

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

**MAHAD**

**Post Monsoon (December 2022 to February 2023)**



**Maharashtra Pollution Control Board**

Kalptaru Point, Sion East, Mumbai – 400 022

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## **ABBREVIATIONS**

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

## 1. Executive Summary

Mahad 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 26<sup>th</sup> 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. Six locations each for surface water and ground water were monitored for the study. Concentration of Total Kjeldahl Nitrogen was found above the standard limits in few of the surface water monitoring. Land index is represented by ground water in the CEPI. Ground water parameters were found to be within the permissible limits, except Iron and Total Kjeldahl Nitrogen, when compared with IS10500:2012 drinking water standards.

Based on the study conducted by CPCB during the period January 2018, the CEPI score of Mahad region as per the revised guidelines of CEPI (2016) was 47.12 (Air Index-41, Water Index-35.75 and Land Index-47.12). However, the present study reports aggregated CEPI score of Mahad region of post-monsoon season (March, 2023), the present CEPI score is 41.45 (Air Index-29.00, Water Index-35.25 and Land Index-33.00). 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 the pollution. As regional office of MPCB has taken various initiatives like installation of CAAQMS, CETPs, etc. in the past few years to control and mitigate the 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 CEPI score of Mahad industrial cluster is decreased approximately 12% from 47.12 of 2018 to 41.45 in 2023.

## 2. Introduction

Over the past few decades, environmental deterioration has become a "common concern" for humanity. The distinctive nature of the current environmental issues is that human activity contributes to them more than natural events. Economic expansion and mindless consumption are beginning to have negative impacts on Mother Nature. It's been studied and reported that the majority of industries (77% approximately) contribute to water pollution, 15% to air pollution, and the remaining 8% to both air and water pollution. Additionally, the most polluting businesses are those that depend on natural resources and are expanding quickly.

These human activities have an adverse effect on the environment by polluting the water we drink, the air we breathe, and the soil in which plants grow. Untreated wastewater from industries has affected the potability and hygiene of drinking water due to the presence of hazardous impurities in it, causing detrimental health effects to human, animal and aquatic life. Exposure to air pollutants is closely related to Pulmonary Diseases, wheezing, asthma, respiratory disease, cardiovascular diseases etc. Moreover, air pollution seems to have various malign health effects in early human life, such as respiratory, cardiovascular, mental, and perinatal disorders, leading to infant mortality or chronic disease in adult age. Therefore, it is crucial to identify and investigate the major sources of pollution to implement mitigation strategies for substantial environmental and health co-benefits. Even though health is a major concern, industrial growth is a necessity for a developing economy. Research into the development of such systems that can cut down on the usage of freshwater by industrial sectors as well as the development of efficient and effective water treatment methods is encouraged for overall socioeconomic progress and well-being. To mitigate any hazardous impacts, new advancements and ongoing monitoring of the execution methods of various programmes and interventions related to industrial wastewater treatment are critically important.

In view of this, Central Pollution Control Board (CPCB) has evolved the concept of Comprehensive Environmental Pollution Index (CEPI) during 2009-10 as a tool for comprehensive environmental assessment of prominent industrial clusters and formulation of remedial Action Plans for the identified critically polluted areas. CEPI bridges the perceptible gap between experts, public, and government departments by simplifying the complexity of environmental issues. It aims at categorizing critically polluted industrial areas based on scientific criteria, so as to ascertain various dimensions of pollution. This is a combined framework used to evaluate the impacts caused by industrial clusters on the nearby environment, as a numerical value.

The present CEPI study includes Mahad city in Raigad district situated in the North Konkan region of Maharashtra state, India. It is located 108.5 km from District's Headquarter Alibag. Savitri river is the main river which originates from Savitri Point in Mahabaleshwar and flows through Mahad. Mahad receives the highest rainfall in Raigad district because of the rain catcher forest of Raigad Fort Natural Reserve. Mahad accounts for lots of 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 based on the revised CEPI version 2016. The results of the application of the Comprehensive Environmental Pollution Index (CEPI) to selected industrial cluster or areas are presented in this report. The main objective of the study is to identify polluted industrial clusters or areas in order to take concerted action and to centrally monitor them at the national level to improve the current status of their environmental components such as air and water quality data, ecological damage, and visual environmental conditions. 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.

### 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 Mahad, 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 MAHAD**

Sampling Criteria	Total Sites	Monitoring Parameters
<b>Ambient Air Quality</b>	<b>08</b>	PM <sub>10</sub> , PM <sub>2.5</sub> , SO <sub>2</sub> , NO <sub>2</sub> , NH <sub>3</sub> , O <sub>3</sub> , C <sub>6</sub> H <sub>6</sub> , CO, BAP, Pb, Ni, As
<b>Volatile Organic Compounds (VOCs)</b>	<b>02</b>	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	<p><b>(i) Simple Parameters</b></p> <p>Sanitary Survey, General Appearance, Colour, Smell, Transparency and Ecological</p> <p><b>(ii) Regular Monitoring Parameters</b></p> <p>pH, O &amp; G, Suspended Solids, DO, COD, BOD, TDS, Electrical Conductivity, Total Dissolved Solids, Nitrite-Nitrogen, Nitrate-Nitrogen, (NO<sub>2</sub>+NO<sub>3</sub>) total nitrogen, Free Ammonia, Total Residual Chlorine, Cyanide, Fluoride, Chloride, Sulphate, Sulphides, Total Hardness, Dissolved Phosphates, SAR, Total Coliforms, Faecal Coliform</p> <p><b>(iii) Special Parameters</b></p> <p>Total Phosphorous, TKN, Total Ammonia (NH<sub>4</sub>+NH<sub>3</sub>)-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</p> <p><b>(iv) Bio-assay (zebra Fish) Test</b> – For specified samples only.</p>
	Ground water - 06	

**Table 3.2 Frequency of Sampling**

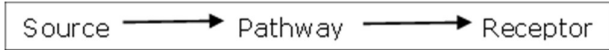
	Parameter	Round of Sampling	Frequency in Each Round
<b>A</b>	<b>Ambient Air Quality Monitoring</b>		
1.	Particulate Matter (size less than 10 µm) or PM <sub>10</sub>	03	3 Shifts of 8 hrs each
2.	Particulate Matter (size less than 2.5 µm) or PM <sub>2.5</sub>	03	1 Shift of 24 hr
3.	Sulphur Dioxide (SO <sub>2</sub> )	03	6 Shifts of 4 hrs each
4.	Nitrogen Dioxide (NO <sub>2</sub> )	03	6 Shifts of 4 hrs each
5.	Ammonia (NH <sub>3</sub> )	03	6 Shifts of 4 hrs each



	<b>Parameter</b>	<b>Round of Sampling</b>	<b>Frequency in Each Round</b>
6.	Ozone (O <sub>3</sub> )	03	24 Shifts of 1 hr each
7.	Benzene (C <sub>6</sub> H <sub>6</sub> )	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>B</b>	<b>Volatile Organic Compounds (VOCs)</b>		
	As mentioned in Table 3.1	03	3 Shifts of 24 hrs each
<b>C</b>	<b>Ground Water</b>		
	As mentioned in Table 3.1	03	01 sample at each round
<b>D</b>	<b>Surface Water</b>		
	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 Mahad 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 Mahad eight locations have been monitored of checking the Ambient Air Quality (AAQ) in triplicate from 23<sup>rd</sup> Jan., 2023 to 27<sup>th</sup> Jan., 2023. Concentration of all the parameters at all studied locations was observed well within the limits. VOCs were monitored at 2 locations namely Sequent Scientific Ltd. and Prasol Chemical Ltd.

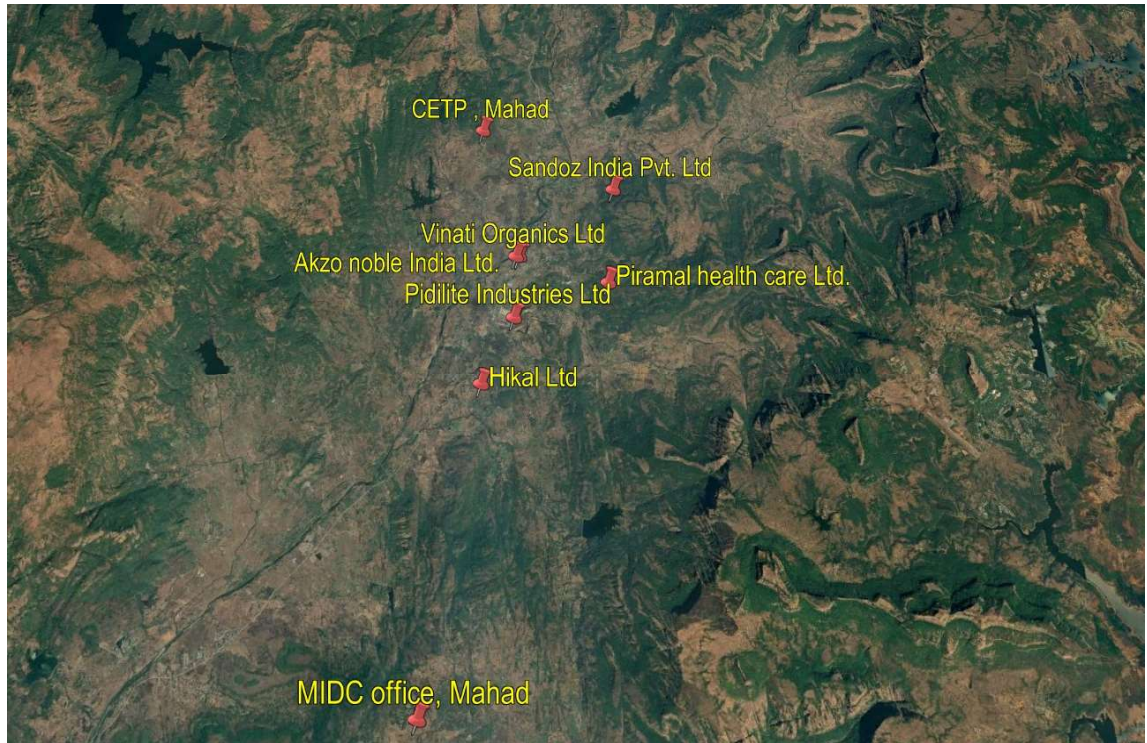
**Table 5.1 Details of Sampling Location of Ambient Air Quality Monitoring**

Sr. No.	Name of Monitoring Location	Latitude	Longitude	Date of Sampling		
				Round-1	Round-2	Round-3
1.	Nearby Piramal Healthcare Ltd.	N18°06'43.50"	E73°31'10.72"	23.01.2023	25.01.2023	27.01.2023
2.	Akzo noble India Ltd. (Nouryon Chemical) Mahad	N18°05'56.99"	E73°29'3.62"	23.01.2023	25.01.2023	27.01.2023
3.	Vinati Organics Ltd Mahad	N18°06'2.01"	E73°29'21.38"	23.01.2023	25.01.2023	27.01.2023
4.	Sandoz India Pvt. Ltd, Mahad	N18°05'55.13"	E73°27'49.53"	23.01.2023	25.01.2023	27.01.2023
5.	Pidilite Industries Ltd	N18°06'26.38"	E73°28'21.46"	23.01.2023	25.01.2023	27.01.2023
6.	CETP, Mahad	N18°05'50.58"	E73°27'59.89"	23.01.2023	25.01.2023	27.01.2023
7.	MIDC Office Mahad	N18°05'54.00"	E73°28'0.86"	23.01.2023	25.01.2023	27.01.2023
8.	Hikal Ltd	N18°05'43.45"	E73°27'53.50"	23.01.2023	25.01.2023	27.01.2023

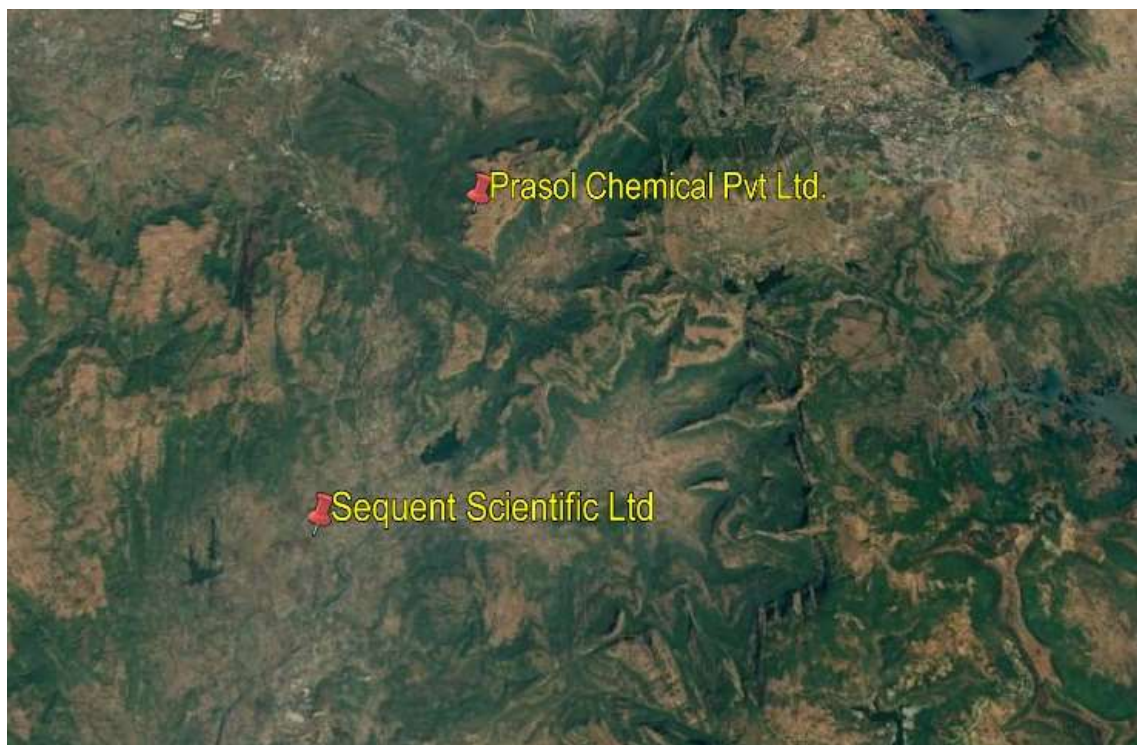
**Table 5.2 Details of Sampling Location of Volatile Organic Compounds (VOCs) Monitoring**

