



# Environmental Monitoring Report

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Project Number: 40156-023  
March 2018

Period: July 2015 – December 2015

## IND: MFF - Sustainable Coastal Protection and Management Investment Program (SCPMIP) - Tranche 1

Submitted by

Project Management Unit, (SCPMIP), Government of Karnataka, Mangaluru

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**Asian Development Bank**

# Environmental Monitoring Report

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Loan Number: 2679

Reporting period: (July- December 2015)

## (MFF - Sustainable Coastal Protection and Management Investment Program -Tranche 1)

Implementing Agency: Project Management Unit, Public Works, Ports and Inland  
Water Transport Department

Executing Agency:

Date: (30/01/2016)



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# List of Abbreviations

ADB	Asian Development Bank
CBO	Community Based Organization
CD	Chart Datum
CIMU	Coastal Infrastructure Management Unit
CMIS	Coastal Management Information System
CMZ	Coastal Management Zone
CPCB	Central Pollution Control Board
CRZ	Coastal Regulation Zone
CWC	Central Water Commission
CWPRS	Central Water and Power Research Station
Db	Decibel
DPR	Detailed Project Report
EIA	Environmental Impact Assessment
EPA	Environment Protection Act
GIS	Geographical Information System
GoI	Government of India
GoK	Government of Karnataka
HTL	High Tide Line
ICMAM	Integrated Coastal and Marine Area Management
ICZMA	Integrated Coastal Zone Management Authority
KPI	Key Performance Indicator
KSCPM	Karnataka Sustainable Coastal Protection and Management
KSCZMA	Karnataka State Coastal Zone Management Authority
KRSRAC	Karnataka State Remote Sensing Application Centre
LTL	Low Tide Line
MoEF	Ministry of Environment, Forests and Climate Change
MFF	Multi Financing Facility
NCPP	National Coastal Protection Project
NGO	Non-Governmental Organization
NHC	Northwest Hydraulic Consultants
O&M	Operation and Maintenance
P&IWT	Ports & Inland Water Transport
PMDC	Project Management and Design Consultants
PPMS	Project Performance and Management System
PPP	Public Private Partnership
PPTA	Project Preparation Technical Assistance
SCPMIP-K	Sustainable Coastal Protection and Management Investment Program – Karnataka
SEA	State Executing Agency
SEIAA	State Environmental Impact Assessment Agency
SMO	Shoreline Management Organisation
SMP	Shoreline Management Plan
SPCB	State Pollution Control Board
TMC	Town Municipal Council
ToR	Terms of Reference

## 1. Introduction

The National Coastal Protection Project (NCP) estimates that 50% of the total of 1,100 km of coastline in the three states of Maharashtra, Goa and Karnataka is facing erosion to some degree. Half of the 300 km coastline of Karnataka is subject to significant coastal erosion and only 58 km has some degree of protection.

The coastal zone is a key part of the economy, supporting agricultural and horticultural activities, fishing, aquaculture, sand and shell mining, harbour development, trade and transport. Rural communities and urban areas are affected by coastal erosion. Rising sea levels and increasing numbers and intensities of storms will result in serious erosion hazards. To address its coastal protection and management issues, the Government of Karnataka has agreed with the Asian Development Bank (ADB) to implement the Sustainable Coastal Protection and Management Investment Program (SCPMIP). The budget for the first tranche of SCPMIP-K amounts to US\$ 48.549 million covering the period Jan 2012 - June 2017.

### Overall Project Description

The 1<sup>st</sup> Tranche sub-project in Ullal consist of 4 components viz., rehabilitation of Ullal breakwaters, construction of two off-shore reefs, construction of four in-shore berms and sand nourishment. Project layout map is provided in appendix A. A brief description and the progress so far of these sub-projects are as follows.

**Inshore Berms** - 4 numbers of Inshore berms are 'T' gryone like structure, forming a length of 120m each placed into sea. The construction of the four in-shore berms commenced in December 2013. The construction materials used are sand filled geotextile bags and containers.

Presently berm No 4 stem – about 70 mtrs, berm No. 2 Stem – about 25 mtrs, berm No. 1 Stem – about 25 mtrs and additional berm No 5 Stem – about 50 mtrs constructed. berm No. 3 work started.

The construction of all the Inshore berms is expected to be completed by March 2016.

**Breakwaters** – The existing Ullal breakwaters are in dilapidated condition and requires immediate rehabilitation. With proposed rehabilitation, the structure will become more robust and adapted to future sea level rise. The southern breakwater will become slightly shorter to allow an increase of sand moving towards the Ullal frontage. Agreement for rehabilitation of breakwaters was signed on 31/07/2014 and the Commencement date was fixed as 01/12/2014.

Contractor deployed men & machineries at site in the month of January 2015. The work was started in December 2014

Now the restoration of 550 mtrs length North Breakwater is completed.

Restoration of about 400 mtrs south breakwater is nearing Completion and is expected to be completed by March 2016.

**Off-Shore Reefs** – Off Shore reefs are cup shaped structures to be constructed at 700m off shore at a depth of -7m w.r.t. to local Chart Datum(CD). Main function of these structures are to break the waves at off shore and reduce the wave intensity before it reaches the coastline. Agreement for construction of 2 off shore reefs was signed on 07/11/2014 and the Commencement date was fixed as 01/12/2014

The reef contractor has started the work in December 2014. Bathymetry, Geo Physical, Geo technical survey and dredging work at South reef completed. The contractor is now casting and stacking tetrapods at

the stack yard in New Mangalore Port Trust (NMPT). Now the Soil stabilisation to south reef is under progress. The agency is planning to complete the construction of south reef by May 2016 and the North reef by March 2017.

**Sand Nourishment** is the process of transporting sand from deeper sections of the sea and feed it to the foreshore to create a new beach or widen the existing beach. Sand nourishment does not stop erosion; but is an essential component to balance the process of erosion and accretion, thus safeguarding the protection of livelihoods and properties. 2x 450,000 m<sup>3</sup> of sand nourishment is proposed on the Ullal frontage after the construction of the above 3 components.

### Project Objectives

The overall objective of SCPMIP-K is to address the immediate coastal protection needs through the implementation of economically viable protection works using environmentally and socially appropriate solutions. In order to achieve this over-arching objective for SCPMIP-K there are a number of key objectives that must be fulfilled, these being;

1. **To address the causes and likely causes of coastal erosion and coastal instability**, directed mainly at other coastal infrastructure that is presently causing, or potentially causing damage to the natural coastal processes.
2. **To support investments for natural protection measures such as the development** and planting of dunes, planting of mangrove or other trees for protection or shelter.
3. **To consider wider coastal management issues** surrounding water quality, navigational entrances, dredging and training of river and drain mouths.
4. **To consider increase of economic and amenity value** of the coast and shoreline.
5. **To develop the institutional capacities to meet the long term needs of sustainable coastal protection and management.** This includes the development of the capacities at central, state and district level in shoreline planning, detailed planning, modelling, design; and coordination and management of coastal infrastructure.

