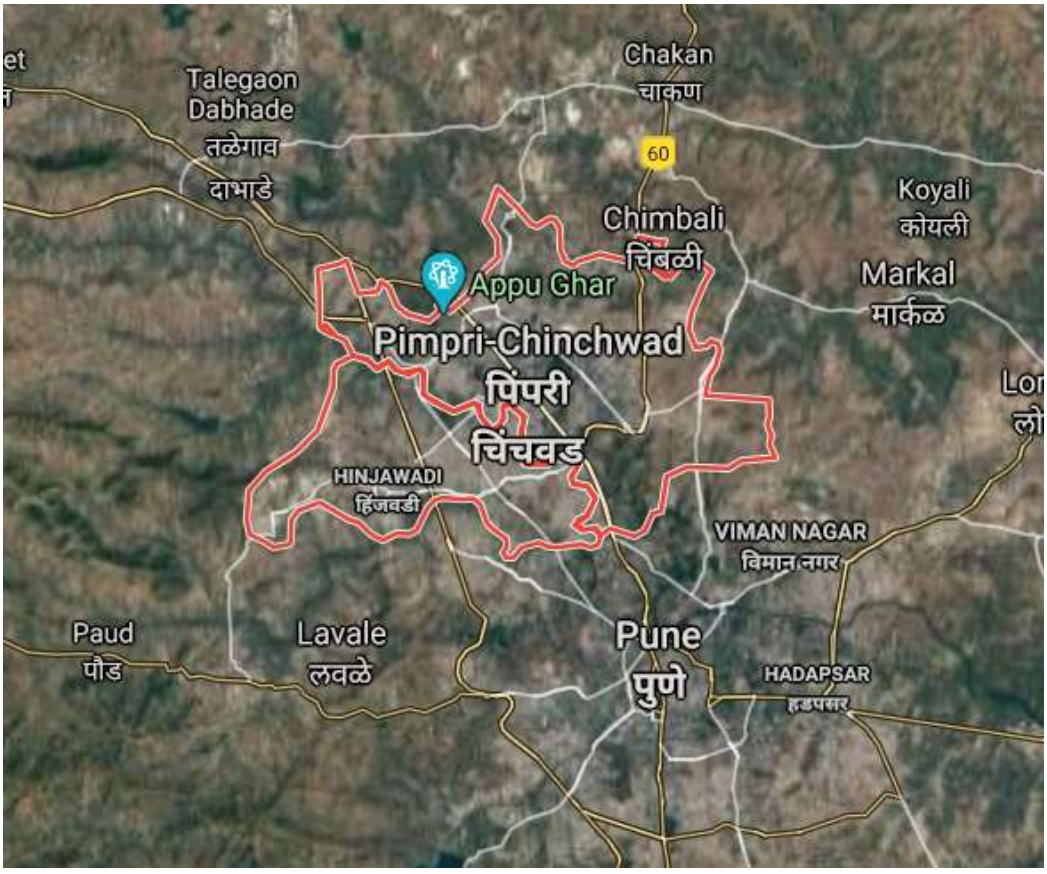
MONITORING, SAMPLING AND ANALYSIS FOR AMBIENT AIR QUALITY, SURFACE WATER QUALITY AND GROUND WATER QUALITY IN 100 POLLUTED INDUSTRIAL AREAS

DURING DECEMBER 2019- FEBRUARY 2020

Environmental Quality Monitoring Report For Pimpri-Chinchwad, Maharashtra



Maharashtra Pollution Control Board

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We would also like to extend our thanks to the concerned staff of Regional Hospitals, who has provided us the health data, which is the most important component of this revised concept of CEPI.

By undertaking this project and completing in schedule time, we consider ourselves very lucky since we have helped the mankind by giving the data on pollution load and further action by the Board, to bring down the pollution level.

We also thank our associates for working on this project for making the write up, making graphs and feeding the data on computer.

This acknowledgement will be incomplete if we do not thank our laboratory analysts and others who made this project a success by timely analyzing the samples.

We also thank our sampling team members for conducting the sampling in this vast area.

Abbreviations:

APHA American Public Health Association

BDL Below Detection Limit

BOD Biochemical Oxygen Demand

CEPI Comprehensive Environmental Pollution Index

CETP Common Effluent Treatment Plant

COD Chemical Oxygen Demand

CPA Critically Polluted Areas

SPA Severely Polluted Areas

DO Dissolved Oxygen

ETP Effluent Treatment Plant

MIBK Methyl Isobutyl Ketone

MPCB Maharashtra Pollution Control Board

NAAQS National Ambient Air Quality Standards

NO_x Oxides of Nitrogen

ND Not Detected

PAH Poly Aromatic Hydrocarbons

PCB Poly Chlorinated Biphenyls

PCT Poly Chlorinated Terphenyls

PM_{10} Particulate Matter (size less than 10 µm)

$PM_{2.5}$ Particulate Matter (size less than 2.5 µm)

SO_2 Sulphur Dioxide

STAP Short Term Action Plan

WHO World Health Organization

1. Introduction:

Over the years, urbanization and industrialization have led to major pollution-related issues due to increased human activities. Lack of planning and a basic understanding of the ecology affects its balance leading to pollution of water, air, soil, and other natural resources. The pollution load in respect of air quality is of relatively high order in metropolitan cities. It is associated with higher rates of several health disorders too. The development of manufacturing, especially near cities and industrial zones, is changing the environment and the natural composition of water. Pollution of natural environment not only affects people but also have adverse impact on economic growth in the long run. Analysis of pollution load shows that there are few industries in the country which contribute to more than 90percent of the pollution. Hence, scientists are exploring the quantum of pollution load as well as to device certain strategies and technologies so that our sustainable development would not be jeopardized otherwise our long cherished dream of establishing eco-socialism on this watery planet could not come true.

Industrial pollution takes on many faces. It contaminates many sources of drinking water, releases unwanted toxins into the air and reduces the quality of soil all over the world. Every liter of waste water discharged by our industries pollutes eight times the quantity of fresh water. The extent of pollution varies with the size of the industry, the nature of the industry, the type of products used and produced etc. 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 perceptive 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 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. Later-on proposals were received from the SPCBs, State Governments, and Industrial Associations and concerned Stake-holders for revisiting the criteria of assessment under CEPI concept. After careful examination and consideration of the suggestions of concerned stake-holders, it was decided to prepare the revised concept of CEPI by eliminating the subjective factors but retaining the factors which can be measured precisely. Hence, revised concept came into existence, which is termed as Revised CEPI Version 2016.

The present report is also based on the revised CEPI version 2016. The results of the application of the Comprehensive Environmental Pollution Index (CEPI) to selected industrial clusters 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. A total of 88 industrial areas or clusters have been selected by the Central Pollution Control Board (CPCB) in consultation with the Ministry of Environment & Forests Government of India for the study. 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.

2. Scope of Work

The Scope of Work consisted of the following:

Monitoring, Sampling, Analysis for Stack, Ambient Air Quality, Surface Water and Ground Water Quality at identified locations in Pimpri-Chinchwad, Maharashtra with a gap of one or two days.

Details regarding the works are provided as below:

Industrial Cluster/ Area	**No. of Stack sites**	**Parameter of Stack**	**No. of AAQM sites**	**Parameter of AAQM**	**Numbers of water quality monitoring site**		**Parameter of Water**
					Surface water	**Ground water**	
Pimpri-Chinchwad	**6**	PM, SO_2 and NO_2	**8**	PM_{10}, $PM_{2.5}$, SO_2, NO_2, NH_3, O_3, C_6H_6, CO, BAP, Pb, Ni, As	**6**	**6**	**(i) Simple Parameters** Sanitary Survey, General Appearance, Colour, Smell, Transparency and Ecological **(ii) Regular Monitoring Parameters** pH, O & G, Suspended Solids, DO, COD, BOD, 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.

2.1 Frequency of Sampling:

Parameter	Round of Sampling	Frequency on each Round
Ambient Air Quality Monitoring		
Particulate Matter (size less than 10 µm) or PM_{10}	03	3 Shifts of 8 hrs each
Particulate Matter (size less than 2.5 µm) or $PM_{2.5}$	03	1 Shifts of 24 hr
Sulphur Dioxide (SO_2)	03	6 Shifts of 4 hrs each
Nitrogen Dioxide (NO_2)	03	6 Shifts of 4 hrs each
Ammonia (NH_3)	03	6 Shifts of 4 hrs each
Ozone (O_3)	03	24 Shifts of 1 hr each
Benzene (C_6H_6)	03	1 Shifts of 24 hr
Carbon Monoxide (CO)	03	24 Shifts of 1 hr each
Benzo (a) Pyrene (BaP) – particulate phase only	03	3 Shifts of 8 hrs each
Lead (Pb)	03	3 Shifts of 8 hrs each
Arsenic (As)	03	3 Shifts of 8 hrs each
Nickel (Ni)	03	3 Shifts of 8 hrs each
Ground Water		
As Mentioned Above	03	01 samples at each round
Surface Water		
As Mentioned Above	03	01 samples at each round

2.2 Methodology followed in Sampling and Analysis

Industries, places and locations that have been chosen for the sampling are representative of the city/ area. Sampling has been done at the potential 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. Methodology for sampling, preservation and analysis have been done according to the references incorporated. Methodology of various types of parameters is presented under following annexure:

1. Stack Emission Sampling and Analysis Methodology – **Annexure I**
2. Ambient Air Sampling and Analysis Methodology **- Annexure II**
3. Surface Water/ Ground water Sampling and Analysis Methodology - **Annexure III**

