ENVIRONMENTAL COMPLIANCE MONITORING REPORT
for
Navi Mumbai International Airport (NMIA)

Sponsor:

City and Industrial Development Corporation of Maharashtra Ltd (CIDCO)

Period:

October – December 2019

PREPARED BY

ADITYA ENVIRONMENTAL SERVICES PVT.LTD.
MOEFCC Recognized Laboratory under EP Act 1986
Accredited under ISO 9001: 2008 & OHSAS 18001: 2007 by ICQS
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1. INTRODUCTION

Mumbai Metropolitan Region (MMR) comprises of areas in and around Mumbai city and includes parts of Mumbai, Thane and Raigad Districts. Mumbai is known as the commercial capital of India and MMR is an industrial and technologically advanced region, which has experienced rapid growth in income and employment. The increasing trend in trading, business and financial services, demands highest order of infrastructure. There is need to enhance the capacity of airport as the existing airport in Mumbai experiencing tremendous pressure for meeting the air traffic demands of this vibrant region. Realizing the need of second airport for Mumbai, the Government of Maharashtra granted approval and appointed City & Industrial Development Corporation of Maharashtra Limited (CIDCO) as Nodal agency for implementation.

The site for the airport was selected near Panvel in Raigad district of Maharashtra state with central coordinates 18°59'33.00"N and 73°4'18.00"E. The Director General of Civil Aviation (DGCA) has approved the site. Environmental Impact Assessment (EIA) study was conducted by Centre for Environmental Science and Engineering (CESE), Indian Institute of Technology (IIT) Mumbai and updated report submitted in April 2011. Environmental Clearance was granted by Ministry of Environment and Forests vide F. No. 10-53/2009- IA.III dt 22.11.2010 and validity extended vide letter dt 20.12.2017.

Pre-development works for the site has started and as compliance to the Environmental clearance, CIDCO appointed Aditya Environmental Services Pvt. Ltd. (AESPL) to conduct Compliance Environmental Monitoring for the New Mumbai International Airport (NMIA) vide Tender No. C. A. No. 01 / CIDCO/ T&C/ CGM (T&A) / STE (S& A) / 2017-18 (2nd call – 1st Extension) & its Work Order No. CIDCO / T&C / CGM (T & A)/ STE (S-I& A)/2018/1383 dated 07.06.2018.

The sampling locations fixed by CIDCO for compliance monitoring once in month for Ambient Air Quality and Noise Level Monitoring; and once in each season (Post, pre & during monsoon) for Soil, ground water and marine/Surface water quality as per Tender are as given in Chapter II for month from October to December 2019. The assignment comprises monitoring of following parameters in and around the surrounding project area:

- Ambient air monitoring
- Ambient noise level monitoring
- Soil
- Ground/surface water
- Marine water for biological and physicochemical parameters.

2. SCOPE OF MONITORING WORK

2.1 Scope of Monitoring Work as per CIDCO Tender:

Scope of monitoring work as per CIDCO tender are as given below:

Table 2-1: Scope of Environmental Monitoring Work as per CIDCO Tender

Sr. No.	Parameters – as per Annexure B	Location	Frequency	Samples/ Year	Samples/ 2 years
1.	**Ambient Air Quality:** $PM_{2.5}$, PM_{10}, SO_2, NO_X, CO, Lead, Ammonia, Hydrocarbon (nMHC).	12	12 Stations per Month	144	288
2.	**Noise: Parameters: Leq Noise level** - Day time & Nighttime separately.	12	Same as per Air Quality	144	288
3.	**Soil: Parameters:** pH, Texture, EC, Na, Mg, K, Sodium Absorption Ratio (SAR), Permeability (cm/sec), Water Holding Capacity (%), Calcium, Cation Exchange Capacity & Porosity (%).	10	10 Stations per season (Post, Pre-& During Monsoon)	30	60
4.	**Ground Water Quality (35):** **Physical Parameters - p**H, Temperature, Turbidity, EC, Salinity, TSS, TDS. **Chemical Parameters:** DO, BOD, COD, Magnesium, Hardness, Alkalinity, Chloride, Sulphate, Fluoride, Sodium, Potassium, Phenol, Total Phosphorous, Total Nitrogen, Sodium Absorption Ratio (SAR), Nitrite-N, Nitrate-N, Calcium. **Heavy Metals:** Fe, Zn, Mg, Mn, Cd, Cr, Hg. **Bacteriological Parameters**; Coliform Count. Total Heterotrophic Bacteria. SPC/100ML.	10	10 Stations per season (Post, Pre-& During Monsoon)	30	60
5.	**Marine/Surface Water Quality parameters (35):** **Physico Chemical parameters:** PH, Temperature, Turbidity, EC, Salinity (ppt), TSS, TDS. **Chemical Parameters:** Nitrate-N, Nitrite N, Phosphate-P, Silicate, DO, BOD, COD, O&G, Magnesium, Hardness, Alkalinity, Chloride, Sulphate, Fluoride, Sodium, Potassium, Phenol, Total phosphorus, Total Nitrogen. **Heavy Metals:** Fe, Zn, Mg, Mn, Cd, Cr, Hg **Bacteriological parameters:** Coliform Count. Marine Biology: Phytoplankton & Zooplankton	13	13 stations per season (Post, Pre-& During Monsoon)	39	78

2.2 **Locations of Monitoring:**

Sampling Locations have been specified by CIDCO in its Tender. The monitoring was carried out at the same locations as fixed by CIDCO. Details of monitoring stations for Ambient Air Quality, Ambient Noise, Soil, Ground Water, Marine Water- physicochemical & biological and along with location maps showing station locations are as given below:

Table 2-2: Details of Ambient Air Quality Monitoring Stations as per CIDCO Tender

Station Code	Station	Remarks
A1	Panvel CIDCO Office	Location of meteorological station and in approach path of airport (residential zone)
A2	Khandeshwar Railway Station	Commercial activity center
A3	Kalamboli CIDCO Office	Receptor oriented as it is in residential zone
A4	Kharghar Nodal Office	Receptor oriented as it is in residential zone
A5	Belapur CIDCO Bhavan	Major commercial activity center, heavy traffic movement
A6	Pargaon High School	Receptor oriented - 400m from proposed runway
A7	Gavanphata Water Tank	Near to main traffic junction and hence heavy traffic movement
A8	Ambuja Cement Ltd	Industrial activity center
A9	Kille Gaothan Guest House	Receptor oriented – on main access road
A10	Panchsheel Guest House	Receptor oriented – on main access road
A11	Airport Entry – West (July to September 2019) GVK Office (October to December 2019)	High vehicular movement at the entry / exit at the west side, near Aamra Marg
A12	Airport Entry – East (July to September 2019) Karnala Sport Academy (October to December 2019)	High vehicular movement at the entry / exit at the east side, near NH4B

Figure 2-1: Map of Ambient Air Quality Monitoring Stations as per CIDCO Tender

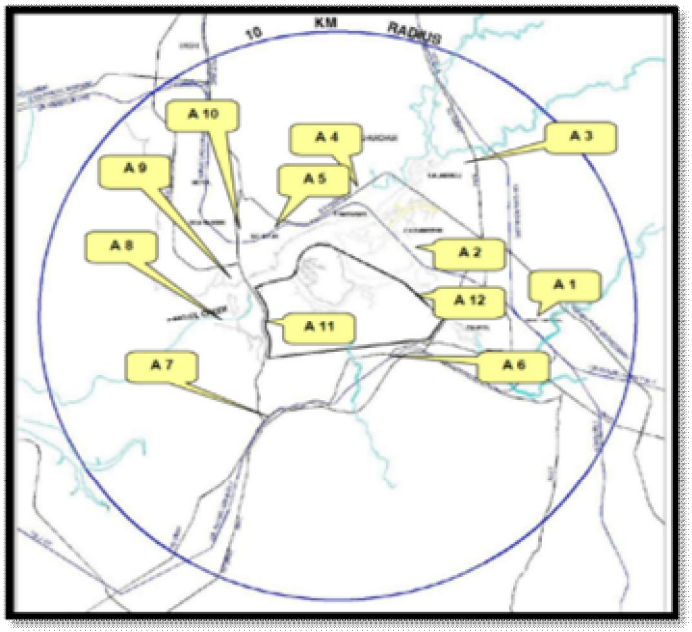


Table 2-3: Ambient Noise Level Monitoring Stations as per CIDCO Tender

Sr. No.	Station Name	Category of area
N1	Ambuja Cement Limited	Industrial area
N2	CIDCO Bhavan, CBD Belapur	Commercial area
N3	Palaspa Junction	Commercial area
N4	Teen Tank Gavanphata	Commercial area
N5	Panvel CIDCO Office	Residential Area (Mixed category)
N6	Kharghar Nodal Office	Residential Area
N7	Panchsheel Guest House	Residential Area
N8	Pargaon School	Sensitive area (Mixed category)
N9	MES School	Sensitive area (Mixed category)
N10	MGM Hospital, Kalamboli	Sensitive area (Mixed category)
N11	Swapna Nagari	Residential Area (Mixed category)
N12	Karnala Bird Sanctuary	Sensitive area