In parallel to the investment program, the project will develop institutional capacities to meet long term needs of sustainable coastal protection and management. The project will support initiatives to increase the participation of the private sector and communities in the planning, design, financing, implementation and maintenance of coastal protection and management projects. The project supports the development of a number of economic initiatives in the coastal zone; where appropriate private sector participation would be incorporated into the project strategies. All investment projects should be implemented based on participative planning, professional design using innovative approaches.

### Environmental Category

The approved environment category of the Project is A; and ADB's Environment Policy (EP) (2002) is applicable for this Project.

### Environmental Performance Indicators

The environmental performance indicators have been framed with the objective of carrying out project progress review. The performance Indicators has been evaluated as per following three heads:

- (i) Environmental condition indicators to determine efficiency of environmental management measures in control of air, noise, soil and water pollution.
- (ii) Environmental management indicators to determine compliance with the suggested mitigation measures.
- (iii) Indicators regarding Communication of requirements with respect to ADB's environmental & social safeguards, national & state level Environmental rules & regulations.



## 2. Compliance Status with National/State/Local Statutory Environmental Requirements

The Tranche -1 project has been accorded with CRZ clearance, apart from this the contractors are responsible for obtaining consent to establish and operate batching plants and use of DG sets if any from the Karnataka State Pollution Control Board(KSPSB). Contractors to obtain and submit Pollution Under Control(PUC) of all the construction vehicles.

**Table 2.1:** Subproject wise Compliance Status

<b>Sl No</b>	<b>Sub Project Component</b>	<b>Statutory Environmental Requirement</b>	<b>Compliance Status</b>
1	Construction of four Inshore Berms	CRZ Clearance	Obtained
2	Rehabilitation of Ullal Breakwaters	CRZ Clearance	Obtained
		Consent to Establish and Operate batching Plant	Obtained
3	Construction of two off shore reefs	CRZ Clearance	Obtained

3. Compliance Status with the Environmental Covenants as Stipulated in the Loan Agreement

<b>Tranche/ Town/ Sub-project/ Package</b>	<b>Environmental Category</b>	<b>Status of preparation of IEE/EIA report</b>	<b>Status of approval of preparation of IEE/EIA report</b>
Tranche 1, Construction of four Inshore Berms	'A' Category	EIA prepared	EIA approved
Tranche 1, Rehabilitation of Ullal Breakwaters	'A' Category	EIA prepared	EIA approved
Tranche 1, Construction of two off shore reefs	'A' Category	EIA prepared	EIA approved

#### 4. Compliance Status with Environmental Management and Monitoring Plans as Stipulated in the Environmental Documentation as agreed with ADB

This section presents the compliance status of Environmental Management and Monitoring Plans of tranche-1 subprojects under implementation. During this reporting period (July 2015- December 2015) all three construction works has been started. Environmental monitoring was conducted during this reporting period in the month of December 2015, for air quality, marine water, noise and sediment quality by an MoEF accredited lab - Environmental Health & Safety Consultant, Bangalore. The contractors are following the EMP, which is part of the EIA and respective contract document. In addition to that, guidelines on general construction EHS measures to be followed / implemented by the Contractor.

Project Activity	Potential Environmental Impact	Proposed Mitigation Measures	Monitoring Method	Compliance Status	Institutional Responsibilities
<b>Pre Construction Stage</b>					
<b>Site preparation:</b>  Material and equipment staging areas and beach access locations	Possible removal of terrestrial habitat	<ul style="list-style-type: none"> <li>Sites rehabilitated before contractor leaves site upon completion of construction activities. Planting and stabilization of site, including replacement of any native plant species.</li> </ul>	Visual Observation	<b>Complied.</b> There is no terrestrial habitat present near the proposed sub project sites. Although the PMU will make sure the site will be rehabilitated, if required before the contractor leaves.	PMU  Contractor
<b>Construction Stage</b>					
<b>Physical</b>					
Berm Construction  Offshore reef construction.  Breakwater construction	<b>Air quality</b>  Reduction in Air quality from exhaust fumes and dust at on-land construction sites	<ul style="list-style-type: none"> <li>Adherence to national emission and ambient quality standards</li> <li>Engines and generators turned off when not in use</li> <li>Equipment conforms to international standards.</li> <li>Dust suppression by regular sprinkling of water (i.e. morning and evening) or other means. Possibly, halt work during excessive onshore winds.</li> <li>Verbal social complaints dealt with immediately and efficiently.</li> </ul>	Visual Observation, AAQM once every season.	<b>Complied.</b> Water sprinkling is being done.  Contractors have been instructed to submit Pollution Under Control certificates.	PMU  Contractor

	<b>Noise</b> Increased noise levels	<ul style="list-style-type: none"> <li>• Adherence to national noise standards.</li> <li>• Engines and generators turned off when not in use</li> <li>• Equipment conforms to international standards</li> <li>• Vehicles and engines fitted with silencers</li> <li>• Daily checks and remedy of potential sources of excessive noise especially out of daylight hours.</li> <li>• Complaints regarding noise dealt with professionally and with respect.</li> <li>• Rock transport plan from quarries to rock transshipment Storage site prepared and adhered to.</li> </ul>	Noise monitoring, visual observation	<b>Complied.</b> Engines and generators are being turned off when not in use.	PMU  Contractor
	<b>Water quality</b> High turbidity during reef filling Possible leaks or spills sediment, fuels, oil, other fluids	<ul style="list-style-type: none"> <li>• Supervision of all operation procedures to minimize spillage of sand</li> <li>• Contingency plans for accidental oil, fuel, and sediment spills should be initiated immediately</li> </ul>	Water quality monitoring, visual observation	<b>Complied.</b> Site engineers are visually monitoring for spillage of sand and oil during construction.	PMU  Contractor
		<b>Biological</b>			
	<b>Marine biota and habitat</b>  Reefs and berms will cover soft-sediment benthic habitat and biota  High turbidity and sediment settlement temporarily impair photosynthesis and biological production in adjacent offshore areas  Possible leaks or spills sediment fuels, oil, other	<ul style="list-style-type: none"> <li>• Develop mitigation components based a review and characterization of fish and invertebrates that occur in the near shore area and estuary including seasonal or migratory species and sensitive times and locations.</li> <li>• Reefs structure is expected to be colonized by biota offsetting smothering soft-sediment biota.</li> <li>• Minimize sediment release during construction to reduce affected area outside immediate reef-site area</li> <li>• Implement contingency plans if</li> </ul>	visual observation for oil spills	Offshore construction activities related to reefs are yet to start. In construction of Inshore Berms, sediment release is bare minimum as the geotextile containers and bags are closed tightly after the sediments filled and compacted within.	PMU  Contractor   PMU  Contractor