3. Monitoring Locations at Pimpri-Chinchwad

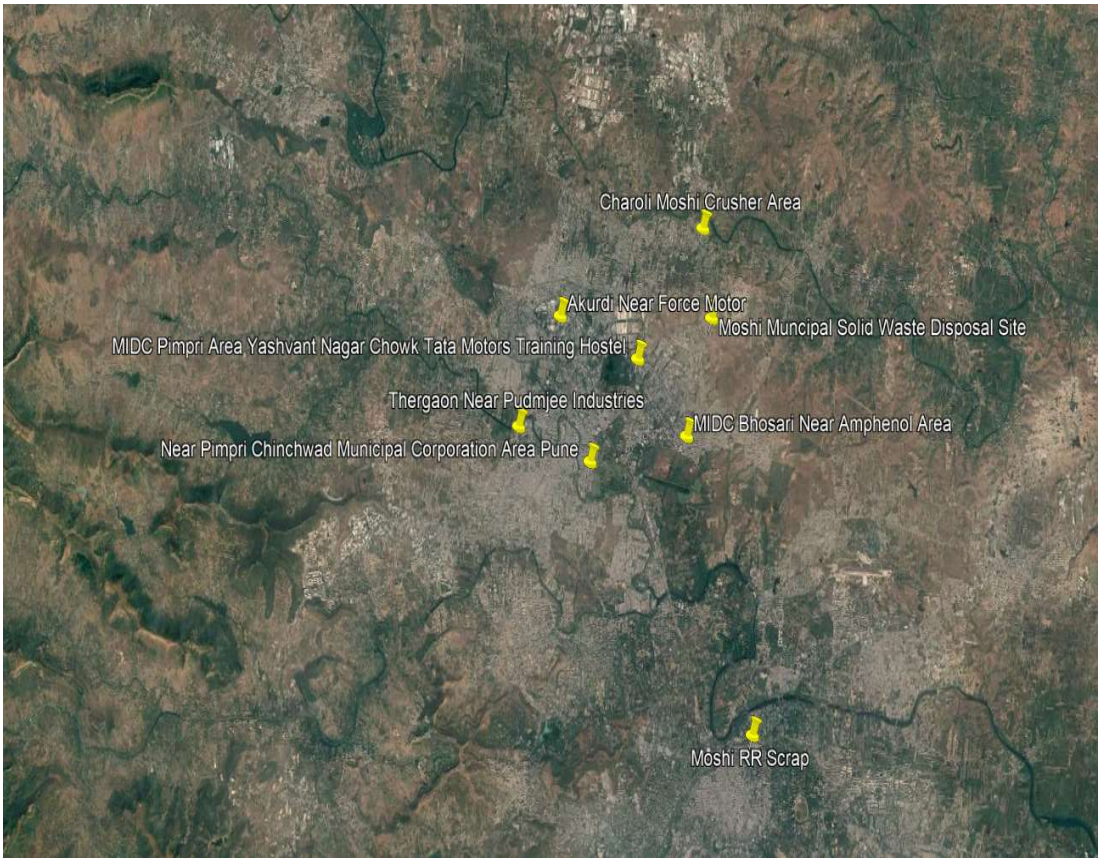
Sr. No.	Name of Monitoring Location	Latitude	Longitude	Date of Sampling		
				Round-1	Round-2	Round-3
AAQM Stations at Pimpri-Chinchwad						
1.	Near Pimpri Chinchwad Municipal Corporation Area Pune	18°36'35.28"N	73°48'3.01"E	17.02.2020	19.02.2020	21.02.2020
2.	Charoli Moshi Crusher Area	18°40'46.96"N	73°50'57.45"E	17.02.2020	19.02.2020	21.02.2020
3.	Akurdi Near Force Motor	18°39'12.41"N	73°47'16.91"E	17.02.2020	19.02.2020	21.02.2020
4.	Thergaon Near Pudmjee Industries	18°37'13.26"N	73°46'12.56"E	17.02.2020	19.02.2020	21.02.2020
5.	MIDC Bhosari Near Amphenol Area	18°37'2.73"N	73°50'32.33"E	17.02.2020	19.02.2020	21.02.2020
6.	MIDC Pimpri Area Yashvant Nagar Chowk Tata Motors Training Hostel	18°38'26.20"N	73°49'16.70"E	17.02.2020	19.02.2020	21.02.2020
7.	Moshi RR Scrap	18°31'40.29"N	73°52'14.03"E	17.02.2020	19.02.2020	21.02.2020
8.	Moshi Muncipal Solid Waste Disposal Site	18°39'10.09"N	73°51'11.03"E	17.02.2020	19.02.2020	21.02.2020
Surface Water Sampling Locations at Pimpri-Chinchwad						
1.	Pawana River-Ravet	18°38'42.49"N	73°44'15.36"E	18.02.2020	20.02.2020	22.02.2020
2.	Pawana River-Chinchwad	18°40'14.87"N	73°40'52.55"E	18.02.2020	20.02.2020	22.02.2020
3.	Pawana River-Pimpri	18°37'29.91"N	73°47'41.09"E	18.02.2020	20.02.2020	22.02.2020
4.	Indrayani-Chikhali River	18°41'8.38"N	73°51'17.54"E	18.02.2020	20.02.2020	22.02.2020
5.	Pawana River-Kasarwadi	18°36'14.86"N	73°49'15.42"E	18.02.2020	20.02.2020	22.02.2020

Sr. No.	Name of Monitoring Location	Latitude	Longitude	Date of Sampling		
				Round-1	Round-2	Round-3
6.	Indrayani River-Moshi Bridge	18°41'11.04"N	73°49'14.92"E	18.02.2020	20.02.2020	22.02.2020
Ground Water Sampling Locations at Pimpri-Chinchwad						
1.	Gandharv Nagari, Moshi	18°39'4.34"N	73°51'7.12"E	19.02.2020	21.02.2020	23.02.2020
2.	Sai Dham Landewadi	18°37'15.68"N	73°50'30.28"E	19.02.2020	21.02.2020	23.02.2020
3.	Near Sarita Kunj Building, Kasarwadi	18°36'8.20"N	73°49'22.06"E	19.02.2020	21.02.2020	23.02.2020
4.	Near Kashiba Shinde Sabhagruha Pimpri	18°36'35.01"N	73°47'57.55"E	19.02.2020	21.02.2020	23.02.2020
5.	Rohit Park-I, Tapkir Nagar Kalewadi	18°35'25.65"N	73°46'56.04"E	19.02.2020	21.02.2020	23.02.2020
6.	Near Shivaji Uday Mandal, Chinchwadgaon	18°37'35.09"N	73°47'10.01"E	19.02.2020	21.02.2020	23.02.2020
Stack Emission monitoring at Pimpri-Chinchwad						
1.	Tata Motors MIDC Pimpri	18°39'8.05"N	73°49'19.34"E	18.02.2020	22.02.2020	25.02.2020
2.	Alfa Laval India	18°32'51.40"N	73°46'21.07"E	18.02.2020	20.02.2020	25.02.2020
3.	Amphenol Interconnect	18°37'3.30"N	73°50'26.72"E	18.02.2020	21.02.2020	24.02.2020
4.	Rich Graviss Product MIDC Bhosari	18°38'31.41"N	73°49'49.89"E	19.02.2020	21.02.2020	25.02.2020
5.	Alicon Atlas Cast Alloy MIDC Chinchwad	18°38'46.56"N	73°48'1.87"E	19.02.2020	21.02.2020	24.02.2020
6.	Exide Industries	18°39'4.29"N	73°48'8.42"E	19.02.2020	22.02.2020	24.02.2020

Sr. No.	Name of Monitoring Location	Latitude	Longitude	Date of Sampling		
				Round-1	Round-2	Round-3
VOCs Emission monitoring at Pimpri-Chinchwad						
1.	Alicon Atlas Cast Alloy MIDC Chinchwad	18°38'46.56"N	73°48'1.87"E	19.02.2020	21.02.2020	24.02.2020
2.	Exide Industries	18°39'4.29"N	73°48'8.42"E	19.02.2020	22.02.2020	24.02.2020

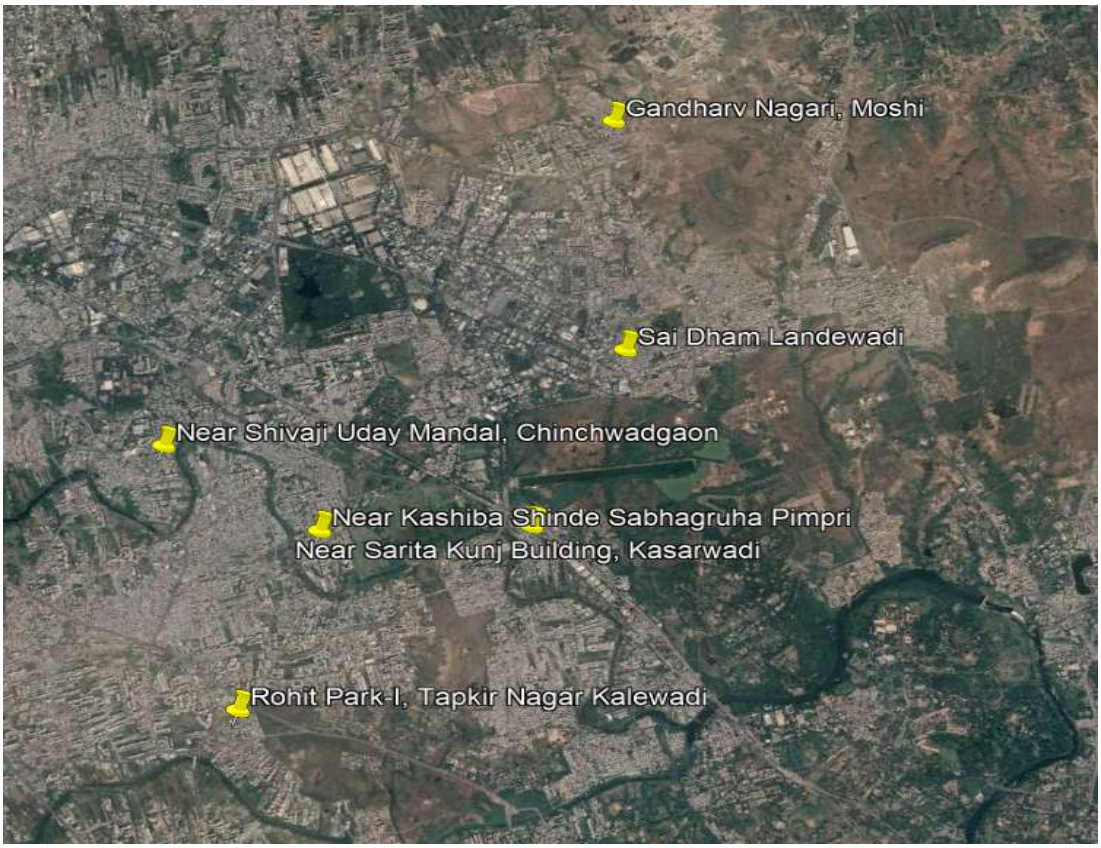
3.1 Mapping of the locations monitored

AAQM Stations at Pimpri-Chinchwad



Surface water sampling locations at Pimpri-Chinchwad

Ground water sampling locations at Pimpri-Chinchwad



4. Result of Analysis:

Results of Analysis are tabulated below for Stack Emission Monitoring, Ambient Air Quality Monitoring, Surface Water Analysis and Water Analysis. These are followed by their respective graphical representation.

***Kindly note:**

- *N.A specifies the sample is not analyzed for the specific parameter.*
- *BDL specifies that the result obtained is below detection limit.*
- *Also, industrial clusters observed with below detection limit parameters are NOT included into the graphs*

4.1 Stack Emission:

Stack Emission Monitoring Results are compared against The Environment (Protection) Rules, 1986 General Emission Standard - Part D. The limits are represented on the graphical representation.