Figure 2-2: Map of Noise Level Monitoring Stations as per CIDCO Tender

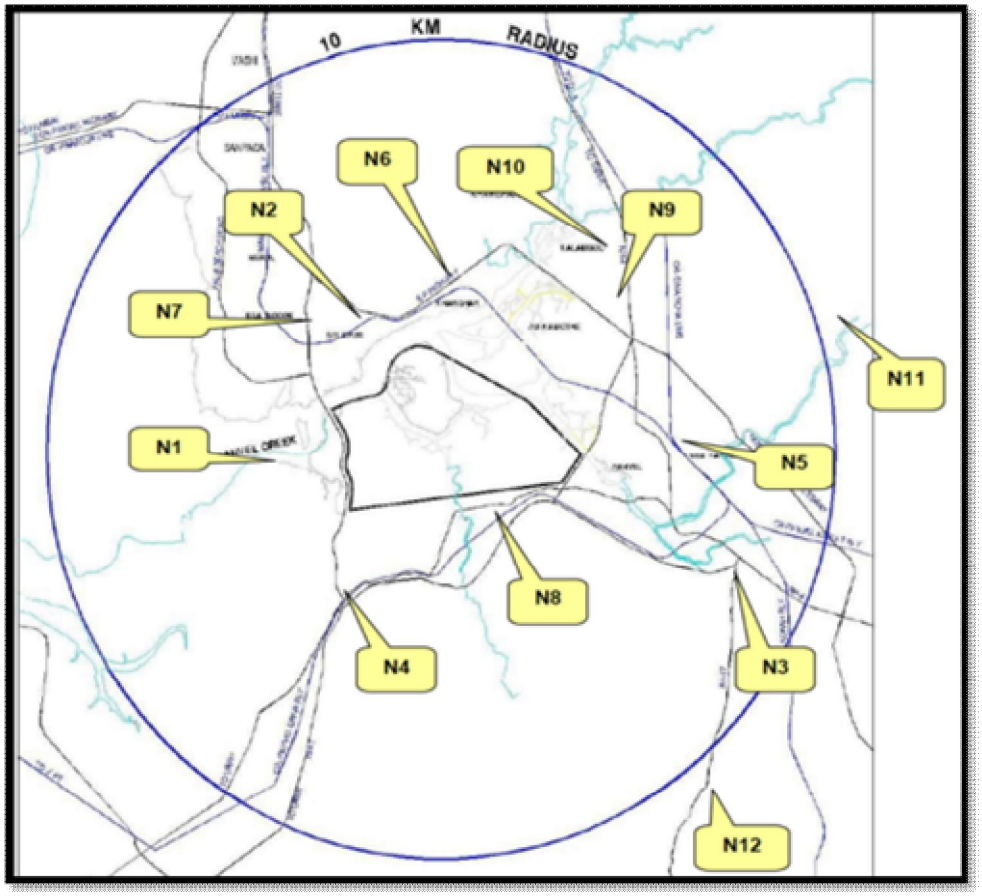


Table 2-4: Soil Quality Monitoring Stations as per CIDCO Tender

Station Code	Stations Name
S1	Targhar
S2	Kopar
S3	Kombadbhuje
S4	Koli
S5	Vaghivali
S6	Ganeshpuri
S7	Ulwe
S8	Pargaon
S9	Vaghivalivada
S10	Chinchpada

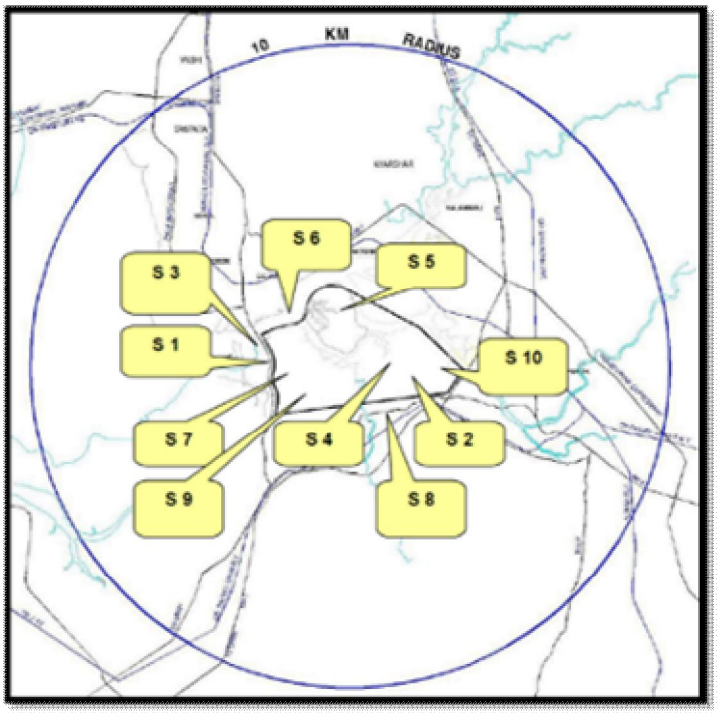


Figure 2-3: Map of Soil Quality Monitoring Stations as per CIDCO Tender

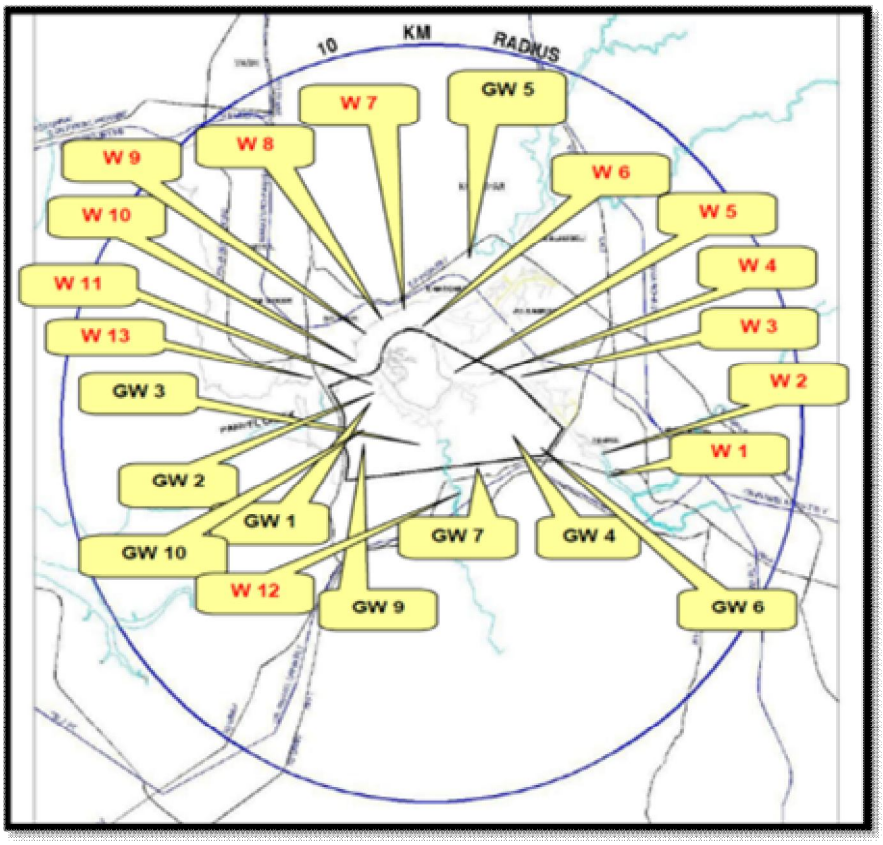
Table 2-5: Details of Ground Water Quality Monitoring Stations as per CIDCO Tender

Station Code	Stations Name
GW1	Open well at Kombadbhuje
GW2	Open well at Ganeshpuri
GW3	Open well at Vaghivalivada
GW4	Open well at Koli
GW5	Open well at Kopar
GW6	Open well at Chinchpada
GW7	Open well at Pargaon
GW8	Open well at Vaghivali
GW9	Open well at Ulwe
GW10	Open well at Targhar

Table 2-6: Details of Marine Water Quality Monitoring Stations as per CIDCO Tender

Station Code	Station details / Location
W1	Extreme end of Gadhi River (upstream side)
W2	Near Pargaon village (200m from W1) in Gadhi River
W3	Near Jui Village (300m from W2) in Gadhi River
W4	Near Kopar Khadi (300m from W3) in Gadhi River
W5	Near Vaghivali village (500m from W4) in Gadhi River
W6	Vaghivali creek junction (300m from W5) in Gadhi River
W7	Near Kharghar Rly Station (300m) in Gadhi River
W8	Near Belpada (300m from W7) in Gadhi River
W9	Near Konkan Bhavan (300m from W8) in Gadhi River
W10	Near Divala village (300m from W10) in Gadhi River
W11	At Junction of Ulwe and Gadhi Rivers in Panvel Creek
W12	In Ulwe River
W13	Near Rathi bander in Panvel Creek

Figure 2-4: Map of Surface Marine, Ground Water & Sediment Monitoring Stations as per CIDCO Tender



2.3 **Period/Time of Sampling (October to December 2019):**

The sampling survey was carried out as per following schedule during October to December 2019. Ambient Air quality, Noise Level Monitoring, Soil, Ground Water and Marine Water samples collected for Post monsoon (November 2019) and for the monthly sampling for October to December samples were collected only for Ambient Air and Noise as per scope of work as per CIDCO tender.

Table 2-7: Period/Time of Sampling for this Survey

Month	Parameter	Sampling Stations	Dates of Sampling	Time Period
October 2019	AAQ	A3, A4, A5	19.10.19	24 hours starting from 10:00am
		A1, A2, A12	22.10.19	
		A9, A10, A11	23.10.19	
		A6, A7, A8	24.10.19	
	NLS	N5, N6, N7, N11	19-20.10.19	
		N8, N9, N10, N12	20-21.10.19	
		N1, N2, N3, N4	21-22.10.19	24 hours starting from 10:00am
November 2019	AAQ	A1, A2, A3	25.11.19	
		A4, A5, A10	26.11.19	
		A8, A9, A11	27.11.19	
		A6, A7, A12	28.11.19	
	NLS	N5, N6, N7, N11	25-26.11.19	
		N8, N9, N10, N12	26-27.11.19	
		N1, N2, N3, N4	27-28.11.19	
	Soil	S1, S2, S3, S4, S5, S6, S7, S8, S9, S10	28.11.19	Grab Sample
	GW	GW1, GW3, GW4, GW6, GW7, GW8, GW9, GW10	28.11.19	Grab Sample
	Marine Water	W1, W2, W3, W4, W5, W12	29.11.19	Grab Sample
		W6, W7, W8, W9, W10, W11, W13	30.11.19	
December 2019	AAQ	A7, A9, A10, A11	25.12.19	24 hours starting from 10:00am
		A2, A6, A8, A12	26.12.19	
		A1, A3, A4, A5	27.12.19	
	NLS	N5, N6, N7, N11	25-26.12.19	
		N8, N9, N10, N12	26-27.12.19	
		N1, N2, N3, N4	27.28.12.19	

3. METHODOLOGY ADOPTED FOR ENVIRONMENTAL MONITORING

3.1 AMBIENT AIR QUALITY

3.1.1 Reconnaissance Survey:

Reconnaissance survey in study area (10 km around proposed airport site) shows that sources of air pollution include the following:

- heavy traffic along Amara Marg, NH4B and Uran / JNPT Road
- construction activity
- industries in Panvel industrial estate (private)
- burning of poor quality fuels in villages within proposed site and nearby

In order to arrest the deterioration in air quality, Govt. of India has enacted Air (Prevention and Control of Pollution) Act in 1981. The responsibility has been further emphasized under Environment (Protection) Act, 1986. Therefore, Central Pollution Control Board had published guideline for measurement of Ambient Air Pollutants Quality Monitoring (NAAQM) in November 2009 at national level.