	fluids	spills of sediment, fuels Oil, or other fluids occur			
		<b>Social, Economic and Cultural</b>			
	<b>Safety and human health</b>  Reduced safety of beach users	<ul style="list-style-type: none"> <li>Public consultation to identify locations, times, and types of potential safety risks, and develop site-specific advisories and safety measures.</li> <li>All equipment, waste, and construction material debris must be inspected and removed daily from site.</li> </ul>	visual observation	<b>Being Complied.</b>  Installation of signage for prohibition of entry of local community and tourist to In shore Berms. Materials and wastes are located at secure / designated locations	PMU  Contractor
	<b>Tourism:</b>  Beach amenity and recreational use disturbed	<ul style="list-style-type: none"> <li>Public consultation to identify locations, times, and types of potential safety risks, and develop site-specific advisories and safety measures.</li> <li>All equipment, waste, and construction material debris must be inspected and removed daily from site.</li> </ul>			
	<b>Fishing activity</b>  Disturb traditional fishing activity	<ul style="list-style-type: none"> <li>Public consultation to identify locations, times, and types of potential conflict, and develop site-specific measures to minimize disruption of boat launching and fishing activity</li> </ul>			
	<b>Navigation</b>  Local navigation	<ul style="list-style-type: none"> <li>Vessel movement and equipment operation to be carried out in consultation with stakeholders to avoid interference with navigation.</li> </ul>			

## 5. Approach and Methodology Engaged for Environmental Monitoring of the Project

The Tranche 1 sub project Monitoring has been divided into three heads viz., Measurement of Coastal data, Baseline Surveys and Environmental Monitoring and apart from this, visual site inspection also plays an important role in identifying impacts. The parameters under these heads are as follows:

### A. Measurement of Coastal Data

- i. Waves (height, direction & time period)
- ii. Current measurements
- iii. Water levels

### B. Baseline surveys

- iv. Bathymetry survey (Seabed level changes)
- v. Topo survey (Beach profiles, Crest levels)

### C. Environmental Monitoring

- vi. Ambient Air Quality Monitoring
- vii. Marine Water Quality Monitoring
- vii. Noise Monitoring
- viii. Sediment Analysis

The Environmental Monitoring parameters have been selected based on the EMP prepared during the Project Preparatory Technical Assistance (PPTA) stage and further parameters such as Measurement of Coastal Data and Baseline surveys have been added to ensure the sub project performance.

Table 5.1: Tranche 1 Monitoring Programme

S.No	Description	Coverage area	Units	Frequency in Months
1	<b>Measurement of Coastal Data</b>			
	Wave	1	LS	Continues
	Tide monitoring	1	LS	Continues
	Current	1	LS	6
2	<b>Baseline Surveys</b>			
	Bathymetry survey	5.945	Sq km	6
	Topo survey	183200	Sqm	6
3	<b>Environmental Monitoring at two stations</b>			Once in a season expect monsoon
	Ambient Air Quality Monitoring			
	Marine Water Quality Monitoring			
	Noise Monitoring			
	Sediment quality (chemical)			

## 6. Monitoring of Environmental Receptors/ Attributes

Monitoring for environmental aspects like air, water, noise and sediment is part of the larger monitoring scheme. The monitoring scheme also includes monitoring the performance of the coastal structures on the adjacent beaches, wave and tide level monitoring. The beach level variations are measured by conducting 6 monthly beach topography survey as well as bathymetry surveys. The proposed monitoring scheme is as presented in Table 5.1 including various parameters, duration and frequency of monitoring

The baseline data of environmental parameters, waves, tides , current, beach profiles have been generated and are available at PMU.

The Environmental Monitoring is been outsourced to an MoEF accredited lab. The Environmental Monitoring Contract is awarded to Environmental Health & Safety Consultant, Bangalore and they will be carrying out monitoring for financial year 2015-2016.

## 7. Details of Grievance Redress Committee and Complaints Received from Public and Action Taken Thereof to Resolve

Grievance redressal is being handled by PMU. However a formal Grievance Redressal Committee (GRC) is yet to be established for the implementation of tranche 1 sub project of SCPMIP to ensure that grievances are addressed in a timely manner, facilitating timely project implementation. Grievances of Affected Persons (APs) will be first brought to the attention of the Joint Director who is working full time at PMU. Grievances not redressed by the PMU will be brought to the Grievance Redressal Committee (GRC) of District Commissioner level.

At present the assistant engineers of PMU receive grievances of local level and it is attended immediately by the site engineer and the contractors. If it is not solved at the level of the assistant engineer level, the matter is brought to the Joint Director and Project Director level and solved immediately.

No environment related grievances have been received by the PMU.



## 8. Conclusion and Recommendation

PMDC-K and PMU have assessed the implementation of EMP during the reporting period, as mentioned in the previous report, some areas such as safety arrangements and usage of personal protective equipment (PPE) by the construction workers require to be improved further. PMU has instructed the civil work Contractors to take appropriate mitigation actions to improve implementation of EMP, worker safety measures, dust control measures by carrying out regular water sprinkling in dust prone areas and to ensure that all workmen and staff employed on site use safety gear provided to them. Correspondence has been made to contractors regarding safety maintenance, implementation of EMP etc. As all three package works are in progress now, following are the key area needs attention and further improvement.

### **Construction of Berms**

M/s RDS Projects Ltd having 20 labours in a rented house is working on 4 no of berms. Presently works are in progress at two fronts at 2 numbers of berms. The labour camp has kitchen and LPG cylinders and fuel has been provided by the contractor. The condition of the house having labours is in good condition. The workers are found working at site wearing helmets. The high visibility vest/Jackets are not being used by the site workers, while the safety shoes are partly being used by the workers. There is no source of dust generation since the activity being handled of sand. Other sources of pollution of operation of construction equipment and vehicles limited to day time construction and emission from these equipment in compliance to the manufacturer's specifications.

### **Construction of Offshore Reef**

M/s Dharti Constructions has been commissioned for construction of offshore reef. Contractor has submitted the HSE manual and Environmental Protection Plan and Procedure during January 2015.

The Rock armour materials of varying sizes/weight are procured from trident infrastructures ltd who inturn are getting the rocks which are by-product of a tunnelling project.. So, this is a good example of reuse of material for sustainable development by reducing the use of natural resources.