Name of the Industry: Tata Motors MIDC Pimpri

Parameters	Units	Results		
		Round-1 (18.02.2020)	**Round-2 (22.02.2020)**	**Round-3 (25.02.2020)**
Particulate Matter	mg/Nm^3	BDL	BDL	BDL
Sulphur Dioxide (SO_2)	mg/Nm^3	10.5	BDL	BDL
	kg/day	0.51	BDL	BDL
Nitrogen dioxide (NO_2)	mg/Nm^3	BDL	12.2	12.4

Name of the Industry: Alfa Laval India

Parameters	Units	Results		
		Round-1 (18.02.2020)	**Round-2 (20.02.2020)**	**Round-3 (25.02.2020)**
Particulate Matter	mg/Nm^3	13	11	12
Sulphur Dioxide (SO_2)	mg/Nm^3	64.5	BDL	BDL
	kg/day	3.91	BDL	BDL
Nitrogen dioxide (NO_2)	mg/Nm^3	BDL	12.8	12.6

Name of the Industry: Amphenol Interconnect

Parameters	Units	Results		
		Round-1 (18.02.2020)	**Round-2 (21.02.2020)**	**Round-3 (24.02.2020)**
Particulate Matter	mg/Nm^3	BDL	BDL	11
Sulphur Dioxide (SO_2)	mg/Nm^3	78.7	BDL	BDL
	kg/day	11.6	BDL	BDL
Nitrogen dioxide (NO_2)	mg/Nm^3	BDL	12.6	12.3

Name of the Industry: Rich Graviss Product MIDC Bhosari

Parameters	Units	Results		
		Round-1 (19.02.2020)	**Round-2 (21.02.2020)**	**Round-3 (25.02.2020)**
Particulate Matter	mg/Nm^3	12	11	12
Sulphur Dioxide (SO_2)	mg/Nm^3	6.56	BDL	BDL
	kg/day	0.846	BDL	BDL
Nitrogen dioxide (NO_2)	mg/Nm^3	BDL	12.5	12.2

Name of the Industry: Alicon Atlas Cast Alloy MIDC Chinchwad

Parameters	Units	Results		
		Round-1 (19.02.2020)	**Round-2 (21.02.2020)**	**Round-3 (24.02.2020)**
Particulate Matter	mg/Nm^3	17	19	15
Sulphur Dioxide (SO_2)	mg/Nm^3	20	11.8	9.18
	kg/day	2.64	1.74	1.33
Nitrogen dioxide (NO_2)	mg/Nm^3	BDL	22.1	21.3

Name of the Industry: Exide Industries

Parameters	Units	Results		
		Round-1 (19.02.2020)	**Round-2 (22.02.2020)**	**Round-3 (24.02.2020)**
Particulate Matter	mg/Nm^3	15	BDL	BDL
Sulphur Dioxide (SO_2)	mg/Nm^3	9.33	BDL	BDL
	kg/day	1.32	BDL	BDL
Nitrogen dioxide (NO_2)	mg/Nm^3	12.6	12.1	12.4

VOCs Results

Name of the Industry: Alicon Atlas Cast Alloy MIDC Chinchwad

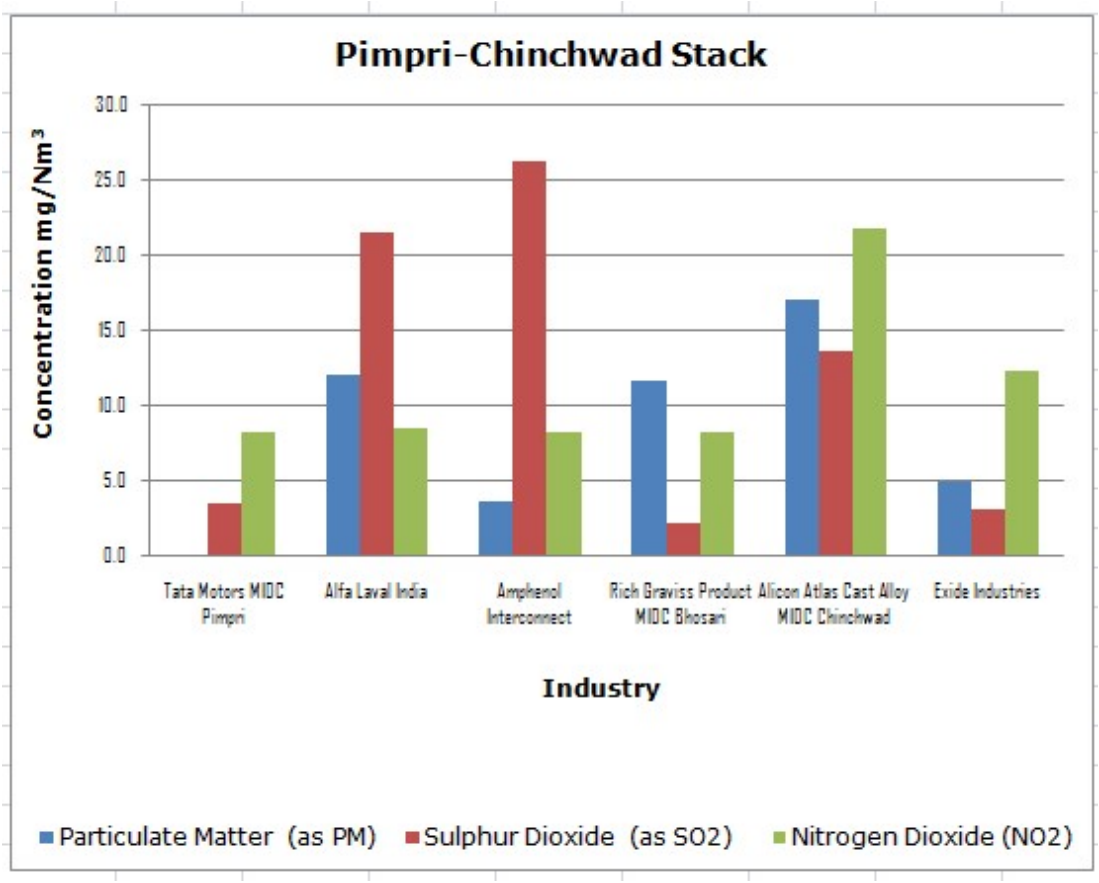
Parameters	Units	Results		
		Round-1 (19.02.2020)	**Round-2 (21.02.2020)**	**Round-3 (24.02.2020)**
Methyl Isobutyl Ketone	mg/Nm^3	BDL	BDL	BDL
Benzene	mg/Nm^3	BDL	BDL	BDL
Toulene	mg/Nm^3	BDL	BDL	BDL
Xylene	mg/Nm^3	BDL	BDL	BDL
Ethyl Benzene	mg/Nm^3	BDL	BDL	BDL
Ethyl Acetate	mg/Nm^3	BDL	BDL	BDL
Isopropyl Alcohol	mg/Nm^3	BDL	BDL	BDL

Name of the Industry: Exide Industries

Parameters	Units	Results		
		Round-1 (19.02.2020)	**Round-2 (22.02.2020)**	**Round-3 (24.02.2020)**
Methyl Isobutyl Ketone	mg/Nm^3	BDL	BDL	BDL
Benzene	mg/Nm^3	BDL	BDL	BDL
Toulene	mg/Nm^3	BDL	BDL	BDL
Xylene	mg/Nm^3	BDL	BDL	BDL
Ethyl Benzene	mg/Nm^3	BDL	BDL	BDL

Parameters	Units	Results		
		Round-1 (19.02.2020)	**Round-2 (22.02.2020)**	**Round-3 (24.02.2020)**
Ethyl Acetate	mg/Nm^3	BDL	BDL	BDL
Isopropyl Alcohol	mg/Nm^3	BDL	BDL	BDL

Graphs: Stack Monitoring for Pimpri-Chinchwad:



4.2 Ambient Air Quality:

In order to arrive at conclusions, the Ambient Air Quality Monitoring Results are compared against National Ambient Air Quality Standards, 2009 (**Annexure V**).

Location: Near Pimpri Chinchwad Muncipal Corporation Area

Parameters	Unit	Std. Limit (NAAQS 2009)	Results		
			Round-1 (17.02.2020)	Round-2 (19.02.2020)	Round-3 (21.02.2020)
Sulphur Dioxide (SO_2)	µg/m^3	**80**	BDL	BDL	BDL
Nitrogen Dioxide (NO_2)	µg/m^3	**80**	7.54	BDL	BDL
Particulate Matter (size less than 10 µm) or PM_{10}	µg/m^3	**100**	169	654	85
Particulate Matter (size less than 2.5 µm) or $PM_{2.5}$	µg/m^3	**60**	41	160	24
Ozone (O_3)	µg/m^3	**100**	BDL	BDL	BDL
Lead (Pb)	µg/m^3	**1**	BDL	BDL	BDL
Carbon Monoxide (CO)	mg/m^3	**4**	BDL	BDL	BDL
Ammonia (NH_3)	µg/m^3	**400**	BDL	BDL	BDL
Benzene (C_6H_6)	µg/m^3	**5**	BDL	BDL	BDL
Benzo (a) Pyrene (BaP) – particulate phase only	ng/m^3	**1**	BDL	3.38	5.9
Arsenic (As)	ng/m^3	**6**	BDL	BDL	BDL
Nickel (Ni)	ng/m^3	**20**	0.706	BDL	BDL

Location: Charoli Moshi Crusher Area

Parameters	Unit	Std. Limit (NAAQS 2009)	Results		
			Round-1 (17.02.2020)	Round-2 (19.02.2020)	Round-3 (21.02.2020)
Sulphur Dioxide (SO_2)	µg/m^3	**80**	BDL	BDL	BDL
Nitrogen Dioxide (NO_2)	µg/m^3	**80**	7.31	BDL	BDL
Particulate Matter (size less than 10 µm) or PM_{10}	µg/m^3	**100**	631	1890	2451

Parameters	Unit	Std. Limit (NAAQS 2009)	Results		
			Round-1 (17.02.2020)	Round-2 (19.02.2020)	Round-3 (21.02.2020)
Particulate Matter (size less than 2.5 µm) or $PM_{2.5}$	µg/m^3	**60**	155	475	300
Ozone (O_3)	µg/m^3	**100**	BDL	BDL	BDL
Lead (Pb)	µg/m^3	**1**	BDL	BDL	0.026
Carbon Monoxide (CO)	mg/m^3	**4**	BDL	BDL	BDL
Ammonia (NH_3)	µg/m^3	**400**	BDL	BDL	BDL
Benzene (C_6H_6)	µg/m^3	**5**	BDL	BDL	BDL
Benzo (a) Pyrene (BaP) – particulate phase only	ng/m^3	**1**	BDL	5.32	3.17
Arsenic (As)	ng/m^3	**6**	BDL	BDL	BDL
Nickel (Ni)	ng/m^3	**20**	0.397	BDL	BDL

Location: Akurdi Near Force Motor

Parameters	Unit	Std. Limit (NAAQS 2009)	Results		
			Round-1 (17.02.2020)	Round-2 (19.02.2020)	Round-3 (21.02.2020)
Sulphur Dioxide (SO_2)	µg/m^3	**80**	BDL	BDL	BDL
Nitrogen Dioxide (NO_2)	µg/m^3	**80**	8.02	BDL	BDL
Particulate Matter (size less than 10 µm) or PM_{10}	µg/m^3	**100**	386	400	109
Particulate Matter (size less than 2.5 µm) or $PM_{2.5}$	µg/m^3	**60**	94	103	30
Ozone (O_3)	µg/m^3	**100**	BDL	BDL	BDL
Lead (Pb)	µg/m^3	**1**	BDL	BDL	0.021
Carbon Monoxide (CO)	mg/m^3	**4**	BDL	0.53	BDL
Ammonia (NH_3)	µg/m^3	**400**	0.96	BDL	BDL
Benzene (C_6H_6)	µg/m^3	**5**	BDL	BDL	BDL
Benzo (a) Pyrene (BaP) – particulate phase only	ng/m^3	**1**	BDL	3.91	3.33