Sr. No.	Name of Monitoring Location	Latitude	Longitude	Date of Sampling		
				Round-1	Round-2	Round-3
1.	Sequent Scientific Ltd	N18°40'00.9"	E73°17'34.3"	23.01.2023	25.01.2023	27.01.2023

Sr. No.	Name of Monitoring Location	Latitude	Longitude	Date of Sampling		
				Round-1	Round-2	Round-3
2.	Prasol Chemical Pvt Ltd.	N18°44'01.1"	E73°19'17.2"	23.01.2023	25.01.2023	27.01.2023



**Fig: Geographical Locations of Ambient Air Sampling**



**Fig: Geographical Locations of VOCs Monitoring**

**Table 5.3 Ambient Air Quality Monitoring Results**

Parameters	Unit	Results			
		Piramal health care Ltd.	Akzo noble India Ltd. (Nouryon Chemical)	Vinati Organics Ltd.	Sandoz India Pvt. Ltd.
Sulphur Dioxide (SO <sub>2</sub> )	µg/m <sup>3</sup>	9.06	9.61	6.99	14.06
Nitrogen Dioxide (NO <sub>2</sub> )	µg/m <sup>3</sup>	14.83	21.05	21.95	17.28
Particulate Matter (size less than 10 µm) or PM <sub>10</sub>	µg/m <sup>3</sup>	69	57	35	48
Particulate Matter (size less than 2.5 µm) or PM <sub>2.5</sub>	µg/m <sup>3</sup>	18	16	11	13
Ozone (O <sub>3</sub> )	µg/m <sup>3</sup>	20.90	23.45	25.70	BLQ
Lead (Pb)	µg/m <sup>3</sup>	BLQ	0.02	BLQ	0.02
Carbon Monoxide (CO) (1h)	mg/m <sup>3</sup>	1.64	1.68	1.43	1.46

Parameters	Unit	Results			
		Piramal health care Ltd.	Akzo noble India Ltd. (Nouryon Chemical)	Vinati Organics Ltd.	Sandoz India Pvt. Ltd.
Carbon Monoxide (CO) (8h)	mg/m <sup>3</sup>	1.92	1.92	1.74	1.68
Ammonia (NH <sub>3</sub> )	µg/m <sup>3</sup>	28.05	38.25	26.13	28.80
Benzene (C <sub>6</sub> H <sub>6</sub> )	µg/m <sup>3</sup>	3.14	2.95	3.03	2.93
Benzo (a) Pyrene (BaP) – particulate phase only	ng/m <sup>3</sup>	BLQ	BLQ	BLQ	BLQ
Arsenic (As)	ng/m <sup>3</sup>	0.42	0.39	BLQ	0.99
Nickel (Ni)	ng/m <sup>3</sup>	7.87	BLQ	BLQ	BLQ

Parameters	Unit	Results			
		MIDC Office	Pidilite Industries Ltd.	CETP, Mahad	HIKAL Ltd.
Sulphur Dioxide (SO <sub>2</sub> )	µg/m <sup>3</sup>	11.38	9.67	14.35	14.96
Nitrogen Dioxide (NO <sub>2</sub> )	µg/m <sup>3</sup>	27.60	30.80	26.87	30.55
Particulate Matter (size less than 10 µm) or PM <sub>10</sub>	µg/m <sup>3</sup>	58	57	60	60
Particulate Matter (size less than 2.5 µm) or PM <sub>2.5</sub>	µg/m <sup>3</sup>	17	16	16	16
Ozone (O <sub>3</sub> )	µg/m <sup>3</sup>	23.50	21.50	27.00	20.40
Lead (Pb)	µg/m <sup>3</sup>	BLQ	BLQ	BLQ	0.03
Carbon Monoxide (CO)-1h	mg/m <sup>3</sup>	1.51	1.40	1.54	1.54
Carbon Monoxide (CO)-8 h	mg/m <sup>3</sup>	1.84	1.91	1.82	1.76
Ammonia (NH <sub>3</sub> )	µg/m <sup>3</sup>	21.00	32.80	31.10	23.55
Benzene (C <sub>6</sub> H <sub>6</sub> )	µg/m <sup>3</sup>	3.26	3.33	2.91	3.04
Benzo (a) Pyrene (BaP) – particulate phase only	ng/m <sup>3</sup>	BLQ	BLQ	BLQ	BLQ
Arsenic (As)	ng/m <sup>3</sup>	0.46	0.70	0.50	1.04
Nickel (Ni)	ng/m <sup>3</sup>	BLQ	BLQ	BLQ	19.30



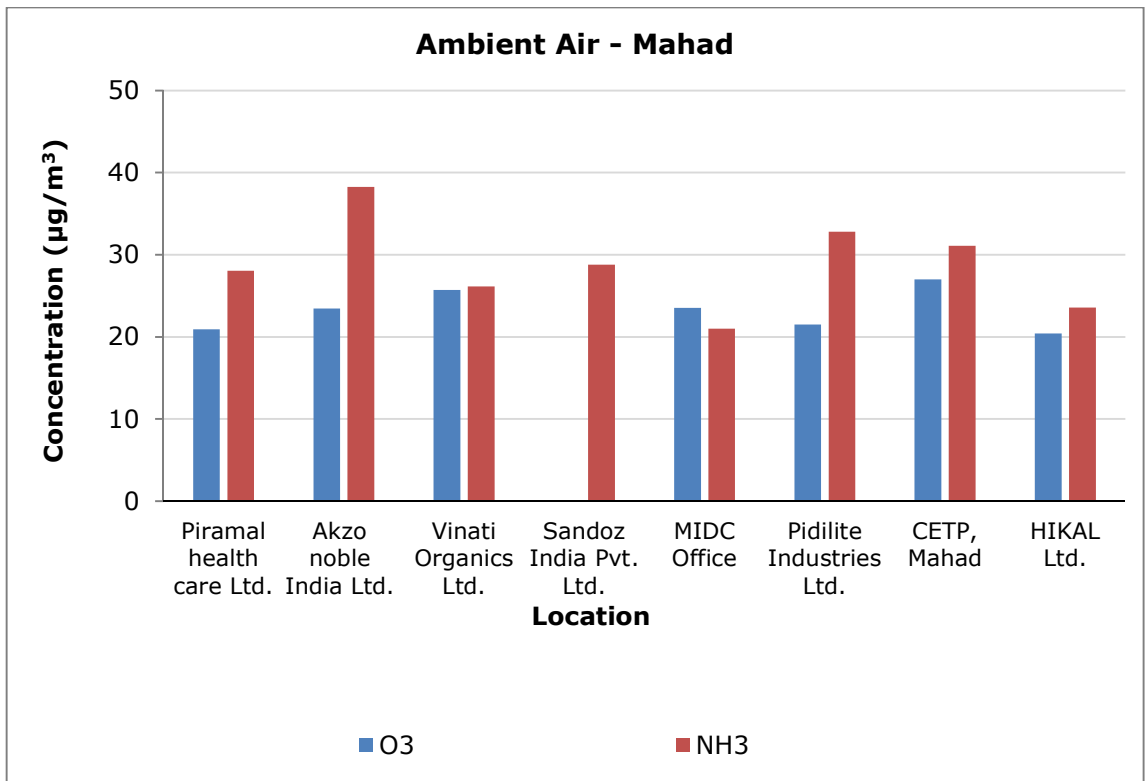
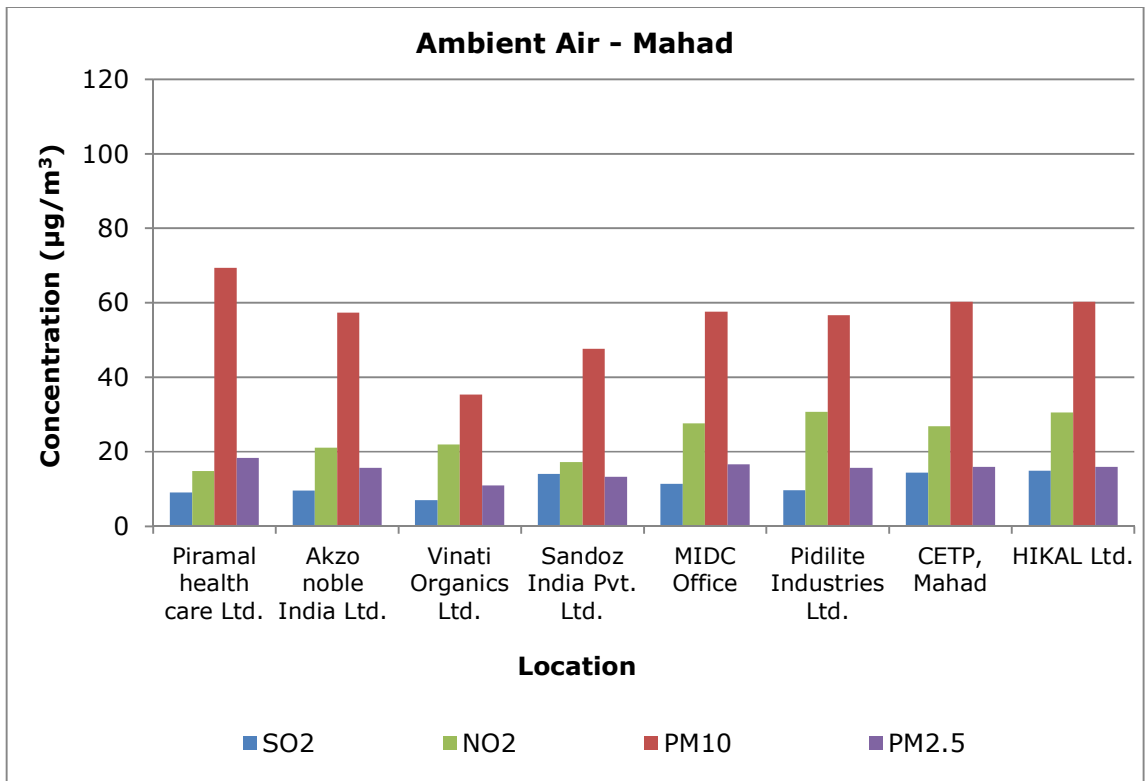
**Table 5.4 Volatile Organic Compounds (VOCs) in Ambient Air Results**