### **Construction of Breakwater**

M/s R.B. Chavan –Arjun Earth Movers (JV) has been commissioned for rehabilitation of North Breakwater and south breakwaters. Construction of North Breakwater is complete while construction of South Break water is going on. For rehabilitation of South breakwater, the rock armour materials obtained after the curtailment of existing south breakwater are being reused to a larger extent. The contractor has about 40 labours and found to be compliant to the site work. The construction works involve casting of Tetrapods. Contractor has taken NoC from Karnataka Pollution Control Board for operating batching plant. Project Insurance, Third party liability insurance and Workmen compensation insurance are in place at time of preparation of this report.

### **Environmental Testing**

Ambient Air Quality testing, Noise level testing was conducted and is compliant to the Indian Standard. Water Quality Testing and sediment testing was also conducted. Although standard are not available for sea water and sediments. The results are consistent to all samples.

# Appendices

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## Appendix A. Location Map of Monitoring Station

Figure A.1: Location Map of Monitoring Station for Trance-1 Sub Project



## Appendix B. Site Photographs

Figure B.1: Ambient Air Quality Monitoring at Ullal



Figure B.2: Ambient Air Quality Monitoring at Bengre





Figure B.3: Off shore sediment sample collection



Figure B.4: Nearshore marine water sample collection



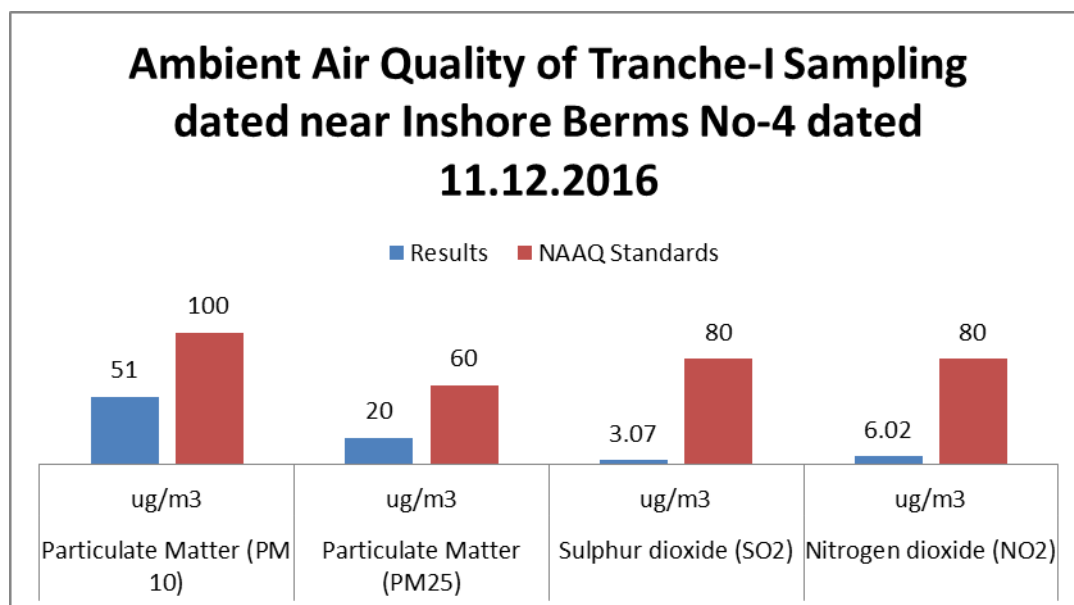
## Appendix C. Environmental Testing

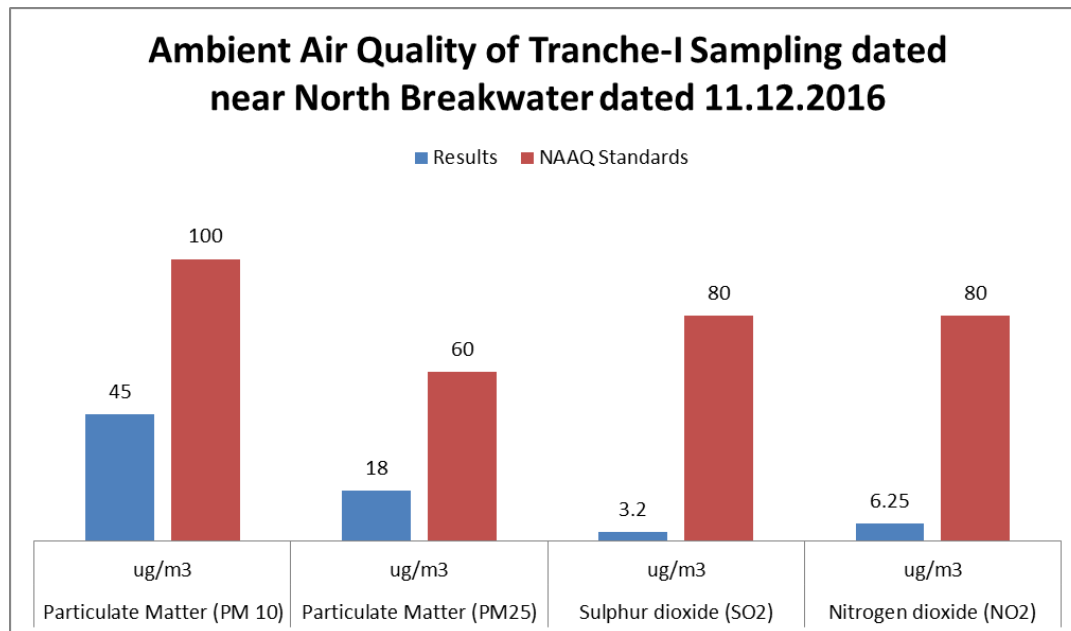
### C.1. Ambient Air Quality Monitoring in Tranche I

Results of Ambient Air Quality Testing Near Inshore Berm No 4

The Ambient air quality testing was conducted for 24 hours on 11 December 2015 at two location one near the Inshore Berm no 4 and other near north break water. This was a normal day having clear sky and no rainfall. The results of both location are well within the permissible limits of National Ambient Air Quality Standards.