3.1.2 Methodology for Ambient Air Quality Monitoring:

To monitor Air Pollutants in Ambient air following method of analysis adopted

S N	Parameter	Sampling Equipment	Method of Analysis	Reference
1.	PM_{10}	RSPM Sampler/ Glass Fiber filter paper.	Gravimetric analysis	CPCB Guidelines Manual 2011
2.	$PM_{2.5}$	$PM_{2.5}$ Sampler/Filter – PTFE, Teflon membrane	Gravimetric analysis	CPCB Guidelines Manual 2011
3.	SO_2	Absorption in TCM	West & Gaeke Method	CPCB Guidelines Manual 2011
4.	NO_X	Absorption in NaOH	Jacob – Hochheiser (Sodium Arsenic)	CPCB Guidelines Manual 2011
5.	CO	Sampling in Tedler bags / CO Meter	GC with Methaniser	CPCB Guidelines Manual 2011
6.	Lead	Sampling using EPM 2000 equivalent Glass Fiber Filter paper	AAS Method	CPCB Guidelines Manual 2011
7.	NH_3	Absorption in sulfuric acid	Indophenol Method	CPCB Guidelines Manual 2011
8.	nMHC	Collection Activated Carbon	Gas Chromatography	APHA

Figure 3-1 Ambient Air Quality Monitoring

3.1.3 Selection of air sampling location

Selection of representative location is very important. Following precautions have been taken while installing AAQM stations:

- It is away from source & other interferences
- Samplers are installed at free flowing well mixed area (3m) above ground level
- Only Calibrated Air Samplers are used
- the samples are transported to the laboratory at the earliest for further analysis
- Gaseous samples were preserved in cold box before taking to laboratory

3.2 AMBIENT NOISE LEVEL

3.2.1 Reconnaissance Survey:

Reconnaissance survey in study area (10 km around proposed airport site) shows that sources of air pollution include the following:

- heavy traffic along Amara Marg, NH4B and Uran/JNPT Road
- construction activity
- industries in Panvel industrial estate (private)
- noise from human habitats/villages within proposed site and nearby

Noise pollution in urban areas is now being recognized as a major environmental issue around the world. With increasing awareness of the adverse impacts of noise on human health, more and more people becoming less tolerant to environmental noise. The objective of this exercise is to assess the baseline status within study area and to compare the noise levels with Ambient Noise Standards for the area.

3.2.2 Methodology for Sample Collection

Integrated Sound Level Meter C390 was used for undertaking the surveys and installed on tripods at the selected locations over a 24-hour period. This Meter is then taken to laboratory where the data collected is downloaded onto PC using specialized software.

Center C-390 Sound level Meter with data logger

Noise is measured in decibel (dB) and 'A' weighting is used for this entire monitoring since in this method of frequency weighting, the signal generated reproduces the way the human ear responds to a range of acoustic frequencies. Leq: The equivalent continuous Sound Pressure Level for a particular duration. The Day-Night Equivalent Sound Level refers to average sound exposure over a 24- hour period. Leq day & night values are calculated from hourly Leq values, with the Leq values for the nighttime increased by 10 dB to reflect the greater disturbance potential from nighttime noises.

Figure 3-2 Ambient Noise level Monitoring

3.3 **Soil**

The purpose of soil testing is to identify the soil fertility that the plants or crop, in a given area will experience.

3.3.1 Reconnaissance Survey:

The study area is rural in character and large tracts are being cultivated as paddy fields. Soil is also seen plentifully at bottom of hills where it supports large vegetation.

3.3.2 Methodology of Sample Collection:

Soil samples are collected after removing top two inches – which may contain high amount of organic carbon and humus. The soil area and volume could be a large field, a small garden, or simply the root zone of a single tree or shrub. The most difficult step in soil testing is accurately representing the desired area of soil. When the sampling area is determined, a sufficient number of soil cores taken to acquire a representative sample. This is generally 10 to 20 cores. The depth of sample for surface soils was taken from 0 to 6 inches or as deep as the primary tillage.

Soil samples collected from proposed project stations by using stainless steel soil sampling probe, packed in labeled polythene bags & send for analyze the physicochemical characteristics. The sample so collected is then made representative by coning- quartering and then stored in plastic bags, sealed and then sent to laboratory for analysis.


Figure 3-3 Soil Sample Collection

3.4 **GROUND WATER SAMPLING**

3.4.1 Reconnaissance Survey:

The villages in study area use ground water from open/bore well and use it for drinking and other domestic purposes. Ground water gets contaminated due to bad sanitary habits such as washing of utensils, cattle and bathing and location of septic tanks in/near the open wells.

3.4.2 Methodology of Sampling:

Ground water sample is collected by using containers and the sampling container is rinsed before using it for storing water samples. Ground water samples are stored in two separate containers for Physicochemical & Microbiological analysis and preservatives added as recommended by Standard Methods APHA, stored in cold storage box and transferred to the laboratory for the further analysis.


Figure 3-4 Ground Water Sampling

3.5 MARINE WATER, SEDIMENTS & PLANKTON SAMPLING EQUIPMENTS

3.5.1 Reconnaissance Survey:

The study area represents complex hydrodynamic system. The Ulwe river flows down through the mountains (to the south) in the centre of project site and joins the Panvel creek. The Gadhi river flows from the East to the West. The Ulwe river will be diverted/retrained as part of the project and the Gadhi river will be partly retrained towards the northern part of the site. The river Gadhi receives sewage from Panvel town and nearby areas. Both the rivers drain into the Panvel creek which drains into the Arabian sea to the west. The Panvel creek also received effluents from CETP at MIDC Taloja and sewage from NMMC STPs in Nerul.

3.5.2 Methodology of Sampling:

3.5.2.1 Niskin Bottle - Marine Water Sampler

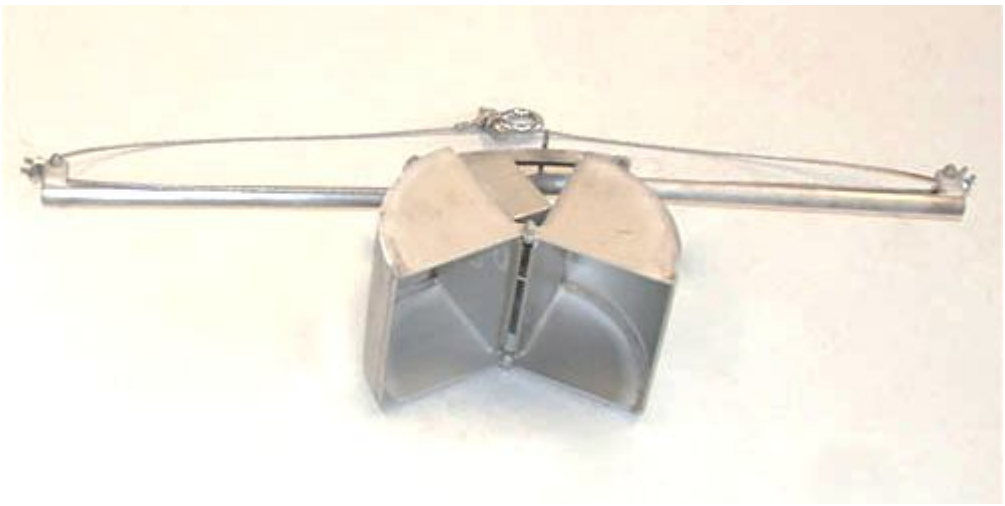
This Water Sampler is used to collect samples at various water depths and can operate at any depth on a cable or line with a messenger.

3.5.2.2 Plankton Net - Biological Samples

This plankton net operates a cable or lined by hand or behind a boat, it can be towed vertically or horizontally. Nets comes in varieties of size (Mesh no 00 equal an aperture of 0.30 inches)

3.5.2.3 Grab Sampler - For Marine Sediments

Sediment grab operate at any depth on a cable or line by free fall (without a messenger). It is extremely heavy and can take samples of hardest rocky ocean bottoms.



Grab Sampler

3.5.2.4 Selection of Stations, Preservation and Transportation of Samples:

Marine water samples were collected from sampling locations in Gadhi River, Ulwe River and Panvel Creek at the locations indicated by CIDCO – in all, 13 samples were collected from 13 sampling locations for physicochemical and Biological samples (Stations 1 to 10 are located in Gadhi River & Station 11 & 13 are Panvel Creek while station 12 in Ulwe River. A good amount of mangrove vegetation was noted on either side of stream 4 to 6. Sampling locations were approached by boats (wherever possible) and collection done irrespective of tide. Sampling were done only for surface water. The samples were preserved and taken to laboratory using vehicle on same day.

3.6 **Laboratory Credentials**

Sampling and analysis were done by laboratory of Aditya Environmental Services Pvt Ltd located at Plot P-1, MIDC Commercial plots, Mohopada, Tal Panvel, Dist. Raigad.

