C_6H_5OH)	mg/L	0.001	IS 3025 (Part 43/Sec 1): 2022
26.	Selenium (as Se)	mg/L	0.001	APHA (24th Edn) 3114C : 2023
27.	Silver (as Ag)	mg/L	0.03	APHA (24th Edn) 3111-B : 2023
28.	Sulphate (as SO_4)	mg/L	1	IS 3025 (Part 24/Sec 1): 2022
29.	Sulphide (as H_2S)	mg/L	0.01	IS 3025 (Part 29): 2022
30.	Total Phosphate (as PO_4)	mg/L	0.1	IS 3025 (Part 31/Sec 1): 2022
31.	Total Alkalinity (as $CaCO_3$)	mg/L	1	IS 3025 (Part 23): 2023
32.	Total Hardness (as $CaCO_3$)	mg/L	1	IS 3025 Part 21: 2009
33.	Calcium Hardness (as $CaCO_3$)	mg/L	1	IS 3025 Part 40: 1991
34.	Zinc (as Zn)	mg/L	0.008	APHA (24th Edn) 3111-B : 2023
35.	Sodium (as Na)	mg/L	1	IS 3025 Part 45: 1993
36.	Potassium (as K)	mg/L	0.5	IS 3025 Part 45: 1993
37.	Sodium Absorption Ratio	-	1	IS 11624: 1986
38.	Cadmium (as Cd)	mg/L	0.003	IS 3025 (Part 41) : 2023
39.	Cyanide (as CN)	mg/L	0.01	IS 3025 (Part 27/Sec 1): 2021
40.	Lead (as Pb)	mg/L	0.01	IS 3025 Part 47: 1994 RA 2019
41.	Mercury (as Hg)	mg/L	0.001	IS 3025 Part 48: 1994 RA 2019
42.	Molybdenum (as Mo)	mg/L	0.07	APHA (24th Edn) 3111-D : 2023
43.	Nickel (as Ni)	mg/L	0.02	IS 3025 Part 54: 2003
44.	***Pesticide Residues***			
i.	Alachlor	µg/L	0.005	SEAAL/INS/SOP/7.2/03

Sr. No.	Parameter	Unit	Detection Limit	Method Reference
ii.	Atrazine	µg/L	0.005	SEAAL/INS/SOP/7.2/03
iii.	Aldrin/Dieldrin	µg/L	0.005	SEAAL/INS/SOP/7.2/03
iv.	Alpha HCH	µg/L	0.005	SEAAL/INS/SOP/7.2/03
v.	Beta HCH	µg/L	0.005	SEAAL/INS/SOP/7.2/03
vi.	Butachlor	µg/L	0.005	SEAAL/INS/SOP/7.2/03
vii.	Chlorpyrifos	µg/L	0.005	SEAAL/INS/SOP/7.2/03
viii.	Delta HCH	µg/L	0.005	SEAAL/INS/SOP/7.2/03
ix.	2,4D chlorophenoxyacetic acid	µg/L	0.005	SEAAL/INS/SOP/7.2/03
x.	DDT (o,p&p,p- Isomers of DDT, DDE, DDD)	µg/L	0.005	SEAAL/INS/SOP/7.2/03
xi.	Endosulfan (□,□& Sulphate)	µg/L	0.005	SEAAL/INS/SOP/7.2/03
xii.	Ethion	µg/L	0.005	SEAAL/INS/SOP/7.2/03
xiii.	γ HCH (Lindane)	µg/L	0.005	SEAAL/INS/SOP/7.2/03
xiv.	Isoproturon	µg/L	0.005	SEAAL/INS/SOP/7.2/03
xv.	Malathion	µg/L	0.005	SEAAL/INS/SOP/7.2/03
xvi.	Methyl Parathion	µg/L	0.005	SEAAL/INS/SOP/7.2/03
xvii.	Monocrotophos	µg/L	0.005	SEAAL/INS/SOP/7.2/03
xviii.	Phorate	µg/L	0.005	SEAAL/INS/SOP/7.2/03
45.	Polychlorinated Biphenyls (PCB)	mg/L	0.000005	SEAAL/INS/SOP/7.2/04
46.	Polynuclear Aromatic Hydrocarbons (PAH)	mg/L	0.000005	SEAAL/INS/SOP/7.2/05
47.	Total Arsenic (as As)	mg/L	0.002	IS 3025(Part 37) : 2022
48.	Total Chromium (as Cr)	mg/L	0.05	IS 3025 Part 52 :2003
49.				
a)	Bromoform	mg/L	0.005	SEAAL/INS/SOP/7.2/02
b)	Dibromochloromethane	mg/L	0.005	SEAAL/INS/SOP/7.2/02
c)	Bromodichloroethane	mg/L	0.005	SEAAL/INS/SOP/7.2/02
d)	Chloroform	mg/L	0.005	SEAAL/INS/SOP/7.2/02
50.	*E.coli*	MPN/100 ml	2	IS 1622: 1981
51.	Total Coliforms	MPN/100 ml	2	IS 1622: 1981
52.	FaecalColiforms	MPN/100 ml	2	IS 1622: 1981

HYR-6.3. Ground Water Analysis Results for the period from April 2024 to September 2024:

Table 6.4: Ground Water Analysis Results

Sl. No.	Parameters	Unit	Acceptable Limit as per IS 10500: 2012	Month	Port Site (Open well) G1	Proposed Port Estate Area (Open well) G2	PAF Area (Open well) G3
Organoleptic & Physical Parameters							
1.	Colour	Hazen Units	*Max.* 5	Apr-24	1	1	1
				May-24	1	1	1
				Jun-24	1	1	1
				Jul-24	1	1	1
				Aug-24	1	1	1
				Sep-24	1	1	1
2.	Odour	-	Agreeable	Apr-24	Agreeable	Agreeable	Agreeable
				May-24	Agreeable	Agreeable	Agreeable
				Jun-24	Agreeable	Agreeable	Agreeable
				Jul-24	Agreeable	Agreeable	Agreeable
				Aug-24	Agreeable	Agreeable	Agreeable
				Sep-24	Agreeable	Agreeable	Agreeable
3.	pH Value	-	6.5 to 8.5	Apr-24	7.95	7.55	6.86
				May-24	7.60	7.39	7.01
				Jun-24	7.12	6.95	6.92
				Jul-24	7.52	6.53	6.82
				Aug-24	8.06	7.61	6.58
				Sep-24	7.85	7.16	6.68
4.	Turbidity	N.T.U.	Max. 1	Apr-24	BDL	BDL	BDL
				May-24	BDL	BDL	BDL
				Jun-24	0.8	6.4	4.6
				Jul-24	0.8	4.2	BDL
				Aug-24	0.6	2.8	BDL
				Sep-24	0.4	0.9	0.5
5.	Total Dissolved Solids	mg/L	Max. 500	Apr-24	330	284	272
				May-24	338	245	285
				Jun-24	310	205	254
				Jul-24	350	278	290
				Aug-24	402	260	316

Sl. No.	Parameters	Unit	Acceptable Limit as per IS 10500: 2012	Month	Port Site (Open well) G1	Proposed Port Estate Area (Open well) G2	PAF Area (Open well) G3
				Sep-24	364	210	324
General Parameters concerning substances undesirable in excessive amounts							
6.	Aluminium (as Al)	mg/L	Max. 0.03	Apr-24	BDL	BDL	BDL
				May-24	BDL	BDL	BDL
				Jun-24	BDL	BDL	BDL
				Jul-24	BDL	BDL	BDL
				Aug-24	BDL	BDL	BDL
				Sep-24	BDL	BDL	BDL
7.	Ammonia (as NH_3-N)	mg/L	Max.0.5	Apr-24	BDL	BDL	BDL
				May-24	BDL	BDL	BDL
				Jun-24	BDL	BDL	BDL
				Jul-24	BDL	BDL	BDL
				Aug-24	BDL	BDL	BDL
				Sep-24	BDL	BDL	BDL
8.	Anionic Detergents (as MBAS) Calculated as LAS mol.wt. 288.38	mg/L	Max. 0.2	Apr-24	BDL	BDL	BDL
				May-24	BDL	BDL	BDL
				Jun-24	BDL	BDL	BDL
				Jul-24	BDL	BDL	BDL
				Aug-24	BDL	BDL	BDL
				Sep-24	BDL	BDL	BDL
9.	Barium (as Ba)	mg/L	Max. 0.7	Apr-24	BDL	BDL	BDL
				May-24	BDL	BDL	BDL
				Jun-24	BDL	BDL	BDL
				Jul-24	BDL	BDL	BDL
				Aug-24	BDL	BDL	BDL
				Sep-24	BDL	BDL	BDL
10.	Boron (as B)	mg/L	Max. 0.5	Apr-24	BDL	BDL	BDL
				May-24	BDL	BDL	BDL
				Jun-24	BDL	BDL	BDL
				Jul-24	BDL	BDL	BDL
				Aug-24	BDL	BDL	BDL
				Sep-24	BDL	BDL	BDL
11.	Calcium (as Ca)	mg/L	Max. 75	Apr-24	25.6	14.4	23.2
				May-24	26.4	8.00	28.0
				Jun-24	20.8	9.60	20.0
				Jul-24	23.2	11.2	24.0
				Aug-24	25.6	8.80	24.8

Sl. No.	Parameters	Unit	Acceptable Limit as per IS 10500: 2012	Month	Port Site (Open well) G1	Proposed Port Estate Area (Open well) G2	PAF Area (Open well) G3
				Sep-24	28.0	10.40	30.4
12.	Chloramines (as Cl_2)	mg/L	Max. 4.0	Apr-24	BDL	BDL	BDL
				May-24	BDL	BDL	BDL
				Jun-24	BDL	BDL	BDL
				Jul-24	BDL	BDL	BDL
				Aug-24	BDL	BDL	BDL
				Sep-24	BDL	BDL	BDL
13.	Chloride (as Cl)	mg/L	Max.250	Apr-24	109	131	101
				May-24	121	106	111
				Jun-24	109	94.3	104
				Jul-24	116	111	104
				Aug-24	125	91.6	104
				Sep-24	108	77.1	106
14.	Copper (as Cu)	mg/L	Max.0.05	Apr-24	BDL	BDL	BDL
				May-24	BDL	BDL	BDL
				Jun-24	BDL	BDL	BDL
				Jul-24	BDL	BDL	BDL
				Aug-24	BDL	BDL	BDL
				Sep-24	BDL	BDL	BDL
15.	Fluoride (as F)	mg/L	Max. 1	Apr-24	BDL	BDL	BDL
				May-24	BDL	BDL	BDL
				Jun-24	BDL	BDL	BDL
				Jul-24	BDL	BDL	BDL
				Aug-24	BDL	BDL	BDL
				Sep-24	BDL	BDL	BDL
16.	Iron (as Fe)	mg/L	Max.0.3	Apr-24	0.13	0.11	0.12
				May-24	0.14	0.12	0.16
				Jun-24	0.18	0.14	0.11
				Jul-24	0.12	0.11	BDL
				Aug-24	0.18	0.11	BDL
				Sep-24	0.25	BDL	BDL
17.	Magnesium (as Mg)	mg/L	Max. 30	Apr-24	9.35	5.41	7.87
				May-24	11.3	5.41	8.40
				Jun-24	13.3	5.41	11.8
				Jul-24	14.1	5.84	13.6
				Aug-24	13.6	5.36	14.1
				Sep-24	11.2	3.41	9.74

Sl. No.	Parameters	Unit	Acceptable Limit as per IS 10500: 2012	Month	Port Site (Open well) G1	Proposed Port Estate Area (Open well) G2	PAF Area (Open well) G3
18.	Manganese (as Mn)	mg/L	Max.0.1	Apr-24	BDL	BDL	BDL
				May-24	BDL	BDL	BDL
				Jun-24	BDL	BDL	BDL
				Jul-24	BDL	BDL	BDL
				Aug-24	BDL	BDL	BDL
				Sep-24	BDL	BDL	BDL
19.	Mineral Oil	mg/L	Max.0.5	Apr-24	BDL	BDL	BDL
				May-24	BDL	BDL	BDL
				Jun-24	BDL	BDL	BDL
				Jul-24	BDL	BDL	BDL
				Aug-24	BDL	BDL	BDL
				Sep-24	BDL	BDL	BDL
20.	Nitrate (as NO_3)	mg/L	Max.45	Apr-24	BDL	BDL	BDL
				May-24	BDL	BDL	BDL
				Jun-24	BDL	BDL	BDL
				Jul-24	BDL	BDL	BDL
				Aug-24	BDL	BDL	BDL
				Sep-24	BDL	BDL	BDL
21.	Phenolic Compounds (as C6H5OH)	mg/L	Max. 0.001	Apr-24	BDL	BDL	BDL
				May-24	BDL	BDL	BDL
				Jun-24	BDL	BDL	BDL
				Jul-24	BDL	BDL	BDL
				Aug-24	BDL	BDL	BDL
				Sep-24	BDL	BDL	BDL
22.	Selenium (as Se)	mg/L	Max. 0.01	Apr-24	BDL	BDL	BDL
				May-24	BDL	BDL	BDL
				Jun-24	BDL	BDL	BDL
				Jul-24	BDL	BDL	BDL
				Aug-24	BDL	BDL	BDL
				Sep-24	BDL	BDL	BDL
23.	Silver (as Ag)	mg/L	Max. 0.1	Apr-24	BDL	BDL	BDL
				May-24	BDL	BDL	BDL
				Jun-24	BDL	BDL	BDL
				Jul-24	BDL	BDL	BDL
				Aug-24	BDL	BDL	BDL
				Sep-24	BDL	BDL	BDL
24.	Sulphate (as SO_4)	mg/L	Max. 200	Apr-24	45.4	35.8	43.2

Sl. No.	Parameters	Unit	Acceptable Limit as per IS 10500: 2012	Month	Port Site (Open well) G1	Proposed Port Estate Area (Open well) G2	PAF Area (Open well) G3
				May-24	40.2	30.4	38.2
				Jun-24	35.6	24.6	30.5
				Jul-24	38.2	32.0	42.2
				Aug-24	42.0	24.0	38.0
				Sep-24	36.0	18.0	42.0
25.	Sulphide (as H_2S)	mg/L	Max. 0.05	Apr-24	BDL	BDL	BDL
				May-24	BDL	BDL	BDL
				Jun-24	BDL	BDL	BDL
				Jul-24	BDL	BDL	BDL
				Aug-24	BDL	BDL	BDL
				Sep-24	BDL	BDL	BDL
26.	Total Alkalinity (as $CaCO_3$)	mg/L	Max.200	Apr-24	101	10.2	12.2
				May-24	90.9	8.08	22.2
				Jun-24	80.8	6.06	18.2
				Jul-24	95.5	9.95	23.9
				Aug-24	104	14.6	20.8
				Sep-24	93.6	10.4	24.9
27.	Total Hardness (as $CaCO_3$)	mg/L	Max. 200	Apr-24	103	58.6	90.9
				May-24	113	42.4	105
				Jun-24	107	46.5	99.0
				Jul-24	116	52.0	116
				Aug-24	120	44.0	120
				Sep-24	116	40.0	116
28.	Zinc (as Zn)	mg/L	Max. 5	Apr-24	BDL	BDL	BDL
				May-24	BDL	BDL	BDL
				Jun-24	BDL	BDL	BDL
				Jul-24	BDL	BDL	BDL
				Aug-24	BDL	BDL	BDL
				Sep-24	BDL	BDL	BDL
Parameters Concerning Toxic Substances							
29.	Cadmium (as Cd)	mg/L	Max. 0.003	Apr-24	BDL	BDL	BDL
				May-24	BDL	BDL	BDL
				Jun-24	BDL	BDL	BDL
				Jul-24	BDL	BDL	BDL
				Aug-24	BDL	BDL	BDL
				Sep-24	BDL	BDL	BDL
30.	Cyanide (as CN)	mg/L	Max.0.05	Apr-24	BDL	BDL	BDL

Sl. No.	Parameters	Unit	Acceptable Limit as per IS 10500: 2012	Month	Port Site (Open well) G1	Proposed Port Estate Area (Open well) G2	PAF Area (Open well) G3
				May-24	BDL	BDL	BDL
				Jun-24	BDL	BDL	BDL
				Jul-24	BDL	BDL	BDL
				Aug-24	BDL	BDL	BDL
				Sep-24	BDL	BDL	BDL
31.	Lead (as Pb)	mg/L	Max. 0.01	Apr-24	BDL	BDL	BDL
				May-24	BDL	BDL	BDL
				Jun-24	BDL	BDL	BDL
				Jul-24	BDL	BDL	BDL
				Aug-24	BDL	BDL	BDL
				Sep-24	BDL	BDL	BDL
32.	Mercury (as Hg)	mg/L	Max. 0.001	Apr-24	BDL	BDL	BDL
				May-24	BDL	BDL	BDL
				Jun-24	BDL	BDL	BDL
				Jul-24	BDL	BDL	BDL
				Aug-24	BDL	BDL	BDL
				Sep-24	BDL	BDL	BDL
33.	Molybdenum (as Mo)	mg/L	Max. 0.07	Apr-24	BDL	BDL	BDL
				May-24	BDL	BDL	BDL
				Jun-24	BDL	BDL	BDL
				Jul-24	BDL	BDL	BDL
				Aug-24	BDL	BDL	BDL
				Sep-24	BDL	BDL	BDL
34.	Nickel (as Ni)	mg/L	Max.0.02	Apr-24	BDL	BDL	BDL
				May-24	BDL	BDL	BDL
				Jun-24	BDL	BDL	BDL
				Jul-24	BDL	BDL	BDL
				Aug-24	BDL	BDL	BDL
				Sep-24	BDL	BDL	BDL
35. Pesticide Residues							
i.	Alachlor	µg/L	20	Apr-24	BDL	BDL	BDL
				May-24	BDL	BDL	BDL
				Jun-24	BDL	BDL	BDL
				Jul-24	BDL	BDL	BDL
				Aug-24	BDL	BDL	BDL
				Sep-24	BDL	BDL	BDL
ii.	Atrazine	µg/L	2	Apr-24	BDL	BDL	BDL

Sl. No.	Parameters	Unit	Acceptable Limit as per IS 10500: 2012	Month	Port Site (Open well) G1	Proposed Port Estate Area (Open well) G2	PAF Area (Open well) G3
				May-24	BDL	BDL	BDL
				Jun-24	BDL	BDL	BDL
				Jul-24	BDL	BDL	BDL
				Aug-24	BDL	BDL	BDL
				Sep-24	BDL	BDL	BDL
iii.	Aldrin/Dieldrin	µg/L	0.03	Apr-24	BDL	BDL	BDL
				May-24	BDL	BDL	BDL
				Jun-24	BDL	BDL	BDL
				Jul-24	BDL	BDL	BDL
				Aug-24	BDL	BDL	BDL
				Sep-24	BDL	BDL	BDL
iv.	Alpha HCH	µg/L	0.01	Apr-24	BDL	BDL	BDL
				May-24	BDL	BDL	BDL
				Jun-24	BDL	BDL	BDL
				Jul-24	BDL	BDL	BDL
				Aug-24	BDL	BDL	BDL
				Sep-24	BDL	BDL	BDL
v.	Beta HCH	µg/L	0.04	Apr-24	BDL	BDL	BDL
				May-24	BDL	BDL	BDL
				Jun-24	BDL	BDL	BDL
				Jul-24	BDL	BDL	BDL
				Aug-24	BDL	BDL	BDL
				Sep-24	BDL	BDL	BDL
vi.	Butachlor	µg/L	125	Apr-24	BDL	BDL	BDL
				May-24	BDL	BDL	BDL
				Jun-24	BDL	BDL	BDL
				Jul-24	BDL	BDL	BDL
				Aug-24	BDL	BDL	BDL
				Sep-24	BDL	BDL	BDL
vii.	Chlorpyrifos	µg/L	30	Apr-24	BDL	BDL	BDL
				May-24	BDL	BDL	BDL
				Jun-24	BDL	BDL	BDL
				Jul-24	BDL	BDL	BDL
				Aug-24	BDL	BDL	BDL
				Sep-24	BDL	BDL	BDL
viii.	Delta HCH	µg/L	0.04	Apr-24	BDL	BDL	BDL
				May-24	BDL	BDL	BDL

Sl. No.	Parameters	Unit	Acceptable Limit as per IS 10500: 2012	Month	Port Site (Open well) G1	Proposed Port Estate Area (Open well) G2	PAF Area (Open well) G3
				Jun-24	BDL	BDL	BDL
				Jul-24	BDL	BDL	BDL
				Aug-24	BDL	BDL	BDL
				Sep-24	BDL	BDL	BDL
ix.	2,4D chlorophenoxyacetic acid	µg/L	30	Apr-24	BDL	BDL	BDL
				May-24	BDL	BDL	BDL
				Jun-24	BDL	BDL	BDL
				Jul-24	BDL	BDL	BDL
				Aug-24	BDL	BDL	BDL
				Sep-24	BDL	BDL	BDL
x.	DDT (o,p&p,p-Isomers of DDT, DDE, DDD)	µg/L	1	Apr-24	BDL	BDL	BDL
				May-24	BDL	BDL	BDL
				Jun-24	BDL	BDL	BDL
				Jul-24	BDL	BDL	BDL
				Aug-24	BDL	BDL	BDL
				Sep-24	BDL	BDL	BDL
xi.	Endosulfan (α,β & Sulphate)	µg/L	0.4	Apr-24	BDL	BDL	BDL
				May-24	BDL	BDL	BDL
				Jun-24	BDL	BDL	BDL
				Jul-24	BDL	BDL	BDL
				Aug-24	BDL	BDL	BDL
				Sep-24	BDL	BDL	BDL
xii.	Ethion	µg/L	3	Apr-24	BDL	BDL	BDL
				May-24	BDL	BDL	BDL
				Jun-24	BDL	BDL	BDL
				Jul-24	BDL	BDL	BDL
				Aug-24	BDL	BDL	BDL
				Sep-24	BDL	BDL	BDL
xiii.	γ HCH (Lindane)	µg/L	2	Apr-24	BDL	BDL	BDL
				May-24	BDL	BDL	BDL
				Jun-24	BDL	BDL	BDL
				Jul-24	BDL	BDL	BDL
				Aug-24	BDL	BDL	BDL
				Sep-24	BDL	BDL	BDL
xiv.	Isoproturon	µg/L	9	Apr-24	BDL	BDL	BDL
				May-24	BDL	BDL	BDL
				Jun-24	BDL	BDL	BDL

Sl. No.	Parameters	Unit	Acceptable Limit as per IS 10500: 2012	Month	Port Site (Open well) G1	Proposed Port Estate Area (Open well) G2	PAF Area (Open well) G3
				Jul-24	BDL	BDL	BDL
				Aug-24	BDL	BDL	BDL
				Sep-24	BDL	BDL	BDL
xv.	Malathion	µg/L	190	Apr-24	BDL	BDL	BDL
				May-24	BDL	BDL	BDL
				Jun-24	BDL	BDL	BDL
				Jul-24	BDL	BDL	BDL
				Aug-24	BDL	BDL	BDL
				Sep-24	BDL	BDL	BDL
xvi.	Methyl Parathion	µg/L	0.3	Apr-24	BDL	BDL	BDL
				May-24	BDL	BDL	BDL
				Jun-24	BDL	BDL	BDL
				Jul-24	BDL	BDL	BDL
				Aug-24	BDL	BDL	BDL
				Sep-24	BDL	BDL	BDL
xvii.	Monocrotophos	µg/L	1	Apr-24	BDL	BDL	BDL
				May-24	BDL	BDL	BDL
				Jun-24	BDL	BDL	BDL
				Jul-24	BDL	BDL	BDL
				Aug-24	BDL	BDL	BDL
				Sep-24	BDL	BDL	BDL
xviii.	Phorate	µg/L	2	Apr-24	BDL	BDL	BDL
				May-24	BDL	BDL	BDL
				Jun-24	BDL	BDL	BDL
				Jul-24	BDL	BDL	BDL
				Aug-24	BDL	BDL	BDL
				Sep-24	BDL	BDL	BDL
36.	Polychlorinated Biphenyls (PCB)	mg/L	Max.0.0005	Apr-24	BDL	BDL	BDL
				May-24	BDL	BDL	BDL
				Jun-24	BDL	BDL	BDL
				Jul-24	BDL	BDL	BDL
				Aug-24	BDL	BDL	BDL
				Sep-24	BDL	BDL	BDL
37.	Polynuclear Aromatic Hydrocarbons (PAH)	mg/L	Max.0.0001	Apr-24	BDL	BDL	BDL
				May-24	BDL	BDL	BDL
				Jun-24	BDL	BDL	BDL
				Jul-24	BDL	BDL	BDL

Sl. No.	Parameters	Unit	Acceptable Limit as per IS 10500: 2012	Month	Port Site (Open well) G1	Proposed Port Estate Area (Open well) G2	PAF Area (Open well) G3
				Aug-24	BDL	BDL	BDL
				Sep-24	BDL	BDL	BDL
38.	Total Arsenic (as As)	mg/L	Max. 0.01	Apr-24	BDL	BDL	BDL
				May-24	BDL	BDL	BDL
				Jun-24	BDL	BDL	BDL
				Jul-24	BDL	BDL	BDL
				Aug-24	BDL	BDL	BDL
				Sep-24	BDL	BDL	BDL
39.	Total Chromium (as Cr)	mg/L	Max. 0.05	Apr-24	BDL	BDL	BDL
				May-24	BDL	BDL	BDL
				Jun-24	BDL	BDL	BDL
				Jul-24	BDL	BDL	BDL
				Aug-24	BDL	BDL	BDL
				Sep-24	BDL	BDL	BDL
40.Trihalomethanes							
a)	Bromoform	mg/L	Max. 0.1	Apr-24	BDL	BDL	BDL
				May-24	BDL	BDL	BDL
				Jun-24	BDL	BDL	BDL
				Jul-24	BDL	BDL	BDL
				Aug-24	BDL	BDL	BDL
				Sep-24	BDL	BDL	BDL
b)	Dibromochloromethane	mg/L	Max. 0.1	Apr-24	BDL	BDL	BDL
				May-24	BDL	BDL	BDL
				Jun-24	BDL	BDL	BDL
				Jul-24	BDL	BDL	BDL
				Aug-24	BDL	BDL	BDL
				Sep-24	BDL	BDL	BDL
c)	Bromodichloroethane	mg/L	Max. 0.06	Apr-24	BDL	BDL	BDL
				May-24	BDL	BDL	BDL
				Jun-24	BDL	BDL	BDL
				Jul-24	BDL	BDL	BDL
				Aug-24	BDL	BDL	BDL
				Sep-24	BDL	BDL	BDL
d)	Chloroform	mg/L	Max. 0.2	Apr-24	BDL	BDL	BDL
				May-24	BDL	BDL	BDL
				Jun-24	BDL	BDL	BDL
				Jul-24	BDL	BDL	BDL

Sl. No.	Parameters	Unit	Acceptable Limit as per IS 10500: 2012	Month	Port Site (Open well) G1	Proposed Port Estate Area (Open well) G2	PAF Area (Open well) G3
				Aug-24	BDL	BDL	BDL
				Sep-24	BDL	BDL	BDL
Bacteriological Analysis							
41.	E.coli	MPN Index /100 ml	Not Detectable	Apr-24	BDL	BDL	BDL
				May-24	BDL	BDL	BDL
				Jun-24	BDL	BDL	BDL
				Jul-24	BDL	BDL	BDL
				Aug-24	BDL	BDL	BDL
				Sep-24	BDL	BDL	BDL
42.	Total Coliforms	MPN Index /100 ml	Not Detectable	Apr-24	BDL	BDL	BDL
				May-24	BDL	BDL	BDL
				Jun-24	BDL	BDL	BDL
				Jul-24	BDL	BDL	BDL
				Aug-24	BDL	BDL	BDL
				Sep-24	BDL	BDL	BDL

HYR-6.4. Graphical representation of Results for Ground Water Analysis:

Figure 6.2: Ground Water Analysis for pH

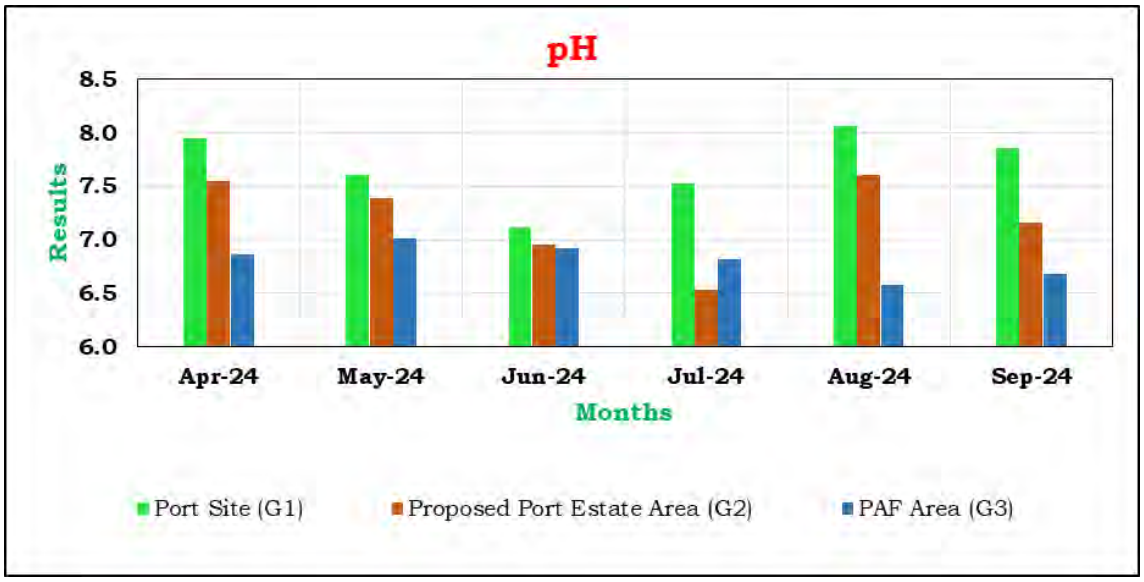


Figure 6.3: Ground Water Analysis for Turbidity

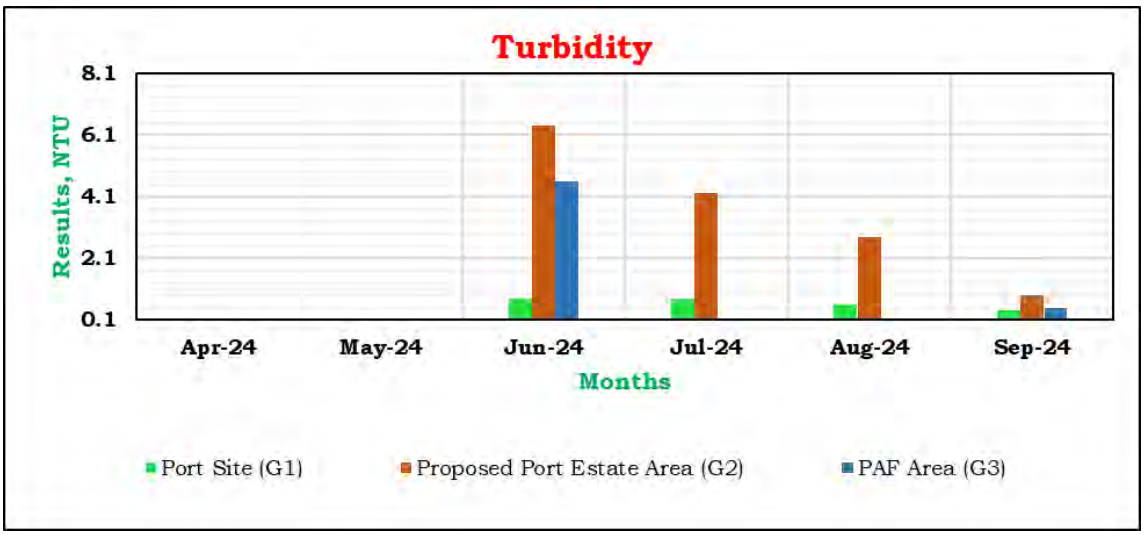


Figure 6.4: Ground Water Analysis for Total Dissolved Solids

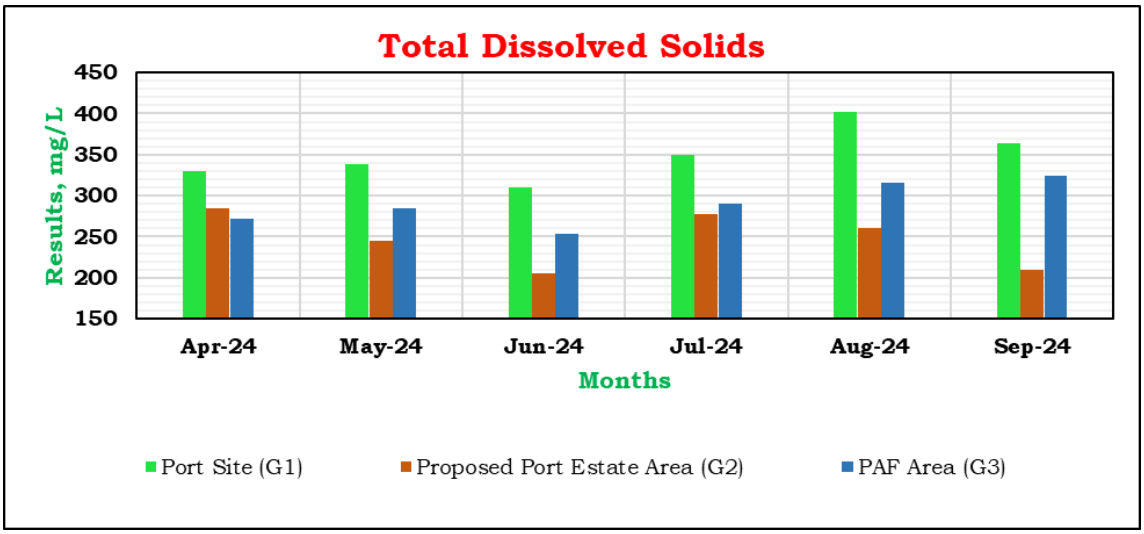


Figure 6.5: Ground Water Analysis for Chloride

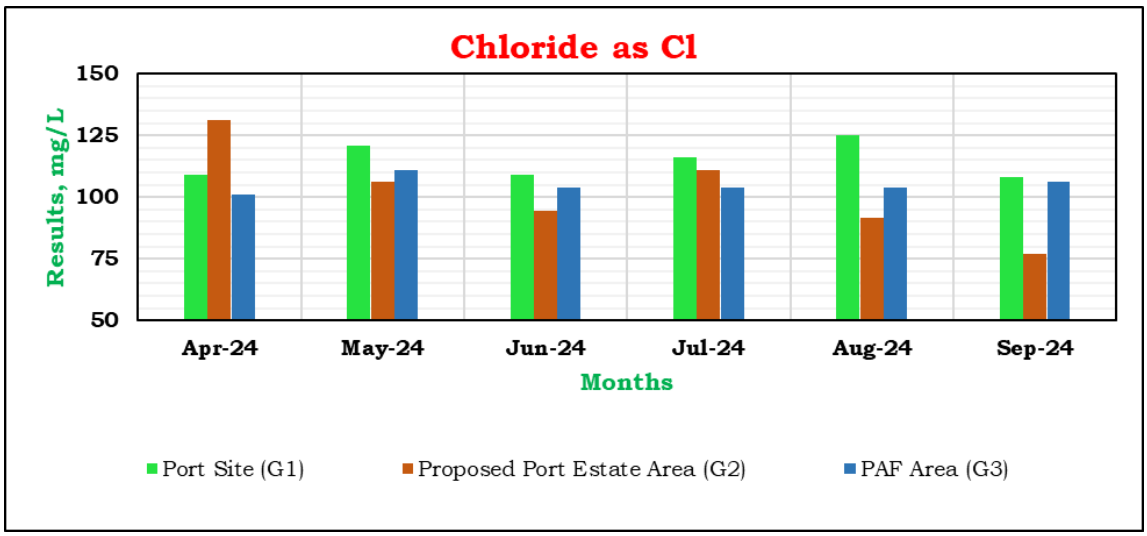


Figure 6.6: Ground Water Analysis for Sulphate as SO_4

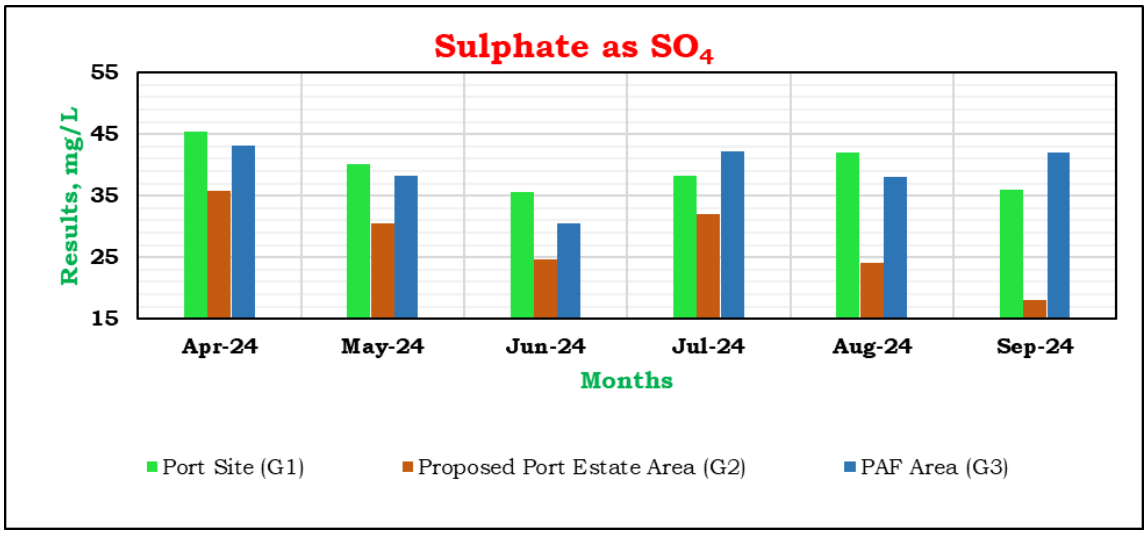


Figure 6.7: Ground Water Analysis for Calcium as Ca

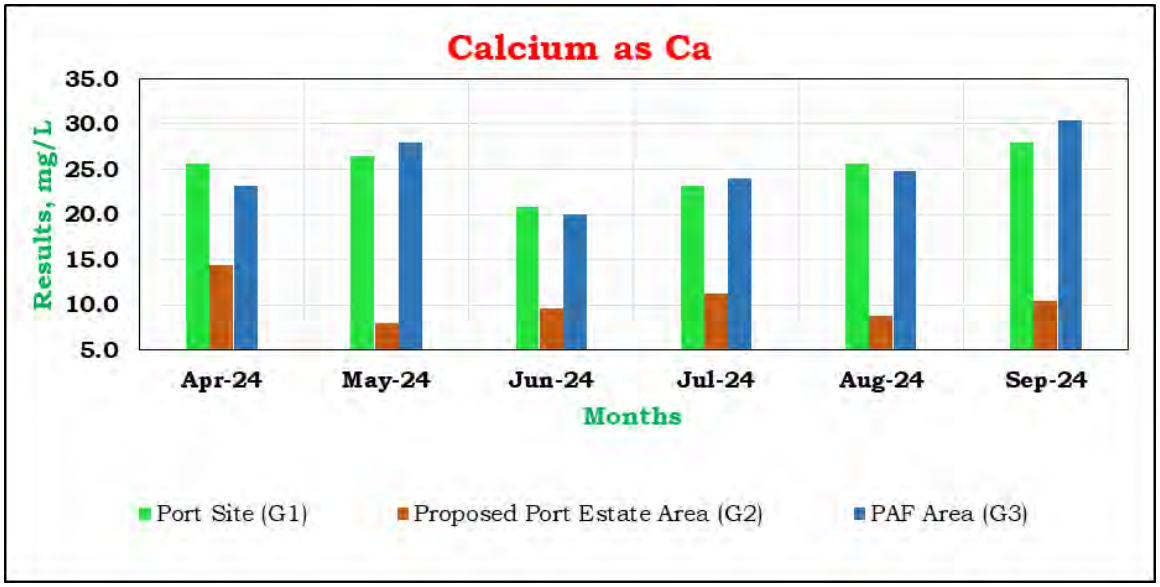


Figure 6.8: Ground Water Analysis for Magnesium as Mg

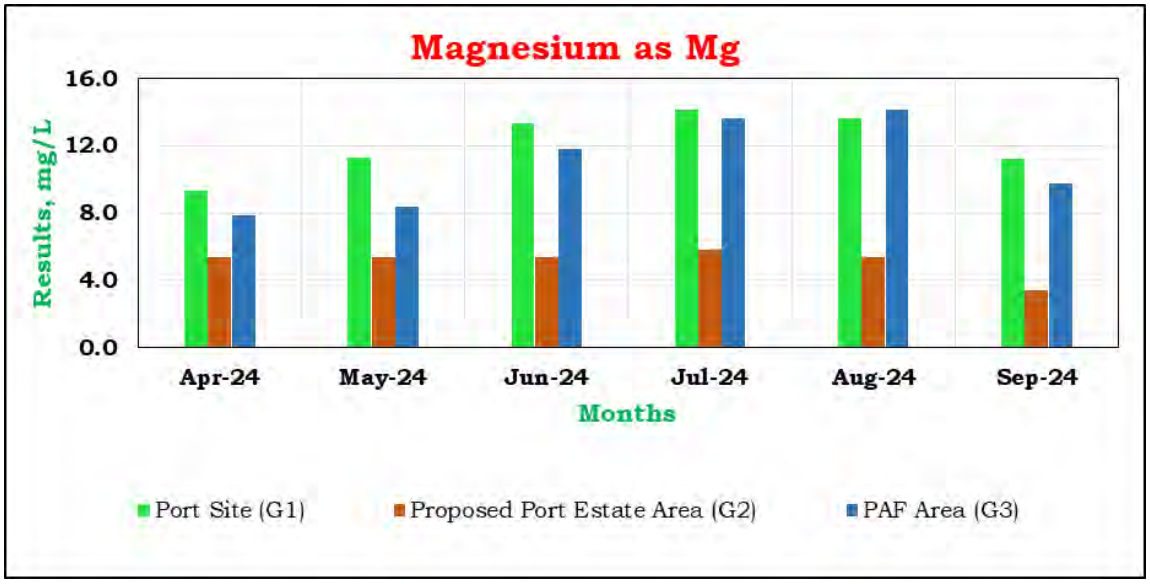


Figure 6.9: Ground Water Analysis for Iron as Fe

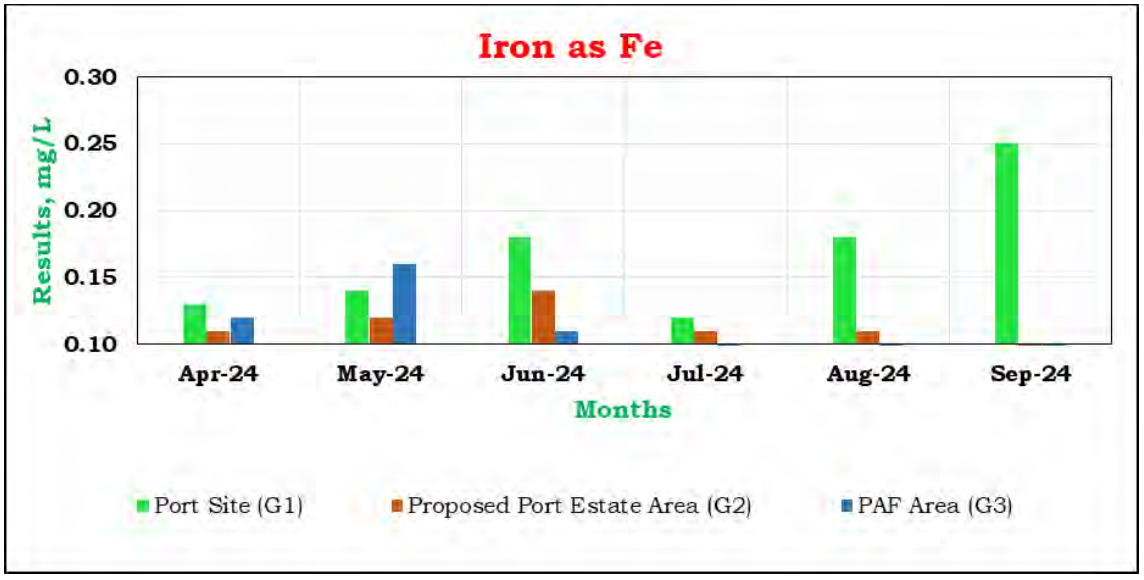


Figure 6.10: Ground Water Analysis for Total Alkalinity as $CaCO_3$

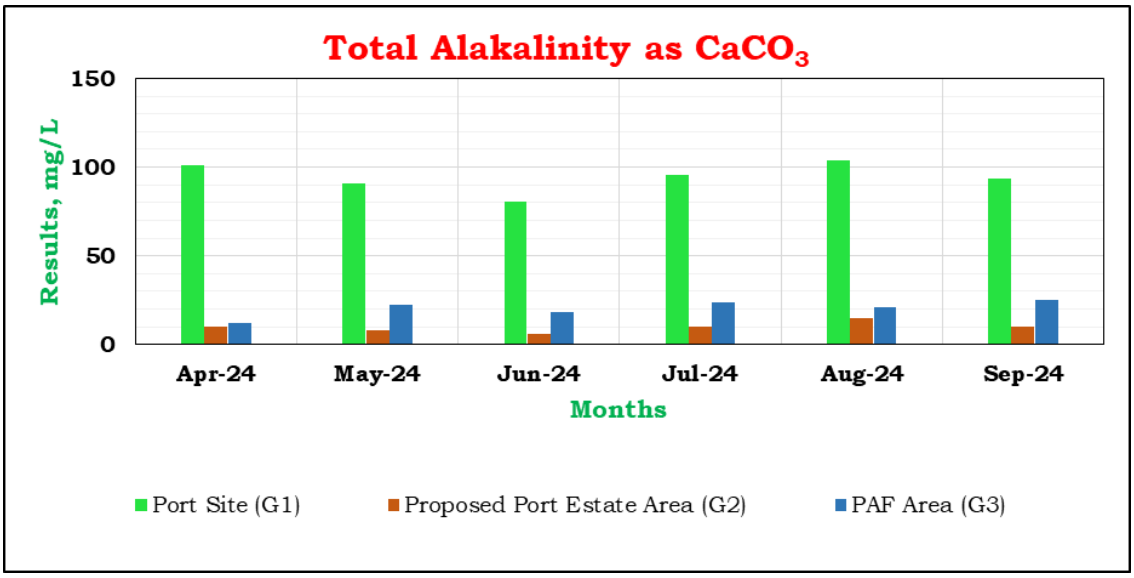
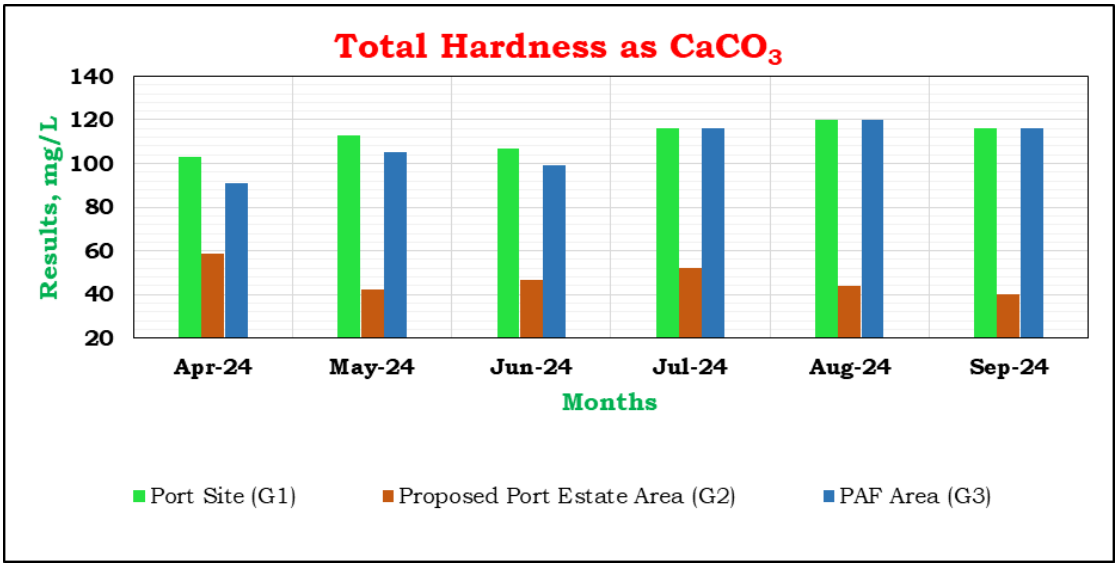


Figure 6.11: Ground Water Analysis for Total Hardness as $CaCO_3$



HYR-6.5. Summary- Ground Water Analysis

During the period from April 2024 to September 2024, the following is the summary of ground water analysis:

a) At the location **Port Site** (Open Well),

- Colour observed was 1 Hazen unit and the odour was agreeable
- pH was observed in the range from7.12 to 8.06
- Turbidity was observed in the range from BDL to 0.8 NTU
- Total Dissolved Solids were observed in the range from 310 to 402 mg/L
- Calcium (as Ca) was observed in the range from 20.8 to 28.0 mg/L
- Chloride (as Cl) was observed in the range from 108 to 125 mg/L
- Iron (as Fe) was observed in the range from 0.120 to 0.250 mg/L
- Magnesium (as Mg) was observed in the range from 9.35 to 14.1 mg/L
- Sulphate (as SO_4) was observed in the range from 35.6 to 45.4 mg/L
- Total Alkalinity (as $CaCO_3$) was observed in the range from 90.9 to 104 mg/L
- Total Hardness (as $CaCO_3$) was observed in the range from 103 to 120 mg/L
- Ammonia (as NH_3-N), Manganese (as Mn), Nitrate (as NO_3), Aluminium (as Al), Zinc (as Zn), Anionic Detergents, Barium (as Ba), Boron (as B) Chloramines (as Cl_2),Fluoride (as F), Copper (as Cu), Mineral Oil, Phenolic Compounds(as C_6H_5OH), Selenium (as Se), Silver (as Ag), Hydrogen Sulphide (as H_2S), Cadmium (as Cd), Cyanide (as CN), Lead (as Pb), Mercury (as Hg), Molybdenum (as Mo), Nickel (as Ni), Total Arsenic (as As), Total Chromium (as Cr), Pesticide Residues, Trihalomethanes, Polychlorinated Biphenyls (PCB) and Polynuclear Aromatic Hydrocarbons (PAH) were observed below detectable limits
- Bacteriological parameters such as *E.coli* and Total Coliforms were not detected.

b) At the location **Proposed Port Estate Area** (Open Well),

- Colour observed was 1 Hazen unit and the odour was agreeable
- pH was observed in the range from 6.53 to 7.61
- Turbidity was observed in the range from BDL to 6.4 NTU
- Total Dissolved Solids were observed in the range from 205 to 284 mg/L
- Calcium (as Ca) was observed in the range from 8.0 to 14.4 mg/L
- Chloride (as Cl) was observed in the range from 77.1 to 131 mg/L

- Iron (as Fe) was observed in the range from BDL to 0.14 mg/L
- Magnesium (as Mg) was observed in the range from 3.41 to 5.84 mg/L
- Sulphate (as SO_4) was observed in the range from 18.0 to 35.8 mg/L
- Total Alkalinity (as $CaCO_3$) was observed in the range from 6.06 to 14.6 mg/L
- Total Hardness (as $CaCO_3$) was observed in the range from 40.0 to 58.6 mg/L
- Ammonia (as NH_3-N), Manganese (as Mn), Nitrate (as NO_3), Aluminium (as Al), Zinc (as Zn), Anionic Detergents, Barium (as Ba), Boron (as B) Chloramines (as Cl_2), Fluoride (as F), Copper (as Cu), Mineral Oil, Phenolic Compounds (as C_6H_5OH), Selenium (as Se), Silver (as Ag), Hydrogen Sulphide (as H_2S), Cadmium (as Cd), Cyanide (as CN), Lead (as Pb), Mercury (as Hg), Molybdenum (as Mo), Nickel (as Ni), Total Arsenic (as As), Total Chromium (as Cr), Pesticide Residues, Trihalomethanes, Polychlorinated Biphenyls (PCB) and Polynuclear Aromatic Hydrocarbons (PAH) were observed below detectable limits
- Bacteriological parameters such as *E.coli* and Total Coliforms were not detected.

c) At the location **PAF Area** (Open Well),

- Colour observed was 1 Hazen unit and the odour was agreeable
- pH was observed in the range from 6.58 to 7.01
- Turbidity was observed in the range from BDL to 4.6 NTU
- Total Dissolved Solids were observed in the range from 254 to 324 mg/L
- Calcium (as Ca) was observed in the range from 20.0 to 30.4 mg/L
- Chloride (as Cl) was observed in the range from 101 to 111 mg/L
- Iron (as Fe) was observed in the range from BDL to 0.16 mg/L
- Magnesium (as Mg) was observed in the range from 7.87 to 14.1 mg/L
- Sulphate (as SO_4) was observed in the range from 30.5 to 43.2 mg/L
- Total Alkalinity (as $CaCO_3$) was observed in the range from 12.2 to 24.9 mg/L
- Total Hardness (as $CaCO_3$) was observed in the range from 90.9 to 120 mg/L
- Turbidity, Ammonia (as NH_3-N), Manganese (as Mn), Nitrate (as NO_3), Aluminium (as Al), Zinc (as Zn), Anionic Detergents, Barium (as Ba), Boron (as B) Chloramines (as Cl_2), Fluoride (as F), Copper (as Cu), Mineral Oil, Phenolic Compounds (as C_6H_5OH), Selenium (as Se), Silver (as Ag), Hydrogen Sulphide (as H_2S), Cadmium (as Cd), Cyanide (as CN),

Lead (as Pb), Mercury (as Hg), Molybdenum (as Mo), Nickel (as Ni), Total Arsenic (as As), Total Chromium (as Cr), Pesticide Residues, Trihalomethanes, Polychlorinated Biphenyls (PCB) and Polynuclear Aromatic Hydrocarbons (PAH) were observed below detectable limits

- Bacteriological parameters such as *E.coli* and Total Coliforms were not detected.

d) Summary – Comparison of Results of **All Locations**,

- Colour observed was 1 Hazen unit and the odour was agreeable in all locations
- Maximum value of pH observed was 8.06 at Port Site
- Maximum value of Turbidity was 6.4 at Proposed Port Estate Area
- Maximum value of Total Dissolved Solids observed was 402 mg/L at Port Site
- Maximum value of Calcium (as Ca) observed was 30.4 mg/L at PAF Area
- Maximum value of Chloride (as Cl) observed was 131 mg/L at Proposed Port Estate Area
- Maximum value of Iron (as Fe) observed was 0.250 mg/L at Port Site
- Maximum value of Magnesium (as Mg) observed was 14.1 mg/L at PAF area and Port site.
- Maximum value of Sulphate (as SO_4) observed was 45.4 mg/L at Port site
- Maximum value of Total Alkalinity (as $CaCO_3$) observed was 104 mg/L at Port Site
- Maximum value of Total Hardness (as $CaCO_3$) observed was 120 mg/L at Port Site and PAF area
- Ammonia (as NH_3-N), Manganese (as Mn), Nitrate (as NO_3), Aluminium (as Al), Zinc (as Zn), Anionic Detergents, Barium (as Ba), Boron (as B) Chloramines (as Cl_2), Fluoride (as F), Copper (as Cu), Mineral Oil, Phenolic Compounds (as C_6H_5OH), Selenium (as Se), Silver (as Ag), Hydrogen Sulphide (as H_2S), Cadmium (as Cd), Cyanide (as CN), Lead (as Pb), Mercury (as Hg), Molybdenum (as Mo), Nickel (as Ni), Total Arsenic (as As), Total Chromium (as Cr), Pesticide Residues, Trihalomethanes, Polychlorinated Biphenyls (PCB) and Polynuclear Aromatic Hydrocarbons (PAH) were observed below detectable limits at all locations

- Bacteriological parameters such as *E.coli* and Total Coliforms were not detected at all locations.