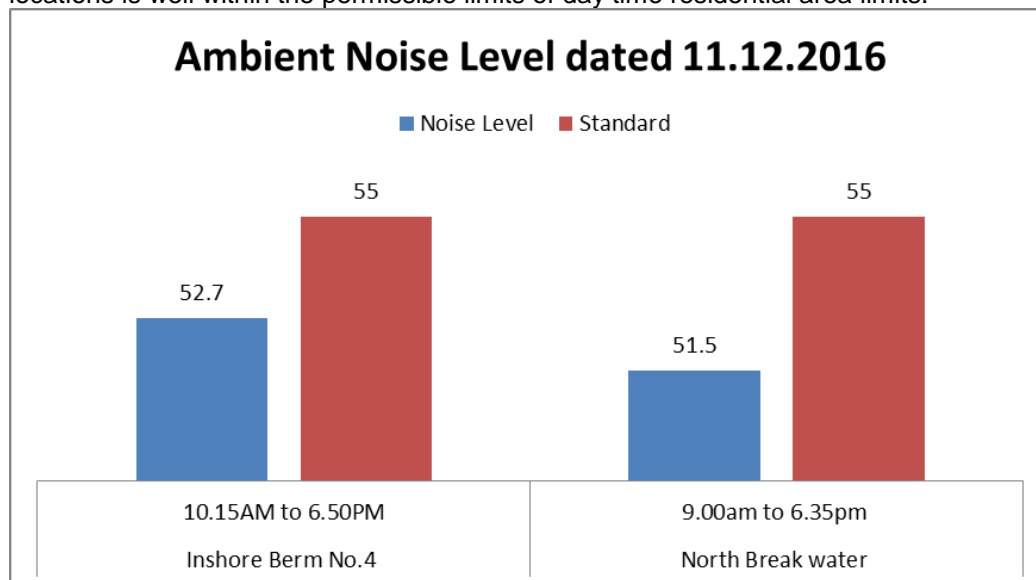
Parameters	Unit	Results Inshore Berm-4	Results North Breakwater	NAAQ Standards	Protocol
Particulate Matter (PM <sub>10</sub> )	ug/m <sup>3</sup>	51	45	100	IS:5182(p 23)-2006
Particulate Matter (PM <sub>25</sub> )	ug/m <sup>3</sup>	20	18	60	USEPA 40 CFR (p53)
Sulphur dioxide (SO <sub>2</sub> )	ug/m <sup>3</sup>	3.07	3.2	80	IS:5182 (P2)-2001
Nitrogen dioxide (NO <sub>2</sub> )	ug/m <sup>3</sup>	6.02	6.25	80	IS:5182 (P6)-2006





### C.2. Ambient Noise Level Monitoring

Noise level testing was conducted at Inshore Berm no 4 and North Break water. Noise level of both locations is well within the permissible limits of day time residential area limits.



### C.3. Sea Water Quality Testing at Construction site.

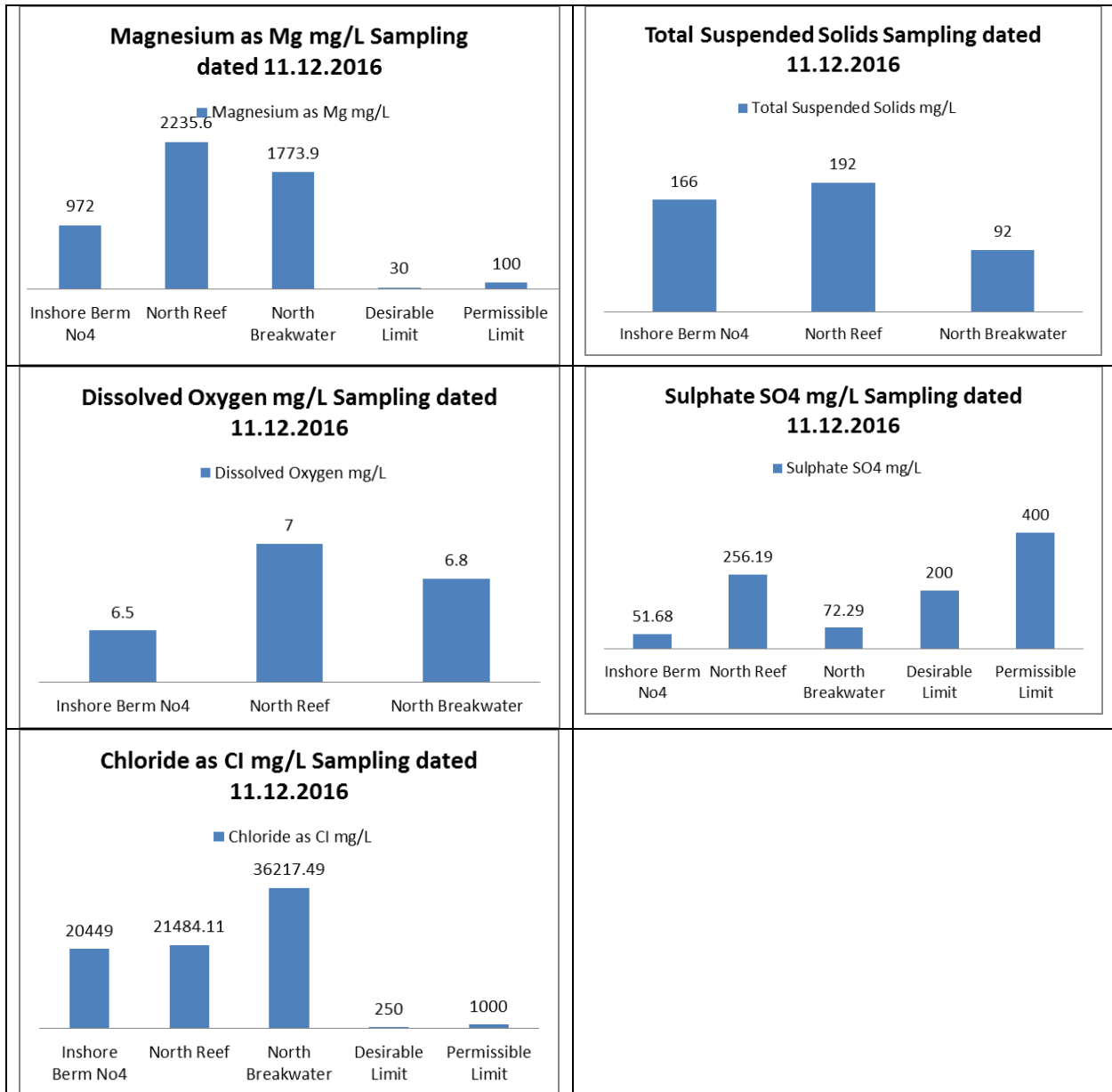
Water Quality Testing has been conducted for 3 location. Since entire work involves sea water, so the sampling has been done accordingly. There is no standard stipulated for sea water. While comparison of result has been done with drinking water standards. The results are far beyond the drinking water standard.