- Our Environmental Laboratory is recognized by Ministry of Environment & Forest (MoEFCC), Govt. of India under Environment (Protection) Act, 1986.
- Laboratory is also certified ISO 9001:2015 and OHSAS 18001:2007.
- Laboratory is accredited under ISO/IEC 17025:2005 (TC-7085) for water, wastewater and soil parameters
- Environmental sampling conducted by our experienced, qualified environmental staff & Analysis and reporting by approved Government Analyst.
- Instruments used for sampling are from reputed manufacturer & are regularly calibrated.
- Chemicals used are Analytical Reagent grade and from reputed manufacturer.
- Analytical Instrumentation used in the laboratory is regularly calibrated.
- We have regular program of Preventive & Annual Maintenance for all critical equipment.
- Ground Water, Soil Analysis - using APHA, BIS, ASTM & CPCB standards Methods for water Analysis.
- Standard Methods Adopted in the laboratory are those prescribed by APHA, BIS, ASTM & CPCB for water, waste & marine water analysis using methods as per NIO (National Institute of Oceanography) Manual.
- We have CRMs (Certified Reference Material) for heavy metals from reputed manufacturers for heavy metals and Standard sea water which we use for analysis.
- We are regularly participating in Proficiency testing with reputed Organizations like Central Pollution Control Board (CPCB), Goa State Pollution Control Board and others as also Intra laboratory QC testing to check performance of our chemists.
- Overall approach & methodology is with Annexure IA Scope of the work & the Best practices as per prevailing norms of Central Pollution Board /Ministry of Environment & Forest etc. /Internationally adopted practices.

4. COMPILATION OF DATA & INFERENCE

4.1 Ambient air quality monitoring report

4.1.1 AAQM Data

Ambient Air Quality was monitored at various locations for relevant parameters as per NAAQS standards published by CPCB in November 2009 considering that the present project is for development of International Airport for Navi Mumbai area. Data is compiled and presented below:

Table 4-1: Ambient Air Quality monitoring at various stations during **October 2019**

Sampling Locations	Kharghar Nodal Office (A4)	Belapur CIDCO Office (A5)	Kalamboli CIDCO Office (A3)	Panvel CIDCO Office (A1)	Khandeshwar Railway Station (A 2)	Karnala Sports Academy (A12)	Kille Gaothan Guest House (A9)	Panchsheel guest House (A10)	GVK Office (A11)	Pargaon High School (A 6)	Gavanphata Water Tank (A7)	Ambuja Cement Ltd (A8)	Limit #	Unit
Sampling Date	**19.10.19**			**22.10.19**			**23.10.19**			**24.10.2019**				
$PM_{2.5}$	19.7	19.5	20.0	18.7	19.5	19.1	19.0	19.1	19.5	20.4	20.0	20.8	60	µg/m3
PM_{10}	60.8	60.8	61.2	58.7	60.4	58.3	59.1	59.3	59.5	62.5	60.4	63.3	100	µg/m3
SO_2	12.2	12.0	12.3	11.6	11.8	11.7	11.9	11.9	12.1	11.3	12.3	12.7	80	µg/m3
NO_X	17.6	17.4	17.2	16.9	17.9	17.1	17.9	17.6	18.0	18.1	17.9	18.9	80	µg/m3
CO	0.18	0.23	0.20	0.18	0.21	0.22	0.23	0.22	0.21	0.21	0.20	0.23	4	mg/m3
Lead	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	1	µg/m3
NH_3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	400	µg/m3
nMHC	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	0.24	ppm

BDL–Below Detectable Limit (Note # Limits as per National Ambient Air Quality Standards NAAQS,2009)

Table 4-2: Ambient Air Quality monitoring at various stations during **November 2019**

Sampling Locations	Panvel CIDCO Office (A1)	Khandeshwar Railway Station (A 2)	Kalamboli CIDCO Office (A3)	Kharghar Nodal Office (A4)	Belapur CIDCO Office (A5)	Panchsheel guest House (A10)	Ambuja Cement Ltd (A8)	Kille Gaothan Guest House (A9)	GVK Office (A11)	Pargaon High School (A 6)	Gavanphata Water Tank (A7)	Karnala Sports Academy (A12)	Limit #	Unit
Sampling Date	**25-11-2019**			**26-11-2019**			**27-11-2019**			**28-11-2019**				
$PM_{2.5}$	20.1	20.6	20.	20.0	20.4	19.8	21.6	19.8	20.8	20.7	20.8	19.4	60	µg/m3
PM_{10}	61.7	62.7	64.6	62.4	63.8	61.0	64.8	61.1	64.2	64.2	62.4	57.5	100	µg/m3
SO_2	12.8	12.5	12.8	12.9	12.6	12.5	13.0	12.4	12.7	12.5	12.8	12.0	80	µg/m3
NO_X	20.2	19.8	20.1	20.6	20.0	19.5	20.1	19.7	19.9	19.8	19.6	17.9	80	µg/m3
CO	0.20	0.24	0.23	0.22	0.21	0.21	0.21	0.22	0.24	0.23	0.22	0.20	4	mg/m3
Lead	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	1	µg/m3
NH_3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	400	µg/m3
nMHC	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	0.24	ppm

BDL–Below Detectable Limit (Note # Limits as per National Ambient Air Quality Standards NAAQS,2009)

Table 4-3: Ambient Air Quality monitoring at various stations during **December 2019**

Sampling Locations	Gavanphata Water Tank (A7)	Kille Gaothan Guest House (A9)	Panchsheel guest House (A10)	GVK Office (A11)	Khandeshwar Railway Station (A 2)	Pargaon High School (A 6)	Ambuja Cement Ltd (A8)	Karnala Sport Academy (A12)	Panvel CIDCO Office (A1)	Kalamboli CIDCO Office (A3)	Kharghar Nodal Office (A4)	Belapur CIDCO Office (A5)	Limit #	Unit
Sampling Date	**25-12-19**				**26-12-19**				**27-12-19**					
$PM_{2.5}$	21.2	20.6	20.7	21.2	21.8	20.1	21.8	20.3	20.7	21.6	21.3	21.8	60	µg/m³
PM_{10}	64.5	63.4	63.5	62.6	64.5	62.6	65.5	61.1	63.0	65.0	64.7	64.0	100	µg/m³
SO_2	13.1	12.9	13.7	13.2	13.0	12.9	13.8	12.7	13.3	13.7	13.4	13.0	80	µg/m³
NO_X	20.4	20.6	21.8	20.8	20.9	20.7	21.5	18.9	21.5	21.4	21.8	21.4	80	µg/m³
CO	0.24	0.25	0.24	0.22	0.22	0.20	0.24	0.22	0.23	0.25	0.24	0.23	4	mg/m³
Lead	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	1	µg/m³
NH_3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	400	µg/m³
nMHC	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	0.24	ppm

BDL–Below Detectable Limit (Note # Limits as per National Ambient Air Quality Standards NAAQS,2009)

4.1.2 Inference of AAQM Data

The concentration of Particulate Matter – 10 μ (PM_{10}) was observed in range of 57.5 – 65.5 $\mu g/m^3$ - at all sampling locations monitored and level of Particulate Matter - 2.5 μ (PM 2.5) were noted under NAAQS limit i.e. in range of 18.7 - 21.8 $\mu g/m^3$ at all stations monitored. Gaseous pollutants - Nitrogen Oxide, Sulfur Dioxide and Carbon Monoxide are under NAAQS norms during collection period (October to December 2019). Lead, Ammonia and nMHC were found below detectable level.

4.2 AMBIENT NOISE LEVEL MONITORING REPORT

4.2.1 Noise Level Data

Ambient Noise level was monitored over 24 hours' duration for Day and Nighttime as per Schedule - II of Environmental Protection Act 1986 for Industrial, Commercial, Residential and Sensitive Area (Refer Table 2.3).
Results of analysis are compiled below:

Table 4-4: Ambient Noise Level monitoring during October to December 2019

Stn Code	Sampling Location	Sampling Date	Observed Value (Leq) (dB(A))						Limiting Standard (Leq) as per EP Act Schedule II. dB(A)	
			Day Time			Nighttime				
			Max	Min	Avg	Max	Min	Avg	Day Time	Nighttime
N 5	Panvel CIDCO Office	19-20.10.19	96.6	42.5	68.6	70.2	40.3	68.7	**55**	**45**
N 6	Kharghar Nodal Office		82.0	59.6	64.1	71.0	57.7	60.9	**55**	**45**
N 7	Panchsheel Guest House		79.5	30.0	63.7	78.5	55.5	61.4	**55**	**45**
N 11	Swapna Nagari		78.5	34.7	68.4	70.8	31.6	54.3	**55**	**45**
N 8	Pargaon High School	20-21.10.19	74.5	34.8	65.2	66.9	30.1	52.4	**50**	**40**
N 9	MES School		77.3	32.5	57.8	63.8	31.7	53.6	**50**	**40**
N 10	MGM Hospital Kalamboli		78.7	42.2	65.0	60.7	32.6	46.5	**50**	**40**
N 12	Karnala Bird Sanctuary		81.5	31.1	45.6	51.9	27.8	35.5	**50**	**40**
N 1	Ambuja Cement Ltd	21-22.10.19	83.6	52.3	63.1	84.8	49.9	60.9	**75**	**70**
N 2	CIDCO Bhavan CBD Belapur		88.1	55.1	68.6	80.3	56.3	63.0	**65**	**55**