HYR-6.6. Surface Water Analysis Results for the period from April 2024 to September 2024:

Table 6.5: Surface Water Analysis Results

Sl. No.	Parameters	Unit	Month	Poovar West Canal S1	Vizhinjam Branch Canal S2	Vellayani Lake S3	Poovar Estuary S4
Physical Parameters							
1.	Colour	Hazen Units	Apr-24	1	1	1	1
			May-24	1	1	1	1
			Jun-24	1	1	1	1
			Jul-24	1	1	1	1
			Aug-24	1	1	1	1
			Sep-24	1	1	1	1
2.	Odour	-	Apr-24	Agreeable	Agreeable	Agreeable	Agreeable
			May-24	Agreeable	Agreeable	Agreeable	Agreeable
			Jun-24	Agreeable	Agreeable	Agreeable	Agreeable
			Jul-24	Agreeable	Agreeable	Agreeable	Agreeable
			Aug-24	Agreeable	Agreeable	Agreeable	Agreeable
			Sep-24	Agreeable	Agreeable	Agreeable	Agreeable
3.	pH Value	-	Apr-24	7.12	7.24	7.19	7.38
			May-24	7.18	7.18	7.21	7.23
			Jun-24	7.05	7.41	7.10	7.18
			Jul-24	7.02	7.58	7.15	7.18
			Aug-24	7.12	6.88	7.37	7.31
			Sep-24	6.30	7.54	7.23	7.45
4.	Turbidity	N.T.U.	Apr-24	2.0	0.9	4.1	1.2
			May-24	1.2	1.0	6.2	0.8
			Jun-24	3.6	10.3	4.2	6.6
			Jul-24	5.6	6.5	3.6	6.6
			Aug-24	0.4	2.6	2.8	2.5
			Sep-24	0.8	2.6	1.5	2.2
5.	Electrical Conductivity (at 25°C)	µmho/cm	Apr-24	1180	295	255	5810
			May-24	1259	336	270	5785
			Jun-24	1744	284	230	4461
			Jul-24	1460	295	218	5708
			Aug-24	1245	280	217	4825
			Sep-24	1428	258	200	5025
6.	Total Dissolved Solids	mg/L	Apr-24	590	190	130	3205
			May-24	630	202	150	3190
			Jun-24	872	170	127	2855

Sl. No.	Parameters	Unit	Month	Poovar West Canal S1	Vizhinjam Branch Canal S2	Vellayani Lake S3	Poovar Estuary S4
			Jul-24	805	188	120	3139
			Aug-24	682	180	118	2895
			Sep-24	785	165	102	3200
Chemical Parameters							
7.	Dissolved Oxygen	mg/L	Apr-24	7.10	6.80	6.90	6.90
			May-24	6.90	7.10	6.80	6.80
			Jun-24	6.80	7.00	6.90	6.90
			Jul-24	6.90	6.90	7.10	6.80
			Aug-24	7.10	6.80	6.90	7.10
			Sep-24	6.90	7.10	7.00	6.70
8.	Biochemical Oxygen Demand (3 days, 27°C)	mg/L	Apr-24	BDL	BDL	BDL	BDL
			May-24	BDL	BDL	BDL	BDL
			Jun-24	BDL	BDL	BDL	BDL
			Jul-24	BDL	BDL	BDL	BDL
			Aug-24	BDL	BDL	BDL	BDL
			Sep-24	BDL	BDL	BDL	BDL
9.	Oil & Grease	mg/L	Apr-24	BDL	BDL	BDL	BDL
			May-24	BDL	BDL	BDL	BDL
			Jun-24	BDL	BDL	BDL	BDL
			Jul-24	BDL	BDL	BDL	BDL
			Aug-24	BDL	BDL	BDL	BDL
			Sep-24	BDL	BDL	BDL	BDL
10.	Free Ammonia	mg/L	Apr-24	BDL	BDL	BDL	1.21
			May-24	BDL	BDL	BDL	1.02
			Jun-24	BDL	BDL	BDL	1.53
			Jul-24	BDL	BDL	BDL	1.12
			Aug-24	BDL	BDL	BDL	1.08
			Sep-24	BDL	BDL	BDL	1.26
11.	Anionic Detergents (as MBAS) Calculated as LAS mol.wt. 288.38	mg/L	Apr-24	BDL	BDL	BDL	BDL
			May-24	BDL	BDL	BDL	BDL
			Jun-24	BDL	BDL	BDL	BDL
			Jul-24	BDL	BDL	BDL	BDL
			Aug-24	BDL	BDL	BDL	BDL
			Sep-24	BDL	BDL	BDL	BDL
12.	Barium (as Ba)	mg/L	Apr-24	BDL	BDL	BDL	BDL
			May-24	BDL	BDL	BDL	BDL
			Jun-24	BDL	BDL	BDL	BDL
			Jul-24	BDL	BDL	BDL	BDL
			Aug-24	BDL	BDL	BDL	BDL
			Sep-24	BDL	BDL	BDL	BDL
13.	Boron (as B)	mg/L	Apr-24	BDL	BDL	BDL	BDL
			May-24	BDL	BDL	BDL	BDL
			Jun-24	BDL	BDL	BDL	BDL
			Jul-24	BDL	BDL	BDL	BDL

Sl. No.	Parameters	Unit	Month	Poovar West Canal S1	Vizhinjam Branch Canal S2	Vellayani Lake S3	Poovar Estuary S4
			Aug-24	BDL	BDL	BDL	BDL
			Sep-24	BDL	BDL	BDL	BDL
14.	Calcium (as Ca)	mg/L	Apr-24	23.2	14.4	12.0	44.8
			May-24	20.0	16.0	9.60	48.0
			Jun-24	18.4	11.2	8.80	64.0
			Jul-24	20.0	14.4	8.00	68.0
			Aug-24	18.4	12.8	8.00	58.4
			Sep-24	29.6	12.8	8.00	62.4
15.	Chloride (as Cl)	mg/L	Apr-24	151	70.5	30.2	906
			May-24	161	80.5	47.3	916
			Jun-24	178	69.5	39.7	844
			Jul-24	166	72.4	35.2	916
			Aug-24	121	61.7	35.2	598
			Sep-24	130	54	32.7	617
16.	Copper (as Cu)	mg/L	Apr-24	BDL	BDL	BDL	BDL
			May-24	BDL	BDL	BDL	BDL
			Jun-24	BDL	BDL	BDL	BDL
			Jul-24	BDL	BDL	BDL	BDL
			Aug-24	BDL	BDL	BDL	BDL
			Sep-24	BDL	BDL	BDL	BDL
17.	Fluoride (as F)	mg/L	Apr-24	BDL	BDL	BDL	BDL
			May-24	BDL	BDL	BDL	BDL
			Jun-24	BDL	BDL	BDL	BDL
			Jul-24	BDL	BDL	BDL	BDL
			Aug-24	BDL	BDL	BDL	BDL
			Sep-24	BDL	BDL	BDL	BDL
18.	Iron (as Fe)	mg/L	Apr-24	0.54	0.36	0.85	0.42
			May-24	0.50	0.43	1.10	0.33
			Jun-24	0.38	0.28	1.25	0.28
			Jul-24	0.30	0.22	1.10	0.30
			Aug-24	0.25	0.20	0.89	0.25
			Sep-24	0.34	0.55	0.95	0.42
19.	Magnesium (as Mg)	mg/L	Apr-24	5.90	5.41	5.41	58.5
			May-24	9.35	5.9	5.41	62.5
			Jun-24	11.3	7.3	4.92	46.7
			Jul-24	11.2	5.84	4.38	51.1
			Aug-24	11.2	5.84	3.90	35.1
			Sep-24	9.25	4.38	3.90	37.5
20.	Manganese (as Mn)	mg/L	Apr-24	BDL	BDL	BDL	BDL
			May-24	BDL	BDL	BDL	BDL
			Jun-24	BDL	BDL	BDL	BDL
			Jul-24	BDL	BDL	BDL	BDL
			Aug-24	BDL	BDL	BDL	BDL
			Sep-24	BDL	BDL	BDL	BDL

Sl. No.	Parameters	Unit	Month	Poovar West Canal S1	Vizhinjam Branch Canal S2	Vellayani Lake S3	Poovar Estuary S4
21.	Mineral Oil	mg/L	Apr-24	BDL	BDL	BDL	BDL
			May-24	BDL	BDL	BDL	BDL
			Jun-24	BDL	BDL	BDL	BDL
			Jul-24	BDL	BDL	BDL	BDL
			Aug-24	BDL	BDL	BDL	BDL
			Sep-24	BDL	BDL	BDL	BDL
22.	Nitrate (as NO_3)	mg/L	Apr-24	BDL	BDL	BDL	BDL
			May-24	BDL	BDL	BDL	BDL
			Jun-24	BDL	BDL	BDL	BDL
			Jul-24	BDL	BDL	BDL	BDL
			Aug-24	BDL	BDL	BDL	BDL
			Sep-24	BDL	BDL	BDL	BDL
23.	Phenolic Compounds (as C_6H_5OH)	mg/L	Apr-24	BDL	BDL	BDL	BDL
			May-24	BDL	BDL	BDL	BDL
			Jun-24	BDL	BDL	BDL	BDL
			Jul-24	BDL	BDL	BDL	BDL
			Aug-24	BDL	BDL	BDL	BDL
			Sep-24	BDL	BDL	BDL	BDL
24.	Selenium (as Se)	mg/L	Apr-24	BDL	BDL	BDL	BDL
			May-24	BDL	BDL	BDL	BDL
			Jun-24	BDL	BDL	BDL	BDL
			Jul-24	BDL	BDL	BDL	BDL
			Aug-24	BDL	BDL	BDL	BDL
			Sep-24	BDL	BDL	BDL	BDL
25.	Silver (as Ag)	mg/L	Apr-24	BDL	BDL	BDL	BDL
			May-24	BDL	BDL	BDL	BDL
			Jun-24	BDL	BDL	BDL	BDL
			Jul-24	BDL	BDL	BDL	BDL
			Aug-24	BDL	BDL	BDL	BDL
			Sep-24	BDL	BDL	BDL	BDL
26.	Sulphate (as SO_4)	mg/L	Apr-24	32.4	7.77	5.18	195
			May-24	28.6	7.12	4.85	186
			Jun-24	24.2	5.22	3.55	168
			Jul-24	20.5	4.66	3.12	215
			Aug-24	18.0	4.12	3.00	154
			Sep-24	36.0	2.85	2.95	170
27.	Total Phosphate (as PO_4)	mg/L	Apr-24	BDL	BDL	BDL	BDL
			May-24	BDL	BDL	BDL	BDL
			Jun-24	BDL	BDL	BDL	BDL
			Jul-24	BDL	BDL	BDL	BDL
			Aug-24	BDL	BDL	BDL	BDL
			Sep-24	BDL	BDL	BDL	BDL
28.	Total Alkalinity (as $CaCO_3$)	mg/L	Apr-24	10.2	30.3	28.3	34.7
			May-24	12.1	24.2	30.3	32.3

Sl. No.	Parameters	Unit	Month	Poovar West Canal S1	Vizhinjam Branch Canal S2	Vellayani Lake S3	Poovar Estuary S4
			Jun-24	10.1	20.2	26.3	28.3
			Jul-24	9.95	23.9	27.9	31.8
			Aug-24	16.6	18.7	33.3	31.8
			Sep-24	10.4	20.8	29.1	29.1
29.	Total Hardness (as $CaCO_3$)	mg/L	Apr-24	82.8	58.3	52.5	354
			May-24	89.0	64.6	46.5	378
			Jun-24	93.0	58.6	42.4	354
			Jul-24	96.0	60.0	38.0	380
			Aug-24	92.0	56.0	38.0	290
			Sep-24	112	50.0	36.0	310
30.	Calcium Hardness (as $CaCO_3$)	mg/L	Apr-24	58.6	36.4	30.3	113
			May-24	50.5	40.4	24.2	121
			Jun-24	46.5	28.3	22.2	162
			Jul-24	50.0	36.0	20.0	170
			Aug-24	46.0	32.0	20.0	146
			Sep-24	74.0	32.0	20.0	156
31.	Zinc (as Zn)	mg/L	Apr-24	BDL	BDL	BDL	BDL
			May-24	BDL	BDL	BDL	BDL
			Jun-24	BDL	BDL	BDL	BDL
			Jul-24	BDL	BDL	BDL	BDL
			Aug-24	BDL	BDL	BDL	BDL
			Sep-24	BDL	BDL	BDL	BDL
32.	Sodium (as Na)	mg/L	Apr-24	58.3	18.5	12.8	293
			May-24	52.0	17.2	13.5	297
			Jun-24	58.0	12.6	10.2	255
			Jul-24	49.0	10.5	8.70	290
			Aug-24	42.0	14.0	8.30	250
			Sep-24	48.0	10.2	8.00	290
33.	Potassium (as K)	mg/L	Apr-24	3.85	2.30	1.72	18.5
			May-24	4.10	1.95	2.14	21.2
			Jun-24	4.88	1.11	1.95	17.5
			Jul-24	4.26	1.00	1.26	17.8
			Aug-24	2.85	1.25	1.38	12.4
			Sep-24	3.44	1.10	1.22	14.6
34.	Sodium Adsorption Ratio	-	Apr-24	2.795	1.054	0.770	6.783
			May-24	2.418	0.933	0.863	6.649
			Jun-24	2.609	0.719	0.682	5.908
			Jul-24	2.151	0.589	0.610	7.044
			Aug-24	1.908	0.813	0.597	6.378
			Sep-24	1.980	0.627	0.576	7.158
35.	Cadmium (as Cd)	mg/L	Apr-24	BDL	BDL	BDL	BDL
			May-24	BDL	BDL	BDL	BDL
			Jun-24	BDL	BDL	BDL	BDL
			Jul-24	BDL	BDL	BDL	BDL

Sl. No.	Parameters	Unit	Month	Poovar West Canal S1	Vizhinjam Branch Canal S2	Vellayani Lake S3	Poovar Estuary S4
			Aug-24	BDL	BDL	BDL	BDL
			Sep-24	BDL	BDL	BDL	BDL
36.	Cyanide (as CN)	mg/L	Apr-24	BDL	BDL	BDL	BDL
			May-24	BDL	BDL	BDL	BDL
			Jun-24	BDL	BDL	BDL	BDL
			Jul-24	BDL	BDL	BDL	BDL
			Aug-24	BDL	BDL	BDL	BDL
			Sep-24	BDL	BDL	BDL	BDL
37.	Lead (as Pb)	mg/L	Apr-24	BDL	BDL	BDL	BDL
			May-24	BDL	BDL	BDL	BDL
			Jun-24	BDL	BDL	BDL	BDL
			Jul-24	BDL	BDL	BDL	BDL
			Aug-24	BDL	BDL	BDL	BDL
			Sep-24	BDL	BDL	BDL	BDL
38.	Mercury (as Hg)	mg/L	Apr-24	BDL	BDL	BDL	BDL
			May-24	BDL	BDL	BDL	BDL
			Jun-24	BDL	BDL	BDL	BDL
			Jul-24	BDL	BDL	BDL	BDL
			Aug-24	BDL	BDL	BDL	BDL
			Sep-24	BDL	BDL	BDL	BDL
39. Pesticide Residues							
i.	Alachlor	µg/L	Apr-24	BDL	BDL	BDL	BDL
			May-24	BDL	BDL	BDL	BDL
			Jun-24	BDL	BDL	BDL	BDL
			Jul-24	BDL	BDL	BDL	BDL
			Aug-24	BDL	BDL	BDL	BDL
			Sep-24	BDL	BDL	BDL	BDL
ii.	Atrazine	µg/L	Apr-24	BDL	BDL	BDL	BDL
			May-24	BDL	BDL	BDL	BDL
			Jun-24	BDL	BDL	BDL	BDL
			Jul-24	BDL	BDL	BDL	BDL
			Aug-24	BDL	BDL	BDL	BDL
			Sep-24	BDL	BDL	BDL	BDL
iii.	Aldrin/Dieldrin	µg/L	Apr-24	BDL	BDL	BDL	BDL
			May-24	BDL	BDL	BDL	BDL
			Jun-24	BDL	BDL	BDL	BDL
			Jul-24	BDL	BDL	BDL	BDL
			Aug-24	BDL	BDL	BDL	BDL
			Sep-24	BDL	BDL	BDL	BDL
iv.	Alpha HCH	µg/L	Apr-24	BDL	BDL	BDL	BDL
			May-24	BDL	BDL	BDL	BDL
			Jun-24	BDL	BDL	BDL	BDL
			Jul-24	BDL	BDL	BDL	BDL
			Aug-24	BDL	BDL	BDL	BDL

Sl. No.	Parameters	Unit	Month	Poovar West Canal S1	Vizhinjam Branch Canal S2	Vellayani Lake S3	Poovar Estuary S4
			Sep-24	BDL	BDL	BDL	BDL
v.	Beta HCH	µg/L	Apr-24	BDL	BDL	BDL	BDL
			May-24	BDL	BDL	BDL	BDL
			Jun-24	BDL	BDL	BDL	BDL
			Jul-24	BDL	BDL	BDL	BDL
			Aug-24	BDL	BDL	BDL	BDL
			Sep-24	BDL	BDL	BDL	BDL
vi.	Butachlor	µg/L	Apr-24	BDL	BDL	BDL	BDL
			May-24	BDL	BDL	BDL	BDL
			Jun-24	BDL	BDL	BDL	BDL
			Jul-24	BDL	BDL	BDL	BDL
			Aug-24	BDL	BDL	BDL	BDL
			Sep-24	BDL	BDL	BDL	BDL
vii.	Chlorpyrifos	µg/L	Apr-24	BDL	BDL	BDL	BDL
			May-24	BDL	BDL	BDL	BDL
			Jun-24	BDL	BDL	BDL	BDL
			Jul-24	BDL	BDL	BDL	BDL
			Aug-24	BDL	BDL	BDL	BDL
			Sep-24	BDL	BDL	BDL	BDL
viii.	Delta HCH	µg/L	Apr-24	BDL	BDL	BDL	BDL
			May-24	BDL	BDL	BDL	BDL
			Jun-24	BDL	BDL	BDL	BDL
			Jul-24	BDL	BDL	BDL	BDL
			Aug-24	BDL	BDL	BDL	BDL
			Sep-24	BDL	BDL	BDL	BDL
ix.	2,4D chlorophenoxyacetic acid	µg/L	Apr-24	BDL	BDL	BDL	BDL
			May-24	BDL	BDL	BDL	BDL
			Jun-24	BDL	BDL	BDL	BDL
			Jul-24	BDL	BDL	BDL	BDL
			Aug-24	BDL	BDL	BDL	BDL
			Sep-24	BDL	BDL	BDL	BDL
x.	DDT (o,p&p,p-Isomers of DDT, DDE, DDD)	µg/L	Apr-24	BDL	BDL	BDL	BDL
			May-24	BDL	BDL	BDL	BDL
			Jun-24	BDL	BDL	BDL	BDL
			Jul-24	BDL	BDL	BDL	BDL
			Aug-24	BDL	BDL	BDL	BDL
			Sep-24	BDL	BDL	BDL	BDL
xi.	Endosulfan (α,β & Sulphate)	µg/L	Apr-24	BDL	BDL	BDL	BDL
			May-24	BDL	BDL	BDL	BDL
			Jun-24	BDL	BDL	BDL	BDL
			Jul-24	BDL	BDL	BDL	BDL
			Aug-24	BDL	BDL	BDL	BDL
			Sep-24	BDL	BDL	BDL	BDL
xii.	Ethion	µg/L	Apr-24	BDL	BDL	BDL	BDL

Sl. No.	Parameters	Unit	Month	Poovar West Canal S1	Vizhinjam Branch Canal S2	Vellayani Lake S3	Poovar Estuary S4
			May-24	BDL	BDL	BDL	BDL
			Jun-24	BDL	BDL	BDL	BDL
			Jul-24	BDL	BDL	BDL	BDL
			Aug-24	BDL	BDL	BDL	BDL
			Sep-24	BDL	BDL	BDL	BDL
xiii.	γ HCH (Lindane)	µg/L	Apr-24	BDL	BDL	BDL	BDL
			May-24	BDL	BDL	BDL	BDL
			Jun-24	BDL	BDL	BDL	BDL
			Jul-24	BDL	BDL	BDL	BDL
			Aug-24	BDL	BDL	BDL	BDL
			Sep-24	BDL	BDL	BDL	BDL
xiv.	Isoproturon	µg/L	Apr-24	BDL	BDL	BDL	BDL
			May-24	BDL	BDL	BDL	BDL
			Jun-24	BDL	BDL	BDL	BDL
			Jul-24	BDL	BDL	BDL	BDL
			Aug-24	BDL	BDL	BDL	BDL
			Sep-24	BDL	BDL	BDL	BDL
xv.	Malathion	µg/L	Apr-24	BDL	BDL	BDL	BDL
			May-24	BDL	BDL	BDL	BDL
			Jun-24	BDL	BDL	BDL	BDL
			Jul-24	BDL	BDL	BDL	BDL
			Aug-24	BDL	BDL	BDL	BDL
			Sep-24	BDL	BDL	BDL	BDL
xvi.	Methyl Parathion	µg/L	Apr-24	BDL	BDL	BDL	BDL
			May-24	BDL	BDL	BDL	BDL
			Jun-24	BDL	BDL	BDL	BDL
			Jul-24	BDL	BDL	BDL	BDL
			Aug-24	BDL	BDL	BDL	BDL
			Sep-24	BDL	BDL	BDL	BDL
xvii.	Monocrotophos	µg/L	Apr-24	BDL	BDL	BDL	BDL
			May-24	BDL	BDL	BDL	BDL
			Jun-24	BDL	BDL	BDL	BDL
			Jul-24	BDL	BDL	BDL	BDL
			Aug-24	BDL	BDL	BDL	BDL
			Sep-24	BDL	BDL	BDL	BDL
xviii.	Phorate	µg/L	Apr-24	BDL	BDL	BDL	BDL
			May-24	BDL	BDL	BDL	BDL
			Jun-24	BDL	BDL	BDL	BDL
			Jul-24	BDL	BDL	BDL	BDL
			Aug-24	BDL	BDL	BDL	BDL
			Sep-24	BDL	BDL	BDL	BDL
40.	Polynuclear Aromatic Hydrocarbons	mg/L	Apr-24	BDL	BDL	BDL	BDL
			May-24	BDL	BDL	BDL	BDL
			Jun-24	BDL	BDL	BDL	BDL

Sl. No.	Parameters	Unit	Month	Poovar West Canal S1	Vizhinjam Branch Canal S2	Vellayani Lake S3	Poovar Estuary S4
	(PAH)		Jul-24	BDL	BDL	BDL	BDL
			Aug-24	BDL	BDL	BDL	BDL
			Sep-24	BDL	BDL	BDL	BDL
41.	Total Arsenic (as As)	mg/L	Apr-24	BDL	BDL	BDL	BDL
			May-24	BDL	BDL	BDL	BDL
			Jun-24	BDL	BDL	BDL	BDL
			Jul-24	BDL	BDL	BDL	BDL
			Aug-24	BDL	BDL	BDL	BDL
			Sep-24	BDL	BDL	BDL	BDL
42.	Total Chromium (as Cr)	mg/L	Apr-24	BDL	BDL	BDL	BDL
			May-24	BDL	BDL	BDL	BDL
			Jun-24	BDL	BDL	BDL	BDL
			Jul-24	BDL	BDL	BDL	BDL
			Aug-24	BDL	BDL	BDL	BDL
			Sep-24	BDL	BDL	BDL	BDL
Biological Analysis							
43.	Total Coliforms	MPN Index/100 mL	Apr-24	BDL	BDL	BDL	BDL
			May-24	BDL	BDL	BDL	BDL
			Jun-24	BDL	BDL	BDL	BDL
			Jul-24	BDL	BDL	BDL	BDL
			Aug-24	BDL	BDL	BDL	BDL
			Sep-24	BDL	BDL	BDL	BDL
44.	Faecal Coliforms	MPN Index/100 mL	Apr-24	BDL	BDL	BDL	BDL
			May-24	BDL	BDL	BDL	BDL
			Jun-24	BDL	BDL	BDL	BDL
			Jul-24	BDL	BDL	BDL	BDL
			Aug-24	BDL	BDL	BDL	BDL
			Sep-24	BDL	BDL	BDL	BDL

HYR-6.7. Graphical representation of Results for Surface Water Analysis:

Figure 6.10: Surface Water Analysis for pH value

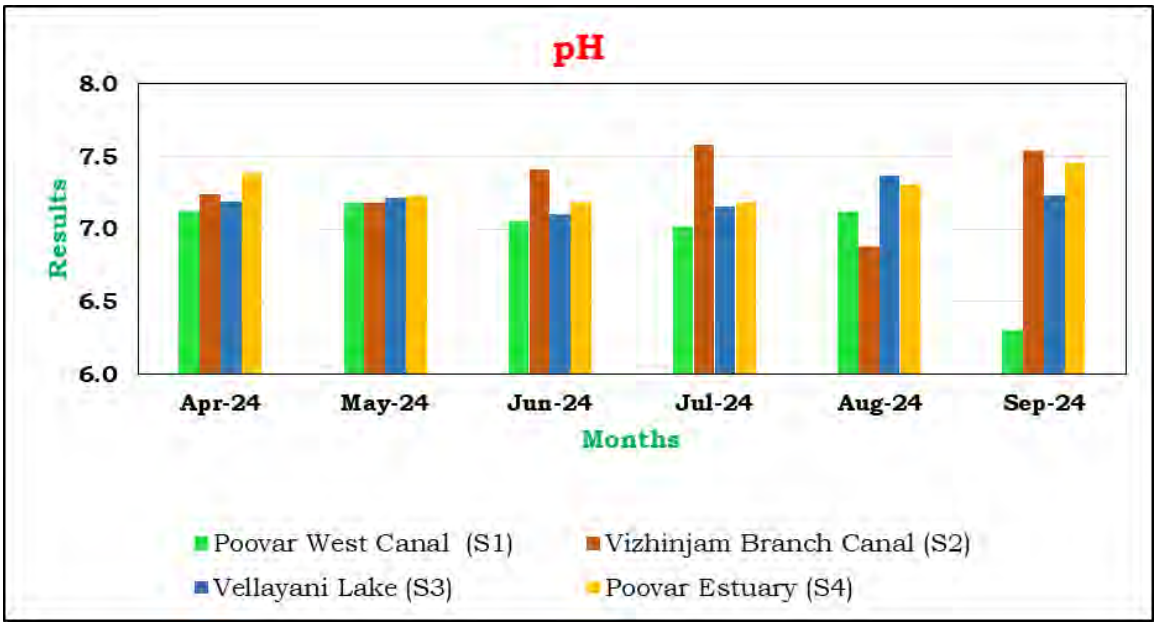


Figure 6.11: Surface Water Analysis for Turbidity

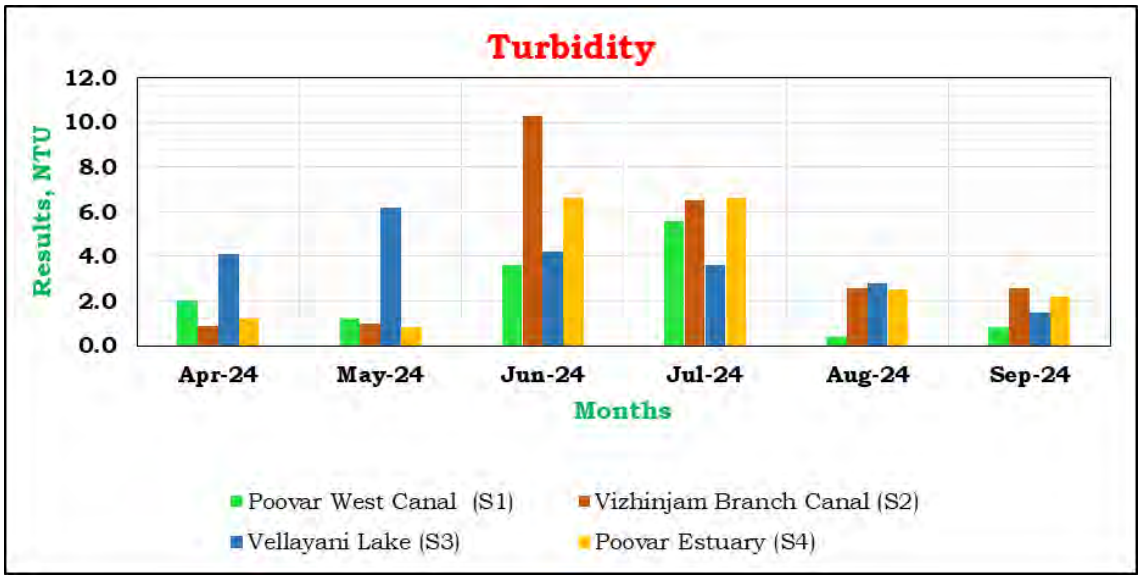


Figure 6.12: Surface Water Analysis for Electrical Conductivity @ 25 °C

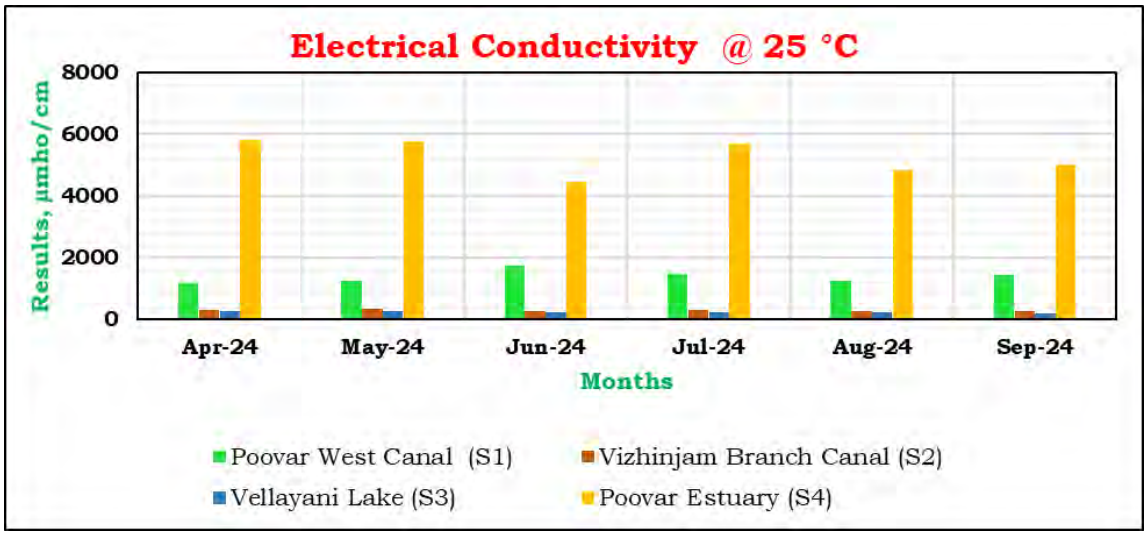


Figure 6.13: Surface Water Analysis for Total Dissolved Solids

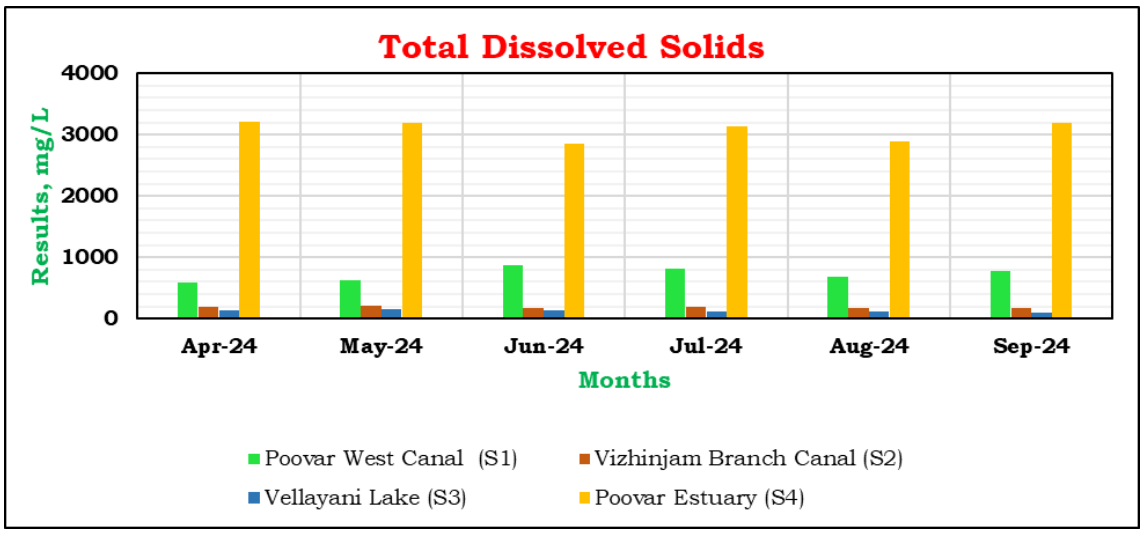


Figure 6.14: Surface Water Analysis for Dissolved Oxygen

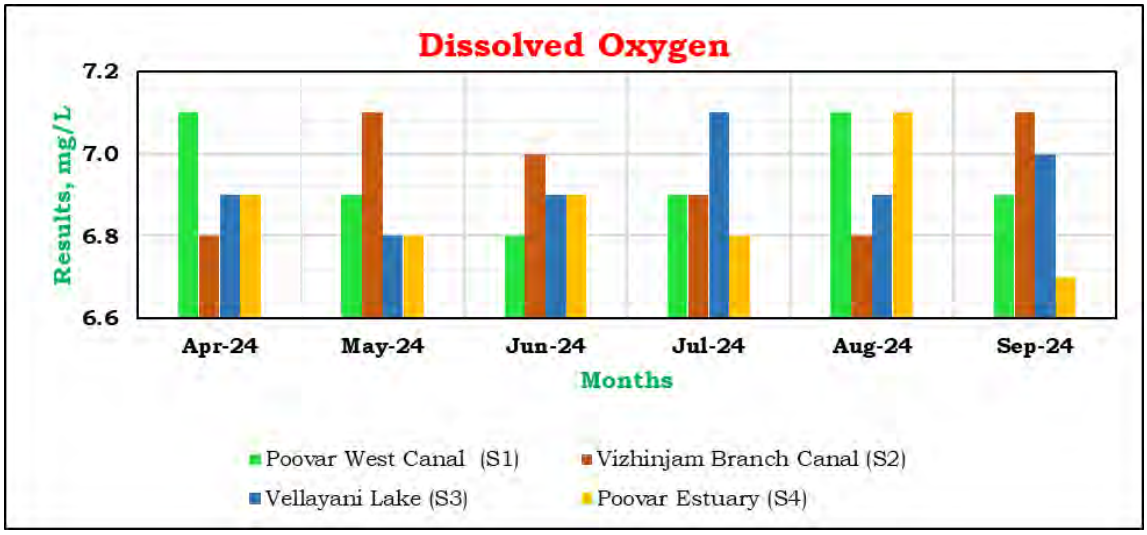


Figure 6.15: Surface Water Analysis for Chloride as Cl

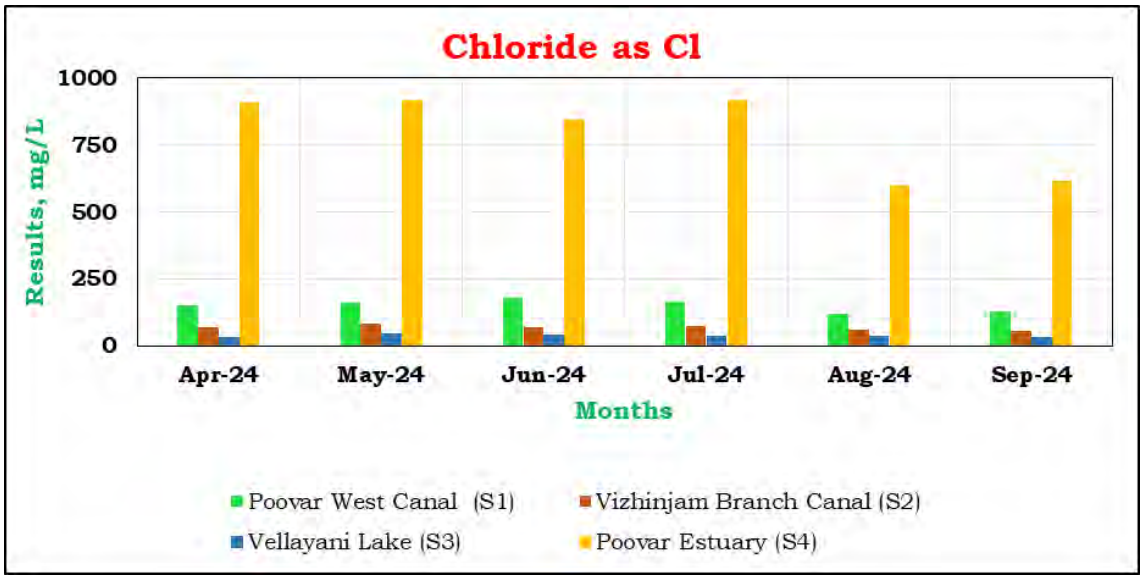


Figure 6.16: Surface Water Analysis for Sulphate as SO_4

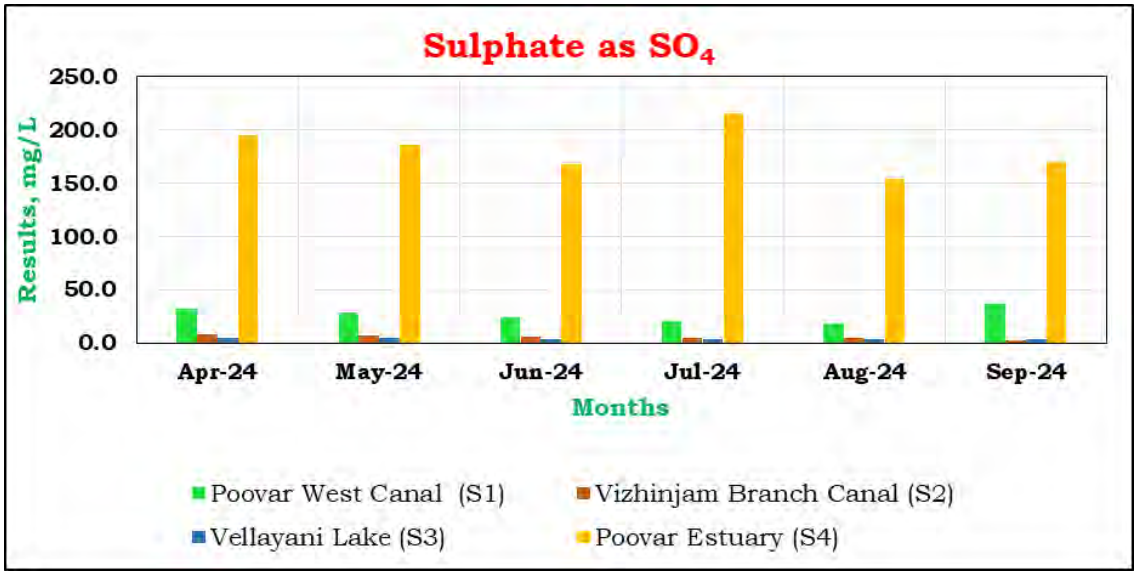


Figure 6.17: Surface Water Analysis for Calcium as Ca

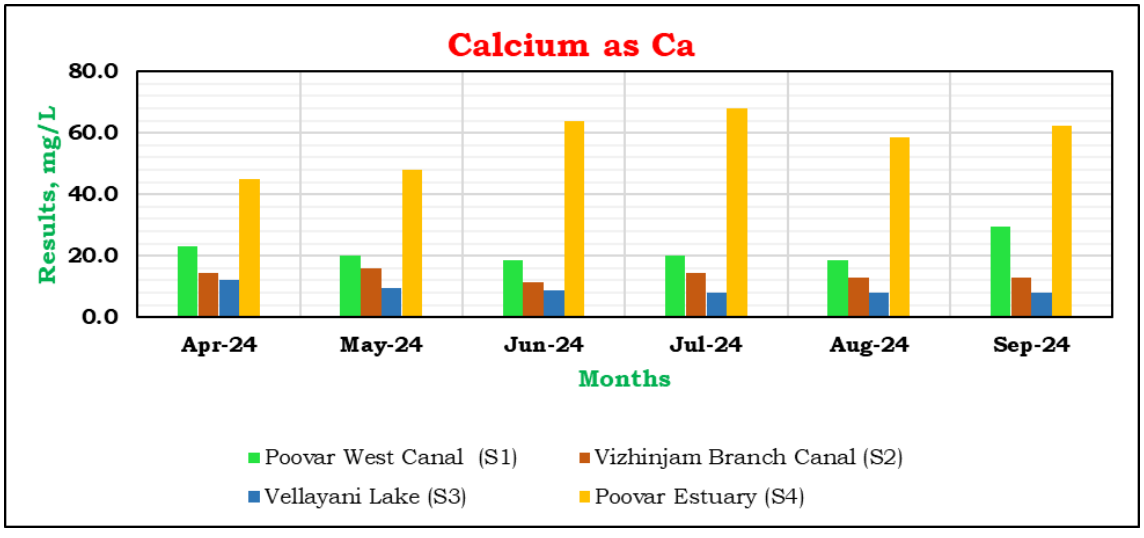


Figure 6.18: Surface Water Analysis for Magnesium as Mg

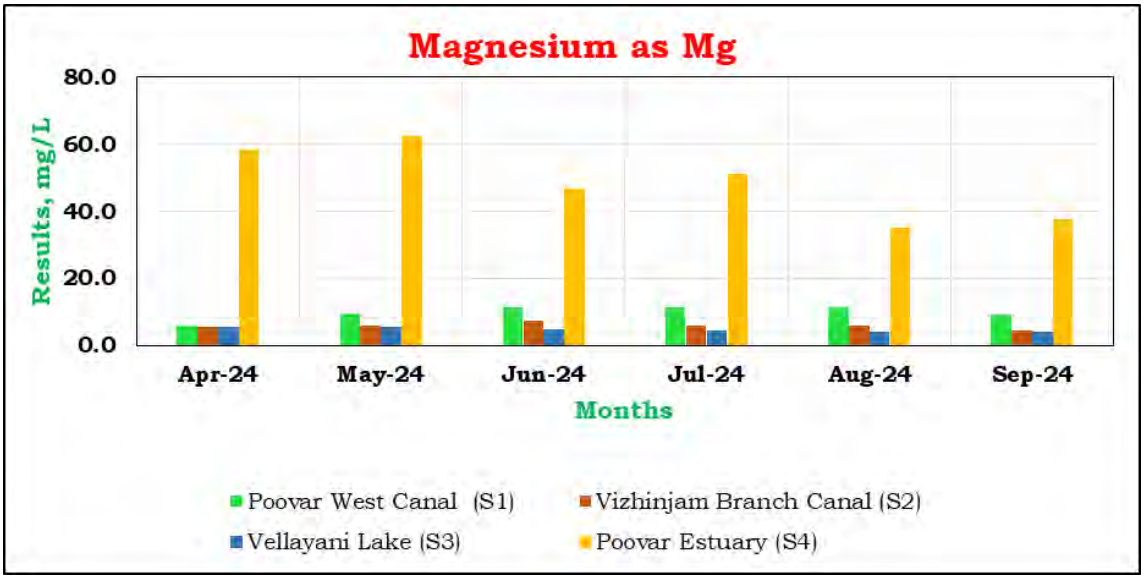


Figure 6.19: Surface Water Analysis for Iron as Fe

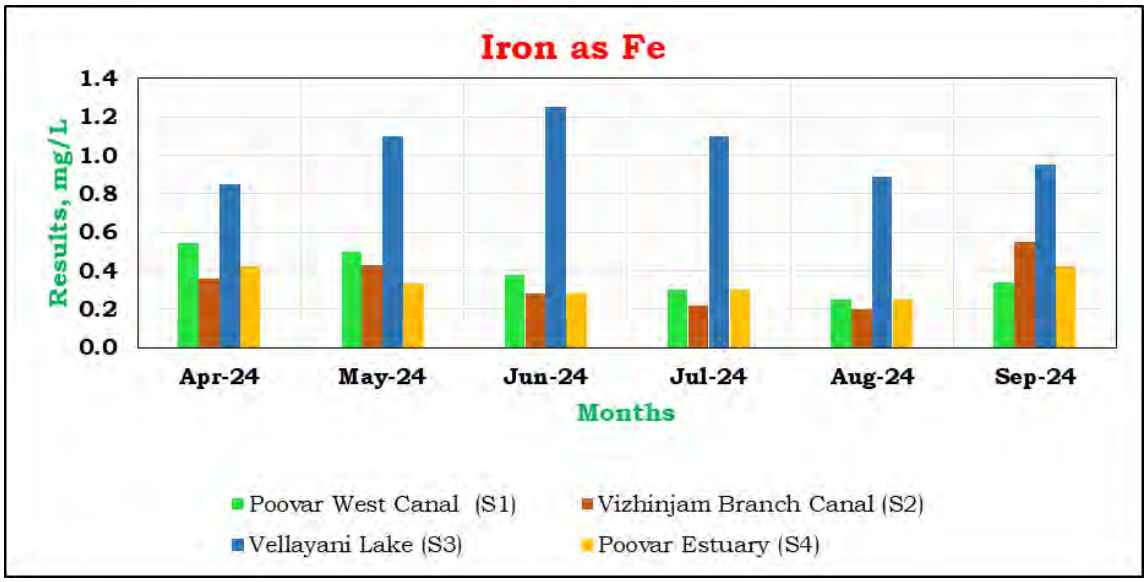


Figure 6.20: Surface Water Analysis for Total Alkalinity as $CaCO_3$

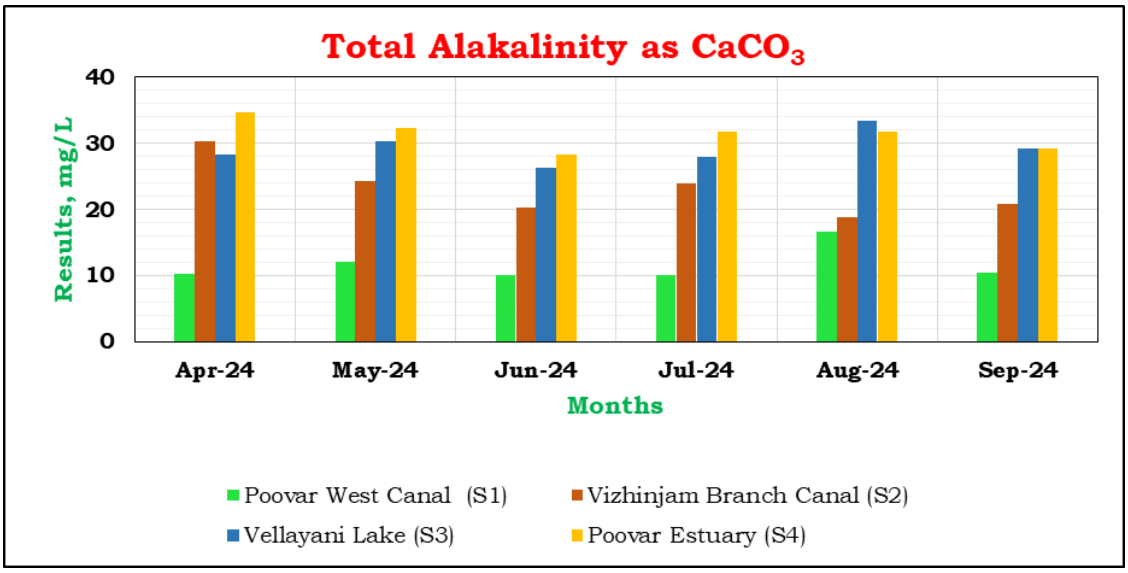


Figure 6.21: Surface Water Analysis for Total Hardness as $CaCO_3$

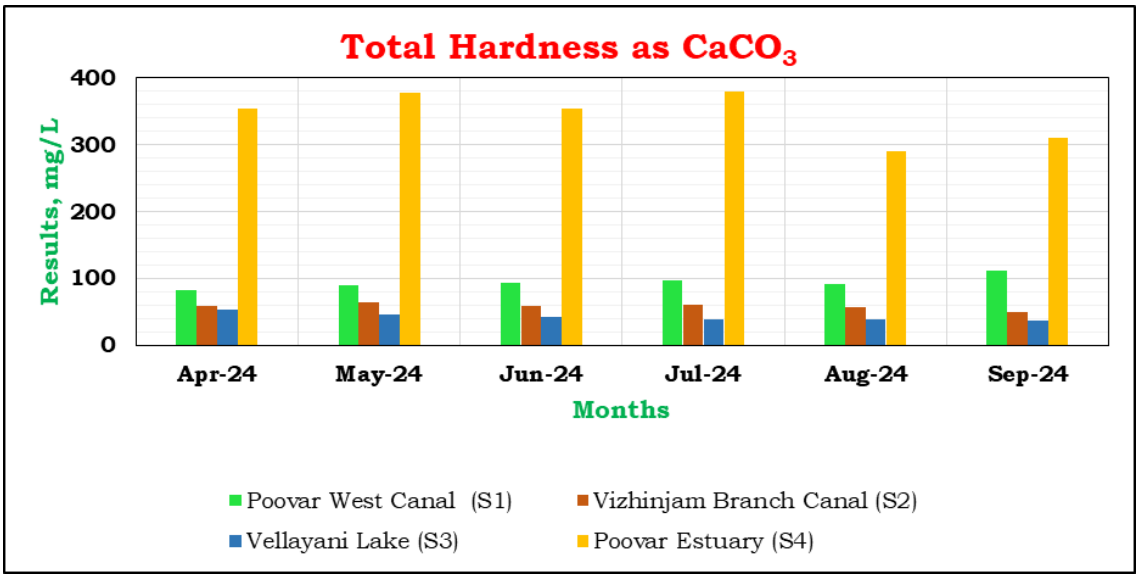


Figure 6.22: Surface Water Analysis for Calcium Hardness as $CaCO_3$

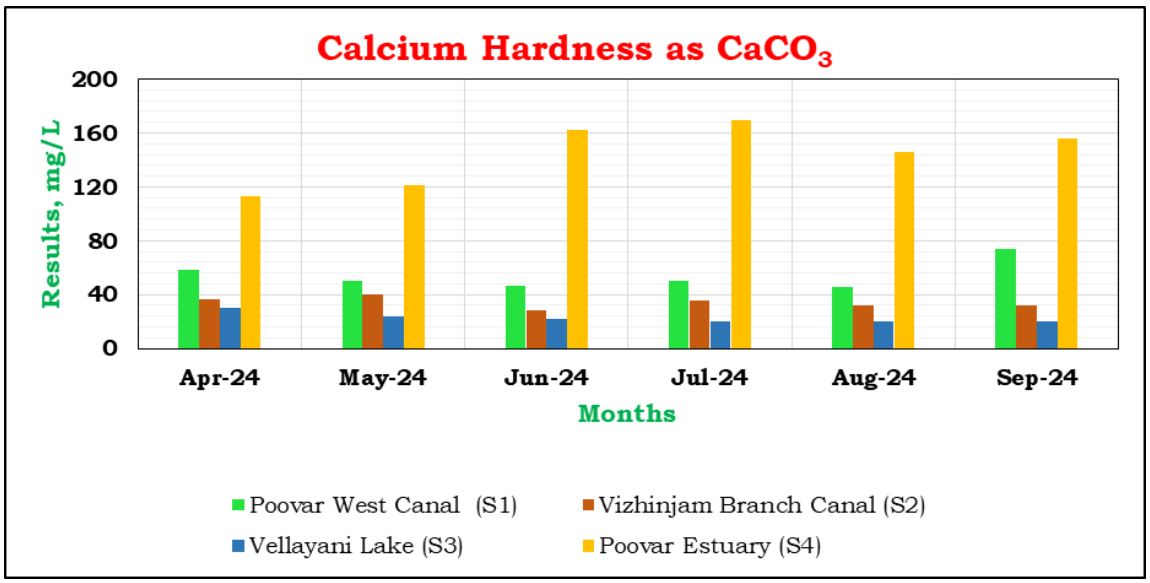


Figure 6.23: Surface Water Analysis for Sodium as Na

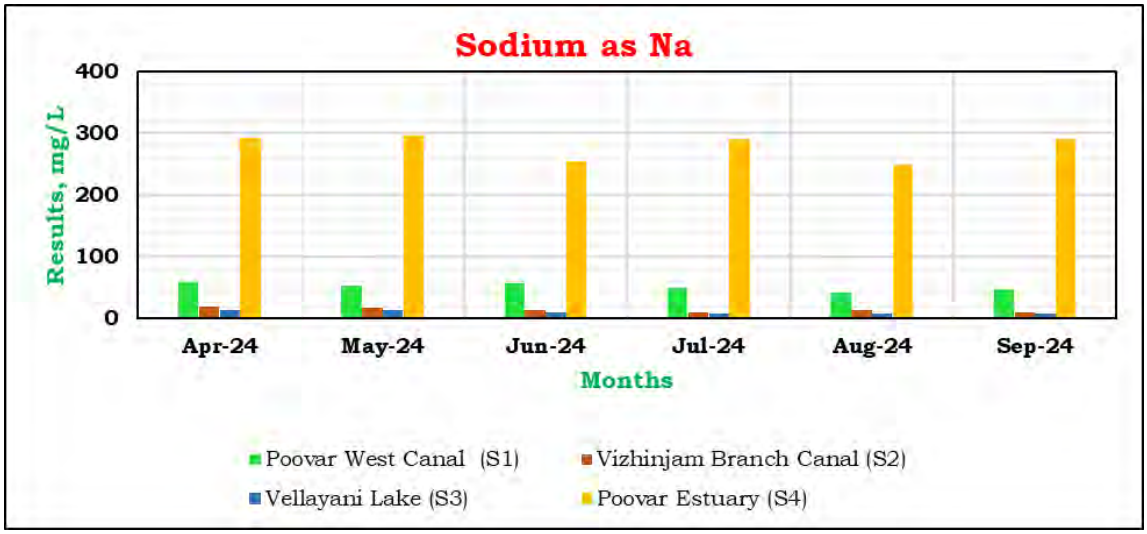


Figure 6.24: Surface Water Analysis for Potassium as K

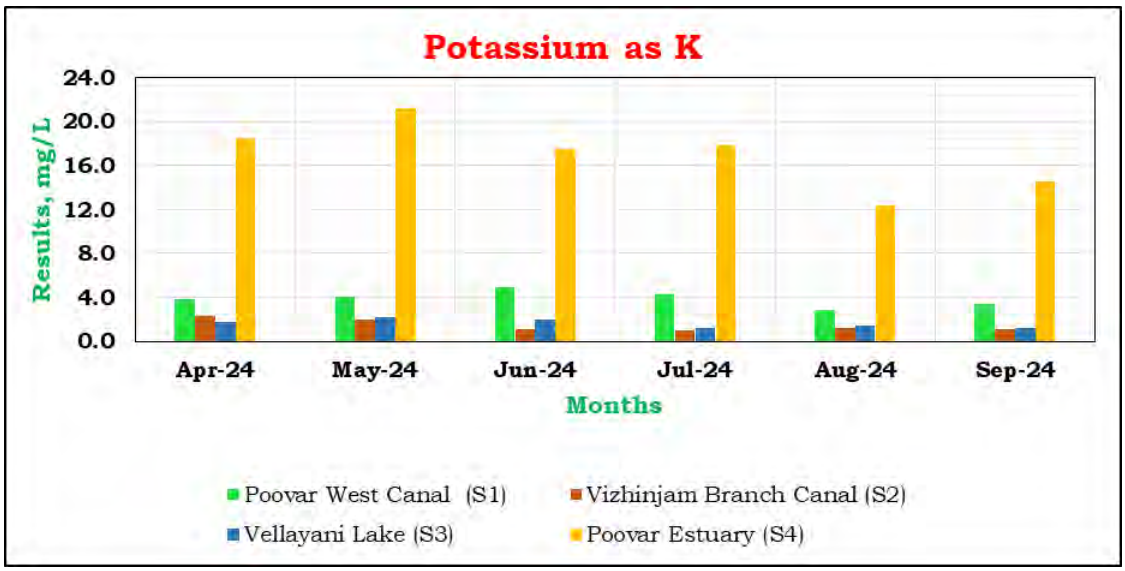
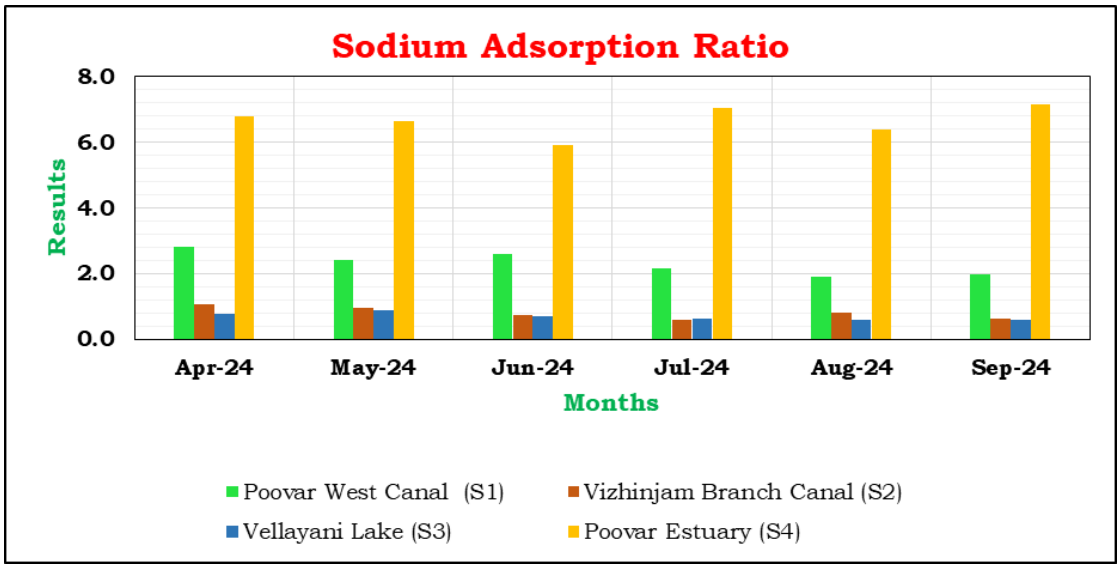


Figure 6.25: Surface Water Analysis for Sodium Adsorption Ratio



HYR-6.8. Summary of Surface water

During the period from April 2024 to September 2024, the following is the summary of surface water analysis:

a) At the location **Poovar West Canal**,

- Colour was observed 1 Hazen unit
- Odour was agreeable
- pH was observed in the range from 6.30 to 7.18
- Turbidity was observed in the range from 0.4 to 5.6 NTU
- Total Dissolved Solids were observed in the range from 590 to 872 mg/L
- Electrical Conductivity was observed in the range from 1180 to 1744 µmho/cm
- Dissolved Oxygen was observed in the range from 6.80 to 7.10 mg/L
- Calcium (as Ca) was observed in the range from 18.4 to 29.6 mg/L
- Chloride (as Cl) was observed in the range from 121 to 178 mg/L
- Iron (as Fe) was observed in the range from 0.25 to 0.54 mg/L
- Magnesium (as Mg) was observed in the range from 5.90 to 11.3 mg/L
- Sulphate (as SO_4) was observed in the range from 18.0 to 36.0 mg/L
- Total Alkalinity (as $CaCO_3$) was observed in the range from 9.95 to 16.6 mg/L
- Total Hardness (as $CaCO_3$) was observed in the range from 82.8 to 112 mg/L
- Calcium Hardness (as $CaCO_3$) was observed in the range from 46.0 to 74.0 mg/L
- Sodium (as Na) was observed in the range from 42.0 to 58.3 mg/L
- Potassium (as K) was observed in the range from 2.85 to 4.88 mg/L
- Sodium Absorption Ratio was observed in the range from 1.908 to 2.795
- Free Ammonia, Zinc (as Zn), Fluoride (as F), Manganese (as Mn), Nitrate (as NO_3), Total Phosphate (as PO_4), Biochemical Oxygen Demand (3 days, 27°C), Oil & Grease, Anionic Detergents, Barium (as Ba), Boron (as B), Copper (as Cu), Mineral Oil, Phenolic Compounds (as C_6H_5OH), Selenium (as Se), Silver (as Ag), Cadmium (as Cd), Cyanide (as CN), Lead (as Pb), Mercury (as Hg), Total Arsenic (as As), Total Chromium (as Cr), Pesticide Residues and Polynuclear Aromatic Hydrocarbons (PAH) were observed below detectable limits
- Bacteriological parameters such as Total Coliforms and Faecal Coliforms were not detected

b) At the location **Vizhinjam Branch Canal**,

- Colour was observed 1 Hazen unit
- Odour was agreeable
- pH was observed in the range from 6.88 to 7.58
- Turbidity was observed in the range from 0.9 to 10.3 NTU
- Total Dissolved Solids were observed in the range from 165 to 202 mg/L
- Electrical Conductivity was observed in the range from 258 to 336 µmho/cm
- Dissolved Oxygen was observed in the range from 6.80 to 7.10 mg/L
- Calcium (as Ca) was observed in the range from 11.2 to 16.0 mg/L
- Chloride (as Cl) was observed in the range from 54 to 80.5 mg/L
- Iron (as Fe) was observed in the range from 0.20 to 0.55 mg/L
- Magnesium (as Mg) was observed in the range from 4.38 to 7.30 mg/L
- Sulphate (as SO_4) was observed in the range from 2.85 to 7.77 mg/L
- Total Alkalinity (as $CaCO_3$) was observed in the range from 18.7 to 30.3 mg/L
- Total Hardness (as $CaCO_3$) was observed in the range from 50.0 to 64.6 mg/L
- Calcium Hardness (as $CaCO_3$) was observed in the range from 28.3 to 40.4 mg/L
- Sodium (as Na) was observed in the range from 10.2 to 18.5 mg/L
- Potassium (as K) was observed in the range from 1.0 to 2.30 mg/L
- Sodium Absorption Ratio was observed in the range from 0.589 to 1.054
- Free Ammonia, Zinc (as Zn), Total Phosphate (as PO_4), Nitrate (as NO_3), Biochemical Oxygen Demand (3 days, 27°C), Oil & Grease, Anionic Detergents, Barium (as Ba), Boron (as B), Copper (as Cu), Fluoride (as F), Manganese (as Mn), Mineral Oil, Phenolic Compounds (as C_6H_5OH), Selenium (as Se), Silver (as Ag), Cadmium (as Cd), Cyanide (as CN), Lead (as Pb), Mercury (as Hg), Total Arsenic (as As), Total Chromium (as Cr), Pesticide Residues and Polynuclear Aromatic Hydrocarbons (PAH) were observed below detectable limits
- Bacteriological parameters such as Total Coliforms and Faecal Coliforms were not detected

c) At the location **Vellayani Lake**,

- Colour was observed 1 Hazen unit

- Odour was agreeable
- pH was observed in the range from 7.10 to 7.37
- Turbidity was observed in the range from 1.5 to 6.2 NTU
- Total Dissolved Solids were observed in the range from 102 to 150 mg/L
- Electrical Conductivity was observed in the range from 200 to 270 µmho/cm
- Dissolved Oxygen was observed in the range from 6.80 to 7.10 mg/L
- Calcium (as Ca) was observed in the range from 8.00 to 12.0 mg/L
- Chloride (as Cl) was observed in the range from 30.2 to 47.3 mg/L
- Iron (as Fe) was observed in the range from 0.85 to 1.25 mg/L
- Magnesium (as Mg) was observed in the range from 3.90 to 5.41 mg/L
- Sulphate (as SO_4) was observed in the range from 2.95 to 5.18 mg/L
- Total Alkalinity (as $CaCO_3$) was observed in the range from 26.3 to 33.3 mg/L
- Total Hardness (as $CaCO_3$) was observed in the range from 36.0 to 52.5 mg/L
- Calcium Hardness (as $CaCO_3$) was observed in the range from 20.0 to 30.3 mg/L
- Sodium (as Na) was observed in the range from 8.00 to 13.5 mg/L
- Potassium (as K) was observed in the range from 1.22 to 2.14 mg/L
- Sodium Absorption Ratio was observed in the range from 0.576 to 0.863
- Free Ammonia, Zinc (as Zn), Total Phosphate (as PO_4), Nitrate (as NO_3), Manganese (as Mn), Biochemical Oxygen Demand (3 days, 27°C), Oil & Grease, Anionic Detergents, Barium (as Ba), Boron (as B), Copper (as Cu), Fluoride (as F), Mineral Oil, Phenolic Compounds (as C_6H_5OH), Selenium (as Se), Silver (as Ag), Cadmium (as Cd), Cyanide (as CN), Lead (as Pb), Mercury (as Hg), Total Arsenic (as As), Total Chromium (as Cr), Pesticide Residues and Polynuclear Aromatic Hydrocarbons (PAH) were observed below detectable limits
- Bacteriological parameters such as Total Coliforms and Faecal Coliforms were not detected

d) At the location **Poovar Estuary**,

- Colour was observed 1 Hazen unit
- Odour was agreeable
- pH was observed in the range from 7.18 to 7.45
- Turbidity was observed in the range from 0.8 to 6.6 NTU

- Total Dissolved Solids were observed in the range from 2855 to 3205 mg/L
- Electrical Conductivity was observed in the range from 4461 to 5810 µmho/cm
- Dissolved Oxygen was observed in the range from 6.70 to 7.10 mg/L
- Free Ammonia was observed in the range from 1.02 to 1.53 mg/L
- Calcium (as Ca) was observed in the range from 44.8 to 68 mg/L
- Chloride (as Cl) was observed in the range from 598 to 916 mg/L
- Iron (as Fe) was observed in the range from 0.25 to 0.42 mg/L
- Magnesium (as Mg) was observed in the range from 35.1 to 62.5 mg/L
- Sulphate (as SO_4) was observed in the range from 154 to 215 mg/L
- Total Alkalinity (as $CaCO_3$) was observed in the range from 28.3 to 34.7 mg/L
- Total Hardness (as $CaCO_3$) was observed in the range from 290 to 380 mg/L
- Calcium Hardness (as $CaCO_3$) was observed in the range from 113 to 170 mg/L
- Sodium (as Na) was observed in the range from 250 to 297 mg/L
- Potassium (as K) was observed in the range from 12.4 to 21.2 mg/L
- Sodium Absorption Ratio was observed in the range from 5.908 to 7.158
- Zinc (as Zn), Total Phosphate (as PO_4), Nitrate (as NO_3), Manganese (as Mn), Biochemical Oxygen Demand (3 days, 27°C), Oil & Grease, Anionic Detergents, Barium (as Ba), Boron (as B), Copper (as Cu), Fluoride (as F), Mineral Oil, Phenolic Compounds (as C_6H_5OH), Selenium (as Se), Silver (as Ag), Cadmium (as Cd), Cyanide (as CN), Lead (as Pb), Mercury (as Hg), Total Arsenic (as As), Total Chromium (as Cr), Pesticide Residues and Polynuclear Aromatic Hydrocarbons (PAH) were observed below detectable limits
- Bacteriological parameters such as Total Coliforms and Faecal Coliforms were not detected

e) Summary – Comparison of Results of **All Locations**,

- Colour was observed 1 Hazen unit at all locations
- Odour was agreeable at all locations
- Maximum value of pH observed was 7.58 at Vizhinjam Branch Canal
- Maximum value of Turbidity observed was 10.3 N.T.U. at Vizhinjam Branch Canal
- Maximum value of Total Dissolved Solids observed was 3205 mg/L at Poovar Estuary
- Maximum value of Electrical Conductivity observed was 5810 µmho/cm at Poovar Estuary
- Maximum value of Dissolved Oxygen observed was 7.10 mg/L at all locations
- Maximum value of Free Ammonia observed was 1.53 mg/L at Poovar Estuary
- Maximum value of Calcium (as Ca) observed was 68.0 mg/L at Poovar Estuary
- Maximum value of Chloride (as Cl) observed was 916 mg/L at Poovar Estuary
- Maximum value of Iron (as Fe) observed was 1.25 mg/L at Vellayani Lake
- Maximum value of Magnesium (as Mg) observed was 62.5 mg/L at Poovar Estuary
- Maximum value of Sulphate (as SO_4) observed was 215 mg/L at Poovar Estuary
- Maximum value of Total Alkalinity (as $CaCO_3$) observed was 34.7 mg/L at Poovar Estuary
- Maximum value of Total Hardness (as $CaCO_3$) observed was 380 mg/L at Poovar Estuary
- Maximum value of Calcium Hardness (as $CaCO_3$) observed was 170 mg/L at Poovar Estuary
- Maximum value of Sodium (as Na) observed was 297 mg/L at Poovar Estuary
- Maximum value of Potassium (as K) observed was 21.2 mg/L at Poovar Estuary
- Maximum value of Sodium Absorption Ratio observed was 7.158 at Poovar Estuary
- Zinc (as Zn), Total Phosphate (as PO_4), Nitrate (as NO_3), Manganese (as Mn), Biochemical Oxygen Demand (3 days, 27°C), Oil & Grease, Anionic Detergents, Barium (as Ba), Boron (as B), Copper (as Cu), Fluoride (as

F), Mineral Oil, Phenolic Compounds (as C_6H_5OH), Selenium (as Se), Silver (as Ag), Cadmium (as Cd), Cyanide (as CN), Lead (as Pb), Mercury (as Hg), Total Arsenic (as As), Total Chromium (as Cr), Pesticide Residues and Polynuclear Aromatic Hydrocarbons (PAH) were observed below detectable limits at all locations

- Bacteriological parameters such as Total Coliforms and Faecal Coliforms were not detected at all locations.

End of Report

Annexure IV

CSR Activities by AVPPL

(April 2024 to September 2024)

CSR REPORT VIZHINJAM

(APRIL - SEPTEMBER 2024)

Adani Vizhinjam Port Pvt. Ltd, 2nd Floor.
01, Port Operation Building, Mulloor Road, Mulloor,
Trivandrum-695521

CSR REPORT VIZHINJAM

(FOR THE PERIOD FROM APRIL TO MONTH OF SEPTEMBER 2024)

Adani Foundation, the CSR arm of Adani Group has been implementing the CSR activities of Adani Vizhinjam Port Pvt. Ltd since 2016 at Vizhinjam. Every month, Adani Foundation touches more than ten thousand people through its various CSR activities. In continuation to that, Adani Foundation has done many activities in the following heads during the reporting period (April 2024 to September 2024).

1. Education
2. Community Health
3. Sustainable Livelihood Development
4. Community Infrastructure Development
5. Others

1. EDUCATION

Following are the major activities conducted under Education during the period.

1.1. Poets and Men of Literature Meet – "Arivarang" Monthly meet

1.2. Distribution of Merit Scholarship

1.1. Poets and Men of Literature meet - "Arivarang" monthly meet.

The monthly poets and men of literature meet has been conducting on every second Saturday at C V Smaraka Grandhasala, Vizhinjam. Six poets and men of Literature from Vizhinjam voluntarily supporting the programme by taking sessions, guiding book reviews and coordinating exposure visits.

The meet felicitated its members who have got full +A in pervious SSLC and plus two board examination with a certificate and memento during the period.

1.2. **Distribution of Merit Scholarship**

As part of the CSR activities of AVPPL/AF, distributed merit scholarship of Rs. 10,000/- each to 127 students during the reporting period. The distribution of the scholarship was done at ward level as follows

At Mulloor Ward, the distribution programme was inaugurated, and the scholarship was awarded by Mrs. Omana, Councilor, Mulloor. At Harbour Ward Councilor Shri. Nisamudheen inaugurated the function and awarded the scholarship. The distribution of scholarship for the students from Vizhinjam and Kottappuram was done at CSR office, Mukkola. At Venganoor Ward, Councilor Smt. Sindhu Vijayan inaugurated the function. The list of scholarship students is attached as an annexture: 1.

2. COMMUNITY HEALTH

Following are the major activities conducted under Community Health during the period.

2.1. Kitchen Garden - Safe to Eat Vegetables for All Homes (SEVAH),

2.2. Farm School & Landscape maintenance at Port site

2.3. Onam fair

2.4. Cancer Care Support

2.5. Patient care support programme

2.6. Convergence of Govt. Schemes

2.7. Medical camps – General & Lifestyle Disease detection

2.8. Community Awareness programme

2.9. SuPoshan

2.1. Safe to Eat Vegetables for All Homes (SEVAH) - 1780 Household homestead vegetable garden

The Kitchen Garden programme, Safe to Eat Vegetables for all homes (SEVAH) is progressing commendably with 1780 households. The kitchen garden programme is intended to cultivate pesticide free organic homely needs of vegetables at the space available within each homestead. During the period 500 new kitchen gardens were initiated and thus the number increased from 1280 to 1780 homestead.

Coordinators training -: As part of the initiation of new kitchen gardens, training was provided to the coordinators on the procedures for kitchen garden input utilization at Farm School with hands-on training.

Implementation of 500 New Kitchen Garden

Kitchen garden was implemented among 500 new homes with 200 old beneficiaries coinciding with the cultivation cycle culmination in the harvest for the month of August 2024 with input kit items of organic manure, bio plant protection agents, hybrid vegetable saplings and grow bags of 10 each

The implementing locations of kitchen garden 2024 includes

1. Kottukal gram Panchayat – 364 beneficiaries.
2. Venganoor Gram Panchayath - 100 beneficiaries.
3. Mulloor, Vizhinjam and Harbor ward - 36 beneficiaries.
4. Old-benificiariaries-200 nos (only grow bags, 10Nos /beneficiary from seedmoney of beneficiary contribution).
5. Total beneficiaries including new and ongoing covered this year – 700Nos

Kitchen garden inauguration

Programme inauguration was done by panchayath president of Venganoor Mr. Sreekumar on 19 th July 2024, in presence of group members, kitchen garden coordinator and officials of Adani Foundation

2.2. Farm School

The Farm school activities are progressing commendably during the reporting period. The Farm School serves as a community school for agricultural learning. It is set in a majestic landscape with a bamboo house as training house and a lawn set in the shape of a leaf, symbolizing the solar energy receptor and plant food factory, thus ultimately the factory feeding humanity, and key oxygen producing organ for mother earth. Farm school has the functional specification of Horticultural Garden and honey production unit, Crop Museum (to house possible Crop Introduction for Vizhinjam), Vegetable and nutrition Garden, Vegetable nursery, Hi tech banana Farming. The Farm school implementation and maintenance is taken care of by Vanitha Karsheeka Karma Sena, one of the livelihood groups formed as part of the CSR activities. The activities at Farm School during the period are as follows.

- Fertilizer application
- Weeding
- Land preparation
- Vegetable cultivation
- harvesting and selling at Farm Counter
- Vermin compost (750 kgs harvested during the period)
- New cultivation and manuring as per the cycles

Yield from The Farm during the period

Sl.no	Month	Yield (Kg)
1	April	898.50
2	May	413.50
3	June	37.25
4	July	102.50
5	Aug	490.60
6	Sept	990.00
Total		**2932.35**

Status of Model Miyawaki Forest at Farm School

The average maximum height of a plant attained in 4 tiers of planted circles.

Reference yr	Outer circle (ht in ft)	Second circle	Third circle	Mid circle
2024 -March	5 ft	12 ft	15ft	18ft
2023-March	2 ft	7 ft	10 ft	12ft

Mary Gold Cultivation for Onam Season in association with Krishi Bhavan

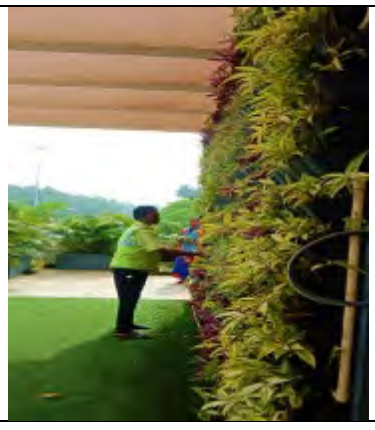
In connection with statewide programme of Govt of Kerala '**Ente Nadu-Ente Onam'** Mary gold cultivation for Onam season, Adani Foundation and Krishi bhavan Vizhinjam collaborated for the cultivation at farm school Vizhinjam. Mary gold seedlings provided by Krishi bhavan was planted in 25 cents by Vantha Karsheeka karma Sena women enterprise group of Vizhinjam. The programme was inaugurated by ward councilors of Venganoor and Mulloor jointly by planting saplings. This was on 6/7/2024. Participated by Agriculture officer Vizhinjam Mrs. Akila, and officials of Adani Foundation.


Harvest for the flower initiated as a festival on 27th August at Farm school - premises of Adani Foundation. The harvest continues all alternate days for two and a half months. An arrangement has been made to market the harvested daily flowers at a competitive rate. Marigold recorded a total harvest during Onam alone recorded 550 kgs. sold to beneficiaries at varying cost of Rs 40-80 per Kg depending on the day and demand.

Horticulture Land scaping at port

The Horticulture Landscaping at the port site is also maintained by Vanitha Karsheeka Karma Sena, which includes

- Horticulture maintenance and management of phase 1 area
- Fuel Station
- Green Belt
- Interior horticulture arrangements at POB & Security building


Total labour days for landscape maintenance

Sl.No	Month	Total Man-days
1	April	49
2	May	62
3	June	30
4	July	47
5	Aug	58
6	Sept	23
Total		**269**

Karshika -Dinam -Farmers Day.

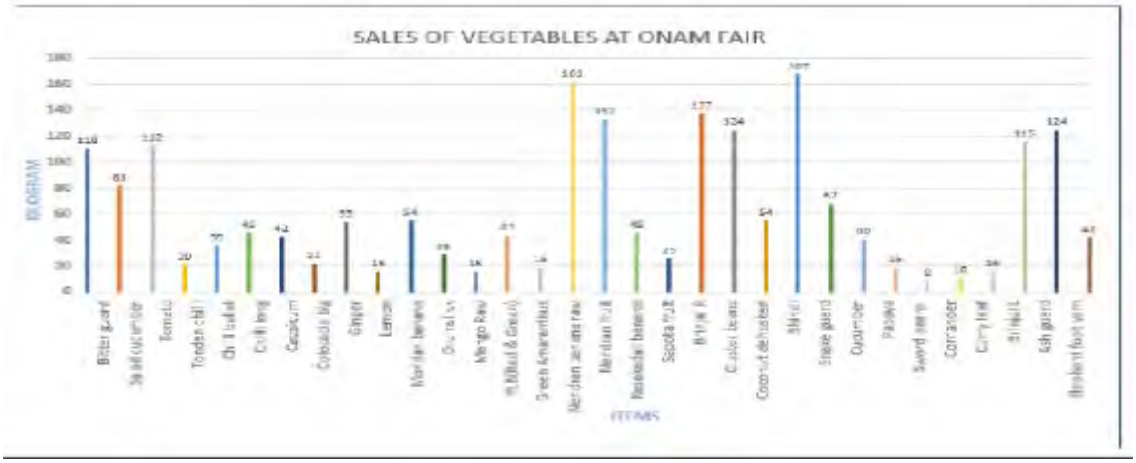
Farmers day is commemorated by the Department of Agriculture -Krishi bhavan Vizhinjam. Farmers of vizhinjam who had excelled in various areas of Agriculture and Animal husbandry were Felicitated. The role of CSR in fostering Agriculture was well acknowledged by farmer fraternity

2.3. Onam Fair

As instructed by the Executive Director, Adani Foundation during his visit to Vizhinjam, an Onam Vipanana Mela of Vegetables from SEVAH member families at Farm School premises was organized for two days during 13th & 14th September 2024. Exactly 2040 kg, more than 2 tons of vegetables were collected from more than 700 groups through entrusted coordinators and farm school. The mela was inaugurated by Mr. G.R. Anil, Minister for food and Civil Supplies & Consumer affairs, presided over by Adv. M. Vincent, MLA for Kovalam. All department heads including the CEO of AVPPL attended the inaugural function. A total sale of Rs. 77,420/-recorded for the sales of vegetables in two days. Thirty-three different items were brought into sales point from kitchen garden sites among 35 groups as follows

Sl no	Item	Qdty in kg
1	Bitter Guard.	110
2	Salad Cucumber	81
3	Tomato	112
4	Tondan -chili	20
5	Chili -Bullet	35
6	Chilli -long	45
6	Capsicum	42
7	Colocacia -BIG	21
8	Ginger	53
9	Leamon	15
10	Mondan -culinary Banana	54
11	Drumstick -fruit	28
12	Mango -Raw	15
13	Yard long Beans -Red and Green	43
14	Green -Amaranthus	18

15	Nendran banana- Raw	161
16	Nendran -fruit	132
17	G7 -Banana	25
18	Rasakadali-Banana	45
19	Sapota -fruit	25
20	Brinjal -round	137
21	Cluster Beans	124
22	Monthan -culinary Banana	50
23	Coconut-dehusked	54
24	Bhindi	167
25	Snake guard -small	67
26	Cucumber	40
27	Papaya-fruit	18
28	Sword beans	8
29	Coriander	10
30	Curry leaf	15
31	Brinjal -Long	115
32	Ash guard	124
33	Elephant foot yam.	41
	Total Kg	**2040**



SEVAH -Beneficiary -Share @ Onam Fair.

It is estimated that 0.5kg to 12kg of vegetables (after home need) were collected from each of 700 beneficiaries from among beneficiaries who has reached harvesting during this period. A total amount of Rs. 20/- to Rs. 480/- were received per beneficiary for the harvested surplus supplied to Onam fair.

Sales for other Livelihood Products @ Onam Fair.

Being Onam time, the fair had given opportunities to purchase products from various livelihood groups fostered by CSR-Vizhinjam – (These includes Vizmart

livelihood and associated Enterprises). Satwara craft items from Sebastain Indian Social projects and Agri organic inputs from VFPCK -Agri -Business units of Department of Agriculture. The sales details during the Onam fair is as follows

Sl. No	shops/Items	Daily Sales Turnover		
		13-09-24	14-09-24	Total
1	SISP	250.00	-	250.00
2	VFPCK	770.00	20.00	790.00
3	BHRAMI	3,000.00	2,000.00	5,000.00
4	PICKLES	700.00	2,500.00	3,200.00
5	GARMENTS	1,630.00	6,650.00	8,280.00
6	TEA STALL	2,000.00	1,200.00	3,200.00
7	CHIPS & VARIETY PUTTUPODI	2,310.00	5,010.00	7,320.00
8	VEGETABLE UNIT	30,000.00	47,420.00	77,420.00
9	LIVELIHOOD UNIT	3,504.00	4,017.00	7,521.00
10	HONEY PRODUCTS	750.00	-	750.00
11	SOAP ITEMS	1,000.00	3,000.00	4,000.00
12	AMOHA BIO TECH	200.00	80.00	280.00
	Total	**46,114.00**	**71,897.00**	**118,011.00**

2.4. Cancer Care Support - providing nutritious Food supplements & Medicines to poor cancer patients.

Cancer care food support has continued during the period. A total no of 182 patients were provided with food support. This is in addition to regular house visits to the families of the suffering patients for consolation and for providing further mental strength.

Other support provided for Cancer patients – Monitoring Devices.

AF Vizhinjam provided a blood pressure monitoring device and a Pulse Oximeter to Abhayam Charitable Society for the status monitoring of Cancer patients as part of the cancer care programme.

In addition to that a wheelchair was provided for Mr. Sulthan 32 yrs as he is paralyzed from the waist down due to a vehicle accident. He was the main source of the income of the family. As he is planning to start a juice shop with the support of many people, the wheelchair will be a great support to him, He and his family thanked Adani Foundation for the support.

2.5. Patient care support programme/Benevolent support programme

As part of the patient care support programme, community volunteers along with CSR team have been visiting the houses of bedridden patients and providing essential care support for 101 patients.

2.6. Convergence of Govt. Schemes

The convergence of Govt. Grant-in-aids schemes in CSR activities is progressing well during the reporting period. Information regarding various schemes have been shared through the WhatsApp groups named "Phoenix – for Widows and divorced" and 'Shalabhangal- Butterflies for children under 18yrs old. Information regarding

- selection students for sports training – SAI
- Volunteers for Lok Sabha Election duty
- Oruma accident insurance
- Nursing and other recruitment abroad
- Various Education Scholarships
- Entrance test - Keem 2024
- Admissions in various courses
- Free Job Training and Employment
- Free skill trainings
- Recruitment to Army
- Employment opportunities of state, central and public sector
- Social welfare schemes of State and Central Government
- Free health Insurance scheme for senior citizens
- Job fairs were circulated during the period.

2.7. Medical Camps – Alopathy and Ayurveda

Medical Camp & Health Awareness programme (02.08.2024)

As part of the CSR activities, a Medical Camp with Health Awareness Session was organized on 2nd August 2024 in association with Kerala Social Security Department & Govt. Family Health Centre Mukkola at new Community Skill Park, Nellikunnu. The awareness session on Hemoglobin was handled by Smt. Leena Raj Adolescent Counselor, Family Health Centre, Mukkola. The session was attended by 147 people & aimed to educate participants about the causes, symptoms, prevention and management of HB, covering various aspects of Health-related awareness. After the awareness health Checkup was done for 147 people. 15 cases were referred to PHC & General Hospital, Trivandrum.

Ayurveda Medical Camp & Lifestyle Disease detection Camp

During the reporting period two Ayurvedha Madical camps were conducted as part of the CSR activities. The first one was on 09.08.2024 in association with Venganoor Gram Panchayat and Love Birds Sports and Arts Club. The screening was done by Government Ayurveda Dispensary, Muttacaud. The camp was Inaugurated by Shri. S. Sreekumar President, Venganoor Gram Panchayat. 82 people from Muttakkad region benefited.

The Second Ayurveda camp and lifestyle disease diagnosis was conducted on 31st August 2024 at community resource Centre cum CSR office Mukkola. The Screening was done by the doctors from Government Ayurveda Dispensary, Kovalam, officials from Family Heath Center, Mukola screened lifestyle diseases. The camp was inaugurated by Shri Prakash.R Janmaitri Police Station, Vizhinjam - Station House Officer. The Ayurveda camp was led by Dr. Smita, Medical Officer of Vizhinjam Ayurveda Hospital. BP, Sugar, Cholesterol and TB tests were conducted by Family Health Center Mukola, Out of the 87 people screened for lifestyle diseases, the samples of 14 people were sent for TB testing.

SL No	Venu	Date	Participants
1	Muttacaud	09.08.2024	82
2	CSR Office Mukkola	31.08.2024	87
	Total		**169**

Lifestyle Disease detection Camps

As part of the community Health initiatives, three lifestyle diseases Camps were organized in association with Kerala Social Security Mission and Venganoor Gram Panchayat during the reporting period. The camps were Inaugurated by Shri. R.S. Sreekumar, President Venganoor Gram Panchayat. Shri. Shibu, Social Security Program Coordinator, Social Security Mission took of session on various lifestyle diseases and their bad effects. A total of 144 people were screened, of these 21 cases referred to nearby PHC & District hospitals for further checkups. Other details of the camps are as follows.

SL No	Venu	Date	Participants
1	Chunakkari Residence Association Muttacaud	02.04.2024	82
2	Love Birds Sports and Arts Club Pananagodu	29.04.2024	62
3	Govt UP School, Panavila	07.05.2024	62
	Total		**144**




As of now AVPPL/AF conducted a total of 21 lifestyle disease detection camps in association with Social Security Mission, Govt. of Kerala. The screening details are as follows.

Sl. No	Type of Tests	Tested	Total Screened		
			Male	Female	Total
1	Blood Pressure	Tested	556	1117	1673
		referred	48	45	93
2	Blood Sugar	Tested	556	1117	1673
		referred	48	57	105
3	Total Cholesterol	Tested	556	1117	1673
		referred	114	146	260
4	Blood Count	Tested	556	1117	1673
		referred	18	26	44
5	Urine Sugar	Tested	556	1117	1673
		referred	16	17	33
6	Urine Albumin	Tested	556	1117	1673
		referred	17	16	33
7	Creatine	Tested	556	1117	1673
		referred	11	6	17
8	Urea	Tested	556	1117	1673
		referred	4	3	7

59	Uric Acid	Tested	556	1117	1673
		referred	3	2	5
10	ECG	Tested	556	1117	1673
		referred	2	2	4
116	Bilirubin	Tested	556	1117	1673
		referred	10	6	16
12	HB	Tested	556	1117	1673
		referred	80	105	185
Total		**Tested**	556	1117	1673
		referred	**371**	**431**	**802**

2.8. Community Awareness Campaign

ToT of Community Volunteers on Rainy Season Diseases & General Safety

Adani Foundation in collaboration with the health wing of Thiruvananthapuram Corporation organized a trainers training programme on Rainy season diseases and general safety during the period. The training was on 24/05/2023, participated 32 community resource persons working in five wars of Vizhinjam region and 10 health workers from Kottukal region. The session on Rainy season diseases was handled jointly by Shri. Babin Kumar, Medical officer, PHC, Mukkola, Shri. Anuroop, JHI and shri. Sudheer, JHI.

The session on General public safety standards and operations was handled by Mr. Shaji Joseph, Safety Office, Adani Vizhinjam Port. As the follow up of the session, the community resource person will administer the same sessions to the community people in their respective wards in the coming weeks.

Launch of Street Play

As part of the Community Awareness Campaign, a street theater of students was formed by Adani Foundation in association with the SPC unit of HSS for girls Venganoor. They were trained a street play on the bad effects of plastic, drugs and Cancer disease during the summer vocation. The first staging of the street play was done at the premises of Vizhinjam port on 31st May 2024. The street play named "Manasakshi" was launched jointly by Dr. Divya.S. Iyer IAS, Managing Director, Vizhinjam International Sea Port Ltd and Mr. Pradeep Jayaraman, CEO AVPPL in the presence of all the AVPPL staff. As the follow up, the students will stage the street play in various community pockets in the coming months according to the community awareness schedule of AVPPL/AF.

2.9. SUPOSHAN (SDG No.2 and SDG No4)

Community reach-out

SuPoshan a healthcare initiative of Adani Foundation implemented to curb malnutrition and anemia among children below 5 years of age and women in reproductive age. The focus of SuPoshan project is on behavior change at family and at community level for healthy nutrition for children, women, and adolescent with family as a unit. SuPoshan Sanginis are the key change agent who promotes right knowledge, Skills, and attitudes through family counseling. During the reporting month, SuPoshan activities reached the families of the Kottukal panchayat in the nineteen wards of CSR intervention through various programmes such as National Nutrition Month, Exhibition-Onam Fair, Swachhta Hi Seva (SHS) 2024 etc. The following are the major activities conducted under SuPoshan during the month of September 2024.

Breakup of Community Engagement program

Sl. No	Programme	April	May	June	July	Aug	Sep	Total
1	Household visits	1369	749	-	-	-	-	2118
2	Family based counseling	460	241	124	161	170	118	1274
3	Anganwadi Visits	41	101	68	52	64	83	409
4	Focus Group Discussions	63	101	28	60	85	90	427
5	Village Level Events	54	10	10	7	10	10	101

6	Anthropometric Measurements	1236	0	12	363	585	74	2270
	Total	**3223**	**1202**	**242**	**643**	**914**	**375**	**6599**

Family Based Counselling

Focusing on better health outcomes & overall well-being, and to develop a healthy community 1274 family counselling were done by the Sangini's in this reporting month mainly in connection with

- Importance of drinking water
- Health and nutrition
- Poshan month
- Need of a safe motherhood
- Mind and body health
- Nutrition of women

Counselling was done on the families of children with age 5 and below, Adolescent, Pregnant and Lactating mothers.

Focus Group Discussions

To gain deep insight to the community about health and nutrition, Sanginies done 427 Focused group discussions in Kottukal panchayat during the reporting period. The focus group discussion mainly focused on

- Policies and schemes for Women, girl child
- Need of Safe Motherhood
- Menstrual Hygiene

- How to make our summers fruitful
- Smart Phone Addiction
- Importance of drinking water
- Diabetics
- Importance of Anthropometric measurement and routine Immunization,
- NRC referral – services
- Goodness of YOGA
- Signs of Anaemia, causes and home-based remedies
- Stay nourished and save money - Right choice of food,
- Seasonal Food Calender
- Hand wash with soap demo
- Menstrual Hygiene Management,
- WHO proven 10 points
- Malnutrition cycle
- Myths & Taboos breaking around cultural practice & dietary practices

Village Level Meeting and events

To unite different type and group of peoples 101 village level meetings and events were held in coordination of Sanginies in Kottukal during the period.




Anganwadi visits

To maintain a good collaboration with the community, Sanginies have been regularly visiting all the Anganwadi's in Kottukal Panchayat. Anganwadi visits will help the Sanginis and Anganwadi Workers for the interaction that includes the heath update of the target people such as children under 5 years, Newborn babies, Adolescent girls, and Women of reproductive age group and the pregnant and lactating mothers.


Anthropometry

During the period SuPoshan Sanginis did universal anthropometry for 2270 children across Kottukal Panchayath and measured their weight, height and MUAC. All children measured as healthy

Other Programmes

Kitchen Garden

With an aim to provide 'safe to eat vegetables for all homes (SEVAH)', the Adani Foundation in 2020 conceived the idea to set up kitchen gardens for people in rural areas of Vizhinjam, with the help of Assistant project manager Rakesh R S, Adani Foundation, the sangini was trained under organic farming from farm school. After the training, the Sangini was selected as kitchen garden coordinator and gave seedlings with grow bags, vermicompost, coir pith compost, VAM, bevaria, pseudomonas, spray head, neem oil, verticillium, organic manure and help the coastal area people to develop kitchen gardens in the house especially in the roofs and backyard of their houses. The Sanginies often visited the houses and given regular guidance needed and monitoring. In the reporting month above 300 families were given seedlings in the Kottukal panchayat.

World Health Day Celebration @ Kottukal Panchayat

World Health Day was celebrated in different places of kottukal panchayat with the participation of Children and Family Members, Anganwadi teachers, Ward members, Asha worker etc. based on the theme "My Health, My Rights". The main attraction of the programmes was poster making, rallies, quiz competitions etc. A total of 129 people participated in the events conducted which includes 27 children aged below 5, 4 pregnant women, 11 lactating women, 37 other women, 4

men, 29 adolescent girls and 10 adolescent boys. And 2 panchayath members, 2 Anganwadi teachers and 3 ASHA workers participated.

