Monitoring, Sampling and Analysis for Ambient Air Quality, Surface Water Quality and Ground Water Quality in Critically/Severely/Other Polluted Industrial Areas of Maharashtra

NAVI MUMBAI

Post-Monsoon (December 2023 to February 2024)

Maharashtra Pollution Control Board

Kalptaru Point, Sion East, Mumbai – 400 022

Index

ABBREVIATIONS

CPCB	Central Pollution Control Board
MPCB	Maharashtra Pollution Control Board
CEPI	Comprehensive Environmental Pollution Index
EPA	Environmental Protection Act, 1986
APHA	American Public Health Association
ASTM	American Society for Testing and Materials
BIS	Bureau of Indian Standards
BLQ	Below the Limit of Quantification
CAAQMS	Continuous Ambient Air Quality Monitoring Station
CEMS	Continuous Emission Monitoring System
CETP	Common Effluent Treatment Plant
VOCs	Volatile Organic Compounds
MIDC	Maharashtra Industrial Development Corporation
NWMP	National Water Quality Monitoring Program
NAAQS	National Ambient Air Quality Standard
ZLD	Zero Liquid Discharge
CPA	Critically Polluted Area
SPA	Severely Polluted Area

1. Executive Summary

Navi Mumbai was monitored for Ambient Air Quality, Ground and Surface Water quality. Based on the data collected by monitoring, a Comprehensive Environmental Pollution Index (CEPI) Score [as per latest directions 120 of Letter No. B-29012/ESS (CPA)/2015-16 dated 26th April 2016 of Central Pollution Control Board (CPCB)] was calculated. Maharashtra Pollution Control Board (MPCB) has carried out monitoring at CPCB location with the additional locations of sampling for ambient air, surface and ground water in consideration with the previous CEPI monitoring and covering the entire CEPI Impact Zone. The post monsoon monitoring was carried out during the period of December 2022 to February 2023 to assess the ambient air quality, surface water quality and ground water quality.

The Ambient Air Quality stations were identified considering the upwind and cross wind direction in the CEPI impact area. Ambient Air Quality was monitored at eight locations. The concentration of all the ambient air parameters was found well within the limits prescribed by NAAQS, 2009. Six locations each for surface water and ground water were monitored for the study. Land index is represented by ground water in the CEPI. Ground water parameters were also found to be within the permissible limits when compared with IS10500:2012 drinking water standards.

Based on the study conducted by CPCB during the period January 2018, the CEPI score of Navi Mumbai region as per the revised guidelines of CEPI (2016) was 66.32 (Air Index–56, Water Index-63 and Land Index–16). However, the present study reports aggregated CEPI score of Navi Mumbai region of post-monsoon season (March, 2024). Based on the study, the present CEPI score is 54.1 (Air Index–28.00, Water Index-50.00 and Land Index–29.00). The CEPI score is the combination of A, B, C and D factors. Here, C factor represents the health data and D factor represents the initiatives taken by MPCB in past few years to mitigate pollution. As the regional offices of MPCB has taken various initiatives like the installation of CAAQMS, CETPs, online VOC analysers, enforcing stricter emission standards, promoting renewable energy adoption to reduce pollution levels, enhancing waste management practices and conducting public awareness campaigns for sustainable practices in the past few years to control and mitigate air and water pollutants. This has contributed to the factor D, hence reduced the CEPI score of the region over the years.

The analysis of the aggregated CEPI score shows that the pollution in Navi Mumbai industrial clusters has been reduced in past few years. Approximately 19% decrease in CEPI score is observed from 66.32 in 2018 to 54.1 in present study.

2. Introduction

In the vibrant tapestry of India's industrial landscape, the state of Maharashtra stands as a testament to both the promise and perils of rapid economic development. With countless number of industrial clusters, Maharashtra has witnessed unprecedented growth and prosperity in recent decades. However, this surge in industrial activity has come at a significant environmental cost, with pollution emerging as a pressing concern in many regions across the state.

Simultaneously, the Comprehensive Environmental Pollution Index (CEPI) has emerged as a beacon of assessment and action in India's environmental landscape. Introduced as a standardized methodology for evaluating and addressing pollution in industrial clusters across the nation, the CEPI represents a significant step towards achieving the delicate balance between economic growth and environmental sustainability. Developed through collaborative efforts between environmental scientists, regulatory authorities, and community stakeholders, the CEPI serves as a vital instrument for identifying, prioritizing, and mitigating pollution in industrial areas. By systematically monitoring, sampling, and analyzing pollution parameters such as ambient air quality, surface water quality, and groundwater quality, the CEPI empowers policymakers and regulators to make informed decisions and allocate resources effectively.

In Maharashtra, where industrial activities drive economic growth and employment opportunities, the importance of the CEPI cannot be overstated. Through strategic monitoring, sampling, and analysis efforts, the CEPI aims to provide a comprehensive assessment of pollution levels and their impacts on environmental health in critically, severely, and other polluted industrial areas across the state.

Moreover, the application of the CEPI extends beyond mere assessment, serving as a catalyst for targeted interventions and regulatory enforcement in polluted industrial areas. By identifying pollution hotspots and vulnerable communities, the CEPI enables authorities to implement remedial measures, enforce pollution control norms, and monitor progress towards environmental sustainability.

In the following sections, we delve into the methodology, findings, and implications of both the CEPI assessment and the Monitoring, Sampling, and Analysis for Ambient Air Quality, Surface Water Quality, and Groundwater Quality in Polluted Industrial Areas of Chembur in Mumbai, Maharashtra. The present CEPI study includes Navi Mumbai region, which is the largest planned city in the world. Its development was started in 1972 to de-congest Mumbai. Navi Mumbai is environmentally very important, ecologically sensitive and are natural habitats for migratory birds. It also includes mangroves, lakes and wetlands. Its industrial area is commonly known as TTC MIDC Estate. This TTC MIDC accounts for about 3254 industrial units of various category engaged in the manufacturing of chemicals, dyes, dye-intermediates, Bulk drugs, pharmaceuticals, Textile auxiliaries, Pesticides, Petrochemicals, Textile processors, Engineering units etc. Besides the industries, there are other sources which are major contributors of pollution like emissions by transport and construction activities etc.

The present report is also based on the revised CEPI version 2016. The index captures the various dimensions of environment including air, water and land. Comprehensive Environmental Pollution Index (CEPI), which is a rational number to characterize the environmental quality at a given location following the algorithm of source, pathway and receptor have been developed. The CEPI reports serve as a roadmap for targeted interventions, regulatory enforcement, and community engagement aimed at mitigating pollution and safeguarding public health in the area. Despite the persistent challenges, ongoing initiatives guided by the CEPI action plan reports offer hope for addressing environmental concerns and fostering sustainable development in Navi Mumbai.

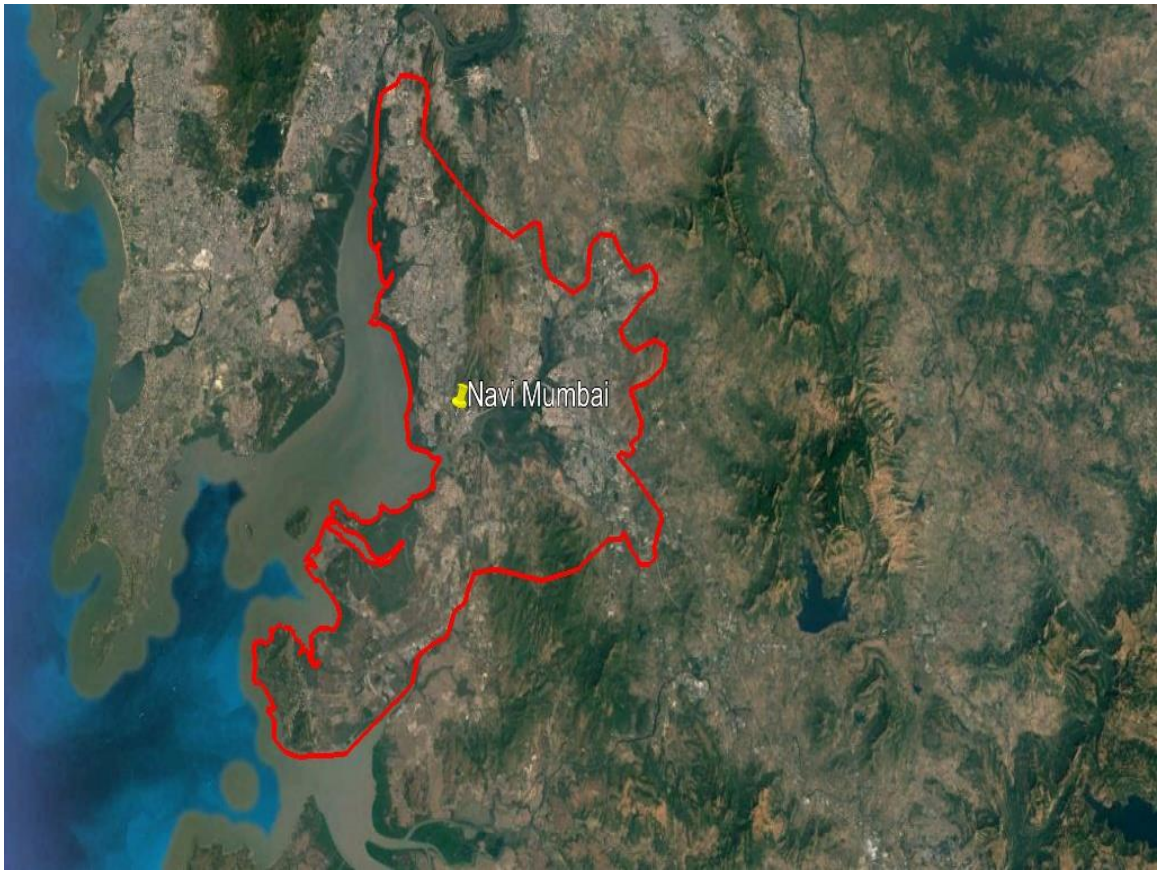


Fig. Navi Mumbai Region CEPI Monitoring Zone

3. Scope of Work

The major scope of work includes:

I. The scope of the present study is to perform three (3) rounds of "Monitoring, Sampling and Analysis for Ambient Air Quality, VOCs in Ambient Air, Surface Water Quality & Ground Water Quality in selected Pollution Industrial Areas (PIAs) of Navi Mumbai, Maharashtra" with a gap of one or two days. The analysis of the collected samples was carried out by the standard methods (CPCB, BIS, APHA, USEPA).

II. To Collect health-related data in the CEPI region.

III. To calculate the Comprehensive Environmental Pollution Index (CEPI) Score as per Revised CEPI-2016 issued by Central Pollution Control Board (CPCB).

The sampling details and frequency of sampling in Ambient Air, VOCs, Surface Water and Ground Water are given in Table 3.1 and Table 3.2 respectively.

Table 3.1 Sampling Details of Navi Mumbai

Sampling Criteria	Total Sites	Monitoring Parameters
Ambient Air Quality	**08**	PM_{10}, $PM_{2.5}$, SO_2, NO_2, NH_3, O_3, C_6H_6, CO, BaP, Pb, Ni, As
Volatile Organic Compounds (VOCs)	**02**	Dichloromethane, Chloroform, Carbon Tetrachloride, Trichloroethylene, Bromodichloromethane, 1,3-Dichloropropane, 1,4-Dichlorobenzene, 1,3-Dichlorobenzene, 1,2-Dichlorobenzene, 1,2-Dibromo-3-Chloropropane, Napthalene, Bromobenzene,1,2,4-Trimethylbenzene, 2-Chlorotoluene, Tert-Butylbenzene, SEC-Butylbenzene, P-Isopropyl toluene, M-Xylene, P-Xylene, Styrene, Cumene 1,2,3-Trichloropropane, N-Propyl benzene, Dibromochloromethane, 1,2-Dibromoethane, Chlorobenzene, 1,1,1,2-Tetrachloroethane, Ethylbenzene, 1,1-Dichloropropylene, 1,2-Dichloroethane, 1,2-Dichloropropane, Trans-1,3-Dichloropropene, CIS 1,3-Dichloropropene, 1,1,2-Trichloroethane, Tetrachloroethylene, 1,3,5-Trimethylbenzene, N-Butylbenzene, 1,2,3-Trichlorobenzene, Hexachlorobutadiene, 1,2,4-Trichlorobenzene, 2,2-Dichloropropane, Dibromo methane, Toluene, O-Xylene, Bromoform, 1,1,2,2-Tetrachloroethane, 4-Chlorotoluene, 1,1-Dichloroethylene, Trans-1,2-Dichloroethylene, 1,1-Dichloroethane, CIS-1,2-Dichloroethylene, Bromochloromethane, 1,1,1-Trichloroethane

Sampling Criteria	Total Sites	Monitoring Parameters
Water Quality Monitoring	**Surface water - 06**	**(i) Simple Parameters** Sanitary Survey, General Appearance, Colour, Smell, Transparency and Ecological **(ii) Regular Monitoring Parameters** pH, O & G, Suspended Solids, DO, COD, BOD, TDS, Electrical Conductivity, Total Dissolved Solids, Nitrite–Nitrogen, Nitrate-Nitrogen, (NO_2+NO_3) total nitrogen, Free Ammonia, Total Residual Chlorine, Cyanide, Fluoride, Chloride, Sulphate, Sulphides, Total Hardness, Dissolved Phosphates, SAR, Total Coliforms, Faecal Coliform **(iii) Special Parameters** Total Phosphorous, TKN, Total Ammonia (NH_4+NH_3)-Nitrogen, Phenols, Surface Active Agents, Anionic detergents, Organo-Chlorine Pesticides, PAH, PCB and PCT, Zinc, Nickel, Copper, Hexa-valent Chromium, Chromium (Total), Arsenic (Total), Lead, Cadmium, Mercury, Manganese, Iron, Vanadium, Selenium, Boron **(iv) Bio-assay (zebra Fish)** Test – For specified samples only.
	Ground water - 06	

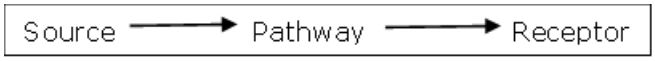
Table 3.2 Frequency of Sampling

	Parameter	Round of Sampling	Frequency in Each Round
A	**Ambient Air Quality Monitoring**		
1.	Particulate Matter (size less than 10 µm) or PM_{10}	03	3 Shifts of 8 hrs each
2.	Particulate Matter (size less than 2.5 µm) or $PM_{2.5}$	03	1 Shift of 24 hrs
3.	Sulphur Dioxide (SO_2)	03	6 Shifts of 4 hrs each
4.	Nitrogen Dioxide (NO_2)	03	6 Shifts of 4 hrs each
5.	Ammonia (NH_3)	03	6 Shifts of 4 hrs each

	Parameter	Round of Sampling	Frequency in Each Round
6.	Ozone (O_3)	03	24 Shifts of 1 hr each
7.	Benzene (C_6H_6)	03	1 Shifts of 24 hrs
8.	Carbon Monoxide (CO)	03	24 Shifts of 1 hr each
9.	Benzo (a) Pyrene (BaP) – particulate phase only	03	3 Shifts of 8 hrs each
10.	Lead (Pb)	03	3 Shifts of 8 hrs each
11.	Arsenic (As)	03	3 Shifts of 8 hrs each
12.	Nickel (Ni)	03	3 Shifts of 8 hrs each
B	**Volatile Organic Compounds (VOCs)**		
	As mentioned in Table 3.1	03	3 Shifts of 24 hrs each
C	**Ground Water**		
	As mentioned in Table 3.1	03	01 sample at each round
D	**Surface Water**		
	As mentioned in Table 3.1	03	01 sample at each round

4. Methodology

The present report is based on the revised Comprehensive Environmental Pollution Index (CEPI) version 2016. The index captures the various dimensions of the environment including air, water and land. Comprehensive Environmental Pollution Index (CEPI) is a rational number, which is used to characterize the environmental quality at a given location. It is three-step process based on the algorithm of Source, Pathway and Receptor.