Stn Code	Sampling Location	Sampling Date	Observed Value (Leq) (dB(A))						Limiting Standard (Leq) as per EP Act Schedule II. dB(A)	
			Day Time			Nighttime				
			Max	Min	Avg	Max	Min	Avg	Day Time	Nighttime
N 3	Palaspa Junction		78.5	40.6	66.7	62.3	34.0	53.8	**65**	**55**
N 4	Teen Tank Gavan Phata		70.8	50.7	62.5	60.8	30.6	52.1	**65**	**55**
N 5	Panvel CIDCO Office	25-26.11.19	75.3	47.4	55.5	68.5	52.7	55.3	**55**	**45**
N 6	Kharghar Nodal Office		72.7	59.3	62.5	68.7	56.4	60.0	**55**	**45**
N 7	Panchsheel Guest House		77.8	51.3	63.8	72.9	52.1	60.5	**55**	**45**
N 11	Swapna Nagari		75.8	35.1	65.2	68.3	33.0	52.4	**55**	**45**
N 8	Pargaon High School	26-27.11.19	78.2	38.3	40.6	58.8	37.8	41.7	**55**	**45**
N 9	MES School		78.8	40.2	59.6	65.1	33.5	52.5	**55**	**45**
N 10	MGM Hospital Kalamboli		82.5	55.9	68.6	85.2	67.8	68.8	**55**	**45**
N 12	Karnala Bird Sanctuary		84.3	28.8	43.9	52.9	28.2	33.0	**55**	**45**
N 1	Ambuja Cement Ltd	27-28.11.19	80.8	54.5	60.7	79.5	52.1	56.8	**75**	**70**
N 2	CIDCO Bhavan CBD Belapur		90.5	56.8	66.3	77.6	55.1	62.7	**65**	**55**
N 3	Palaspa Junction		72.2	41.7	64.0	63.7	35.5	51.2	**65**	**55**
N 4	Teen Tank Gavan Phata		68.5	52.2	61.1	58.6	33.7	50.6	**65**	**55**
N 5	Panvel CIDCO Office	25-26.12.19	76.3	32.9	49.5	52.1	32.2	40.5	**55**	**45**
N 6	Kharghar Nodal Office		92.6	38.5	55.2	59.9	32.9	41.9	**55**	**45**
N 7	Panchsheel Guest House		95.6	33.0	42.8	61.0	31.8	38.7	**55**	**45**
N 11	Swapna Nagari		74.2	37.2	61.9	66.3	32.2	51.3	**55**	**45**
N 8	Pargaon High School	26-27.12.19	89.7	33.6	46.5	57.0	31.8	42.0	**55**	**45**
N 9	MES School		80.8	41.7	60.3	67.7	34.6	48.6	**55**	**45**
N 10	MGM Hospital Kalamboli		94.1	36.9	54.4	58.3	32.7	38.4	**55**	**45**
N 12	Karnala Bird Sanctuary		84.9	35.0	50.2	59.0	32.5	44.2	**55**	**45**
N 1	Ambuja Cement Ltd	27-28.12.19	80.7	45.3	57.8	73.7	46.5	56.7	**75**	**70**
N 2	CIDCO Bhavan		87.9	44.6	67.0	76.1	54.8	60.6	**65**	**55**

Stn Code	Sampling Location	Sampling Date	Observed Value (Leq) (dB(A))						Limiting Standard (Leq) as per EP Act Schedule II. dB(A)	
			Day Time			Nighttime				
			Max	Min	Avg	Max	Min	Avg	Day Time	Nighttime
	CBD Belapur									
N 3	Palaspa Junction		76.0	37.1	53.0	59.0	34.0	48.2	**65**	**55**
N 4	Teen Tank Gavan Phata		76.9	35.5	42.1	59.1	32.0	38.0	**65**	**55**

4.2.2 Inference of Noise Data

During daytime, the average Noise level was observed in the range of 40.6 -68.6 dB(A) & Nighttime levels were observed at 33.0 – 68.8 dB(A) during sampling period. Following observations are made about average Noise levels in the monitoring carried out in different months:

- In October 2019 average Noise level exceeded the EP Act Standards during day time as well as night time at Panvel CIDCO Office (68.6 & 68.7 dBA), Kharghar Nodal Office (64.1 & 60.9 dBA), Panchsheel Guest House (63.7 & 61.4 dBA), Swapna Nagari (68.4 & 54.3 dBA), Pargaon High School (65.2 & 52.4 dBA), MES School (57.8 & 53.6 dBA), MGM Hospital Kalamboli (65.0 & 46.5 dBA), CIDCO Bhavan (68.6 & 63.0 dBA), only during day time at Palaspa Junction (55.7 dBA) respectively were higher than NAAQS limits.
- In November 2019 average Noise level exceeded the EP Act Standards during day time as well as night time at Panvel CIDCO Office (55.5 & 55.3 dBA), Kharghar Nodal Office (62.5 & 60.0 dBA), Panchsheel Guest House (63.8 & 60.5 dBA), Swapna Nagari (65.2 & 52.4 dBA), MES School (59.6 & 52.5 dBA), MGM Hospital Kalamboli (68.6 & 68.8 dBA), only during day time at CIDCO Bhavan (62.7 dBA) respectively were higher than NAAQS limits.
- In December 2019 average Noise level exceeds the EP Act Standards during daytime as well as nighttime at Swapna Nagari (61.9 & 51.3 dBA), MES School (60.3 & 48.6 dBA), CIDCO Bhavan (67.0 & 60.6 dBA), only during nighttime at Kharghar Nodal Office (55.2 dBA) respectively were higher than NAAQS limits.

All other stations show the noise below the EP Act Standard during study period from October to December 2019.

4.3 SOIL QUALITY MONITORING REPORT

4.4.1 Soil Analysis Data

Data on soil analysis is compiled and presented below for the sampling period:

Table 4-5: Soil analysis of various stations in study area during post monsoon **November 2019**

Sr. No.	Locations / Sampling Date		Targhar (S1)	Kopar (S2)	Kombadbhuje (S3)	Koli (S4)	Vaghivali (S5)	Ganeshpuri (S6)	Ulwe (S7)	Pargaon (S8)	Vaghivalivada (S9)	Chinchpada (S10)	Unit
			28-11-2019										
1.	pH		6.92	6.82	6.82	6.94	6.85	6.90	6.87	6.84	6.80	6.80	--
2.	Texture	Clay	68	75	81	69	74	68	72	80	80	69	%
		Silt	25	14	10	20	18	23	22	10	10	19	
		Fine Sand	10	11	9	11	08	09	06	10	10	12	
3.	Conductivity		280.9	340	280.8	250.8	340.8	290.4	298.4	299.4	280.8	290.8	µS/cm
4.	Sodium (Na)		40	50	50	30	60	60	20	80	40	60	Kg/hectare
5.	Magnesium (Mg)		11	12	11	13	11	12	12	11	13	12	meq/l
6.	Potassium (K)		90	100	80	100	80	80	100	80	80	80	Kg/hector
7.	Sodium Absorption Ratio (SAR)		8.7	10.7	10.7	6.3	13.1	12.8	4.3	17.1	8.3	12.8	%
8.	Permeability		0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	Cm/sec
9.	Water Holding Capacity (WHC)			42.4	42.6	42	45.8	44.6	40.8	44.5	42.3	40.5	%
10.	Calcium (Ca)		31	32	33	33	31	32	32	33	33	32	meq/l
11.	Cation Exchange Capacity (CEC)		80	100	100	60	120	120	40	160	80	20	Cmol/Kg
12.	Porosity		16.8	12.4	12.9	12.8	14.8	14.8	14.2	15.2	12.3	14.2	%

4.4.2 Soil Data Inference during Post Monsoon November 2019:

The texture composition of soil is changed due to land filling activities at all villages. There was marginal high level of metals like Sodium at Vaghivali, Pargaon, Ganeshpuri and Chinchpada; and Potassium at Kopar, Ulwe and Targhar respectively. Slightly high level of Calcium was observed at Kombadbhuje, Koli, Pargaon and Vaghivalivada. The metal concentration increased in soil due to ongoing landfilling activities. The soil project site is low permeable and has low porosity. Overall soil quality was observed fertile in nature and suitable to grow local plants varieties at all locations.

4.4 **GROUND WATER QUALITY ANALYSIS REPORT**

4.5.3 GW Analysis Data during Post monsoon (November 2019)

The physicochemical analysis of ground water study showed considerable variation and is compiled and presented below:

Table 4-6: Ground Water analysis at various stations during November 2019

Sr. No.	Sampling Locations	GW 1	GW 2	GW 3	GW 4	GW 5	GW 6	GW 7	GW 8	GW 9	GW 10
	Sampling month	28.11.19									
1	pH	6.91		6.82	6.82		6.83	7.12	7.81	7.72	7.08
2	Turbidity	2.0		2.0	2.0		2.0	3.0	2.0	2.8	2.0
3	Temperature	27.2		27.6	27.2		28.0	27.3	27.3	27.4	27.5
4	Conductivity	155.2		195.2	184.9		170.6	201.3	56.3	136.5	142.5
5	Salinity	1.4		1.3	1.2		1.2	0.10	0.02	0.09	0.06
6	SS	16		22	14		28	34	18	42	30
7	Total Dissolved Solid	120		120	110		140	150	40	80	110
8	Dissolved Oxygen	6.3		6.6	6.4		6.3	6.5	5.6	6.0	6.3
9	BOD	14		18	4.0		20	16	4.0	04	6.0
10	COD	50		50	10		60	50	10	20	20
11	Magnesium (as Mg)	7.68		11	15.8		6.72	22.08	14.4	26.8	3.84
12	Hardness (as CaCO3)	194		140	222		92	240	92	198	46
13	Alkalinity	190		132	250		80	228	84	172	42
14	Chlorides (as Cl)	35		80	22		88	69	16	32	42
15	Sulphate (as SO4-2)	65.8		18	72.87		50	51	15	10	22
16	Fluoride (as F)	BDL		BDL	0.2		BDL	BDL (DL-0.02)	BDL(DL-0.2)	BDL (DL-0.05)	BDL(DL-0.2)
17	Sodium (as Na)	3.0	Village Reclaimed	4.0	2.0	Village Reclaimed	2.0	4.0	4.0	3.0	5.0
18	Potassium (as K)	4.0		5.0	3.0		2.0	6.0	2.0	5.0	4.0
19	Phenolic Compound	BDL		BDL	BDL		BDL	BDL	BDL	BDL	BDL
20	Total phosphorous	BDL		BDL	BDL		BDL	BDL	BDL	BDL	BDL
21	TKN	BDL		BDL	BDL		BDL	BDL	BDL	BDL	BDL
22	Sodium absorption ratio	0.3		0.3	0.3		0.3	0.72	0.56	0.59	0.56
23	Nitrate (as NO3-)	BDL		BDL	BDL		BDL	BDL	BDL	BDL	BDL
24	Nitrite (as NO-2)	BDL		BDL	BDL		BDL	BDL	BDL	BDL	BDL
25	Calcium (as Ca)	64.8		34.4	37.4		28.8	59.2	12.8	34.4	12.0
26	Iron (as Fe)	0.05		0.07	0.06		0.05	0.07	0.04	0.06	0.02
27	Zinc (as Zn)	BDL		BDL	BDL		BDL	BDL (DL-0.01)	BDL	BDL	BDL
28	Manganese (as Mn)	BDL		BDL	BDL		BDL	BDL	BDL	BDL	BDL
29	Cadmium (as Cd)	BDL		BDL	BDL		BDL	BDL	BDL	BDL	BDL
30	Chromium (as Cr)	BDL		BDL	BDL		BDL	BDL	BDL	BDL	BDL
31	Mercury (as Hg)	BDL		BDL	BDL		BDL	BDL	BDL	BDL	BDL
32	Coliform (MPN/ 100ml)	>1600		>1600	>1600		>1600	>1600	>1600	>1600	>1600
33	Heterophilic Bacteria (SPC/100ml)	113×10^{-3}		125×10^{-3}	118×10^{-3}		110×10^{-3}	126×10^{-3}	140×10^{-3}	121×10^{-3}	113×10^{-3}