Sl.No	Parameters	Unit	Results			Std.IS 10500:2012 (Second Revision)	
			Inshore Berm No4	North Reef	North Breakwater	Desirable Limit	Permissib le Limit
1	pH		8.1	8.09	8.06	6.5	8.5
2	Turbidity	NTU	5.55	2.72	1.48	1	5
3	Conductivity	µs/cm	60400	50800	42300	..	
4	Acidity	mg/L	BDL	BDL	BDL	..	
5	Total Dissolved Solids	mg/L	37708	38888	26254	500	2000
6	Alkalinity	mg/L	110	130	90	200	600
7	Total Hardness	mg/L	7200	11800	8800	200	600
8	Calcium as Ca	mg/L	1280	1040	600	75	200
9	Magnesium as Mg	mg/L	972	2235.6	1773.9	30	100
10	Total Suspended Solids	mg/L	166	192	92	..	
11	Dissolved Oxygen	mg/L	6.5	7	6.8	..	
12	Sulphate SO <sub>4</sub>	mg/L	51.68	256.19	72.29	200	400
13	Chloride as Cl	mg/L	20449	21484.11	36217.49	250	1000
14	Iron Fe	mg/L	0.4	0.84	0.03	0.3	
15	B.O.D(3 days in 27°C)	mg/L	Not Detecte d	Not Detected	8	..	
16	Oil & Grease	mg/L	BDL	BDL	BDL	..	
17	Fecal Coliform	CFU / 100 ml	< 1	< 1	< 1	Nil	

DL-Desirable Limit PL-Permissible Limit, BDL – Below Detectable Limit





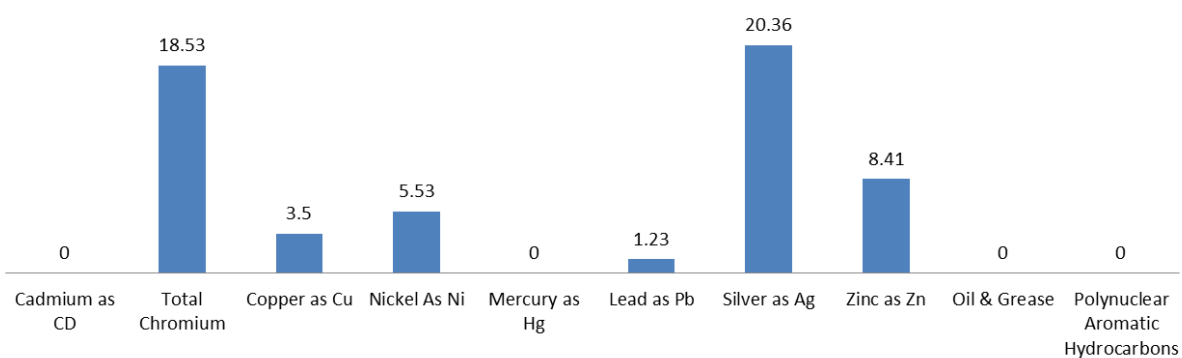


#### C.4. Sediment Quality Testing

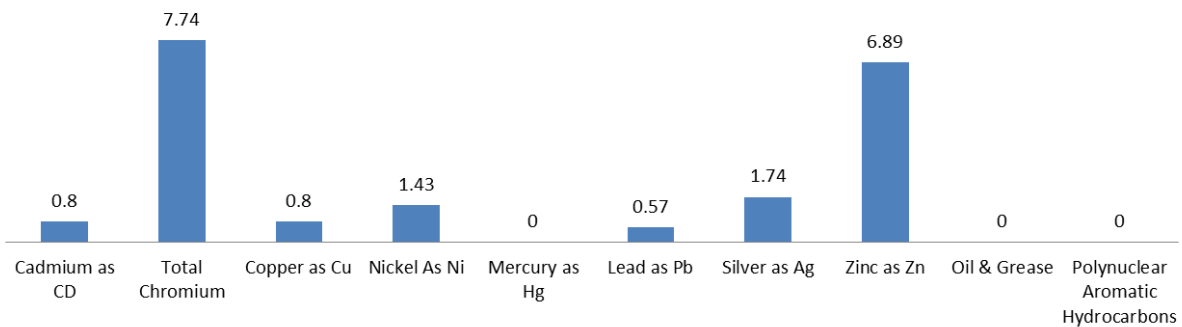
Sediment testing has also been conducted for the samples collected from the sea bed near north reef and north breakwater. The parameters selected are Cadmium, Chromium, Copper, Nickel, Mercury, Lead, Silver, Zinc, Oil & Grease and Polynuclear Aromatic Hydrocarbon. Out of the above parameters, mercury, oil & Grease and Polynuclear aromatic hydrocarbons are absent in both sample. While Cadmium is absent in the sample of North reef.

Sl.No	Parameters	Unit	North Reef	North Breakwater
1	Cadmium as CD	Mg/kg	0	0.8
2	Total Chromium	Mg/kg	18.53	7.74
3	Copper as Cu	Mg/kg	3.5	0.8
4	Nickel As Ni	Mg/kg	5.53	1.43
5	Mercury as Hg	Mg/kg	0	0
6	Lead as Pb	Mg/kg	1.23	0.57
7	Silver as Ag	Mg/kg	20.36	1.74
8	Zinc as Zn	Mg/kg	8.41	6.89
9	Oil & Grease	Mg/kg	0	0
10	Polynuclear Aromatic Hydrocarbons	Mg/kg	0	0

### Analysis of Sediments of North Reef Sampling dated 11.12.2016



### Analysis of Sediments of North Breakwaters Sampling dated 11.12.2016



## C.5. Lab results of Environmental Monitoring



Recognised by Ministry of Environment & Forests (MoEF),  
Govt. of India, New Delhi, Dated : 28-07-2011 to 27-07-2016

ISO 9001:2008,

ISO 14001 : 2004

BS OHSAS 18001:2007

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Tel : 080 23012100/ 121/122 Fax : 080 23012111  
E-mail : info@ehsrdc.in / ehsrdc2010@gmail.com  
Website : www.ehsrdc.in

### Test Report

#### ANALYSIS REPORT OF AMBIENT AIR QUALITY

1. Name of the Station : Near Inshore Berm No- 4
2. Name of the Project : CRZ Sustainable Coastal Protection & Management  
Investment Program, (Tranche-1),  
Old Port Office Building Bunder,  
Mangalore-575001.
3. Sample Collected by : M/s. Environmental Health and Safety Research &  
Development Centre, Bangalore - 560 010.
4. Date of Collection : 11.12.2015
5. Particulars of Sample Collected : Ambient Air collected through  
Fine Particulate Sampler - APM 550  
Respirable Dust Sampler - 460NL
6. Date of Sample Receipt : 13.12.2015
7. Sample Number : EHSRDC/ SCPMIP/A/15/12/10328
8. Report to be Sent : 21.12.2015
9. Page No : 1 of 8

Sl.No	Parameters	Unit	Results	NAAQ Standards	Protocol
1.	Period of sampling / Time	Hrs	24 10.00am -10.00am	24	--
2.	Particulate Matter (PM <sub>10</sub> )	µg/ m <sup>3</sup>	51	100	IS: 5182 (P 23)-2006
3.	Particulate Matter (PM <sub>2.5</sub> )	µg/ m <sup>3</sup>	20	60	USEPA 40 CFR (P 53)
4.	Sulphur dioxide (SO <sub>2</sub> )	µg/ m <sup>3</sup>	3.07	80	IS: 5182 (P2)-2001
5.	Nitrogen dioxide (NO <sub>2</sub> )	µg/ m <sup>3</sup>	6.02	80	IS: 5182 (P6)-2006