Ambient air stations, Surface water locations and Ground water locations were decided by the respective regional officers. The sampling was done in 3 rounds with an interval of one or two days at each location. Sampling has been done at the potentially polluted areas so as to arrive at the CEPI. This will further help the authorities to monitor the areas in order to improve the current status of their environmental components such as air and water quality data, ecological damage and visual environmental conditions.

AIR ENVIRONMENT

5. Air Environment

For studying the Air Environment of Navi Mumbai area, monitoring stations were identified considering the upwind and cross wind direction and all 12 parameters as per the notification of National Ambient Air Quality Standards (NAAQS) were carried out.

**Kindly note: Volatile Organic Compounds (VOCs) concentration is not detected in most of the Air samples collected; hence it is not shown in the graphs.*

In Navi Mumbai eight locations have been monitored for checking the Ambient Air Quality (AAQ) in triplicate from 2nd Jan., 2024 to 6th Jan., 2024. Volatile Organic Compounds (VOCs) were monitored at 2 locations namely Zoetis Pharmaceuticals Research Pvt. Ltd. and Deepak Fertilizer and Petrochemicals Ltd.

Table 5.1 Details of Sampling Location of Ambient Air Quality Monitoring

Sr. No.	Name of Monitoring Location	Latitude	Longitude	Date of Sampling		
				Round-1	Round-2	Round-3
1.	DY Patil Hospital	N19^{0}02'27.88"	E73^{0}01'27.22"	02.01.2024	04.01.2024	06.01.2024
2.	TTCWMA, Mahape	N19^{0}06'28.72"	E73°01'51.68"	02.01.2024	04.01.2024	06.01.2024
3.	Nearby Reliable IT Park	N19^{0}06'30.77"	E73^{0}01'49.57"	02.01.2024	04.01.2024	06.01.2024
4.	Nearby Zoetis Pharmaceuticals Research Pvt. Ltd.	N19°03'59.58"	E73°01'32.13"	02.01.2024	04.01.2024	06.01.2024
5.	CETP Koparkharine, near ETP Table No. I	N19^{0}04'30.99"	E73^{0}04'03.74"	02.01.2024	04.01.2024	06.01.2024
6.	Nearby Ashi India Glass	N19^{0}05'10.73"	E73^{0}06'19.14"	02.01.2024	04.01.2024	06.01.2024
7.	Nearby Technova Imaging System	N19^{0}03'27.50"	E73^{0}06'48.19"	02.01.2024	04.01.2024	06.01.2024
8.	Nearby Deepak Fertilizer and Petrochemicals	N19^{0}04'08.26"	E73^{0}07'59.22"	02.01.2024	04.01.2024	06.01.2024

Table 5.2 Details of Sampling Location of Volatile Organic Compounds (VOCs) Monitoring

Sr. No.	Name of Monitoring Location	Latitude	Longitude	Date of Sampling		
				Round-1	Round-2	Round-3
1.	Nearby Zoetis Pharmaceuticals Research Pvt. Ltd.	N19°03'59.58"	E73°01'32.13"	16.01.2023	18.01.2023	20.01.2023
2.	Nearby Deepak Fertilizer and Petrochemicals	N19^{0}04'08.26"	E73^{0}07'59.22"	16.01.2023	18.01.2023	20.01.2023

Fig: Geographical Locations of Ambient Air Quality Monitoring

Fig. Geographical Locations of VOCs Monitoring

Table 5.3 Ambient Air Quality Monitoring Results

Parameters	Unit	Results			
		DY Patil Hospital	TTC WMA, Mahape	Nearby Reliable IT Park	Nearby Zoetis Pharmaceuticals Research Pvt. Ltd.
Sulphur Dioxide (SO_2)	$\mu g/m^3$	BLQ	99.70	BLQ	BLQ
Nitrogen Dioxide (NO_2)	$\mu g/m^3$	16.50	15.40	17.30	19.23
Particulate Matter (size less than 10 µm) or PM_{10}	$\mu g/m^3$	57	61	61	78
Particulate Matter (size less than 2.5 µm) or $PM_{2.5}$	$\mu g/m^3$	16	16	17	22
Ozone (O_3)	$\mu g/m^3$	27.70	BLQ	43.20	28.80
Lead (Pb)	$\mu g/m^3$	BLQ	BLQ	BLQ	0.02
Carbon Monoxide (CO) (1h)	mg/m^3	1.39	1.60	1.54	1.51
Carbon Monoxide (CO) (8h)	mg/m^3	1.74	1.78	1.71	1.81
Ammonia (NH_3)	$\mu g/m^3$	87.53	170.50	110.23	203.00

Parameters	Unit	Results			
		DY Patil Hospital	TTC WMA, Mahape	Nearby Reliable IT Park	Nearby Zoetis Pharmaceuticals Research Pvt. Ltd.
Benzene (C_6H_6)	$\mu g/m^3$	2.37	2.67	2.72	2.68
Benzo (a) Pyrene (BaP) – particulate phase only	ng/m^3	BLQ	BLQ	BLQ	BLQ
Arsenic (As)	ng/m^3	BLQ	BLQ	0.87	0.45
Nickel (Ni)	ng/m^3	BLQ	BLQ	BLQ	BLQ

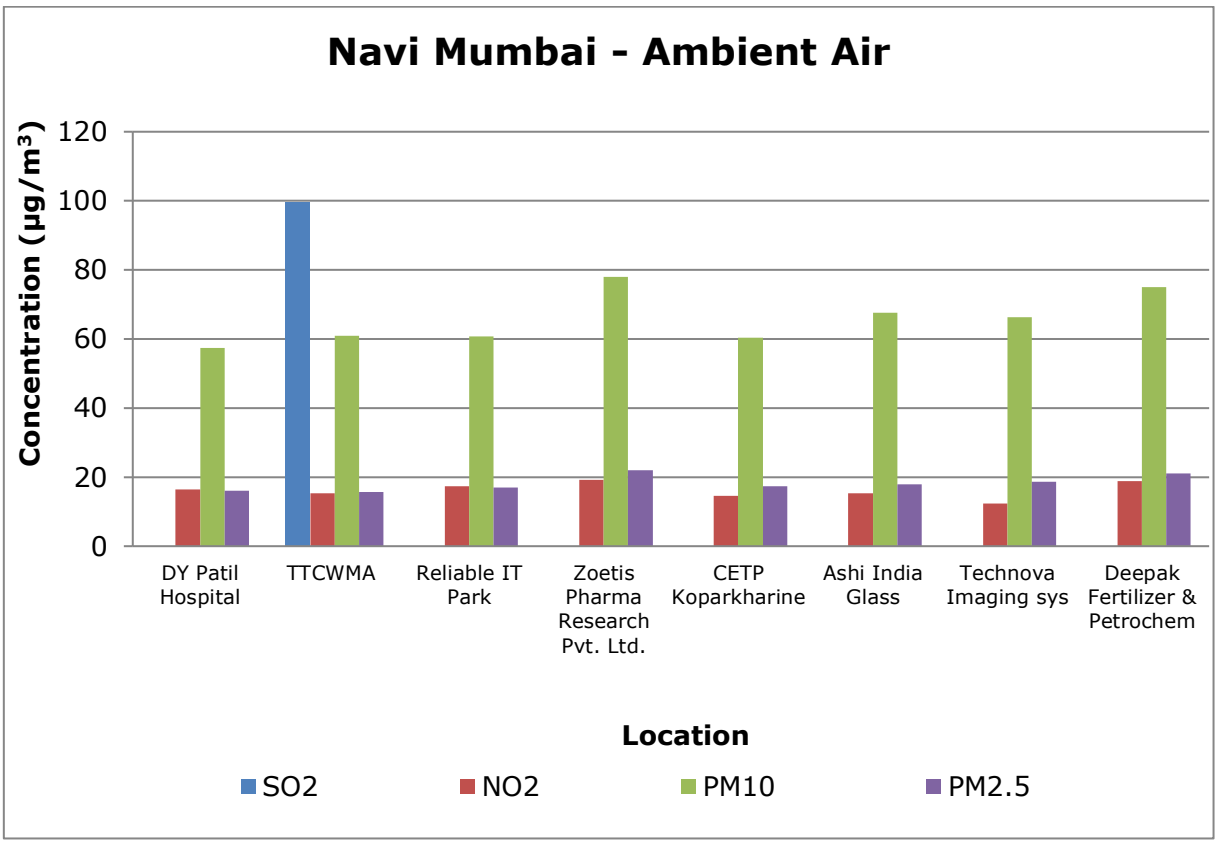
Parameters	Unit	Results			
		CETP Koparkharine Near ETP Table No. I	Nearby Ashi India Glass	Nearby Technova Imaging System	Nearby Deepak Fertilizer and Petrochemicals
Sulphur Dioxide (SO_2)	$\mu g/m^3$	BLQ	BLQ	BLQ	BLQ
Nitrogen Dioxide (NO_2)	$\mu g/m^3$	14.50	15.40	12.30	18.90
Particulate Matter (size less than 10 µm) or PM_{10}	$\mu g/m^3$	60	68	66	75
Particulate Matter (size less than 2.5 µm) or $PM_{2.5}$	$\mu g/m^3$	17	18	19	21
Ozone (O_3)	$\mu g/m^3$	26.40	27.85	30.40	98.50
Lead (Pb)	$\mu g/m^3$	BLQ	0.02	0.02	BLQ
Carbon Monoxide (CO) (1h)	mg/m^3	1.52	1.77	1.53	1.36
Carbon Monoxide (CO) (8h)	mg/m^3	1.76	1.94	1.84	1.88
Ammonia (NH_3)	$\mu g/m^3$	151.07	91.13	76.67	77.40
Benzene (C_6H_6)	$\mu g/m^3$	2.44	2.34	3.10	2.75
Benzo (a) Pyrene (BaP) – particulate phase only	ng/m^3	BLQ	BLQ	BLQ	BLQ
Arsenic (As)	ng/m^3	BLQ	BLQ	0.73	0.35
Nickel (Ni)	ng/m^3	4.11	BLQ	BLQ	BLQ

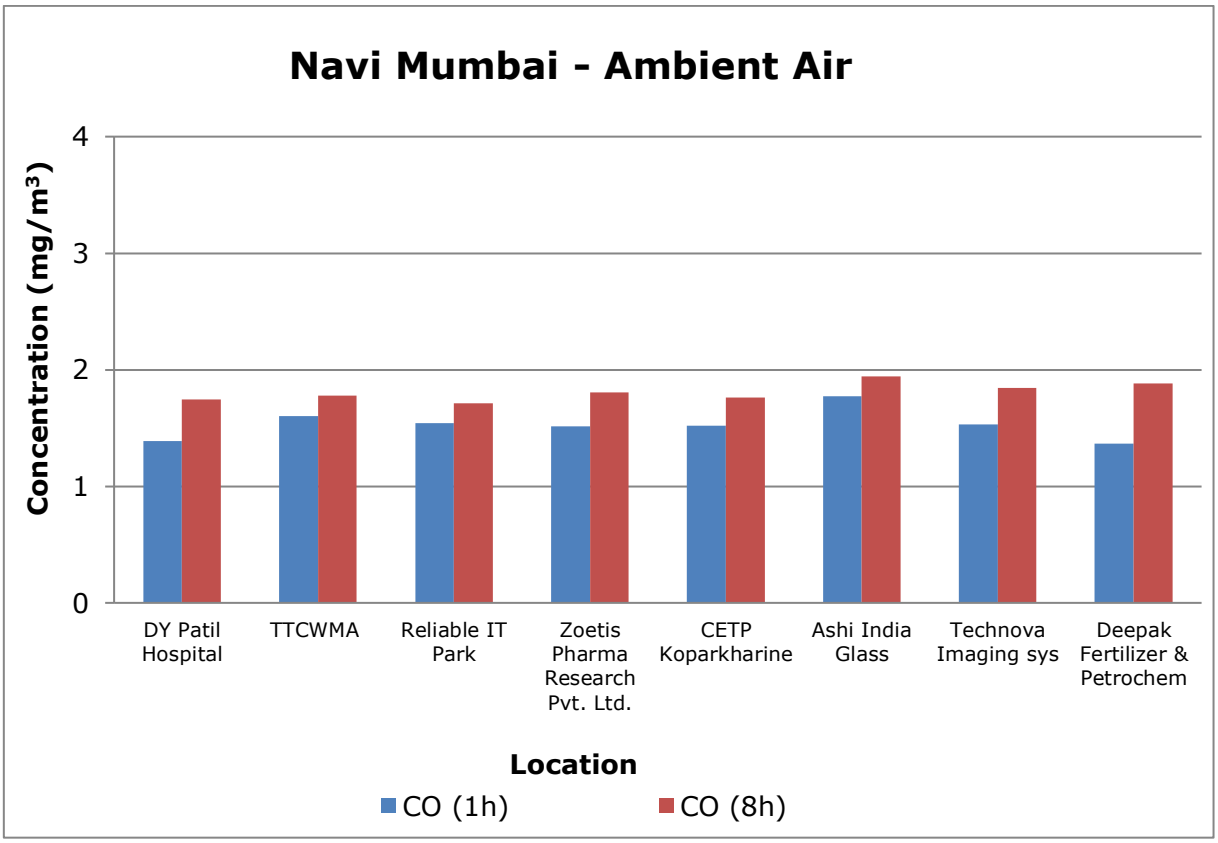
Table 5.4 Volatile Organic Compounds (VOCs) in Ambient Air Results