International Mother's Day Celebration @ Kottukal Panchayat

International Mother's Day was celebrated in different places of kottukal panchayat with the participation of Children and Family Members, Anganwadi teachers, Ward members, Asha worker etc. The main attraction of the programmes was awareness sections, cooking demo, games, poster making, rallies, quiz competition etc.

Menstrual Hygiene Day Celebration @ Kottukal Panchayat

Menstrual Hygiene Day was celebrated in different places of kottukal panchayat with the participation of Children and Family Members, Anganwadi teachers, Ward members, Asha worker etc based on the theme "Together for a #Period Friendly World". The main attraction of the programmes was poster making and awareness classes.


World Environment Day Celebration

World Environment Day was celebrated in different places of kottukal panchayat with the participation of Children and Family Members, Anganwadi teachers, Ward members, Asha worker etc. on 5th June 2024 on the theme "Land restoration, desertification, and drought resilience". The main attraction of the programmes was awareness sections, planting trees etc. About 200 trees were planted of different varieties and 176 people participated in the event.


World Food Safety Day Celebration

World Food Safety Day was celebrated in different places of kottukal panchayat with the participation of Children and Family Members, Anganwadi teachers, Ward members, Asha worker etc. based on the theme "Food safety: prepare for the unexpected". The main attraction of the programs was cooking demo and FGD. For the participants the Sanginies demonstrated nutritious food recipes, 3 cooking demo were conducted and 41 people of kottukal panchayat participated.

International Yoga Day Celebration

International Yoga Day was celebrated in different places of kottukal panchayat with Ward Members, School teachers, Asha worker etc. based on the theme "Yoga for Women Empowerment". The main attraction of the programs was the yoga event. About 100 people from different parts of Kottukal panchayat participated in the event

Cooking Demo

Sanginies demonstrated recipes rich in calcium, protein, iron, and vitamin C for the target people especially for the pregnant and lactating women. 52 cooking demos were conducted by Sangini in the reporting period. The main aim is to promote and prepare diversified plant-based recipes for pregnant women which includes

- Food groups promoted by AYUSH:
- Beetroot & Carrot
- Moringa leaves
- Dates, Raisins, Figs
- Demonstrated Iron-rich recipes for adolescent girls to develop taste and consumption on green vegetables Including leafy vegetables, sprouts, millets.
- Demonstrated Protein and Calcium rich recipes for children 2-5 yrs to develop taste on vegetables and dairy products.
- Demonstrated a complete Poushtik Thali for anemic adolescent girls and pregnant women; and for lactating mothers to increase breastmilk production

Independence Day Celebration

India's Independence Day was celebrated on 15 August, which marks the country's freedom from British rule in 1947. The day symbolises the arduous struggle for independence which is led by many prominent leaders. Independence Day is a day for the citizens to reflect on the sacrifices that have been made by many people in the past to get India free from the rule of the Britishers. On this day Sanginies

of site Vizhinjam celebrated India's 78th Independence Day in collaboration with the Anganwadies of Kottukal Panchayat.

Foundation Day Celebration

Adani Foundation celebrated its 28th Anniversary this year. In celebration of this milestone, a few activities were held in the SuPoshan Vizhinjam Site.

Observance of World Breastfeeding Week

World Breastfeeding Week 2024 focused on strengthening the capacity of actors that must protect, promote, and support breastfeeding across different levels of society. This year theme for the week was "Closing the gap: Breastfeeding support for all". Target audiences including governments, health systems, workplaces and communities will be informed, educated, and empowered to strengthen their capacity to provide and sustain breastfeeding-friendly environments for families in the post pandemic world. Breastfeeding is the key to sustainable development strategies post-pandemic, as it improves nutrition, ensures food security, and reduces inequalities between and within countries. For the week Sanginies and health workers promoted the community by providing awareness on the importance of breastfeeding, discussed the benefits of breastfeeding for both mothers and infants,

highlighted nutrition, immunity, and bonding advantages. Slogans were prepared in local language promoting early initiation of breast feeding, exclusive breast feeding, etc. Sanginis demonstrated recipes rich in calcium, protein, iron, and vitamin C for pregnant and lactating women. Role-playing sessions were conducted by the sanginies in the community on breastfeeding techniques and positions, positive results become evident, and the child's growth improves over time. Husbands of pregnant and lactating women taken oath to support breastfeeding, and certificates were distributed to acknowledge their commitment.

Sl. No	Type of Activity	No. of Activities	No. of Participants
1	Organized rally with Women in reproductive age and children in village for awareness around WBW	13	169
2	FGD's	23	239
3	Oath Taking ceremony with Husbands of lactating and pregnant women	2	4
5	Cooking competition amongst 1000 days beneficiaries with local ingredients at AWC	12	38
6	Family counselling for promoting healthy food for lactating women	37	111
7	Role Play	2	34

Onam fair - Exhibition

An exhibition was done by the SuPoshan sanginies in the Onam fair program on Safe to eat vegetables for all homes held in Farm school on 13th and 14th September 2024. Sangini exhibited tricolor foods, rainbow diets, different dishes using

amurthampodi, charts, etc. Sanginies explained the visitors about the importance and need of tricolor foods, rainbow diet etc. Also, sanginies explained about the Project SuPoshan to the unknowns.

Celebration of National Nutrition Month (Poshan Maah 2022)

The Ministry of Women and Child Development celebrated the 7th Rashtriya Poshan Maah (National Nutrition Month) from September 1 to September 30, 2024, as part of the national POSHAN Abhiyaan, a Central government initiative which aims to strengthen the efforts to end hunger and malnutrition. This year the theme of Poshan Maah 2024 was "SuPoshan Mein Poshan Tyohar". Vizhinjam site celebrated National Nutrition Month in the following ways:

Sl. No	Type of Activity	No. of Activities	No. of Participants	Type of Participants	Activities Done/Topic Covered
1	Launch of National Nutrition Month	1	24	Panchayat members, Mothers, ASHA worker, Anganwadi worker. Mothers & Adolescent Children, 0-5 years children, pregnant and lactating mothers.	Importance of Poshan Maah, Cooking Competition, pledge, rally.
2	Poshan Rally	8	156	Panchayat members, Mothers, ASHA worker, Anganwadi worker. Mothers & Adolescent Children, 0-5 years children, pregnant and lactating mothers.	Goodness of Poushtik Aahar Goodness of Greens Goodness of micronutrients (Tri-colour food) & millets. Goodness of 1000 days Goodness of Ahar and Swachchata
3	Focus Group Discussions	24	432	Panchayat members, Mothers, ASHA worker, Anganwadi worker. Mothers & Adolescent Children, 0-5 years children, pregnant and lactating mothers.	Importance of Anthropometric measurement and routine Immunization. Goodness of YOGA - YOGAME - with RPA and

					adolescent girls to stay healthy. Preapare Seasonal Food Calender
4	Family Counselling	160	223	Panchayat members, Mothers, ASHA worker, Anganwadi worker. Mothers & Adolescent Children, 0-5 years children, pregnant and lactating mothers.	Tricolour food / Rainbow diet, food pyramid, promote home-made diet (Nutrimix) for children above six months, Safe cooking practices, basic hygiene for cooking, avoid over cooking, Millets based recipes, Danger sign during pregnancy, 4 ANC, consumption of IFA and calcium supplements, Proper diet for pregnant and lactating mothers (LM needs 500 extra calories than her normal diet) Age-appropriate diet by using different food groups - locally available Newborn care - wrapping, KMC, EIBF, EBF. Handwash with soap, menstrual hygiene, feces management with lactating mothers and adolescent girls Diarrhoea management at home, ORS making at home
5	Cooking Demo	26	43	Panchayat members, Mothers, ASHA worker, Anganwadi worker. Mothers & Adolescent Children, 0-5 years children, pregnant and lactating mothers.	Promote and prepare diversified plant-based recipes for pregnant women. Recipes using locally available Vegetables
6	WASH Practices	2	52	Panchayat members, Mothers, ASHA worker, Anganwadi worker. Mothers & Adolescent Children, 0-5 years	Handwashing Demo & Promotion of Hygiene Practices

				children, pregnant and lactating mothers.	
7	Food competition	4	68	Panchayat members, Mothers, ASHA worker, Anganwadi worker. Mothers & Adolescent Children, 0-5 years children, pregnant and lactating mothers.	Recipes using locally available Vegetables
8	Seeds Distribution	100	225	Panchayat members, Mothers, ASHA worker, Anganwadi worker. Mothers & Adolescent Children, 0-5 years children, pregnant and lactating mothers.	Giving seeds to beneficiaries who already have developed Poshan Vatika at HH level
9	Tree Planting	100	225	Panchayat members, Mothers, ASHA worker, Anganwadi worker. Mothers & Adolescent Children, 0-5 years children, pregnant and lactating mothers.	Plants like Moringa, Lemon, Awla, Guava, Papaya etc (provide at institutions like schools, AWC)
10	Games	8	132	Panchayat members, Mothers, ASHA worker, Anganwadi worker. Mothers & Adolescent Children, 0-5 years children, pregnant and lactating mothers.	Sports program - Conducted fun game like spoon race, ball throwing, ball passing etc. with children of 0-5 yrs (Prize & banana distribute after program), women, adolescent boys and girls.
11	Quiz Competition	7	121	Panchayat members, Mothers, ASHA worker, Anganwadi worker. Mothers & Adolescent Children, 0-5 years children, pregnant and lactating mothers.	On tricolor foods, rainbow diets, 10 proven steps, nutrition etc.
12	Role Play and Hand Wash	2	28	Panchayat members, Mothers, ASHA worker, Anganwadi worker. Mothers & Adolescent Children, 0-5 years children, pregnant and lactating mothers.	On importance of complementary feeding, MHM, age-appropriate feeding. Barriers to healthy eating in the community (myths related to pregnancy, lactation and Menstruation). Hand Wash practice to children using soap
Total		**442**	**1729**		


Sangini Monthly training

Training programmes have been conducting for the smooth functioning of SuPoshan project to Sanginies twice a month, thus 12 trainings conducted during the period. Sanignies present their activities during the period in the meeting and discuss the plan for the coming period. A thematic input session will be there for every meeting. Discussions and planning were also conducted for special days/days of importance/celebrations.


The following topics were included in the training.

- Actions for women's health
- How to make summers fruitful for Adolescent
- Need of Safe Motherhood
- Policies and schemes – Women & Girl child
- Kitchen Garden
- Onam fair
- Poshan Maah Celebration
- Swachhta Hi Seva campaign

3. SUSTAINABLE LIVELIHOOD DEVELOPMENT (SLD)

The projects under SLD included,

1. Competitive Exam Preparation
2. Digital Literacy – E-Learnings
3. Skill Development Programme &
4. Livelihood Development Programme

3.1. "Coaching for Victory" – Competitive Exam Coaching Programme

Offline Training Classes

Progressing the training sessions for the Competitive Exam Preparation candidates based on the notifications declared by the Central/State Government job openings under different departments. The training is going on at Sahridayananda Library Hall, Uchakkada, Mulloor since June 2023. Subject wise classes for syllabus-based examinations are focusing on regular daily mock tests. Intensive syllabus-based training is provided for the candidates by the experts.

Learning Activities

In addition to the offline classes, other learning methods have been progressing simultaneously as follows.

- Study materials like Rank file pages, easy study methods from You Tube and voice clips related to the daily test topics links have been shared to groups on a regular basis.
- Different vacancy announcements from Central and State government have also been circulating through digital media.
- Daily mock test for a score of 30 has been conducted on a regular basis.

- After the successful completion of every day mock test the top scorers will be announced by the coordinator in the group.
- From this year onwards, a 100 marks mock test purely based on the previous question papers is conducted on regular weekends and the results will be announced through the groups.

As of now we are providing training sessions on the following topics,

i. General English.
ii. Mathematics.
iii. Indian Constitution.
iv. Malayalam.
v. General Knowledge.
vi. History.

Notifications from the Government agencies were circulated on a weekly basis through social media groups.

Achievements:

- ✓ 100% of the candidates are applying and attending Central/State Govt. examinations.
- ✓ In total 15 candidates are included in 57 several 10th/+2/Degree Level Shortlists/ Ranklists published by Kerala Public Service Commission.
- ✓ Aiswarya J R achieved 4th Rank in High School Teacher examination and joined GGHSS-Dhanuvachapuram.
- ✓ Mr. Jobin J from Kottappuram, who achieved 1661st rank in Civil Police Officer examination has successfully passed in the medical test on 20th March 2024. He may get the appointment letter very soon.
- ✓ Mr. Vishnu S R & Mr. Jayasankar, who joined Kerala Police Department completed their training on 31st May 2024.
- ✓ On 27th July 2024, 23 candidates from the Competitive Exam Preparation batches attended the Lower Division Clerk Examination (Trivandrum Dist.) conducted by Kerala Public Service Commission, Kerala.

Details of the achievers are as follows,

Adani Skill Development Centre					
Coaching For Victory					
Achievers Details - 2022-23					
Sl. No	**Name of the Candidate**	**Category Number**	**Selected Job Roles**	**Eligibility Level**	**Status**
1	Vishnu K	548/19	Last Grade Servant (Idukki)	Plus Two	Joined on 12-11-2022
		609/21	Company Board Last Grade	Plus Two	Preliminary Exam passed. Selected for Main Exam
		368/21	Village Field Assistant (Kasargod)	Plus Two	Preliminary Exam passed. Selected for Main Exam
		558/21	Bevco Lower Division Clerk	Plus Two	Preliminary Exam passed. Selected for Main Exam
		027/22	Beat Forest Officer (Pathanamthitta)	Plus Two	Preliminary Exam passed. Selected for Main Exam
		600/21	Prison Officer Men	Plus Two	Preliminary Exam passed. Selected for Main Exam
		466/21	India Reserve Battalion (Regular Wing)	Plus Two	Preliminary Exam passed. Selected for Main Exam
2	Vishnu S R	609/21	Company Board Last Grade	Plus Two	Preliminary Exam passed. Selected for Main Exam
		530/19	Civil Police Officer (Kasargod)	Plus Two	Achieved 380th Rank, received advice memo & joined on 02-09-2023

		368/21	Village Field Assistant (Idukki)	Plus Two	Preliminary Exam passed. Selected for Main Exam
		558/21	Bevco Lower Division Clerk	Plus Two	Preliminary Exam passed. Selected for Main Exam
		027/22	Beat Forest Officer (Pathanamthitta)	Plus Two	Preliminary Exam passed. Selected for Main Exam
		600/21	Prison Officer Men	Plus Two	Preliminary Exam passed. Selected for Main Exam
		466/21	India Reserve Battalion (Regular Wing)	Plus Two	Preliminary Exam passed. Selected for Main Exam
3	Jayasankar	609/21	Company Board Last Grade	Plus Two	Preliminary Exam passed. Selected for Main Exam
		340/20	Civil Police Officer (Trivandrum)	Plus Two	Achieved 8th Rank, Advice Memo Received & Joined on 17-08-2023
		530/19	Civil Police Officer (Trivandrum)	Plus Two	Achieved 383rd Rank
		368/21	Village Field Assistant (Trivandrum)	Plus Two	Preliminary Exam passed. Selected for Main Exam
		558/21	Bevco Lower Division Clerk	Plus Two	Preliminary Exam passed. Selected for Main Exam
		653/21	Company Board /Corporation Assistant (KSRTC/KLDB)	Degree	Preliminary Exam passed. Selected for Main Exam
		388/19	Sub Inspector of Police	Degree	Supplementary List
		600/21	Prison Officer Men	Plus Two	Preliminary Exam passed. Selected for Main Exam
		251/21	Bevco Assistant	Degree	Preliminary Exam passed. Selected for Main Exam
		466/21	India Reserve Battalion (Regular Wing)	Plus Two	Preliminary Exam passed. Selected for Main Exam
4	Gopika R Murali	207/19	Lower Division Clerk (Malappuram District)	Plus Two	Joined on 28-11-2022
		94/20	Civil Police Officer (Women)	Plus Two	Physical Exam Passed. Waiting for Rank List.
		245/20	Firewomen	Plus Two	Selected for the Physical Examination.
		609/21	Company Board Last Grade	Plus Two	Preliminary Exam passed. Selected for Main Exam
		368/21	Village Field Assistant (Trivandrum)	Plus Two	Preliminary Exam passed. Selected for Main Exam
		558/21	Bevco Lower Division Clerk	Plus Two	Preliminary Exam passed. Selected for Main Exam
		653/21	Company Board /Corporation Assistant (KSRTC/KLDB)	Degree	Preliminary Exam passed. Selected for Main Exam
		251/21	Bevco Assistant	Degree	Preliminary Exam passed. Selected for Main Exam
		027/22	Beat Forest Officer (Trivandrum)	Plus Two	Preliminary Exam passed. Selected for Main Exam
		089/19	Secretariate Office Assistant (Special Recruitment)	Plus Two	Preliminary Exam passed. Selected for Main Exam
5	Jobin J	466/21	India Reserve Battalion (Regular Wing)	Plus Two	Preliminary Exam passed. Selected for Main Exam
		027/22	Beat Forest Officer (Wayanad)	Plus Two	Preliminary Exam passed. Selected for Main Exam

		530/19	Civil Police Officer (Malappuram)	Plus Two	Achieved 1661st Rank
6	Sreedevi G S	652/21	Prison Officer Women	Plus Two	Preliminary Exam passed. Selected for Main Exam
		609/21	Company Board Last Grade	Plus Two	Preliminary Exam passed. Selected for Main Exam
7	Jishnu Vinayan	368/21	Village Field Assistant (Kozhikode)	Plus Two	Preliminary Exam passed. Selected for Main Exam
		530/19	Civil Police Officer (Thrissur)	Plus Two	Physical Exam Passed. Waiting for Rank List.
		466/21	India Reserve Battalion (Regular Wing)	Plus Two	Preliminary Exam passed. Selected for Main Exam
8	Sreekanth S Nair	466/21	India Reserve Battalion (Regular Wing)	Plus Two	Preliminary Exam passed. Selected for Main Exam
		530/19	Civil Police Officer (Thrissur)	Plus Two	Physical Exam Passed. Waiting for Rank List.
9	Anoop Mohan	466/21	India Reserve Battalion (Regular Wing)	Plus Two	Preliminary Exam passed. Selected for Main Exam
10	Reshma	558/21	Bevco Lower Division Clerk	Plus Two	Preliminary Exam passed. Selected for Main Exam
		609/21	Company Board Last Grade	Plus Two	Preliminary Exam passed. Selected for Main Exam
11	Rani	609/21	Company Board Last Grade	Plus Two	Preliminary Exam passed. Selected for Main Exam
12	Karthika G	653/21	Company Board /Corporation Assistant (KSRTC/KLDB)	Degree	Preliminary Exam passed. Selected for Main Exam
		026/22	Company Board /Corporation Assistant (KSFE/KSEB/KMML)	Degree	Preliminary Exam passed. Selected for Main Exam
		027/22	Beat Forest Officer (Idukki)	Plus Two	Preliminary Exam passed. Selected for Main Exam
13	Chithra K	368/21	Village Field Assistant	Plus Two	Preliminary Exam passed. Selected for Main Exam
		747/21	Data Entry Operator	Plus Two	Preliminary Exam passed. Selected for Main Exam
14	Stenu J	530/19	Civil Police Officer (Trivandrum)	Plus Two	Achieved 933rd Rank
15	Jayasree S S	277/18	Confidential Assistant	Plus Two	Achieved 12th Rank, Advice Memo Received & Joined on 21-08-2023
16	Aiswarya J R	562/2021	High School Teacher (Hindi)	Degree	Achieved 4th Rank, joined on 24-01-2024
17	Sujithra B S	325/2021	Confidential Assistant	Degree	Achieved 17th Rank and joined GST Department - Kottayam

3.2. SKILL DEVELOPMENT PROGRAMME

Employability Skilling Programmes – Transit Campus, Vizhinjam

- In this FY 2024-25, ASDC is conducting eight different domain courses for the community youths in and around Vizhinjam area. The registration process for the courses started in the month of April 2024. All the batches will start only after successfully conducting the Induction Programme. Details of the courses are as follows

General Duty Assistant (Batch 1 & 2)

After successfully completing 2 batches in April with 29 trainees, we conducted induction program for 56 trainees who were taken admission as part of International Women's Day special batch. From this, 44 were showed interest and completed registration process for attending the GDA training. Theory and Practical sessions are going on from 13th May 2024 onwards, handling by Ms. Sheeja M, Trainer-GDA.

On the Job Training

On the job Training for the ongoing GDA batch trainees are arranged at NIMS Medicity, Neyyattinkara, Trivandrum. 26 trainees from both the batches were started attending OJT from 8th April 2024. Trainees were deployed in all the departments in the hospital and was supervised by the trainer. All the instructions regarding their duties were briefed and reviewed by the nursing superintendent. Trainees successfully completed the OJT training on 30th April 2024. The management and the nursing superintendent were given good feedback about their performance and dedication on the OJT time.

Guest Lecture Session – OJT

As per the availability of the experts in the hospital, we arranged Guest Lecture sessions for the trainee at the OJT Centre. All the trainees in the OJT batches attended the session which gave them additional information and motivation for doing the job. The details are as follows,

- **Infection control Measures in Hospital & Biomedical Waste Management** – This session was conducted on 11th April and handled by Ms. Viji J S, Infection Control Staff, NIMS Hospital. He explained about the methods and procedures of Biomedical Waste Management and the infection control measures.


- **Hospital HR Procedures –**

A guest session about the HR procedures of Hospital was arranged for the OJT trainees at NIMS Hospital was arranged on 22nd April 2024. The session was handled by Ms. Jessy Mol J A, HR Manager, NIMS Medicity. This session was attended by 26 trainees in which HR Policies of the organization, In take process were discussed.


Practical Assessment

For the ongoing batches, practical assessment was conducted on 24th & 25th April 2024 at centre. All the 29 trainees from the GDA batches attended the assessment and completed successfully.


Beauty Therapist (Batch 3 & 4)

As part of International Women's Day, ASDC Vizhinjam centre collected 52 applications from the community people for the beautician course. Induction programme was conducted at centre on 13th March 2024 with a participation of 38 applicants and parents meeting was done on 16th March. From 18th March 2024 onwards, new 2 batches were started with 34 trainees at CSR office building. Theory and Practical sessions are handling by Ms. Mini Jose, Trainer-BT & HS.


Certificate & Student Kit Distribution

Certificates for the trainees who successfully completed the BT & HS batches were distributed at Centre on 23rd April 2024. The available student kits were also distributed to the trainees on that occasion. Mr. Sebastian Britto, Program

Manager, AF Vizhinjam, Mr. George Zen P T, Project Officer, AF Vizhinjam and Mr. Anurag M J, Centre Head, ASDC Vizhinjam were attended the ceremony and distributed certificates and student kits to all the trainees.

Guest Lecture on Skin Care

Date: June 8, 2024.

Venue: ASDC Vizhinjam Centre

Guest Speaker: Sajil Ashokan, Founder of Param Pavithra Organics, Kerala

Session Summary:

The guest session on skin care, held on June 8, 2024, at the ASDC Vizhinjam Centre, was a resounding success. Sajil Ashokan, the founder of Param Pavithra Organics, delivered an informative and engaging talk on the importance of natural products in skin care.

Session Highlights:

- Sajil Ashokan explained the different skin types and their characteristics.
- He emphasized the importance of using natural products in skin care, citing the benefits of natural ingredients over harsh chemicals.
- He introduced Param Pavithra Organics, his brand of natural skin care products, and explained the story behind its creation.
- He showcased the various products offered by Param Pavithra Organics and their uses.

Key Takeaways:

- Understanding of skin types and their needs.
- Importance of natural ingredients in skin care.
- Introduction to Param Pavithra Organics and its products.

Audience Feedback:

- The audience found the session informative and engaging.
- They appreciated the knowledge shared by Sajil Ashokan and found it useful.
- They showed interest in Param Pavithra Organics products and asked questions about their use.

Conclusion:

The guest session on skin care was a success, and Sajil Ashokan's expertise and passion for natural skin care were evident throughout the session. The audience benefited from the knowledge shared, and the session achieved its objective of promoting natural skin care and introducing Param Pavithra Organics.

Webinar Report

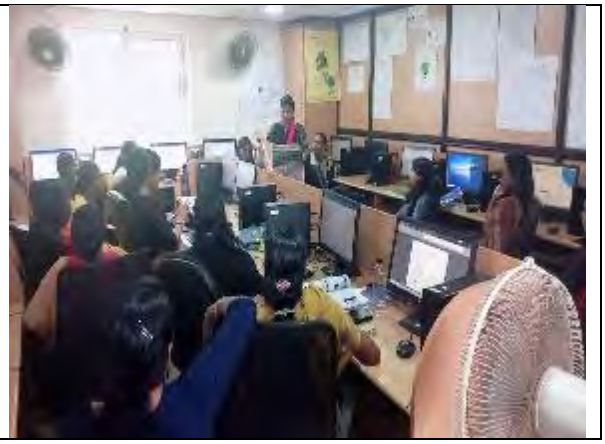
On 11th June 2024, Tuesday, a workshop on hair cutting and treatment was conducted by Streax Company at Trivandrum. From ASDC Vizhinjam centre, Ms. Mini Jose, Trainer Beauty Therapist & Hair Stylist attended a workshop for upgrading the knowledge and familiarizing her with the new technologies in hair treatment. The workshop was held from 10am to 5pm and covered various topics related to hair styling, including:

- Different hair cutting techniques
- Hair setting methods
- Various hair coloring techniques and timing

The workshop was informative and provided hands-on experience, enhancing my knowledge and skills in hair styling. I appreciate Streax Company for organizing such a valuable workshop.

Domestic Data Entry Operator- (Batch 3 & 4)

On 18th March 2024, Vizhinjam centre started Induction program as part of the Domestic Data Entry Operator course at centre. 48 community youth were applied for the course and 36 participated in the Induction Program at Transit Campus, Mukkola. After successfully completing the Induction Programme, 34 showed interest to join the training programme and as of now, all the trainees were completed ERP registration, and the sessions are going on. Ms. Neethu V Nath, Trainer-DDEO is handling the sessions which covers typing skills, English & Malayalam Typing, MS Office etc.

Self-Employed Tailoring (Batch 1 & 2)

After successfully completing the last batch with 32 trainees, ASDC Vizhinjam centre started 2 new batches for the Self-Employed Tailor course at VizMart building, Vizhinjam with 29 trainees. Ms. Preeja U P is handling the sessions.

Certificate Distribution

Hard Copy certificates for the trainees completed Self Employed Tailor course under ASDC Vizhinjam centre held at VizMart building was conducted on 18th May 2024. Mr. George Zen P T, Project Officer, AF Vizhinjam and Mr. Anurag M J, Centre Head, ASDC Vizhinjam participated and distributed the certificates in the presence of Ms. Preeja U P, Trainer SET. Trainees shared their feedback and conveyed thanks to ASDC & AF for conducting such a training program at Vizhinjam.

Hair Stylist (Batch 2 & 3)

As part of International Women's Day, ASDC Vizhinjam centre collected 52 applications from the community people for the beautician course. The induction programme was conducted at the centre on 13th March 2024 with a participation of 38 applicants and parents meeting was done on 16th March. From 18th March 2024 onwards, 2 new batches were started with 36 trainees at CSR office building.

Guest Lecture

A Guest Lecture on Hair Treatment was organized by Adani Skill Development Centre, Vizhinjam on 23rd August 2024 for the ongoing Beauty Therapist and Hair Stylist batch trainees. The session was handled by Mr. Saji George, from Matrix Cosmetics Company, certified and experienced trainer in Beauty & Wellness sector. Hair protection, hair cutting, and hair treatment were the main topics. Practical demonstration was also conducted for better understanding.

ITV Truck Operator (Batch 1)

ITV Truck Operator batch training was started from 18th March 2024 at Transit Campus, Mukkola under ASDC Vizhinjam centre. 20 trainees regularly attend the session from 8am to 10am. Training support was provided from the Vizhinjam port itself. Mr. Vijaya Reddy, Manager-Planning & Mr. Balamurugan, Junior Manager were handled the session. Mr. Anilkumar B S, Trainer-IOT coordinated the sessions and provided sessions on the new technologies supporting their jobs.


Practical Training

Handson training for all the 17 ITV Truck Operator trainees was completed by the reporting month. The training was given on 40 ft. trailer vehicle rented by ASDC. All the trainees got 2 hrs driving training inside the container yard. They got good practice on bend movement, parking vehicle near the cranes in proper alignment, reverse etc. Mr. Rintu, an experienced driver at Vizhinjam port handled the training with the presence of Mr. Anilkumar B S, Trainer-ASDC.


Offer Letter Distributed

Offer Letter for the 5 local trainees was distributed by Dr. R Bindu, Hon. Minister of Higher Education, GoK on 15th June 2024. For the rest of 12 trainees, Mr. Sreejith S, Placement Manager- ASDC Vizhinjam has handed over the same at Transit Campus. From 1st August 2024 onwards, 17 trainees will be deployed at Vizhinjam port as ITV drivers for a stipend of Rs.15,000/- for 3 months. After completing the OJT, they will be considered into fixed term with a monthly package of Rs.23,500/-

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Language & Soft Skill Training

Soft Skill portions like Communication skills, Language skills, Resume Preparation, Interview skills are provided to the domain trainees as per the SOP. Ms. Kavitha, Trainer - Language & Soft Skill is handling the soft skill portions for the ongoing domain batches. Offline sessions are provided for the DEO, GDA and BT, ITV & Lasher batch trainees for covering the soft skill portions. Final assessment for the lasher and ITV batches were completed as per the schedule.

For the placement support, sessions on Interview Skills, Personality Skills, Time Management, Counselling etc. are provided as part of the training. More concentration is being given on the Resume Preparation and Mock Interview sessions. Free courses available on LMS like Interview Skill course was attended by the trainees of all the courses.

Placement Details during the period

Sl.No	Course	No. of Placed
1	General Duty Assistant	40
2	General Housekeeper	19
3	Diploma in Warehouse management	23
4	ITV	17
5	Lasher	24
6	Data Entry Operator	23
7	Community Placements	3

Offer Letter Distributed

Offer Letter for all the 17 ITV Truck Operator trainees under ASDC Vizhinjam centre was distributed in the month of June 2024. For the 5 localites, offer letters were distributed by Dr. R Bindu, Hon. Minister of Higher Education. From 1st August 2024 onwards, 17 trainees will be deployed at Vizhinjam port as ITV drivers for a stipend of Rs.15,000/- for 3 months. After completing the OJT, they will be considered into fixed term with a monthly package of Rs.23,500/-.

Job Portal Registration

Adani Skill Development Centre Vizhinjam is taken an initiative to motivate trainees to register into the various job portals available for finding and referring more job opportunities based on their qualifications and skills like indeed.com, shine.come, NCS, linkedin.com and Nukari

District Skill Development Centre – KASE – Pappanamcode, Trivandrum

Partnership Forges New Opportunities for Learning: In a groundbreaking development, Adani Skill Development Centre and Kerala Academy for Skill Excellence-KASE (under Kerala Skill Mission) have officially linked an agreement on 25th January 2024 at KASE District Skill Development Centre, Pappanamcode, Trivandrum to collaborate on the delivery of skill courses aimed at addressing the growing demand for specialized expertise in industries.

The agreement was signed and handed over between Dr. Veena N Madhavan, MD KASE and Shri. Rajesh Kumar Jha, MD & CEO, Adani Vizhinjam Port Pvt. Ltd. In this occasion, the 3000 sq.ft. District Kaushal Kendra of KASE building at Pappanamcode, Trivandrum was inaugurated by Shri. Sivankutty, Hon. Minister for Education, Skills and Labor, GoK in the presence of Mr. Vinod T V, COO-KASE, Dr. Anil Balakrishnan, Head CSR-Southern Region, Chief Project Officer-CSP Vizhinjam, other elected officials and team members of KASE and ASDC, Vizhinjam.

Adani Skill Development Centre started conducting batches for the Lasher, Front of House and Diploma in Warehouse Management courses at KASE building from this month onwards. Total admissions achieved in the FY 2024-25 is as follows:

Sl. No.	Course Name	Eligibility	Duration	Certification	Venue of Classes	Participants
1	Lasher	10th	190 hrs	ASDC & KASE	District Skill Development Centre-Pappanamcode	26
2	Diploma in Warehouse Management	Degree	400 hrs	ASDC & KASE	District Skill Development Centre-Pappanamcode	13
Total						**39**

Course Details

Lasher (Batch 1)

From the 28 applicants, 27 were showed interest for joining the Lasher training programme at District Skill Development Centre, Pappanamcode. Induction programme was conducted for the applicants on 13th March 2024 to 15th March 2024 at centre. After successfully completing the Induction Programme, classes were started from 18th March 2024 with 27 trainees at Pappanamcode Centre.

Theory portions and Soft Skill Portions were completed as per the schedule by 24th May 2024.


Offer Letter Distribution

As the Lasher batch with 24 trainees were completed at Transit Campus, Mukkola, all the trainees were selected to Vizhinjam port on the "Lasher-Trainee" job role from 1st August 2024 onwards. Offer letters for all the trainees were handed over to them by Mr. Sreejith S, Placement Manager and Mr. Vipin S, Trainer-Lasher, ASDC Vizhinjam.





On the Job Training at Vizhinjam port

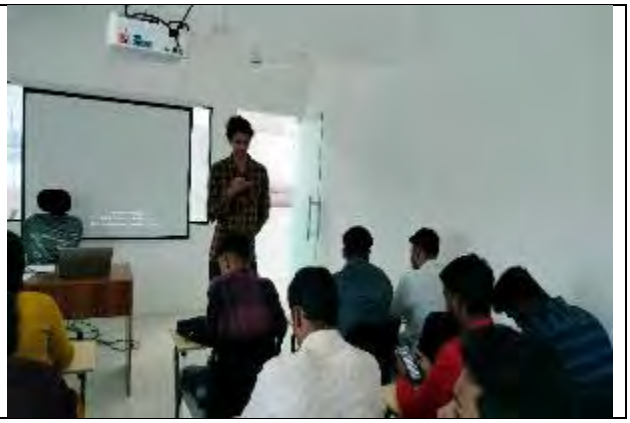
ASDC Vizhinjam centre completed training on Lasher course for 24 trainees at Transit Campus, Mukkola and 26 trainees at District Skill Development Centre, Trivandrum under KASE. 24 trainees trained at Transit Campus were placed at Vizhinjam port on 1st August 2024 as Lasher-Trainees. As of now, On the Job Training is going on Vizhinjam port. Mr. Vipin S, Lasher-Trainer is handling the sessions with the guidance and support of Operations team at Port.


Diploma in Warehouse Management (Batch 1)

A new batch with 16 trainees was started for the Diploma in Warehouse Management course at District Skill Development Centre, Trivandrum on 2nd September 2024. Mr. Nidhin S Raj, Trainer-Warehouse Management, is handling the sessions. He arranged Guest lecture sessions by the domain experts who are handling the sessions in various training institutes.


Language & Soft Skill Training

Soft Skill portions like Communication skills, Language skills are provided to the domain trainees as per the SOP. Ms. Kavitha T R, Trainer- Language & Soft Skill is handling the portions for the ongoing port related domain batches running at District Skill Development Centre, Pappanamcode, Trivandrum. Trainees from Lasher and Diploma in Warehouse Management courses are actively participating in the same. Final assessment on the Soft Skill portion was completed by all the trainees.

For the placement support, sessions on Interview Skills, Personality Skills, Time Management, Counselling etc. are provided as part of the training. More concentration is being given on the Resume Preparation and Mock Interview sessions. Free courses available on LMS like Interview Skill course was attended by the trainees of all the courses. Details as follows,

Sl. No.	Course Name	Total Trainees	Interview Skill Course Attendees
1	Lasher	26	26
2	Diploma in Warehouse Management	13	6
	Total	**39**	**32**

General Activities

World Book & Copyright Day -2024 Celebration

World Book and Copyright Day is a celebration to promote the enjoyment of books and reading. Each year, on 23 April, celebrations take place all over the world to recognize the scope of books - a link between the past and the future, a bridge between generations and across cultures. On this occasion, UNESCO and the international organizations representing the three major sectors of the book industry - publishers, booksellers, and libraries, select the World Book Capital for a year to maintain, through its own initiatives, the impetus of the Day's celebrations. The theme of this year Worl Book and Copyright Day is "Read Your Way". Considering the new generation technologies, there are many ways to read and capture the contents like E-Library, Audio Library, Videos etc.

As part of sharing the importance of book reading day, ASDC Vizhinjam centre conducted several activities on 23rd May 2024, Tuesday related to book reading and motivating our trainees to ensure reading habit in their day-to-day life.

Book Fair (nearby Library visit) – For understanding about the varieties and types of books, a visit was arranged to the C V Smaraka Library, Thennoorkonam, Mukkola for the ongoing skill trainees. Our 22 trainees from the BT & DDEO batches visited the library and experienced the books in the library. Shri. S K Vijayakumar, Secretary of C V Smaraka Library gave a brief on the procedures for taking library membership, types of books available in the library and different community groups formed as part of uplifting the book reading and social activities. Mr. George Zen P T, Project Officer, AF-Vizhinjam and Ms. Mini Jose, Trainer-BT accompanied with trainees and arranged all the facilities at the library.

Poster Making – Trainees from the DDEO, BT & HS batches designed several posters regarding the World Book Day. As per their concepts, posters were designed in the chart paper and presented in from of all the trainees.

Bookmark Creation – 5 bookmarks were created by the trainees related with different books read by them. They created it with chart paper and by their own ideas.

Review Writing – A review on the book- "Oru Deshathinte Kadha" written by S K Pottekadu, the famous novelist in Malayalam was written by Ms. Sunitha M from the Domestic Data Entry Operator batch.

Author's Session – In relation with the World Book Day celebration, a guest session was arranged at Transit Campus on 23rd April 2024 at 3:00pm for the ongoing batch trainees. The invitee was Mr. Mulloor Madhu, famous writer and police officer residing at Mulloor area, near to Vizhinjam port. Mr. Anurag M J, Centre Head-ASDC did a introduction speech about the importance of the day and invited all the participants to the session. Mr. George Zen P T, PO-AF Vizhinjam, briefed about the book reading benefits and facilities available for the same. A total of 63 trainees from DDEO, BT & Lasher batches participated in the session.

International Anti-Tobacco Awareness Session

As the 31st of May is observed as the International Anti-Tobacco Day, ASDC Vizhinjam centre arranged an Awareness Program for the ongoing batch trainees at Transit Campus. It was headed by the GDA trainees of ongoing batch. The trainees focused on the awareness about the harmful effects of tobacco and promote a tobacco-free lifestyle among all batches. The program began with a skit, showcasing the dangers of tobacco addiction and its impact on health and relationships among all batches.

World Environment Day Celebration

On 5th June 2024, Vizhinjam centre observed World Environment Day with great enthusiasm and zeal. The trainees actively participated in various activities organized to promote environmental awareness and conservation.

Activities:

- ✓ **Tree Planting:** Trainees planted trees in the centre premises, emphasizing the importance of afforestation.
- ✓ **Poster Creation:** Participants created posters highlighting environmental issues and solutions.
- ✓ **Articles:** Trainees wrote articles on environmental conservation and its significance.
- ✓ **Pledge:** All participants took a pledge to protect the environment and promote sustainability.
- ✓ **Competition:** An essay competition was held on the topic "The Role of Young People in Environment Conservation." Two winners were selected and awarded small plants as prizes.

Winners:

- ➢ 1st Place - Stephy Bosco (DDEO batch)
- ➢ 2nd Place - Chinchu S (GDA batch)

Mr. Anurag M J, Centre Head, ASDC Vizhinjam handed over the plants as the prizes for the competition winners. All the other staff members coordinated and did arrangements for conducting the same in good manner.

Fire & Safety Training

On 6th June 2024, ASDC Vizhinjam centre conducted a session on Fire Safety for all the batch trainees undergoing training in various courses. The session was handled by Mr. Vipin S, Trainer-Lasher. A total of 103 members participated in the training including all the staff members. The training was conducted in 2 sessions, Forenoon and Afternoon.

Training Content:

1. What is Fire?
2. Triangle of Fire
3. Classification of Fire
4. Fire Extinguisher Types
5. PASS Method (Pull, Aim, Squeeze, Sweep)
6. Practice and Use of Fire Extinguishers
7. Video presentations on fire safety
8. Demonstration of the use of Fire Extinguisher

Training Summary:

Mr. Vipin Sivarajan conducted two interactive sessions, covering the fundamental aspects of fire safety. The participants actively engaged in discussions and practiced using fire extinguishers. The training aimed to equip the participants with essential knowledge and skills to respond effectively in fire emergencies.

Outcome:

The training enhanced the participants' understanding of fire safety and their confidence in using fire extinguishers. The session's interactive approach and practical demonstrations made the training engaging and informative. By investing in fire safety training, ASDC Vizhinjam Centre demonstrates its

commitment to ensuring a safe working environment for its employees and trainees.

All the team members coordinated and very well arranged for conducting the session.

International Drug Abuse Day – 2024

The International Day Against Drug Abuse and Illicit Trafficking was observed at Adani Skill Centre, Vizhinjam, on 26th June 2024 based on the theme "The evidence is clear: Invest in prevention". Drug abuse is one of the major challenges across the world as it continues to be a significant threat to global health and social well-being. The way drugs are impacting the youths and hampering their potential highlights the urgent need to find a solution to the drug problem. The event aimed to raise awareness about the risks and consequences of drug abuse and illicit trafficking. According to UNO, this year, World Drug Abuse Day is call to – Raise Awareness, Advocate of Investment, Empower Community, facilitate dialogue and collaborations, Promote Evidence based policy making, Engage Communities, Empower Youth. Based on this, ASDC Vizhinjam centre conducted various activities to promote the importance of the day.

An awareness session was arranged for the ongoing batch trainees at Transit Campus in association with the Kerala Excise Department. Mr. Padmakumar, Excise Preventive Officer, Neyyattinkara Circle handled a detailed session for the trainees.

He explained about all the issues, situations and legal issues while abusing drugs as well as carrying the same. He also shared the contact number for reporting if anything like the same is happening in the community. Trainees were very much

excited, and they cleared some doubts related with the drug abuse and its legal formalities also. Trainees showcased their creativity and talent through various performances, including skits, mimes, and street dramas, conveying powerful messages against drug abuse. The event concluded with a pledge taken by all participants to spread awareness and support the cause. The program was successfully conducted by the trainees, and the enthusiasm and energy of the participants made it a memorable event.

In association with Girls Higher Secondary School, Venganoor, ASDC Vizhinjam centre arranged a skit at Mukkola Junction as part of sharing the awareness about the drug abuse and illegal trafficking. CSR Team members, GHSS for Girls Venganoor staff members, SPC Cadets, Police Officials and localites were presented for watching the skit. Everyone appreciated the little champs for showcasing such a meaningful skit in front of the community people.

All the ASDC Vizhinjam team members participated and coordinated the same events for reaching it out to the community people as well.

National Reading Day – 2024

"Words are sharper than swords, so reading books with strings of words is best for human growth."

As the 19th day of June month is observed as the National Reading Day, Adani Skill Development Centre Vizhinjam celebrated with various programmes and competitions at Transit Campus, Mukkola.

The day is attribute to the effort of P N Panicker to transform society with his literacy movement in India. The Father of Reading passed away on June 19, 1995.

PN Panicker founded Sanadana Dharma Library which was the centre of the library movement in Kerala. About 50 students of General Duty Assistant, Data Entry Operator and Beauty Therapist batches who are being trained under Adani Skill Development Vizhinjam Center participated in the said program.

Dr. D Anilkumar, Associate Professor, St. Xavier College, Thumba, Trivandrum was the chief guest of the program. Mr. George Zen P T, Livelihood Project Officer, AF Vizhinjam and S K Vijayakumar, Secretary, C V Smaraka Library Vizhinjam were also presented in the celebration. Dr. Anilkumar talked about many famous Malayalam books, the life stories of some Malayalam writers and the benefits of reading books.

As part of the celebration various competitions like Malayalam Book reading, Malayalam Books and Author's Names items were conducted and distributed prices on that occasion.

Ms. Sheeja M, Trainer-GDA, Ms. Mini Jose, Trainer-BT & HS, Ms. Kavita T R, Trainer Language & Soft Skill, Ms. Neetu V Nath, Trainer-DDEO, Mr. Anilkumar B S, Trainer-IoT, Mr. Sreejith S, Placement Manager and Mr. Vipin S, Trainer-Lasher organized this event.

International Yoga Day

"Yoga for Self & Society"

International Yoga Day was celebrated by ASDC Vizhinjam centre on 21st June 2024 with yoga practicing. Ms. Reeja from the BT batch, who is a regular and experienced Yoga practitioner took sessions for the ongoing batch trainees. The

sessions were held at the CSR Office building with a participation of 76 trainees as 2 different batches. 13 livelihood group members also participated in the same.

Employer Engagement Programme – Season Two Senior Living

An employer engagement program related to placements held on 03-05-2024, Thursday by season two senior living, Trivandrum for General Duty Assistant batch at Adani skill development Centre, Vizhinjam. Mrs. Sathikumari T, A G M – Operations & Mr. Sridath D, Senior coordinator share the details and rules and responsibilities for the post of patient care assistants in their care home and home-based patient care services. 18 candidates from 2 batches attended the session.

Points Discussed.

- Duties and responsibilities of the job role
- Salary and Allowances Rs. 17000/- to 19000/- / Month + Food and Accommodation
- Holidays, leaves and duty shifts
- Q & A session with candidates

Vizhinjam Port Exposure Visit – ITV & Lasher Batches

Exposure Visits are a very important training methodology as it enables the participants from a different setting to interact with and learn from each other, allowing them to view practical/real life situations. This may help them to understand about their own domain working atmosphere and realize the importance of training for getting into that environment.

On 9th May 2024, Thursday, ASDC Vizhinjam centre arranged an Exposure Visit to Vizhinjam port for the Lasher batch trainees. In total 52 trainees from the Lasher batches ongoing at Transit Campus, Mukkola and District Skill Development Centre, Pappanamcode participated in the visit along with the ASDC team members.

Mr. Anurag M J, Centre Head welcomed all the participants and gave a brief on the importance of the exposure visit and engaged all the department team members in the port office to interact with trainees. Dr. Anil Balakrishnan, Head-CSR, Southern Region, Chief Project Officer-CSP, interacted with our trainees and motivated them to train with a goal. He ensured all the training facilities and modules.

Mr. Sarath from the Project Team gave a presentation on the past, present and future of Vizhinjam Port. He also visualized how important is Vizhinjam port in the logistic world. He played a short, animated video on how in future the Vizhinjam port will run and its facilities. Mr. Deepesh, HR Manager-AVPPL, interacted with all the trainees. Mr. Prakash Pillai, Sr. Manager-Operations and Mr. Vijaya Reddy, Planning -Manager, interacted with all the trainees and understood their knowledge on lasher job and lashing activities. Mr. Shery Francis, Manager-Operations took a session on lashing activities and understood them about the role which a lasher is playing inside a port business. He very well explained about the transshipment works, Container Yard works etc...

Dr. T M George, Technical Advisor, CSP Vizhinjam also interacted with trainees and guided them how to become a good employee and how to get better career growth with a good attitude. Mr. Anilkumar B S, Trainer-IoT, Mr. Vipin S, Trainer-Lasher Ms.

Kavitha T R, Trainer – Soft Skill & Mr. Sreejith S, Placement Manager from ASDC team also joined and coordinated the visit.

Trainees were very well motivated, and they saw all the facilities like CRMG Cranes, ITV Vehicles, RMQC Cranes and witnessed the trial run activities happening in the yard.

Industrial Visit – BT & HS Batches

On 31st May 2024, an Industrial Visit to Women Studio City Collection, Trivandrum was conducted to provide hands-on experience and exposure to a professional beauty studio setting, enhancing the trainees' knowledge and skills in beauty therapy and hair styling. The studio offers a wide range of beauty services and products, making it an ideal destination for the trainees to gain practical insight into the industry. During the visit, the trainees were given a comprehensive tour of the studio, showcasing various sections, including: - Beauty product displays featuring renowned brands - Hair care and styling sections - Skin care and makeup areas - Nail care and pedicure stations - Equipment and tools used in beauty treatments Key Takeaways: - Trainees gained hands-on experience with various beauty products and equipment - They learned about the latest trends and

techniques in beauty therapy and hair styling - They understood the importance of maintaining a clean and hygienic environment in a beauty studio - They saw demonstrations of various beauty treatments and services offered in a professional setting Conclusion: The industrial visit to Women Studio City Collection provided a valuable learning experience for the Beauty Therapist and Hair Stylist trainees. They gained practical knowledge, insights, and exposure to a professional beauty studio setting, enhancing their skills and preparing them for their future careers in the beauty industry.

National Technology Day

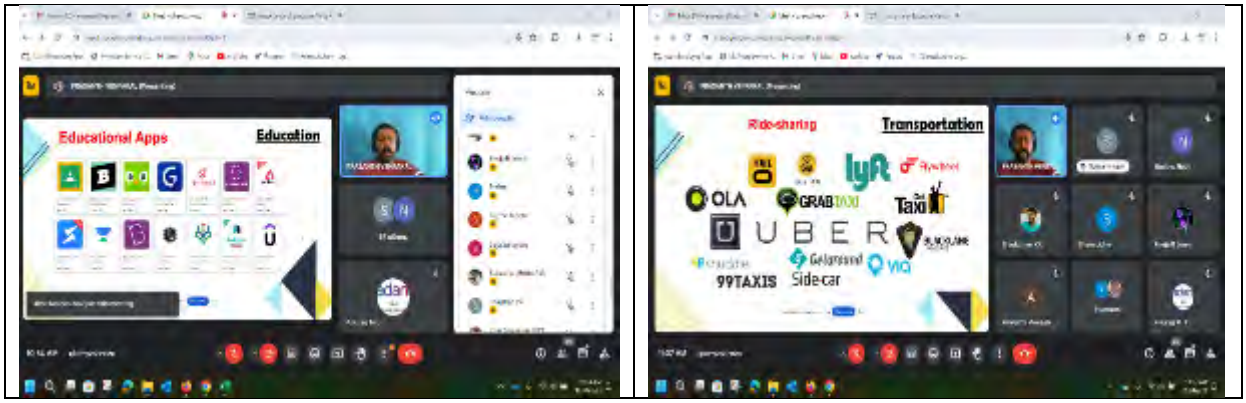
National Technology Day is observed every year on May 11 across the country. The day commemorates the achievements of engineers and scientists in the field of science and technology. During the ongoing pandemic, the day holds a special significance. The theme for National Technology Day 2024 is "From Schools to Startups: Igniting Young Minds to Innovate". It emphasizes nurturing schoolchildren to start their own start-ups and contribute to making India the hub of startups in the world.