Parameters	Unit	Std. Limit (NAAQS 2009)	Results		
			Round-1 (17.02.2020)	Round-2 (19.02.2020)	Round-3 (21.02.2020)
Arsenic (As)	ng/m^3	**6**	BDL	BDL	BDL
Nickel (Ni)	ng/m^3	**20**	0.706	BDL	BDL

Location: Thergaon Near Pudmjee Industries

Parameters	Unit	Std. Limit (NAAQS 2009)	Results		
			Round-1 (17.02.2020)	Round-2 (19.02.2020)	Round-3 (21.02.2020)
Sulphur Dioxide (SO_2)	µg/m^3	**80**	BDL	BDL	BDL
Nitrogen Dioxide (NO_2)	µg/m^3	**80**	8.25	BDL	BDL
Particulate Matter (size less than 10 µm) or PM_{10}	µg/m^3	**100**	345	305	178
Particulate Matter (size less than 2.5 µm) or $PM_{2.5}$	µg/m^3	**60**	84	79	46
Ozone (O_3)	µg/m^3	**100**	BDL	BDL	BDL
Lead (Pb)	µg/m^3	**1**	BDL	BDL	BDL
Carbon Monoxide (CO)	mg/m^3	**4**	0.7	0.54	BDL
Ammonia (NH_3)	µg/m^3	**400**	0.8	0.56	BDL
Benzene (C_6H_6)	µg/m^3	**5**	BDL	BDL	BDL
Benzo (a) Pyrene (BaP) – particulate phase only	ng/m^3	**1**	BDL	3.78	BDL
Arsenic (As)	ng/m^3	**6**	BDL	BDL	BDL
Nickel (Ni)	ng/m^3	**20**	0.458	BDL	BDL

Location: MIDC Bhosari Near Amphenol Area

Parameters	Unit	Std. Limit (NAAQS 2009)	Results		
			Round-1 (17.02.2020)	Round-2 (19.02.2020)	Round-3 (21.02.2020)
Sulphur Dioxide (SO_2)	µg/m^3	**80**	BDL	BDL	BDL
Nitrogen Dioxide (NO_2)	µg/m^3	**80**	8.01	BDL	BDL

Parameters	Unit	Std. Limit (NAAQS 2009)	Results		
			Round-1 (17.02.2020)	Round-2 (19.02.2020)	Round-3 (21.02.2020)
Particulate Matter (size less than 10 µm) or PM_{10}	µg/m^3	**100**	360	435	90
Particulate Matter (size less than 2.5 µm) or $PM_{2.5}$	µg/m^3	**60**	76	110	27
Ozone (O_3)	µg/m^3	**100**	BDL	BDL	BDL
Lead (Pb)	µg/m^3	**1**	BDL	BDL	BDL
Carbon Monoxide (CO)	mg/m^3	**4**	BDL	BDL	BDL
Ammonia (NH_3)	µg/m^3	**400**	BDL	BDL	BDL
Benzene (C_6H_6)	µg/m^3	**5**	BDL	BDL	BDL
Benzo (a) Pyrene (BaP) – particulate phase only	ng/m^3	**1**	BDL	2.61	5.22
Arsenic (As)	ng/m^3	**6**	BDL	BDL	BDL
Nickel (Ni)	ng/m^3	**20**	0.350	BDL	BDL

Location: MIDC Pimpri Area Yashvant Nagar Chowk Tata Motors Training Hostel

Parameters	Unit	Std. Limit (NAAQS 2009)	Results		
			Round-1 (17.02.2020)	Round-2 (19.02.2020)	Round-3 (21.02.2020)
Sulphur Dioxide (SO_2)	µg/m^3	**80**	BDL	BDL	BDL
Nitrogen Dioxide (NO_2)	µg/m^3	**80**	8.72	BDL	BDL
Particulate Matter (size less than 10 µm) or PM_{10}	µg/m^3	**100**	408	537	434
Particulate Matter (size less than 2.5 µm) or $PM_{2.5}$	µg/m^3	**60**	105	135	100
Ozone (O_3)	µg/m^3	**100**	BDL	22.5	BDL
Lead (Pb)	µg/m^3	**1**	BDL	BDL	0.027
Carbon Monoxide (CO)	mg/m^3	**4**	BDL	BDL	BDL
Ammonia (NH_3)	µg/m^3	**400**	0.61	BDL	BDL
Benzene (C_6H_6)	µg/m^3	**5**	BDL	BDL	BDL

Parameters	Unit	Std. Limit (NAAQS 2009)	Results		
			Round-1 (17.02.2020)	Round-2 (19.02.2020)	Round-3 (21.02.2020)
Benzo (a) Pyrene (BaP) – particulate phase only	ng/m^3	**1**	BDL	3.39	17.4
Arsenic (As)	ng/m^3	**6**	BDL	BDL	BDL
Nickel (Ni)	ng/m^3	**20**	0.319	BDL	BDL

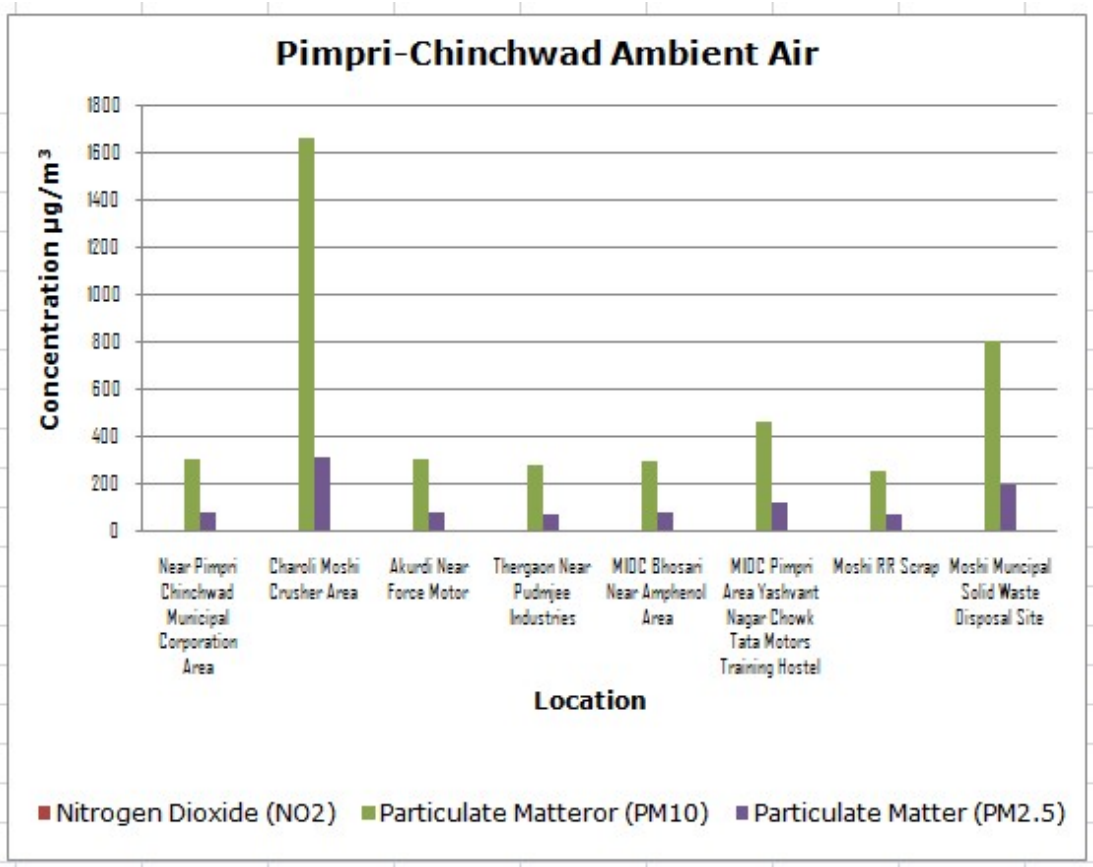
Location: Moshi RR Scrap

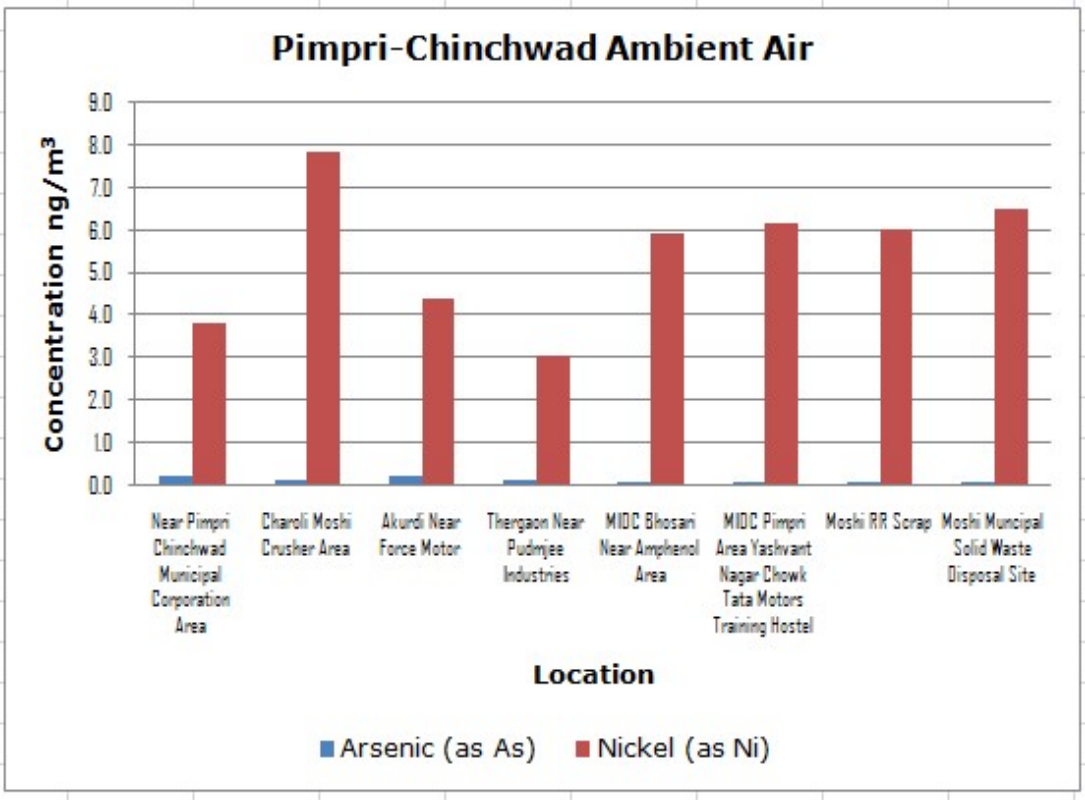
Parameters	Unit	Std. Limit (NAAQS 2009)	Results		
			Round-1 (17.02.2020)	Round-2 (19.02.2020)	Round-3 (21.02.2020)
Sulphur Dioxide (SO_2)	µg/m^3	**80**	BDL	BDL	BDL
Nitrogen Dioxide (NO_2)	µg/m^3	**80**	7.76	BDL	BDL
Particulate Matter (size less than 10 µm) or PM_{10}	µg/m^3	**100**	225	430	105
Particulate Matter (size less than 2.5 µm) or $PM_{2.5}$	µg/m^3	**60**	53	110	27
Ozone (O_3)	µg/m^3	**100**	BDL	BDL	BDL
Lead (Pb)	µg/m^3	**1**	BDL	BDL	BDL
Carbon Monoxide (CO)	mg/m^3	**4**	BDL	BDL	BDL
Ammonia (NH_3)	µg/m^3	**400**	BDL	BDL	BDL
Benzene (C_6H_6)	µg/m^3	**5**	BDL	BDL	BDL
Benzo (a) Pyrene (BaP) – particulate phase only	ng/m^3	**1**	BDL	BDL	3.94
Arsenic (As)	ng/m^3	**6**	BDL	BDL	BDL
Nickel (Ni)	ng/m^3	**20**	0.317	BDL	BDL