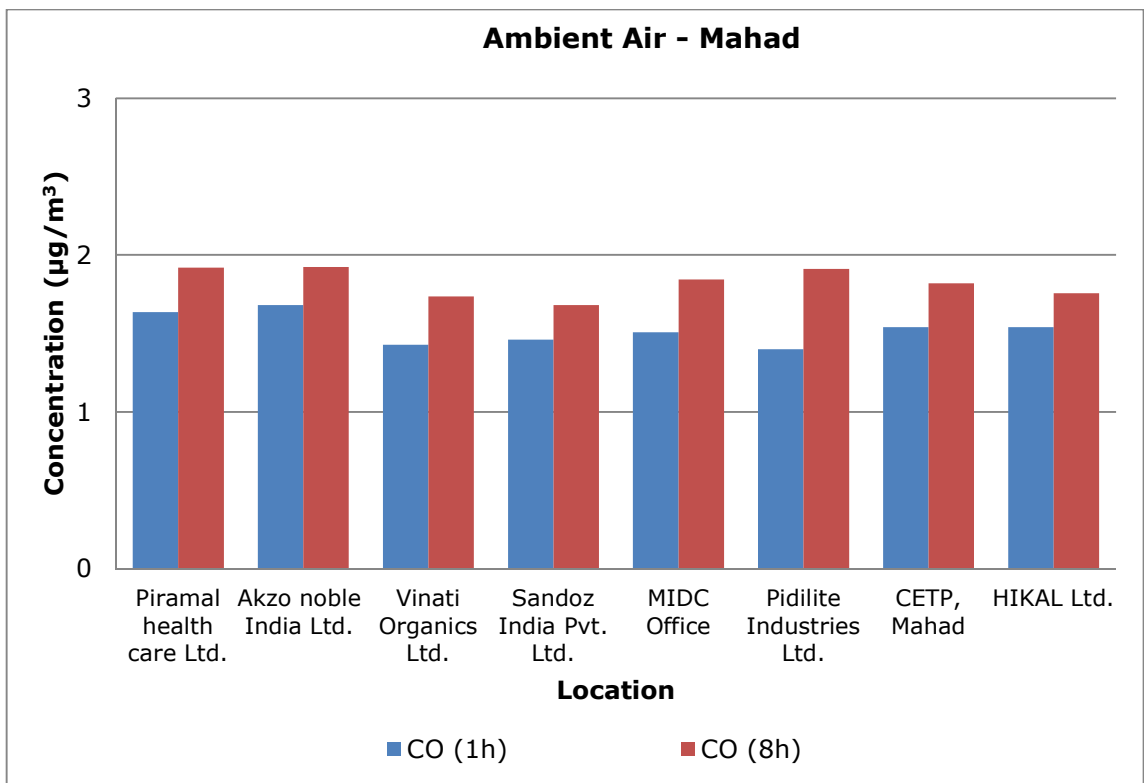
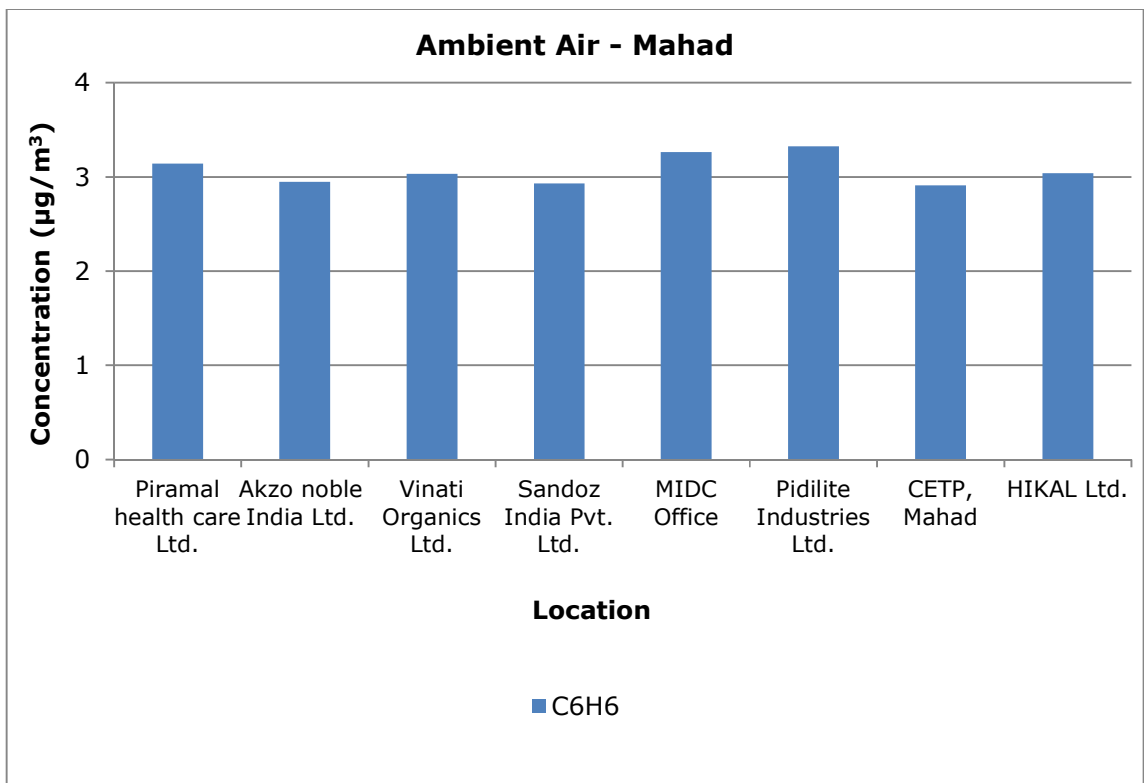
Parameters	Unit	Results	
		Sequent Scientific Ltd.	Prasol Chemical Pvt Ltd.
Dichloromethane	µg/m <sup>3</sup>	BLQ	BLQ
Chloroform	µg/m <sup>3</sup>	BLQ	BLQ
Carbon Tetrachloride	µg/m <sup>3</sup>	BLQ	BLQ
Trichloroethylene	µg/m <sup>3</sup>	BLQ	BLQ
Bromodichloromethane	µg/m <sup>3</sup>	BLQ	BLQ
1,3-Dichloropropane	µg/m <sup>3</sup>	BLQ	BLQ
1,4-Dichlorobenzene	µg/m <sup>3</sup>	0.70	0.78
1,3-Dichlorobenzene	µg/m <sup>3</sup>	0.81	0.90
1,2-Dichlorobenzene	µg/m <sup>3</sup>	BLQ	2.9
1,2-Dibromo-3-Chloropropane	µg/m <sup>3</sup>	BLQ	BLQ
Napthalene	µg/m <sup>3</sup>	4.5	4.83
Bromobenzene	µg/m <sup>3</sup>	BLQ	BLQ
1,2,4-Trimethylbenzene	µg/m <sup>3</sup>	BLQ	BLQ
2-Chlorotoluene	µg/m <sup>3</sup>	BLQ	BLQ
Tert-Butylbenzene	µg/m <sup>3</sup>	0.53	BLQ
SEC-Butylbenzene	µg/m <sup>3</sup>	BLQ	BLQ
P-Isopropyltoluene	µg/m <sup>3</sup>	0.74	BLQ
M-Xylene	µg/m <sup>3</sup>	BLQ	BLQ
P-Xylene	µg/m <sup>3</sup>	BLQ	BLQ
Styrene	µg/m <sup>3</sup>	BLQ	BLQ
Cumene	µg/m <sup>3</sup>	BLQ	BLQ
1,2,3-Trichloropropane	µg/m <sup>3</sup>	BLQ	BLQ
N-Propylbenzene	µg/m <sup>3</sup>	2	BLQ
Dibromochloromethane	µg/m <sup>3</sup>	BLQ	BLQ
1,2-Dibromoethane	µg/m <sup>3</sup>	BLQ	BLQ
Chlorobenzene	µg/m <sup>3</sup>	BLQ	0.69
1,1,1,2-Tetrachloroethane	µg/m <sup>3</sup>	BLQ	BLQ
Ethylbenzene	µg/m <sup>3</sup>	BLQ	BLQ
1,1-Dichloropropylene	µg/m <sup>3</sup>	BLQ	BLQ
1,2-Dichloroethane	µg/m <sup>3</sup>	BLQ	BLQ
1,2-Dichloropropane	µg/m <sup>3</sup>	BLQ	BLQ

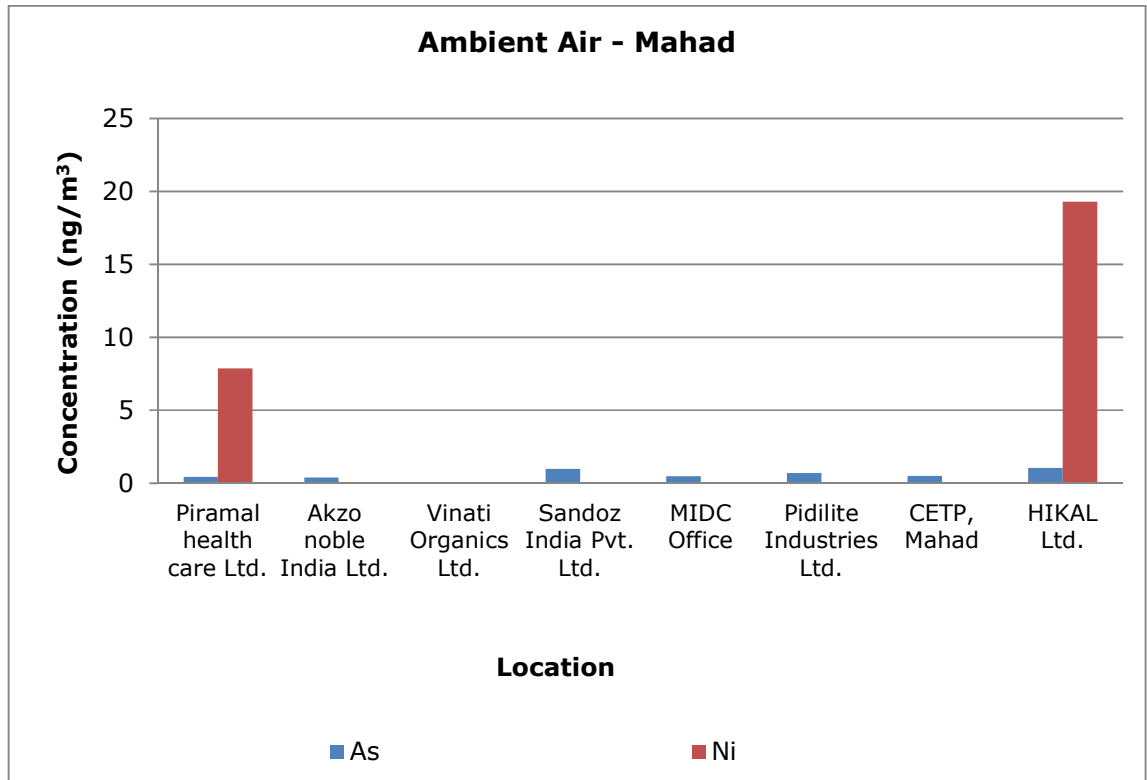


Parameters	Unit	Results	
		Sequent Scientific Ltd.	Prasol Chemical Pvt Ltd.
Trans-1,3-Dichloropropene	µg/m <sup>3</sup>	BLQ	BLQ
CIS 1,3-Dichloropropene	µg/m <sup>3</sup>	BLQ	BLQ
1,1,2-Trichloroethane	µg/m <sup>3</sup>	BLQ	BLQ
Tetrachloroethylene	µg/m <sup>3</sup>	BLQ	BLQ
1,3,5-Trimethylbenzene	µg/m <sup>3</sup>	BLQ	BLQ
N-Butylbenzene	µg/m <sup>3</sup>	1.97	BLQ
1,2,3-Trichlorobenzene	µg/m <sup>3</sup>	BLQ	BLQ
Hexachlorobutadiene	µg/m <sup>3</sup>	BLQ	BLQ
1,2,4-Trichlorobenzene	µg/m <sup>3</sup>	BLQ	BLQ
2,2-Dichloropropane	µg/m <sup>3</sup>	BLQ	BLQ
Dibromomethane	µg/m <sup>3</sup>	BLQ	BLQ
Toluene	µg/m <sup>3</sup>	0.53	0.5
O-Xylene	µg/m <sup>3</sup>	BLQ	BLQ
Bromoform	µg/m <sup>3</sup>	BLQ	BLQ
1,1,2,2-Tetrachloroethane	µg/m <sup>3</sup>	BLQ	BLQ
4-Chlorotoluene	µg/m <sup>3</sup>	BLQ	BLQ
1,1-Dichloroethylene	µg/m <sup>3</sup>	BLQ	BLQ
Trans-1,2-Dichloroethylene	µg/m <sup>3</sup>	BLQ	BLQ
1,1-Dichloroethane	µg/m <sup>3</sup>	BLQ	BLQ
CIS-1,2-Dichloroethylene	µg/m <sup>3</sup>	BLQ	BLQ
Bromochloromethane	µg/m <sup>3</sup>	BLQ	BLQ
1,1,1-Trichloroethane	µg/m <sup>3</sup>	BLQ	BLQ

**Graphs - Ambient Air Quality Monitoring of Mahad**







# **WATER ENVIRONMENT**

## 6. Water Environment

For studying the water environment of Mahad area, six samples of Effluent Treatment Plant (ETP) outlet were collected from different industries. The quality of waste water was determined by determining various parameters as per standards and corresponding results are discussed below:

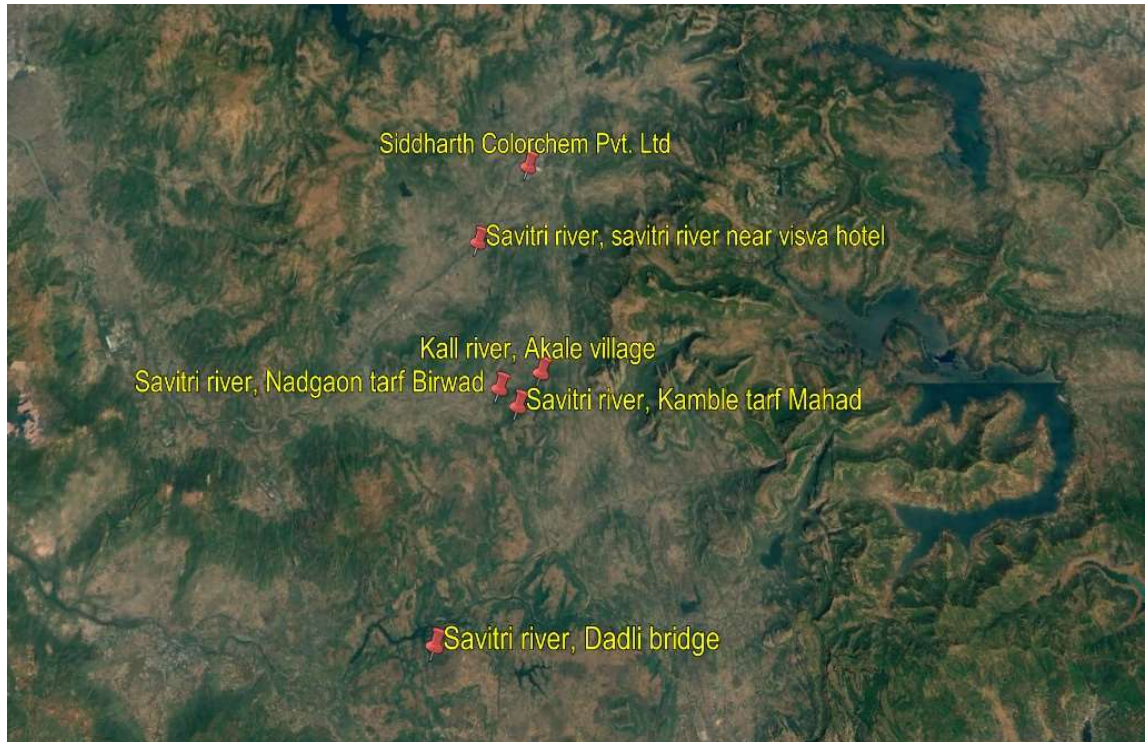
Six surface water samples are collected from Mahad region.