ASDC Vizhinjam centre took the initiative to introduce the new Technologies which is now available and helpful for our day-to-day human life. As part of the same, a Guest Lecture Session was arranged on 11th May 2024 at 10:30am through Google Meet platform. The session was handled by Dr. Prasanth Venpakal, Assistant Professor in Commerce, Trivandrum. He explained about the application available in the market which can be used in Education, E-Commerce,

Transportation and other sectors. He presented all the major applications, its use and how it can be installed in mobile phones.

He mentioned how safely the apps can be used and the point to remember while using an unknown application. Some important Cyber Laws and Cyber Crime incidents were also showcased in the same. Trainees used this opportunity to clarify some major doubts and shared their own experiences while using the applications.

It was a useful Guest Session which gave a clear idea about the application and its use in the new technology.



International Nurses Day -2024

On 12th May 2024, we honor the selflessness, dedication and skill of nurses everywhere……!

The WHO European Region celebrates International Nurses Day on 12 May, held each year on the anniversary of Florence Nightingale's birth. We, ASDC Vizhinjam Centre also celebrated the International Nurses Day-2024 at Transit Campus, Mukkola on 13th May 2024 at 11 am. As part of the importance of the day, we felicitate Ms. Bindhu, Nursing Officer, Community Health Centre, Vizhinjam jointly by Mr. George Zen P T, Project Officer, AF Vizhinjam and Mr. Anurag M J, Centre Head, Adani Skill Development Centre Vizhinjam. She has over 20 years of nursing experience and has been serving at CHC Vizhinjam for the last 4 years. She shared her journey to the nursing profession with an average family and her experiences in this field. She was very excited to share her achievements and recognition she got from various places for her services. She motivated and congratulated our new

GDA trainees to use this opportunity and to become a good nursing assistant in future.

She lit the lamp and shared her thoughts with the new GDA trainees and officially announced the starting of new GDA batches. A total of 55 trainees participated in the same and they were very well motivated to select the GDA course for getting a job.

All the ASDC Vizhinjam team members took initiatives and supported to conduct the programme. Ms. Sheeja M, Trainer-GDA, ASDC Vizhinjam shared vote of thanks to all the guest panel and participants on that occasion.

Self Defense Training Program

Self-Defense training equips your physical skills but also enhances your mental and emotional resilience, empowering you to navigate challenging situations with confidence.

Adani Skill Development Centre, Vizhinjam in association with Janamaithri Police Station Vizhinjam conducted a Self-Defense training program for the International Women's Day Special ladies batch trainees at CSR Office building on 14th May 2024. The session was inaugurated by Mr. George Zen P T, Project Officer, Adani Foundation Vizhinjam in the presence of Mr. Stephen Vinod, Project Officer, Adani Foundation Vizhinjam. CSR Team members and ASDC Vizhinjam team members. Mr. John Paul, ASI, Vizhinjam, Mr. Anish M, Senior Civil Police Officer, Vizhinjam, Ms. Athulya, CPO Vizhinjam, Ms. Jaya Meri, CPO Vizhinjam and Ms. Preethi, CPO Vizhinjam participated in the program.

They took session on women violences and type of registered cases under Vizhinjam police station. They gave instructions to all the ladies to be cautious while walking along roadside, alone in home, talking with strangers and use of social media platforms. Importance of Self-Defensing, when it must be taken, how it must be done etc. were very well explained by the police officials. Cheating happening in social media was also highlighted in the session and they gave proper instruction to the participants on using such platforms.

Official trained our trainees how to use some self-defensing activities while happening any of the situations. They taught them how to do it and demonstrated some of the items with participants. Participants were very excited and eager to study and practice those items.

SAKSHAM DAY Celebration -2024

As completing the 8 years of successful journey in Skill Development, Adani Skill Development Centre arranged some celebrations across nation. A Virtual Event was organized by HO team via Google Meet on 16th May 2024 at 3:00pm. Shri. Jatin Trivedi, COO-ASDC, made a presentation on the history of ASDC and the year wise achievements. Shri. Vasanth Gadhavi, Executive Director-ASDC also participated in the celebration and conveyed his wishes to all the ASDCians across the nation.

Mr. Dhruv Trivedi, Assistant Manager-MIS, coordinated with 8 successful candidates across nation for sharing their stories in the event. ASDC Vizhinjam centre was very excited to showcase one of the success stories of Ms. Sindhu Rajeev -BT Trainee. She completed the Beauty Therapist course in October 2021

and started her own parlor in November 2021. She also gave an opportunity to her colleague in her parlor. She was very passionate about her success in the Beautician field. She attended many other advanced courses conducted by some of the cosmetics companies and last year she joined Hair Stylist course under ASDC Vizhinjam centre as part of upgradation. As of now, she is running her parlor in a better way and one of the BT trainees from Vizhinjam centre is earning with her from the same parlor. Ms. Sindhu is happy to say that now she can take some money for her family and the studies of her children from her own entrepreneur program. She conveyed her thanks and support of ASDC Vizhinjam team for conducting such a training program at Vizhinjam location.

Other 7 stories from Karnataka, Tamil Nadu, Gujarat states were presented in that occasion. From Vizhinjam centre, 33 trainees participated virtually and 52 attended the event from Transit Campus, Mukkola.

The virtual event was ended by 4:30pm with a thanking note by Ms. Radhika Maira, Manager-Operations ASDC.

Career Guidance Session

ASDC Vizhinjam centre in association with ASAP, Kerala, conducted a Career Guidance session for the ongoing BT, GDA, DDEO & HS trainees at Community Skill Park building on 28th September 2024. The session was handled by Mr. Lipin Rajasekharan, a freelance educator and trainer. He holds a master's degree in English from MG University, Kottayam. Since 2015, he is working as a Communicative English trainer at ASAP.

Shifting Transit Campus to Community Skill Park

As per the MoU agreement signed between ASAP Kerala and ASDC, the Transit Campus, which was running at I R Building, Opposite to Canara Bank, Mukkola, Mulloor was shifted to Community Skill Park building on 6th September 2024. The ongoing batches of General Duty Assistant (2 batches) and Domestic Data Entry Operator (2 batches) were shifted to CSP and resume the batches from 9th September onwards.

Exposure Visit to Vizhinjam Port

On 25th July 2024, Thursday, ASDC Vizhinjam centre arranged an Exposure Visit to Vizhinjam port for the GDA, BT, DDEO & Warehouse Management batch trainees. In total 51 trainees from the Transit Campus, Mukkola and District Skill Development Centre, Pappanamcode participated in the visit along with the ASDC team members.

Mr. Anurag M J, Centre Head welcomed all the participants and gave a brief on the importance of the exposure visit and engaged all the department team members in the port office to interact with trainees. Mr. Sarath from the Project Team gave a presentation on the past, present and future of Vizhinjam Port. He also visualized how important is Vizhinjam port in the logistic world. He played a short, animated video on how in future the Vizhinjam port will run and its facilities.

Domain Trainers Mini Jose, Sheeja M, Kavitha T R, Neethu V Nath, Mr. Vipin S, Mr. Anilkumar B S, & Mr. Sreejith S, Placement Manager from ASDC team also joined and coordinated the visit.

Trainees were very well motivated, and they saw all the facilities like CRMG Cranes, ITV Vehicles, STS Cranes and witnessed on the trial run activities happening at yard.

World Hepatitis Day

ASDC Vizhinjam centre conducted a Guest Session on 27th July 2024, Saturday through online platform as part of Worl Hepatitis Day. The session was handled by Ms. Leena Raj L R, Adolescent health Counsellor, Family Health Centre, Mukkola, Vizhinjam. The session aimed to educate participants about the causes, symptoms, prevention and management of Hepatitis. The session delivered an engaging and informative presentation, covering various aspects of Hepatitis, including its typers, transmission modes, risk factors and treatment options. She emphasized the importance of vaccination, safe practices and early detection in prevention and managing the disease. The session was interactive with participants asking queries and sharing their concerns. Total 60 trainees from various batches participated in the same.

World Youth Skills Day - 2024

In 2014, the United Nations General Assembly declared 15 July as World Youth Skills Day to celebrate the strategic importance of equipping young people with skills for employment, decent work and entrepreneurship, as well as for addressing global challenges and advancing sustainable development.

The theme for World Youth Skills Day 2024 is "Youth Skills for Peace and Development". It highlights the crucial role that young people play in peacebuilding and conflict resolution efforts.

As a part of familiarizing the importance of the day, ASDC Vizhinjam Centre planned to celebrate the World Youth Skill Day with various activities as a week program. In this week programme various competitions may be conducted for the youths at centre on various items. On the first day 15th July 2024 Monday, we conducted a Food Competition activity. The event aimed to showcase the culinary talents of our participants in cooking. There were 4 categories like snacks items, traditional Payasam items, cake items and pudding items in which 41 participants prepared a variety of dishes. The dishes were judged by the CSR officials which was showcased at Transit Campus.

Literary Competitions were also conducted to showcase the literary skills of the trainees. 89 participants from various domains participated in the programmes like Drawing Competition, Story writing & Poetry Writing - Malayalam & English, Advertising Copy Contest - English, Malayalam, Fabric Painting etc.

On 19th July 2024, the Exhibition Competitions in 4 Categories, Anchoring Competition and Live Skill Tests in 6 various domains were conducted at Community Skill Park building. For the live skill tests, gifts for the winners were shared on the spot as an appreciation. All the competition items were evaluated by the officials from the Adani Foundation team as per the prescribed criteria.

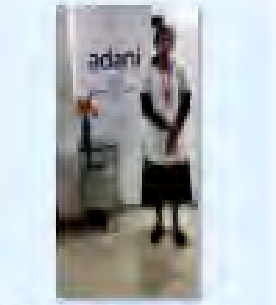
As part of celebration, an official program was arranged at CSP building having the guest from the Adani Foundation team. Mr. Sebatian Britto, Program Manager, Adani Foundation Vizhinjam, Dr. T M George, Technical Advisor, ASDC, Mr. Rakesh, Senior Project Officer, AF Vizhinjam, and the other project officers Mr. George Zen P T, Mr. Stephen Vinod, Ms. Maya G. Ms. Preji were also participated and evaluated the competitions. The winners of all the competitions were awarded by the guests

on that occasion. Trainees showcased an energetic group dance and a meaningful skit as part of the celebration. 155 trainees from all the ongoing batches participated in the program.

All the ASDC Vizhinjam team members took their efforts and dedication for making this event a great success as well as an interesting one. In the Event we encouraged the trainees to exhibit their skills. It was a memorable event.

Teacher's Day Celebration

As part of the Teacher's Day celebration Adani Skill Development Centre conducted a presentation competition for the trainees across the nation. Trainees wanted to present a topic and capture the video for evaluation. From ASDC Vizhinjam centre, 4 trainees from the BT, GDA & DDEO participated in the competition and the video of Ms. Shobha from the Domestic Data Entry Operator batch was selected by the HO team. The selected videos were showcased in the virtual meet conducted by HO team.



Adithya_GDA-Vizhinjam

Arya_BT-Vizhinjam

Mable_GDA-Vizhinjam

Sobha_DDEO-Vizhinjam

Community Skill Park, Vizhinjam

Inauguration of Community Skill Park – Vizhinjam

On 15th June 2024, the Community Skill Park, Vizhinjam training building and hostel block was inaugurated by Dr. R Bindhu, Minister for Higher Education, GoK. She said that this Community Skill Park will prepare the youth for building capability to the opportunities at Vizhinjam International Seaport.

Presiding over the function, Minister of Ports/Cooperation Department Hon. VN Vasavan commented that Community Skill Park is the best example of how the development of Vizhinjam can be utilized by the local community people. Adv. Vincent, MLA-Kovalam was the chief guest of the program.

Principal Secretary Higher Education Dr. Ishita Roy IAS welcomed the ceremony, ASAP Kerala CMD Dr. Usha Titus, Vizhinjam Seaport Ltd. MD Dr. Divya S Iyer IAS, Adani Port CEO Pradeep Jayaraman. Ward Councilors Paniyadima (Kottappuram Ward), C Omana (Mulloor Ward), Adani Skill Development Center CEO- Mr. E. Jatin Trivedi attended the function.

3.3. LIVELIHOOD UPDATES

Status of existing livelihood groups

Name of IG activity of SHG's/JLG/FPC's	Financial Year of inception	Income in the reporting month (in Rs.)	Income (From April. to this reporting month of the (FY 24-25) in Rs.	Cumulative income (from inception of the groups)	
				No. of groups/JLG/FPC's	Amount in Rs.
Stiching/ weaving - (SRM Stitching Unit)	05.09.2019	7,630.00	45,163.00	1	859,377.00
Cleaning Services - Clean 4 U	10.04.2017	112,400.00	781,915.00	1	34,729,804.00
Poultry Units - Anaswara &Thripthi	20.01.2018	10,800.00	70,150.00	2	1,988,257.00

Canteen/Hotel Unit - Harbour , Canteen/Hotel Unit - U Me & Tea Canteen/Hotel Unit -Thattukada	13.07.2017 05.09.2019 16.07.2019	468,830.00	2,207,700.00	4	16,861,544.00
Eco friendly bag unit - Sreebhadhra Bags	05.11.2017	45,600.00	141,300.00	1	947,526.00
Vegetation Cleaning unit - Vanitha Karsheeka Karma Sena	05.09.2019	232,900.00	1,135,590.00	1	966,340.00
Laundry Service - Prime Events/Power laundry	06.02.2018 (Prime Events) 12.11.2019 (Laundry)	4,250.00	27,745.00	1	2,039,212.00
Data Entry and online services - Data Plus & SWAP	22.03.2018 (Data Plus) 01.12.2020 (SWAP)	44,760.00	281,520.00	2	345,600.00
Sale of Organic/Provisions - Turn to Fresh Organic Shop &/Provisions - Samudra Activity group	05.09.2019 (Turn to fresh) 03.12.2020	796,901.00	1,468,611.00	2	3,304,894.00
Sale of State Lottery & Tender Coconut	02.02.2022	-		0	51,034.00
Sale of organic Vegetable - Eco Shop	10.08.2018	77,420.00	262,152.00	1	3,562,061.00
Patient Care Services - Spandanam	01.03.2021	66,000.00	360,000.00	1	1,929,300.00
Milk and Milk products – Milma Parlor	02.04.2022	13,600.00	143,300.00	1	1,684,598.00
Viz Mart Consotium	01.08.2024	858,665.00	1,717,330.00	1	1,717,330.00
Total		**2,739,756.00**	**8,642,476.00**	**19.00**	**70,986,877.00**

VIZMART

Viz Mart, the consotium of livelihood groups, the selling counter at Viz Mart, Farm School, workers canteen and snacks counter at port premises are progressing well during the period.

24 Lashers and 12 cleaning staff are working at port under Viz Mart payroll.

Vanitha Karsheeka Karma Sena got an AMC contract with AVPPL for pest control and vegetation cleaning during the period

Basic Management training programme on Livelihood group and individual enterprises

Adani Foundation conducted basic management trainings as part of the livelihood support programme of AVPPL/AF in association with Venganoor Gramapanchayath during the period as follows.

Sl No	Date	Topics	No of Participants
1	03.04.2024	Feasibility, Business idea and Leadership	33
2	15.04.2024	Project Preparation & Marketing	33
3	10.07.2024	Orientation	21
4	17.07.2024	Cash Management	20
5	18.07.2024	Debt Management	18
6	31.07.2024	Proposal Planning	28
7	03.08.2024	Feasibility, Business idea and Leadership	20
8	24.08.2024	Leadership & Debt Management	20
9	19.09.2024	Discussion on Project Proposal	17
10	22.09.2024	Discussion on Marketing	17

Exposure Visit to Vizhinjam Port and Viz Mart by Venganoor Gram Panchayath Livelihood Members.

As the follow up of the livelihood training provided to the members of the Venganoor Gram Panchayat, an exposure visit was organized to Vizhinjam Port and the livelihood ventures initiated by Adani Foundation at Vizhinjam during the period. This was to provide a basic understanding of various running livelihood units under the consortium of Viz Mart at Vizhinjam and other CSR activities along with the construction progress of Vizhinjam Port.

Individual- micro–Enterprise Initiatives

AF has been supporting group enterprise since 2017 onwards, last year a new initiative of individual enterprise support programme started, under this programme the following enterprises were progressing during the reporting period.

Status of existing livelihood groups

Number of Individual Beneficiaries	Income in the reporting month (in Rs.)	Income (From April. to this reporting month of the (FY24-25) in Rs.	Cumulative income (from inception of the groups)	Average Income / Month in Rs.
Chinnu Stores - Sheeja	45,000.00	216,400.00	1,425,820.00	36,066.00
Sindhu Tailoring shop - Sindhu	19,800.00	88,400.00	436,890.00	14,733.00
Petty Tea Shop - Sulekhs	27,300.00	113,000.00	647,036.00	18,833.00
Stiching bag & Chappals - Peter	13,760.00	102,060.00	334,440.00	17,010.00
Petty Tea Shop - Baby	27,300.00	136,375.00	670,671.00	22,729.17
Street shop - Baby			1,052,548.00	-
Mrs. Nirmala - Fish Vending	43,400.00	250,400.00	1,023,008.00	41,733.00

Mrs. Jespi - Fish Vending	-	312,900.00	1,816,502.00	52,150.00
Mrs. Gulastic Amma	61,300.00	312,200.00	1,815,802.00	52,033.00
			9222717.00	

3.4. Sports Support

Sports Support to St. Mary's School Kottappuram

The sports training support to St. Mary's School Kottappuram is progressing well during the reporting period. The training support includes coaching to Football, Basketball, and volleyball has been providing daily two hours after class hours 6 days in a week. In addition to that coaching support for athletic items has also been provided for selected students.

Nutritious food support including milk, boiled egg and banana has also been provided as part of the programme for selected students. The playground on the school premises is being used for this purpose.

Sports support to Kovalm FC

Adani Foundation has been supporting the selected players from coastal part of Vizhinjam of Kovalm FC, a professional football club in Trivandrum. The support has been providing in the form of Nutritious food supplements practice materials and motivation sessions for players.

4. COMMUNITY INFRASTRUCUTRE DEVELOPMENT

4.1. Material Recovery Facility (MRF)

Material Recovery Facility is mainly designed to effectively manage plastic waste generated in Vizhinjam. Waste materials generated at source level are collected at MRF and segregated to sort plastic wastes. Stones and glass materials are initially removed. Segregated plastic wastes are dust removed, transported via conveyor belt to the shredding unit. Plastic with size below 6 microns are crushed to powdered form. Plastics of size above 6 microns are shredded to cube form. These shredded plastics will be taken from MRF for further reuse. Nearly 1 ton of plastic is expected to reach MRF daily. Waste will be collected from the wards of Kottapuram, Vizhinjam, Mulloor, Harbour and Venganoor by Haritha Karmasena members hired by Corporation.

The mentioned MRF is constructed in 3500 square feet area. (36.0X9.0=324m2). The maintenance of the MRF building will be undertaken by Trivandrum Municipal Corporation. Waste Management activities are implemented by Clean Kerala Company. All the civil works completed during the period.

4.2. Community Health Centre-NEW BLOCK

The new CHC building is a three storeyed RCC building (7000 sq feet area in each floor) constructed near to old CHC. The This hospital may be converted to Taluk Hospital in future thereby curtailing almost all the limitations of existing CHC. The inpatient admission will be raised from 40 to 100nos.

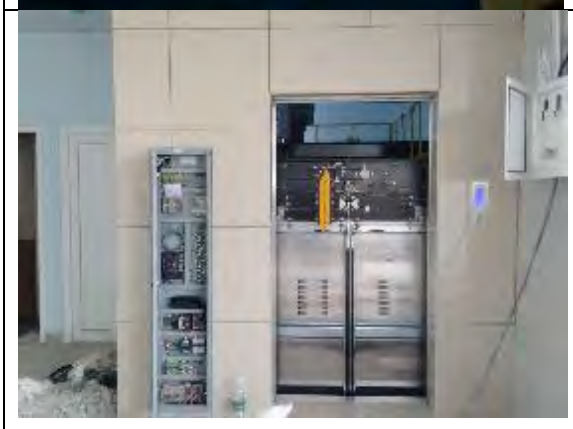
The main facilities designed for the department are listed below.

1. Reception Area.
2. Gynaec Operation Theatre-2 nos.

3. Post Operation Area.
4. Nebulisation Unit.
5. Anaesthesia /Counselling Room.
6. Labour rooms-2 nos.
7. Prewash Area.
8. Doctor's Lounge.
9. Nurse Station.
10. Staff Lounge.
11. Changing Room.
12. Sterile Store.
13. Toilets for Men and Women

All work on the second floor completed, except lift services. In ground floor and first floor, electrical works, Aluminum partition works, floor works, lift services are pending. Interlock works in between the new and old building is being carried out.






3.1. PLAYGROUND AT VELYAKADAPURAM

A temporary playground is constructed in Velyakadapuram for youth of fishermen community. The playground area is 70m long and 60m wide.

4.3. Model Anganwadi Building

As majority of Anganwadis are functioning on rental basis with limited facilities, Adani Foundation in cooperation with Government has come up with an ideal plan to provide a kinder garden that can render Montessori environment to kids of Vizhinjam community.

All the civil work were completed during the period.


4.4. New Block at St. Mary's HSS, Kottappuram

The construction of a new block for ST. Mary's Higher Secondary School Campus is progressing during the period. The total area of the new block is nearly 8028.44 square feet. The ground floor is meant to be an open space leading to the existing playground area. The first floor consists of 3class rooms, stairway, passageway. The second floor is also allocated for 4 classrooms.


4.5. Beach Bay Building construction at Vizhinjam

The mentioned building is a 3 storeyed building with 6 rooms in each floor. The foundation of the structure is constructed using cast in situ piles of diameter 70 cm and 80 cm. The reinforcement for pile caps are placed after chipping the pile surface and concreted using 1:1/2:3 mix. Pile caps are of size 275X100 cm and 110x110 cm respectively. The size of each plinth beam is 230X450cm2. The plinth

area of rcc structure is 150m2(1615 sq feet). The height of each floor including slab height is 3.30m.

4.6. Other major projects under progress

Sl N	Project	
1	Playground	• AS per the request of Kottappuram community a playground has been agreed to develop at Vizhinjam. • Harbour Engineering Department provided an acre of land for the purpose. • Sports Kerala Foundation has submitted a project at an estimated cost of Rs. 1.75 crore to establish the playground. • As got the NFA approval, instruction given to TCD for transferring the half share of amount Rs. 87.5 lakhs to VISL

5. Others

Leadership Training Progamme & Exposure Visit of Venganoor Gramapanchayath Balasabha.

Adani Foundation provided training support to the "Balasabha"- Children's group of Venganoor Gram Panchayat in soft skills during summer vacation. After two days of classroom training, an exposure visit was also organized to Vizhinjam international seaport to get motivation to the participants. The details of the training and exposure visits are as follows.

Date	Topic	Place	Participants
02.05.2024 (Batch -1)	personality development, leadership, Personal and environmental protection and Palliative Care	NSS Karayogam Muttacadu	50
03.05.2024 (Batch -2)	personality development, leadership, Personal and	Govt LPS School Nellikuzhi	50

	environmental protection and Palliative Care		
24.05.2024	Exposure Visit	Adani Vizhinjam Port	100

100 children selected from the 20 wards of the gram panchayat participated in the training and follow up exposure visit. The training program was inaugurated by Mr. R.S.Sreekumar, President, Venganoor Gram Panchayat. Classes were handled by Adani Foundation team members.




Senior Citizen Forum meet

The regular monthly senior citizen's forum meeting was held on 24th May 2024 at C V Smaraka Grandhashala. The Program was started at 3:00 pm, participated 25 elders. The theme for the day was the reporting exposure visit conducted last month to Sai Gram. Participants express their thoughts and feelings about the visit followed by a fun-filled session on "attention" by one of the Foundation team members, Mr. Johny. The forum gave a farewell honor to Mr, John Paul, Sub Inspector, Community relation Officer and in charge of Janamithri Police, Vizhinjam Police Station. The event was organized because of his wholehearted support to the monthly meeting of senior citizens. The Farewell

ceremony was attended by his colleagues also from the department. Adani Foundation facilitated him with a memento as a token of appreciation.

Another meet was conducted on 6th September at C V Smaraka Grandhashala. The Program was started at 3:00 pm. 19 elders were attended an Artificial Intelligence session. Mr. Anilkumar experienced Artificial Intelligence Trainer took the session. After that Shri. Jhony, corporate affairs performed fun activities with the elders.

World Eleder Abuse Awareness Day cum senior citizen's Meet.

The purpose of WEAAD is to provide an opportunity for communities around the world to promote a better understanding of abuse and neglect of older persons by raising awareness of the cultural, social, economic and demographic processes affecting elder abuse and neglect. Elder Abuse Awareness Day was jointly organized by Adani Foundation, HelpAge India and CV Samaraka Grandhasala., It spoke about the difficulties faced by the elderly in society and the legal assistance they needed. The official theme of World Elder Abuse Awareness Day 2024 was

“Prioritizing the dignity, Safety and Wellbeing for older persons of all identities. A session was conducted on the theme for Senior Citizen Members. The class was handled by Mr.Shiju & Mrs.Athira From HelpAge India. Mr.Ajayakumar Member of Senior Citizen Forum Welcomed the event presided over by Adani Foundation Livelihood Coordinate Mr.George Zen.

International Yoga Day

The international Yoga Day was celebrated on theme of the year “Yoga for Self & Society” jointly with ASDC, & Govt UP School Nellivila. As part of the celebration a yoga session with a narrative of the importance of yoga as a transformative practice represents the harmony of mind and body, the balance between thought and action, and the unity of restraint and fulfillment. It integrates the body, mind, spirit, and soul, offering a holistic approach to health and well-being that brings peace to our hectic lives. The session cum practice was handled by Mrs, Reeja, eginning with Guruvandanam the emphasis was given to pranayama and its variance into the technique of Kapalnharathi. The programme was inaugurated by Mrs. Rama Priya, Standing Committee Chairperson and Member of Nellivila ward in Venganoor gram Panchayat. The orientation was welcomed with great enthusiasm and an eye opening to majority as the technique were very simple to learn with practice.

The participants of this orientation were UP School Students, Nellivila School, Trainees of ASDC skill batches, SuPoshan Sanginies, Community Volunteers, Livelihood Members and staff of Adani Foundation. All the participants promised to carry forward the yoga techniques for their family members.


World Environment Day

Environment day was commemorated on June 5th in collaboration with the Department of Forests at HSS for Girls Venganoor. The programme was inaugurated by School Headmaster in presence of Adani Foundation officials and students of SPC and Eco Club.100 nos of root trainer forest plants were distributed among students for planting at their home.

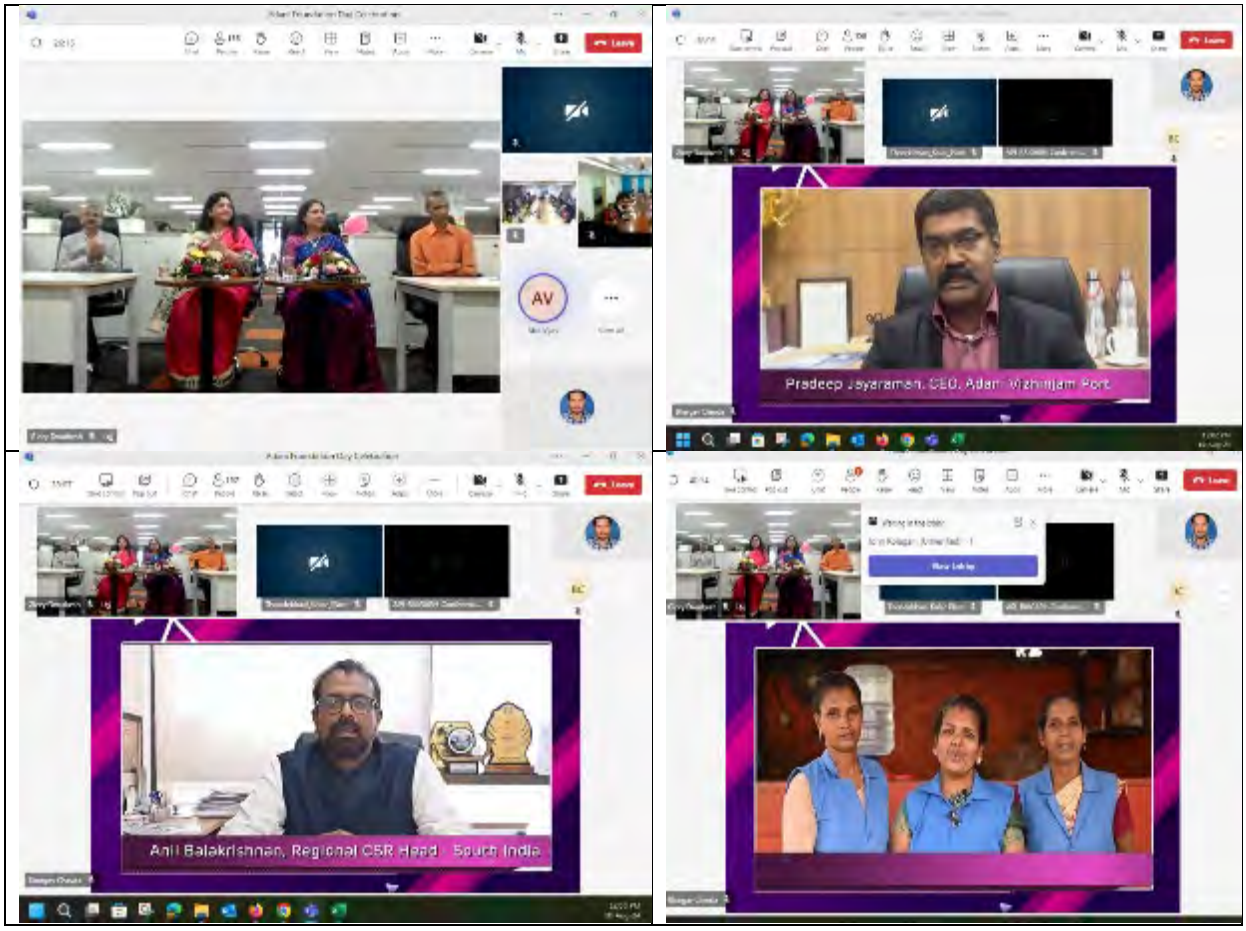

3.1. Support for Wayanad Kerala

Over 400 lives were lost in the worst-ever natural disaster that struck Kerala on 30 July 2024. The Wayanad landslides wiped out three villages in the foothills of Vellarimala hills. Saddened by the tragic event, Adani Group Chairman Mr. Gautam Adani announced a contribution of ₹ 5 crore in financial assistance to support relief efforts in Kerala.

In his recent post on X, he said, "Deeply saddened by the tragic loss of life in Wayanad. My heart goes out to the affected families. The Adani Group stands in solidarity with Kerala during this difficult time. We humbly extend our support with a contribution of Rs 5 Cr to the Kerala Chief Minister's Distress Relief Fund."

Adani Foundation Day Celebration

Adani Foundation Day was celebrations at Transit Campus, Mukkola. A virtual event was organized by Adani Foundation Ho team on 10th August 2024. Respected Dr. Priti G Adani, Chairperson-AF, Dr. Shilin Ma'am, Shri. Vasanth Gadhavi, ED-AF participated and shared their thoughts and wishes to everyone. Celebration videos conducted in various locations were showcased on that occasion.



Onam grocery Kit under Employee Volunteering Programme (EVP)

On the auspicious occasion of the birthday of respected chairperson, Adani Foundation on August 29th, 2024, and Onam, Kerala's state festival in September 2024, Adani Foundation, Vizhinjam initiated a programme for distributing grocery kits to the poor community people during Onam days under Employee Volunteering Programme (EVP). 60 employees showed their willingness to provide 133 grocery kits worth Rs. 750/-per kit. All the 133 grocery kits were distributed to very poor households including bedridden individuals, cancer patients, and widows during the inauguration of Onam fair at Farm School by Adv. G.R. Anil, Honorable Minister for Food and Civil Supplies. Minister, MLA, various department heads at AVPPL distributed the kits to beneficiaries

Press Releases

സാമൂഹ്യ തിന്മകൾക്കെതിരെ ബോധവത്ക്കരണവുമായി വിദ്യാർത്ഥികൾ

മംഗളം

സാഹിത്യ അഭിരുചി ക്യാമ്പിന്റെ ഭാഗമായി അറിവരങ്ങ് കൂട്ടായ്മ സംഘടിപ്പിച്ചു

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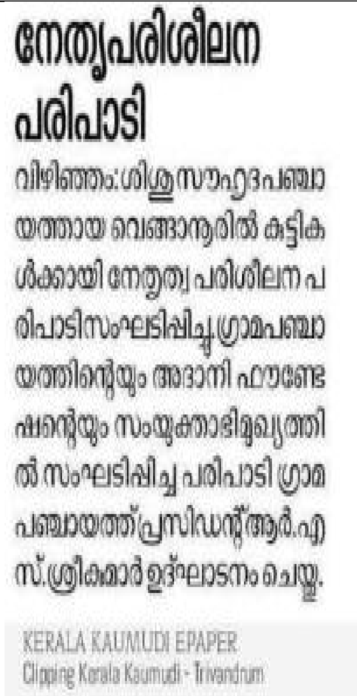
മഴക്കാല രോഗങ്ങളും ശുചീകരണവും - ബോധവൽക്കരണ പരിപാടി സംഘടിപ്പിച്ചു.

28.05.2024

തിരുവനന്തപുരം:അദാനി വിഴിഞ്ഞം തുറമുഖ കമ്പനിയുടെ സാമൂഹ്യ പ്രതിബദ്ധതാ വിഭാഗമായ അദാനി ഫൗണ്ടേഷൻ,തിരുവനന്തപുരം കോർപ്പറേഷൻ,ഹെൽത്ത് ഡിപ്പാർട്ട്മെന്റ് എന്നിവർ സംയുക്തമായി മഴക്കാല രോഗങ്ങളെ കുറിച്ചും ശുചീകരണ പ്രവർത്തനങ്ങളെക്കുറിച്ചും ബോധവൽക്കരണ ക്ലാസുകൾ സംഘടിപ്പിച്ചു.വിഴിഞ്ഞം മേഖലയിലെ അഞ്ചു വാർഡുകളിലായി പ്രവർത്തിച്ചുവരുന്ന ഫൗണ്ടേഷൻ കമ്മ്യൂണിറ്റി വോളണ്ടിയേഴ്സിനായാണ് ക്ലാസുകൾ സംഘടിപ്പിച്ചത്.കമ്മ്യൂണിറ്റി

അദാനി ഫൗണ്ടേഷൻ ആർത്തവ ശുചിത്വ ദിന ബോധവൽകരണ ക്ലാസുകൾ സംഘടിപ്പിച്ചു.

28.05.2024



നേതൃപരിശീലന പരിപാടി

വിഴിഞ്ഞം:ശിശുസൗഹൃദപഞ്ചായത്തായ വെങ്ങാനൂരിൽ കുട്ടികൾക്കായി നേതൃത്വ പരിശീലന പരിപാടിസംഘടിപ്പിച്ചു.ഗ്രാമപഞ്ചായത്തിന്റെയും അദാനി ഫൗണ്ടേഷന്റെയും സംയുക്താഭിമുഖ്യത്തിൽ സംഘടിപ്പിച്ച പരിപാടി ഗ്രാമപഞ്ചായത്ത് പ്രസിഡന്റ് ആർ.എസ്.ശ്രീകുമാർ ഉദ്ഘാടനം ചെയ്തു.

KERALA KAUMUDI EPAPER
Clipping Kerala Kaumudi - Trivandrum

മംഗളം

യുവതികൾക്ക് സ്വയം പ്രതിരോധ പരിശീലനം നൽകി

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NAUTICAL TIMES

ലോക പരിസ്ഥിതി ദിനം വിവിധ പരിപാടികളോടെ ആഘോഷിച്ചു

വായനാദിനം ആചരിച്ചു

അന്താരാഷ്ട്ര ലഹരി വിരുദ്ധ ബോധവൽക്കരണ ദിനം ആചരിച്ചു.

27.06.2024

തിരുവനന്തപുരം:അദാനി ഫൗണ്ടേഷൻ,അദാനി സ്കിൽ ഡെവലപ്മെന്റ് സെന്റർ, വിഴിഞ്ഞം ഇന്റർനാഷണൽ പോർട്ട്സ്, എച്ച് എസ്.എസ്. ഫോർ ഗേൾസ് വെങ്ങാനൂർ എന്നിവരുടെ സംയുക്താഭിമുഖ്യത്തിൽ അന്താരാഷ്ട്ര ലഹരി വിരുദ്ധ ബോധവൽക്കരണ ദിനമാചരിച്ചു.മയക്കുമരുന്ന് ഉപയോഗം മൂലം സമൂഹത്തിൽ ഉണ്ടാകുന്ന പ്രശ്നങ്ങളെക്കുറിച്ച് അവബോധം സൃഷ്ടിക്കാൻ ലക്ഷ്യമിട്ട് വെങ്ങാനൂർ സ്കൂളിലെ എസ്. പി. സി. സ്റ്റുഡന്റ്സ് കേഡറ്റ് അംഗങ്ങൾ മുക്കോല ജംഗ്ഷനിൽ തെരുവ് നാടകവും അവതരിപ്പിച്ചു. എക്സൈസ്

അന്താരാഷ്ട്ര യോഗ ദിനം ആചരിച്ചു.

26.06.2024

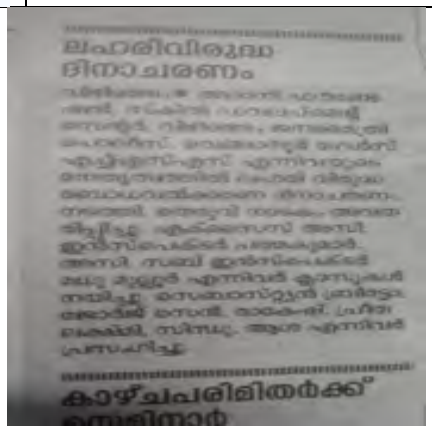
തിരുവനന്തപുരം: അദാനി ഫൗണ്ടേഷൻ,അദാനി സ്കിൽ ഡെവലപ്മെന്റ് സെന്റർ, വെങ്ങാനൂർ ഗ്രാമപഞ്ചായത്ത്,നെല്ലിവിള ഗവൺമെന്റ് യു.പി സ്കൂൾ എന്നിവരുടെ സംയുക്താഭിമുഖ്യത്തിൽ അന്താരാഷ്ട്ര യോഗദിനം ആചരിച്ചു.നെല്ലിവിള ഗവൺമെന്റ് യു.പി സ്കൂളിലെ കുട്ടികളും അധ്യാപകരും,വിസ്മാ ലൈവ്ലി ഹുഡ് അംഗങ്ങളും ,സുപോഷൺ സംഗിനിമാരും അദാനി ഡെവലപ്മെന്റ് സെന്ററിലെ കുട്ടികളും പങ്കെടുത്തു. യോഗ ട്രെയിനർ റീജ ക്ലാസുകൾക്ക് നേതൃത്വം നൽകി.അദാനി ഫൗണ്ടേഷൻ ലൈവിലിഹുഡ് കോർഡിനേറ്റർ ജോർജ സൈൻ അധ്യക്ഷത വഹിച്ചു.വെങ്ങാനൂർ ഗ്രാമപഞ്ചായത്ത് അംഗം മെഫിയ

അന്താരാഷ്ട്ര ലഹരി വിരുദ്ധ ബോധവൽക്കരണ ദിനം ആചരിച്ചു

200 ഫല വൃക്ഷത്തൈകൾ വിതരണം ചെയ്തു

വിഴിഞ്ഞം പരിസ്ഥിതി ദിനാഘോഷ ഭാഗമായി അദാനി ഫൗണ്ടേഷൻ കോട്ടുകാൽ ഗ്രാമപഞ്ചായത്ത് പരിധിയിൽ 200 ഫല വൃക്ഷത്തൈകൾ വിതരണം ചെയ്തു

ലഹരിവിരുദ്ധ ദിനാചരണം



കാഴ്ചപരിമിതർക്ക്

കേരള കൗമുദി

ബോധവത്കരണ ദിനം

വിഴിഞ്ഞത്ത് അസാപ് കമ്മ്യൂണിറ്റി സ്കിൽ പാർക്ക് തുറന്നു

വിഴിഞ്ഞം അസാപ് സ്കിൽ പാർക്ക് ഉദ്ഘാടനം

കേരള കൗമുദി

അദാനി ഫൗണ്ടേഷൻ ലോക ഭക്ഷ്യ സുരക്ഷാദിനാഘോഷം

ലഹരി വിരുദ്ധ ബോധവത്കരണം

Vizhinjam gets ASAP's new community skill park

Times News Network

Skill park at Vizhinjam is the 16th such park completed in state

T'puram: Higher education minister R Bindu inaugurated ASAP's Vizhinjam Community Skill Park on Saturday. The community skill parks are established in public-private partnership by ASAP (Additional Skill Acquisition Programme) with the intention of making available to the public the services of ASAP, an effective intervention of the department of higher education to enable educated and skilled youth to enter advanced career fields.

The skill park at Vizhinjam is the 16th such skill park completed in the state and will provide excellent and innovative vocational training. It will provide courses on national and international standards in association with the leading industrial organizations of the country to make the youth employable and efficient as per the changing working conditions.

Vizhinjam Community Skill Park will be one of the key hubs for skill training emerging in connection with Vizhinjam port. A hostel facility has also been prepared in addition to the skill park for the convenience of students living and studying in the coastal region. Vizhinjam Community Skill Park has been completed at a cost of Rs.10.2 [illegible] ... The hostel block has four floors with an area of [illegible] square feet.

Classrooms with state-of-the-art facilities and lab facilities are the specialty of the building. Changing rooms with locker facilities, meeting rooms and IT lab facility with a separate server room have been prepared for the students. The Skill Park is designed to be disability friendly.

Once the Skill Park becomes functional, the skill courses required to get more employment in the port sector will be made available here. Along with this, various skill courses conducted by ASAP Kerala and other training programmes of the govt will be held at the Vizhinjam Skill Park.

വിഴിഞ്ഞം കമ്മ്യൂണിറ്റി സ്കിൽ പാർക്ക്

തൊഴിലവസരങ്ങളുടെ വാതായന

തുറമുഖത്തെ തൊഴിൽസാധ്യതകളിലേക്ക് യുവതയെ സജ്ജരാക്കും: മന്ത്രി

അസാപിന്റെ കമ്മ്യൂണിറ്റി സ്കിൽ പാർക്ക് തുറന്ന

തൊഴിൽ വാതായനം തുറന്ന് അസാപ്

വിഴിഞ്ഞം അസാപ് കമ്മ്യൂണിറ്റി സ്കിൽ പാർക്ക് നാടിന് സമർപ്പിച്ചു

തിരുവനന്തപുരം: വിഴിഞ്ഞം കമ്മ്യൂണിറ്റി സ്കിൽ പാർക്കിലൂടെ വിഴിഞ്ഞം തുറമുഖത്തെ തൊഴിൽ സാധ്യതകളിലേക്ക് യുവജനതയെ സജ്ജരാക്കുമെന്ന് ഉന്നതവിദ്യാഭ്യാസ മന്ത്രി ആർ ബിന്ദു. നിർമ്മാണം പൂർത്തിയാക്കിയ അസാപ്പിന്റെ വിഴിഞ്ഞം കമ്മ്യൂണിറ്റി സ്കിൽ പാർക്കിന്റെയും ഹോസ്റ്റൽ ബ്ലോക്കിന്റെയും ഉദ്ഘാടനം നിർവഹിച്ച് സംസാരിക്കുകയായിരുന്നു മന്ത്രി. അസാപ് കേരളവഴി നൂതന നൈപുണ്യ കോഴ്സുകൾ വിദ്യാർത്ഥികളിലേക്ക് എത്തിച്ച് ഇപ്പോഴത്തെ നൈപുണി വിടവ് നികത്താനാണ് ഉന്നത വിദ്യാഭ്യാസ വകുപ്പ് ശ്രമിക്കുന്നതെന്നും, നിലവിൽ അസാപ് കേരള കമ്മ്യൂണിക്കേറ്റീവ് ഇംഗ്ലീഷ് അടക്കം ജർമ്മൻ, ഫ്രഞ്ച്, ജാപ്പനീസ് തുടങ്ങിയ വിദേശ ഭാഷകളിൽ പ്രാവീണ്യം നേടാനാവുന്ന ഭാഷാ കോഴ്സുകൾ നൽകുന്നുണ്ടെന്നും മന്ത്രി കൂട്ടിച്ചേർത്തു.

ചടങ്ങിൽ തുറമുഖ മന്ത്രി വി എൻ വാസവൻ അധ്യക്ഷത വഹിച്ചു. കോവളം എംഎൽഎ എം വിൻസെന്റ് മുഖ്യാതിഥിയായി.

വിഴിഞ്ഞം അസാപ് കമ്മ്യൂണിറ്റി സ്കിൽ പാർക്ക് നാടിന് സമർപ്പിച്ചു

അസാപ് കമ്യൂണിറ്റി പാർക്ക് ഉദ്ഘാടനം ചെയ്തു

തീരദേശവാസികൾക്ക് വൻ അവസരങ്ങൾ -മന്ത്രി ബിന്ദു

കേരളകൗമുദി

തൊഴിൽ വാതായനം തുറന്ന് അസാപ്

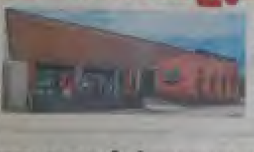
...ഫോൺ: 9495999697.

w.asap kerala.gov.in

വിഴിഞ്ഞം അസാപ് കമ്യൂണിറ്റി സ്കിൽ പാർക്ക് നാടിന് സമർപ്പിച്ചു

വിഴിഞ്ഞം കമ്യൂണിറ്റി സ്കിൽ പാർക്ക്

തൊഴിലവസരങ്ങളുടെ വാതായന...



തുറമുഖത്തെ തൊഴിൽസാധ്യതകളിലേക്ക്

വിഴിഞ്ഞം തുറമുഖം

യുവജനതക്ക് തൊഴിൽസാധ്യതയൊരുക്കും - മന്ത്രി ഡോ. ആർ ബിന്ദു

> വിഴിഞ്ഞം അസാപ് കമ്യൂണിറ്റി സ്കിൽ പാർക്ക് നാടിന് സമർപ്പിച്ചു

അസാപിന്റെ കമ്യൂണിറ്റി സ്കിൽ പാർക്ക് തുറന്നു

പ്ലാസ്റ്റിക് മാലിന്യ സംസ്കരണം;
കെട്ടിടനിർമാണം പുരോഗമിക്കുന്നു

യുവജനദിനം
ആഘോഷിച്ചു

വഴിയോര കച്ചവട
തൊഴിലാളി യൂണി.

ദക്ഷിണ കേ

ഓണക്കാല ജമന്തി കൃഷിക്ക് തുടക്കം കുറിച്ചു

സിറാജ്

കേരള കൗമുദി

ഓണക്കാല ജമന്തിക്കൃഷിക്ക് തുടക്കംകുറിച്ചു

കേരള കൗമുദി

ലോക യുവജന നൈപുണ്യ ദിനാഘോഷം

വിഴിഞ്ഞം: അദാനി ഗ്രൂപ്പിന്റെ പദ്ധതിയുടെ ഭാഗമായി അദാനി ഫൗണ്ടേഷൻ കീഴിൽ പ്രവർത്തിക്കുന്ന അദാനി സ്കിൽ ഡെവലപ്മെന്റ് സെന്ററിൽ ലോക യുവജന നൈപുണ്യ ദിനം ആഘോഷിച്ചു. യൂത്ത് കൗൺസിലർ, പൂർവ്വവിദ്യാർത്ഥി കൗൺസിലർ, അഡ്വൈസറി കൗൺസിൽ, വിവിധ ട്രേഡ് അസോസിയേഷനുകൾ സംഘടിപ്പിച്ച അദാനി ഫൗണ്ടേഷൻ പ്രോഗ്രാം മാനേജർ സെബാസ്റ്റ്യൻ ബ്രിട്ടോ, അദാനി സ്കിൽ ഡെവലപ്മെന്റ് സെന്റർ ടെക്നിക്കൽ അഡ്വൈസർ ഡോ. റ്റി എം ജോർജ്, സീനിയർ പ്രോജക്ട് ഓഫീസർ രാകേഷ് എന്നിവർ പങ്കെടുത്തു. അദാനി സ്കിൽ ഡെവലപ്മെന്റ് സെന്ററിലെ വ്യത്യസ്ത കോഴ്സുകളിൽ പരിശീലനം നേടിക്കൊണ്ടിരിക്കുന്ന 150 ൽ അധികം കുട്ടികൾ പങ്കെടുക്കുകയും അദാനി ഫൗണ്ടേഷനിലെ മറ്റുദ്യോഗസ്ഥരുടെ പങ്കാളിത്തത്തോടെ അദാനി സ്കിൽ ഡെവലപ്മെന്റ് സെന്ററിലെ സ്റ്റാഫ് അംഗങ്ങൾ പരിപാടിയ്ക്ക് നേതൃത്വം നൽകുകയും ചെയ്തു.

കോവളം• മുങ്ങിമരണ പ്രതിരോധ ദിനത്തോടനുബന്ധിച്ച് ഇന്ന് ജലസുരക്ഷ, മുങ്ങിമരണം തടയൽ എന്നിവ സംബന്ധിച്ച് കോവളത്ത് ബോധവത്കരണ പരിപാടി നടത്തും. ബോട്ട് സംഘടിയാണ് സംഘാടകർ.