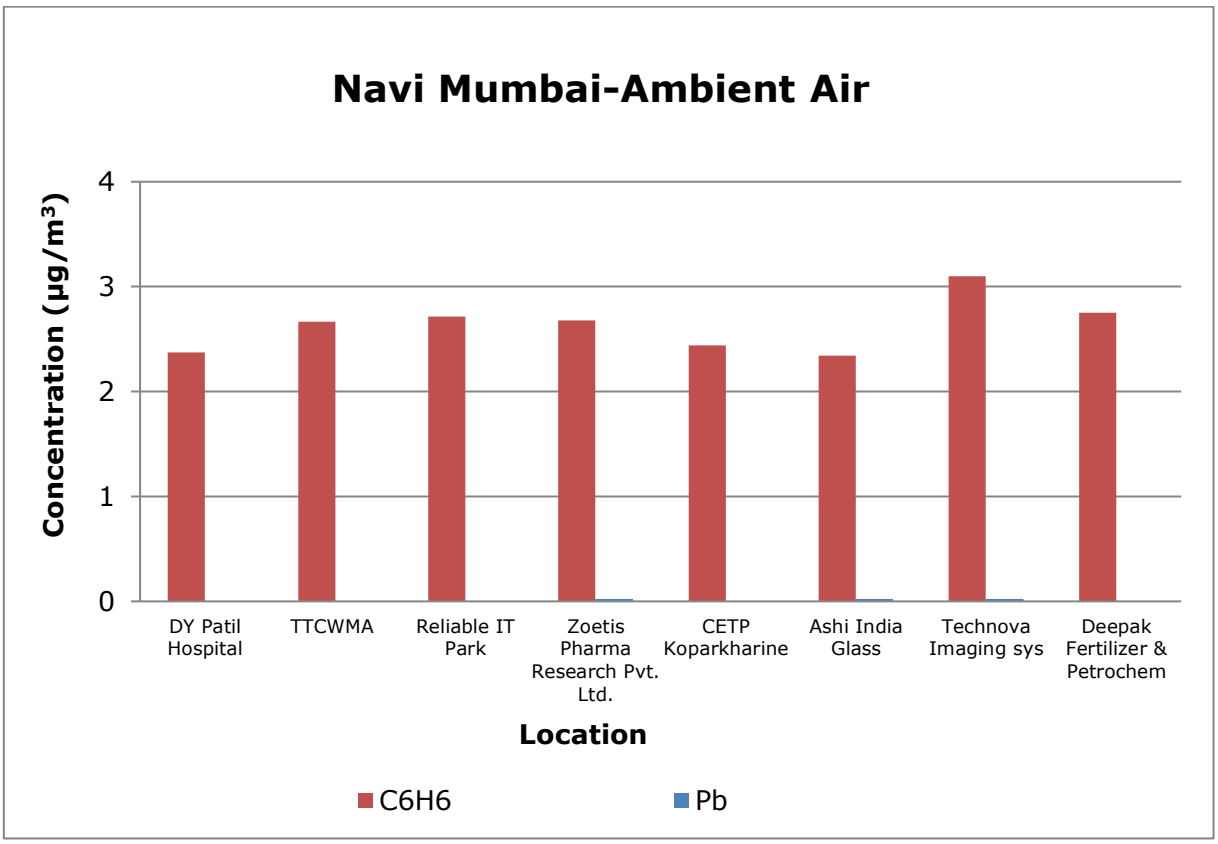
Parameters	Unit	Results	
		Zoetis Pharmaceuticals Research Pvt. Ltd.	Deepak Fertilizer and Petrochemicals
Dichloromethane	µg/m³	1.02	1.44
Chloroform	µg/m³	0.94	0.55
Carbon Tetrachloride	µg/m³	BLQ	BLQ
Trichloroethylene	µg/m³	BLQ	0.58
Bromodichloromethane	µg/m³	BLQ	BLQ
1,3-Dichloropropane	µg/m³	BLQ	BLQ
1,4-Dichlorobenzene	µg/m³	6.76	BLQ
1,3-Dichlorobenzene	µg/m³	BLQ	1.50
1,2-Dichlorobenzene	µg/m³	BLQ	BLQ
1,2-Dibromo-3-Chloropropane	µg/m³	BLQ	BLQ
Napthalene	µg/m³	BLQ	BLQ
Bromobenzene	µg/m³	BLQ	BLQ
1,2,4-Trimethylbenzene	µg/m³	BLQ	BLQ
2-Chlorotoluene	µg/m³	BLQ	BLQ
Tert-Butylbenzene	µg/m³	BLQ	BLQ
SEC-Butylbenzene	µg/m³	BLQ	BLQ
P-Isopropyltoluene	µg/m³	1.21	1.79
M-Xylene	µg/m³	BLQ	BLQ
P-Xylene	µg/m³	1.74	3.30
Styrene	µg/m³	BLQ	BLQ
Cumene	µg/m³	BLQ	BLQ
1,2,3-Trichloropropane	µg/m³	BLQ	BLQ
N-Propylbenzene	µg/m³	BLQ	7.95
Dibromochloromethane	µg/m³	BLQ	BLQ
1,2-Dibromoethane	µg/m³	BLQ	BLQ
Chlorobenzene	µg/m³	0.54	BLQ
1,1,1,2-Tetrachloroethane	µg/m³	BLQ	BLQ
Ethylbenzene	µg/m³	BLQ	1.72
1,1-Dichloropropylene	µg/m³	BLQ	BLQ
1,2-Dichloroethane	µg/m³	BLQ	3.47

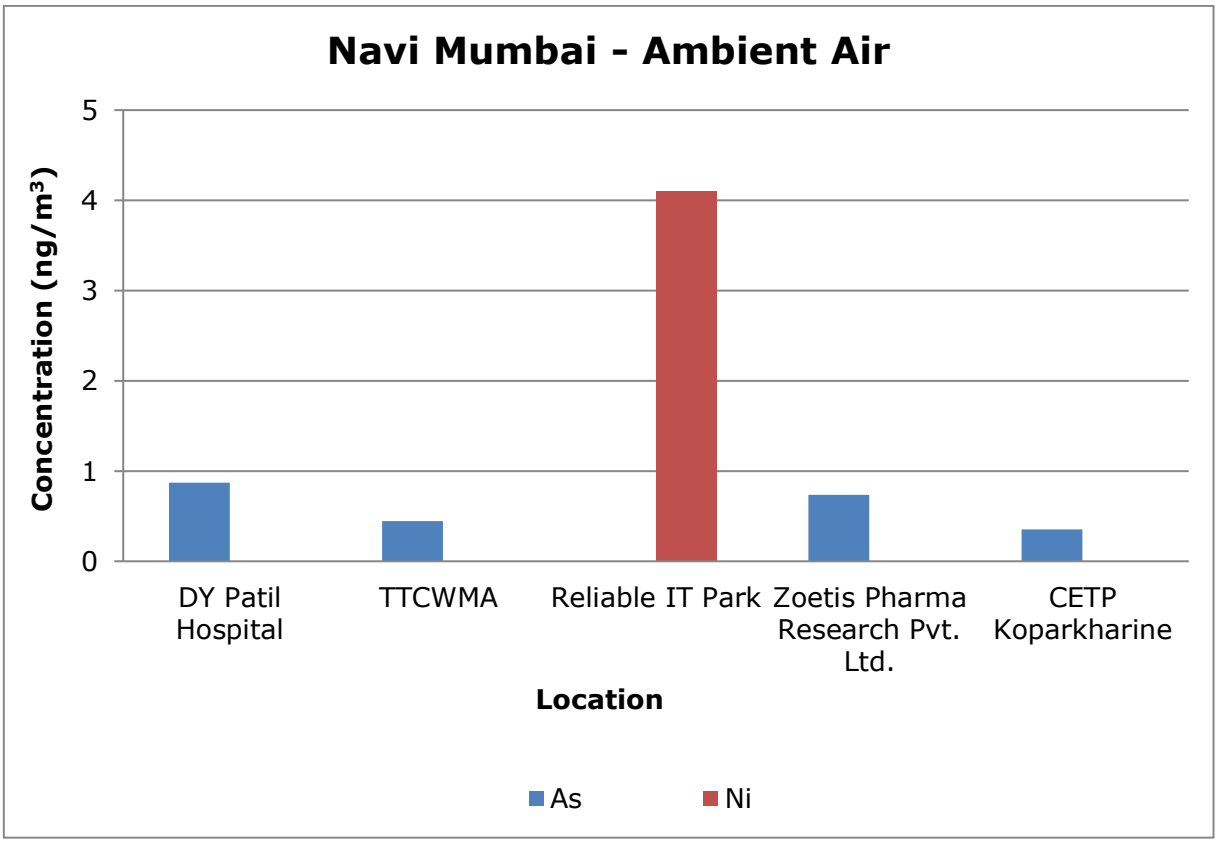
Parameters	Unit	Results	
		Zoetis Pharmaceuticals Research Pvt. Ltd.	Deepak Fertilizer and Petrochemicals
1,2-Dichloropropane	µg/m³	BLQ	BLQ
Trans-1,3-Dichloropropene	µg/m³	BLQ	BLQ
CIS 1,3-Dichloropropene	µg/m³	BLQ	BLQ
1,1,2-Trichloroethane	µg/m³	BLQ	BLQ
Tetrachloroethylene	µg/m³	0.50	BLQ
1,3,5-Trimethylbenzene	µg/m³	BLQ	BLQ
N-Butylbenzene	µg/m³	BLQ	BLQ
1,2,3-Trichlorobenzene	µg/m³	BLQ	BLQ
Hexachlorobutadiene	µg/m³	BLQ	BLQ
1,2,4-Trichlorobenzene	µg/m³	BLQ	BLQ
2,2-Dichloropropane	µg/m³	BLQ	2.64
Dibromomethane	µg/m³	BLQ	BLQ
Toluene	µg/m³	1.16	0.69
O-Xylene	µg/m³	1.24	BLQ
Bromoform	µg/m³	BLQ	BLQ
1,1,2,2-Tetrachloroethane	µg/m³	BLQ	BLQ
4-Chlorotoluene	µg/m³	BLQ	BLQ
1,1-Dichloroethylene	µg/m³	BLQ	BLQ
Trans-1,2-Dichloroethylene	µg/m³	BLQ	BLQ
1,1-Dichloroethane	µg/m³	BLQ	BLQ
CIS-1,2-Dichloroethylene	µg/m³	BLQ	BLQ
Bromochloromethane	µg/m³	BLQ	BLQ
1,1,1-Trichloroethane	µg/m³	BLQ	BLQ

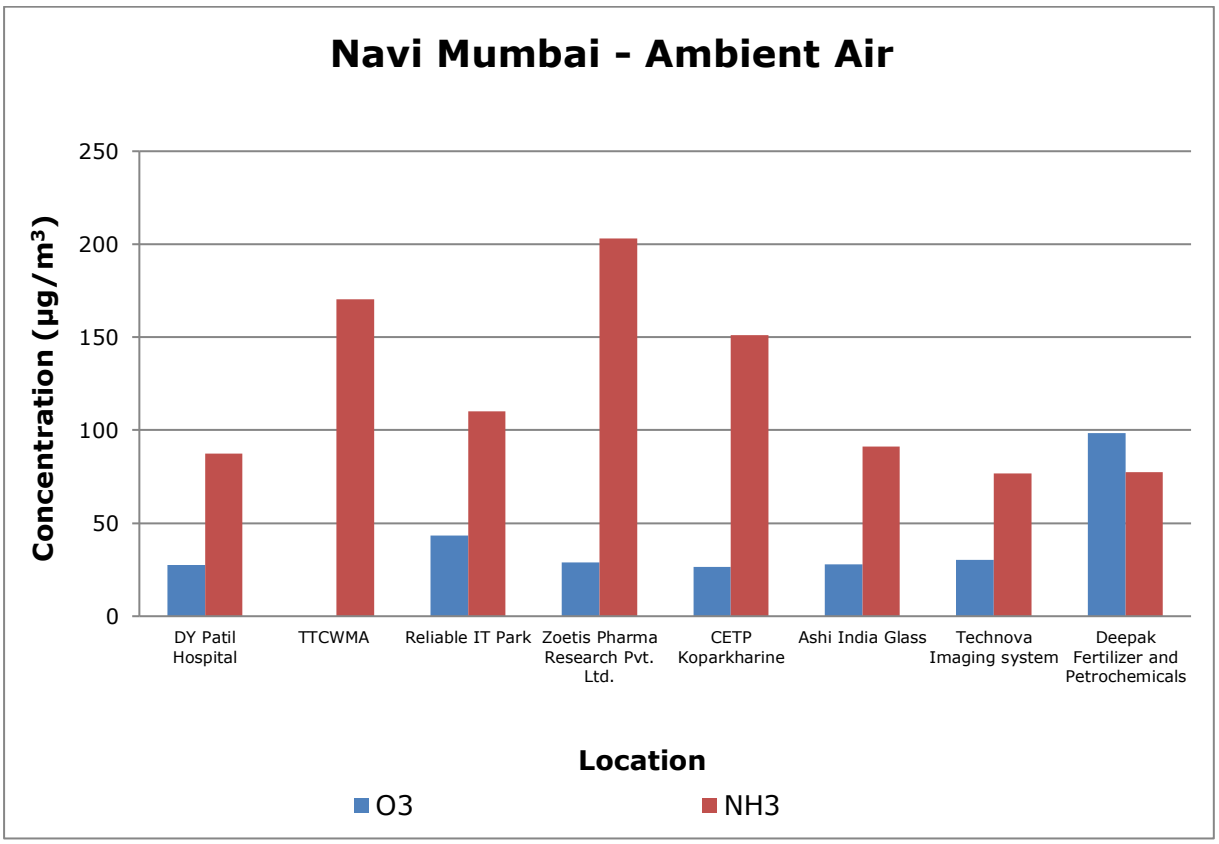
Graphs - Ambient Air Quality Monitoring in Navi Mumbai






Navi Mumbai-Ambient Air
Concentration (µg/m³)
4
3
2
1
0
DY Patil Hospital
TTCWMA
Reliable IT Park
Zoetis Pharma Research Pvt. Ltd.
CETP Koparkharine
Ashi India Glass
Technova Imaging sys
Deepak Fertilizer & Petrochem
Location
C6H6
Pb


Navi Mumbai - Ambient Air
Concentration (ng/m³)
5
4
3
2
1
0
DY Patil Hospital
TTCWMA
Reliable IT Park
Zoetis Pharma Research Pvt. Ltd.
CETP Koparkharine
Location
As
Ni


Navi Mumbai - Ambient Air
Concentration (µg/m³)
250
200
150
100
50
0
DY Patil Hospital
TTCWMA
Reliable IT Park
Zoetis Pharma Research Pvt. Ltd.
CETP Koparkharine
Ashi India Glass
Technova Imaging system
Deepak Fertilizer and Petrochemicals
Location
O3
NH3

6. Water Environment

For studying the water environment of Navi Mumbai area, surface water was collected from Nallah, Lake and River. To understand the quality of treated effluent, samples were collected from following six industries - (i) Airoli Creek Taloja (ii) Vashi Creek (ii) CETP Outlet (iii) Siemens Nallah (iv) CBD Nallah (v) CETP Taloja Bridge (vi) Lek Village Ghot. The following points are observed through the analysis of water samples:

- All six water samples collected are found acceptable in general appearance, colour, smell and transparency.
- General parameters like pH and suspended solids, are observed well within the limits in all the samples.
- BOD concentration values were found to exceed the standard limit in all the samples.
- In fish bioassay, 87%- 100% survival of fishes was achieved. Vashi Creek water achieved 100% fish survival.
- All metals like Arsenic, Nickel, Copper, Iron, Hexavalent Chromium (Cr^{6+}) etc. were also observed either below the limit of quantification (BLQ) or below their standard limits.
- Parameters like Total Residual Chlorine, Cyanide, Fluoride, Sulphide, Dissolved Phosphate, Total Ammonical Nitrogen and Phenolic compounds, also meet the criteria as prescribed by CPCB.
- Organo Chlorine Pesticides, Polynuclear aromatic hydrocarbons (PAH) and Polychlorinated Biphenyls (PCB) are also observed below the limit of quantification in all the studied samples.