INFERENCE	As per NAAQ Standards, Report Status: - The measured values for the above parameters are within the standards.
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\*\*\*End of Report\*\*\*

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## Test Report

### ANALYSIS REPORT OF AMBIENT AIR QUALITY

1. Name of the Station : Near North Break Water
2. Name of the Project : CRZ Sustainable Coastal Protection & Management Investment Program, (Tranche-1), Old Port Office Building Bunder, Mangalore-575001.
3. Sample Collected by : M/s. Environmental Health and Safety Research & Development Centre, Bangalore - 560 010.
4. Date of Collection : 11.12.2015
5. Particulars of Sample Collected : Ambient Air collected through Fine Particulate Sampler - APM 550 Respirable Dust Sampler - 460NL
6. Date of Sample Receipt : 13.12.2015
7. Sample Number : EHSRDC/ SCPMIP / A/15/12/10329
8. Report to be Sent : 21.12.2015
9. Page No : 2 of 8

Sl.No	Parameters	Unit	Results	NAAQ Standards	Protocol
1.	Period of sampling / Time	Hrs	24 8.30am -8.30am	24	--
2.	Particulate Matter (PM <sub>10</sub> )	µg/ m <sup>3</sup>	45	100	IS: 5182 (P 23)-2006
3.	Particulate Matter (PM <sub>2.5</sub> )	µg/ m <sup>3</sup>	18	60	USEPA 40 CFR (P 53)
4.	Sulphur dioxide (SO <sub>2</sub> )	µg/ m <sup>3</sup>	3.20	80	IS: 5182 (P2)-2001
5.	Nitrogen dioxide (NO <sub>2</sub> )	µg/ m <sup>3</sup>	6.25	80	IS: 5182 (P6)-2006

INFERENCE	As per NAAQ Standards, Report Status: - The measured values for the above parameters are within the standards.
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## Test Report

### AMBIENT NOISE LEVEL MONITORING REPORT

1. Name of the Project : CRZ Sustainable Coastal Protection & Management Investment Program, (Tranche-1), Old Port Office Building Bunder, Mangalore-575001.
2. Sample Collected by : M/s. Environmental Health and Safety Research & Development Centre, Bangalore – 560 010.
3. Date of Collection : 11.12.2015
4. Particulars of Sample Collected : Ambient Noise Level Collected through Sound Level Meter EQ-8852/C-322
5. Date of Sample Receipt : 13.12.2015
6. Sample Number : EHSRDC/ SCPMIP /N/15/12/10330-10331
7. Report to be Sent : 21.12.2015
8. Method Adopted : Instrument Method
9. Page No : 3 of 8

Sl.No	Sample Location	Time Frequency	Parameters	Std.
			$L_{eq}$ dB(A)	
10330	Inshore Berm No- 4	10.15AM to 6.50PM	52.7	55.0 dB(A) - Day
10331	North Break Water	9.00AM to 6.35PM	51.5	

IP – Industry Premises,

- Note :
- Day Time is reckoned between 6 A.M and 10 P.M
- Night Time is reckoned between 10 P.M and 6 A.M
- $L_{eq}$ : It is energy mean of the noise level over a specified period.
- \*dB (A)  $L_{eq}$  denotes the time weighted average of the level of sound in decibels on scale A which is relatable to human hearing.
- A "decibel" is a unit in which noise is measured.
- "A", in dB (A)  $L_{eq}$ , denotes the frequency weighting in the measurement of noise and corresponds to Frequency response characteristics of the human ear.

INFERENCE	As per CPCB Standards, Report Status: - The measured values for the above locations are within the standards.
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\*\*\*End of Report\*\*\*

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## Test Report

### ANALYSIS REPORT OF SEA WATER QUALITY

1. Name of the Location : Inshore Berm No- 4
2. Name of the Project : CRZ Sustainable Coastal Protection & Management  
Investment Program, (Tranche-1),  
Old Port Office Building Bunder,  
Mangalore-575001.
3. Sample Collected by : M/s. Environmental Health and Safety Research &  
Development Centre, Bangalore - 560 010.
4. Date of Collection : 11.12.2015
5. Particulars of Sample Collected : SeaWater, Grab Sampling
6. Date of Sample Receipt : 13.12.2015
7. Sample Number : EHSRDC/ SCPMIP /W/15/12/10332
8. Analysis started on : 13.12.2015
9. Analysis Completed on : 18.12.2015
10. Page No. : 4 of 8
11. Report to be Sent : 21.12.2015
12. Protocol : APHA, 22<sup>nd</sup> Edition/IS: Standard

Sl.No	Parameters	Protocol	Unit	Result
1.	pH	4500H <sup>+</sup> B	-	8.10
2.	Turbidity	2130 B	NTU	5.55
3.	Conductivity	2510 B	μs /cm	60400
4.	Acidity	2310 B	mg/L	BDL
5.	Total Dissolved Solids	2540 C	mg/L	37708
6.	Alkalinity	2320 B	mg/L	110
7.	Total Hardness	2340 C	mg/L	7200
8.	Calcium as Ca	3500-Ca	mg/L	1280
9.	Magnesium as Mg	3500 Mg B	mg/L	972
10.	Total Suspended Solids	2540 D	mg/L	166
11.	Dissolved Oxygen	4500-O C	mg/L	6.5
12.	Sulphate as SO <sub>4</sub>	4500-SO <sub>4</sub> <sup>2-</sup>	mg/L	51.68
13.	Chloride as Cl	4500-Cl B	mg/L	20449
14.	Iron as Fe	3500-Fe B	mg/L	0.40
15.	B.O.D (3 days in 27°C)	5210 B	mg/L	Not Detected
16.	Oil & Grease	5520 B	mg/L	BDL
17.	Fecal Coliform	9222 D	CFU/100ml	<1

BDL - Below Detectable Limit

\*\*\*End of Report\*\*\*

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## Test Report

### ANALYSIS REPORT OF SEA WATER QUALITY

1. Name of the Location : North Reef
2. Name of the Project : CRZ Sustainable Coastal Protection & Management  
Investment Program, (Tranche-1),  
Old Port Office Building Bunder,  
Mangalore-575001.
3. Sample Collected by : M/s. Environmental Health and Safety Research &  
Development Centre, Bangalore - 560 010.
4. Date of Collection : 11.12.2015
5. Particulars of Sample Collected : Sea Water, Grab Sampling
6. Date of Sample Receipt : 13.12.2015
7. Sample Number : EHSRDC/ SCPMIP /W/15/12/10333
8. Analysis started on : 13.12.2015
9. Analysis Completed on : 18.12.2015
10. Page No. : 5 of 8
11. Report to be Sent : 21.12.2015
12. Protocol : APHA, 22<sup>nd</sup> Edition/IS: Standard