കിറ്റ് കൈമാറി

വിഴിഞ്ഞം• വിഴിഞ്ഞത്തെ ചച്ചക്കറി തോട്ടം പദ്ധതി ഭാഗമായി അദാനി ഫൗണ്ടേഷൻ വൈവള കിറ്റ്, ഗ്രോബാഗ്, തൈകൾ എന്നിവ വിതരണം ചെയ്തു. വെങ്ങാനൂർ പഞ്ചായത്ത് പ്രസിഡന്റ് ആർ.എസ് ശ്രീകുമാർ ഉദ്ഘാടനം ചെയ്തു.

12:14

യുവജന നൈപുണ്യ ദിനം ആഘോഷിച്ചു

19.07.2024

വിഴിഞ്ഞം : അദാനി സ്കിൽ ഡെവലപ്മെന്റ് സെന്ററിൽ ലോക യുവജന നൈപുണ്യ ദിനം ആഘോഷിച്ചു. ഈ ദിവസത്തിന്റെ പ്രധാന്യത്തോട് അനുബന്ധിച്ച് വിവിധ നൈപുണ്യ മത്സരങ്ങൾ സംഘടിപ്പിച്ചു. അദാനി ഫൗണ്ടേഷൻ പ്രോഗ്രാം മാനേജർ സെബാസ്റ്റ്യൻ ബ്രിട്ടോ, അദാനി സ്കിൽ ഡെവലപ്മെന്റ് സെന്റർ ടെക്നിക്കൽ അഡ്വൈസർ ഡോ.റ്റി എം ജോർജ്, സീനിയർ പ്രൊജക്റ്റ് ഓഫീസർ രാകേഷ് എന്നിവർ പ്രസംഗിച്ചു.

വിട്ടുവളപ്പിലെ പച്ചക്കറിതോട്ടത്തിന് തുടക്ക

വെങ്ങാനൂർ പഞ്ചായത്ത് പ്രസിഡന്റ് ആർ. എസ് ശ്രീകുമാർ ഗുണഭോക്താക്കൾക്ക് പച്ചക്കറി തൈകൾ വിതരണം ചെയ്ത് ഉദ്ഘാടനം ചെയ്യുന്നു

കമ്യൂണിറ്റി സ്കിൽ പാർക്ക്

വിഴിഞ്ഞത്ത് തുറക്കുന്നത് പുതിയ തൊഴിൽസാധ്യത

അനാപ് കേരള

വീട്ടുവളപ്പിലെ പച്ചക്കറിത്തോട്ടത്തിന് അദാനി ഫൗണ്ടേഷൻ തുടക്കം കുറിച്ചു

സഹോദരിയെ കുത്തിക്കൊന്ന പതിനേഴുകാരൻ അറസ്റ്റിൽ

ഗർഭിണിയായിരിക്കെ യുവതി മരിച്ചു, മൃതദേഹം പുഴയിൽ തള്ളി കാമുകൻ.

വീട്ടുവളപ്പിലെ പച്ചക്കറിത്തോട്ടത്തിന് അദാനി ഫൗണ്ടേഷൻ തുടക്കം കുറിച്ചു

സഹോദരിയെ കുത്തിക്കൊന്ന പതിനേഴുകാരൻ അറസ്റ്റിൽ

ഗർഭിണിയായിരിക്കെ യുവതി മരിച്ചു, മൃതദേഹം പുഴയിൽ തള്ളി കാമുകൻ.

സാൻ ഫെർണാൻഡോയ്ക്ക് ഇന്ന് വിഴിഞ്ഞത്ത് സ്വീകരണം

ലോക മുലയൂട്ടൽ വാരം

വിഴിഞ്ഞം: അദാനി വിഴിഞ്ഞം കമ്പനിയുടെ സാമൂഹിക പ്രതിബദ്ധതാ വിഭാഗമായ അദാനി ഫൗണ്ടേഷൻ അദാനി വിൽമാറിന്റെ നേതൃത്വത്തിൽ ദേശീയ തലത്തിൽ നടപ്പാക്കി വരുന്ന സുപോഷൺ പദ്ധതിയുടെ ഭാഗമായി കോട്ടുകാൽ ഗ്രാമ പഞ്ചായത്തിലെ അങ്കണവാടികളുമായി ചേർന്ന് ബോധവത്കരണ ക്ലാസുകൾ, കുക്കിംഗ് ഡെമോൺസ്ട്രേഷനുകൾ, റാലികൾ എന്നിവ നടത്തി. ലോക മുലയൂട്ടൽ വാരത്തിന്റെ ഭാഗമായി മുലയൂട്ടുന്ന അമ്മമാരെ പ്രോത്സാഹിപ്പിക്കുകയും കുടുംബങ്ങൾ, സമൂഹങ്ങൾ, കമ്മ്യൂണിറ്റികൾ, ആരോഗ്യ പ്രവർത്തകർ എന്നിവർക്ക് അവരെ പിന്തുണയ്ക്കാൻ കഴിയുന്ന വഴികൾ പ്രദർശിപ്പിക്കുകയും ചെയ്തു.കോട്ടുകാൽ മേഖലയിലെ ആരോഗ്യ കേന്ദ്രത്തിൽ നിന്നുള്ള പ്രവർത്തകർ, സുപോഷൺ സഹിനിമാർ, അദാനി ഫൗണ്ടേഷൻ പ്രവർത്തകർ എന്നിവർ ബോധവത്കരണ ക്ലാസുകൾ നടത്തി.

അവയവദാനദിനാചരണം

മംഗളം

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ലോക മുലയൂട്ടൽ വാരത്തിന്റെ ഭാഗമായി പരിപാടി സംഘടിപ്പിച്ചു

ആയുർവേദ മെഡിക്കൽ ക്യാമ്പ് സംഘടിപ്പിച്ചു

സിറാജ്

കേരള കൗമുദി

അദാനി സ്കിൽ ഡെവലപ്മെന്റ് സെന്ററിൽ സ്വാതന്ത്ര്യദിനം

ഓണം വിപണന മേള സംഘടിപ്പിച്ചു

മംഗളം

സ്വാതന്ത്ര്യ ദിനാഘോഷം സംഘടിപ്പിച്ചു.

കേരള കൗമുദി

വിഷമില്ലാ പച്ചക്കറി ഉത്പാദിപ്പിക്കേണ്ടത് സമൂഹം: മന്ത്രി ജി.ആർ. അനിൽ

ഓണം വിപണന മേള

Mathrubhumi
മാതൃഭൂമി

ഇനിയെങ്കിലും സംരക്ഷിക്കണം വെള്ളായണിക്കായലിനെ

- ചെളിയും കുളവാഴകളും നിറയുന്നു
- വെള്ളം സംഭരിക്കാനുള്ള ശേഷി നഷ്ടപ്പെട്ടു
- ആവാസവ്യവസ്ഥയും തകരുന്നു

മത്സ്യസമ്പത്ത് കൂട്ടാൻ ....

അടിയന്തരമായി ശുചീകരിക്കണം

6/09/2024 THIRUVANANTHAPURAM Pg 02

ചന്ദ്രിക

അദാനി ഫൗണ്ടേഷൻ ഓണം വിപണന മേള

വിഴിഞ്ഞം അദാനി ഫൗണ്ടേഷൻ സമൂഹിക പ്രതിബദ്ധതാ പദ്ധതിയുടെ ഭാഗമായി സംഘടിപ്പിക്കുന്ന ഓണം വിപണന മേള മന്ത്രി ജി ആർ അനിൽ ഉദ്ഘാടനം ചെയ്തു.വിഴിഞ്ഞത്തെ 5 വാർഡുകളിലായി അദാനി ഫൗണ്ടേഷന്റെ കീഴിലുള്ള ഫാം സ്കൂൾ നേതൃത്വം നൽകുന്ന അടുക്കളത്തോട്ടം പദ്ധതിയിലെ 1760 കുടുംബങ്ങൾ ഉൽപാദിപ്പിക്കുന്ന രണ്ടര പച്ചക്കറികളും ഫൗണ്ടേഷനുമായി സഹകരിക്കുന്ന സ്വയംസഹായ സംഘങ്ങളുടെ ഉൽപന്നങ്ങളുമാണ് മേളയിൽ ലഭ്യമാക്കിയിട്ടുള്ളത്. മുതലപ്പൊഴിയിലെ ജീവനക്കാരുടെ നേതൃത്വത്തിൽ നിർധനരായ കുടുംബങ്ങൾക്ക് നൽകുന്ന വീടുകളിൽ വിതരണത്തിന്റെ ഉദ്ഘാടനവും മന്ത്രി നിർവഹിച്ചു. അഡ്വ. എം. വിൻസന്റ് എം.എൽ.എ അധ്യക്ഷനായി. വെങ്ങാനൂർ പഞ്ചായത്ത് പ്രസിഡന്റ് ആർ എസ് ശ്രീകുമാർ, കോട്ടുകാൽ പഞ്ചായത്ത് പ്രസിഡന്റ് ചന്ദ്രലേഖ, നഗരസഭ കൗൺസിലർമാരായ ഓമന, തിസമ്യൂൽ, അദാനി വിഴിഞ്ഞം പോർട്ട് സി.ഇ.ഒ പ്രദീപ് ജയരാമൻ, സി.എസ്.ആർ മേധാവി ഡോ. അനിൽ ബാലകൃഷ്ണൻ, അദാനിഫൗണ്ടേഷൻ പ്രോഗ്രാം മാനേജർ സെബാസ്റ്റ്യൻ ബ്രിട്ടോ സംസാരിച്ചു.

സുപ്രഭാതം

ഓണം വിപണന മേള സംഘടിപ്പിച്ചു

വിഴിഞ്ഞം ▸ അദാനി ഫൗണ്ടേഷൻ സമൂഹിക പ്രതിബദ്ധതാ പദ്ധതിയുടെ ഭാഗമായി ഓണം വിപണനമേള മന്ത്രി ജി.ആർ അനിൽ ഉദ്ഘാടനം ചെയ്തു.

വിഴിഞ്ഞത്തെ അഞ്ച് വാർഡുകളിലായി അദാനി ഫൗണ്ടേഷന്റെ കീഴിലുള്ള ഫാം സ്കൂൾ നേതൃത്വം നൽകുന്ന അടുക്കളത്തോട്ടം പദ്ധതിയിലെ 1,760 കുടുംബങ്ങൾ ഉൽപാദിപ്പിച്ച രണ്ടര പച്ചക്കറികളും ഫൗണ്ടേഷനുമായി സഹകരിക്കുന്ന സ്വയം സഹായ സംഘങ്ങളുടെ ഉൽപന്നങ്ങളുമാണ് മേളയിൽ ലഭ്യമായത്. മുതലപ്പൊഴി ജീവനക്കാരുടെ നേതൃത്വത്തിൽ നിർധനരായ കുടുംബങ്ങൾക്ക് നൽകുന്ന ഓണക്കിറ്റ് വിതരണത്തിന്റെ ഉദ്ഘാടനവും മന്ത്രി നിർവഹിച്ചു.

അഡ്വ. എം. വിൻസന്റ് എം.എൽ.എ അധ്യക്ഷനായി. വെങ്ങാനൂർ പഞ്ചായത്ത് പ്രസിഡന്റ് ആർ എസ് ശ്രീകുമാർ, കോട്ടുകാൽ പഞ്ചായത്ത് പ്രസിഡന്റ് ചന്ദ്രലേഖ, നഗരസഭ കൗൺസിലർമാരായ ഓമന, തിസമ്യൂൽ, അദാനി വിഴിഞ്ഞം പോർട്ട് സി.ഇ.ഒ പ്രദീപ് ജയരാമൻ, സി.എസ്.ആർ മേധാവി ഡോ. അനിൽ ബാലകൃഷ്ണൻ, അദാനിഫൗണ്ടേഷൻ പ്രോഗ്രാം മാനേജർ സെബാസ്റ്റ്യൻ ബ്രിട്ടോ സംസാരിച്ചു.

അദാനി ഫൗണ്ടേഷന്റെ അടുക്കളത്തോട്ടം പദ്ധതി നാടിനു മാതൃക: മന്ത്രി ജി.ആർ.അനിൽ

മനോരമ ലേഖകൻ

വിഴിഞ്ഞം ● ഓരോ വീട്ടിലും വിഷരഹിത പച്ചക്കറികൾ ഉൽപാദിപ്പിക്കേണ്ടത് സമൂഹത്തിന്റെ ഉത്തരവാദിത്തമായി മാറണമെന്നും അദാനി ഫൗണ്ടേഷൻ വിഴിഞ്ഞത്ത് നടപ്പാക്കുന്ന അടുക്കളത്തോട്ടം

ഓണവൈബിൽ തലസ്ഥാനം

വിഷരഹിത പച്ചക്കറികൾ ഉല്പാദിപ്പിക്കേണ്ടത് സമൂഹത്തിന്റെ ഉത്തരവാദിത്തം: ജി ആർ അനിൽ

ഓണം വിപണന മേള

ഓണം ചാരിറ്റിക്ക്

അദാനി ഫൗണ്ടേഷൻ ഓണം വിപണന മേള സംഘടിപ്പിച്ചു

അദാനി ഫൗണ്ടേഷൻ സുപോഷൺ പരിപാടി

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അദാനി ഫൗണ്ടേഷൻ ഓണം വിപണന മേള സംഘടിപ്പിച്ചു

13.09.2024

വിഴിഞ്ഞം:അദാനി ഫൗണ്ടേഷൻ സമൂഹിക പ്രതിബദ്ധതാ പദ്ധതിയുടെ ഭാഗമായി സംഘടിപ്പിക്കുന്ന ഓണം വിപണനമേള ഭക്ഷ്യ വകുപ്പ് മന്ത്രി ജി. ആർ. അനിൽ ഉദ്ഘാടനം ചെയ്തു. വിഴിഞ്ഞത്തെ 5 വാർഡുകളിലായി അദാനി ഫൗണ്ടേഷന്റെ കീഴിലുള്ള ഫാം സ്കൂൾ നേതൃത്വം നൽകുന്ന അടുക്കളത്തോട്ടം പദ്ധതിയിലെ 1760 കുടുംബങ്ങൾ ഉൽപാദിപ്പിച്ച ജൈവ പച്ചക്കറികളും ഫൗണ്ടേഷനുമായി സഹകരിക്കുന്ന സ്വയം സഹായ

മംഗളം

വയനാട് പുനരധിവാസം: അദാനി ഗ്രൂപ്പ് 5 കോടി മുഖ്യമന്ത്രിക്ക് കൈമാറി

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കേരള കൗമുദി

പ്ലാസ്റ്റിക് മാലിന്യ സംസ്കരണം

കെട്ടിടനിർമ്മാണം പൂർത്തിയായി

പ്രവർത്തനം ഇങ്ങനെ

പ്ലാന്റ് സ്ഥാപിക്കുന്നത് 15 സെന്റിൽ

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പ്ലാസ്റ്റിക് മാലിന്യസംസ്കരണ പദ്ധതി: മന്ദിരം പൂർത്തിയായി

Annexure V

Compliance to Conditions of KCZMA Recommendation

Annexure V

Half Yearly Compliance of Conditions Stipulated in KCZMA Recommendations for Environment and CRZ Clearance (EC) for the Period April 2024 to September 2024		
S. No.	**Conditions**	**Compliance Status as on 30.09.2024**
(i)	The developmental works and the construction of the structures may be undertaken as per the plans approved by the concerned local Authorities, local administration, conforming to the existing local and central rules and regulations including the existing provisions of CRZ Notification.	**Complied** All the construction activities are being carried out as per existing Central/local rules. Necessary permissions under CRZ Notification 2011 & its amendments have been obtained. Further, necessary approvals from concerned Statutory Departments/Agencies have been obtained for the construction designs/drawings relating to construction activities as mentioned hereunder: • Consent to Establish (CTE) No. PCB/HO/TVM/ICE/08/2015 dated 15.09.2015 valid up to 31.07.2018 was renewed from Kerala State Pollution Control Board (KSPCB) vide Consent No. PCB/HO/TVM/ICE-R/02/2018, dated 19.07.2018 valid up to 31.07.2023 and further renewed vide Consent No. KSPCB/TV/ICE/10029484/2023 dated 30.07.2023 valid up to 31.07.2028 (A Copy of the same was submitted along with HYCR for the period April 2023 to September 2023). All other port construction-related aligned activities such as paver blocks, batching plants, etc. fall under this CTE taken for the port development. • Airport Authority of India NOC vide NOC no AAI/SR/NOC/RHQ dated 7.12.2015. • As per the exemption granted by GoK G.O. No. 310/2015/LSGD dated 01/10/2015, AVPPL is not required to obtain any further building permits/permission to construct port related building within the port premises. • Permissions with respect to store petroleum in tank/s in connection with pump outfit for fuelling motor conveyances has been obtained in Form XIV for the storage of 40.00 KL of Petroleum class B in tank/s in the port premises from Petroleum & Explosives Safety Organisation (PESO) as per the provisions of the Petroleum Act, 1934 and under the Petroleum Rules, 2002 vide License No.: P/SC/KL/14/3732(P499906) dated 05.10.2023

Half Yearly Compliance of Conditions Stipulated in KCZMA Recommendations for Environment and CRZ Clearance (EC) for the Period April 2024 to September 2024		
S. No.	**Conditions**	**Compliance Status as on 30.09.2024**
		(Copy of the same was submitted along with HYCR for the period October 2023 to March 2024).
(ii)	Since the project envisages development of roads, infrastructural facilities, dredging of the lake and kayals proper environmental safety measures must be ensured.	**Complied** All safety measures are being adopted. Full-time Environment & Safety professionals are employed by AVPPL, contractors & subcontractors, to oversee the implementation of environmental safety measures. Organizational Structure for Environment, Health, and Safety (EHS) & CSR for construction phase is enclosed as **Annexure X**. All work plans are executed after assessing the defined EHS plans. It is also submitted that dredging of lakes or kayals are not envisaged as part of this project.
(iii)	The project proponent must obtain necessary clearance separately from the Kerala State Pollution Control Board, Health Department and other appropriate Authorities when such implementation programmes are undertaken.	**Being Complied** Consent to Establish (CTE) has been obtained from Kerala State Pollution Control Board (KSPCB) vide Consent No. PCB/HO/TVM/ICE/08/2015, dated 15.09.2015 valid up to 31.07.2018. Subsequently, the CTE was renewed vide Consent No. PCB/HO/TVM/ICE-R/02/2018 dated 19.07.2018 valid up to 31.07.2023. The CTE was further renewed vide Consent No. KSPCB/TV/ICE/10029484/2023 dated 30.07.2023 valid up to 31.07.2028 (A Copy of the same was submitted along with HYCR for the period April 2023 to September 2023). AVPPL submitted application for Consent to Operated (CTO) to KSPCB before commissioning of the project vide Application No-10076351 dated 06.08.2024. The application is under scrutiny by KSPCB.
(iv)	The construction should be undertaken, if any with least damages to the existing mangroves. A buffer zone of 50m shall be provided for mangroves present in the area.	**Not Applicable** There are no mangroves in the vicinity of the project area.

Half Yearly Compliance of Conditions Stipulated in KCZMA Recommendations for Environment and CRZ Clearance (EC) for the Period April 2024 to September 2024		
S. No.	**Conditions**	**Compliance Status as on 30.09.2024**
(v)	The project proponent must take necessary arrangements for disposal of solid wastes and for the treatment of effluents / wastes. It must be ensured that the effluents/solid wastes are not discharged into the backwater area/sea.	**Being Complied** No solid waste is being disposed in the CRZ area. Bio-degradable waste is being treated in an Organic Waste Converter (OWC) installed at site and the output is being used as manure in greenbelt development within the port project areas. The dry waste is being properly collected, segregated, and disposed of in line with the Solid Waste Management Rules 2016, as amended. The Half Yearly Report of the Solid Waste Management at Vizhinjam Port for the period April 2024 to September 2024 is enclosed as **Annexure VIII**. A Provision for installing Sewage Treatment Plant (STP) facility of adequate capacity in phased manner in accordance with the CRZ Notification is being implemented. STP with capacity of 50 KLD is being developed: 1. The STP material is received as site along with Sewage Pumps 2. Excavation and Rock breaking activity has begun at the STP location 3. Sewage Pump Stations are under construction 4. Laying of Sewer Line is in progress
(vi)	The project proponent should provide necessary facilities for official of the Kerala Coastal Zone Management Authority (KCZMA) for inspection of the project site and its premises at any time.	**Noted** All necessary support will be extended to officials of KCZMA during inspection of the project/site visit; at any time.
(vii)	The KCZMA may be duly informed of any construction/developmental works/major activities undertaken in the CRZ area of the project	**Being Complied** • Member Secretary KCZMA is also the member secretary of NGT appointed committee; the committee meets every six months to review the compliance of Environmental & CRZ Clearance and the progress of the project are being presented.

Half Yearly Compliance of Conditions Stipulated in KCZMA Recommendations for Environment and CRZ Clearance (EC) for the Period April 2024 to September 2024		
S. No.	**Conditions**	**Compliance Status as on 30.09.2024**
		• Meetings are held with officials of KCZMA to appraise them on various project related activities. • HYCRs are being furnished to KCZMA including the details of the development works. • Breakwater – Wave Wall construction works, Container Backup Yard development works, Yard IT & Automation works, Approach Road Works, etc. are in progress.
(viii)	Environmental clearance must be obtained from the Ministry of Environment & Forests.	**Complied** Environment & CRZ Clearance (EC) has been obtained from Ministry of Environment & Forest vide MoEF letter dated 03.01.2014 (F.No.11-122/2011-IA.III). Due to the validity limit of Five (05) years at the time, the EC was valid till 02.01.2019. Thereafter, as per EIA Notification 2006 and Office Memorandum (O.M.) dated 12.04.2016, the validity of the EC will stand automatically for Seven (07) years and therefore considered up to 02.01.2021. Further, as per the provisions of MoEF&CC, the validity of the EC may be further extended for a maximum period of three years. VISL had submitted online application and required documents on PARIVESH for extension of EC. The Proposal was considered in the 247th EAC meeting of Infra-1 committee and MoEF&CC vide letter No. IA/KL/MIS/178082/2020 dated 29.12.2020 have extended the validity of EC of Vizhinjam Seaport by three (03) years till 02.01.2024. Further, considering the outbreak of COVID-19 pandemic, MoEF&CC have issued Notification (SO-221 E) dated 18.01.2021 such that the period from the 01.04.2020 to the 31.03.2021 shall not be considered for the purpose of calculation of validity of existing ECs. Therefore, the EC of Vizhinjam Seaport is valid till 02.01.2025 (which can be further extended up on application to MoEF&CC for 1 more year).
(ix)	An adequate financial provision has to be made for	**Complied**

Half Yearly Compliance of Conditions Stipulated in KCZMA Recommendations for Environment and CRZ Clearance (EC) for the Period April 2024 to September 2024		
S. No.	**Conditions**	**Compliance Status as on 30.09.2024**
	environmental protection measures.	A total of approx. Rs. 40 Crore has been set aside for environmental protection measures as per the EIA report.
(x)	Scrutiny fee of Rs. 10,00,000/- (Rupees Ten lakh only) to be remitted under the head account 1425-800-97 applications for scrutiny fee etc. for CRZ clearance, in the district/Sub Treasury concerned, if private parties are involved in the project and the challan receipt in original be forwarded to the Science & Technology Department quoting this letter.	**Not Applicable** The condition is not applicable since the application for EC was submitted by Vizhinjam International Seaport Ltd. (VISL), a Government of Kerala (GoK) undertaking.

Annexure VI

Compliance of the Commitments made during Public Hearing

Annexure VI

Compliance of the Response/Commitments made during Public Hearing		
S. No.	**Conditions**	**Compliance Status as on 30.09.2024**
1	Good compensation package for all livelihood issues have been included for all related PAPs for all affected sectors including the fisheries sector. Strict adherence to EMP compliance with all relevant rules and regulations will be done	**Being Complied** In consultation with the fishermen, enhanced livelihood compensation of Rs. 108.32 Crores was sanctioned by GoK and distributed up to date by VISL to the fishermen as livelihood compensation. Till 30.09.2024 an amount of Rs. 106.93 Crores have been disbursed for a total number of 2697 Livelihood Affected Persons (LAPs) whose verification was complete in all respects; this includes boat owners to whom kerosene is supplied free of cost during the breakwater construction period. Remaining few disbursals would be done as soon as possible. *(Source: VISL)*
2	Land under the Jamaath which includes Karimppaly, Magham, Varuthari Pally, etc. need to be protected and should not be acquired.	**Complied** These lands have not been acquired.
3	Compensation for the land acquired (rail/road connectivity and back up areas) are paid promptly and any for additional land required also will be paid in the same way.	**Complied** Compensation for all the procured land has been disbursed along with R&R package as per applicable rules in force. Similar policy will be followed for the remaining extent of land acquisition also viz-a-viz applicable. *(Source: VISL)*
4	Additional fish landing centre will be constructed	**Being Complied** Planning work for the fish landing center and the associated breakwater had been initiated as part of the funded work component of the Port concession agreement. However, based on the recommendations of the report on physical model studies carried out by Central Water and Power Research Station (CWPRS), the geometry of the breakwater originally proposed for the fishing harbour is found to be not suitable with respect to tranquillity and therefore the design of the new fishing landing centre needed to be revisited. Consultations between Fisheries Department and Ports Department, Government of Kerala (GoK) are being held to decide the suitable location for the additional fishing harbour in

Compliance of the Response/Commitments made during Public Hearing		
S. No.	**Conditions**	**Compliance Status as on 30.09.2024**
		consultation with the fishermen community. GoK would soon be finalising the plan of action based on the final CWPRS report to develop and make available the additional fish landing facilities for the benefit of the local fishermen in a time bound manner. *(Source: VISL)*
5	Existing harbour will be improved under the CSR provisions of the project	**Being Complied** GoK has formed a higher-level committee to prepare a master plan for the old fishing harbour. Government Departments concerned are coordinating to resolve the differences and to arrive at an acceptable plan in consultation with all stakeholders and accordingly a proposal for 25 crores for additional landing facilities at the southern side and a project for 45 crores with necessary facilities at the Northern Part has been formulated and submitted under PMMSY scheme and waiting for approval of GoI. *(Source: VISL)*
6	Fisherman will get first preference to cross the ship channel	**Will be Complied as per the Applicable Laws**
7	GoK/VISL will monitor the shore line changes during construction and operational phases. If necessary, intervention to arrest erosion will be carried out.	**Being Complied** AVPPL engaged NIOT to study the long-term shoreline change monitoring based on high resolution satellite imageries, beach profile analysis and other related measurements supported with ground truthing. Annual Reports on Shoreline Change Analysis of Vizhinjam Coast Using Beach Profiles and Satellite Images had been prepared for the study periods: Feb 2015 to Sep 2018, Oct 2018 to Sep 2019, Oct 2019 to Sep 2020, Oct 2020 to Sep 2021, Oct 2021 to Sep 2022 and Oct 2022 to Sep 2023. These studies on the Shoreline Change Analysis of Vizhinjam Coast have not observed any shoreline change erosion occurring within 10 km due to the Vizhinjam port project. The Annual Reports after vetting by NGT appointed expert committee and shoreline monitoring cell, are uploaded on to the KCZMA website. The link for the last Annual Report on the KCZMA website is provided below: (https://keralaczma.gov.in/index.php/reports/annual-reports).

Compliance of the Response/Commitments made during Public Hearing		
S. No.	**Conditions**	**Compliance Status as on 30.09.2024**
		Thereafter, for the study period October 2023 to September 2024, NIOT has been engaged by AVPPL and the report is awaited.
8	Water supply provision to the Vizhinjam fishing village	**Complied** Kerala Water Authority (KWA) set up a 3.00 MLD water supply scheme for the project with the source of water being Vellayani Lake which was commissioned in April 2013 by VISL by expending an amount of Rs. 8.10 Crores. The net availability of treated water from this supply scheme is 2.49 MLD of potable water out of which 1.49 MLD of water shall be distributed to the local people as part of social welfare measures of VISL. The balance 1.0 MLD was to be used for port related activities. However, at present, the entire treated water from the scheme is being utilised by the community. For Operation & Maintenance (O&M) of the same, an amount of Rs. 5.38 crores have been spent up to 31.03.2021. From 04.04.2019 onwards, O&M of the scheme is being done by KWA. An additional amount of Rs. 1.74 Crores has been sanctioned and deposited by VISL to KWA to extend piped water connections for treated water supply facilities to the community at Kottapuram Village. More than 1000 free domestic water connections have been given to the project affected areas. KWA now have adequate coverage of water supply around the port and project affected areas. *(Source: VISL)*
9	Construction of the new fishing harbour will be simultaneously completed with the port project	**Being Complied** Refer point 4 above
10	Railway work will be initiated after Environment Clearance (EC)	**EC Amendment granted by MoEF&CC** Konkan Railway Corporation Limited (KRCL) has been engaged for turnkey execution of the project. Out of the total rail route length of 10.7 km, about 9.0 km is planned to be passing through an underground tunnel to minimize the disturbance to the local population. Detailed Project Report (DPR) has been approved by Southern Railway and Railway Board. EC amendments in this regard has been granted by MoEF&CC on 17.07.2024 vide EC Identification Number EC24A033KL158955 and related

Compliance of the Response/Commitments made during Public Hearing		
S. No.	**Conditions**	**Compliance Status as on 30.09.2024**
		compliances are being filed under the said the same. *(Source: VISL)*
11	Job Opportunity - Preference will be given to local people during construction stage	**Being Complied** Preference is being given to local people based on Skill & competency during the construction stage. Out of an average of 746 persons engaged at site for various construction activities during the compliance period, 243 are from Kerala and out of them 169 are from the nearby wards of the project site.
17	Upgradation of PHC at Vizhinjam will be carried out	**Being Complied** Community Health Centre (CHC) at Vizhinjam at a project cost of Rs. 7.79 Crore is being developed through HED where funding is split between GoK component of Rs. 482 Lakhs and Rs. 297 Lakhs from Adani Foundation. The new CHC building is a three storeyed RCC building (7000 sq. ft. area in each floor) constructed adjacent to the old CHC. The inpatient admission will be raised from 40 to 100 Nos. The main facilities designed for the department are: • Reception Area. • Gynaec Operation Theatre-2 nos. • Post Operation Area. • Nebulisation Unit. • Anaesthesia /Counselling Room. • Labour rooms-2 nos. • Prewash Area. • Doctor's Lounge. • Nurse Station. • Staff Lounge. • Changing Room. • Sterile Store. • Toilets for Men and Women All work on the second floor completed, except lift services. In ground floor and first floor, electrical works, Aluminum partition works, floor works, lift services are pending. Interlock works in between the new and old building is being carried out.

Compliance of the Response/Commitments made during Public Hearing		
S. No.	**Conditions**	**Compliance Status as on 30.09.2024**
		 **CHC at Vizhinjam**
18	New fishing harbour with all the infrastructural facilities will be constructed with reserved rights to mooring/berthing the boats	**Being Complied** Refer point 4 above
19	Appropriate compensation will be given to the resort owners as per the regulatory advice of KCZMA and MoEF since the resorts are seen to be located in No Development Zone (NDZ) as per CRZ Notification 2011	**Being Complied** Resort owners evicted have been compensated for land and not for the structures since they were in violation of CRZ notification. Remaining land of 2.865 Ha is to be acquired by Land Acquisition (LA) process; for which notification has been published and the acquisition is in an advanced stage. *(Source: VISL)*
20	Rail, Road, Coastal and Inland Waterways connectivity will be ensured to the rest of Kerala and other Indian Peninsula Ports	**Being Complied** Multi-Modal (Road, Rail & Coastal) connectivity is within the scope of the project and this will be fully materialised once all phases of the project are implemented. <u>Railway:</u> Konkan Railway Corporation Limited (KRCL) has been engaged for turnkey execution of the project. Out of the total rail route length of 10.7 km, about 9.0 km is planned to be passing through an underground tunnel to minimize the disturbance to the local population. Detailed Project Report (DPR)

Compliance of the Response/Commitments made during Public Hearing		
S. No.	**Conditions**	**Compliance Status as on 30.09.2024**
		has been approved by Southern Railway and Railway Board. EC amendments in this regard has been granted by MoEF&CC on 17.07.2024 vide EC Identification Number EC24A033KL158955. *(Source: VISL)* Road: A proposal was initiated by GoK with NHAI for the development of a clover leaf intersection and a design consultant has been appointed for the study and preparation of the Detailed Engineering Design and Drawings for the proposed Cloverleaf Interchange at the Junction Point at NH-66 connecting the Port Approach Road, NH-66 and Outer Ring Road (ORR). Land acquisition for the clover leaf interchange is underway. In the meantime, temporary connectivity by way of median cutting at NH 66 is being proposed, which is being considered by NHAI based on the Port Traffic Movement Scheme submitted by AVPPL. Development of Coastal shipping and Inland Waterways connectivity are being planned to the rest of Kerala and other peninsular ports by Government Departments concerned. *(Source: VISL)*
21	Waste Management, Water Treatment plants, etc. will be part of an operational EMP	**Being Complied** The dry waste is being properly collected, segregated, and disposed of in line with the Solid Waste Management Rules 2016, as amended. No solid waste is being disposed in the CRZ area. Bio-degradable waste is being treated in an Organic Waste Converter (OWC) installed at site and the output is being used as manure in greenbelt development within the port project areas. A Provision for installing Sewage Treatment Plant (STP) facility of adequate capacity in phased manner in accordance with the CRZ Notification is being implemented.
22	Shoreline monitoring on 15 km both sides on regular basis during construction and operation as suggested in EIA report will be carried out	**Being Complied** Based on the Shoreline Monitoring Plan prepared by L&T IEL under the guidance of NIOT, oceanographic and shoreline monitoring is being carried out for a stretch of 40 km (20 km on both sides of the project site) and reports are being regularly submitted to MoEF&CC as a part of the HYCRs. Broadly the scope covers:

Compliance of the Response/Commitments made during Public Hearing		
S. No.	**Conditions**	**Compliance Status as on 30.09.2024**
		• Wave Observations • Onshore Cross beach profiling • Offshore Cross beach profiling • Littoral Environmental Observations (LEO) • Beach Sampling • Multi-beam Echo Sounder (MBES) survey • Grab Sampling • Current & Tide Observations • Weather Observations • Marine Water Sampling
23	VISL will ensure that appropriate dredging and reclamation methodology as suggested in EIA report will be adopted to contain the turbidity within applicable limits.	**Complied** A total 7.21 Mm^3 dredged material has been utilized for reclamation of 63.43 Ha area of land. With respect to dredging and reclamation, the requirements for reclamation of berths for Phase I development of the port have been completed.
24	Appropriate measures relating to maintenance of health, hygiene, safety and security will be implemented as per EIA report	**Complied** An officer of VISL has been designated as Head (EHS & CSR) for effective implementation of the stipulated EHS safeguards & CSR activities. AVPPL has also appointed competent and qualified professional for effective implementation of EHS safeguards & CSR activities. In addition to the above, independent environment, health and safety consultants have been appointed as per concession agreement signed between GoK and AVPPL. It is also ensured that contractors executing the work also deploy qualified and competent EHS personnel for effective implementation of EMP measures.
25	VISL will ensure that livelihood issues of Mussel collectors are addressed as per the EIA report	**Being Complied** Government Orders have been issued for disbursal of Rs. 12.65 Crore for 271 mussel collectors. Till date 262 Mussel collectors have collected the compensation amount totalling to Rs. 12.36 Crore. Although they were offered alternate livelihood plan through cage fishing, they opted for one-time settlement citing the risks involved in such fishing. *(Source: VISL)*
26	VISL will ensure all the project components i.e., including road/rail connectivity are	**Being Complied** Refer point 20 above EMP as prescribed in the EIA are being implemented. CSR activities are being activities are being carried

Compliance of the Response/Commitments made during Public Hearing		
S. No.	**Conditions**	**Compliance Status as on 30.09.2024**
	implemented in time. In addition the planned CSR and EMP measures will also be implemented and monitored to ensure the socio-economic development of the region.	out in villages within 10 km radius of the project. Details of the same are being submitted as a part of the HYCRs.
27	The implementation of the EMP/RAP/CSR will be ensured through the institutional and regulatory mechanism with regular monitoring and periodic compliance reports to the MoEF	**Being Complied** EMP as prescribed in the EIA are being implemented and reported in the HYCRs. CSR activities are being activities are being carried out in villages within 10 km radius of the project. Details of the same are being submitted as a part of the HYCRs.
28	Special care will be taken to minimise the tree felling in the backup area and to plan the development in tune with the topography.	**Complied** Cutting of trees is minimised to the extent possible. AVPPL, in collaboration with Forest department, have carried out planting of 40,040 trees in two Phases in adequate land as identified by social Forest Department, for a total area of 29.65 Ha spending Rs. 254.50 Lakhs. This has sufficiently covered the obligation of compensatory afforestation required for the development of all the phases of Vizhinjam Port.
29	The livelihood restoration measures for fisherman affected during construction phase as reported in the EIA has to be implemented	**Being Complied** Refer point 1 above
30	Dredging materials will be used for reclaiming (filling) the sea and additional materials are not required	**Complied** Refer point 23 above

Compliance of the Response/Commitments made during Public Hearing		
S. No.	**Conditions**	**Compliance Status as on 30.09.2024**
31	The number of fishermen who will be temporarily affected in the Adimalathura stretch have been assessed and livelihood restoration measures have been framed for the construction period	**Complied** Earlier it was proposed that the fishermen at Adimalathura will be compensated for the construction period of three years, treating them as temporarily affected. However, based on the request of the fishermen (stating that demarcation of the shipping channel and movement of ships would affect them permanently) their compensation has been enhanced considering seven years of livelihood loss. The GoK order to this effect has been issued on 31.05.2018 and compensation has been disbursed to 602 eligible fishermen amounting to a total of Rs. 36.42 Crore. *(Source: VISL)*
32	There will be no erosion on the shoreline on account of dredging the deep sea at (-) 18m to (-) 20m	**Being Complied** Refer point 7 above
33	An Area Development Plan (ADP) is being prepared by CEPT University (Ahmedabad) for planned development of the region to avoid haphazard development.	**Being Complied** The final Integrated Area Development Plan prepared through CEPT University, Ahmadabad in consultation with Town Planning, Tourism, Industry and other line departments was reviewed by the expert committee constituted by GoK. Tourism management plan would be discussed with tourism department for a way forward. A transaction advisory services tender for planned business promotion and development in the nearby area has been floated and in process. *(Source: VISL)*
34	Maximum 3 ships are expected per day in phase I. Appropriate traffic mechanism to cross the ship channel for fisherman with first priority will be practised as is happening in Cochin Port where fishing harbour, container berth, navy, shipyard, inland water	**Will be Complied** Restrictions on fishing will be as per the applicable laws.

Compliance of the Response/Commitments made during Public Hearing		
S. No.	**Conditions**	**Compliance Status as on 30.09.2024**
	transport etc are co-existing	
35	An additional fish landing centre has been suggested at Vizhinjam to decongest the existing harbour, and to cater to the needs of the fisherman in the 15 km vicinity including Pozhiyur & Poovar, considering the suitability of the site having natural bay, increased tranquillity and operational / infrastructural convenience than location like Pozhiyur–Poovar estuary	**Being Complied** Refer point 4 above
36	Implementation of CSR measures and planned development of the region through well designed area development plan will arrest the formation of slums and the like.	**Being Complied** Refer point 27 above
37	"Inconvenience Allowances" during construction period of three years to the fisherman (As per EIA Report)	**Complied** An amount of Rs. 31.57 Crores have been sanctioned by the GoK as inconvenience compensation in the form of kerosene. The entire Rs. 31.57 Crore has been given to the disbursal agency (Matsyafed) for the distribution. *(Source: VISL)*
38	As per the Entitlement Framework, Hardship Allowance is suggested in the EIA/EMP for resort workers who lost their job due to	**Complied** Compensation for livelihood loss; Rs 6.08 Crores out of allocated Rs. 6.11 Crores has been disbursed to 211 out of 213 number of resorts workers and settled completely. The remaining two workers were unable to provide the requisite necessary documents and therefore could not be confirmed for disbursement. *(Source: VISL)*

Compliance of the Response/Commitments made during Public Hearing		
S. No.	**Conditions**	**Compliance Status as on 30.09.2024**
	acquisition of the resort	
39	During the construction period of three years livelihood assistance to the shore seine fisherman in the 2km ship channel foot print beach has been suggested although they can move further southward and continue with their activity.	**Being Complied** Refer point 1 above
40	Ensure that all EMP related aspects are properly implemented during construction and operational phase	**Being Complied** Refer point 23 above
41	A dedicated port road directly connecting to NH-47 bypass is envisaged.	**Being Complied** Refer point 20 above
42	Rail connectivity is proposed along the outer side of the stream running parallel to the harbour road and that too on elevated structures without affecting the entry to the fishing harbour	**Being Complied** Refer point 20 above
43	The port project will not affect the inflow of Neyyar river and AVM canal	**Not Applicable** This is a fact, since both are away from the project site
44	The port road will be access controlled for the exclusive use of container and related port movements. The suggestion for a new	**Not Applicable** The port road will not be access controlled and connectivity for the residents will not be affected.

Compliance of the Response/Commitments made during Public Hearing		
S. No.	**Conditions**	**Compliance Status as on 30.09.2024**
	approach road can be considered on technical feasibility and subject to surrendering of adequate land by the beneficiaries	
45	The Master Plan has already included a reservoir/ground water recharge facility adjoining the road for water-shed management	**Complied** Kerala State Remote Sensing and Environment Centre (KSREC) have studied the impact due to construction of port approach road. Recommendations of KSREC are being implemented and suitable mitigation measures as suggested in the KSREC report are being adopted during construction.
46	Where ever possible and based on eligibility, local people will be employed	**Being Complied** Refer point 11 above
47	Reconstruction of Roads in the nearby area- Adequate provisions have been made for the old fishing harbour and its linkage roads as it will be adopted as a part of best practice and beautification process	**Being Complied** GoK has formed a higher-level committee to prepare a master plan for the old fishing harbour. Government Departments concerned are coordinating to resolve the differences and to arrive at an acceptable plan in consultation with all stakeholders and accordingly a proposal for 25 crores for additional landing facilities at the southern side and a project for 45 crores with necessary facilities at the Northern Part has been formulated and submitted under PMMSY scheme and waiting for approval of GoI. *(Source: VISL)*
48	The development of the warehouse area will be taken up	**Will be Complied** This is part of the proposed port estate development.
49	Livelihood Compensation considered for those who were affected at Adimalathura during construction phase and those affected in the project foot print area at Mulloor and Valiyakadappuram during construction/ operation phase	**Complied** Earlier it was proposed that the fishermen at Adimalathura will be compensated for the construction period of three years, treating them as temporarily affected. However, based on the request of the fishermen (stating that demarcation of the shipping channel and movement of ships would affect them permanently) their compensation has been enhanced considering seven years of livelihood loss. The GoK order to this effect has been issued on 31.05.2018 and compensation has been disbursed to

Compliance of the Response/Commitments made during Public Hearing		
S. No.	**Conditions**	**Compliance Status as on 30.09.2024**
		602 eligible fishermen amounting to a total of Rs. 36.42 Crore. *(Source: VISL)*
50	CSR activity suggested a skill development centre to equip the local people to adapt to the industrial needs of port/tourism and fisheries so that they can be appropriately employed based on their merit. However during construction period the EIA study has suggested to adequately employ local population to the maximum extent possible	**Complied** Additional Skill Acquisition Program (ASAP) is a GoK initiative aimed to impart required skills to local youth for improving their employability. A Community Skill Park (CSP) in an area of 1.5 acres of land handed over by VISL has been developed at Vizhinjam. The CSP operates on a PPP model wherein 25,000 sq. ft. building with facilities for students' hostel have been constructed by GoK by ASAP under ADB assistance, whereas the operation of the centre with logistics and other high-end courses are being taken up by Adani Skill Development Centre (ASDC) as per an agreement with GoK/ASAP/VISL. The CSP developed is a 3 storied building with facilities such as office space, seminar hall, training rooms, IT lab, library, meeting room, faculty room, etc. ASDC is conducting various domain courses, livelihood related courses, and high-end port related courses according to the anticipated vacancies arising in the port, in other top organizations and ports in India and abroad to benefit the community youth in and around Vizhinjam area and other locals. The CSP developed is a 3 storied building with facilities such as office space, seminar hall, training rooms, IT lab, library, meeting room, faculty room, etc. On 15.06.2024, the CSP training building and hostel block was inaugurated by Dr. R Bindhu, Minister for Higher Education, GoK. Preference is being given to local people based on Skill & competency during the construction stage. Out of an average of 746 persons engaged at site for various construction activities during the compliance period, 243 are from Kerala and out of them 169 are from the nearby wards of the project site.
51	Loss of livelihood to the traditional fisherman who do shell fishing in the Mulloor beach area is a real issue/impact.	**Being Complied** Refer point 1 above

Compliance of the Response/Commitments made during Public Hearing		
S. No.	**Conditions**	**Compliance Status as on 30.09.2024**
	All necessary provisions for livelihood assistance have been considered in the EIA Report.	
52	Only prohibited area for fishing is inside the breakwater. However fishing will be restricted along ship channel and port limits subject to safety norms and operational requirements.	**Will be Complied** Restrictions on fishing will be as per the applicable laws.
53	The existing notification of the Vizhinjam Port includes the Vizhinjam Fishing harbour. The revised Notification will include the Vizhinjam Deep Water Port based on revised Port limit provided in the EIA report. Except inside the breakwater of the Deep Water Port in all other areas of the port limit fishing is allowed with all safety and operational restrictions.	**Complied** GoK notified the limits of the Vizhinjam International Deepwater Multipurpose Seaport and altered the limits of the existing Vizhinjam Port (Vizhinjam Fishing harbour) vide G.O. (P) No. 22/2019/F&D dated 21.05.2019. Vizhinjam fishing harbour is excluded from revised notification. Restrictions on fishing will be as per the applicable laws.
54	There will only be a movement of 8 barges per day during the construction period of 3 years and the same will not be a hindrance for the fisherman to cross since this is far less than the number of	**Being Complied** The project is being executed in a manner that there is minimum disturbance to fishing activity. Restrictions on fishing will be as per the applicable laws.

Compliance of the Response/Commitments made during Public Hearing		
S. No.	**Conditions**	**Compliance Status as on 30.09.2024**
	ships being crossed by them daily in the international ship channel.	
55	The maximum rate of accretion at southern side of the harbour will be 21.6 m/year in the 1st year and by the end of tenth year it reduces to 0.5 m/year. The shoreline evolution along the south side of the port will get stabilized in the initial years. On stabilization, the maximum net increase in the shoreline accretion would be around 27m immediately south of the port which reduces to negligible levels within 2.3km alongshore. There will not be any impact on the shoreline along Poovar-Pozhiyar sector which is about 7km away from the proposed port.	**Being Complied** Several studies on the Shoreline Change Analysis of Vizhinjam Coast have not observed any shoreline change erosion occurring within 10 km due to the Vizhinjam port project.
56	The 8 resorts affected will be compensated in line with R&R package in place but subject to the advice of the KCZMA/MoEF considering that all these resorts are in NDZ as per CRZ Notification, 2011	**Being Complied** All authorized-cum-affected resort owners evicted have been compensated adequately for land as per Central/State government norms. Payment transfer for the land acquisition of the last three resorts has been made to District Collector and which is in the process of acquisition. *(Source: VISL)*
57	The cruise terminal proposed in the	**Noted**

Compliance of the Response/Commitments made during Public Hearing		
S. No.	**Conditions**	**Compliance Status as on 30.09.2024**
	project, will promote tourism in the Kovalam-Poovar belt and the region may become the cruise hub/tourism gate way of India in future	Once the first phase of port becomes operational, it would naturally attract tourism. Action is also being taken in consultation with the State Tourism Department, to design port linked tourism packages focussing on the Kovalam-Vizhinjam-Poovar tourism corridor.
58	CSR activity considers training the local people to adapt to the new economic development of the area	**Being Complied** Refer point 50 above
59	The Coast Guard & Navy Berth are as per the needs of the Ministry of Defence on national security	VISL and GoK conducted a series of discussions with Coast Guard, Navy and Ministry of Defence for in-principle approval for the proposal of Navy and Coast Guard. The in-principle approval was then essential as the issue of both the RFP for PPP and EPC works were dependent on them and any further postponement then would have resulted in inordinate delay in implementation of the project. The matter was placed before the Empowered Committee of Secretaries constituted for implementation of Vizhinjam Seaport and chaired by Chief Secretary. The Empowered Committee in its 15th meeting held on 15.02.2014 decided and recommended to GoK to go ahead without participation of the Indian Navy and Coast Guard if the 'In-Principle' approval is not received by 25.02.2014. As an in-principle approval for development of the Navy and Coast Guard Berths was not provided by the Ministry of Defence, GoK, based on recommendation of the Empowered Committee and vide Government Order G.O(MS) No.21/2014/F&PD dated 01.03.2014, decided to proceed without the participation of Indian Navy/Coast Guard for development of Vizhinjam International Seaport.

Annexure VII

Status of Environment Management Plan

Annexure VII

Status of Environment Management Plan-Port Site-Construction Stage Potential Impacts and Mitigation Measures of Various Project Activities				
S. No.	**Activity**	**Relevant Environmental Components likely to be impacted**	**Proposed Mitigation Measures**	**Status as on 30.09.2024**
1	Capital dredging	Marine water quality Marine ecology	o Check turbidity levels with baseline levels as reference during entire monitoring programme o Preparation of Dredge/reclamation Management plan o Discharge of waste into sea will be prohibited o Oil Spill control measures will be adopted o Ensure that slop tanks will be provided to barges/ workboats for collection of liquid/ solid waste o Marine environmental monitoring as per environmental monitoring programme	**Compiled** o A total 7.21 Mm^3 dredged material has been utilized for reclamation of 65.71 Ha area of land. With respect to dredging and reclamation, the requirements for reclamation of berths for Phase I development of the port have been completed.
2	Material transport and construction activities	Air Quality	o Most of the Breakwater stones will be transported from the quarries to the nearest harbour. From there through Barges it will be transported to project site. This is will avoid substantiate flow of Heavy Vehicles during construction Phase thereby	**Complied** o Phase I Breakwater is completed, and further requirement of stones are not envisaged.