Table 6.1 Details of Sampling Location of Surface Water

Sr. No.	Name of Monitoring Location	Latitude	Longitude	Date of Sampling		
				Round-1	Round-2	Round-3
1.	Airoli Creek at Airoli Bridge	N19^{0}08'09.00"	E72^{0}59'59.03"	03.01.2024	05.01.2024	07.01.2024
2.	Vashi Creek at Vashi Bridge	N19^{0}03'83.20"	E72^{0}58'68.20"	03.01.2024	05.01.2024	07.01.2024
3.	Siemens Nallah	N19°09'3.11"	E73° 0'18.78"	03.01.2024	05.01.2024	07.01.2024
4.	CBD Nallah	N19°0'28.72"	E73° 1'29.24"	03.01.2024	05.01.2024	07.01.2024
5.	Kasardi River Near CETP Taloja Bridge	N19°05321593°	E73°11432839°	03.01.2024	05.01.2024	07.01.2024
6.	Lek Village Ghot	N19°0872947°	E73°1030953°	03.01.2024	05.01.2024	07.01.2024

Fig: Geographical Locations of Surface Water Sampling

Table 6.2 Results of Surface Water

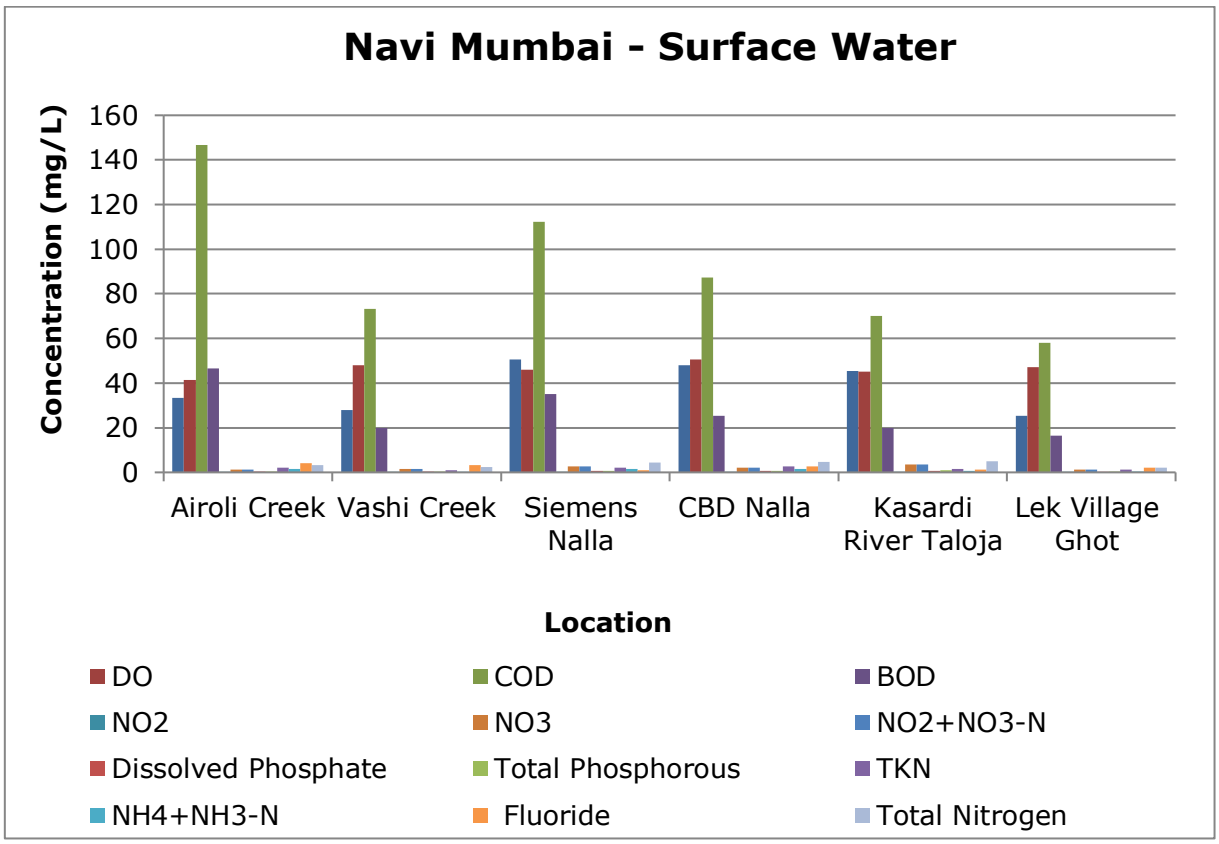
Parameters	Unit	Results					
		Airoli Creek at Airoli Bridge	**Vashi Creek at Vashi Bridge**	**Siemens Nallah**	**CBD Nallah**	**Kasardi River Near CETP Taloja Bridge**	**Lek Village Ghot**
Sanitary Survey		Reasonably clean neighbourhood	Reasonably clean neighbourhood	Reasonably clean neighbourhood	Reasonably clean neighbourhood	Reasonably clean neighbourhood	Reasonably clean neighbourhood
General Appearance		Floating matter	No Floating matter	Floating matter	No Floating matter	Floating matter	No Floating matter
Transparency	m	0.60	0.60	0.40	0.40	0.50	0.40
Temperature	°C	29	28	28	29	27	27
Colour	Hazen	2	1	3	1	2	1
Smell	-	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable
pH	-	6.77	6.73	6.82	6.71	6.75	7.16
Oil & Grease	mg/L	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
Suspended Solids	mg/L	33	28	51	48	45	25

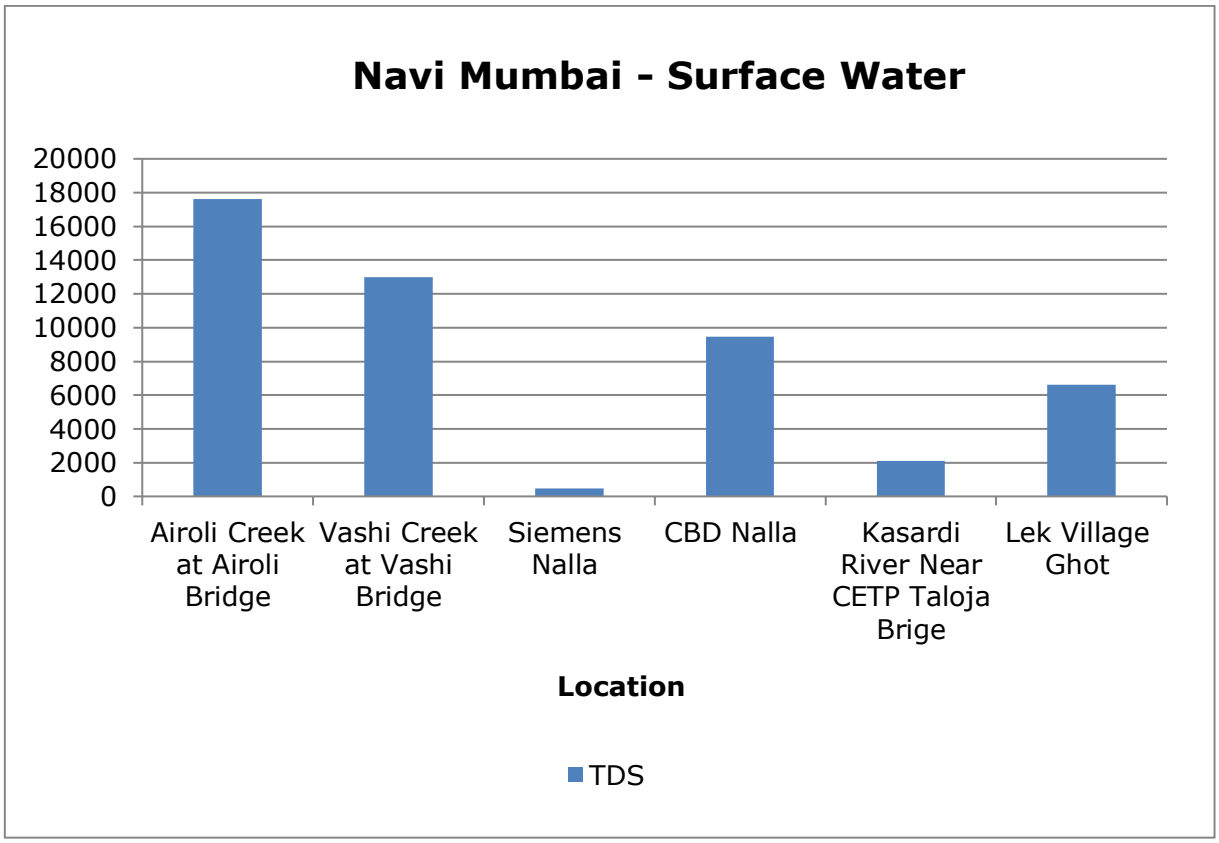
Parameters	Unit	Results					
		Airoli Creek at Airoli Bridge	Vashi Creek at Vashi Bridge	Siemens Nallah	CBD Nallah	Kasardi River Near CETP Taloja Bridge	Lek Village Ghot
Total Dissolved Solids	mg/L	17613	12982	489	9463	2085	6601
Dissolved Oxygen (% Saturation)	%	42	48	46	51	45	47
Chemical Oxygen Demand	mg/L	147	73	112	87	70	58
Biochemical Oxygen Demand (3 days,27°C)	mg/L	47	20	35	25	20	16
Electrical Conductivity (at 25 °C)	µmho/cm	30733	22458	871	16516	3726	11402
Nitrite Nitrogen (as NO_2)	mg/L	0.06	0.09	0.04	0.04	0.05	0.06
Nitrate Nitrogen (as NO_3)	mg/L	1.23	1.40	2.67	2.10	3.59	1.24
(NO_2 + NO_3)-Nitrogen	mg/L	1.27	1.43	2.69	2.14	3.61	1.30
Free Ammonia (as NH_3-N)	mg/L	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
Total Residual Chlorine	mg/L	BLQ	BLQ	BLQ	BLQ	0.23	0.23
Cyanide (as CN)	mg/L	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
Fluoride (as F)	mg/L	4.17	3.33	0.83	2.63	1.37	2.23
Sulphide (as H_2S)	mg/L	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
Dissolved Phosphate (as P)	mg/L	0.32	0.33	0.56	0.61	0.75	0.27
Sodium Adsorption Ratio	-	11.01	12.04	2.06	8.75	3.66	5.07
Total Coliforms	MPN Index/ 100 ml	810	804	933	1247	1074	1020
Faecal Coliforms	MPN Index/ 100 ml	467	274	433	723	848	477