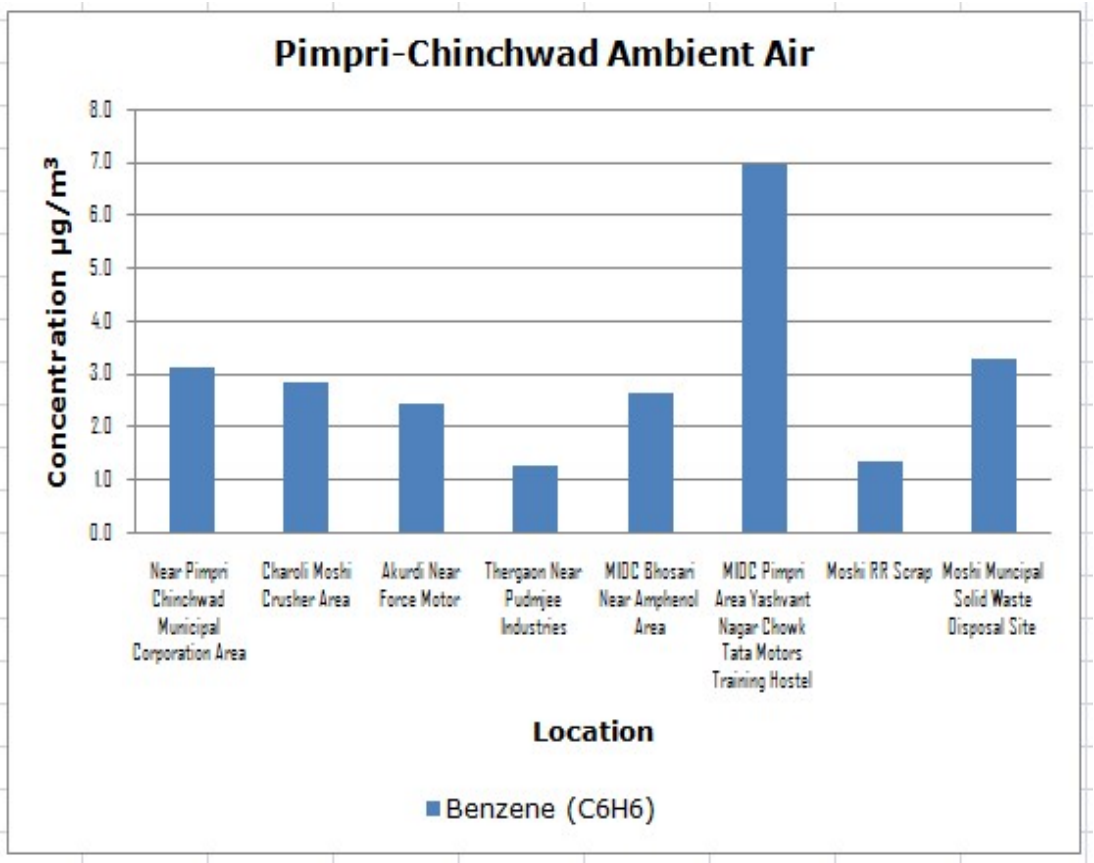
Location: Moshi Muncipal Solid Waste Disposal Site

Parameters	Unit	Std. Limit (NAAQS 2009)	Results		
			Round-1 (17.02.2020)	Round-2 (19.02.2020)	Round-3 (21.02.2020)
Sulphur Dioxide (SO_2)	µg/m^3	**80**	BDL	BDL	BDL
Nitrogen Dioxide (NO_2)	µg/m^3	**80**	7.54	BDL	BDL
Particulate Matter (size less than 10 µm) or PM_{10}	µg/m^3	**100**	823	767	822
Particulate Matter (size less than 2.5 µm) or $PM_{2.5}$	µg/m^3	**60**	207	194	166
Ozone (O_3)	µg/m^3	**100**	BDL	BDL	BDL
Lead (Pb)	µg/m^3	**1**	BDL	BDL	BDL
Carbon Monoxide (CO)	mg/m^3	**4**	BDL	BDL	BDL
Ammonia (NH_3)	µg/m^3	**400**	BDL	0.58	BDL
Benzene (C_6H_6)	µg/m^3	**5**	BDL	BDL	BDL
Benzo (a) Pyrene (BaP) – particulate phase only	ng/m^3	**1**	BDL	2.51	7.34
Arsenic (As)	ng/m^3	**6**	BDL	BDL	BDL
Nickel (Ni)	ng/m^3	**20**	0.319	BDL	BDL

Graphs: Ambient Air Quality Monitoring for Pimpri-Chinchwad:







4.3 Surface Water Quality:

Water Analysis Results are compared against CPCB document on criteria for Comprehensive Environmental Assessment of Industrial Clusters-Water Quality Parameters Requirement and Classification **(Annexure IX)**, CPCB Water Quality Criteria **(Annexure VIII)** and Drinking Water Specification, IS 10500:2012 **(Annexure VII)**, Wastewater Analysis Results are compared with General Standards for Discharge of Environmental Pollutants Part A: Effluents, The Environment (Protection) Rules, 1986, Schedule VI **(Annexure V)**.

Location: Pawana River-Ravet

Parameters	**Unit**	**Std. Limit**	**Results**		
			Round-1 (18.02.2020)	**Round-2 (20.02.2020)**	**Round-3 (22.02.2020)**
Colour	Hazen		1	1	1
Smell	-		Agreeable	Agreeable	Agreeable
pH	-	**5.5 -9.0**	7.58	7.01	7.59
Oil & Grease	mg/L	**10**	BDL	BDL	BDL

Parameters	Unit	Std. Limit	Results		
			Round-1 (18.02.2020)	Round-2 (20.02.2020)	Round-3 (22.02.2020)
Suspended Solids	mg/L	**100**	BDL	18	23
Dissolved Oxygen (% Saturation)	%	**60-140**	60	26	80
Chemical Oxygen Demand	mg/L	**250**	15	17	BDL
Biochemical Oxygen Demand (3 days, 27°C)	mg/L	**30**	5	4	BDL
Electrical Conductivity (at 25°C)	µmho/cm	**4000**	406	491	120
Nitrite Nitrogen (as NO_2)	mg/L	**5**	0.49	25.8	BDL
Nitrate Nitrogen (as NO_3)	mg/L	**10**	2.51	4.38	0.92
(NO_2 + NO_3)-Nitrogen	mg/L	**15**	3	30.2	0.92
Free Ammonia (as NH_3-N)	mg/L	**5**	BDL	BDL	BDL
Total Residual Chlorine	mg/L	**1**	BDL	BDL	BDL
Cyanide (as CN)	mg/L	**0.2**	BDL	BDL	BDL
Fluoride (as F)	mg/L	**2**	0.51	0.83	0.21
Sulphide (as S^{2-})	mg/L	**2**	BDL	BDL	BDL
Dissolved Phosphate (as P)	mg/L	**5**	BDL	BDL	BDL
Sodium Absorption Ratio	-		0.75	1.26	0.61
Total Coliforms	MPN index/ 100 mL		5.4×10^3	1.6×10^4	1600
Faecal Coliforms	MPN index/ 100 mL		3.5×10^3	1.6×10^4	240
Total Phosphorous (as P)	mg/L		0.22	BDL	BDL

Parameters	Unit	Std. Limit	Results		
			Round-1 (18.02.2020)	Round-2 (20.02.2020)	Round-3 (22.02.2020)
Total Kjeldahl Nitrogen (as N)	mg/L	**100**	9.70	9.07	3.58
Total Ammonia (NH_4+NH_3)-Nitrogen	mg/L	**1.5**	BDL	BDL	BDL
Phenols (as C_6H_5OH)	mg/L	**10**	BDL	BDL	BDL
Surface Active Agents (as MBAS)	mg/L	**200**	BDL	BDL	BDL
Organo Chlorine Pesticides					
Alachlor	µg/L		BDL	BDL	BDL
Atrazine	µg/L		BDL	BDL	BDL
Aldrin	µg/L		BDL	BDL	BDL
Dieldrin	µg/L		BDL	BDL	BDL
Alpha HCH	µg/L		BDL	BDL	BDL
Beta HCH	µg/L		BDL	BDL	BDL
Delta HCH	µg/L		BDL	BDL	BDL
Chlorpyriphos	µg/L		BDL	BDL	BDL
Butachlor	µg/L		BDL	BDL	BDL
p,p DDT	µg/L		BDL	BDL	BDL
o,p DDT	µg/L		BDL	BDL	BDL
p,p DDE	µg/L		BDL	BDL	BDL
o,p DDE	µg/L		BDL	BDL	BDL
p,p DDD	µg/L		BDL	BDL	BDL
o,p DDD	µg/L		BDL	BDL	BDL

Parameters	Unit	Std. Limit	Results		
			Round-1 (18.02.2020)	Round-2 (20.02.2020)	Round-3 (22.02.2020)
Alpha Endosulfan	µg/L		BDL	BDL	BDL
Beta Endosulfan	µg/L		BDL	BDL	BDL
Endosulfan Sulphate	µg/L		BDL	BDL	BDL
Y HCH (Lindane)	µg/L		BDL	BDL	BDL
Polynuclear aromatic hydrocarbons (PAH)	µg/L	**0.2**	BDL	BDL	BDL
Polychlorinated Biphenyls (PCB)	µg/L	**0.02**	BDL	BDL	BDL
Zinc (as Zn)	mg/L	**300**	BDL	BDL	BDL
Nickel (as Ni)	mg/L	**200**	BDL	BDL	BDL
Copper (as Cu)	mg/L	**100**	BDL	BDL	BDL
Hexavalent Chromium (as Cr^{6+})	mg/L		BDL	BDL	BDL
Total Chromium (as Cr)	mg/L	**100**	BDL	BDL	BDL
Total Arsenic (as As)	mg/L	**100**	BDL	BDL	BDL
Lead (as Pb)	mg/L	**100**	BDL	BDL	BDL
Cadmium (as Cd)	mg/L	**5**	BDL	BDL	BDL
Mercury (as Hg)	mg/L	**1**	BDL	0.003	BDL
Manganese (as Mn)	mg/L	**2**	BDL	BDL	BDL
Iron (as Fe)	mg/L	**3**	BDL	BDL	BDL
Vanadium (as V)	mg/L	**0.2**	0.011	BDL	BDL
Selenium (as Se)	mg/L	**0.05**	BDL	BDL	BDL
Boron (as B)	mg/L		BDL	BDL	BDL