Status of Environment Management Plan-Port Site-Construction Stage Potential Impacts and Mitigation Measures of Various Project Activities				
S. No.	**Activity**	**Relevant Environmental Components likely to be impacted**	**Proposed Mitigation Measures**	**Status as on 30.09.2024**
			minimizing impact on Air and Noise Quality in the project region. o To reduce impacts from exhausts, emission control norms will be enforced / adhered. o All the vehicles and construction machinery will be periodically checked to ensure compliance to the emission standards o Construction equipment and transport vehicles will be periodically washed to remove accumulated dirt o Providing adequately sized construction yard for storage of construction materials, equipment tools, earthmoving equipment etc. o Provide enclosures on all sides of construction site o Movement of material will be mostly during non-peak hours. o On-site vehicle speeds will be controlled to reduce excessive dust suspension in air and	

Status of Environment Management Plan-Port Site-Construction Stage Potential Impacts and Mitigation Measures of Various Project Activities				
S. No.	**Activity**	**Relevant Environmental Components likely to be impacted**	**Proposed Mitigation Measures**	**Status as on 30.09.2024**
			dispersion by traffic o Water sprinkling will be carried out to suppress fugitive dust o Environmental awareness program will be provided to the personnel involved in developmental works o Use of tarpaulin covers and speed regulations for vehicles engaged in transportation	
		Noise	o Noise levels will be maintained below threshold levels stipulated by Central/Kerala State Pollution Control Board (CPCB)/KSPCB o Procurement of machinery / construction equipment will be done in accordance with specifications conforming to source noise levels less than 75 dB (A) o Well-maintained construction equipment, which meets the regulatory standards for source noise levels, will be used	**Being Complied** o Noise levels are being monitored every fortnight and are found to be well within the permissible limits within the project area. o Contractors are also monitoring the Noise level in their work area and results are within the stipulated limits. o Protective gear like earplugs, muffs are provided to workers exposed to noise level beyond threshold limits. o Acoustic Barriers and Enclosures shall be set up wherever necessary for noisy equipment. o Well-maintained construction equipment, which meets the regulatory standards for source noise levels, is being used. o Piling for Phase I construction has been completed.

Status of Environment Management Plan-Port Site-Construction Stage Potential Impacts and Mitigation Measures of Various Project Activities				
S. No.	**Activity**	**Relevant Environmental Components likely to be impacted**	**Proposed Mitigation Measures**	**Status as on 30.09.2024**
			o Any equipment emitting high noise, wherever possible, will be oriented so that the noise is directed away from sensitive receptors o Noise attenuation will be practiced for noisy equipment by employing suitable techniques such as acoustic controls, insulation and vibration dampers o High noise generating activities such as piling and drilling will be scheduled at daytime (6.00 am to 10 pm) to minimise noise impacts o Personnel exposed to noise levels beyond threshold limits will be provided with protective gear like earplugs, muffs, etc. o Ambient noise levels will be monitored at regular intervals	
		Disturbance to Natural Drainage pattern	o Port development is mostly on reclaimed land o Rainwater/surface water harvesting pond included in design o Existing drainage near port boundary (backup area) will be	**Being Complied** o Measures have been taken for maintaining the natural flow of the streams. o A study was conducted to access the rainwater harvesting potential and recommend for planning accurate, successful and implementable rainwater

Status of Environment Management Plan-Port Site-Construction Stage Potential Impacts and Mitigation Measures of Various Project Activities				
S. No.	**Activity**	**Relevant Environmental Components likely to be impacted**	**Proposed Mitigation Measures**	**Status as on 30.09.2024**
			o integrated with port storm water drainage & management plan o Existing drains / Streams that are passing in ware house area will not be closed/ diverted. And these streams will be de-silted and enhanced to improve their carrying capacities	harvesting management system within the proposed sites for the sustainable development of existing groundwater resources and thereby suitable rainwater harvesting structures are recommended. To capture, store and reuse a percentage of the estimated runoff, rainwater collection and storage sumps are recommended at suitable locations. However, since the area within the port is reclaimed land, rainwater harvesting structures at the suggested locations were found to be not feasible. o Drains/streams passing through the port area are not closed.
		Vegetation and Strain on existing infrastructure	o Port development is planned mostly on reclaimed land; o Land use at backup area, PAF Zone and warehouse area will be mostly coconut plantation and low mixed plantation o Adequate green belt will be developed in port and its associated (backup area, PAF, warehouse and road & rail connectivity). o Temporary workers camp with self-sufficient infrastructure facilities.	**Being Complied** o Although a natural greenbelt exists, the greenbelt of adequate width with suitable species as identified in the EIA will be developed in all possible areas including back-up areas and along the boundary of the project area in line with the establishment of the project. A greenbelt development plan has been considered in the Master Plan and adequate budgetary provision has been kept for this purpose. Landscape development work has been completed at several locations in the port areas. o Care is taken to limit the falling of trees to the minimum. Due permission is taken for trees to be cut down because of the port development from the department

Status of Environment Management Plan-Port Site-Construction Stage Potential Impacts and Mitigation Measures of Various Project Activities				
S. No.	**Activity**	**Relevant Environmental Components likely to be impacted**	**Proposed Mitigation Measures**	**Status as on 30.09.2024**
				concerned (Forest Department). o AVPPL, in collaboration with Forest department, have carried out planting of 40,040 trees in two Phases in adequate land as identified by social Forest Department, for a total area of 29.65 Ha spending Rs. 254.50 Lakhs. This has sufficiently covered the requirement of compensatory afforestation required for the entire Master Plan development of Vizhinjam Port. o There are no labourers residing in the labour camps. It is ensured that construction workers who are staying outside in contractor rented houses/apartments are provided with necessary infrastructure facilities.
		Existing Traffic	o NH-47 bypass under construction around 2.0 km from the proposed Port site and the Transportation of construction materials will be carried out during non- peak hours. Hence a dedicated road of 45 M RoW is proposed to connect site with NH Bypass o Regularization of truck movement o Majority of rock for breakwater construction will be transported through sea route via barges from nearby quarry sites	**Being Complied** o Development of dedicated road connectivity approach road (2.0 km) from the port to the NH-47 Bypass is in progress. A proposal was initiated by GoK with NHAI for the development of a clover leaf intersection and a design consultant has been appointed for the study and preparation of the Detailed Engineering Design and Drawings for the proposed Cloverleaf Interchange at the Junction Point at NH-66 connecting the Port Approach Road, NH-66, and Outer Ring Road (ORR). Land acquisition for the clover leaf interchange is underway. In the meantime, temporary connectivity by way of median cutting at NH 66 is being proposed, which is

Status of Environment Management Plan-Port Site-Construction Stage Potential Impacts and Mitigation Measures of Various Project Activities				
S. No.	**Activity**	**Relevant Environmental Components likely to be impacted**	**Proposed Mitigation Measures**	**Status as on 30.09.2024**
			o A dedicated rail network of approximately 15 km is proposed from port to Nemom railway station	being considered by NHAI based on the Port Traffic Movement Scheme submitted by AVPPL. o Traffic monitoring and regularization is being carried out for maximum efficiency. o Transportation of construction materials is being carried out considering the non-peak traffic timing and local restrictions during festivals, strikes, etc. o Konkan Railway Corporation Limited (KRCL) has been engaged for turnkey execution of the project. Out of the total rail route length of 10.7 km, about 9.0 km is planned to be passing through an underground tunnel to minimize the disturbance to the local population. Detailed Project Report (DPR) has been approved by Southern Railway and Railway Board. EC amendments in this regard has been granted by MoEF&CC on 17.07.2024 vide EC Identification Number EC24A033KL158955.
3.	Land Reclamation	Existing Water Resources like Groundwater and surface water	o Land to be reclaimed will be separated from adjoining land by creating containment bund. o Return sea water will be sent back to sea through appropriate channels.	**Being Complied** o A total 7.21 Mm^3 dredged material has been utilized for reclamation of 63.43 Ha area of land. With respect to dredging and reclamation, the requirements for reclamation of berths for Phase I development of the port have been completed. o The existing drains are maintained for unhindered disposal of surface drainage water.

Status of Environment Management Plan-Port Site-Construction Stage Potential Impacts and Mitigation Measures of Various Project Activities				
S. No.	**Activity**	**Relevant Environmental Components likely to be impacted**	**Proposed Mitigation Measures**	**Status as on 30.09.2024**
4.	Solid Waste Management	Soil quality	o Construction waste will be used within port site for filling of low lying areas. o Composted bio-degradable waste will be used as manure in greenbelt. o Other recyclable wastes will be sold. o Excavated soil at backup, PAF Zone and ware house area will be stockpiled in a corner of the site in bunded area to avoid run off with storm water. o General refuse generated on-site will be collected in waste skips and separated from construction waste. o Burning of refuse at construction sites will be prohibited. o All control measure will be taken to avoid the contamination of groundwater during construction phase	**Being Complied** o Construction waste is used within port site for filling of low-lying areas in line to C&D Waste Management Rules 2016, as amended. o Contractors working at the site have been made responsible for management of Solid Waste during construction stage and are complying with the provisions pertaining to Solid Waste Management Rules 2016, as amended. o An Organic Waste Converter (OWC) has been installed at site and is operating for bio-degradable waste; output is being used as manure in greenbelt development. o General refuse waste is being stored separately and sent to approved recyclers and/or sold. o No burning of refuse at construction sites is being done. o There is no disposal of waste in the project area which may lead to groundwater contamination.
5.	Handling of	Human safety and	o Adequate safety measures as per	**Being Complied** o Adequate safety measures as per OSHA standards are

Status of Environment Management Plan-Port Site-Construction Stage Potential Impacts and Mitigation Measures of Various Project Activities				
S. No.	**Activity**	**Relevant Environmental Components likely to be impacted**	**Proposed Mitigation Measures**	**Status as on 30.09.2024**
	hazardous wastes	property loss	OSHA standards will be adopted o Construction site will be secured by fencing with controlled/limited entry points. o Hazardous materials such as lubricants, paints, compressed gases, and varnishes etc., will be stored as per the prescribed/approved safety norms. o Medical facilities including first aid will be available for attending to injured workers. o Handling and storage as per statutory guidelines. o Positive isolation procedures will be adhered o Hazardous wastes will be disposed through approved KSPCB/CPCB vendors.	adopted as and when necessary, as per the HSE Plan. o Construction site is being secured by fencing wherever possible with controlled/limited entry points. Boundary wall construction is ongoing at available fronts. o Medical facilities including first aid are available for attending to injured workers. Ambulance is also available at site for shifting the injured to the nearby hospitals. o Handling and storage of Hazardous Materials is being done as per statutory guidelines. o Hazardous waste is disposed through approved KSPCB/CPCB vendors.
6.	Water Resources	Water scarcity / Pollution	o Water requirement during the construction is expected to be around 0.10 MLD o Water will be sourced from Vellayani lake	**Being Complied** o KWA set up a 3.00 MLD water supply scheme for the project with the source of water being Vellayani Lake. The net availability of treated water from this supply scheme is 2.49 MLD of potable water out of which 1.49

Status of Environment Management Plan-Port Site-Construction Stage Potential Impacts and Mitigation Measures of Various Project Activities				
S. No.	**Activity**	**Relevant Environmental Components likely to be impacted**	**Proposed Mitigation Measures**	**Status as on 30.09.2024**
			o Avoid/minimise the loss during conveyance o Optimized utilization of the water o Care will be taken to prevent the runoff from the construction site to the nearby natural streams, if any	MLD of water shall be distributed to the local people as part of social welfare measures of VISL. The balance 1.0 MLD was to be used for port related activities. However, at present, the entire treated water from the scheme is being utilised by the community. o The water for construction purposes for the port is being sourced from the open market/private suppliers. o Care is being taken to prevent the runoff from the construction site to the nearby natural streams.
7.	Fishing	Fishermen and fishing villages	o Signboards will be placed at the construction activities in order to make fishermen aware of the ongoing construction activities o Necessary marker buoys will be installed o Interactions will be initiated with the fishing community before commencement of construction works	**Being Complied** o Signboards have been placed for demarcation of construction area. o Navigational buoys/marker buoys are placed in the marine area for fishing boats to maintain a safe distance from the areas of breakwater construction. o The number of buoys for monitoring in the project area has been optimized, considering the safety of fishermen and ease of movement during construction. o Using the technological advancement the dedicated CSR team of AVPPL are in constant touch with the fishermen/fishing community members to facilitate the flow of various project related information/updates. o AVPPL CSR team also provides regular updates to the committee which has been formed by the local church representatives adjoining to the port area, who in turn

Status of Environment Management Plan-Port Site-Construction Stage Potential Impacts and Mitigation Measures of Various Project Activities				
S. No.	**Activity**	**Relevant Environmental Components likely to be impacted**	**Proposed Mitigation Measures**	**Status as on 30.09.2024**
				pass on port project execution information to the fishermen.
8.	Tourism	Effect on tourism	o Tourism activity is observed at Kovalam located about 2.0 km towards the North of Proposed Port. Mathematical Modelling studies on shoreline changes show the insignificant impact due to the port development on the existing coastline. However, the Shoreline monitoring during construction as well as operation Phases were proposed. o A cruise terminal and related facilities is part and parcel of the project. This is to largely compensate the losses made o For all acquired properties and land adequate compensation will be provided based on legally valid documents	**Being Complied** o The tourism activity in the nearby Kovalam area is not impacted by the construction of the port. o Shoreline monitoring for a stretch of 40 km (20 km on both sides of the project site) is being done and reports are regularly submitted to regulatory authorities. o Implementation of the Tourism Management Plan is being discussed with tourism department and which would be integrated with the tourism directorates plan in the area. *(Source: VISL)* o All authorized-cum-affected resort owners evicted have been compensated adequately for land as per Central/State government norms. Payment transfer for the land acquisition of the last three resorts has been made to District Collector and which is in the process of acquisition. *(Source: VISL)*
9	Breakwater	Change in shoreline	o Shoreline monitoring shall be carried out o Suitable Shoreline protection	**Being Complied** o Comprehensive Shoreline Monitoring is being carried out under the technical Guidance of NIOT and Six monthly monitoring reports are being submitted

Status of Environment Management Plan-Port Site-Construction Stage Potential Impacts and Mitigation Measures of Various Project Activities				
S. No.	**Activity**	**Relevant Environmental Components likely to be impacted**	**Proposed Mitigation Measures**	**Status as on 30.09.2024**
			measures will be implemented based on the observations	regularly as part of EC & CRZ Compliance. The existing Shoreline Monitoring consists of: o Wave and Current Observations by INCOIS o Onshore & Offshore Cross beach profiling o Littoral Environmental Observations (LEO) o Beach Sampling o Multi-beam Echo Sounder (MBES) survey o River cross section surveys o Grab Sampling o Tide Observations o Weather Observations o Water Sampling o L&T Infrastructure Engineering Ltd. (L&T IEL) had prepared Mathematical Modelling Reports based on Shoreline Monitoring data; which were vetted by National Institute of Ocean Technology (NIOT). o Suitable Shoreline protection measures will be implemented based on the observations, if any.
10	Effect on existing fishing harbour	Movement of fishing boats	o Detailed modelling studies have been carried out on tranquillity conditions in the fishing harbour with port development. The studies reveal that the tranquillity conditions will be improved in	**Being Complied** o Wave, current and tide data are being monitored along with the shoreline monitoring of 40 km stretch. Based on the above, the modelling studies done at the EIA stage has been further evaluated. o During operation phase traffic of Marine vessel/fishing

Status of Environment Management Plan-Port Site-Construction Stage Potential Impacts and Mitigation Measures of Various Project Activities				
S. No.	**Activity**	**Relevant Environmental Components likely to be impacted**	**Proposed Mitigation Measures**	**Status as on 30.09.2024**
			fishing harbour with construction of the port. Further minor accretion happening within the fishing harbour will be arrested o Traffic of Marine vessel/ fishing boats will be planned without affecting each other o Adoption of fishing harbour to manage it to perform as per International standard o A new fishing harbour provided under CSR initiatives because of additional tranquillity creator. o Loss of livelihood will be either taken care of in the new port premises or adequately compensated mostly in the form of employment	boats will be planned without affecting each other as per the applicable laws. o Based on the recommendations of the report on physical model studies carried out by CWPRS, the geometry of the breakwater originally proposed for the fishing harbour is found to be not suitable with respect to tranquillity and therefore the design of the new fishing landing centre needed to be revisited. Consultations between Fisheries Department and Ports Department, GoK are being held to decide the suitable location for the additional fishing harbour in consultation with the fishermen community. GoK would soon be finalising the plan of action based on the final CWPRS report to develop and make available the additional fish landing facilities for the benefit of the local fishermen in a time bound manner. *(Source: VISL)* o In consultation with the fishermen, enhanced livelihood compensation of Rs. 108.32 Crores was sanctioned by GoK and distributed up to date by VISL to the fishermen as livelihood compensation. Till 30.09.2024 an amount of Rs. 106.93 Crores have been disbursed for a total number of 2697 Livelihood Affected Persons (LAPs) whose verification was complete in all respects; this includes boat owners to whom kerosene is supplied free

Status of Environment Management Plan-Port Site-Construction Stage Potential Impacts and Mitigation Measures of Various Project Activities				
S. No.	**Activity**	**Relevant Environmental Components likely to be impacted**	**Proposed Mitigation Measures**	**Status as on 30.09.2024**
				of cost during the breakwater construction period. Remaining few disbursals would be done as soon as possible. *(Source: VISL)*
11	Shoreline changes	Erosion/accretion	Final shoreline Impact management plan will be prepared in consultation with agencies like CESS/INCOIS, NGO and local bodies and will implemented.	**Being Complied** o NIOT has been engaged to give technical advice on aspects related to shoreline monitoring & shoreline evolution. o Comprehensive Shoreline Monitoring is being carried out under the technical Guidance of NIOT and six-monthly monitoring reports are being submitted regularly as part of EC & CRZ Compliance. o Wave, current and tide data are being monitored a 40 km stretch. o L&T IEL had prepared Mathematical Modelling Reports based on Shoreline Monitoring data; which were vetted by NIOT.

Environmental Management Plan – Rail*/Road Corridors *No Construction work was carried out during the compliance period in the rail corridor			
S. No.	**Environmental Impacts and Issues**	**Mitigation Measures**	**Status as on 30.09.2024**
1	Environmental Management and Monitoring Facility Equipment for EMP (Meters, Vehicles and Buildings)	o This will include institutional requirements, training, environmental management and monitoring. Provision for purchasing required equipment.	**Noted for Compliance** o An Environment Management Cell has been established to look after day-to-day affairs like Monitoring, Training, etc. o Appropriate institutional mechanism for maintenance of health, hygiene, safety, security has been put in place. o An officer of VISL has been designated as General Manager – Environment for supervision of the stipulated Environment, Health and Safety (EHS) safeguards. AVPPL has also appointed competent and qualified professional team for the effective implementation of EHS safeguards & CSR activities. In addition to the above, an Environmental Expert of the independent engineer and safety consultants have been appointed as per concession agreement signed between GoK and AVPPL. o It is also ensured that contractors executing the work also deploy qualified and competent EHS personnel for effective implementation of EHS measures. o Third party environmental monitoring through NABL accredited laboratory has commenced since August 2016 and the monitoring results are satisfactory.
2	Altered Road embankment	o Retaining walls and gabions should be provided	**Noted for Compliance** o AVPPL engaged Kerala State Remote Sensing and Environment Centre (KSREC) to undertake study on Groundwater impact due to construction of port approach road. The suitable mitigation measures as suggested by KSREC are being adopted during construction.

Environmental Management Plan – Rail*/Road Corridors *No Construction work was carried out during the compliance period in the rail corridor			
S. No.	**Environmental Impacts and Issues**	**Mitigation Measures**	**Status as on 30.09.2024**
3	Dust	o Water should be sprayed during the construction phase, at mixing sites, and temporary roads. o In laying sub-base, water spraying is needed to aid compaction of the material. After the compaction, water spraying should be carried out at regular intervals to prevent dust. o Vehicles delivering materials should be covered to reduce spills and dust blowing off the load.	**Being Compiled** o Regular Water Sprinkling is done on the approach road by water tankers. o Water spraying is carried out at regular intervals after compaction o Tarpaulin cover is used in vehicles delivering materials.
4	Air Pollution	o Vehicles and machinery are to be maintained so that emissions conform to National and State standards. o All vehicles and machineries should obtain Pollution Under Control Certificates (PUC).	**Being Complied** o It is ensured that all vehicles entering the port have Pollution Under Control (PUC) Certificate.
5	Noise	o Machinery and vehicles will be maintained to keep their noise to a minimum. o Construction of noise barriers of an average length of 100m and eight feet height wherever necessary. o Proper maintenance of the rail track and rail wagon, by frequent lubrication to avoid frictional noise. o Regular monitoring shall be carried out	**Being Compiled** o All the machinery and vehicles are maintained to keep the noise at minimum. o Noise monitoring is being done since August 2016, and the readings are within the limits at port site. o Regular monitoring of ambient Noise is carried out since August 2016 as per the Environmental Monitoring Plan prescribed in EIA and results are within the prescribed limit at port site.

Environmental Management Plan – Rail*/Road Corridors *No Construction work was carried out during the compliance period in the rail corridor			
S. No.	**Environmental Impacts and Issues**	**Mitigation Measures**	**Status as on 30.09.2024**
		as per the Environmental Monitoring Plan.	
6	Loss of low lying land and ponds	o Impacted ponds can be enhanced by constructing bridged structures like Gabions to avoid plugging of springs. o Mitigation/Compensation shall be affected for the completely impacted ponds. o At Chainage km 6.500 the Railway alignment goes below the Existing NH and then at km 6.600 it will hit pond. The pond will be excavated partially and the soil material shall be used to fill in the western part and an equivalent area lost may be excavated to compensate the loss of effective pond area.	**Being Complied** o AVPPL engaged KSREC to undertake study on Groundwater impact due to construction of port approach road. KSREC had provided recommendations for AVPPL in the process of constructing the approach road to port: o The de-silting and rejuvenating the existing pond at the higher elevation, between chainages 1510 to 1570, and by constructing elevated road and the status quo maintenance of the pond A at the lower elevation within the chainages 980 to 1080 and by building elevated road will improve the recharge. o Subsurface dyke suggested will provide additional recharge not only nullify the impact of impervious area generated due to the road construction but will provide water in the wells during summer. o Cross Vents suggested below the road will help in sustaining the recharge of groundwater in the lean period and will act as drain-out mechanism at times of high groundwater level. o The surface ponds suggested are additional facilities to improve the recharge and to increase the water retaining capacity of the watershed. o These suitable mitigation measures as suggested by KSREC are being adopted during construction.

Environmental Management Plan – Rail*/Road Corridors *No Construction work was carried out during the compliance period in the rail corridor			
S. No.	**Environmental Impacts and Issues**	**Mitigation Measures**	**Status as on 30.09.2024**
			o KRCL has been engaged for turnkey execution of the project. Out of the total rail route length of 10.7 km, about 9.0 km is planned to be passing through an underground tunnel to minimize the disturbance to the local population. Detailed Project Report (DPR) has been approved by Southern Railway and Railway Board. EC amendments in this regard has been granted by MoEF&CC on 17.07.2024 vide EC Identification Number EC24A033KL158955 and related compliances are being filed under the said the same. *(Source: VISL)*
7	Flood Impacts and Cross Drainage Structures	o Formation level should be raised according to the design and the cross drainage structures suitably planned for the flood events.	**Being Complied** o Care is taken such that the formation level is as per suitable design and the cross-drainage structures are also being implemented.
8	Alteration of drainage	o In sections along watercourses, earth and stone will be properly disposed of so as not to block rivers and streams, thereby preventing any adverse impact on water quality. o All necessary measures shall be taken to prevent earthworks and stone works from impeding cross drainage at streams and canals or existing irrigation and drainage systems in conformity to the Contractors visual integration and management plan and EMP.	**Being Complied** o AVPPL engaged KSREC to undertake study on Groundwater impact due to construction of port approach road. KSREC had provided recommendations for AVPPL in the process of constructing the approach road to port: o The de-silting and rejuvenating the existing pond at the higher elevation, between chainages 1510 to 1570, and by constructing elevated road and the status quo maintenance of the pond A at the lower elevation within the chainages 980 to 1080 and by building elevated road will improve the recharge. o Subsurface dyke suggested will provide additional recharge not only nullify the impact of impervious area

Environmental Management Plan – Rail*/Road Corridors *No Construction work was carried out during the compliance period in the rail corridor			
S. No.	**Environmental Impacts and Issues**	**Mitigation Measures**	**Status as on 30.09.2024**
			generated due to the road construction but will provide water in the wells during summer. o Cross Vents suggested below the road will help in sustaining the recharge of groundwater in the lean period and will act as drain-out mechanism at times of high groundwater level. o The surface ponds suggested are additional facilities to improve the recharge and to increase the water retaining capacity of the watershed. o These suitable mitigation measures as suggested by KSREC are being adopted during construction.
9	Contamination from Wastes	o All justifiable measures will be taken to prevent the wastewater produced during construction from entering directly into rivers and irrigation systems.	**Being Complied** o Measures are being taken up to prevent the wastewater produced during construction from entering directly into rivers and irrigation systems. o No waste water is disposed into the water bodies.
10	Borrow pits	o Borrow pits are to be identified, opened and closed after consultations and proper documentation.	**Will be Complied as and when required**
11	Quarrying and Material sources	o Quarrying will be carried out at approved and licensed quarries only.	**Noted**
12	Soil Erosion and Soil Conservation	o On slopes and other suitable places along the two proposed corridors, trees and grass should be planted. o On sections with filling and deep cutting	**Being Complied** o AVPPL engaged KSREC to undertake study on Groundwater impact due to construction of port approach road. KSREC had provided recommendations for AVPPL in the process of

Environmental Management Plan – Rail*/Road Corridors *No Construction work was carried out during the compliance period in the rail corridor			
S. No.	**Environmental Impacts and Issues**	**Mitigation Measures**	**Status as on 30.09.2024**
		their slopes should be covered by sod, or planted with grass, etc. o If existing irrigation and drainage system, ponds are damaged, they will be suitably repaired. o Retaining walls and gabions shall be suitably provided.	constructing the approach road to port. o The suitable mitigation measures as suggested by KSREC are being adopted during construction.
13	Loss of agricultural topsoil	o Arable land should not be used for topsoil borrowing. o Topsoil will be kept and reused after excavation is over. o Any surplus to be used on productive agricultural land.	**Being Complied** o Arable land is not being used for topsoil borrowing o The topsoil excavated is being stored and will be reused during development of greenbelt.
14	Compaction of Soil and Damage to Vegetation	o Construction vehicles should operate within the Corridor of Impact avoiding damage to soil and vegetation.	**Being Complied** o Construction vehicles are being operated only alongside the road boundary; thereby avoiding damage to soil and vegetation.
15	Loss of trees and Avenue Planting	o Areas of trees cleared will be replaced according to Compensatory Afforestation Policy under the Forest Conservation Act - 1980. o Landscaping shall be done at major junctions.	**Being Compiled** o Although a natural greenbelt exists, the greenbelt of adequate width with suitable species as identified in the EIA will be developed in all possible areas including back-up areas and along the boundary of the project area in line with the establishment of the project. Landscape development work is also being implemented at several locations in the port areas. o Care is taken to limit the felling of trees to the bare minimum.

Environmental Management Plan – Rail*/Road Corridors *No Construction work was carried out during the compliance period in the rail corridor			
S. No.	**Environmental Impacts and Issues**	**Mitigation Measures**	**Status as on 30.09.2024**
			Due permission is taken for trees being cut down because of the port development from concerned department (Forest Department). o AVPPL, in collaboration with Forest department, have carried out planting of 40,040 trees in two Phases in adequate land as identified by social Forest Department, for a total area of 29.65 Ha spending Rs. 254.50 Lakhs. This has sufficiently covered the requirement of compensatory afforestation required for the entire Master Plan development of Vizhinjam Port. o Plantation of saplings along the road margins, road junctions and road medians are being carried out as part of the greenbelt development plan.
16	Vegetation clearance	o Tree clearing within the ROW should be avoided beyond that which is directly required for construction activities and/ or to reduce accidents. o Especially in plantation and house garden areas both along road and rail alignment.	**Being Complied** o Care is taken to limit the felling of trees to the bare minimum. o Permission for trees being cut down because of the port development has been obtained from concerned department (Forest Department).
17	Fauna	o Construction workers should protect natural resources and animals. Hunting of birds and other local animals is prohibited.	**Being Complied** o Regular awareness sessions are conducted for construction workers regarding importance of natural resources and animals. o Hunting of birds & other local animals is strictly prohibited
18	Traffic Jams and congestion	o If there is traffic congestion during construction, measures should be taken to	**Being Complied** o In order to avoid traffic congestion, if any, during the

Environmental Management Plan – Rail*/Road Corridors *No Construction work was carried out during the compliance period in the rail corridor			
S. No.	**Environmental Impacts and Issues**	**Mitigation Measures**	**Status as on 30.09.2024**
		relieve it as far as possible with the co-operation of the traffic police.	construction of the road, measures will be taken to relieve it as far as possible with the co-operation of the traffic police.
19	Health and Safety	o All contractors' staff and workers must wear high visibility purpose made overalls or trousers/waist coat at all times. All operators working with any materials above head height (even in trenches) must wear hard hats all at times on the worksite.	**Being Compiled** o All the workers are provided with Personal Protective Equipment's (PPEs), and it is ensured that they wear it all the time o Also, all the contractors working at the site have a dedicated health and safety person to oversee the work carried out.
20	Pollution of Streams parallel or along the alignments	o Construction material/waste should be disposed of properly so as not to block or pollute streams or ponds with special attention to confining concrete work.	**Being Complied** o Construction materials/waste are being disposed properly; so as not to block or pollute streams or ponds.
21	Cultural Remains	o Construction should be stopped until authorised department assess the remains to preserve Archaeological relics and cultural structures like Temples, mosques and churches. o Archaeologists will supervise the excavation to avoid any damage in the relics.	**Noted for Compliance**

Environment Management Plan – Warehouse Area* (Construction Phase) *No work was carried out in Warehouse area during compliance period				
S. No.	**Activity**	**Relevant Environmental Components likely to be impacted**	**Proposed Mitigation Measures**	**Status as on 30.09.2024**
1	Material transport and construction activities	Air Quality/Dust	o To reduce impacts from exhausts, emission control norms will be enforced / adhered. o All the vehicles and construction machinery will be periodically checked to ensure compliance to the emission standards. o Construction equipment and transport vehicles will be periodically washed to remove accumulated dirt. o Providing adequately sized construction yard for storage of construction materials, equipment, tools, earthmoving equipment, etc. o Provide enclosures on all sides of construction site o Movement of material will be mostly during non-peak hours. o On-site vehicle speeds will be controlled to reduce excessive dust suspension in air and dispersion by traffic o Water should be sprayed during the construction phase, at mixing sites, and temporary roads. o In laying sub-base, water spraying is needed to aid compaction of the material. After the compaction, water spraying should be carried	**Complied** o Monthly Environment Monitoring is being carried out and the parameters are within the stipulated limit. o It is ensured that all vehicles entering the area have a valid PUC certification.

Environment Management Plan – Warehouse Area* (Construction Phase) *No work was carried out in Warehouse area during compliance period				
S. No.	**Activity**	**Relevant Environmental Components likely to be impacted**	**Proposed Mitigation Measures**	**Status as on 30.09.2024**
			out at regular intervals to prevent dust. o Vehicles delivering materials should be covered to reduce spills and dust blowing off the load. o Environmental awareness program will be provided to the personnel involved in developmental works. o Use of tarpaulin covers and speed regulations for vehicles engaged in transportation.	
		Noise	o Noise levels will be maintained below threshold levels stipulated by Central/Kerala State Pollution Control Board (CPCB)/KSPCB. o Procurement of machinery / construction equipment will be done in accordance with specifications conforming to source noise levels less than 75 dB (A). o Well-maintained construction equipment, which meets the regulatory standards for source noise levels, will be used o Any equipment emitting high noise, wherever possible, will be oriented so that the noise is directed away from sensitive receptors. o Noise attenuation will be practiced for noisy equipment by employing suitable techniques	**Complied** o Ambient Noise is being monitored fortnightly for Day & Nighttime and results are within the prescribed limit. o Construction equipment and machinery procurement is done in accordance with specifications conforming to the prescribed standards. o Personnel engaged in construction activity are provided with appropriate PPE's (Earplugs/muffs)

Environment Management Plan – Warehouse Area* (Construction Phase) *No work was carried out in Warehouse area during compliance period				
S. No.	**Activity**	**Relevant Environmental Components likely to be impacted**	**Proposed Mitigation Measures**	**Status as on 30.09.2024**
			such as acoustic controls, insulation and vibration dampers. o High noise generating activities such as piling and drilling will be scheduled at daytime (6.00 am to 10 pm) to minimize noise impacts. o Personnel exposed to noise levels beyond threshold limits will be provided with protective gear like earplugs, muffs, etc. o Ambient noise levels will be monitored at regular intervals	
2	Construction of Buildings, Roads, Sheds, etc.	Vegetation and Strain on existing infrastructure	o Most of the land is covered with coconut trees and few other trees. Trees that are cut down will be accounted for and the same no. of trees of the same or some other species will be replanted at another location to compensate for the loss of greenery.	**Being Complied** o Care is taken to limit the falling of trees to the bare minimum. Due permission is taken for trees to be cut down because of the port development from the concerned department (Forest Department). o AVPPL, in collaboration with the Forest department, have carried out planting of 40,040 trees in two Phases in adequate land as identified by social Forest Department, for a total area of 29.65 Ha spending Rs. 254.50 Lakhs. This has sufficiently covered the requirement of compensatory afforestation required for

Environment Management Plan – Warehouse Area* (Construction Phase) *No work was carried out in Warehouse area during compliance period				
S. No.	**Activity**	**Relevant Environmental Components likely to be impacted**	**Proposed Mitigation Measures**	**Status as on 30.09.2024**
				the entire Master Plan development of Vizhinjam Port.
		Water Environment	o The streams 1 and 2 will be made to avoid entering the warehouse area by diverging them into the Karichal River. o A tunnel like arrangement with RCC structures will be used so as to not affect the streams (3 and 4) that will go through the warehouse area. The streams will be made to go under the warehouse areas through the tunnel. o Another option is to divert the stream through the boundary o An application has been filed with the irrigation department for permission.	**Will be Complied** o Will be appropriately planned during the development stage. There is no work carried out during the compliance period.
			o The low lying area in the region is already made use by the local people, and has been degraded. There are no active ecological systems in the area. As far as possible, during operation phase the network of streams that add to the low lying area of the region will be diverted or channeled under the constructed buildings to avoid impact to the low lying area. o Filling of low lying areas (if required) shall be done	**Will be Complied** o Will be appropriately planned during the development stage. There is no work carried out during the compliance period. o In G.O. dated GO(MS)No.27/2022/AGRI dated 18.04.2022, the government verified the area in detail and has given permission and order for the conversion of the 24.7980 Ha of paddy land for use of port activities.

Environment Management Plan – Warehouse Area* (Construction Phase) *No work was carried out in Warehouse area during compliance period				
S. No.	**Activity**	**Relevant Environmental Components likely to be impacted**	**Proposed Mitigation Measures**	**Status as on 30.09.2024**
			o Construction waste such as cement, paint, and other construction waste will flow into the downstream parts of the streams and Karichal River. Construction will be avoided during rainy season. Good housekeeping practices, such as cement being stored in dry areas will be taken care of. Labour camps will be provided with proper support services.	**Will be Complied** o Will be appropriately planned during the development stage. There is no work carried out during the compliance period.
		Disturbance to Natural Drainage pattern	o As mentioned above, formidable measures will be taken to avoid the disturbance to the natural flow of water. If some structure or building comes in the way of the existing flow of water, the flow will be redirected to the closest stream in the drainage pattern. o In sections along watercourses, earth and stone will be properly disposed of so as not to block rivers and streams, thereby preventing any adverse impact on water quality. o All necessary measures shall be taken to prevent earthworks and stone works from impeding cross drainage at streams and canals or existing irrigation and drainage systems in conformity EMP.	**Will be Complied** o Will be appropriately planned during the development stage. There is no work carried out during the compliance period.
		Existing Traffic	o Transportation of construction materials will	**Will be Complied**

Environment Management Plan – Warehouse Area* (Construction Phase) *No work was carried out in Warehouse area during compliance period				
S. No.	**Activity**	**Relevant Environmental Components likely to be impacted**	**Proposed Mitigation Measures**	**Status as on 30.09.2024**
			be carried out during non- peak hours. o Regularization of truck movement. o Existing roads shall be strengthened and shall be used for the construction material transportation.	
3	Solid Waste Management	Soil quality	o Construction waste will be used within warehouse site for filling of low lying areas. o Composted bio-degradable waste will be used as manure in greenbelt. Other recyclable wastes will be sold. o Excavated soil will be stockpiled in a corner of the site in bunded area to avoid run off with storm water. o General refuse generated on-site will be collected in waste skips and separated from construction waste. o Burning of refuse at construction sites will be prohibited.	**Will be Complied** o Will be appropriately planned during the development stage. There is no work carried out during the compliance period.

Project Annex Facility (PAF) Zone - Construction Phase *Construction work was carried out in a limited way during the compliance period in PAF Zone				
S. No.	**Activity**	**Relevant Environmental Components likely to be impacted**	**Proposed Mitigation Measures**	**Status as on 30.09.2024**
1	Material transport and construction activities	Air Quality/Dust	o To reduce impacts from exhausts, emission control norms will be enforced / adhered. o All the vehicles and construction machinery will be periodically checked to ensure compliance to the emission standards. o Construction equipment and transport vehicles will be periodically washed to remove accumulated dirt. o Providing adequately sized construction yard for storage of construction materials, equipment tools, earthmoving equipment, etc. o Provide enclosures on all sides of construction site o Movement of material will be mostly during non-peak hours. o On-site vehicle speeds will be controlled to reduce excessive dust suspension in air and dispersion by traffic o Water should be sprayed during the construction phase, at mixing sites, and temporary roads o In laying sub-base, water spraying is needed to aid compaction of the material. After the compaction, water spraying should be carried out at regular intervals to prevent dust.	**Complied** o Monthly Ambient Air Monitoring is being carried out and the parameters are within the stipulated limits. o It is ensured that all vehicles entering the area have a valid PUC certification. o Vehicles entering the site are following speed limit. o Tarpaulin cover is used for vehicles transporting construction material. o Environment awareness programs are provided to the personnel engaged in development work.

Project Annex Facility (PAF) Zone - Construction Phase *Construction work was carried out in a limited way during the compliance period in PAF Zone				
S. No.	**Activity**	**Relevant Environmental Components likely to be impacted**	**Proposed Mitigation Measures**	**Status as on 30.09.2024**
			o Vehicles delivering materials should be covered to reduce spills and dust blowing off the load. o Environmental awareness program will be provided to the personnel involved in developmental works. o Use of tarpaulin covers and speed regulations for vehicles engaged in transportation.	
		Noise	o Noise levels will be maintained below threshold levels stipulated by Central/Kerala State Pollution Control Board (CPCB)/KSPCB. o Procurement of machinery / construction equipment will be done in accordance with specifications conforming to source noise levels less than 75 dB (A). o Well-maintained construction equipment, which meets the regulatory standards for source noise levels, will be used o Any equipment emitting high noise, wherever possible, will be oriented so that the noise is directed away from sensitive receptors. o Noise attenuation will be practiced for noisy equipment by employing suitable techniques such as acoustic controls, insulation and vibration dampers. o High noise generating activities such as piling	**Complied** o Ambient Noise is being monitored fortnightly for Day & Nighttime and results are within the prescribed limits. o Construction equipment machinery procurement is done in accordance with specifications conforming to prescribed standards. o Personnel engaged in construction activity are provided with appropriate PPE's (Earplugs/muffs).

Project Annex Facility (PAF) Zone - Construction Phase *Construction work was carried out in a limited way during the compliance period in PAF Zone				
S. No.	**Activity**	**Relevant Environmental Components likely to be impacted**	**Proposed Mitigation Measures**	**Status as on 30.09.2024**
			and drilling will be scheduled at daytime (6.00 am to 10 pm) to minimise noise impacts. o Personnel exposed to noise levels beyond threshold limits will be provided with protective gear like earplugs, muffs, etc. o Ambient noise levels will be monitored at regular intervals	
2	Construction of Buildings, Roads, Parking features, etc.	Vegetation and Strain on existing infrastructure	o Most of the land is covered with coconut trees and few other trees. Trees that are cut down will be accounted for and the same no. of trees of the same or some other species will be replanted at another location to compensate for the loss of greenery. o There are very few existing buildings and infrastructure on the PAF zone area land which will be acquired and people in that area will be rehabilitated.	**Being Complied** o Due permission is taken for trees to be cut down because of the port development from the concerned department (Forest Department). o AVPPL, in collaboration with the Forest department, have carried out planting of 40,040 trees in two Phases in adequate land as identified by social Forest Department, for a total area of 29.65 Ha spending Rs. 254.50 Lakhs. This has sufficiently covered the requirement of compensatory afforestation required for the entire Master Plan development of Vizhinjam Port. o Land acquisition has been completed by following due process.

Project Annex Facility (PAF) Zone - Construction Phase *Construction work was carried out in a limited way during the compliance period in PAF Zone				
S. No.	**Activity**	**Relevant Environmental Components likely to be impacted**	**Proposed Mitigation Measures**	**Status as on 30.09.2024**
		Existing Traffic	o Transportation of construction materials will be carried out during non-peak hours. o Regularization of truck movement. o The existing roads shall be strengthened and shall be used for the construction material transportation.	**Being Complied** o Transportation of construction materials is being carried out considering the non-peak traffic timing and local restrictions during festivals, strikes, etc. o Traffic monitoring & regularization is being carried out for maximum efficiency. o Existing roads are being used for transportation of construction material.
		Solid Waste	o Construction waste will be used within port site for filling of low lying areas. o Composted bio-degradable waste will be used as manure in greenbelt. Other recyclable wastes will be sold. o Excavated soil will be stockpiled in a corner of the site in bunded area to avoid run off with storm water. o General refuse generated on-site will be collected in waste skips and separated from construction waste. o Burning of refuse at construction sites will be prohibited.	**Being Complied** o Construction waste is used within port site for filling of low-lying areas in line to C&D Waste Management Rules 2016, as amended. o No burning of refuse at construction sites is being done. o The dry waste is being properly collected, segregated, and disposed of in line with the Solid Waste Management Rules 2016, as amended. o Bio-degradable waste is being treated in an Organic Waste Converter (OWC) installed at site and the output is being used as manure in greenbelt development within the port project areas.

BACK UP AREA – Construction Phase Construction of buildings is ongoing in reclaimed area during the compliance period				
S. No.	**Activity**	**Relevant Environmental Components likely to be impacted**	**Proposed Mitigation Measures**	**Status as on 30.09.2024**
1	Material transport and construction activities	Air Quality	o To reduce impacts from exhausts, emission control norms will be enforced / adhered. o All the vehicles and construction machinery will be periodically checked to ensure compliance to the emission standards o Construction equipment and transport vehicles will be periodically washed to remove accumulated dirt o Providing adequately sized construction yard for storage of construction materials, equipment tools, earthmoving equipment, etc. o Provide enclosures on all sides of construction site o Movement of material will be mostly during non-peak hours. o On-site vehicle speeds will be controlled to reduce excessive dust suspension in air and dispersion by traffic o Water sprinkling will be carried out to suppress fugitive dust o Environmental awareness program will be provided to the personnel involved in developmental works o Use of tarpaulin covers and speed regulations for vehicles engaged in transportation	**Being Complied** o Ambient air quality monitoring is carried out at 5 locations (including one location at port site) as per the Environment Monitoring Plan prescribed in EIA. The results obtained are within the limits prescribed by NAAQS. o It is ensured that all vehicles entering the port have PUCs. o Water sprinkling is being carried out at regular intervals over the temporary road during transportation of materials. o All the trucks transporting material are covered by tarpaulin cover. o Signage's for speed control are placed within the port area. o Adequate storage for construction material is provided within the port area on reclaimed land. o Environmental awareness programs are regularly carried out for contractors working at site. o AVPPL have engaged a dust sweeper sprinkling system for dust suppression along the roads and on the storage yard.

BACK UP AREA – Construction Phase Construction of buildings is ongoing in reclaimed area during the compliance period				
S. No.	**Activity**	**Relevant Environmental Components likely to be impacted**	**Proposed Mitigation Measures**	**Status as on 30.09.2024**
		Noise	o Noise levels will be maintained below threshold levels stipulated by Central/Kerala State Pollution Control Board (CPCB)/KSPCB o Procurement of machinery/construction equipment will be done in accordance with specifications conforming to source noise levels less than 75 dB (A) o Well-maintained construction equipment, which meets the regulatory standards for source noise levels, will be used o Any equipment emitting high noise, wherever possible, will be oriented so that the noise is directed away from sensitive receptors o Noise attenuation will be practiced for noisy equipment by employing suitable techniques such as acoustic controls, insulation and vibration dampers o High noise generating activities such as piling and drilling will be scheduled at daytime (6.00 am to 10 pm) to minimise noise impacts o Personnel exposed to noise levels beyond threshold limits will be provided with protective gear like earplugs, muffs, etc. o Ambient noise levels will be monitored at regular intervals	**Being Compiled** o All the machinery and vehicles are maintained to keep the noise at minimum. o Regular Ambient Noise monitoring is being carried out as per the Environmental Monitoring Plan prescribed in EIA since August 2016, and the readings are within the limits at port site. o Personnel exposed to noise levels beyond threshold limits are provided with protective gear.

BACK UP AREA – Construction Phase Construction of buildings is ongoing in reclaimed area during the compliance period				
S. No.	**Activity**	**Relevant Environmental Components likely to be impacted**	**Proposed Mitigation Measures**	**Status as on 30.09.2024**
2	Construction Activities	Water Environment	o Formation level should be raised according to the design and the cross drainage structures suitably planned for the flood events. o All justifiable measures will be taken to prevent the wastewater produced during construction from entering directly into the water bodies.	**Being Compiled** o During the construction, care was taken such that the formation level is as per suitable design and the cross-drainage structures are also being implemented. o No wastewater is disposed into the water bodies.
		Land Environment	o On slopes and other suitable places along the two proposed corridors, trees and grass should be planted. o On sections with filling and deep cutting their slopes should be covered by sod, or planted with grass, etc. o If existing irrigation and drainage system, ponds are damaged, they will be suitably repaired. o Retaining walls and gabions shall be suitably provided.	**Being Complied** o Plantation of saplings along the port boundary is being carried out as a part of the master plan development/greenbelt development plan. o Retaining walls or gabions are suitably provided.
			o Arable land should not be used for topsoil borrowing. o Topsoil will be kept and reused after excavation is over. o Any surplus to be used on productive agricultural land.	**Being Complied** o Topsoil is not being used for borrowing. o If any topsoil needs to be excavated, the same will be stored in a designated area and will be utilized for greenbelt development as per the greenbelt development plan.
			o Construction vehicles should operate within the	**Being Complied**

BACK UP AREA – Construction Phase Construction of buildings is ongoing in reclaimed area during the compliance period				
S. No.	**Activity**	**Relevant Environmental Components likely to be impacted**	**Proposed Mitigation Measures**	**Status as on 30.09.2024**
			Backup Areas avoiding damage to soil and vegetation.	o Construction vehicles are being operated only alongside the road and port boundaries; thereby avoiding damage to soil and vegetation.
			o Areas of trees cleared will be replaced according to Compensatory Afforestation Policy under the Forest Conservation Act - 1980. o Landscaping shall be done at major junctions.	Refer point No.15 of Environment Management Plan – Road/Rail Corridors
			o Tree clearing within the backup areas should be avoided beyond that which is directly required for construction activities and/or to reduce accidents.	**Being Complied** o Tree clearing is done only for the purpose of development of port and/or for avoiding causalities due to natural calamities where the trees were standing very dangerously.

Annexure VIII

Solid Waste Management Report

(April 2024 to September 2024)

HALF YEARLY REPORT
Solid Waste Management at Vizhinjam Port

April 2024 - September 2024

Client: Adani Vizhinjam Port Pvt. Ltd.
01, Port Operation Building, Vizhinjam Seaport, Mulloor P.O., Vizhinjam,
Thiruvananthapuram - 695521, Kerala, India

Contractor: Qrex Bio Solutions Pvt. Ltd.
Door No.26/391(11), Sathabdhi Smaraka Building, Municipal Market,
Market Road, Attingal, Thiruvananthapuram - 695 101, Kerala

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1 Introduction

Qrex Bio Solutions Pvt. Ltd, a reputable company in the field of waste management, has been actively engaged in various initiatives aimed at promoting sustainable environmental practices. With a proven track record spanning 23 years, we have consistently played a central role in the conception, development, and execution of impactful waste management projects across diverse sectors.

Our commitment to excellence and innovation has been demonstrated through our involvement in municipal, industrial, and commercial waste management projects. The versatility and expertise of Qrex Bio Solutions Pvt. Ltd have been showcased through the successful implementation of effective waste management strategies. Notably, our organization introduced innovative composting techniques to the Attingal Municipality, resulting in a substantial reduction of 4500 tons of organic waste sent to landfills annually.

At Qrex Bio Solutions Pvt. Ltd, we pride ourselves on utilizing cutting-edge technologies such as windrow composting, vermin composting, bio methanation, and black soldier fly methods. These advanced techniques are instrumental in contributing to a cleaner environment and promoting a more responsible approach to waste management.

We express our sincere gratitude for the trust placed in us by Adani Vizhinjam Port Pvt.Ltd. (AVPPL) as reflected in the service order (Order no 5702011963, Date 11.07.2023). With this opportunity, we are committed to ensuring that all solid waste management processes are executed effectively and with the utmost dedication.

2 Scope of Work

This project of waste management at Vizhinjam Seaport aims to achieve Zero Waste to Landfill through end-to-end solutions in coordination with environment department of AVPPL. Qrex has been made responsible for handling solid waste management activities from Collection, Segregation, Transportation, Treatment till final disposal of all the various types of organic and inorganic domestic solid waste being generated at Vizhinjam port and managing with 5R principles of waste management (Reduce- Reprocess- Reuse-Recycle & Recover), aligned with all govt. rules & regulations.