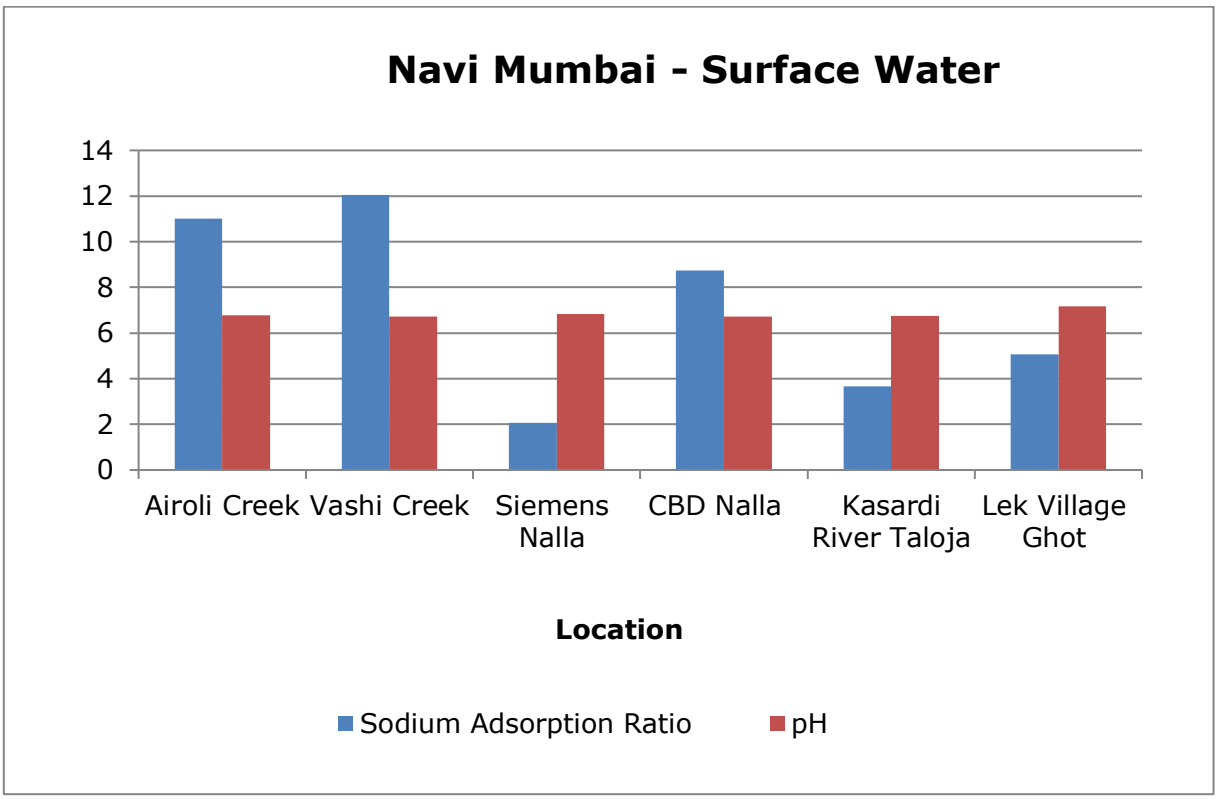
Parameters	Unit	Results					
		Airoli Creek at Airoli Bridge	Vashi Creek at Vashi Bridge	Siemens Nallah	CBD Nallah	Kasardi River Near CETP Taloja Bridge	Lek Village Ghot
Total Phosphate (as P)	mg/L	0.38	0.39	0.65	0.68	0.82	0.30
Total Kjeldahl Nitrogen (as N)	mg/L	2.05	0.93	2.24	2.61	1.49	1.12
Total Ammonia (NH_4+NH_3)-Nitrogen	mg/L	1.49	0.22	1.39	1.51	0.67	0.38
Phenols (as C_6H_5OH)	mg/L	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
Anionic Detergents (as MBAS Calculated as LAS, mol.wt.288.38)	mg/L	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
Organo Chlorine Pesticides	µg/L	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
Polynuclear aromatic hydrocarbons (as PAH)	mg/L	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
Polychlorinated Biphenyls (PCB)	mg/L	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
Zinc (as Zn)	mg/L	BLQ	BLQ	0.10	BLQ	BLQ	BLQ
Nickel (as Ni)	mg/L	BLQ	0.03	0.01	0.02	0.02	0.01
Copper (as Cu)	mg/L	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
Hexavalent Chromium (as Cr^{6+})	mg/L	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
Total Chromium (as Cr)	mg/L	0.05	0.06	0.03	0.03	0.03	BLQ
Total Arsenic (as As)	mg/L	BLQ	0.02	0.02	BLQ	BLQ	BLQ
Lead (as Pb)	mg/L	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
Cadmium (as Cd)	mg/L	BLQ	BLQ	BLQ	BLQ	0.00	BLQ
Mercury (as Hg)	mg/L	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ

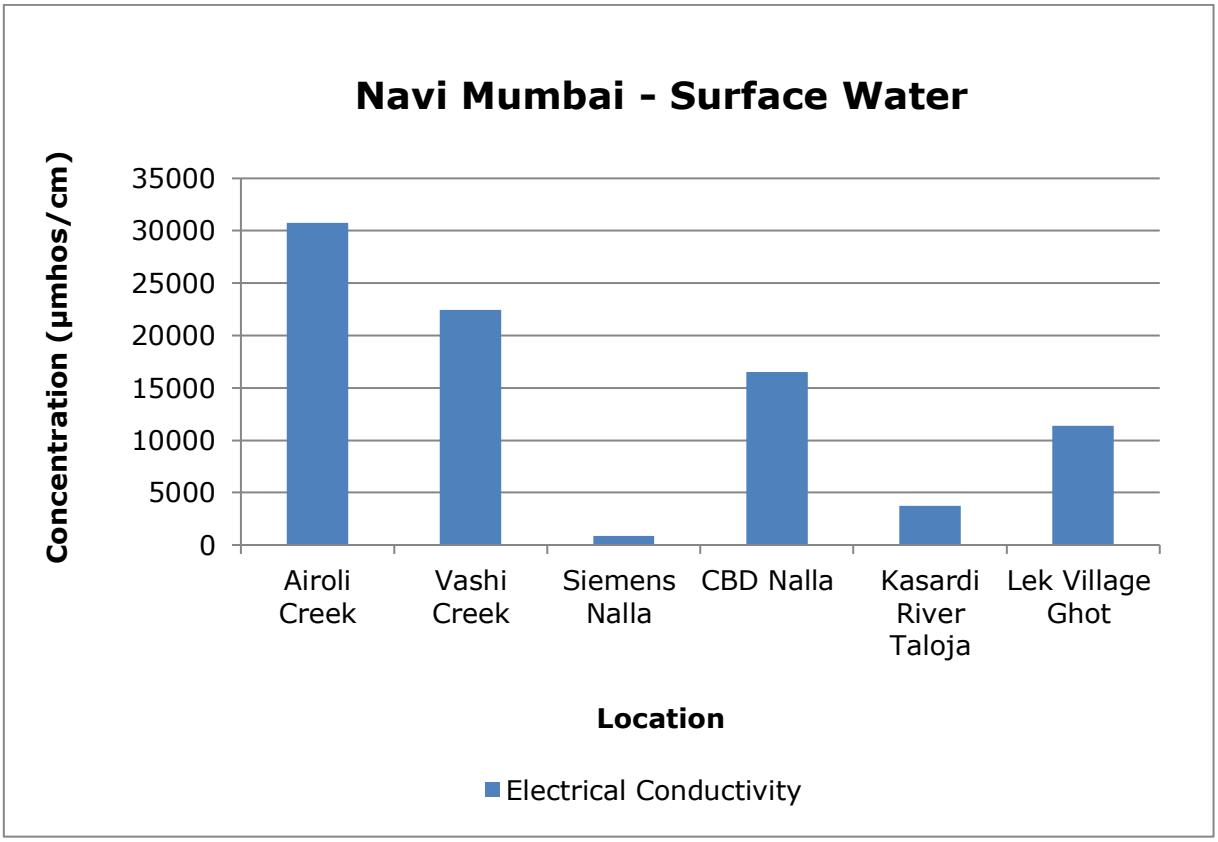
Parameters	Unit	Results					
		Airoli Creek at Airoli Bridge	Vashi Creek at Vashi Bridge	Siemens Nallah	CBD Nallah	Kasardi River Near CETP Taloja Bridge	Lek Village Ghot
Manganese (as Mn)	mg/L	0.35	0.12	0.09	0.42	0.52	0.33
Iron (as Fe)	mg/L	0.18	0.37	0.33	0.71	0.81	0.12
Vanadium (as V)	mg/L	0.02	0.01	0.03	0.03	0.02	0.03
Selenium (as Se)	mg/L	0.01	0.01	0.01	0.01	0.01	BLQ
Boron (as B)	mg/L	BLQ	BLQ	BLQ	BLQ	0.24	BLQ
Total Nitrogen	mg/L	3.33	2.36	4.30	4.75	5.10	2.01
Bioassay Test on fish	% survival	93	100	97	93	90	87

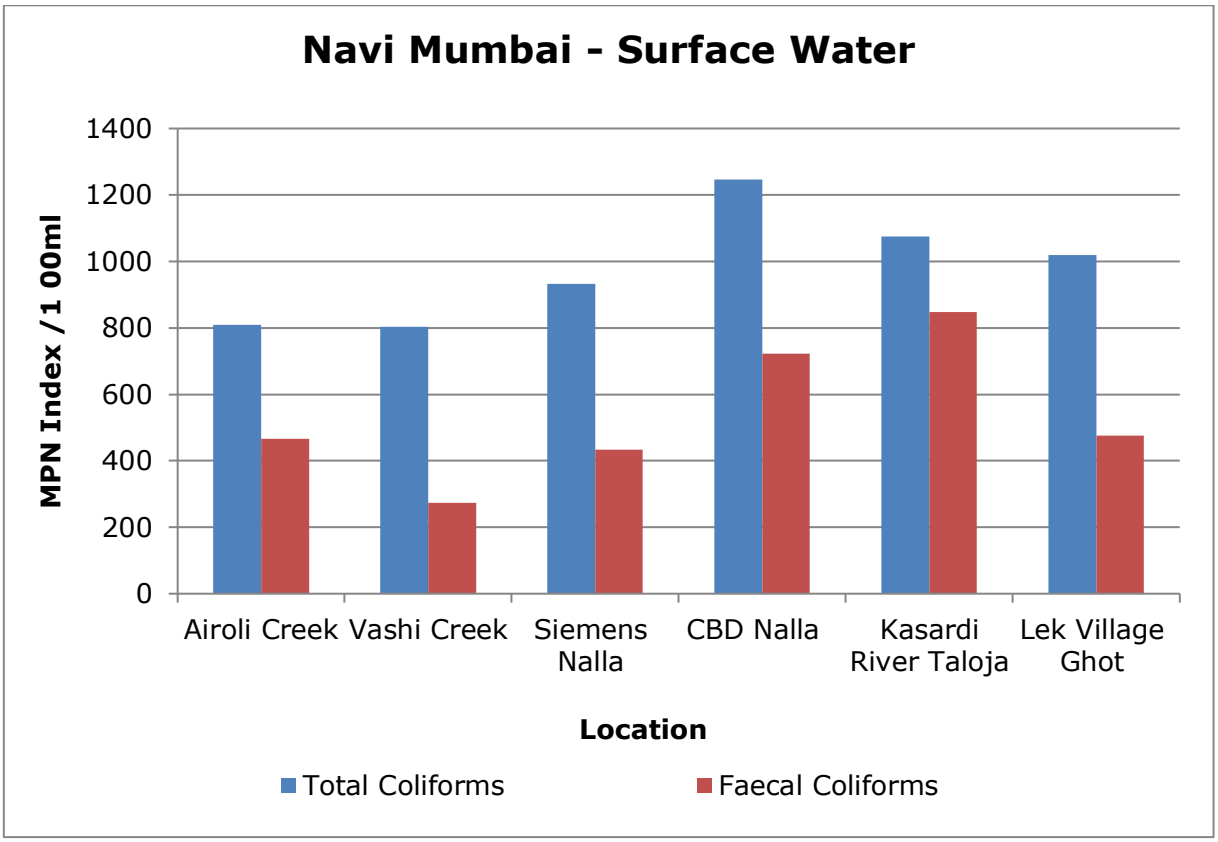
Graphs - Surface Water Quality of Navi Mumbai

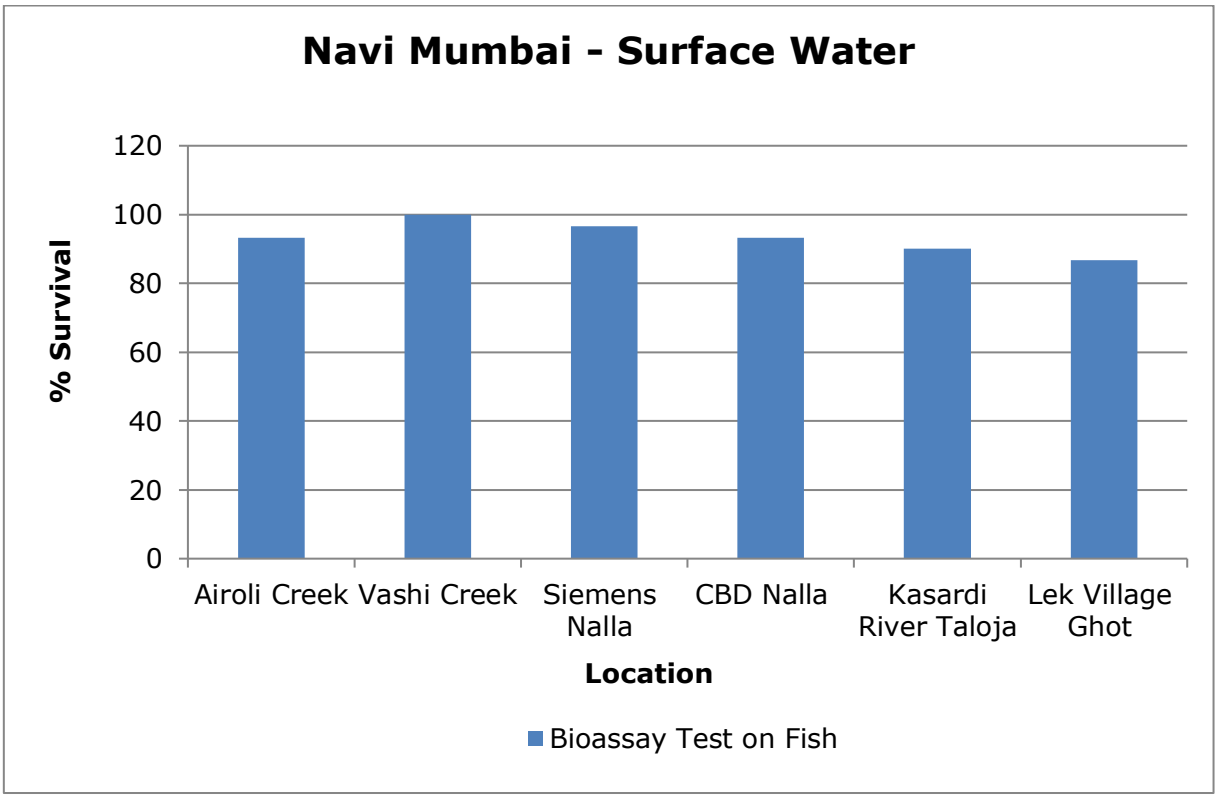





Navi Mumbai - Surface Water
14
12
10
8
6
4
2
0
Airoli Creek
Vashi Creek
Siemens Nalla
CBD Nalla
Kasardi River Taloja
Lek Village Ghot
Location
Sodium Adsorption Ratio
pH


Navi Mumbai - Surface Water
Concentration (µmhos/cm)
35000
30000
25000
20000
15000
10000
5000
0
Airoli Creek
Vashi Creek
Siemens Nalla
CBD Nalla
Kasardi River Taloja
Lek Village Ghot
Location
Electrical Conductivity


Navi Mumbai - Surface Water
MPN Index /1 00ml
1400
1200
1000
800
600
400
200
0
Airoli Creek
Vashi Creek
Siemens Nalla
CBD Nalla
Kasardi River Taloja
Lek Village Ghot
Location
Total Coliforms
Faecal Coliforms


Navi Mumbai - Surface Water
% Survival
120
100
80
60
40
20
0
Airoli Creek
Vashi Creek
Siemens Nalla
CBD Nalla
Kasardi River Taloja
Lek Village Ghot
Location
Bioassay Test on Fish

7. Land Environment

For studying the land Environment of Navi Mumbai area, ground water was collected from Bore well. Dug well, and Hand Pump. A total of 6 samples were collected from i) Dugwell at Turbhe Gaon (ii) MSW Dumping Ground (iii) MSW TTC Area (iv) TTC WMA (v) TTC Plot no. 142 MIDC (vi) Mumbai Waste Management Ltd. (MWML) site.