GW1: Open Well at Kombadbhuje; GW2: Well near pond at Ganeshpuri; GW3: Open well at Vaghivalivada; GW4: Open Well at Koli; GW5: Open well at Kopar; GW6: Open well at Chinchpada; GW7: A well Near Pargaon; GW8: Well near Vaghivali; GW9: Open well at Ulwe; GW10: Well near pond at Targhar

BDL: Below Detectable Limit

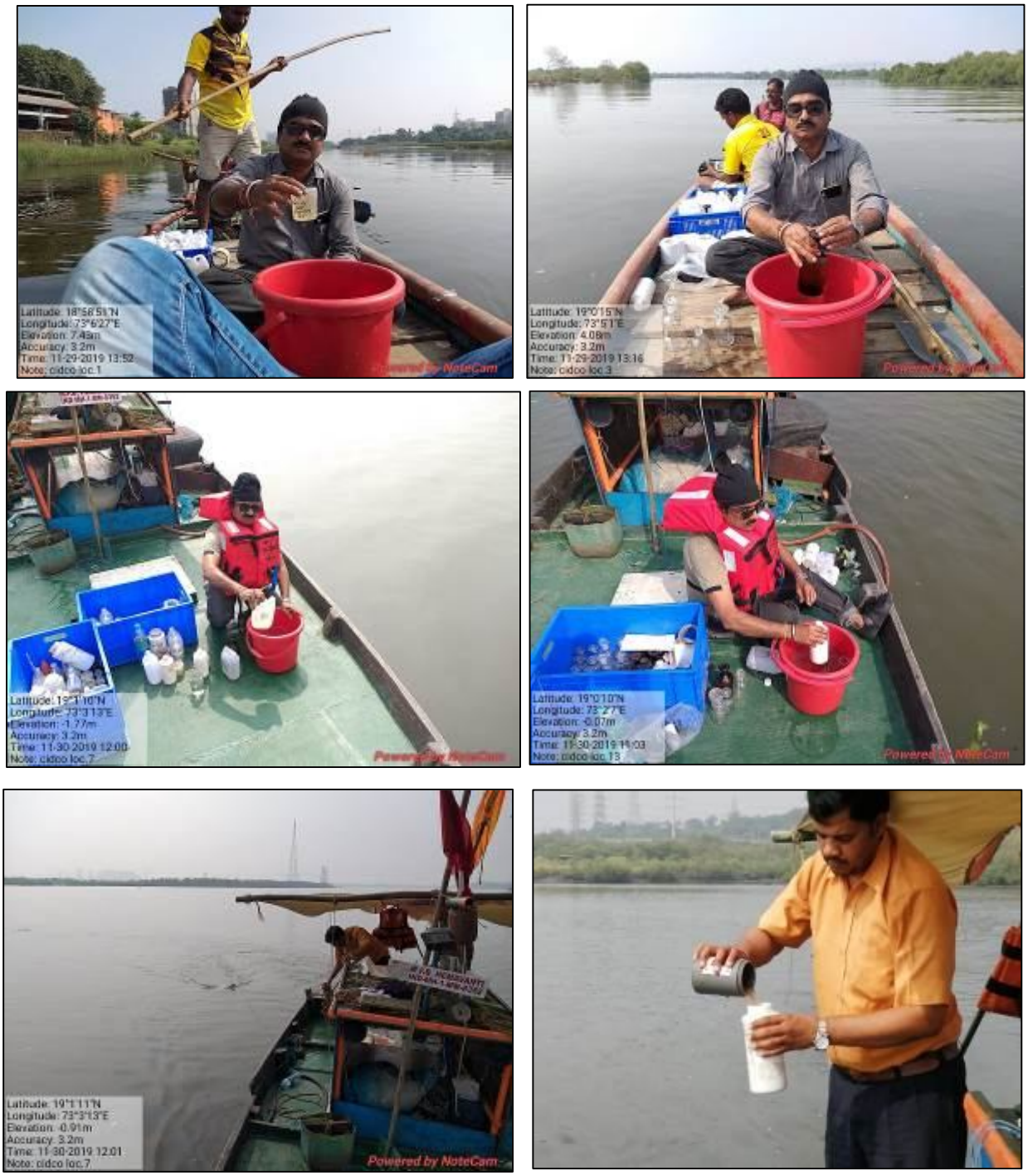
4.5.4 GW Analysis Inference:

The ground water quality showed considerable variation. Some ground water parameters were within desirable limit, some between desirable and permissible limit and few exceeded the permissible limit. The ground water not fully complied the quality requirements as per IS 10500 revised in 2012 for purpose of drinking water.

The quality of collected ground water was not suitable for drinking purpose due to the presence of coliform & heterotrophic bacteria at all locations i.e. Koli, Pargaon, Chinchpada, Vaghivalivada, Ulwe, Vaghivali, Targhar & Kombadbhuje. Proper treatment of ground water required before consumption. At present Ganeshpuri and Kopar villages reclaimed and there is no water source available for ground water analysis.

4.5 MARINE WATER QUALITY ANALYSIS REPORT DURING POST MONSOON

Surface Marine water samples were collected for different Physiochemical and Biological parameters from 13 stations during 29th to 30st November 2019 (post monsoon). Analysis part is mentioned in subsequent sections below.



Collection of Water samples

4.8.1 Analytical Data - Physicochemical Parameters during Post Monsoon

Table 4-7: Marine Water physicochemical analysis at various stations during **November 2019**

Sr. No.	Parameter	W 1	W 2	W 3	W 4	W 5	W 6	W7	W 8	W9	W 10	W11	W12	W13	Unit
		S	S	S	S	S	S	S	S	S	S	S	S	S	
1.	pH	6.82	6.54	6.70	6.62	6.52	6.58	6.64	6.68	6.78	6.66	6.64	6.62	6.50	--
2.	Turbidity	7.6	7.3	7.3	5.6	8.2	6.8	8.6	7.6	7.8	7.6	9.4	8.2	6.8	NTU
3.	Temperature	29.1	29.4	31.6	30.5	30.2	29.4	29.6	30.2	30.6	29.8	30.4	28.7	30.1	°C
4.	Salinity	6.0	24.2	32.4	33.1	34.2	32.3	33.4	31.4	32.1	33.7	33.2	8.6	33.6	ppt
5.	TSS	126	116	134	126	112	98	123	128	128	112	128	124	120	mg/l
6.	TKN	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	mg/l
7.	Total phosphorous	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	mg/l
8.	DO	2.1	2.1	2.2	2.6	2.1	2.0	2.4	2.4	2.2	2.4	2.4	2.4	2.6	mg/l
9.	BOD	0.8	1.2	1.0	1.6	1.0	0.8	1.0	1.1	0.8	1.1	1.1	1.1	1.6	mg/l
10.	TDS	4530	4960	4790	4960	4680	4590	4860	4980	4580	4720	4670	4960	4860	mg/l
11.	Oil & Grease	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	mg/l
12.	Nitrate as NO3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	mg/l
13.	Nitrite as NO2	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	mg/l
14.	Sulphate as SO4	68	92	78	42	48	58	54	94	78	92	78	76	75	mg/l
15.	Iron as Fe	0.16	0.12	0.10	0.09	0.11	0.09	0.10	0.08	0.14	0.08	0.11	0.10	0.10	mg/l
16.	Magnesium as Mg	42.3	40.3	50.6	44.2	38.2	46.8	60.8	50.4	38.4	52.9	50.6	51.8	52.3	mg/l
17.	Chromium as Cr	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	mg/l
18.	Cadmium as Cd	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	mg/l
19.	Mercury as Hg	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	mg/l
20.	Zinc as Zn	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	mg/l
21.	Manganese Mn	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	mg/l
22.	Sodium, Na	24	42	46	28	20	24	18	22	20	18	20	21	26	mg/l
23.	Potassium K	30	28	32	20	16	18	26	28	28	25	28	36	30	mg/l
24.	Silicate	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	mg/l
25.	Hardness	674	428	466	392	356	374	380	412	658	420	372	432	380	mg/l
26.	Alkalinity	560	364	392	384	340	368	372	398	562	398	378	422	480	mg/l
27.	Chloride	3546	4762	4616	4786	4567	4386	4820	4678	4261	4620	4560	4824	4532	mg/l
28.	Electrical Conductivity	666.2	802.3	724.3	738.2	698.8	689.1	724.3	748.6	664.2	698	698.3	732.1	696.2	µS/Cm
29.	COD	160	120	140	140	120	140	120	100	120	100	100	120	100	mg/l
30.	Phenol	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	mg/l
31.	Fluoride	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	mg/l

4.8.2 Inference - Physicochemical Parameters during Post Monsoon:

The pH value ranged from 6.50 to 6.82 at surface basic nature of water. Salinity was low station W1, W2 and W12 due to influx of fresh water during collection Period of post monsoon due to vicinity of Gadhi (W1& W2) and Ulwe river (W12). The total suspended solids were found quite high.

Dissolved Oxygen level was observed low during collection of time due to seasonal variation. COD and BOD value suggests the presence of chemically and biologically oxidizable organic matter present in water body which comes as domestic sewage discharge from surrounding areas (villages, STPs of NMMC in Nerul) and effluents from CETP at MIDC Taloja.