Parameters	Unit	Std. Limit	Results		
			Round-1 (18.02.2020)	Round-2 (20.02.2020)	Round-3 (22.02.2020)
Total Nitrogen	mg/L		10.4	17.8	3.78
Bioassay Test on fish	% survival	**90% survival of fish after 96 hours in 100% effluent**	40	30	60

Location: Pawana River-Chinchwad

Parameters	Unit	Std. Limit	Results		
			Round-1 (18.02.2020)	Round-2 (20.02.2020)	Round-3 (22.02.2020)
Colour	Hazen		1	1	1
Smell	-		Agreeable	Agreeable	Agreeable
pH	-	**5.5 -9.0**	6.59	7.23	7.82
Oil & Grease	mg/L	**10**	BDL	BDL	BDL
Suspended Solids	mg/L	**100**	12	20	8
Dissolved Oxygen (% Saturation)	%	**60-140**	0	55	72
Chemical Oxygen Demand	mg/L	**250**	56	30	20
Biochemical Oxygen Demand (3 days, 27°C)	mg/L	**30**	16	8	5
Electrical Conductivity (at 25°C)	µmho/cm	**4000**	451	512	592
Nitrite Nitrogen (as NO_2)	mg/L	**5**	BDL	0.14	BDL
Nitrate Nitrogen (as NO_3)	mg/L	**10**	12	7.89	7.58
(NO_2 + NO_3)-Nitrogen	mg/L	**15**	12	8.53	7.58

Parameters	Unit	Std. Limit	Results		
			Round-1 (18.02.2020)	Round-2 (20.02.2020)	Round-3 (22.02.2020)
Free Ammonia (as NH_3-N)	mg/L	**5**	BDL	BDL	BDL
Total Residual Chlorine	mg/L	**1**	BDL	BDL	BDL
Cyanide (as CN)	mg/L	**0.2**	BDL	BDL	BDL
Fluoride (as F)	mg/L	**2**	0.8	1.52	0.3
Sulphide (as S^{2-})	mg/L	**2**	BDL	BDL	BDL
Dissolved Phosphate (as P)	mg/L	**5**	0.46	BDL	0.96
Sodium Absorption Ratio	-		0.9	0.8	1.31
Total Coliforms	MPN index/ 100 mL		9.2×10^3	1.6×10^4	1.6×10^4
Faecal Coliforms	MPN index/ 100 mL		5.4×10^3	1.6×10^4	1.4×10^3
Total Phosphorous (as P)	mg/L		0.8	0.38	2.28
Total Kjeldahl Nitrogen (as N)	mg/L	**100**	7.72	5.6	4.92
Total Ammonia (NH_4+NH_3)-Nitrogen	mg/L	**1.5**	BDL	BDL	2.32
Phenols (as C_6H_5OH)	mg/L	**10**	BDL	BDL	BDL
Surface Active Agents (as MBAS)	mg/L	**200**	BDL	BDL	BDL
Organo Chlorine Pesticides					
Alachlor	µg/L		BDL	BDL	BDL
Atrazine	µg/L		BDL	BDL	BDL
Aldrin	µg/L		BDL	BDL	BDL

Parameters	Unit	Std. Limit	Results		
			Round-1 (18.02.2020)	Round-2 (20.02.2020)	Round-3 (22.02.2020)
Dieldrin	µg/L		BDL	BDL	BDL
Alpha HCH	µg/L		BDL	BDL	BDL
Beta HCH	µg/L		BDL	BDL	BDL
Delta HCH	µg/L		BDL	BDL	BDL
Chlorpyriphos	µg/L		BDL	BDL	BDL
Butachlor	µg/L		BDL	BDL	BDL
p,p DDT	µg/L		BDL	BDL	BDL
o,p DDT	µg/L		BDL	BDL	BDL
p,p DDE	µg/L		BDL	BDL	BDL
o,p DDE	µg/L		BDL	BDL	BDL
p,p DDD	µg/L		BDL	BDL	BDL
o,p DDD	µg/L		BDL	BDL	BDL
Alpha Endosulfan	µg/L		BDL	BDL	BDL
Beta Endosulfan	µg/L		BDL	BDL	BDL
Endosulfan Sulphate	µg/L		BDL	BDL	BDL
Y HCH (Lindane)	µg/L		BDL	BDL	BDL
Polynuclear aromatic hydrocarbons (PAH)	µg/L	**0.2**	BDL	BDL	BDL
Polychlorinated Biphenyls (PCB)	µg/L	**0.02**	BDL	BDL	BDL
Zinc (as Zn)	mg/L	**300**	BDL	BDL	BDL
Nickel (as Ni)	mg/L	**200**	BDL	BDL	BDL

Parameters	Unit	Std. Limit	Results		
			Round-1 (18.02.2020)	**Round-2 (20.02.2020)**	**Round-3 (22.02.2020)**
Copper (as Cu)	mg/L	**100**	BDL	BDL	BDL
Hexavalent Chromium (as Cr^{6+})	mg/L		BDL	BDL	BDL
Total Chromium (as Cr)	mg/L	**100**	BDL	BDL	BDL
Total Arsenic (as As)	mg/L	**100**	BDL	BDL	BDL
Lead (as Pb)	mg/L	**100**	BDL	BDL	BDL
Cadmium (as Cd)	mg/L	**5**	BDL	BDL	BDL
Mercury (as Hg)	mg/L	**1**	BDL	BDL	BDL
Manganese (as Mn)	mg/L	**2**	0.164	0.148	BDL
Iron (as Fe)	mg/L	**3**	0.167	0.072	BDL
Vanadium (as V)	mg/L	**0.2**	BDL	BDL	BDL
Selenium (as Se)	mg/L	**0.05**	0.008	BDL	BDL
Boron (as B)	mg/L		BDL	BDL	BDL
Total Nitrogen	mg/L		10.4	7.52	6.58
Bioassay Test on fish	% survival	**90% survival of fish after 96 hours in 100% effluent**	30	40	40

Location: Pawana River-Pimpri

Parameters	Unit	Std. Limit	Results		
			Round-1 (18.02.2020)	Round-2 (20.02.2020)	Round-3 (22.02.2020)
Colour	Hazen		1	1	8
Smell	-		Agreeable	Agreeable	Disagreeable
pH	-	**5.5 -9.0**	6.92	6.69	7
Oil & Grease	mg/L	**10**	BDL	BDL	BDL
Suspended Solids	mg/L	**100**	30	48	112
Dissolved Oxygen (% Saturation)	%	**60-140**	0	65	45
Chemical Oxygen Demand	mg/L	**250**	49	41	34
Biochemical Oxygen Demand (3 days, 27°C)	mg/L	**30**	13	10	10
Electrical Conductivity (at 25°C)	µmho/cm	**4000**	547	485	492
Nitrite Nitrogen (as NO_2)	mg/L	**5**	BDL	BDL	BDL
Nitrate Nitrogen (as NO_3)	mg/L	**10**	5.88	8.3	4.27
(NO_2 + NO_3)-Nitrogen	mg/L	**15**	5.88	8.3	4.27
Free Ammonia (as NH_3-N)	mg/L	**5**	BDL	BDL	BDL
Total Residual Chlorine	mg/L	**1**	BDL	BDL	BDL
Cyanide (as CN)	mg/L	**0.2**	BDL	BDL	BDL
Fluoride (as F)	mg/L	**2**	1.2	0.51	0.7
Sulphide (as S^{2-})	mg/L	**2**	BDL	BDL	BDL
Dissolved Phosphate (as P)	mg/L	**5**	0.54	BDL	1.36
Sodium Absorption Ratio	-		1.13	0.88	1.74

Parameters	Unit	Std. Limit	Results		
			Round-1 (18.02.2020)	**Round-2 (20.02.2020)**	**Round-3 (22.02.2020)**
Total Coliforms	MPN index/ 100 mL		9.2 X 10^3	1.6 x 10^4	1.6 x 10^4
Faecal Coliforms	MPN index/ 100 mL		3.9 X 10^2	1.6 x 10^4	3.5 x 10^3
Total Phosphorous (as P)	mg/L		0.74	0.22	2.92
Total Kjeldahl Nitrogen (as N)	mg/L	**100**	30.2	2.8	4.7
Total Ammonia (NH_4+NH_3)-Nitrogen	mg/L	**1.5**	0.81	BDL	BDL
Phenols (as C_6H_5OH)	mg/L	**10**	BDL	BDL	BDL
Surface Active Agents (as MBAS)	mg/L	**200**	BDL	BDL	BDL
Organo Chlorine Pesticides					
Alachlor	µg/L		BDL	BDL	BDL
Atrazine	µg/L		BDL	BDL	BDL
Aldrin	µg/L		BDL	BDL	BDL
Dieldrin	µg/L		BDL	BDL	BDL
Alpha HCH	µg/L		BDL	BDL	BDL
Beta HCH	µg/L		BDL	BDL	BDL
Delta HCH	µg/L		BDL	BDL	BDL
Chlorpyriphos	µg/L		BDL	BDL	BDL
Butachlor	µg/L		BDL	BDL	BDL
p,p DDT	µg/L		BDL	BDL	BDL

Parameters	Unit	Std. Limit	Results		
			Round-1 (18.02.2020)	Round-2 (20.02.2020)	Round-3 (22.02.2020)
o,p DDT	µg/L		BDL	BDL	BDL
p,p DDE	µg/L		BDL	BDL	BDL
o,p DDE	µg/L		BDL	BDL	BDL
p,p DDD	µg/L		BDL	BDL	BDL
o,p DDD	µg/L		BDL	BDL	BDL
Alpha Endosulfan	µg/L		BDL	BDL	BDL
Beta Endosulfan	µg/L		BDL	BDL	BDL
Endosulfan Sulphate	µg/L		BDL	BDL	BDL
Y HCH (Lindane)	µg/L		BDL	BDL	BDL
Polynuclear aromatic hydrocarbons (PAH)	µg/L	**0.2**	BDL	BDL	BDL
Polychlorinated Biphenyls (PCB)	µg/L	**0.02**	BDL	BDL	BDL
Zinc (as Zn)	mg/L	**300**	BDL	BDL	BDL
Nickel (as Ni)	mg/L	**200**	BDL	BDL	BDL
Copper (as Cu)	mg/L	**100**	BDL	BDL	BDL
Hexavalent Chromium (as Cr^{6+})	mg/L		BDL	BDL	BDL
Total Chromium (as Cr)	mg/L	**100**	0.082	BDL	0.083
Total Arsenic (as As)	mg/L	**100**	BDL	BDL	BDL
Lead (as Pb)	mg/L	**100**	BDL	BDL	BDL
Cadmium (as Cd)	mg/L	**5**	BDL	BDL	BDL
Mercury (as Hg)	mg/L	**1**	BDL	0.002	BDL