Six ground water samples were collected from MIDC Navi Mumbai region.

- All the water samples collected are found acceptable in general appearance, colour, smell and transparency.
- General parameters like pH, suspended solids, TDS, electrical conductivity, BOD, and COD are also observed well within the limits in all the collected samples.
- 80-100% survival was achieved in Fish Bioassay.
- All metals like Arsenic, Nickel, Copper, Iron, Hexavalent Chromium (Cr^{6+}) etc. were also observed either below the limit quantification or below their standard limits.
- Parameters like Total Residual Chlorine, Cyanide, Fluoride, Sulphide, Dissolved Phosphate, Total Ammonical Nitrogen and Phenolic compounds, also met the criteria as prescribed by CPCB.
- Organo Chlorine Pesticides, Polynuclear aromatic hydrocarbons (PAH) and Polychlorinated Biphenyls (PCB) were below the limit quantification in all studied samples.

Table 7.1 Details of Sampling Location of Ground Water

Sr. No.	Name of Monitoring Location	Latitude	Longitude	Date of Sampling		
				Round-1	Round-2	Round-3
1.	Dug Well at Turbhe Gaon	N19°04'16.30"	E 73°0'34.09"	03.01.2024	05.01.2024	07.01.2024
2.	Navi Mumbai MSW Dumping Ground Borewell Water Turbhe	N19^{0}04'42.97"	E73^{0}01'36.71"	03.01.2024	05.01.2024	07.01.2024
3.	MSW, TTC Area Borewell	N19^{0}04'40.94"	E73^{0}08'15.11"	03.01.2024	05.01.2024	07.01.2024
4.	TTC WMA Site Borewell	N19^{0}06'31.05"	E73^{0}01'49.67"	03.01.2024	05.01.2024	07.01.2024
5.	TTC Plot no. 142 Borewell	N19^{0}05'46.58"	E73^{0}01'27.10"	03.01.2024	05.01.2024	07.01.2024
6.	Mumbai Waste Management limited Borewell MIDC Taloja	N19^{0}05'48.65"	E73^{0}06'56.03"	03.01.2024	05.01.2024	07.01.2024

Fig: Geographical Locations of Groundwater Sampling in Navi Mumbai

Table 7.2 Results of Ground Water

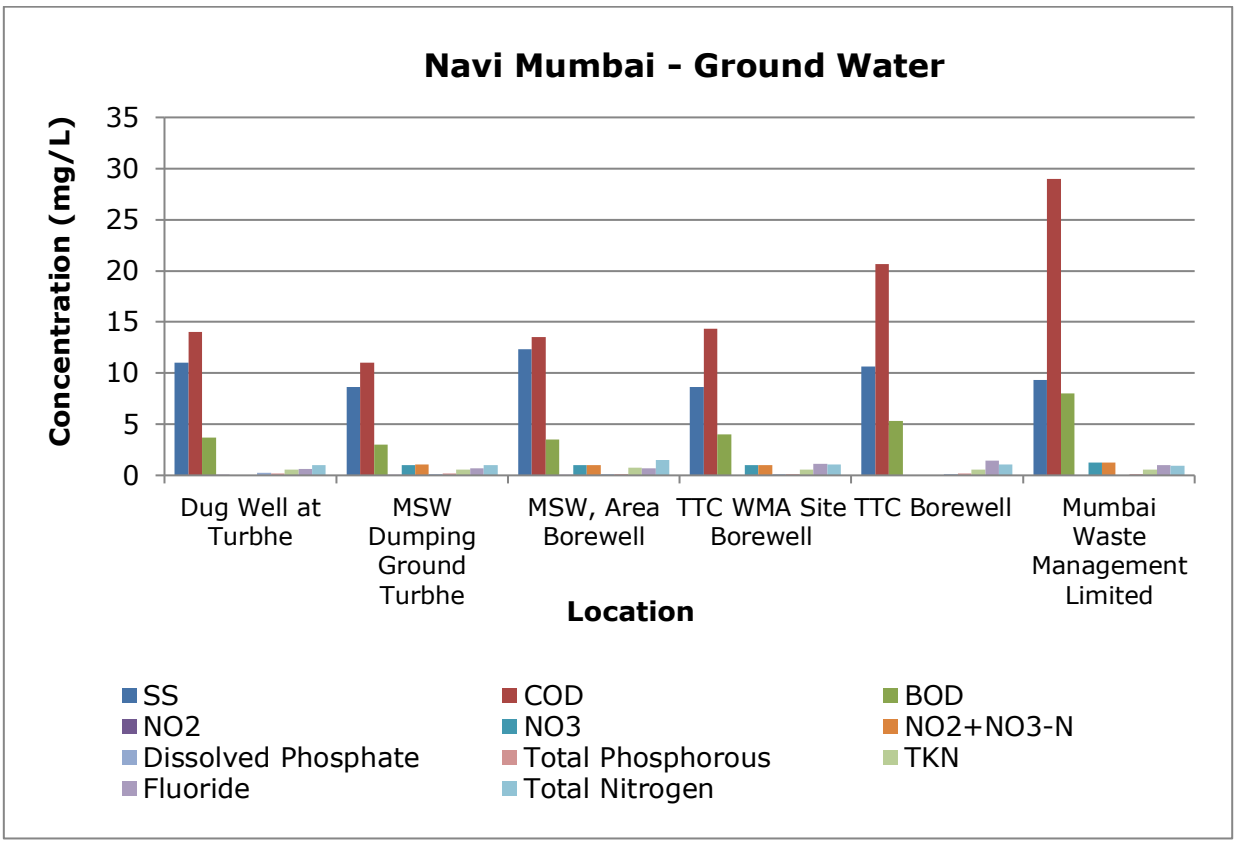
Parameters	Unit	Results					
		Dug Well at Turbhe Gaon, Navi Mumbai	MSW Dumping Ground Borewell Water Turbhe	MSW, Area Borewell Navi Mumbai	TTC WMA Site Borewell	TTC Plot no. 142 Borewell	MWML Plot No. P-32 and P-32 Part MIDC, Taloja
Sanitary Survey	-	Reasonably clean neighbourhood	Reasonably clean neighbourhood	Reasonably clean neighbourhood	Reasonably clean neighbourhood	Reasonably clean neighbourhood	Reasonably clean neighbourhood
General Appearance	-	No Floating matter	No Floating matter	No Floating matter	No Floating matter	No Floating matter	No Floating matter
Transparency	m	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Temperature	^{o}C	28	28	28	28	29	28
Colour	Hazen	1	1	1	1	1	1
Smell	-	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable
pH	-	6.80	6.76	7.23	7.45	6.69	6.70
Oil & Grease	mg/L	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
Suspended Solids	mg/L	11	9	12	9	11	9

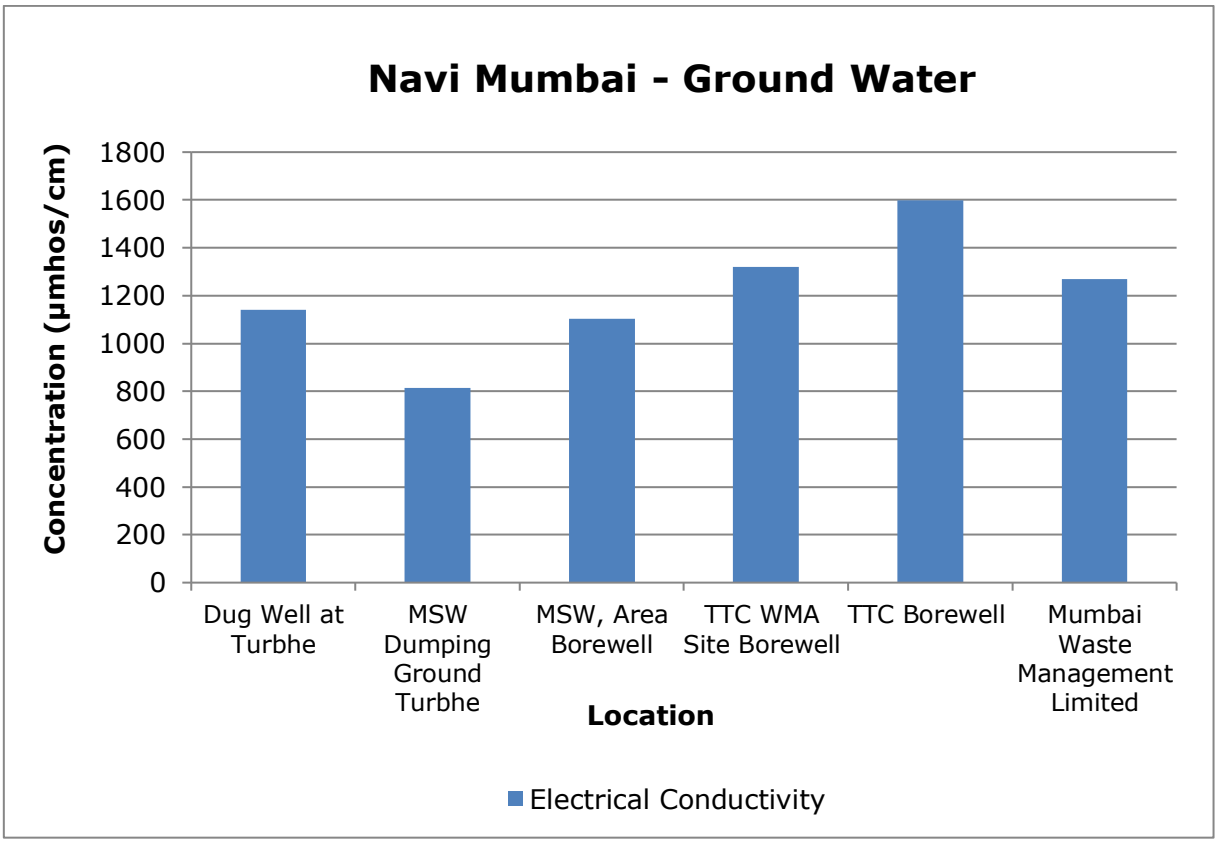
Parameters	Unit	Results					
		Dug Well at Turbhe Gaon, Navi Mumbai	MSW Dumping Ground Borewell Water Turbhe	MSW, Area Borewell Navi Mumbai	TTC WMA Site Borewell	TTC Plot no. 142 Borewell	MWML Plot No. P-32 and P-32 Part MIDC, Taloja
Total Dissolved Solids	mg/L	641	455	616	736	895	711
Chemical Oxygen Demand	mg/L	14	11	14	14	21	29
Biochemical Oxygen Demand (3 days,27°C)	mg/L	4	3	4	4	5	8
Electrical Conductivity (at 25 °C)	µmho/cm	1141	814	1102	1319	1599	1269
Nitrite Nitrogen (as NO_2)	mg/L	0.04	0.07	0.02	BLQ	BLQ	BLQ
Nitrate Nitrogen (as NO_3)	mg/L	BLQ	1.00	1.00	1.00	BLQ	1.24
(NO_2 + NO_3)-Nitrogen	mg/L	BLQ	1.07	1.02	1.00	BLQ	1.24
Free Ammonia (as NH_3-N)	mg/L	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
Total Residual Chlorine	mg/L	0.26	0.23	0.24	BLQ	BLQ	BLQ
Cyanide (as CN)	mg/L	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
Fluoride (as F)	mg/L	0.63	0.70	0.67	1.10	1.43	1.00
Sulphide (as H_2S)	mg/L	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
Dissolved Phosphate (as P)	mg/L	0.26	0.11	0.11	0.11	0.11	BLQ
Sodium Adsorption Ratio	-	2.35	1.78	2.32	2.51	2.56	1.92
Total Coliforms	MPN Index/ 100 ml	643	847	593	1071	1600	887
Faecal Coliforms	MPN Index/ 100 ml	350	654	322	1260	730	234
Total Phosphate (as P)	mg/L	0.21	0.16	0.13	0.14	0.16	0.12