2.1 Responsibility

- Waste collection & transportation from various locations in the Vizhinjam port site and specified AVPPL locations within a radius of 2 km outside the project site.
- Waste from AVPPL locations not within the port are processed separately outside of the port site.
- Sorting and segregation and management of segregated waste.
- Ensuring collected waste undergoes proper disposal procedures through approved and authorized channels and submits the required documentation to uphold environmental standards and regulatory compliance.
- Recycle/disposal certificates/receipts from Pollution Control Board (PCB) approved/authorized agencies provided to AVPPL.

3 Activity Overview

This comprehensive waste management process involves the systematic collection, handling, and disposal of various types of waste generated by vessels, construction and operations, and related activities. The primary objective is to mitigate the environmental impact of maritime and land ward side operations while complying with international regulations and standards to create a cleaner and more sustainable environment within the port premises and beyond. Our company focused on prioritizing environmental cleanliness and implemented various activities to achieve this goal.

April 2024 – September 2024 activities are described as follows.

3.1 Daily Activities

A significant aspect of the activities involves the daily collection of waste from strategically placed bins throughout the port premises. During this period, we maintained rigorous collection schedule, ensuring that waste was properly sorted and segregated according to designated categories for efficient disposal. Our team meticulously gathered waste from these bins daily apart from Sundays (Weekly off), thereby promoting an organized waste management system. Our daily activities are detailed in the following sections.

3.1.1 Bin Monitoring

Our team employs a proactive approach by closely monitoring the waste bins .Through regular checks, we ensure that waste bins are not allowed to overflow, preventing litter accumulation and potential hazards.

Table 1: Waste Bin Details

S. No.	Waste Bin Locations	Waste Bin	Qty (Set of 2: Dry & Wet)
1	GIS Building, Mukkola	Bin 1	1
2	Police Aid Post	Bin 2	1
3	Substation	Bin 3	1
4	Main Gate	Bin 4	1
5	Security Building	Bin 5	1
6	CSR Canteen	Bin 6	1
7	Dredging Canteen	Bin 7	1
8	POB Inside	Bin 8	1
9	POB Outside	Bin 9	1
10	Workshop Building	Bin 10	1
11	Outside Workshop Building	Bin 11	1
12	RMU Building	Bin 12	1
13	Fire Station	Bin 13	1
14	Berth	Bin 14	1
TOTAL			**14**

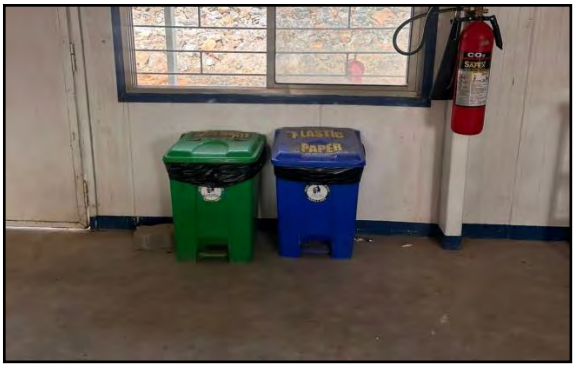
Bin 1

Bin 2

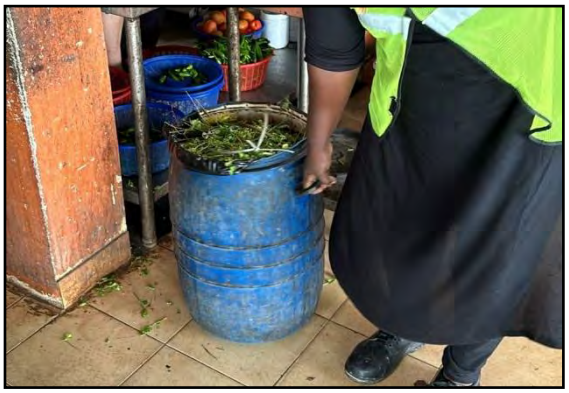
Bin 3

Bin 4

Bin 5



Bin 6



Bin 7

Bin 8

Bin 9

Bin 10

Bin 11

Bin 12

Bin 13

Bin 14

Figure 1: Strategically Placed Waste Bins in the Port

3.1.2 Collection of waste from bins

Waste Collection:

Our team diligently collects waste from the designated bins placed throughout the port premises on a daily basis. Our waste collection team adheres to a predetermined schedule. Every morning our team initiates a comprehensive waste collection effort within the port premises. Our trained personnel follow waste handling protocols, employing appropriate safety equipment and techniques to collect waste efficiently.

Figure 2: Collection of waste from strategically placed bins

3.1.3 Weighing and Segregation of Collected Waste

Weighing:

Each day, our team ensures that the accumulated waste undergoes a systematic weighing process and is documented in daily and monthly reports.

Segregation:

Waste is segregated at the point of collection to separate different types of waste, such as general waste, recyclables, and more. This initial sorting streamlines the recycling process.

Figure 3: Waste Segregation

Transport to Processing Centre:

Collected waste is transported to a centralized processing centre equipped to handle different waste types. This reduces transportation-related emissions and facilitates efficient waste management.

Figure 4: Transportation of Waste

Sorting Facility:

At the processing centre, waste undergoes further sorting to categorize materials accurately. Automated and manual sorting processes are employed to separate recyclable materials from non-recyclables.

3.1.4 Emergency Response

Our waste collection team remains prepared to address urgent waste disposal needs, responding promptly to unexpected situations or spills that require immediate attention.

3.2 Waste Audit and Reporting

We conduct regular waste audits to assess our waste management processes and generate detailed reports for analysis.

3.2.1 Month wise waste collection report April 2024 - September2024

Waste collection details are provided in the tables below:

Table 2: Waste Collection Details April 2024

Date	Food	Plastic	Paper	Card Board	Thermocol	Glass
	Quantity in kg					
01.04.24	147.2	15.9	24.7	2.2	0.2	-
02.04.24	137.0	16.2	19.9	3.2	0.5	2.4
03.04.24	141.3	16.1	23.1	1.7	-	0.2
04.04.24	151.7	16.3	22.6	4.1	0.8	1.7
05.04.24	137.2	17.7	19.4	1.1	-	-
06.04.24	123.1	12.4	15.6	2.5	-	0.3
07.04.24	Sunday(Weekly Off)					
08.04.24	152.4	17.8	21.8	2.3	0.4	-
09.04.24	148.0	17.4	23.2	4.4	0.4	1.3
10.04.24	139.9	17.0	17.0	3.1	0.1	-
11.04.24	152.8	18.2	20.0	21.3	1.6	2.0
12.04.24	138.5	18.8	22.5	26.5	2.1	-
13.04.24	129.4	15.7	15.8	2.5	-	0.7
14.04.24	Sunday(Weekly Off)					
15.04.24	156.6	20.7	27.9	4.1	1.4	-
16.04.24	155.8	20.9	21.6	5.0	0.4	2.0
17.04.24	146.7	17.6	15.7	3.8	0.1	-
18.04.24	153.9	19.3	19.6	1.6	-	-
19.04.24	144.1	20.9	20.4	7.0	0.6	0.8
20.04.24	107.2	14.2	14.9	2.2	0.2	-
21.04.24	Sunday(Weekly Off)					
22.04.24	153.9	22.3	24.1	3.9	0.7	-
23.04.24	190.2	17.6	19.5	3.9	-	1.8
24.04.24	146.9	15.7	21.6	9.6	1.1	1.2
25.04.24	152.4	17.4	19.6	3.1	0.2	0.6
26.04.24	145.3	20.2	21.5	1.9	-	0.6
27.04.24	73.3	10	9.2	2.1	-	-
28.04.24	Sunday(Weekly Off)					
29.04.24	167.5	21.8	26.6	4.3	1.0	1.7
30.04.24	152.1	19.7	19.9	7.4	0.3	0.4
Total	**3744.4**	**457.8**	**527.7**	**134.8**	**12.1**	**17.7**

Table 3: Waste Collection Details May2024

Date	Food	Plastic	Paper	Metal Scrap	Card Board	Thermocol	Tin
	Quantity in kg						
01.05.24	139.0	16.4	25.1	1.4	0.7	-	1.2
02.05.24	82.3	11.9	17.0	3.8	0.7	-	1.2
03.05.24	185.3	19.6	22.7	4.7	1.2	1.9	-
04.05.24	140.4	14.5	18.8	2.3	-	1.3	-
05.05.24	Sunday (Weekly Off)						
06.05.24	163.8	22.7	29.2	1.1	1.1	-	1.2
07.05.24	143.0	15.4	23.4	2.7	0.6	1.6	2.3
08.05.24	131.8	16.7	21.2	4.6	-	0.2	-
09.05.24	144.0	14.4	20.8	1.4	2.0	0.7	1.2
10.05.24	132.1	14.8	19.2	2.2	3.5	-	-
11.05.24	124.2	13.3	15.1	1.2	-	-	1.2
12.05.24	Sunday (Weekly Off)						
13.05.24	143.0	21.5	22.2	0.7	1.7	0.1	1.6
14.05.24	142.1	18.2	20.7	2.1	1.0	-	1.2
15.05.24	142.7	19.2	18.5	1.4	1.5	1.9	1.2
16.05.24	144.4	16.3	21.7	0.8	1.4	-	1.2
17.05.24	145.2	15.5	20.1	1.3	0.9	-	-
18.05.24	129.8	14.1	18.3	1.6	2.3	0.2	1.6
19.05.24	Sunday (Weekly Off)						
20.05.24	137.7	19.2	24.6	2.3	0.9	-	-
21.05.24	143.9	18.0	20.4	1.5	2.8	1.4	1.2
22.05.24	139.7	18.6	22.6	0.9	0	-	-
23.05.24	149.6	17.1	22.6	1.3	1.7	-	1.2
24.05.24	141.4	17.5	21.2	-	1.6	1.3	-
25.05.24	133.0	14.2	19.0	-	0.9	-	1.2
26.05.24	Sunday (Weekly Off)						
27.05.24	148.4	20.0	23.1	2.2	2.6	-	-
28.05.24	146.5	17.5	20.5	-	4.6	1.1	1.2
29.05.24	152.2	20.0	19.7	1.6	0.9	-	-
30.05.24	144.5	17.3	19.4	-	1.7	2.8	1.6
31.05.24	143.6	16.0	20.7	-	1.2	2.3	-
Total	**3813.6**	**459.9**	**567.8**	**43.1**	**37.5**	**16.8**	**21.5**

Table 4: Waste Collection Details June 2024

Date	Food	Plastic	Paper	Metal Scrap	Card Board	Thermocol	Tin	Wood
	Quantity in kg							
01.06.24	143.9	14.7	23.6	0.4	10	0.2	0.6	-
02.06.24	Sunday (Weekly Off)							
03.06.24	151.4	22.1	29.7	0.2	3.7	0.7	-	17
04.06.24	171.7	17	26.8	-	0.6	-	-	-
05.06.24	156.7	18.2	23	-	5.7	1.2	0.4	0.6
06.06.24	150.6	18.8	28	0.4	3.1	0.6	-	-
07.06.24	147.1	18.7	28.8	-	2.2	-	0.4	-
08.06.24	131.1	13.7	17.9	-	1.7	-	-	-
09.06.24	Sunday (Weekly Off)							
10.06.24	171.5	23.1	29.2	0.2	3.9	0.8	-	-
11.06.24	146.8	18	22.7	-	4	1.1	0.6	-
12.06.24	143.7	18.7	22	0.2	3	0.4	-	46.7
13.06.24	157	16.9	19	-	5.3	0.9	-	-
14.06.24	124.9	17.6	22.1	-	1.9	-	0.2	-
15.06.24	120.2	12.4	18.7	0.8	-	0.6	-	-
16.06.24	Sunday (Weekly Off)							
17.06.24	154.9	22	29.9	-	1.4	-	-	
18.06.24	134.1	19	24.1	0.2	3.2	-	0.2	13.2
19.06.24	152.5	17	22.5	-	2.5	1	-	32.7
20.06.24	145.6	20.1	23.4	0.6	3.7	-	0.2	-
21.06.24	147.4	20	20.9	-	8.5	0.4	-	-
22.06.24	134.5	14.3	18.8	-	7.5	-	-	-
23.06.24	Sunday (Weekly Off)							
24.06.24	174.4	23	27.3	-	3.5	0.3	0.2	-
25.06.24	141.9	19.8	23.5	0.2	15.4	0.3	-	27.7
26.06.24	156.4	17.9	21.5	-	0.7	-	0.4	-
27.06.24	146.3	20	22.1	-	6.7	1.2	-	-
28.06.24	143.6	18.8	24.7	-	7.4	0.1	0.2	9.4
29.06.24	131.6	17.1	22.9	0.4	7.1	0.8	0.8	6.8
30.06.24	Sunday (Weekly Off)							
Total	**3679.8**	**458.9**	**593.1**	**3.6**	**112.7**	**10.6**	**4.2**	**154.1**

Table 5: Waste Collection Details July 2024

Date	Food	Plastic	Paper	Card Board	Thermocol	Tin	Wood
	Quantity in kg						
01.07.24	125.2	16.4	23.0	11.5	1.0	0.2	-
02.07.24	146.6	17.8	23.6	5.5	-	0.2	-
03.07.24	146.1	25.6	20.4	6.2	1.4	-	-
04.07.24	146.9	23.1	25.4	5.2	-	-	-
05.07.24	133.8	18.8	21.9	24.2	0.8	0.8	-
06.07.24	120.6	13.0	20.2	20.0	-	-	-
07.07.24	Sunday (Weekly Off)						
08.07.24	155.6	24.8	31.5	14.4	1.2	-	-
09.07.24	153.0	19.2	24.9	7.7	0.4	-	-
10.07.24	164.6	19.7	24.0	13.9	-	0.8	1.7
11.07.24	225.5	30.6	28.0	11.2	-	-	-
12.07.24	236.2	26.1	25.9	11.4	-	-	-
13.07.24	227.8	17.5	24.2	15.9	-	0.2	-
14.07.24	Sunday (Weekly Off)						
15.07.24	172.4	29.3	29.4	25.9	-	0.6	-
16.07.24	150.3	26.9	23.7	14.0	-	-	-
17.07.24	152.2	23.2	24.0	4.0	-	0.2	-
18.07.24	148.6	18.7	22.9	18.4	1.0	-	-
19.07.24	151.6	18.2	22.6	6.0	1.6	-	-
20.07.24	128.0	15.9	17.5	13.0	-	-	-
21.07.24	Sunday (Weekly Off)						
22.07.24	159.4	24.7	26.8	20.0	-	-	-
23.07.24	145.9	22.0	22.8	17.4	1.2	0.4	-
24.07.24	149.3	20.3	23.3	11.3	-	-	0.9
25.07.24	144.5	26.9	20.6	17.4	0.6	-	-
26.07.24	153.9	16.8	20.1	5.3	-	0.8	-
27.07.24	147.9	16.1	16.5	5.7	-	-	-
28.07.24	Sunday (Weekly Off)						
29.07.24	167.7	23.0	25.8	31.1	-	0.2	-
30.07.24	158.4	17.4	21.1	11.9	-	-	-
31.07.24	147.6	18.4	23.1	17.2	0.6	0.4	-
Total	**4259.6**	**570.4**	**633.2**	**365.7**	**9.8**	**4.8**	**2.6**

Table 6: Waste Collection Details August 2024

Date	Food	Plastic	Paper	Card Board	Thermocol	Tin
	Quantity in kg					
01-08-2024	198.1	17.7	22.0	3.2	-	0.2
02-08-2024	165.5	16.7	21.4	1.3	-	0.2
03-08-2024	145.1	14.0	19.0	1.9	1.4	-
04-08-2024	Sunday(Weekly off)					
05-08-2024	197.8	28.2	30.0	1.3	0.2	0.4
06-08-2024	152.9	22.8	18.1	0.8	-	0.2
07-08-2024	150.3	21.1	21.5	1.4	-	0.2
08-08-2024	156.6	21.2	19.0	3.1	-	-
09-08-2024	149.0	20.4	22.1	1.4	0.1	0.6
10-08-2024	125.7	14.7	13.5	1.4	-	-
11-08-2024	Sunday(Weekly off)					
12-08-2024	174.4	24.0	31.8	0.3	-	0.2
13-08-2024	147.3	22.4	24.3	8.2	-	-
14-08-2024	147.2	17.9	18.3	1.4	0.6	0.2
15-08-2024	148.9	19.5	28.9	1.2	-	-
16-08-2024	83.7	20.2	23.6	3.0	-	-
17-08-2024	149.7	13.4	18.1	1.9	-	-
18-08-2024	Sunday(Weekly off)					
19-08-2024	156.3	29.2	27.7	0.2	-	-
20-08-2024	148.7	22.5	21.5	7.5	-	0.2
21-08-2024	155.8	19.1	22.0	1.8	-	-
22-08-2024	151.6	19.7	24.2	0.3	-	0.4
23-08-2024	148.4	20.7	23.6	5.4	-	0.2
24-08-2024	289.3	17.7	16.6	2.9	-	-
25-08-2024	Sunday(Weekly off)					
26-08-2024	150.7	28.5	29.2	0.4	0.2	-
27-08-2024	77.7	26.0	25.5	9.6	-	0.2
28-08-2024	151.6	18.3	20.1	5.0	-	-
29-08-2024	156.6	25.7	29.0	0.7	-	0.4
30-08-2024	143.1	25.0	25.5	1.5	0.2	-
31-08-2024	149.8	22.4	21.0	11.2	-	0.4
Total	**4171.8**	**569.0**	**617.5**	**78.3**	**2.7**	**4.0**

Table 7: Waste Collection Details September 2024

Date	Food	Plastic	Paper	Card Board	Thermocol
	Quantity in kg				
01-09-2024	Sunday (Weekly off)				
02-09-2024	252.2	21.7	20.4	3.5	-
03-09-2024	171.8	19.7	25.6	1.2	-
04-09-2024	161.5	20.4	23.0	2.2	0.2
05-09-2024	164.1	21.4	20.9	1.5	-
06-09-2024	157.1	20.0	21.9	0.8	-
07-09-2024	162.2	16.9	18.0	0.4	-
08-09-2024	Sunday (Weekly off)				
09-09-2024	190.1	28.4	29.9	1.2	-
10-09-2024	184.8	21.0	25.1	2.2	-
11-09-2024	183.2	19.3	19.1	0.5	-
12-09-2024	156.4	21.6	21.5	1.2	-
13-09-2024	167.3	18.5	18.9	3.4	0.4
14-09-2024	173.2	17.0	18.7	0.3	-
15-09-2024	Sunday (Weekly off)				
16-09-2024	Onam Holiday				
17-09-2024	168.3	28.0	29.7	2.6	-
18-09-2024	211.6	21.6	24.0	0.9	-
19-09-2024	157.8	23.5	17.8	2.7	0.1
20-09-2024	182.8	21.0	24.8	0.7	-
21-09-2024	161.8	17.3	16.9	0.9	-
22-09-2024	Sunday (Weekly off)				
23-09-2024	236.3	29.8	29.7	0.7	-
24-09-2024	184.2	21.6	21.0	2.3	-
25-09-2024	177.9	22.7	21.2	1.8	-
26-09-2024	184.6	24.0	19.3	1.1	-
27-09-2024	200.4	24.7	20.1	1.2	0.1
28-09-2024	166.7	21.7	17.5	1.6	-
29-09-2024	Sunday (Weekly off)				
30-09-2024	258.8	27.4	28.8	4.0	-
Total	**4415.1**	**529.2**	**533.8**	**38.9**	**0.8**

3.2.2 Total waste collection report April 2024 -September 2024

Item wise collection report April 2024 - September 2024 is given below:

Table 8: Total waste collection report April 2024 -September2024

Month	Food	Plastic	Paper	Metal Scrap	Card Board	Thermocol	Wood	Tin	Glass
	Quantity in kg								
April 2024	3744.4	457.8	527.7	-	134.8	12.1	-	-	17.7
May 2024	3813.6	459.9	567.8	43.1	37.5	16.8	-	21.5	-
June 2024	3679.8	458.9	593.1	3.6	112.7	10.6	154.1	4.2	-
July 2024	4259.6	570.4	633.2	-	365.7	9.8	2.6	4.8	-
August 2024	4171.8	569.0	617.5	-	78.3	2.7	-	4.0	-
September 2024	4415.1	529.2	533.8	-	38.9	0.8	-	-	-
Total	**24084.3**	**3045.2**	**3473.1**	**46.7**	**767.9**	**52.8**	**156.7**	**34.5**	**17.7**

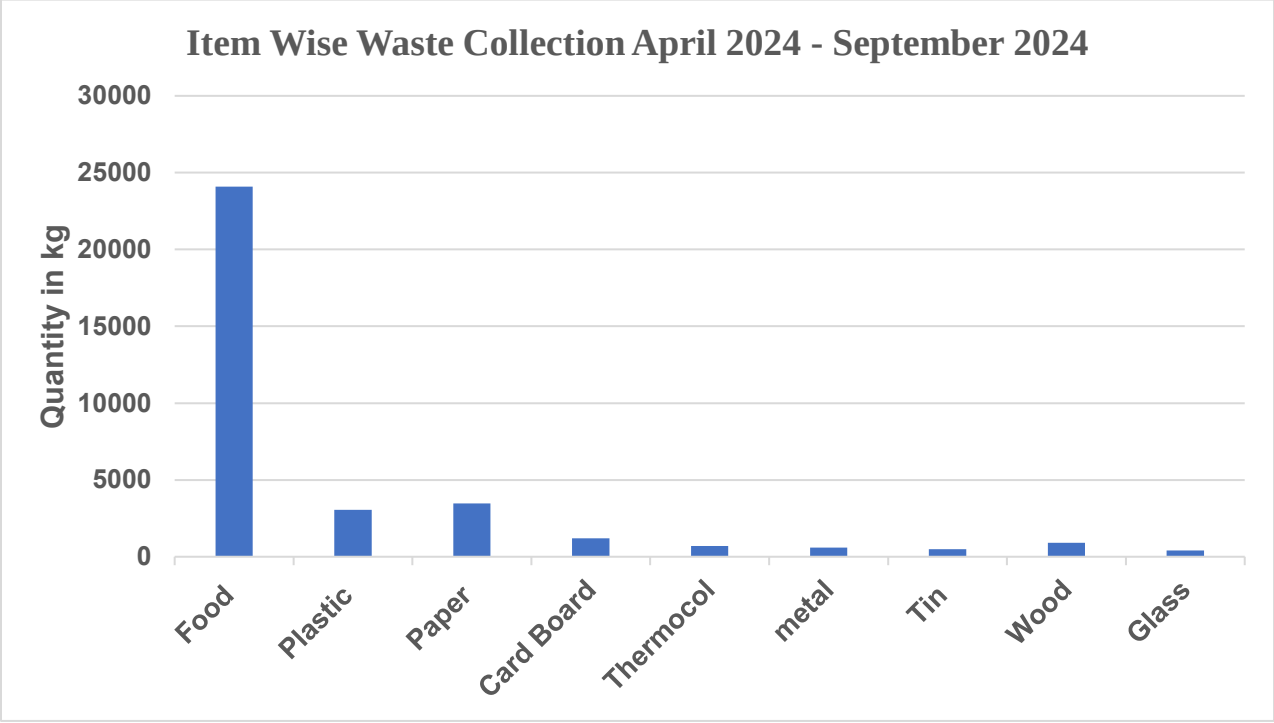


Figure 5: Item Wise Waste Collection April 2024 - September 2024

3.2.3 Total bin wise collection (dry and wet) April 2024 – September 2024

Total bin wise collection (dry and wet) April 2024 -September 2024 is given below:

Table 9: Bin Wise Collection Details (Wet Waste) April 2024 -September 2024

S. No.	BIN	WET WASTE (Quantity in kg)						
		Apr-24	May-24	Jun-24	Jul-24	Aug-24	Sep-24	Total
1	BIN 1	30.7	30.2	36.8	30.3	40.8	32.0	190.0
2	BIN 2	326.1	398.2	382.2	438.7	155.8	334.6	1761.1
3	BIN 3	56.9	43.1	50.9	49.8	46.9	41.6	268.3
4	BIN 4	427.8	423.2	433.7	398.3	526.8	447.7	2362.4
5	BIN 5	61.7	69.6	67.4	75.0	73.1	67.1	376.7
6	BIN 6	464.5	414.6	428.7	425.2	444.6	504.7	2395.8
7	BIN 7	557.0	550.8	381.8	363.9	430.4	395.4	2289.9
8	BIN 8	1662.4	781.1	933.2	1190.0	895.5	1355.8	6300.5
9	BIN 9	53.7	935.6	806.0	1123.0	1181.7	823.0	4125.1
10	BIN 10	65.1	53.3	56.1	60.5	55.3	48.7	346.5
11	BIN 11	38.5	76.8	65.4	75.6	72.4	61.4	356.5
12	BIN 12	-	37.3	37.6	29.3	81.8	108.9	283.6
13	BIN 13	-	-	-	-	78.7	101.2	179.9
14	BIN 14	-	-	-	-	88.0	93.0	181.0
TOTAL		**3744.4**	**3813.6**	**3679.8**	**4259.6**	**4171.8**	**4415.1**	**24084.3**

Note: Wet Waste (Food Waste)

Table 10: Bin Wise Collection Details (Dry Waste) April 2024 -September 2024

S. No.	BIN	DRY WASTE (Quantity in kg)						
		Apr-24	May-24	Jun-24	Jul-24	Aug-24	Sep-24	Total
1	BIN 1	19.4	19.4	20.0	26.3	23.7	16.7	136.3
2	BIN 2	119.3	123.7	138.1	151.8	76.2	100.4	983.8
3	BIN 3	24.3	22.2	28.7	60.4	30.4	19.5	206.4
4	BIN 4	165.6	128.1	144.5	153.8	139.3	123.7	1150.1
5	BIN 5	40.5	32.4	36.7	67.1	38.0	31.4	283.3
6	BIN 6	145.5	128.1	144.5	164.9	151.3	140.1	1160.9
7	BIN 7	152.4	161.4	137.5	227.8	151.9	143.6	1364.0
8	BIN 8	377.6	263.6	169.8	272.3	224.0	139.7	1964.5
9	BIN 9	45.4	137.7	338.1	190.2	141.9	132.7	1783.9
10	BIN 10	41.8	60.8	92.9	126.1	43.8	48.8	406.7
11	BIN 11	18.3	43.2	58.1	84.9	45.5	51.9	335.5
12	BIN 12	-	26.0	28.3	60.9	72.4	101.2	300.1
13	BIN 13	-	-	-	-	58.1	35.5	93.6
14	BIN 14	-	-	-	-	75.0	17.5	92.5
TOTAL		**1150.1**	**1146.6**	**1337.2**	**1586.5**	**1271.5**	**1102.7**	**7594.6**

Note: Dry Waste (Plastic+ Paper+ Cardboard)

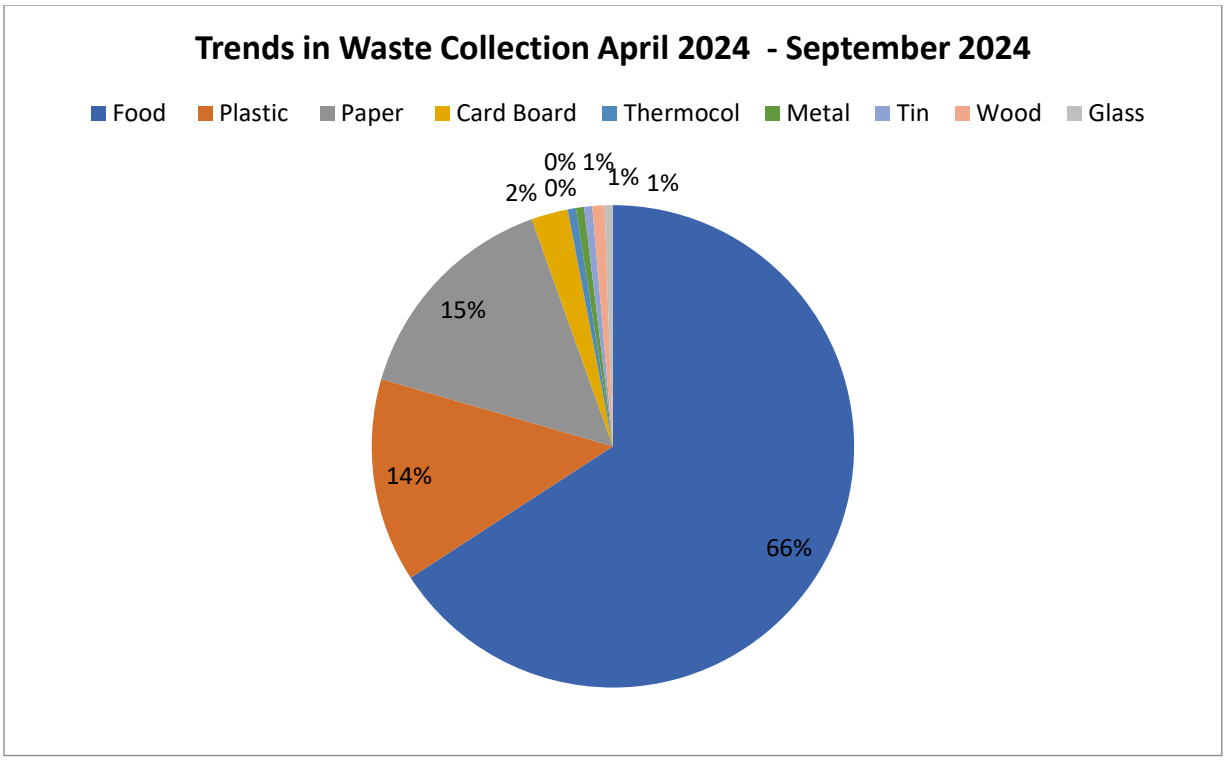


Figure 6: Trends in Waste collection April 2024 - September 2024

Note:
Others (Metal Scrap, Wood, Tin, Glass)

Figure 7: Month wise waste collection April 2024 – September 2024

3.3 Other Activities

During the period from April 2024 to September 2024, our activities at the Adani Vizhinjam Port were marked by a good approach to environmental conservation and community engagement. The schedule was aimed at the port's cleanliness and promoting environmental awareness.
The activities are described as follows.

3.3.1 Drainage Cleaning Near Karimpallikara

Our commitment to maintaining a pollution-free environment extends to regular drainage cleaning activities. We encountered a drainage blockage issue resulting from the accumulation of plastic waste from the nearby local community at Karimpllikara. Our response and proactive approach ensured the swift removal of the blockage, allowing for unimpeded water flow and preventing potential health hazards.

Figure 8: Drainage Cleaning near Karimpallikara

During the cleaning process, trained personnel equipped with the necessary tools and equipment diligently remove debris, silt, and other potential obstructions from the drainage channels. By doing so, the flow of water was restored, minimizing the chances of flooding during heavy rainfall and reducing the likelihood of waterborne illnesses.

3.3.2 Port Environment Cleaning

Maintaining a pristine port environment is integral to our commitment to maritime sustainability. Our port environment cleaning program encompasses a range of practices designed to uphold the integrity of marine ecosystems, ensure operational excellence, and promote a safe and attractive port facility for all stakeholders. Our daily activities include street cleaning, drain cleaning, and the identification and mitigation of unauthorized disposal sites.

Figure 9: Daily Port Environment Cleaning Activities

Our cleaning teams conduct daily rounds to remove litter, debris, and waste from designated areas within the port. This routine prevents accumulation, enhances visual appeal, and minimizes the risk of pollution.

3.3.3 Inaugural Mothership Docking Function

On July 12, the inaugural Mothership Docking Function at AVPPL was a success. We carefully managed the event's waste, collecting 49.4 kg of plastic, 52.2 kg of cardboard, 29.0 kg of waste paper, and 17.8 kg of other waste. Each was recycled following proper guidelines.

Table 11: Inaugural Mothership Docking Function - Collected Waste

Plastic	Card Board	Waste Paper	Other Waste
Quantity in kg			
49.4	52.2	29.0	17.8

Figure 10: Inaugural Mothership Docking Function Waste Collection

4 Waste Recycling and Decomposition

Waste Recycling and Decomposition activities are detailed in the following Sections.

4.1 Recycling and Treatment of Various Waste Types

Wet Waste:

Each day, we treat and compost 40 kg of wet waste using an Organic Waste Converter (OWC). This waste is carefully processed within the converter to facilitate rapid decomposition. The end result of process is a high-quality, nutrient-rich compost that serves as a valuable resource for agricultural initiatives, landscaping, and horticulture.

Figure 11: Composting Process using Organic Waste Converter

During this period, 24084.3 kg wet waste was collected and the OWC efficiently transformed the 5927.0 kg of wet waste into 1349.6 kg of high-quality organic manure. The remaining quantity of 9779.3 kg of wet waste is treated in Qrex's composting unit due to the limited capacity of the Vizhinjam Port OWC, which can process only around 40 kg per day. Currently manure is kept in the storage for handing over to Adani Foundation for use in the Farm School and Greenbelt/Landscape Development.

Figure 12: Manure Handover to Adani CSR Team for Agricultural/Farming Initiatives

Plastic:
Total of 3045.2 kg of plastic was collected. Embracing a responsible approach to recycling, we handed over 760 kg of recyclable plastic to scrap plastic buyers , ensuring these materials find new life in the production cycle, the remaining 2285.2 kg of plastic has been thoughtfully allocated to an authorized cement company for use in their process.

Paper:
3473.1 kg of paper has been collected and handed over to recyclers.

Cardboard:
767.9 kg of cardboard was collected from the port premises. Following the collection process, these recyclable materials are handed over to recycling unit.

Others:
During this period, we collected 46.7 kg of metal scrap, 52.8 kg of thermocol, 156.7 kg of wood, 34.5 kg of tin and 17.7 kg of glass. Following the collection process, these recyclable materials are handed over to recycling unit.

5 Machinery Details

We operate in coordination with a range of machinery, including an Organic Waste Converter (OWC), Collection Vehicle, Waste Collection Bins, and various tools that aid our operations.

Table 12: Machinery Details

S. No.	Item	Qty	Owned by
1	Organic Waste Converter (OWC)	1	AVPPL
2	Collection Vehicle	2	Qrex
3	Waste Collection Bins	28	Qrex
4	Sprayers, Hand Tools, etc..	-	Qrex

6 Employee Details

Our dedicated team, consisting of a Manager, Driver Cum Supervisor, Workers, and Drivers, actively contributes to the success of our waste management initiatives.

Table 13: Employee Details

S. No.	Designation	Number
1	Manager	1
2	Driver Cum Supervisor	1
3	Worker	4
4	Driver	2

7 Initiatives and Future Plans

Our initiatives and future plans in waste management exemplify our dedication to a more sustainable future. By implementing innovative practices, engaging the community, and fostering responsible waste management habits, we are working towards creating a greener, cleaner, and more resilient port environment.

1. Enhanced Waste Sorting and Segregation:

Invest in advanced waste sorting technologies to improve the efficiency of separating recyclables, organic waste and general waste at source.

2. Introduction of New Recycling Programs:

We are actively working on introducing new recycling programs to enhance waste management practices at Vizhinjam Port.

3. Zero-Waste Port:

Our ultimate goal is to transform the port into a zero-waste facility, where waste generation is minimized, and the majority of waste is recycled.

4. Environmental Audits:

Conduct regular environmental audits to assess the environmental impact of waste management operations and identify areas for improvement.

8 Conclusion

Collection of 3045.2 kg of plastic have implemented recycling, redirecting 760.0 kg of recyclable plastic to scrap buyers and allocating the remaining quantity to an authorized cement company. Similarly, the collection of 3473.1 kg of paper has been handed over to an authorized cement company. Additionally, the collection of 767.9 kg cardboard handed over to the authorized recycling unit. We collected 46.7 kg of metal scrap, 52.8 kg of thermocol, 156.7 kg of wood,34.5 kg of tin and 17.7 kg of glass. These recyclable materials are handed over to recycling unit. By employing advanced processes, we ensure these materials contribute to a circular economy.

Table 14: Waste Collection Summary April 2024 to September 2024

S.No.	Waste Category	Quantity (kg)
1	Dry Waste (Plastic,Paper,Cardboard, etc..)	7594.60
2	Wet Waste (Food Waste,Vegetable Peels,Fruits,Leftovers,,etc..)	24084.30
Total Quantity		**31678.90**

9 Annexure A

Annexure attached as Follows

Agreement 1

भारतीय गैर न्यायिक

एक सौ रुपये Rs. 100

रु. 100 ONE HUNDRED RUPEES

सत्यमेव जयते

भारत INDIA

INDIA NON JUDICIAL

കേരളം केरल KERALA DH 213223

Agreement for collection, transportation, segregation and disposal of non-recyclable wasteincludingmixednon-combustible,inertwasteasspecifiedintheSolidWasteManagementRules2016 for landfill sand combustible waste for furnace-based industries

Agreement from 01-01-2023 to 31-12-2025

This Agreement for collection, transportation, segregation and disposal of non-recyclable waste including mixed non-combustible, inert waste as specified in the Solid Waste Management Rules2016forlandfillsandcombustiblewasteforfurnace-basedindustries (hereinafter referred to as the "Agreement"),is made and entered into this 1st day of January 2023

By and between

For QREX BIO SOLUTIONS PRIVATE LIMITED

TRIVANDRUM

For TIFFOT PRIVATE LIMITED

KUNNUKARA P.O. EKM

12 MAY 2022

ForQrexbiosolutionsPrivateLtd

ForTiffotPrivateLtd

Qrex bio solutions Private Ltd, a Company operated in Kerala represented by Sri Mohankumar, Managing Director and having its registered office at **26/391(1) Sathabdhi Smaraka Building, Municipal Market, Market Road ,Attingal, Tiruvananthapuram , Kerala** (Hereinafter referred to as the "**First Party/Qrex**", which expression shall, unless repugnant to the context, mean and include its successors and assigns) of the One Part.

And

Tiffot Pvt Ltd, represented by Sri Rishad T N, Director having its Registered Office at **400/C, Ground Floor ,Kunnukara P O, Kunnukara, Ernakulam 683578**(Hereinafter referred to as the "**Tiffot** "which expression shall, unless repugnant to the context, mean and include its successors and assigns)of the Other Part.

ForQREX BIO SOLUTIONS PRIVATE LIMITED

TRIVANDRUM

For TIFFOT PRIVATE LIMITED

12 MAR 2024

ForQrexbiosolutionsPrivateLtd

ForTiffotPrivateLtd

2

Agreement 2

भारतीय गैर न्यायिक

एक सौ रुपये

Rs. 100

ONE HUNDRED RUPEES

रु. 100

भारत INDIA

INDIA NON JUDICIAL

കേരളം केरल KERALA

DV 500130

SERVICE AGREEMENT FOR CO-PROCESSING OF NON –HAZARDOUS SOLID WASTE

This Service Agreement for Co-Processing of MUNCIPAL SOLID WASTE , (hereinafter referred to as "Agreement") is made and executed at Chennai on this 10th Jan 2023

BY AND BETWEEN

TIFFOT PRIVATE LIMITED (CIN :U37100KL2021PTC068732), a Company registered under the provisions of Companies Act -2013 and having its Registered Office at 400/C KUNNUKARA P O KUNNUKARA ,COCHIN , represented by its authorized signatory Mr. RISHAD T N, (PAN: AAICT5856E) hereinafter referred to as "TIFFOT", (which expression shall, unless repugnant to the context or contrary to the meaning thereof be deemed to mean and include its successors-in-title and permitted assigns) of the First Part;

AND

CHETTINAD CEMENT CORPORATION PRIVATE LIMITED (CIN: U93090TN1962PTC004947), a Company incorporated under the provisions of the Companies Act-1956 (Since repealed and consolidated

Director

For Chettinad Cement Corporation Private Limited

Authorised Signatory

22 DEC 2022

18057 04.01.2023 100

Sold to TIFFOT PVT LTD

KUNNUKARA-

A. A. REVI

STAMP VENDOR ALANGAD

under the provisions of Companies Act-2013) and having its Registered Office at 4th Floor, Chettinad Towers, No.603, Anna Salai, Chennai, Tamil Nadu-600006 and Corporate office at Sigapi Achi Building, 18/3, Rukmani Lakshmipathy Road, Egmore, Chennai 600008, represented herein by its authorized signatory Mr.S.P.Meyyappan, (PAN :AAIPM5990K) hereinafter referred to as "CCCPL", (which expression shall unless it be repugnant to the context or contrary to the meaning thereof be deemed to mean and include its successors-in-title and permitted assigns)of the Second Part;

TIFFOT and CCCPL are hereinafter individually referred to as a **"Party"**, and collectively referred to as the **"Parties"**

WHEREAS:

A. The TIFFOT is a Private Limited company incorporated in India and is involved in the business Management of municipal solid waste and it is recognized by Muncipal Corporation. Tiffot is involved in the business of collection, transportation, segregation and disposal of municipal waste have entered in agreement with Clean Kerala company limited is in search for a destination for disposal of plastic waste, footwear & bags which is generated during the Segregation process of Municipal Solid Waste (All Districts in Kerala through Clean Kerala Company Limited) in a manner compliant with applicable regulatios

B. CCCPL is involved in the business of producing, grinding, manufacturing, finishing, packing, repacking, mixing, grading, supplying, wholesaling, retailing of ordinary portland cement and portland pozzolana cement under its brand name "CHETTINAD CEMENT" and has plants located the following places

1. Puliyur Works,
Kumara Rajah Muthiah Nagar,
Puliyur CF Post, Karur District- 639 114
Tamil Nadu

2. Karikkali Works,
Rani Meyyammai Nagar,Vedasandur Taluk,
Karikkali Post, Dindigul District 624 703
Tamil Nadu

3. Ariyalur Works
Trichy-Ariyalur Road, Keelpaluvur
Ariyalur 621 707
Tamilnadu

4. Kallur Works
Survey No.5, Sangem.K Village, Bhaktampalli (Post), Chandapur S.O,
Chincholi, Gulbarga -585 305
Karnataka

5. Dachepalli Works
Sy.No 184, 185 etc., of Pedagarlapadu (V),
Sy.No 642 & 643 of Kesanupalli (V),
Dachepalli (M), Guntur – 522 414
Andhra Pradesh

and are desirous to foster and advance environmentally safe production practices.

C. The Management of CCCPL, as a responsible corporate citizen is very much keen on carrying out

.

For Chettinad Cement Corporation Private Limited

Authorised Signatory

Annexure IX

EMP Expenditure

Annexure IX

S. No.	Environmental Management Plan	Commitment in EIA	Apr 2024 to Sep 2024	Total Till Date
		(In Rs. Crores)		
1	Cost of Contractors EMP for all planned EMP implementation measures (Action plan report)	1	-	1.07
2	Cost of Capacity building- Training and Institutional strengthening (Training workshop)	0.2	0.0238	0.0738
3	Compensatory afforestation for the green cover lost for the port and its associated facilities (2500 plants per Ha for 25 Ha area)	1.25	-	2.55
4	Air quality monitoring at sensitive locations	0.252	0.147	3.96
5	Water quality monitoring at major water bodies	0.054		
6	Noise monitoring at sensitive locations	0.009		
7	Soil quality monitoring at sensitive locations	0.002		
8	Marine water quality and sediment and marine biology	1.08		
9	Shoreline changes	0.3	0.27	18.05
10	Cost of Median planting with a suitable species of creepers and metallic wire mesh fencing along the road (2000 m long median planting)	0.83	-	0.972
11	Solid waste management (sector wise)- Collection disposal system	2.5	0.18	0.775
12	Storm Water Management	5	4	4.3
13	Marine Life Protection out of Oil Spill (Provision for scavenger boat) One tugboat with booms and skimmer and dust exhausting equipment	20	6	6
14	Cost of scavenger boat including manpower (Cost of boat)	0.2	-	0.03
15	Dust Sweeper (2 Nos.)	0.6	0.0166	0.0166
16	Air Pollution Control (Four water tankers for wetting of road surface and sprinkling system)	1	0.06	1.11
17	Water and wastewater treatment plants	4	1.66	1.685
18	Battery of toilets with bimonthly maintenance provision	1	0.14	0.67
19	Desilting and strengthening of Streams	0.5	-	0.6
20	Enhancement of water bodies (ponds along road & rail)	0.1	0.24	0.49
21	Enhancement of religious structures (Temple)	0.05	0.015	0.082
22	Cultural property rehabilitation cost for sacred grove	0.01	-	0.001
TOTAL		**39.937**	**12.75**	**42.44**

Annexure X

Environment Health, Safety & CSR Organizational Structure

Annexure X

Environment, Health & Safety Organizational Structure:

S. No.	Name	Designation	Experience (Years)	Qualification	Organization
1.	Prasad Kurien	GM-Environment	30	B-Tech Civil Engg., M-Tech Env Engg., PMP	Vizhinjam International Seaport Ltd.
2.	Dr. Nehru Kumar Vaithilingam	Environmental Expert (Independent Engineer)	27	BE Civil Engg., ME Env Engg., PhD Env	Indian Institute of Technology (IIT), Madras
3.	Dr. Anil Kumar Trivedi	AVP & Head Environment	23	Ph. D. in Environment (EIA), M.Tech. in Environment Management, Diploma in Industrial Safety, Certified professional in Ergonomics from BOSH (UK)	Adani Ports & Special Economic Zone Ltd. (APSEZ)
4.	Hebin C	Head – Environment	17	MS, Oceanography & Coastal Area Studies	Adani Vizhinjam Port Pvt. Ltd. (AVPPL)
5.	Anshul Sanduja	Manager - Environment	13	B. Tech – Chemical Engineering, M. Tech – Environment Engineering & Science, Post Graduate Diploma in Environment Law & Policy, Post Graduate Diploma in Environment Sustainability	APSEZ
6.	Jesse Benjamin Fullonton	Assistant Manager - Environment	13	BSc. Chemical Tech; Msc. Env. Tech	AVPPL

S. No.	Name	Designation	Experience (Years)	Qualification	Organization
7.	Arumugam S	Deputy Manager - Safety, Environment and Health	5	M.Tech – Industrial Safety Engineering	AVPPL
8.	Radha S	Engineer	9	MTech	AVPPL
9.	Limna B	Senior Assistant	16	Pre-degree, ITI	AVPPL
10.	Sreekutty SR	Horticulture Assistant	1	BSc Botany	AVPPL
11.	Shaji Joseph	Assistant Manager - HSE	16	Diploma in mechanical & Diploma in fire and safety, NEBOSH IGC, IOSH MS	HOWE
12.	Daison Jayanth E	Assistant Manager - HSE	13	B.E Mechanical Engineering, Advanced Diploma in Industrial Safety, NEBOSH IGC, IOSH MS, Lead Auditor	HOWE

CSR Organizational Structure:

S. No.	Name	Designation	Experience (Years)	Qualification	Organization
1.	Anil Balakrishnan	Southern Regional head for CSR and Chief Project Officer- Community Skill Park, Adani Skill Development Centre	26	MSW, Phd.	Adani Foundation (AF)
2.	Sebastian Britto. A. G	Programme Manager	27	MA, Economics	AF
3.	Rakesh R. S	Sr. Project Officer	26	MBA, Bsc Agriculture	AF

S. No.	Name	Designation	Experience (Years)	Qualification	Organization
4.	Stephen Vinod	Project Officer	23	BA, Economics	AF
5.	George Zen	Consultant – Livelihood	38	BA, Sociology	AF
6.	Maya G	Project Officer Community Health	14	BA, IT-TTC	AF
7.	Preji P	SuPoshan Officer	1	MSW	AF
8.	Dr. T.M George	Technical Advisor	30	M Tech, PHD	Adani Skill Development (ASDC)
9.	Anurag MJ	Centre Head	10	MSc. Computer Science	ASDC
10.	Sreejith	Placement Manager	10	MBA (Marketing)	ASDC
11.	Kavitha TR	Trainer – Language & Soft Skill	15	MA, B.Ed. (Eng.), SET, CTET, MA Sociology	ASDC
12.	Neethu V Nath	Trainer – Domestic Data Entry Operator	5	MTech (Computer Science)	ASDC
13.	Mini Jose	Trainer – Beauty Therapist & Hair Stylist	13	S.S.L.C, Diploma in Fashion Technology, Diploma in Beauty Therapy,	ASDC
14.	Sheeja. M	Trainer – General Duty Assistant	10	BSc Nursing	ASDC
15.	Anilkumar BS	Trainer - IOT	22	BTech (ECE)	ASDC
16.	Nidhin S Raj	Trainer – Warehouse Management	7	MBA (Business Admn.)	ASDC

Annexure XI

Email Submission of HYCR for the Period October 2023 to March 2024

From:	PRASAD KURIEN
To:	rosz.bng-mef@nic.in; rosz.bng-mefcc@gov.in
Cc:	Ssuresh.cpcb@nic.in; tvpmro@gmail.com; Kushal.vashist@gov.in; MS KCZMA; zobangalore.cpcb@nic.in; pamidisuneel; Pradeep Jayaraman; Hebin Chenthamarakshan; Jesse Benjamin Fullonton; ceo@vizhinjamport.in; MD VISL
Subject:	EC_F. No. 11-1222011-IA.III dated 03.01.2014-HYCR-Oct2023-Mar2024_29.05.2024 - Half Yearly EC Compliance Report (HYCR) - Oct 2023 to Mar 2024 reg.
Date:	Wednesday, May 29, 2024 2:16:02 PM

Dear Sir/Madam,

MoEF&CC had issued Environmental Clearance and CRZ Clearance (EC) on 3rd January 2014 to the proposed Vizhinjam International Multipurpose Deepwater Seaport at Vizhinjam in Thiruvananthapuram District of Kerala State. (EC No. F.No.11 - 122/2011 - IA. III) and subsequently extended the EC validity up to 2nd January 2024 (An additional validity due to Covid is also availed and hence the validity is applicable up to 2nd January 2025) with the same terms and conditions.

Kindly find attached the Half Yearly Compliance Report (HYCR) for the period from Oct 2023 to March 2024 for records and reference.

Acknowledgement on receipt of the email with its contents is highly appreciated.

EC_F. No. 11-1222011-IA.III dated 03.01.2014-HYCR-Oct2023-Mar2024_24.05.2024.pdf

With Best Regards,

--
Prasad Kurien
General Manager-Environment
Vizhinjam International Seaport Limited
Thiruvananthapuram

VIZHINJAM INTERNATIONAL SEAPORT LIMITED

(A Government of Kerala Undertaking)

Vizhinjam International Deepwater Multipurpose Seaport

Half Yearly Compliance Report (HYCR) of Conditions of Environmental and CRZ Clearance for the Period April 2024 to September 2024

November 2024