Parameters	Unit	Std. Limit	Results		
			Round-1 (18.02.2020)	Round-2 (20.02.2020)	Round-3 (22.02.2020)
Manganese (as Mn)	mg/L	**2**	0.026	0.205	0.198
Iron (as Fe)	mg/L	**3**	0.209	0.264	0.459
Vanadium (as V)	mg/L	**0.2**	BDL	BDL	BDL
Selenium (as Se)	mg/L	**0.05**	0.008	BDL	BDL
Boron (as B)	mg/L		BDL	BDL	BDL
Total Nitrogen	mg/L		31.5	4.62	5.63
Bioassay Test on fish	% survival	**90% survival of fish after 96 hours in 100% effluent**	50	30	40

Location: Indrayani-Chikhali River

Parameters	Unit	Std. Limit	Results		
			Round-1 (18.02.2020)	Round-2 (20.02.2020)	Round-3 (22.02.2020)
Colour	Hazen		1	1	1
Smell	-		Agreeable	Agreeable	Agreeable
pH	-	**5.5 -9.0**	7	6.91	7.45
Oil & Grease	mg/L	**10**	BDL	BDL	BDL
Suspended Solids	mg/L	**100**	8	34	<5
Dissolved Oxygen (% Saturation)	%	**60-140**	90	60	88
Chemical Oxygen Demand	mg/L	**250**	13	8	6

Parameters	Unit	Std. Limit	Results		
			Round-1 (18.02.2020)	**Round-2 (20.02.2020)**	**Round-3 (22.02.2020)**
Biochemical Oxygen Demand (3 days, 27°C)	mg/L	**30**	4	2	2
Electrical Conductivity (at 25°C)	µmho/cm	**4000**	311	489	286
Nitrite Nitrogen (as NO_2)	mg/L	**5**	BDL	BDL	BDL
Nitrate Nitrogen (as NO_3)	mg/L	**10**	2.13	6.3	1.54
(NO_2 + NO_3)-Nitrogen	mg/L	**15**	2.13	6.3	1.54
Free Ammonia (as NH_3-N)	mg/L	**5**	BDL	BDL	BDL
Total Residual Chlorine	mg/L	**1**	BDL	BDL	BDL
Cyanide (as CN)	mg/L	**0.2**	BDL	BDL	BDL
Fluoride (as F)	mg/L	**2**	0.96	0.7	0.27
Sulphide (as S^{2-})	mg/L	**2**	BDL	BDL	BDL
Dissolved Phosphate (as P)	mg/L	**5**	BDL	BDL	BDL
Sodium Absorption Ratio	-		0.62	0.43	1.05
Total Coliforms	MPN index/ 100 mL		240	240	920
Faecal Coliforms	MPN index/ 100 mL		130	240	130
Total Phosphorous (as P)	mg/L		BDL	0.22	BDL
Total Kjeldahl Nitrogen (as N)	mg/L	**100**	3.02	2.12	2.01
Total Ammonia (NH_4+NH_3)-Nitrogen	mg/L	**1.5**	BDL	BDL	BDL

Parameters	Unit	Std. Limit	Results		
			Round-1 (18.02.2020)	Round-2 (20.02.2020)	Round-3 (22.02.2020)
Phenols (as C_6H_5OH)	mg/L	**10**	BDL	BDL	BDL
Surface Active Agents (as MBAS)	mg/L	**200**	BDL	BDL	BDL
Organo Chlorine Pesticides					
Alachlor	µg/L		BDL	BDL	BDL
Atrazine	µg/L		BDL	BDL	BDL
Aldrin	µg/L		BDL	BDL	BDL
Dieldrin	µg/L		BDL	BDL	BDL
Alpha HCH	µg/L		BDL	BDL	BDL
Beta HCH	µg/L		BDL	BDL	BDL
Delta HCH	µg/L		BDL	BDL	BDL
Chlorpyriphos	µg/L		BDL	BDL	BDL
Butachlor	µg/L		BDL	BDL	BDL
p,p DDT	µg/L		BDL	BDL	BDL
o,p DDT	µg/L		BDL	BDL	BDL
p,p DDE	µg/L		BDL	BDL	BDL
o,p DDE	µg/L		BDL	BDL	BDL
p,p DDD	µg/L		BDL	BDL	BDL
o,p DDD	µg/L		BDL	BDL	BDL
Alpha Endosulfan	µg/L		BDL	BDL	BDL
Beta Endosulfan	µg/L		BDL	BDL	BDL

Parameters	Unit	Std. Limit	Results		
			Round-1 (18.02.2020)	Round-2 (20.02.2020)	Round-3 (22.02.2020)
Endosulfan Sulphate	µg/L		BDL	BDL	BDL
Y HCH (Lindane)	µg/L		BDL	BDL	BDL
Polynuclear aromatic hydrocarbons (PAH)	µg/L	**0.2**	BDL	BDL	BDL
Polychlorinated Biphenyls (PCB)	µg/L	**0.02**	BDL	BDL	BDL
Zinc (as Zn)	mg/L	**300**	BDL	BDL	BDL
Nickel (as Ni)	mg/L	**200**	BDL	BDL	BDL
Copper (as Cu)	mg/L	**100**	BDL	BDL	BDL
Hexavalent Chromium (as Cr^{6+})	mg/L		BDL	BDL	BDL
Total Chromium (as Cr)	mg/L	**100**	BDL	BDL	BDL
Total Arsenic (as As)	mg/L	**100**	BDL	BDL	BDL
Lead (as Pb)	mg/L	**100**	BDL	BDL	BDL
Cadmium (as Cd)	mg/L	**5**	BDL	0.002	BDL
Mercury (as Hg)	mg/L	**1**	BDL	BDL	BDL
Manganese (as Mn)	mg/L	**2**	0.079	BDL	BDL
Iron (as Fe)	mg/L	**3**	0.556	BDL	BDL
Vanadium (as V)	mg/L	**0.2**	BDL	BDL	0.009
Selenium (as Se)	mg/L	**0.05**	BDL	BDL	BDL
Boron (as B)	mg/L		BDL	BDL	BDL
Total Nitrogen	mg/L		3.48	3.5	2.35

Parameters	Unit	Std. Limit	Results		
			Round-1 (18.02.2020)	Round-2 (20.02.2020)	Round-3 (22.02.2020)
Bioassay Test on fish	% survival	**90% survival of fish after 96 hours in 100% effluent**	60	50	70

Location: Pawana River-Kasarwadi

Parameters	Unit	Std. Limit	Results		
			Round-1 (18.02.2020)	Round-2 (20.02.2020)	Round-3 (22.02.2020)
Colour	Hazen		1	1	1
Smell	-		Agreeable	Agreeable	Disagreeable
pH	-	**5.5 -9.0**	6.91	6.47	7.49
Oil & Grease	mg/L	**10**	BDL	BDL	BDL
Suspended Solids	mg/L	**100**	40	84	62
Dissolved Oxygen (% Saturation)	%	**60-140**	0	79.5	50
Chemical Oxygen Demand	mg/L	**250**	44	48	25
Biochemical Oxygen Demand (3 days, 27°C)	mg/L	**30**	12	12	7
Electrical Conductivity (at 25°C)	µmho/cm	**4000**	560	517	531
Nitrite Nitrogen (as NO_2)	mg/L	**5**	0.05	BDL	BDL
Nitrate Nitrogen (as NO_3)	mg/L	**10**	8.54	8.16	8.58
(NO_2 + NO_3)-Nitrogen	mg/L	**15**	8.59	8.16	8.69
Free Ammonia (as NH_3-N)	mg/L	**5**	BDL	BDL	BDL

Parameters	Unit	Std. Limit	Results		
			Round-1 (18.02.2020)	**Round-2 (20.02.2020)**	**Round-3 (22.02.2020)**
Total Residual Chlorine	mg/L	**1**	BDL	BDL	BDL
Cyanide (as CN)	mg/L	**0.2**	BDL	BDL	BDL
Fluoride (as F)	mg/L	**2**	1.7	0.65	1.28
Sulphide (as S^{2-})	mg/L	**2**	BDL	BDL	BDL
Dissolved Phosphate (as P)	mg/L	**5**	BDL	BDL	0.7
Sodium Absorption Ratio	-		1.23	9.26	1.9
Total Coliforms	MPN index/ 100 mL		9.2 X 10^3	9.2 x 10^3	9.2 x 10^3
Faecal Coliforms	MPN index/ 100 mL		2.8 X 10^3	9.2 x 10^3	2.2 x 10^3
Total Phosphorous (as P)	mg/L		BDL	0.12	2
Total Kjeldahl Nitrogen (as N)	mg/L	**100**	13.7	7.84	2.8
Total Ammonia (NH_4+NH_3)-Nitrogen	mg/L	**1.5**	2.53	2.5	3.35
Phenols (as C_6H_5OH)	mg/L	**10**	BDL	BDL	BDL
Surface Active Agents (as MBAS)	mg/L	**200**	BDL	BDL	BDL
Organo Chlorine Pesticides					
Alachlor	µg/L		BDL	BDL	BDL
Atrazine	µg/L		BDL	BDL	BDL
Aldrin	µg/L		BDL	BDL	BDL
Dieldrin	µg/L		BDL	BDL	BDL

Parameters	Unit	Std. Limit	Results		
			Round-1 (18.02.2020)	Round-2 (20.02.2020)	Round-3 (22.02.2020)
Alpha HCH	µg/L		BDL	BDL	BDL
Beta HCH	µg/L		BDL	BDL	BDL
Delta HCH	µg/L		BDL	BDL	BDL
Chlorpyriphos	µg/L		BDL	BDL	BDL
Butachlor	µg/L		BDL	BDL	BDL
p,p DDT	µg/L		BDL	BDL	BDL
o,p DDT	µg/L		BDL	BDL	BDL
p,p DDE	µg/L		BDL	BDL	BDL
o,p DDE	µg/L		BDL	BDL	BDL
p,p DDD	µg/L		BDL	BDL	BDL
o,p DDD	µg/L		BDL	BDL	BDL
Alpha Endosulfan	µg/L		BDL	BDL	BDL
Beta Endosulfan	µg/L		BDL	BDL	BDL
Endosulfan Sulphate	µg/L		BDL	BDL	BDL
Y HCH (Lindane)	µg/L		BDL	BDL	BDL
Polynuclear aromatic hydrocarbons (PAH)	µg/L	**0.2**	BDL	BDL	BDL
Polychlorinated Biphenyls (PCB)	µg/L	**0.02**	BDL	BDL	BDL
Zinc (as Zn)	mg/L	**300**	BDL	BDL	0.091
Nickel (as Ni)	mg/L	**200**	BDL	BDL	0.014
Copper (as Cu)	mg/L	**100**	BDL	BDL	0.022