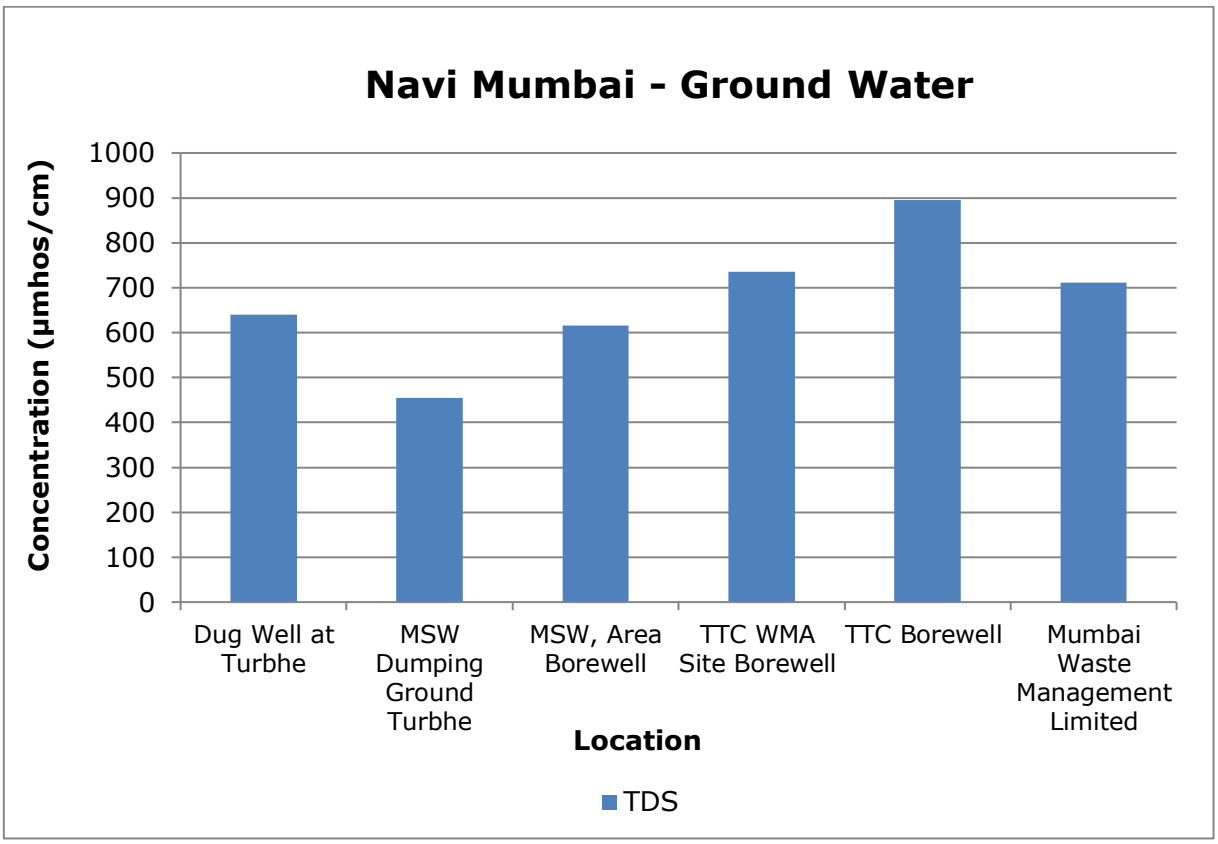
Parameters	Unit	Results					
		Dug Well at Turbhe Gaon, Navi Mumbai	MSW Dumping Ground Borewell Water Turbhe	MSW, Area Borewell Navi Mumbai	TTC WMA Site Borewell	TTC Plot no. 142 Borewell	MWML Plot No. P-32 and P-32 Part MIDC, Taloja
Total Kjeldahl Nitrogen (as N)	mg/L	0.56	0.56	0.75	0.56	0.56	0.56
Total Ammonia (NH_4+NH_3)-Nitrogen	mg/L	0.13	0.13	0.13	BLQ	BLQ	BLQ
Phenols (as C_6H_5OH)	mg/L	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
Anionic Detergents (as MBAS Calculated as LAS, mol.wt.288.38)	mg/L	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
Organo Chlorine Pesticides	µg/L	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
Polynuclear aromatic hydrocarbons (as PAH)	mg/L	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
Polychlorinated Biphenyls (PCB)	mg/L	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
Zinc (as Zn)	mg/L	BLQ	BLQ	BLQ	0.08	BLQ	BLQ
Nickel (as Ni)	mg/L	0.02	0.01	0.01	0.01	0.01	0.03
Copper (as Cu)	mg/L	BLQ	0.06	BLQ	BLQ	BLQ	0.04
Hexavalent Chromium (as Cr^{6+})	mg/L	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
Total Chromium (as Cr)	mg/L	0.04	BLQ	0.03	0.03	0.03	0.05
Total Arsenic (as As)	mg/L	BLQ	BLQ	BLQ	BLQ	0.01	BLQ
Lead (as Pb)	mg/L	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
Cadmium (as Cd)	mg/L	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
Mercury (as Hg)	mg/L	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
Manganese (as Mn)	mg/L	0.10	0.08	0.06	0.06	0.07	0.14
Iron (as Fe)	mg/L	0.40	0.32	0.38	0.35	0.27	0.35
Vanadium (as V)	mg/L	BLQ	0.03	0.01	0.01	0.02	0.02

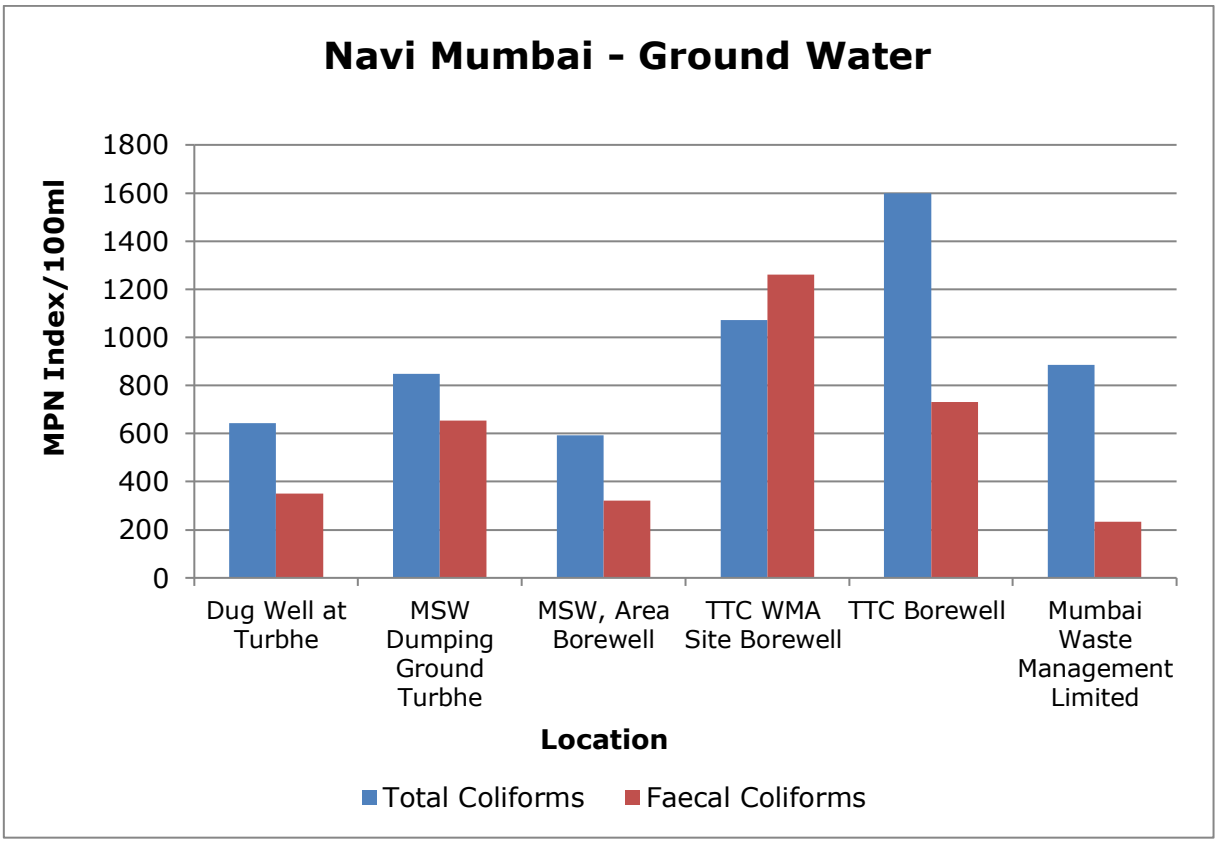
Parameters	Unit	Results					
		Dug Well at Turbhe Gaon, Navi Mumbai	MSW Dumping Ground Borewell Water Turbhe	MSW, Area Borewell Navi Mumbai	TTC WMA Site Borewell	TTC Plot no. 142 Borewell	MWML Plot No. P-32 and P-32 Part MIDC, Taloja
Selenium (as Se)	mg/L	BLQ	BLQ	0.01	0.02	BLQ	BLQ
Boron (as B)	mg/L	BLQ	0.15	BLQ	BLQ	0.15	BLQ
Total Nitrogen	mg/L	1.02	1.01	1.53	1.06	1.06	0.93
Bioassay Test on fish	% survival	100	90	100	97	97	93

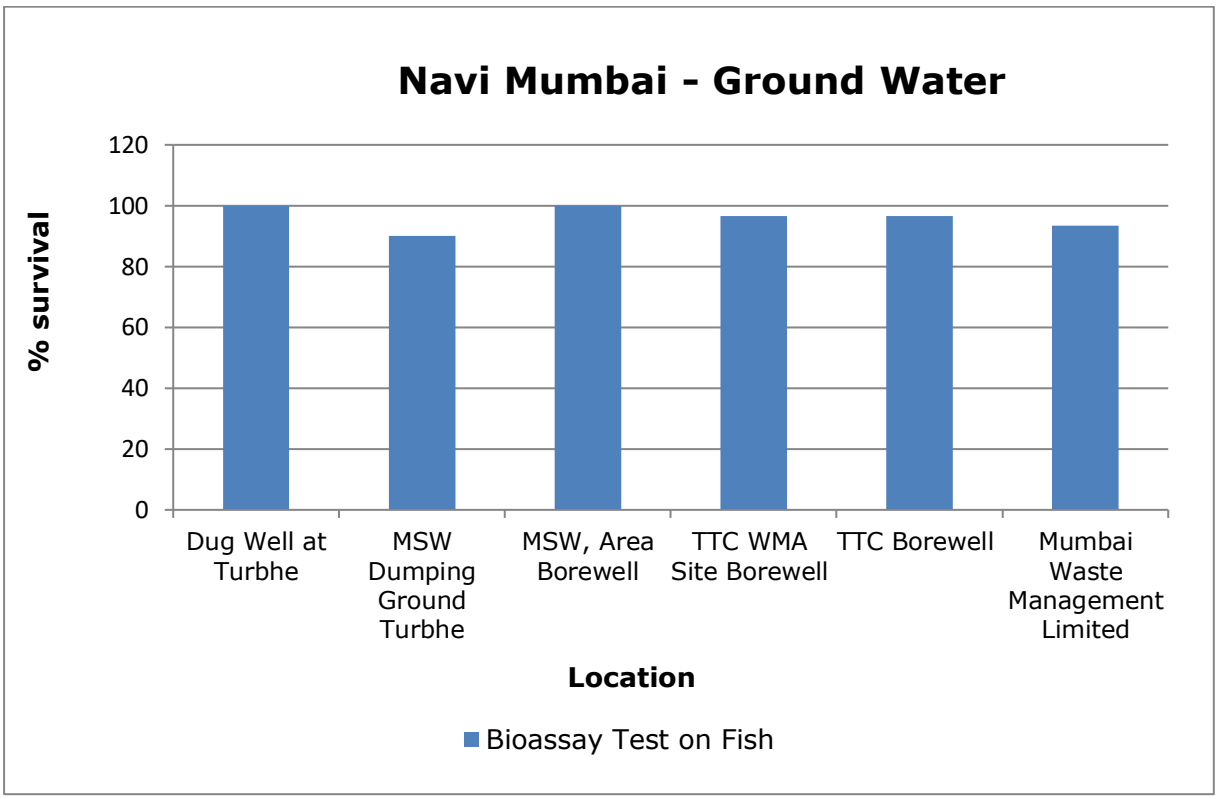
Graphs - Ground Water Quality of Navi Mumbai






Navi Mumbai - Ground Water
Concentration (µmhos/cm)
1000
900
800
700
600
500
400
300
200
100
0
Dug Well at Turbhe
MSW Dumping Ground Turbhe
MSW, Area Borewell
TTC WMA Site Borewell
TTC Borewell
Mumbai Waste Management Limited
Location
TDS


Navi Mumbai - Ground Water
MPN Index/100ml
1800
1600
1400
1200
1000
800
600
400
200
0
Dug Well at Turbhe
MSW Dumping Ground Turbhe
MSW, Area Borewell
TTC WMA Site Borewell
TTC Borewell
Mumbai Waste Management Limited
Location
Total Coliforms
Faecal Coliforms


Navi Mumbai - Ground Water
% survival
120
100
80
60
40
20
0
Dug Well at Turbhe
MSW Dumping Ground Turbhe
MSW, Area Borewell
TTC WMA Site Borewell
TTC Borewell
Mumbai Waste Management Limited
Location
Bioassay Test on Fish

C: Receptor

Component C (Impact on Human Health) 10	
Main - 10	
% increase in cases	**Marks**
<5%	**0**
5-10%	**5**
>10%	**10**

- % increase is evaluated based on the total no. of cases recorded during two consecutive years.
- For Air Environment, total no. of cases related to Asthma, Bronchitis, Cancer, Acute respiratory infections etc. are to be considered.
- For surface water/ ground water Environment, cases related to Gastroenteritis, Diarrhoea, renal (kidney) malfunction, cancer etc are to be considered.
- For the above evaluation, the previous 5 years records of 3-5 major hospitals of the area shall be considered.

Annexure – I Health Related Data enclosed.

9. CEPI Score

Comprehensive Environmental Pollution Index (CEPI) is intended to act as early warning tool which helps in categorization of industrial clusters/ areas in terms of priority of needing attention. The CEPI score have been calculated based on CPCB Letter No. B-29012/ESS (CPA)/2015-16 dated 26th April 2016. The scoring system involves an algorithm that considers the basic selection criteria. It is proposed to develop the CEPI based on Sources of pollution, real time observed values of the pollutants in the ambient air, surface water and ground water in & around the industrial cluster and health related statistics.

Table 8.1 CEPI score of the Post monsoon season (March 2024)

	A1	A2	A	B	C	D	CEPI
Air Index	3.00	4.00	12.00	6.00	10.00	0.00	28.00
Water Index	2.50	4.00	10.00	30.00	10.00	0.00	50.00
Land Index	2.50	4.00	10.00	9.00	10.00	0.00	29.00
						Aggregated CEPI	**54.10**

Table 8.2 Comparison of CEPI Scores

Year	Air Index	Water Index	Land Index	CEPI
CEPI score March 2024	28.00	50.00	29.00	**54.10**
CEPI Score June 2023	36.00	49.30	16.00	**53.59**
CEPI score March 2023	36.00	50.75	16.00	**53.59**
CEPI Score June 2021	35.00	48.25	39.25	**55.36**
CEPI Score March 2021	42.75	43.75	36.00	**52.40**
CEPI score March 2020	50.80	17.80	25.30	**53.00**
CEPI score June 2019	46.25	30.00	25.50	**50.36**
CEPI score March 2019	40.0	32.5	22.5	**44.39**
CEPI score June 2018	40.0	22.0	13.5	**41.78**

Year	Air Index	Water Index	Land Index	CEPI
CEPI score March 2018	48.0	53.75	56.25	**67.54**
CPCB CEPI score March 2018	56.00	63.00	16.00	**66.32**

CEPI Score Calculation:

Navi Mumbai, Maharashtra - CEPI - March 2024

Ambient Air Analysis report

Pollutant	Group	A1	A2	A (A1 X A2)
CO	B	2	Large	
PM_{10}	B	0.5		
$PM_{2.5}$	B	0.5		
		3	**4**	**12**

Pollutant	Avg (1)	Std (2)	EF (3) [(3)=(1)/(2)]	No. of samples Exceeding (4)	Total no. of samples (5)	SNLF Value (6) [(6)=(4)/(5)x(3)]	SNLF score (B)	
CO	1.8	2	0.91	0	8	0.00	L	6
PM_{10}	65.8	100	0.66	0	8	0.00	L	0
$PM_{2.5}$	18.2	60	0.30	0	8	0.00	L	0
B score = (B1+B2+B3)							**B**	**6**

C	**10**	**>10 %**
D	**0**	**A-A-IA**

Air CEPI	**(A+B+C+D)**	**28.0**

Water Quality Analysis report

Pollutant	Group	A1	A2	A (A1 X A2)
BOD	B	2	Large	
TN	A	0.25		
TKN	A	0.25		
		2.5	**4**	**10**