The concentration of Magnesium, Sodium and Iron were low.

4.6 MARINE WATER QUALITY ANALYSIS REPORT (BIOLOGICAL PARAMETERS)

4.9.1 Analytical Data - Biological Parameters during Post Monsoon:

Biological parameters viz. Phytoplankton, Zooplankton and Microbiology were analyzed, and compiled data is presented below:

Table 4-8: Marine Water biological analysis of stations (W1 to W7) during November 2019

Parameter	W 1	W 2	W3	W4	W5	W6	W7
	S	S	S	S	S	S	S
Phytoplankton							
Population (nox10³/L)	73.6	19.2	44.8	38.4	25.6	33.6	31.2
Total Genera	22	12	16	10	14	11	15
Major Genera	***Scenedesmus, Pediastrum, Cosmarium, Thalassiosira***	***Thalassiosira, Nitzschia, Navicula, Pleurosigma***	***Pleurosigma, Navicula, Coscinodiscus, Biddulphia***	***Nitzschia, Navicula, Thalassionema, Thalassiosira***	***Thalassiosira, Pleurosigma, Cyclotella, Navicula***	***Coscinodiscus, Gramatophora, Thalassiosira, Ditylum***	***Navicula, Pleurosigma, Synedra, Melosira***
Diversity Index	1.78	1.82	1.96	2.02	1.56	1.62	1.94
Zooplankton							
Population (no x 10³/100m³)	42.6	16.4	28.2	6.8	19.4	18.7	9.2
Total Group	8	12	15	7	9	10	12
Major Groups	**Copepods foraminiferans**	**Copepods Gastropods**	**Copepods Decapods**	**Copepods amphipods**	**Gastropods, foraminiferans**	**Copepods Isopods**	**Copepods Gastropods**
Biomass (ml/100m³)	7.8	4.6	9.4	1.2	3.6	2.7	4.2
Diversity Index	1.90	0.68	1.84	0.72	1.34	1.86	2.32
Microbiology							
Coliform/100 ml	>1600	>1600	>1600	>1600	>1600	>1600	>1600

Table 4-9: Marine water biological analysis of stations (W8 to W13) during November 2019

Parameter	W8	W9	W10	W11	W12	W13
	S	S	S	S	S	S
Phytoplankton						
Population (nox10³/L)	34.4	49.6	20.8	41.6	81.6	22.4
Total Genera	9	13	16	12	23	14
Major Genera	***Pleurosigma, Navicula, Skeletonema, Coscinodiscus***	***Nitzschia, Pleurosigma, Cyclotella, Gyrosigma***	***Guinardia, Leptocylindrus, Biddulphia, Pleurosigma***	***Thalassionema, Pleurosigma, Pleurosigma, Thalassiothrix***	***Scenedesmus, Oscillatoria, Actinastrum, Navicula***	***Thalassiosira, Skeletonema, Navicula, Pleurosigma***
Diversity Index	1.88	1.62	2.08	1.36	2.04	1.64
Zooplankton						
Population (no x 10³/100m³)	54	26	12	26.2	45.2	17.8
Total Group	7	2	11	6	8	10
Major Groups	**Copepods, Mysids**	**Copepods Decapods**	**Copepods Acetes sp.**	**Copepods Acetes sp.**	**Copepods, Acetes sp.**	**Copepods Acetes sp.**
Biomass (ml/100m³)	12.8	4.6	7.2	19.8	16.8	8.4
Diversity Index	2.16	1.58	1.94	0.32	0.38	0.56
Microbiology						
Coliform/100 ml	>1600	>1600	>1600	>1600	>1600	>1600

4.9.2 Inferences - Biological Parameters during Post Monsoon:

4.9.2.1 Phytoplankton

In November 2019, Phytoplankton population density ranges from 19.2-81.6 x 10^3/l at surface water of all 13 stations. Highest phytoplankton population at surface water of station 12 may be due to influx of domestic water from surrounding villages; total generic groups ranges from 9-23 nos. at surface water of all 13 stations. Maximum generic diversity 24 no. is observed at surface water of Station W12 during November 2019.

Nitzschia, *Navicula, Thalassiosira, Pleurosigma and Cyclotella* are most common ones, followed by rest of observed genera like *Biddulphia*, Skeletonema and *Coscinodiscus*. The other freshwater phytoplankton genera found are *Scenedesmus*, *Cosmarium, Oscillatoria and Pediastrum* in Gadhi River (Station 1) and Ulwe River (Station 12) respectively. *Nitzschia*, *Navicula and Thalassiosira* are common Genera noted in all stations. Graphical representations of phytoplankton population and total genera is represented in **Figure 4.1**. The graph below represents the population of phytoplankton is more at station 12 and station 1; and less at station 8, which represents there is discharge of sewage and domestic waste. The phytoplankton trend with respect to total number of genera is almost same throughout all stations except station 1 and 12, where total genera were noted high in number. Some of the major genera seen were photographed and shown in **Figure 4.2**.

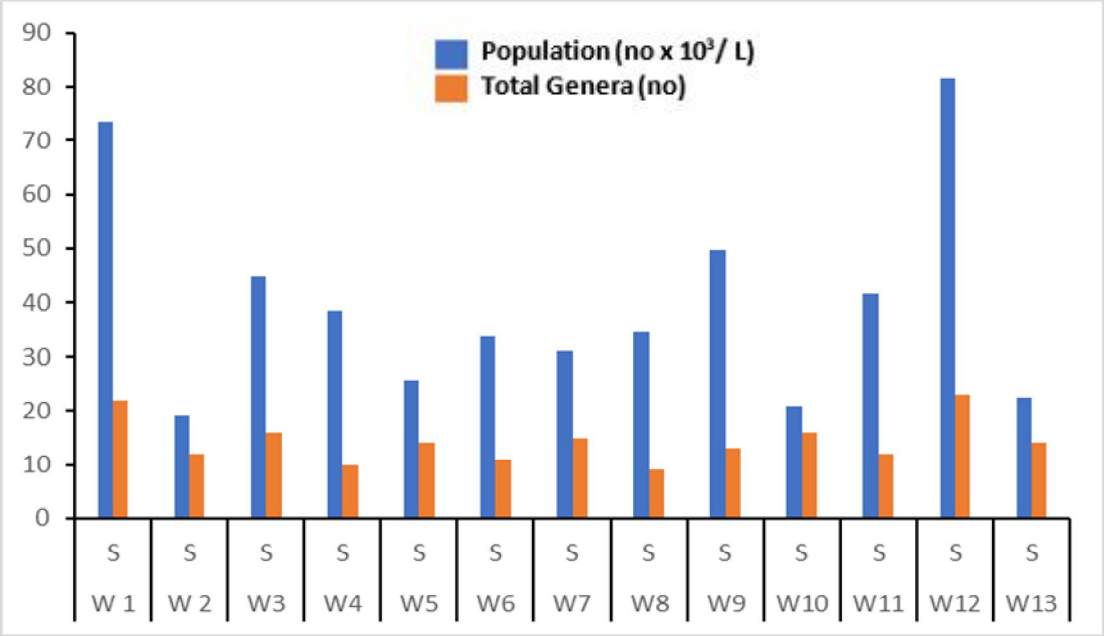


Figure 4-1 : Representation of phytoplankton population & Total genera for November 2019

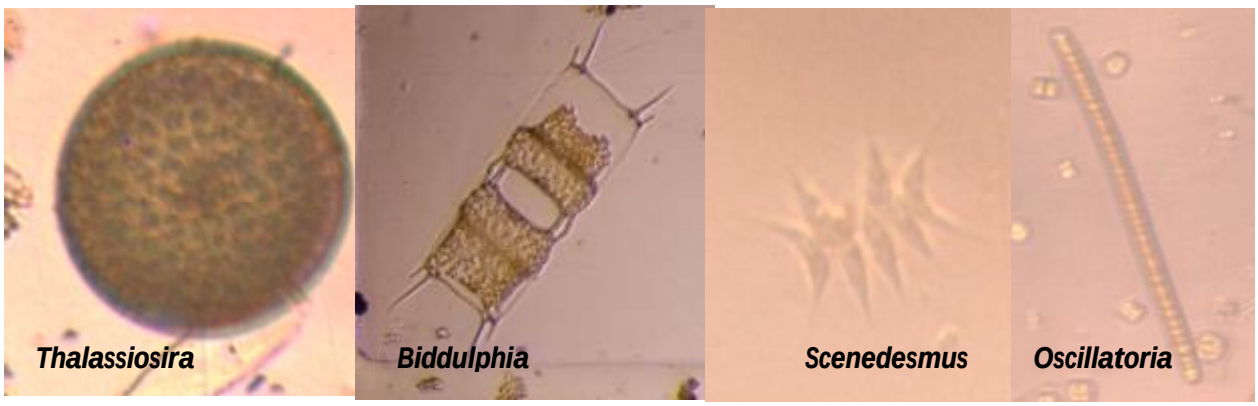


Figure 4-2: Phytoplankton found in samples for November 2019

4.9.2.2 Zooplankton

In November 2019, the zooplankton biomass ranged from 1.2 to 19.8 ml/100 m^3 with population density of 6.8 to 54.0 no x 10^3/100m^3 while having faunal group ranging from 2-15 nos. The zooplankton was noted with good population and group diversity. Copepods, Gastropods & Acetes were common groups observed, **Figure 4.3** represents zooplankton standing stock graphically. The graph below represents that average standing stock reported from all stations; Station 9 shows lowest population as compared to Station 8 with highest population; and station 4 shows lowest biomass and Station 11 shows highest biomass respectively.