- All six water samples collected are found acceptable in general appearance, colour, smell and transparency.
- General parameters like pH, electrical conductivity, suspended solids, BOD, and COD are also observed well within the limits in all the samples.
- In fish bioassay, 100% survival of fishes was achieved in all the water samples.
- The presence of total and faecal coliform was also well within the limits prescribed.
- All metals like Arsenic, Nickel, Copper, Iron, Hexavalent Chromium (Cr<sup>6+</sup>) etc. are also observed either below detection limit or below their standard limits.
- Parameters like Total Residual Chlorine, Total Kjeldahl Nitrogen, 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 detectable limit 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.	Savitri river, Dadli bridge, Arvind nagar	N18°04'30.54"	E73°25'15.35"	24.01.2023	26.01.2023	28.01.2023
2.	Savitri river, savitri river near visva hotel	N18°05'12.17"	E73°26'40.04"	24.01.2023	26.01.2023	28.01.2023
3.	Savitri river, Nadgaon tarf Birwad	N18°06'50.10"	E73°28'39.17"	24.01.2023	26.01.2023	28.01.2023
4.	Savitri river, Kamble tarf	N18°04'32.86"	E73°28'26.38"	24.01.2023	26.01.2023	28.01.2023
5.	Kall river, Akale village, Near Bhorao	N18°10'30.05"	E73°29'54.37"	24.01.2023	26.01.2023	28.01.2023

Sr. No.	Name of Monitoring Location	Latitude	Longitude	Date of Sampling		
				Round-1	Round-2	Round-3
6.	Siddharth Colorchem Pvt. Ltd	N18°05'47.14"	E73°28'14.45"	24.01.2023	26.01.2023	28.01.2023



**Fig: Geographical Locations of Surface Water Sampling**

**Table 6.2 Results of Surface Water**

Parameters	Unit	Results					
		Savitri river, Dadli bridge	Savitri river near visva hotel	Savitri river, Nadgaon tarf Birwad	Savitri river, Kamble tarf Mahad	Kall river, Akale village, Near Borao	Siddhart Colorchem Pvt. Ltd.
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	0.30	0.40	0.20	0.30	0.30	0.20
Temperature	°C	27	27	27	27	27	28

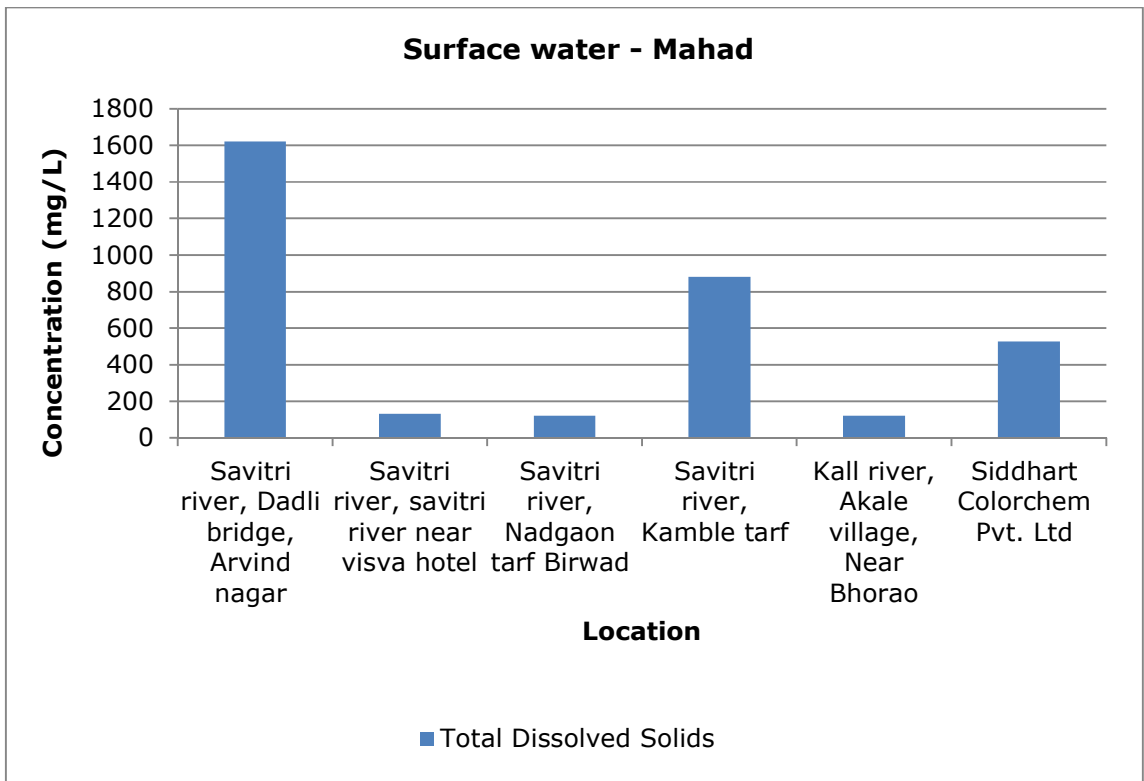
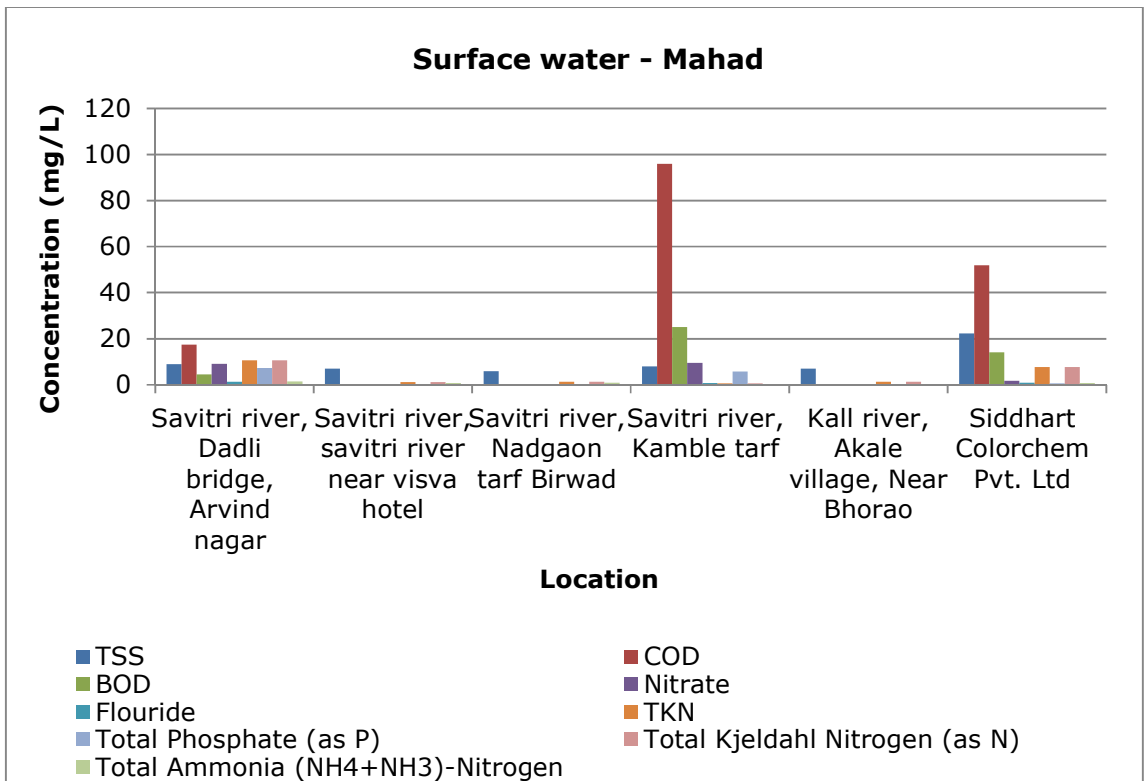
Parameters	Unit	Results					
		Savitri river, Dadli bridge	Savitri river near visva hotel	Savitri river, Nadgaon tarf Birwad	Savitri river, Kamble tarf Mahad	Kall river, Akale village, Near Borao	Siddhart Colorchem Pvt. Ltd.
Colour	Hazen	1	1	1	1	1	3
Smell	-	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable
pH	-	7.28	8.23	8.04	7.92	8.44	7.70
Oil & Grease	mg/L	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
Suspended Solids	mg/L	9	7	6	8	7	22
Total Dissolved Solids	mg/L	1622	132	122	882	122	527
Dissolved Oxygen (% Saturation)	%	56.33	70.67	72.33	56.00	75.33	60.00
Chemical Oxygen Demand	mg/L	18	BLQ	BLQ	96	BLQ	52
Biochemical Oxygen Demand (3 days, 27°C)	mg/L	5	BLQ	BLQ	25	BLQ	14
Electrical Conductivity (at 25 °C)	µmho/cm	2896	236	216	1574	218	943
Nitrite Nitrogen (as NO <sub>2</sub> )	mg/L	0.02	BLQ	BLQ	0.02	BLQ	BLQ
Nitrate Nitrogen (as NO <sub>3</sub> )	mg/L	9.14	BLQ	BLQ	9.46	BLQ	1.74
(NO <sub>2</sub> + NO <sub>3</sub> )-Nitrogen	mg/L	9.15	BLQ	BLQ	9.48	BLQ	1.74
Free Ammonia (as NH <sub>3</sub> -N)	mg/L	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
Total Residual Chlorine	mg/L	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
Cyanide (as CN)	mg/L	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
Fluoride (as F)	mg/L	1.27	0.20	0.17	0.77	0.20	0.87
Sulphide (as H <sub>2</sub> S)	mg/L	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
Dissolved Phosphate (as P)	mg/L	3.28	BLQ	BLQ	BLQ	BLQ	0.22
Sodium Adsorption Ratio	-	10.17	1.20	1.04	6.80	1.16	4.48