Pollutant	Avg (1)	Std (2)	EF (3) [(3)=(1)/(2)]	No. of samples Exceeding (4)	Total no. of samples (5)	SNLF Value (6) [(6)=(4)/(5)x(3)]	SNLF score (B)	
BOD	27.22	8	3.40	6	6	3.40	C	30

TN	3.64	15	0.24	0	6	0.00	L	0
TKN	1.74	3	0.58	0	6	0.00	L	0
B score = (B1+B2+B3)							**B**	**30**

C	**10**	**>10 %**
D	**0**	**A-A-A**

Water CEPI	**(A+B+C+D)**	**50.0**

Ground Water Quality Analysis report

Pollutant	Group	A1	A2	A (A1 X A2)
Se	B	2	Large	
F	A	0.25		
TDS	A	0.25		
		2.5	**4**	**10**

Pollutant	Avg (1)	Std (2)	EF (3) [(3)=(1)/(2)]	No. of samples Exceeding (4)	Total no. of samples (5)	SNLF Value (6) [(6)=(4)/(5)x(3)]	SNLF score (B)	
Se	0.01	0.01	0.60	1	6	0.10	M	9
F	0.92	1.5	0.61	0	6	0.00	L	0
TDS	676	2000	0.34	0	6	0.00	L	0
B score = (B1+B2+B3)							**B**	**9**

C	**10**	**>10%**
D	**0**	**A-A-A**

Land CEPI	**(A+B+C+D)**	**29.0**

Water CEPI Score (im) **50.75**

Air CEPI Score (i2) **36.00**

Land Score (i3) **16.00**

Aggregated CEPI Score = **im + {(100-im)*i2/100)*i3/100)}**

where, im = maximum sub index; and
i2 and i3 are sub indices for other media

CEPI Score **53.59**

10. Conclusion

Ambient Air Quality

- In the present study, 08 AAQ stations were identified in the CEPI impact area to cover both upwind and cross wind directions and AAQ survey was conducted.
- All air quality parameters are observed well within the limits as per NAAQS.
- Concentration of PM10 is observed in the range of 57 µg/m^3 to 78 µg/m^3 and PM2.5 in the range of 16 to 22 µg/m^3 at the studied locations.
- The air index of the present study is 28.0

Surface Water Quality

- To understand the quality of treated effluent, samples were collected from six industries
- Higher concentration of BOD and Total phosphates was observed in the surface water samples collected which may be due to domestic wastewater, sewage, other localized activities.
- All the industries in Navi Mumbai region are either reusing the treated trade effluent as sewage in their process or gardening.
- The water index of the presnt study is 50.0

Ground Water Quality

- Six ground water samples were collected from different Dug well, well and Bore well in the region.
- Ground water of the studied regions was found to be safe for drinking with a very low concentration of TDS, TKN and iron, chromium and other general as well as carcinogenic parameters.
- In the CEPI score calculated for Land Environment by CPCB in March (post monsoon) 2018 also there was no critical pollutant exceeding in any water sample collected.
- The Land index of the present study is 29.0

CEPI Score

- The CEPI Score post monsoon season is 54.1.
- During calculation of CEPI score, water Index is calculated highest with 50, followed by the Land Index 29.00 and Air index as 28. The parameters of surface water and ground water in Navi Mumbai region are found well within the limits. Hence, aggregated CEPI score is computed as 54.1, which is lower than the CPCB CEPI score 2018 post monsoon season, which was 66.32.
- In CEPI score of CPCB 2018 (post monsoon), the air index and water Index was higher as compared to the present (post monsoon 2023) indices.

- In comparison with the CEPI Score of 2023 (post monsoon), there is a decrease in the air Index, but the Land index increased this year.
- Collective efforts of regional office of MPCB, NMMC, administration and environmental organizations are resulting in significant reduction in pollution level.
- Efforts taken to reduce the pollution level is represents factor D in CEPI Calculation, which also affects the overall CEPI score.
- The present study is the compilation of post monsoon season, which results in dilution of environmental samples resulting in lower pollution load, hence also affects the total score.
- In conclusion, approximately 19% decrease in CEPI score is observed from 66.32 in 2018 to 54.1 to the present study (March, 2024).

11. Efforts taken by MPCB to Control and Reduce Environmental Pollution Index

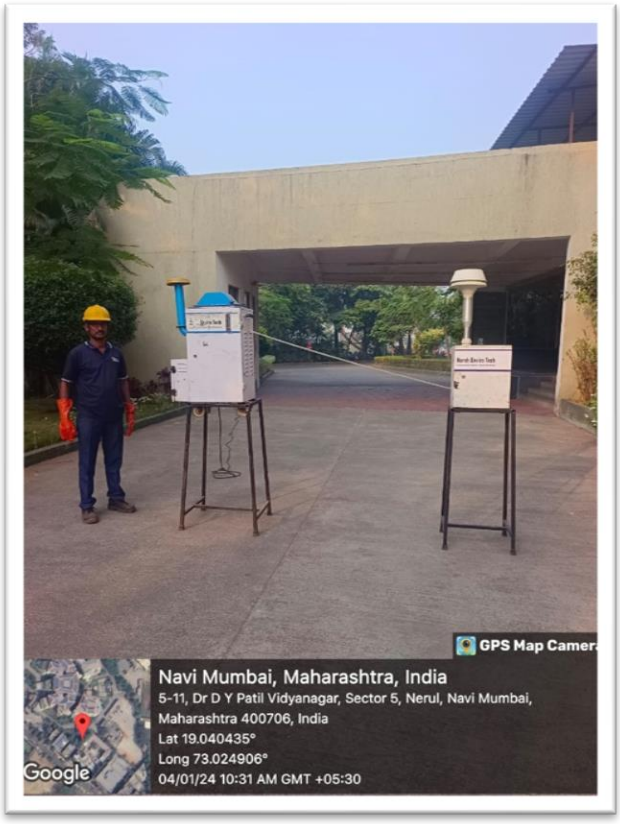
- Drive against open burning of biomass, crop residue, garbage, leaves, etc.
- Organic Waste Compost Machines Malls, Infrastructure projects, Large scale hospitals & Hotels has installed OWC.
- Waste collection and segregation centres: Provided by NMMC at all wards.
- Construction of Common Effluent Treatment Plant (CETP): 1 CETP of 27 MLD capacity is already operational and complied.
- Installation of CEMS installed for Air and Water in Large and Medium scale RED category industries: 63 Nos. of unit has installed CEMS & connected to CETP server.
- Arrangement of scientific collection and treatment of sewage generated: 04 Nos of STP having total capacity as 256.5 MLD with adequate capacity of collection sumps are provided by NMMC.
- Installation of CAAQMS station: Total 4 Nos. (1 old + 3 new) of CAAQMS stations are operational.
- Number of Monitoring stations under National Water Quality Monitoring Programme (NWMP): 1 (Vashi Creek at Vashi Bridge).
- Steps are taken for industrial area/other units to recycle 100% treated effluent to achieve Zero Liquid Discharge (ZLD): 11 Nos of Industries has adapted ZLD.
- Steps are taken to reduce dust emission: Concretization of Roads and twice daily sweeping of Roads by NMMC authority. Presently NMMC has proccured2 Nos. of fogging machines. NMMC is already having 6 Nos. of mechanical sweeping machines.
- Around 1 lakh trees are planted in last one year (2021-2022).
- Directions issued to the industries to switch over on clean fuel.

	
Continuous Ambient Air Quality Monitoring Station (CAAQMS)	**Ambient Air Quality Monitoring (AAQM) Van**

12. Photographs

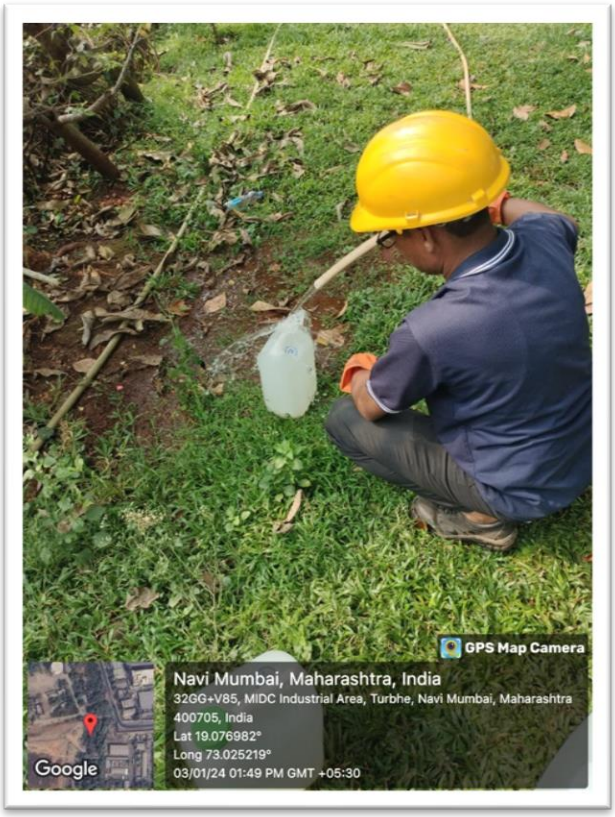
Ambient Air Sampling at TIS MIDC, Taloja

Ambient Air Sampling at Ashi India Glass



Ambient Air Sampling at Hospital Sector-V Nerul,

Ambient Air Sampling at Zoetis Pharmaceuticals Research Pvt.

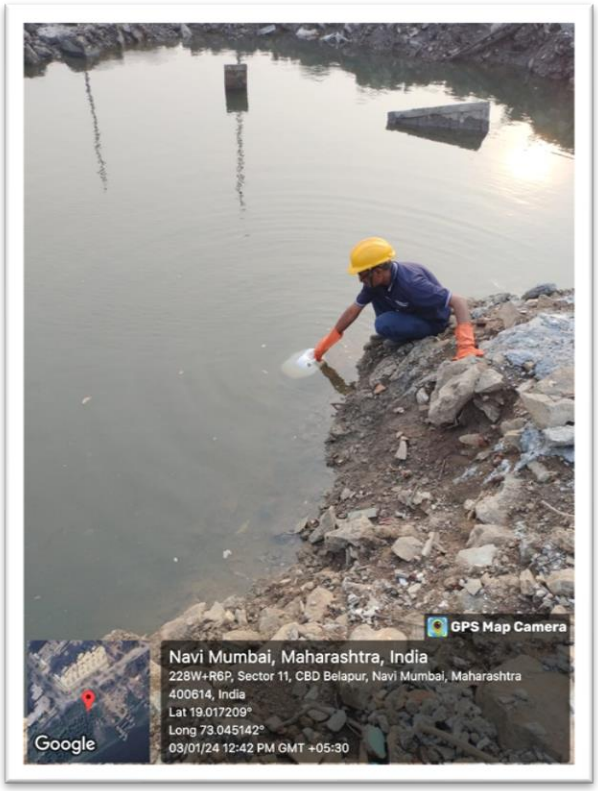


Groundwater Sampling – MSW, Area Borewell Navi Mumbai

Groundwater Sampling – Dug Well at Turbhe Gaon, Navi Mumbai

Groundwater Sampling – Mumbai Waste Management Limited

Groundwater Sampling – TTC WMA Site Borewell

	
Surfacewater Sampling – CBD Nalla	**Surfacewater Sampling – Vashi Creek at Vashi Bridge**
	
Surfacewater Sampling – Airoli Creek at Airoli Bridge	**Surfacewater Sampling –Kasardi River Near CETP Taloja Brige**

HEALTH STATISTICS

Required for Comprehensive Environmental Pollution Index (CEPI)
Post-monsoon Season (December 2023- February 2024) Study by
Maharashtra Pollution Control Board (MPCB), MAHARASHTRA

Name of the Polluted Industrial Area (PIA)	NAVI MUMBAI
Name of the major health center/ organization	~~R N Hospital~~ Dr. R.N. Patil's Suraj Hospital
Name and designation of the Contact person	Santosh Deshmukh 9920870636
Address	Sun Palm view, Sec. 15 Sanpada Navi Mumbai

S No.	Diseases	No. of Patients Reported	
		Year 2021-2022	Year 2022-2023
AIRBORNE DISEASES			
1.	Asthma	21	23
2.	Acute Respiratory Infection	187	141
3.	Bronchitis	36	24
4.	Cancer	9	6
WATERBORNE DISEASES			
1.	Gastroenteritis	96	86
2.	Diarrhea	113	103
3.	Renal diseases	6	11
4.	Cancer	12	8

Date: 24/1/24

Signature

Dr. R. N. Patil's SURAJ HOSPITAL Reg. No. 039

HEALTH STATISTICS

Required for Comprehensive Environmental Pollution Index (CEPI) Post-monsoon Season (December 2023- February 2024) Study by Maharashtra Pollution Control Board (MPCB), MAHARASHTRA

Name of the Polluted Industrial Area (PIA)	NAVI MUMBAI
Name of the major health center/ organization	Mahatma Gandhi Mission Hospital
Name and designation of the Contact person	Mr. Shyam Yempalle
Address	P.No-35, Sec-3, Vashi, Navi Mumbai. 400703.

S No.	Diseases	No. of Patients Reported	
		Year 2021-2022	Year 2022-2023
AIRBORNE DISEASES			
1.	Asthma	161	140
2.	Acute Respiratory Infection	192	392
3.	Bronchitis	176	164
4.	Cancer	650	694
WATERBORNE DISEASES			
1.	Gastroenteritis	218	239
2.	Diarrhea	08	18
3.	Renal diseases	742	356
4.	Cancer	–	–

Date: 24.1.24.

Signature

24.1.24.

ADMINISTRATOR
MGM NEW BOMBAY HOSPITAL, VASHI

HEALTH STATISTICS

Required for Comprehensive Environmental Pollution Index (CEPI)
Post-monsoon Season (December 2023- February 2024) Study by
Maharashtra Pollution Control Board (MPCB), MAHARASHTRA

Name of the Polluted Industrial Area (PIA)	NAVI MUMBAI
Name of the major health center/ organization	E.S.I.S. Hospital
Name and designation of the Contact person	
Address	

S No.	Diseases	No. of Patients Reported	
		Year 2021-2022	Year 2022-2023
AIRBORNE DISEASES			
1.	Asthma	295	524
2.	Acute Respiratory Infection	250	584
3.	Bronchitis	64	185 +98
4.	Cancer	6+4	13
WATERBORNE DISEASES			
1.	Gastroenteritis	136	279
2.	Diarrhea		
3.	Renal diseases	226+178	240 + 14
4.	Cancer	127+3+1	9+7

Date:

लिपिक
रा. का. वि. यो. रुग्णालय
वाशी, नवी मुंबई - ४००७०३.

Signature
(Sister Incharge OPD)