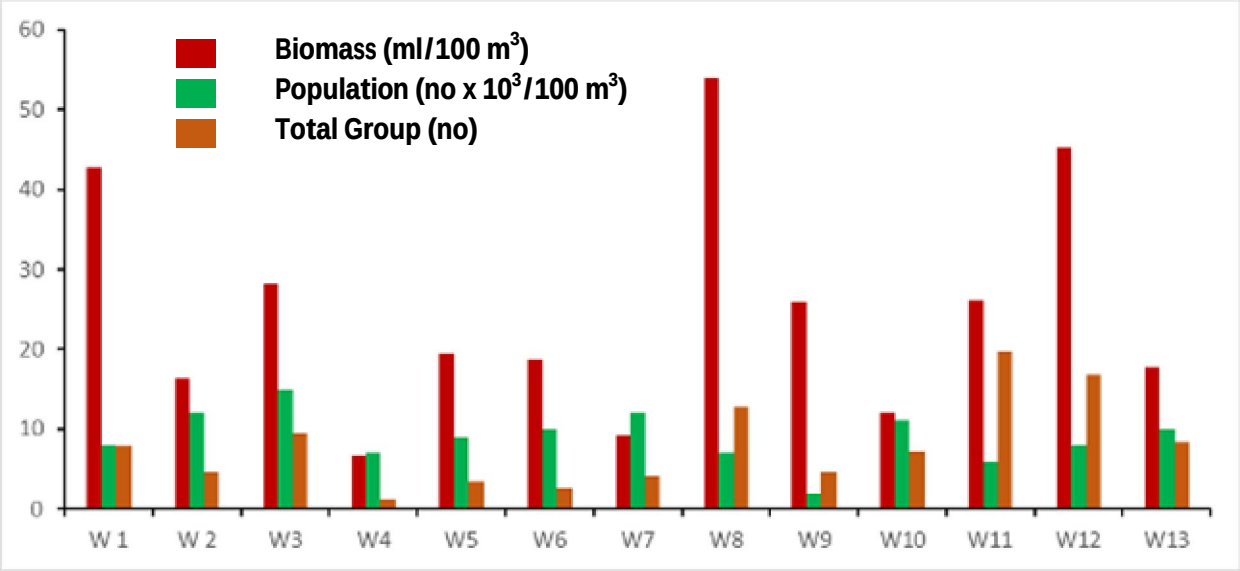


Figure 4-3: Representations of Zooplankton Biomass, Population & Total group for November 2019

Figure 4-4: Zooplankton found in samples for November 2019

4.9.2.3 Microbiology

Coliform microbes were present at all stations in surface level. No specific trend was observed.

5. CHAPTER V: CONCLUSION & RECOMMENDATION

Based on the study of activities planned during pre-development works and on the basis of the environmental baseline monitoring results, certain issues are identified, and steps taken to mitigate the environmental impacts. These mitigation measures need to be under constant watch through continuous vigilance, auditing and monitoring of air quality:

5.1 Ambient Air Quality

5.1.1 Observations

As can be seen from analysis data, **Table 4.1 to 4.3**, the ambient air monitoring results are within NAAQS limit.

5.1.2 NMIA Pre - development Activities and impacts on Air Quality:

Construction activities at NMIA during pre-development works which contribute to pollution of ambient air include:

- demolition of hill and excavation of large quantity of material like murum and rock which is being utilized within site and balance taken to fill up nearby areas.
- Controlled blasting to demolish the hill
- Rehabilitation and re-settlement of nearly 3000 households in 7 villages within NMIA site is in progress and about 95% works is completed. This activity results in generation of traffic
- Demolition of structures vacated results in dust emissions
- Plying of trucks, dumpers, ripper dozer, excavators etc. for handling of materials
- Operation of DG sets used for site offices

The air gets polluted by activities like excavation, land filling, controlled blasting, construction, material handling and transportation during construction phase due to traffic and high dust levels.

5.1.3 Mitigation Measures Taken and Proposed:

Contractors engaged by CIDCO for pre-development works have been asked to take up following mitigation measures to ensure minimal impacts on ambient air quality:

- Use temporary screens of tin or fabric to create barriers against dust.
- Provision of water sprinkling at the construction site and along roads for dust suppression.
- Wheel wash system on roads leading out of site to ensure that truck tyres do not spew out dust.
- Cover Trucks carrying earth, sand or stone with tarpaulin to avoid spillage. Avoid overloading of such trucks.

- Provide workers working in high dust areas and on earth moving machineries with face masks/goggles for their protection.
- Use high tech equipment for controlled (delayed) blasting with proper blast pattern along with cover on rock surface being excavated which will generate minimal noise as well as dust.
- The blasting is being undertaken under guidance of Indian Institute of Technology (IIT) previously known as Indian School of Mines, Dhanbad) and M/s Deeptec who guide regarding appropriate operation control, blast design, quantity of explosives, blasting pattern, watering of blasting area etc.
- Maintain construction machinery and equipment in good working condition with PUC Certification for all transport vehicles used. Vehicles & construction equipment which do not meet vehicular pollution standards are not allowed within construction site.

  It is proposed to reinforce the same through continuous vigilance, auditing and monitoring of air quality.

5.2 **Ambient Noise:**

5.2.1 Observations from Data:

Ambient Noise levels exceed the limits prescribed under Schedule II of Environmental Protection Act 1986 for various locations including Panvel CIDCO Office, Kharghar Nodal Office, Panchsheel Guest House, MES School, Swapna Nagari, Pargaon High School, MGM Hospital Kalamboli etc. due to heavy vehicular movement during sampling period (table 4.4).

5.2.2 NMIA Pre- Development Activities and impacts on Ambient Noise Levels:

Construction activities at NMIA during pre-development works which contribute to ambient noise include:

- demolition of hill and excavation of large quantity of material like murum and rock which is being utilized within site and balance taken to fill up nearby areas.
- Controlled blasting to demolish the hill
- Rehabilitation and re-settlement of nearly 3000 households in 7 villages within NMIA site is in progress and about 95% works is completed. This activity results in generation of traffic
- Demolition of structures vacated results in noise generation
- Plying of trucks, dumpers, ripper dozer, excavators, wheel loaders etc. for handling and re-handling of excavated material handling of materials
- Operation of DG sets used for site offices

5.2.3 Mitigation Measures Proposed:

Contractors engaged by CIDCO for pre-development works have been asked to take up following mitigation measures to ensure minimal impacts on ambient noise levels:

- Use of temporary screens of tin to create barriers against noise propagation in active construction areas.
- Workers working in high noise areas and on earth moving machineries are provided with earmuffs/ear plugs for their protection
- Trucks and construction machinery used on site to be well maintained to ensure low noise generation. Norms of Noise levels for Construction machinery as specified under EP Act should be strictly followed.
- High tech equipments are used for controlled (delayed) blasting with proper blast pattern along with cover on rock surface being excavated which will generate minimal noise.
- The blasting is being undertaken under guidance of Indian Institute of Technology (IIT) previously known as Indian School of Mines, Dhanbad) and M/s Deeptec who guide regarding appropriate operation control, blast design, quantity of explosives, blasting pattern, watering of blasting area, prevention of fly rock etc.
- construction activities are not be carried out nighttime hours
- construction machineries and DG sets used are provided with silencers
- DG sets used should conform to EP Act norms for air pollution and noise
- Before controlled blasting the surrounding villages are informed, so that they can go to a safe place away from the project site

5.3 **Soil**

5.3.1 Observations from Data:

Land use at NMIA site prior to pre-development works included agriculture, vacant land and inter- tidal area (partially under mangrove cover). Soil is fertile and can support vegetation (Table 4.5).

5.3.2. NMIA Pre – Development Activities and impacts anticipated on soil:

Construction activities at NMIA during pre-development works include:

- demolition of hill which will generate of material like murum and rock which will be utilized within site and balance will be taken to fill up nearby areas
- Site level is currently low and is being increased to +6 to +7m above existing GL by using excavated material.
- The area of the site is partially inundated during high tide. This area will be filled up to make available land for airport development

The soil will get affected by above activities.

5.3.3 Mitigation measure proposed:

Contractors engaged by CIDCO for pre-development works have been asked to take up following mitigation measures to ensure minimal impacts on land environment:

- removal of existing topsoil within site by excavating and storing the same for future use.
- Such excavated soil should be stored separately and used as final top layer after landfilling is completed-particularly in areas of proposed green belt development

5.4 Ground Water:

5.4.1 Observations from Data:

Ground Water quality is poor and fails to meet IS 10500:2012 norms at number of locations. The area of the site is low lying and partially inundated during high tide. Ground water table is high and mostly open dug wells are seen in rural areas (Table 4.6).

5.4.2 NMIA Pre - Development Activities and impacts anticipated on Ground Water Quality:

Construction activities at NMIA during pre-development works include:

- demolition of hill which will generate of material like murum and rock which will be utilized within site and balance will be taken to fill up nearby areas
- Site level is currently low and will be increased to +6 to +7m above existing GL by using excavated material.
- The area of the site is partially inundated during high tide. This area will be filled up to make available land for airport development

The ground water quality will get affected by above activities.

5.4.4 Mitigation Measures for Rehabilitated Settlements:

CIDCO needs to make adequate and clean piped water supply available for people to be accommodated in Rehabilitated settlements.

5.5 Marine Water:

5.5.1 Observations from Data:

Marine Water quality is moderate, may be due to hindrances (Table 4.7 and 4.8).

5.5.2 NMIA Pre- Development Activities and impacts anticipated on Marine Water Quality:

Construction activities at NMIA during pre-development works include:

- demolition of hill which will generate of material like murum and rock which will be utilized within site and balance will be taken to fill up nearby areas.
- Site level is currently low and will be increased to +6 to +7m above existing GL by using excavated material.
- The area of the site is partially inundated during high tide. This area will be filled up to make available land for airport development

The marine water quality may get affected by activities such as land filling, diversion of courses of Ulwe and training of Gadhi rivers.

5.5.4 Mitigation Measures for protection of Marine Water Quality:

Mitigation measures taken up at NMIA during pre-development works are as follows:

- landfilling is done in areas inundated during high tide, taking care that there is no disposal of debris in inter tidal area, nor any water way is obstructed
- for excavated areas and freshly filled up areas, proper garland drains leading to settlement basins followed by filter bunds are provided so that rainwater does not carryover the loose excavated material into marine areas.
- polyelectrolytes are used to help settle loose suspended material in the settlement basins.