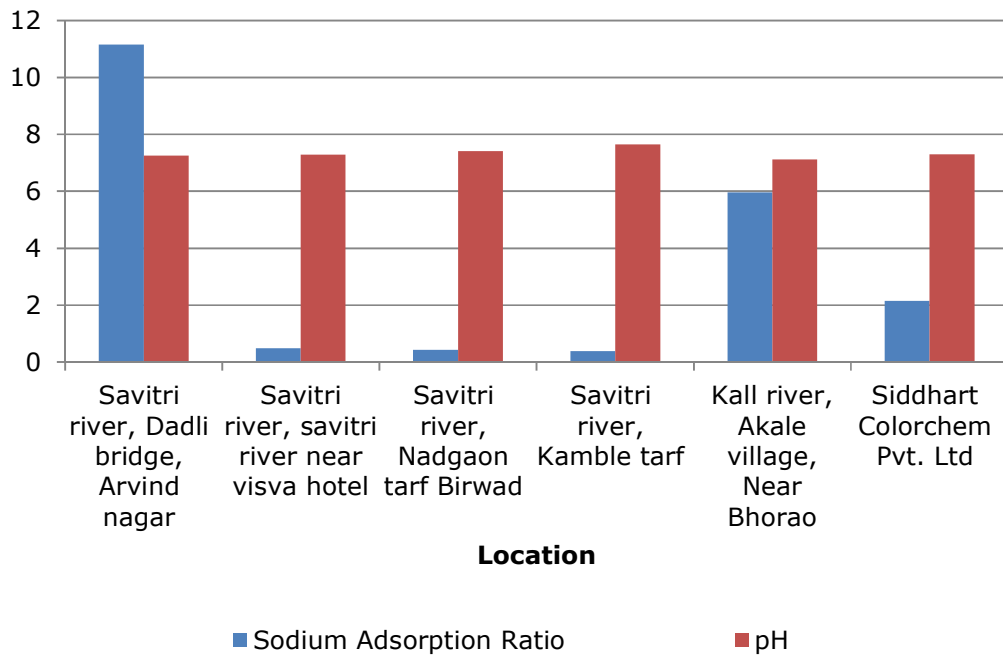
Parameters	Unit	Results					
		Savitri river, Dadli bridge	Savitri river near visva hotel	Savitri river, Nadgaon tarf Birwad	Savitri river, Kamble tarf Mahad	Kall river, Akale village, Near Bhorao	Siddhart Colorchem Pvt. Ltd.
Total Coliforms	MPN Index/100 ml	146	128	77	64	147	178
Faecal Coliforms	MPN Index/100 ml	5	15	9	3	34	101
Total Phosphate (as P)	mg/L	7.23	BLQ	BLQ	5.80	BLQ	0.55
Total Kjeldahl Nitrogen (as N)	mg/L	10.65	1.12	1.31	0.56	1.31	7.67
Total Ammonia (NH <sub>4</sub> +NH <sub>3</sub> )-Nitrogen	mg/L	1.54	0.69	0.82	0.13	0.39	0.72
Phenols (as C <sub>6</sub> H <sub>5</sub> OH)	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	0.18	0.15	0.16	0.13	0.24	0.09
Nickel (as Ni)	mg/L	BLQ	BLQ	BLQ	BLQ	BLQ	0.03
Copper (as Cu)	mg/L	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
Hexavalent Chromium (as Cr <sup>6+</sup> )	mg/L	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
Total Chromium (as Cr)	mg/L	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
Total Arsenic (as As)	mg/L	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
Lead (as Pb)	mg/L	0.01	0.02	BLQ	BLQ	0.03	BLQ

Parameters	Unit	Results					
		Savitri river, Dadli bridge	Savitri river near visva hotel	Savitri river, Nadgaon tarf Birwad	Savitri river, Kamble tarf Mahad	Kall river, Akale village, Near Borao	Siddhart Colorchem Pvt. Ltd.
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	BLQ	BLQ	BLQ	BLQ	BLQ	0.09
Iron (as Fe)	mg/L	0.12	0.12	0.10	BLQ	0.08	0.21
Vanadium (as V)	mg/L	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
Selenium (as Se)	mg/L	0.01	BLQ	0.01	BLQ	BLQ	0.01
Boron (as B)	mg/L	0.32	BLQ	BLQ	0.33	BLQ	BLQ
Total Nitrogen	mg/L	16.94	1.73	1.91	3.90	1.79	9.41
Bioassay Test on fish	% survival	100	100	100	100	100	100

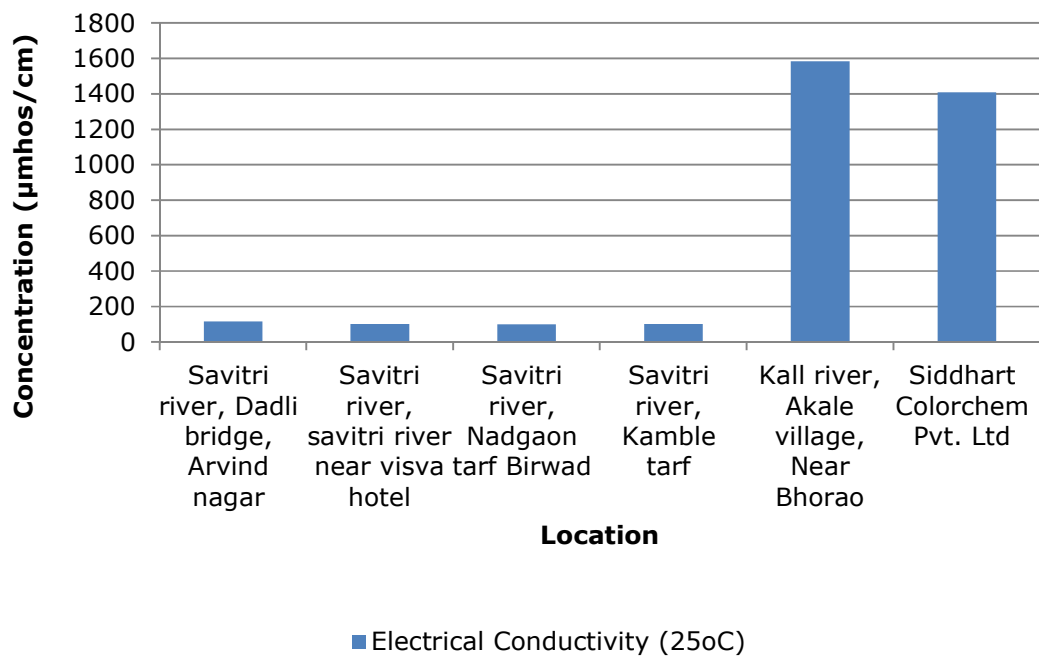
### Graphs - Surface Water Quality of Mahad

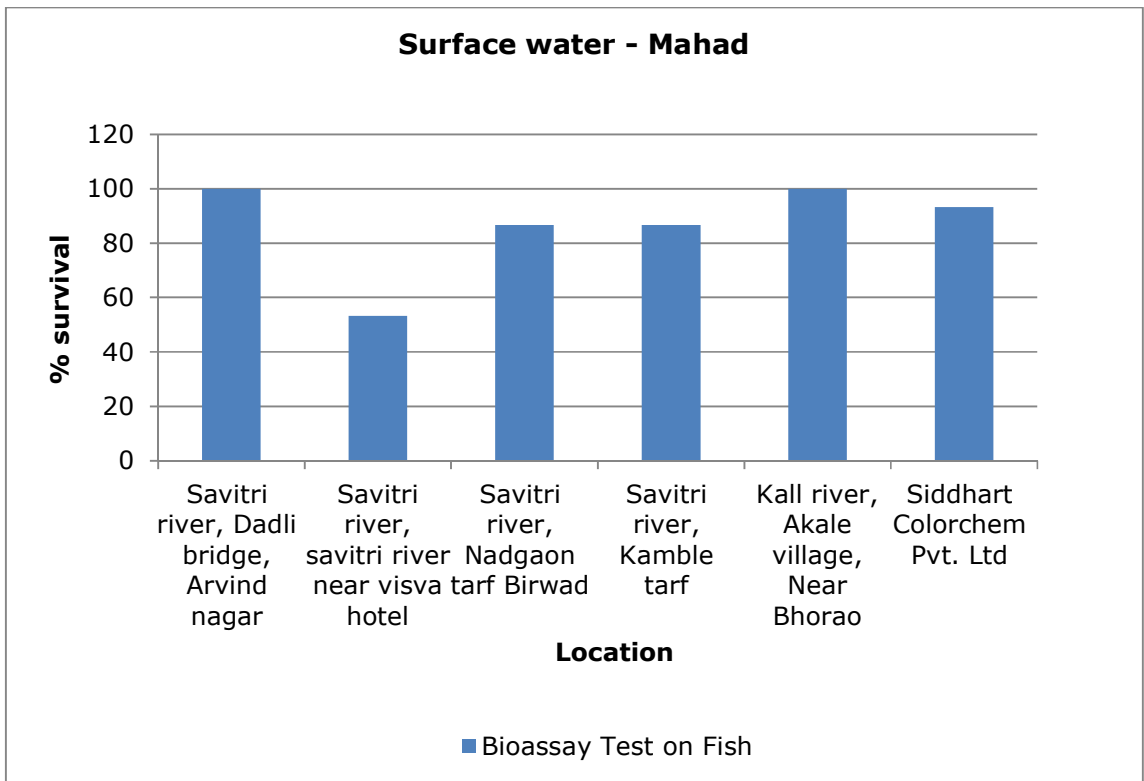
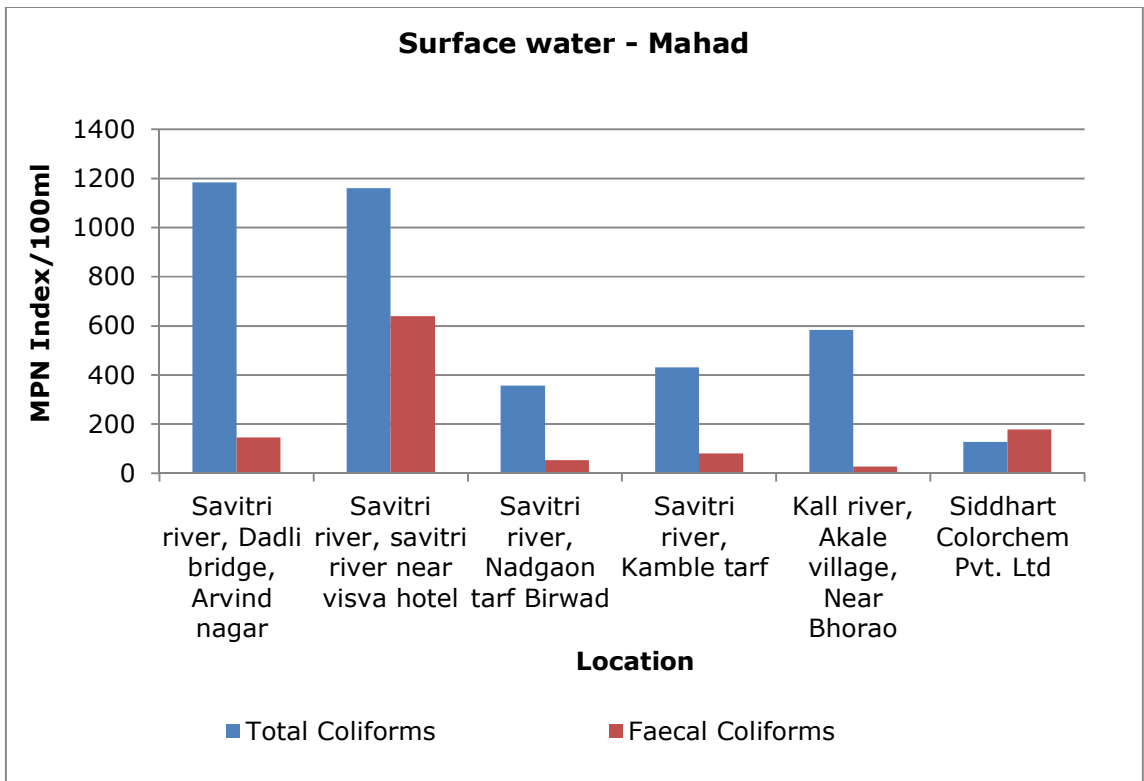


### Surface water - Mahad



### Surface water - Mahad





# **LAND ENVIRONMENT**

## 7. Land Environment

For studying the land Environment of Mahad area, ground water was collected from Bore well, Dug well, and Hand Pump. A total of 6 samples were collected from (i) Borewell at Mr. Anand Nayan farm house (ii) Well at Mr. Jadhav House Aasanpoi (iii) Hand Pump near Baudhabari Village (iv) Handpump near Navi Nagar Village Near Mahad Police Station (v) Hand Pump near Akole Village (vi) Well at Deshmukh Kamble Village.

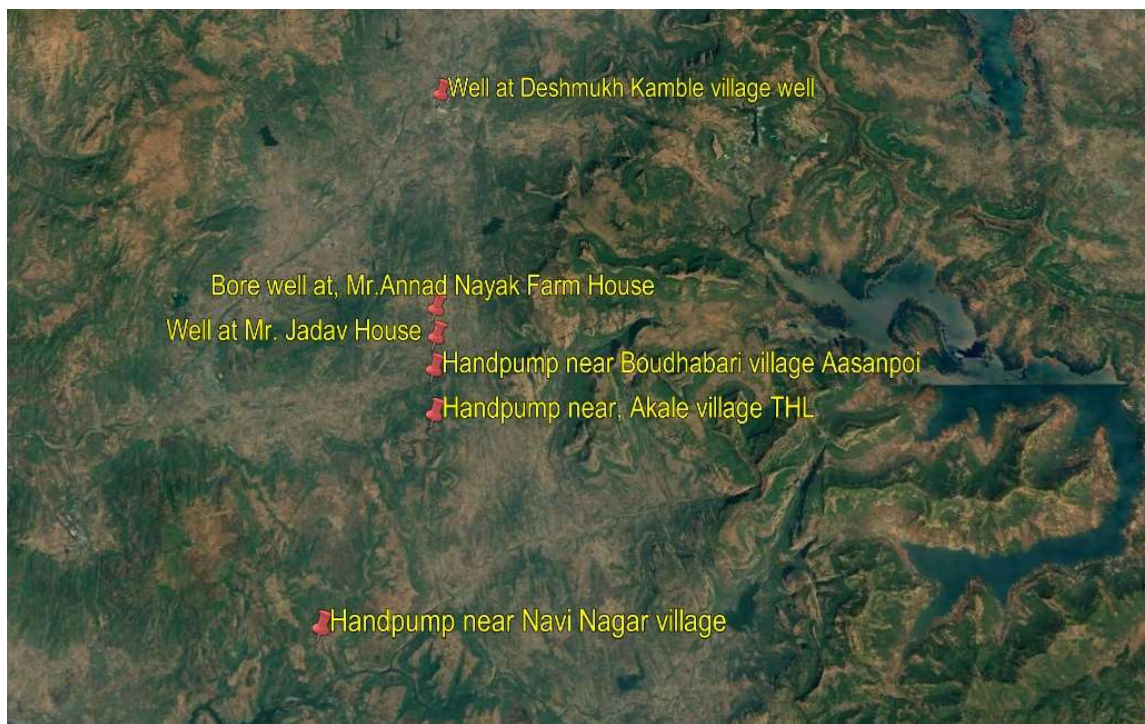
Six ground water samples were collected from MIDC Mahad region.