Sl.No	Parameters	Protocol	Unit	Result
1.	pH	4500H <sup>+</sup> B	-	8.09
2.	Turbidity	2130 B	NTU	2.72
3.	Conductivity	2510 B	µs /cm	50800
4.	Acidity	2310 B	mg/L	BDL
5.	Total Dissolved Solids	2540 C	mg/L	38888
6.	Alkalinity	2320 B	mg/L	130
7.	Total Hardness	2340 C	mg/L	11800
8.	Calcium as Ca	3500-Ca	mg/L	1040
9.	Magnesium as Mg	3500 Mg B	mg/L	2235.6
10.	Total Suspended Solids	2540 D	mg/L	192
11.	Dissolved Oxygen	4500-O C	mg/L	7.0
12.	Sulphate as SO <sub>4</sub>	4500-SO <sub>4</sub> <sup>2-</sup>	mg/L	256.19
13.	Chloride as Cl	4500-Cl B	mg/L	21484.11
14.	Iron as Fe	3500-Fe B	mg/L	0.84
15.	B.O.D (3 days in 27°C)	5210 B	mg/L	Not Detected
16.	Oil & Grease	5520 B	mg/L	BDL
17.	Fecal Coliform	9222 D	CFU/100ml	<1

BDL - Below Detectable Limit

\*\*\*End of Report\*\*\*

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## Test Report

### ANALYSIS REPORT OF SEA WATER QUALITY

1. Name of the Location : North Break Water
2. Name of the Project : CRZ Sustainable Coastal Protection & Management Investment Program, (Tranche-1), Old Port Office Building Bunder, Mangalore-575001.
3. Sample Collected by : M/s. Environmental Health and Safety Research & Development Centre, Bangalore - 560 010.
4. Date of Collection : 11.12.2015
5. Particulars of Sample Collected : Sea Water, Grab Sampling
6. Date of Sample Receipt : 13.12.2015
7. Sample Number : EHSRDC/ SCPMIP /W/15/12/10334
8. Analysis started on : 13.12.2015
9. Analysis Completed on : 18.12.2015
10. Page No : 6 of 8
11. Report to be Sent : 21.12.2015
12. Protocol : APHA, 22<sup>nd</sup> Edition/ IS: Standard

Sl.No	Parameters	Protocol	Unit	Result
1.	pH	4500H <sup>+</sup> B	-	8.06
2.	Turbidity	2130 B	NTU	1.48
3.	Conductivity	2510 B	µs /cm	42300
4.	Acidity	2310 B	mg/L	BDL
5.	Total Dissolved Solids	2540 C	mg/L	26524
6.	Alkalinity	2320 B	mg/L	90.0
7.	Total Hardness	2340 C	mg/L	8800
8.	Calcium as Ca	3500-Ca	mg/L	600
9.	Magnesium as Mg	3500 Mg B	mg/L	1773.9
10.	Total Suspended Solids	2540 D	mg/L	92.0
11.	Dissolved Oxygen	4500-O C	mg/L	6.8
12.	Sulphate as SO <sub>4</sub>	4500-SO <sub>4</sub> <sup>2-</sup>	mg/L	72.29
13.	Chloride as Cl	4500-Cl B	mg/L	36217.49
14.	Iron as Fe	3500-Fe B	mg/L	0.03
15.	B.O.D (3 days in 27°C)	5210 B	mg/L	8.0
16.	Oil & Grease	5520 B	mg/L	BDL
17.	Fecal Coliform	9222 D	CFU/100ml	<1

BDL - Below Detectable Limit

\*\*\*End of Report\*\*\*

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## Test Report

### ANALYSIS REPORT OF SEDIMENT SAMPLE

1. Name of the Location : North Reef
2. Name of the Project : CRZ Sustainable Coastal Protection & Management  
Investment Program, (Tranche-1),  
Old Port Office Building Bunder,  
Mangalore-575001.
3. Sample Collected by : M/s. Environmental Health and Safety Research &  
Development Centre, Bangalore – 560 010.
4. Date of Collection : 11.12.2015
5. Particulars of Sample Collected : Sediment sample
6. Date of Sample Receipt : 18.12.2015
7. Sample Number : EHSRDC/ SCPMIP /S/15/12/10335
8. Report To be sent : 21.12.2015
9. Page No : 7 of 8

Sl.No	Parameters	Protocol	Unit	Result
1	Cadmium as Cd	Lab-SOP, QMA/SOIL/SOP	mg/kg	BDL
2	Total Chromium		mg/kg	18.53
3	Copper as Cu		mg/kg	3.5
4	Nickel as Ni		mg/kg	5.53
5	Mercury as Hg		mg/kg	BDL
6	Lead as Pb		mg/kg	1.23
7	Silver as Ag		mg/kg	20.36
8	Zinc as Zn		mg/kg	8.41
9	Oil & Grease		mg/kg	BDL
10	Polynuclear Aromatic Hydrocarbons		mg/kg	BDL

Note: BDL – Below Detectable Limit

\*\*\*End of Report\*\*\*

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## Test Report

### ANALYSIS REPORT OF SEDIMENT

1. Name of the Location : North Break Water
2. Name of the Project : CRZ Sustainable Coastal Protection & Management Investment Program, (Tranche-1), Old Port Office Building Bunder, Mangalore-575001.
3. Sample Collected by : M/s. Environmental Health and Safety Research & Development Centre, Bangalore - 560 010.
4. Date of Collection : 11.12.2015
5. Particulars of Sample Collected : Sediment sample
6. Date of Sample Receipt : 13.12.2015
7. Sample Number : EHSRDC/ SCPMIP /S/15/12/10336
8. Report To be sent : 21.12.2015
9. Page No : 8 of 8

Sl.No	Parameters	Protocol	Unit	Result
1	Cadmium as Cd	Lab-SOP, QMA/SOIL/SOP	mg/kg	0.8
2	Total Chromium		mg/kg	7.74
3	Copper as Cu		mg/kg	0.8
4	Nickel as Ni		mg/kg	1.43
5	Mercury as Hg		mg/kg	BDL
6	Lead as Pb		mg/kg	0.57
7	Silver as Ag		mg/kg	1.74
8	Zinc as Zn		mg/kg	6.89
9	Oil & Grease		mg/kg	BDL
10	Polynuclear Aromatic Hydrocarbons		mg/kg	BDL

Note: BDL - Below Detectable Limit

\*\*\*End of Report\*\*\*

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