- All the water samples collected are found acceptable in general appearance, colour, smell and transparency.
- General parameters like pH, suspended solids, BOD, and COD are also observed well within the limits in all the collected samples.
- Concentration of Total Kjeldahl Nitrogen (TKN) and Iron is found higher than the standard limits in few of the water samples.
- Out of six, 5 water samples of achieved 100% survival in Fish Bioassay. Only the water sample collected from the Borewell at Mr. Anand House, Aasanpoi showed 90% fish survival.
- The presence of total and faecal coliform was also well within the prescribed limits.
- All metals like Arsenic, Nickel, Copper, Iron, Hexavalent Chromium (Cr<sup>6+</sup>) etc. are also observed either below detection limit 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 below the detectable limit 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.	Borewell at Mr. Anand Nayak farm house Aasanpoi	18°05'52.89"N	73°29'7.24"E	24.01.2023	26.01.2023	28.01.2023
2.	Well at Mr. Jadhav House Aasanpoi	18°05'55.43"N	73°29'11.39"E	24.01.2023	26.01.2023	28.01.2023
3.	Hand Pump near Baudhabari Village Aasanpoi	18° 5'47.40"N	73°29'13.90"E	24.01.2023	26.01.2023	28.01.2023

Sr. No.	Name of Monitoring Location	Latitude	Longitude	Date of Sampling		
				Round-1	Round-2	Round-3
4.	Handpump near Navi Nagar Village Near Mahad Police Station	18° 5'56.85"N	73°27'47.04"E	24.01.2023	26.01.2023	28.01.2023
5.	Hand Pump near Akole Village	18° 6'1.91"N	73°27'45.27"E	24.01.2023	26.01.2023	28.01.2023
6.	Well at Deshmukh Kamble Village	18° 4'52.09"N	73°28'14.24"E	24.01.2023	26.01.2023	28.01.2023



**Fig: Geographical Locations of Ground Water Sampling**



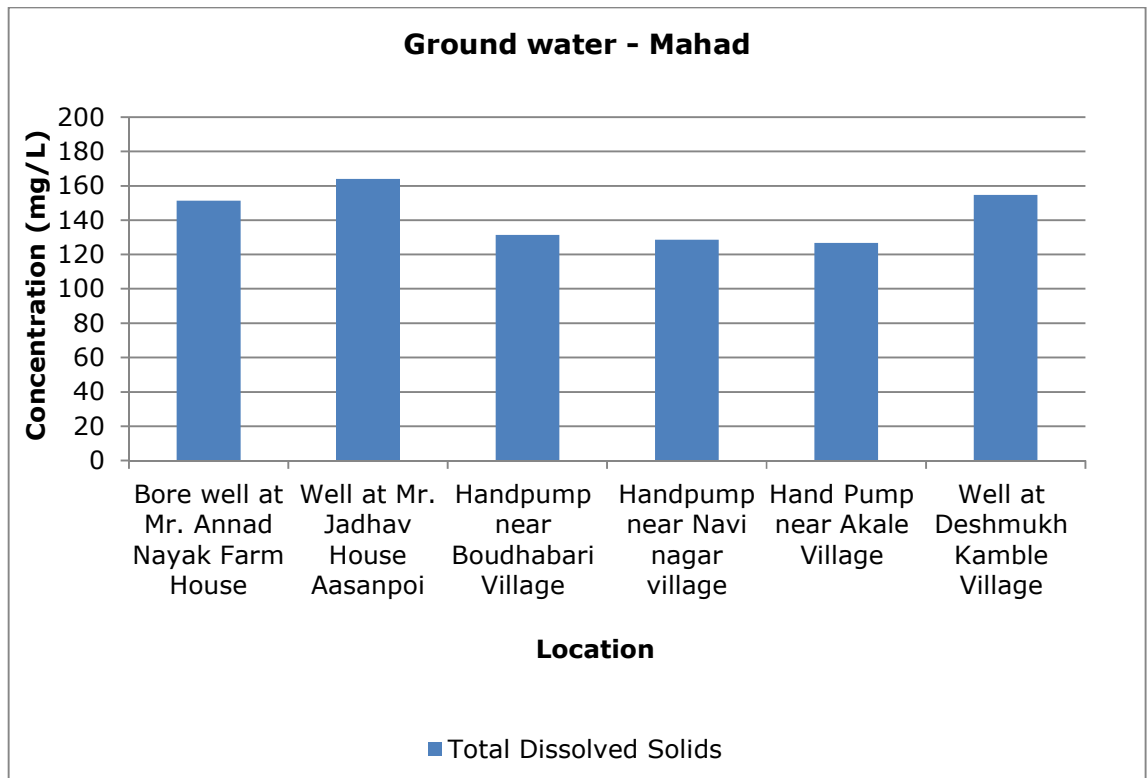
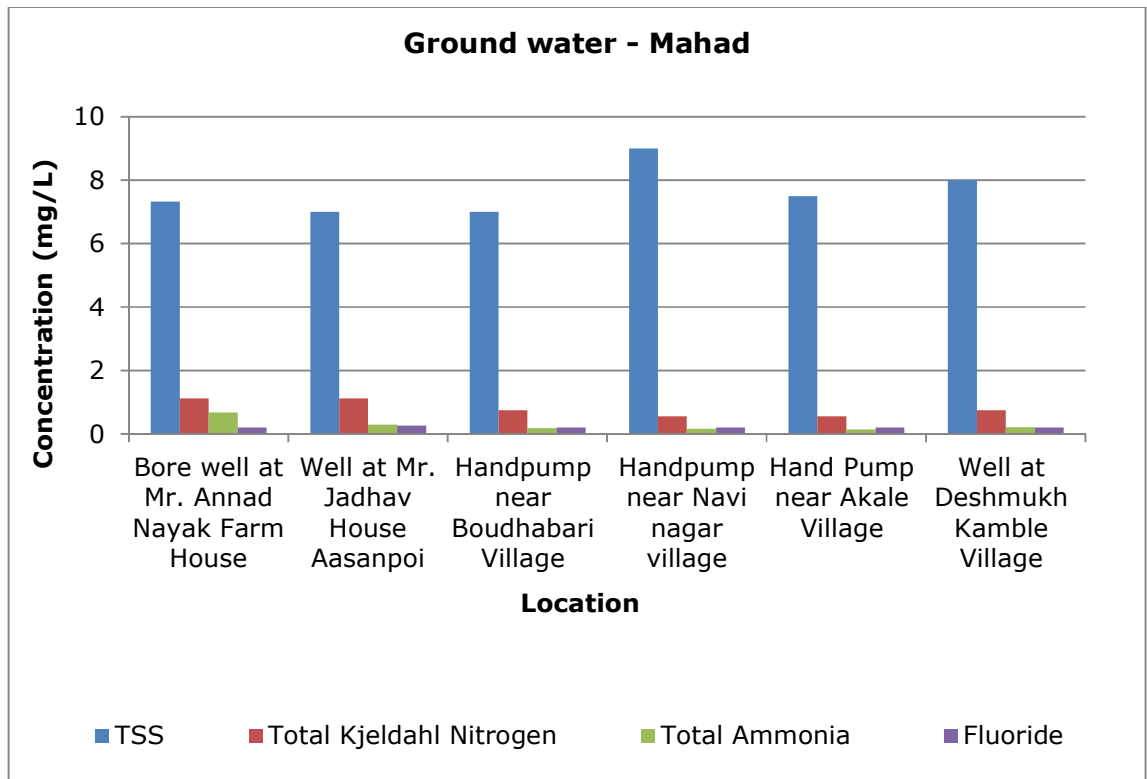
**Table 7.2 Results of Ground Water**

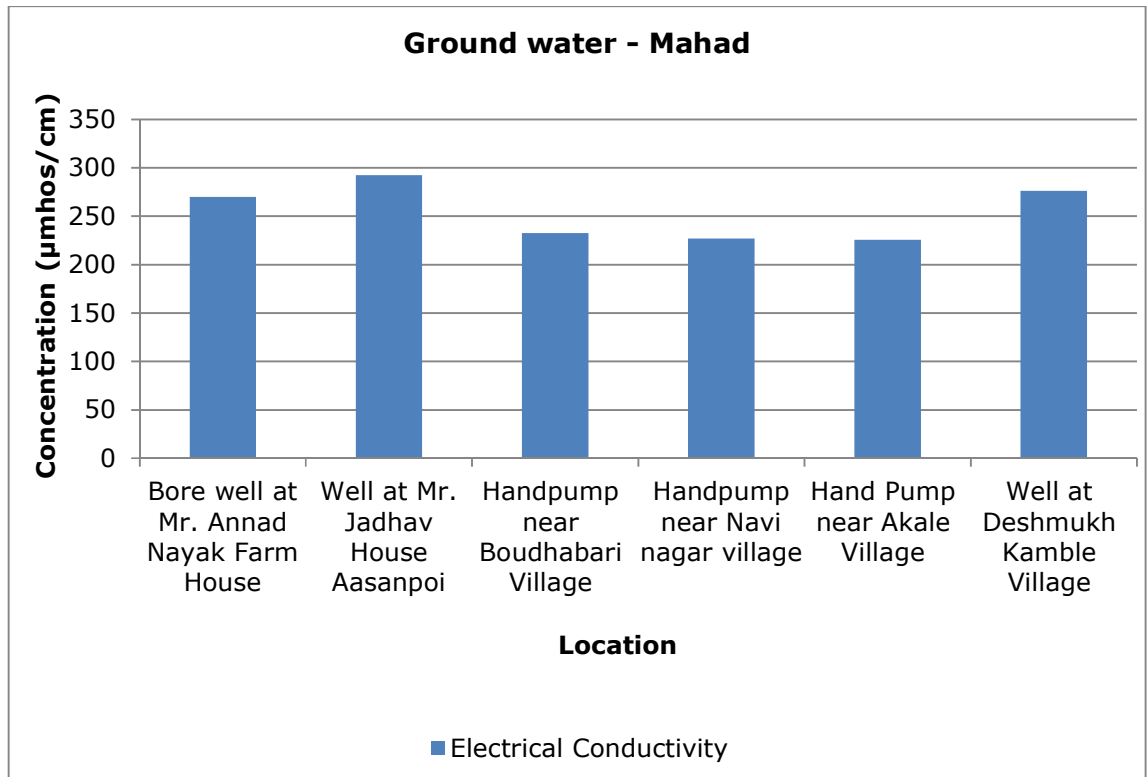
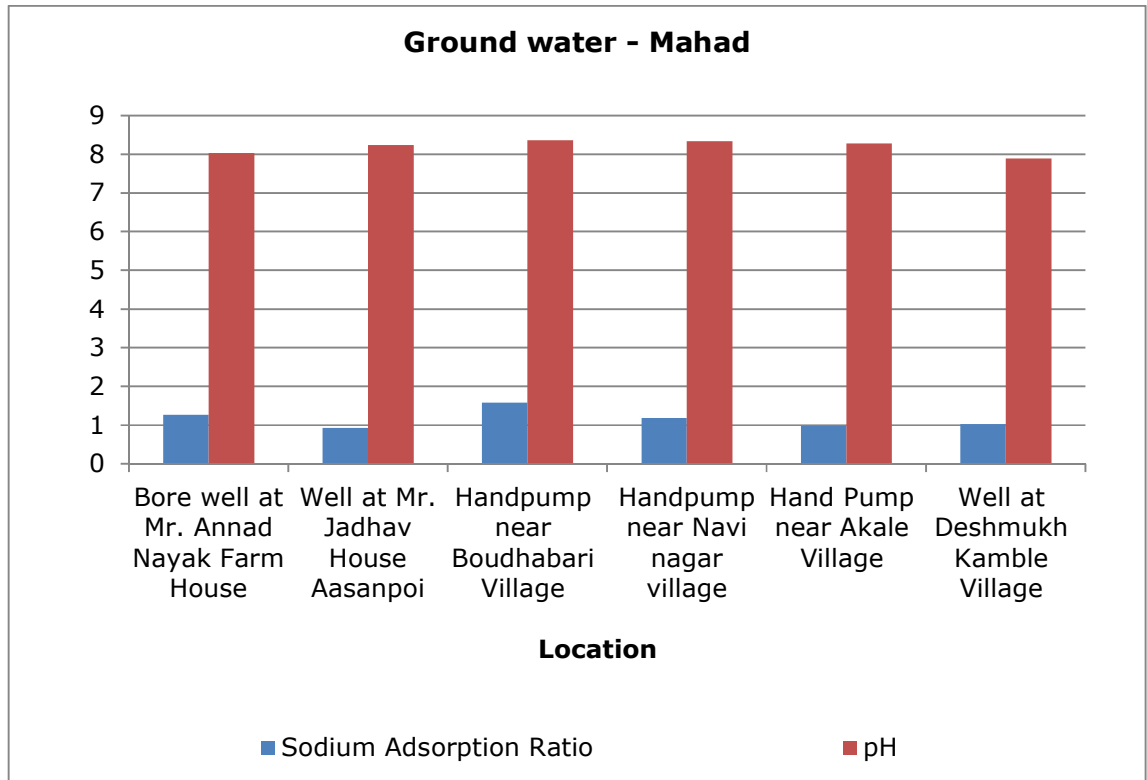
Parameters	Unit	Results					
		Bore well at Mr. Anand Nayak Farm House, Aasanpoi, Mahad	Well at Mr. Jadav House, Aasanpoi, THL, Mahad	Handpump near Boudhabari village Aasanpoi, THL Mahad	Handpump near Navi Nagar village, Near Mahad Police Station Mahad	Handpump near, Akale village THL, Mahad	Well at Deshmukh Kamble village well, THL Mahad
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	°C	26	26	27	27	27	27
Colour	Hazen	1	1	1	1	1	1
Smell	-	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable
pH	-	8.03	8.23	8.35	8.34	8.28	7.89
Oil & Grease	mg/L	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
Suspended Solids	mg/L	7	7	7	9	8	8
Total Dissolved Solids	mg/L	151	164	131	129	127	155
Chemical Oxygen Demand	mg/L	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
Biochemical Oxygen Demand (3 days, 27°C)	mg/L	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
Electrical Conductivity (at 25 °C)	µmho/cm	270	292	233	227	226	276
Nitrite Nitrogen (as NO <sub>2</sub> )	mg/L	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
Nitrate Nitrogen (as NO <sub>3</sub> )	mg/L	BLQ	BLQ	BLQ	BLQ	BLQ	1.03
(NO <sub>2</sub> + NO <sub>3</sub> )-Nitrogen	mg/L	BLQ	BLQ	BLQ	BLQ	BLQ	1.03

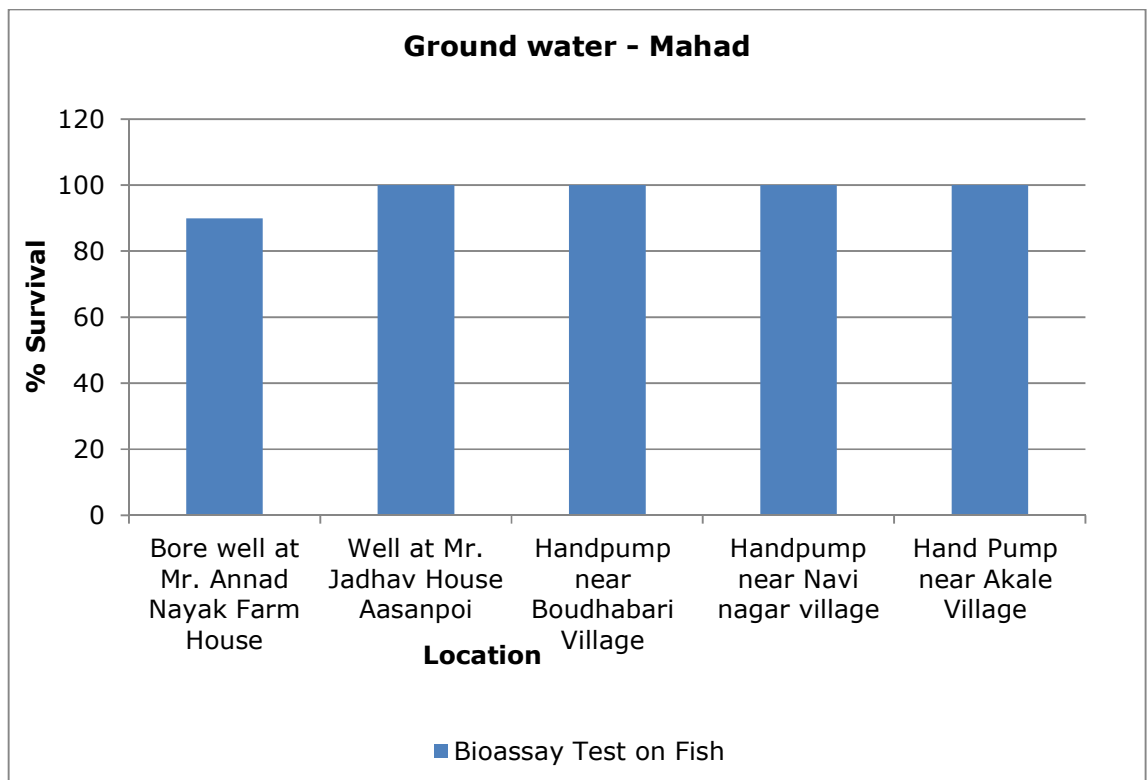
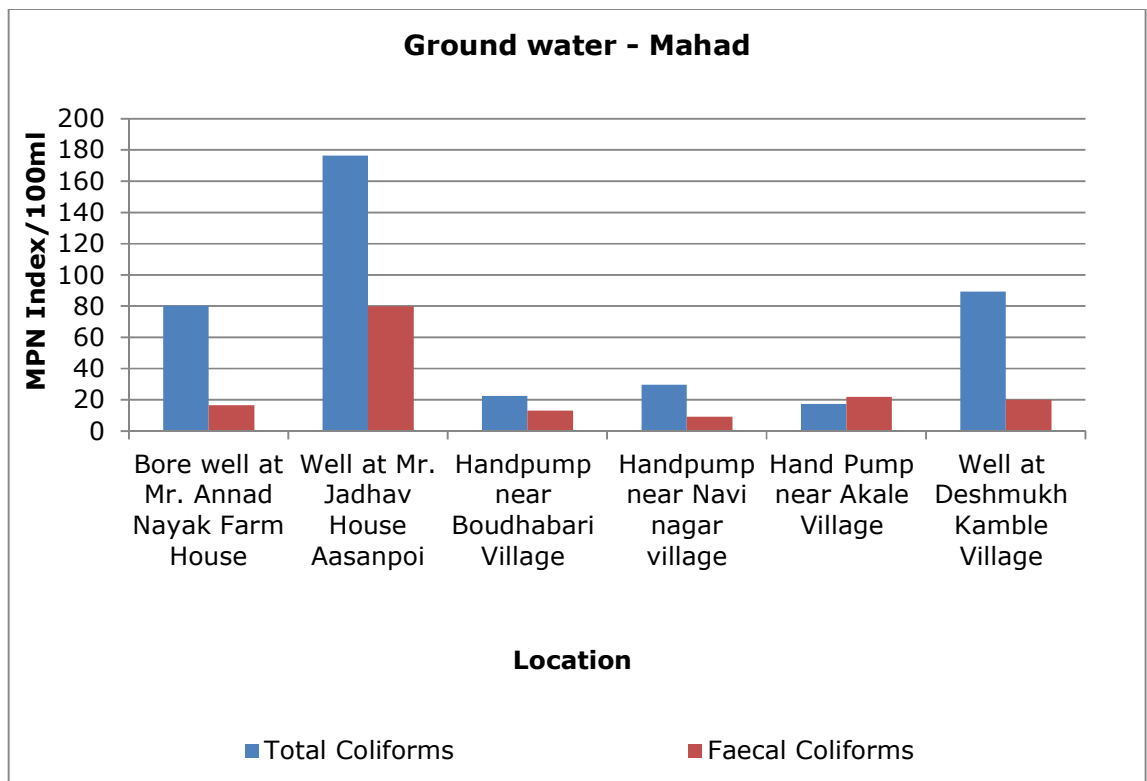
Parameters	Unit	Results					
		Bore well at Mr. Anand Nayak Farm House, Aasanpoi , Mahad	Well at Mr. Jadav House, Aasanpoi, THL, Mahad	Handpump near Boudhabari village Aasanpoi, THL Mahad	Handpump near Navi Nagar village, Near Mahad Police Station Mahad	Handpump near, Akale village THL, Mahad	Well at Deshmukh Kamble village well, THL Mahad
Free Ammonia (as NH <sub>3</sub> -N)	mg/L	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
Total Residual Chlorine	mg/L	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
Cyanide (as CN)	mg/L	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
Fluoride (as F)	mg/L	0.20	0.27	0.20	0.20	0.20	0.20
Sulphide (as H <sub>2</sub> S)	mg/L	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
Dissolved Phosphate (as P)	mg/L	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
Sodium Adsorption Ratio	-	1.27	0.93	1.58	1.18	0.98	1.03
Total Coliforms	MPN Index/ 100 ml	80	176	23	30	18	89
Faecal Coliforms	MPN Index/ 100 ml	17	80	13	9	22	20
Total Phosphate (as P)	mg/L	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
Total Kjeldahl Nitrogen (as N)	mg/L	1.12	1.12	0.75	0.56	0.56	0.75
Total Ammonia (NH <sub>4</sub> +NH <sub>3</sub> )-Nitrogen	mg/L	0.68	0.30	0.18	0.16	0.14	0.21
Phenols (as C <sub>6</sub> H <sub>5</sub> OH)	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

Parameters	Unit	Results					
		Bore well at Mr. Anand Nayak Farm House, Aasanpoi, Mahad	Well at Mr. Jadav House, Aasanpoi, THL, Mahad	Handpump near Boudhabari village Aasanpoi, THL Mahad	Handpump near Navi Nagar village, Near Mahad Police Station Mahad	Handpump near, Akale village THL, Mahad	Well at Deshmukh Kamble village well, THL Mahad
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	0.08	0.05	0.06	0.08	BLQ
Nickel (as Ni)	mg/L	BLQ	0.01	BLQ	BLQ	BLQ	BLQ
Copper (as Cu)	mg/L	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
Hexavalent Chromium (as Cr <sup>6+</sup> )	mg/L	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
Total Chromium (as Cr)	mg/L	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
Total Arsenic (as As)	mg/L	BLQ	0.01	BLQ	BLQ	BLQ	BLQ
Lead (as Pb)	mg/L	BLQ	BLQ	BLQ	BLQ	0.01	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	BLQ	0.04	BLQ	BLQ	BLQ	BLQ
Iron (as Fe)	mg/L	BLQ	0.29	0.23	BLQ	0.12	BLQ
Vanadium (as V)	mg/L	BLQ	0.02	BLQ	0.01	0.01	BLQ
Selenium (as Se)	mg/L	BLQ	0.01	BLQ	BLQ	BLQ	BLQ
Total Nitrogen	mg/L	BLQ	BLQ	0.20	BLQ	BLQ	BLQ
Boron (as B)	mg/L	1.36	1.37	1.33	1.05	0.98	1.76
Bioassay Test on fish	% survival	90	100	100	100	100	100

### Graphs - Ground Water Quality of Mahad







## 8. Health Related Data

### C: Receptor

<b>Component C (Impact on Human Health) 10</b>	
<b>Main - 10</b>	
<b>% increase in cases</b>	<b>Marks</b>
<b>&lt;5%</b>	<b>0</b>
<b>5-10%</b>	<b>5</b>
<b>&gt;10%</b>	<b>10</b>

- % 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 26<sup>th</sup> 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 groundwater in & around the industrial cluster and health related statistics.

**Table 8.1 CEPI score of the Post monsoon season 2023**

	<b>A1</b>	<b>A2</b>	<b>A</b>	<b>B</b>	<b>C</b>	<b>D</b>	<b>CEPI</b>
<b>Air Index</b>	3	4	12	2	10	5	<b>29.00</b>
<b>Water Index</b>	1.5	4	6	14.25	10	5	<b>35.25</b>
<b>Land Index</b>	1.5	4	6	12	10	5	<b>33.00</b>
<b>Aggregated CEPI</b>							<b>41.45</b>

**Table 8.2 Comparison of CEPI Scores**

	<b>Air Index</b>	<b>Water Index</b>	<b>Land Index</b>	<b>CEPI</b>
<b>CEPI Score March 2023</b>	29.00	35.25	33.00	<b>41.45</b>
<b>CEPI Score June 2021</b>	21.50	20.00	41.00	<b>43.54</b>
<b>CEPI Score March 2021</b>	21.50	39.00	37.25	<b>43.89</b>
<b>CEPI score March 2020</b>	41.80	20.30	23.30	<b>44.60</b>
<b>CEPI score June 2019</b>	30.50	51.50	50.00	<b>58.90</b>
<b>CEPI score march 2019</b>	34.75	45.00	45.00	<b>53.60</b>
<b>CEPI score June 2018</b>	26.00	39.25	45.00	<b>50.61</b>
<b>CEPI score March 2018</b>	32.50	38.50	45.00	<b>51.88</b>



<b>CPCB CEPI score March 2018</b>	41.00	35.75	29.00	<b>47.12</b>
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**CEPI Score Calculation:**

<b>Mahad</b>
<b>Ambient Air Analysis Report</b>

Pollutant	Group	A1	A2	A (A1 X A2)
PM <sub>10</sub>	B	2	Large	
PM <sub>2.5</sub>	B	0.5		
CO	B	0.5		
		<b>3</b>	<b>4</b>	<b>12</b>

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)		
PM <sub>10</sub>	55.58	100	0.56	0	8	0.00	L	0	
PM <sub>2.5</sub>	15.33	60	0.26	0	8	0.00	L	0	
CO	1.82	2	0.91	0	8	0.00	L	2	
<b>B score = (B1+B2+B3)</b>								<b>B</b>	<b>2</b>

<b>C</b>	<b>10</b>	<b>&gt;10%</b>
<b>D</b>	<b>5</b>	<b>A-IA-A</b>

<b>Air CEPI Score</b>	<b>(A+B+C+D)</b>	<b>29.00</b>
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<b>Water Quality Analysis Report</b>
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Pollutant	Group	A1	A2	A (A1 X A2)
TKN	A	1	Large	
TN	A	0.25		
Zn	A	0.25		
		<b>1.5</b>	<b>4</b>	<b>6</b>

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)		
TKN	3.77	3	1.26	1	6	0.21	M	11.25	
TN	5.95	15	0.40	1	6	0.07	M	3	
Zn	0.16	0.3	0.53	0	6	0.00	L	0	
<b>B score = (B1+B2+B3)</b>								<b>B</b>	<b>14.25</b>

<b>C</b>	<b>10</b>	<b>&gt;10%</b>
<b>D</b>	<b>5</b>	<b>A-IA-A</b>

<b>Water CEPI Score</b>	<b>(A+B+C+D)</b>	<b>35.25</b>
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<b>Ground Water Quality Analysis Report</b>
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<b>Pollutant</b>	<b>Group</b>	<b>A1</b>	<b>A2</b>	<b>A (A1 X A2)</b>
TKN	A	1	Large	
Fe	A	0.25		
TN	A	0.25		
		<b>1.5</b>	<b>4</b>	<b>6</b>

<b>Pollutant</b>	<b>Avg (1)</b>	<b>Std (2)</b>	<b>EF (3) [(3)=(1)/(2)]</b>	<b>No. of samples Exceeding (4)</b>	<b>Total no. of samples (5)</b>	<b>SNLF Value (6) [(6)=(4)/(5)x(3)]</b>	<b>SNLF score (B)</b>	
TKN	0.81	1	0.81	2	6	0.27	M	12
Fe	0.21	0.3	0.70	0	6	0.00	M	0
TN	1.31	45	0.03	0	6	0.00	M	0
<b>B score = (B1+B2+B3)</b>							<b>B</b>	<b>12</b>

<b>C</b>	<b>10</b>	<b>&gt;10%</b>
<b>D</b>	<b>5</b>	<b>A-IA-A</b>

<b>Land CEPI Score</b>	<b>(A+B+C+D)</b>	<b>33.00</b>
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**Water CEPI Score (im)      35.25**

**Land CEPI Score (i2)      33.00**

**Air CEPI Score (i3)      29.00**

**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      41.45**

## 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 PM<sub>10</sub> is observed in the range of 35.33µg/m<sup>3</sup> to 69.33µg/m<sup>3</sup> and PM<sub>2.5</sub> in the range of 11.00 to 18.33µg/m<sup>3</sup> at the studied locations, which are less than the limits laid down in NAAQS. However, in CPCB CEPI report (2018), out of 24 samples, 10 of PM<sub>10</sub> and 7 of PM<sub>2.5</sub> are found to exceed the standards limits of NAAQS.
- In the CEPI score calculated for Air Environment by CPCB in March 2018, the concentration of PM<sub>10</sub> has exceeded at all the studied locations and which contributed to higher air index (41.00). However, in the present report, concentration of both PM<sub>10</sub> and PM<sub>2.5</sub> are found below permissible levels resulted in less exceedance factor, this time air index is calculated as 29, which is quite lower than the CPCB report.

### Surface Water Quality

- To understand the quality of treated effluent, samples were collected from six industries
- Higher concentration of Total phosphates was observed in the surface water sample collected from Savitri river, Dadli bridge and Savitri river, Kamble tarf Mahad. which may be due to domestic wastewater, sewage, other localized activities.
- In Mahad region, industries are reusing either the treated trade effluent as sewage in their process or gardening.
- In the CEPI score calculated for Water Environment by CPCB in March 2018, concentration values of total hardness were higher and exceeded at 3 of the studied locations.

### Ground Water Quality

- Six ground water samples were collected from different Dug well, well and Bore well in the region.
- Higher concentration of TKN and Iron was observed in 2 of the ground water samples collected, this may be due to agricultural processes.
- In the CEPI score calculated for Land Environment by CPCB in March 2018 also there is no critical pollutant exceeding in any water sample collected.

### CEPI Score

- The CEPI Score post monsoon season is 41.45.

- During calculation of CEPI score, water Index is calculated highest with 35.25, followed by the Land Index 33 and Air index as 29. The parameters of surface water and ground water in Mahad region is well within the limits. Hence, aggregated CEPI score is calculated as 41.45.
- In CEPI score of CPCB 2018, the Air index was higher as compared to the present (March, 2023) indices.
- As per the CPCB CEPI calculation revised in 2016, Health statistics represented by Receptor C in CEPI Calculation, also plays an important role.
- For analysing the health data collected from hospitals in the vicinity of the studied area, more than 10% increase in air and water borne disease cases is observed in the consecutive years of 2020-2021 and 2021-2022. Hence score for receptor C is considered as 10 for all air, water & land Environment. However, in the CEPI score calculated by CPCB (2018), the receptor C (the health data) score was zero for all three environmental components i.e. air, water and land. The increase in health data is observed, which may be due to the decreased immunity in masses after the pandemic of COVID-19 globally.
- Collective efforts of regional office of MPCB, NMMC, administration and environmental organizations are resulting in control of pollution level in this region.
- 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, this year in 2023, CEPI score calculated in the Mahad region is 41.45, which is 12% lower than the CEPI score (47.12) observed in 2018.

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

- Waste collection and segregation centres:
  - a) **Domestic Solid Waste:** MMC has provided on site waste collection and segregation facility for residential area.
  - b) **Industrial Non-Hazardous waste:** Recyclable waste is sent to authorized segregation facility for residential area.
  - c) **Hazardous waste:** industrial hazardous waste sent to common hazardous treatment and disposal facility by industries.
- One Common Effluent Treatment plant (CETP) of 7.5 MLD capacity is installed for the treatment of wastewater.
- Continuous Emission Monitoring System (CEMS) are installed for Air and Water in 30 Large and Medium scale RED category industries.
- Arrangement of scientific collection and treatment of sewage generated by each industry:-65 no of Industries.
- Installation of CAAQMS station: 01 no.
- Establishment of Monitoring stations under National Water Quality Monitoring Programme (NWMP): 05 no.
- Steps are taken for industrial area/other units to recycle 100%% treated effluent to achieve zero liquid discharge (ZLD):18 nos.
- Steps taken to reduce dust emission:- Industry have changed their F.O. to low Sulphur fuel and Green Fuel like LPG, PNG, and Electricity.
- Tree plantation in last one year (2021-2022): 14056
- Various awareness programs are conducted regularly in coordination with TBIA, TTCWMA, CETP & other industries.



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



**Ambient Air Quality Monitoring (AAQM) Van**



## 12. Photographs



**Ambient Air Sampling at Khaire tarf Birwadi**

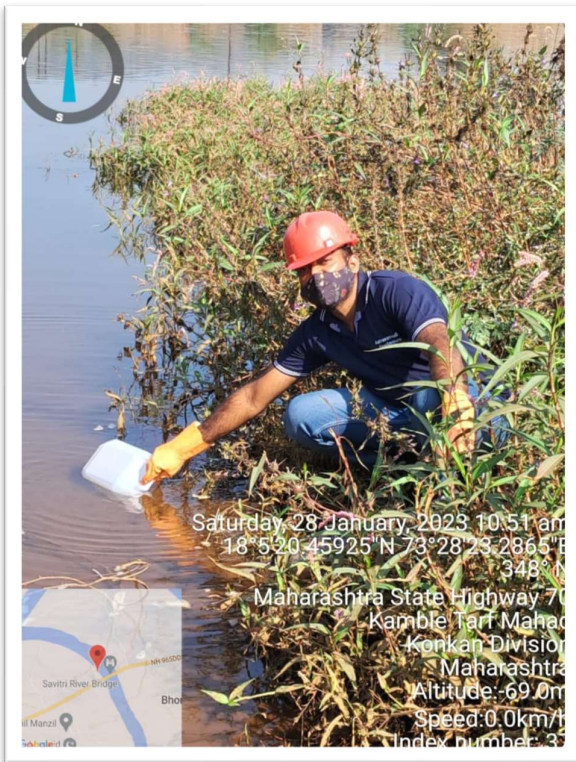
**Ambient Air Sampling at Hikal Ltd.**



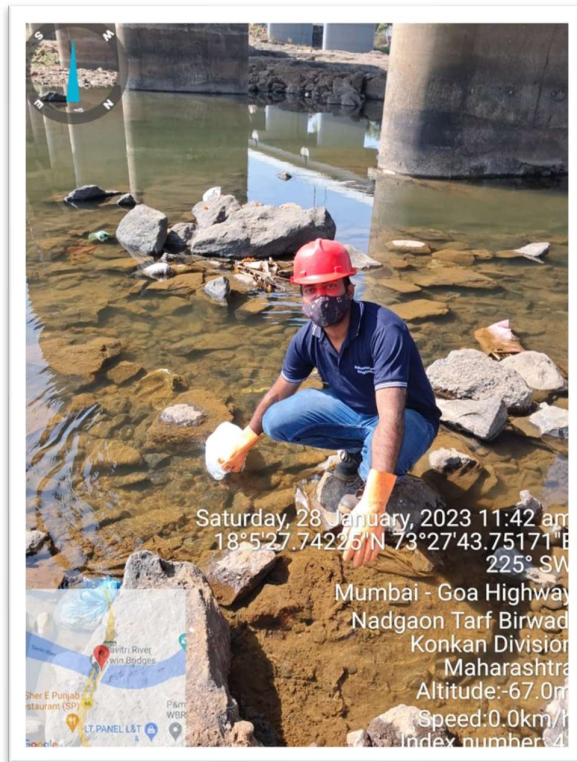
**Ambient Air Sampling at MIDC Office**

**Ambient Air Sampling at Sandoz India Ltd.**





**Surface water sampling at Kamble Tarf Mahad**



**Surface water sampling at Nadgaon Tarf Birwadi**



**Surface water sampling at Savitri River, Dadli Bridge**



**Surface water sampling at Savitri River near Vishwa Hotel**





**Groundwater sampling at Asanpoi**



**Groundwater sampling at Bhoradi**



**Groundwater sampling at Akale village**



**Groundwater sampling at Navenagar**



## Annexure – I Health Related Data

### HEALTH STATISTICS

Required for Comprehensive Environmental Pollution Index (CEPI) Study by  
Maharashtra Pollution Control Board (MPCB)

Name of the Polluted Industrial Area (PIA)	MAHAD
Name of the major health center/ organization	MMA hospital MIDC
Name and designation of the Contact person	Dr. Ramesh Naitik, Medical Superintendent,
Address	9503856761, 7350004779 MIDC Mahad, Nadgaon, Tarf Birwadi, Maharashtra 402309

S No.	Diseases	No. of Patients Reported	
		2022 (Jan-Dec)	2021 (Jan-Dec)
<b>AIRBORNE DISEASES</b>			
1.	Asthma	15	10
2.	Acute Respiratory Infection	750	500
3.	Bronchitis	--	--
4.	Cancer	--	--
<b>WATERBORNE DISEASES</b>			
1.	Gastroenteritis	--	--
2.	Diarrhea	60	40
3.	Renal diseases	--	--
4.	Cancer	--	--

Date: 20/10/2023

  
 Signature  


## HEALTH STATISTICS

Required for Comprehensive Environment Pollution Index (CEPI) study by  
Maharashtra Pollution Control Board (MPCB)

Name of the polluted Industrial Area (PIA)	MAHAD
Name of the major health center/ organization	RURAL HOSPITAL (P.H.C. Birwadi)
Name and designation of the contact person	DR E.C. Biradar (9606221024) medical officer
Address P.H.C. Birwadi Raigad Dist. Raigad	MG Rd, Mahad, Maharashtra 402301

S No.	Diseases	No. of Patients Reported	
		2022 (Jan-Dec)	2021 (Jan-Dec)
AIRBORNE DISEASES			
1.	Asthma	9	12
2.	Acute Respiratory Infection	140	180
3.	Bronchitis	7	10
4.	Cancer	1	1
WATERBORNE DISEASES			
1.	Gastroenteritis	18	22
2.	Diarrhea	28	16
3.	Renal Diseases	01	0
4.	Cancer	0	0

Date:

सदर पत्रोट हे मा आ केंद्र किरवडि  
अंतर्गत येवणाऱ्या O.P.D. वेळां वर  
दण्यात आले आहेत

Signature:

  
Medical Officer  
Primary Health Center Birwadi,  
Tal.: Mahad, Dist.-Raigad.