Parameters	Unit	Std. Limit	Results		
			Round-1 (18.02.2020)	**Round-2 (20.02.2020)**	**Round-3 (22.02.2020)**
Hexavalent Chromium (as Cr^{6+})	mg/L		BDL	BDL	BDL
Total Chromium (as Cr)	mg/L	**100**	BDL	0.026	BDL
Total Arsenic (as As)	mg/L	**100**	BDL	BDL	BDL
Lead (as Pb)	mg/L	**100**	BDL	BDL	BDL
Cadmium (as Cd)	mg/L	**5**	BDL	BDL	BDL
Mercury (as Hg)	mg/L	**1**	BDL	BDL	BDL
Manganese (as Mn)	mg/L	**2**	0.092	0.242	0.029
Iron (as Fe)	mg/L	**3**	0.252	0.284	0.728
Vanadium (as V)	mg/L	**0.2**	BDL	BDL	BDL
Selenium (as Se)	mg/L	**0.05**	0.005	BDL	BDL
Boron (as B)	mg/L		BDL	BDL	BDL
Total Nitrogen	mg/L		15.5	9.63	4.71
Bioassay Test on fish	% survival	**90% survival of fish after 96 hours in 100% effluent**	40	40	50

Location: Indrayani River-Moshi Bridge

Parameters	Unit	Std. Limit	Results		
			Round-1 (18.02.2020)	**Round-2 (20.02.2020)**	**Round-3 (22.02.2020)**
Colour	Hazen		1	1	10
Smell	-		Agreeable	Agreeable	Disagreeable

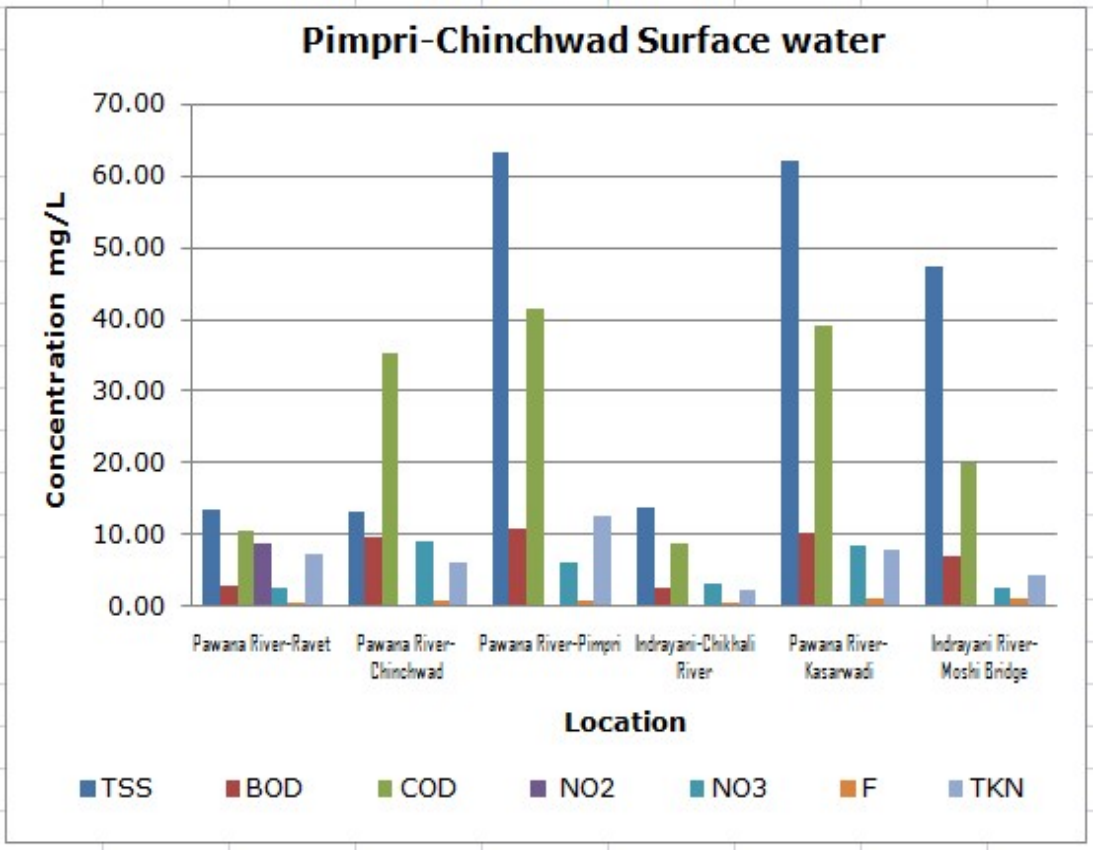
Parameters	Unit	Std. Limit	Results		
			Round-1 (18.02.2020)	**Round-2 (20.02.2020)**	**Round-3 (22.02.2020)**
pH	-	**5.5 -9.0**	7.08	6.89	7.37
Oil & Grease	mg/L	**10**	BDL	BDL	BDL
Suspended Solids	mg/L	**100**	14	32	96
Dissolved Oxygen (% Saturation)	%	**60-140**	50	80	48
Chemical Oxygen Demand	mg/L	**250**	24	18	18
Biochemical Oxygen Demand (3 days, 27°C)	mg/L	**30**	11	5	5
Electrical Conductivity (at 25°C)	µmho/cm	**4000**	830	408	431
Nitrite Nitrogen (as NO_2)	mg/L	**5**	0.16	BDL	BDL
Nitrate Nitrogen (as NO_3)	mg/L	**10**	3.09	2.37	2.13
(NO_2 + NO_3)-Nitrogen	mg/L	**15**	3.25	2.37	2.13
Free Ammonia (as NH_3-N)	mg/L	**5**	BDL	BDL	BDL
Total Residual Chlorine	mg/L	**1**	BDL	BDL	BDL
Cyanide (as CN)	mg/L	**0.2**	BDL	BDL	BDL
Fluoride (as F)	mg/L	**2**	0.85	1.44	1
Sulphide (as S^{2-})	mg/L	**2**	0.025	BDL	BDL
Dissolved Phosphate (as P)	mg/L	**5**	0.4	BDL	0.92
Sodium Absorption Ratio	-		0.80	0.63	1.34
Total Coliforms	MPN index/ 100 mL		1.6 X 10^4	1.6 x 10^4	1.6 x 10^4

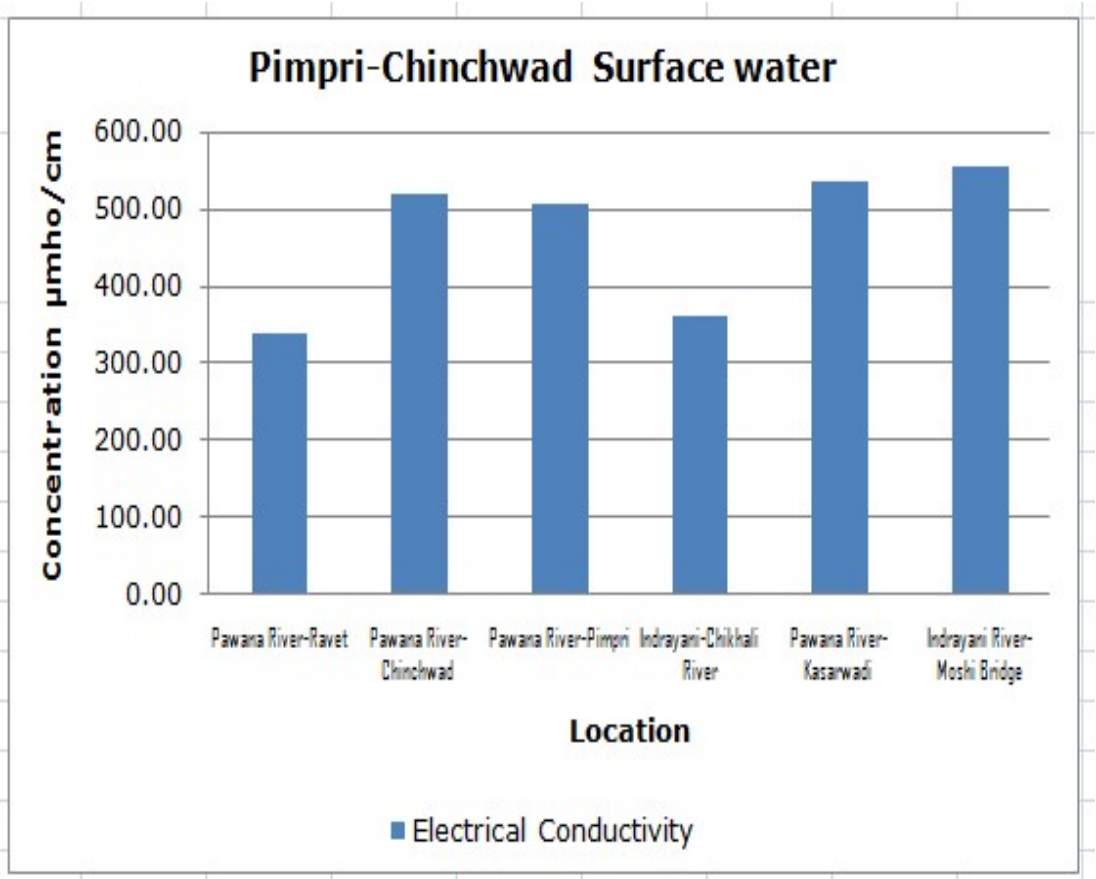
Parameters	Unit	Std. Limit	Results		
			Round-1 (18.02.2020)	**Round-2 (20.02.2020)**	**Round-3 (22.02.2020)**
Faecal Coliforms	MPN index/ 100 mL		3.9 X 10^2	1.6 x 10^4	3.5 x 10^3
Total Phosphorous (as P)	mg/L		0.5	BDL	2.21
Total Kjeldahl Nitrogen (as N)	mg/L	**100**	8.06	3.13	2.24
Total Ammonia (NH_4+NH_3)-Nitrogen	mg/L	**1.5**	BDL	4.4	2.22
Phenols (as C_6H_5OH)	mg/L	**10**	BDL	BDL	BDL
Surface Active Agents (as MBAS)	mg/L	**200**	BDL	BDL	BDL
Organo Chlorine Pesticides					
Alachlor	µg/L		BDL	BDL	BDL
Atrazine	µg/L		BDL	BDL	BDL
Aldrin	µg/L		BDL	BDL	BDL
Dieldrin	µg/L		BDL	BDL	BDL
Alpha HCH	µg/L		BDL	BDL	BDL
Beta HCH	µg/L		BDL	BDL	BDL
Delta HCH	µg/L		BDL	BDL	BDL
Chlorpyriphos	µg/L		BDL	BDL	BDL
Butachlor	µg/L		BDL	BDL	BDL
p,p DDT	µg/L		BDL	BDL	BDL
o,p DDT	µg/L		BDL	BDL	BDL
p,p DDE	µg/L		BDL	BDL	BDL

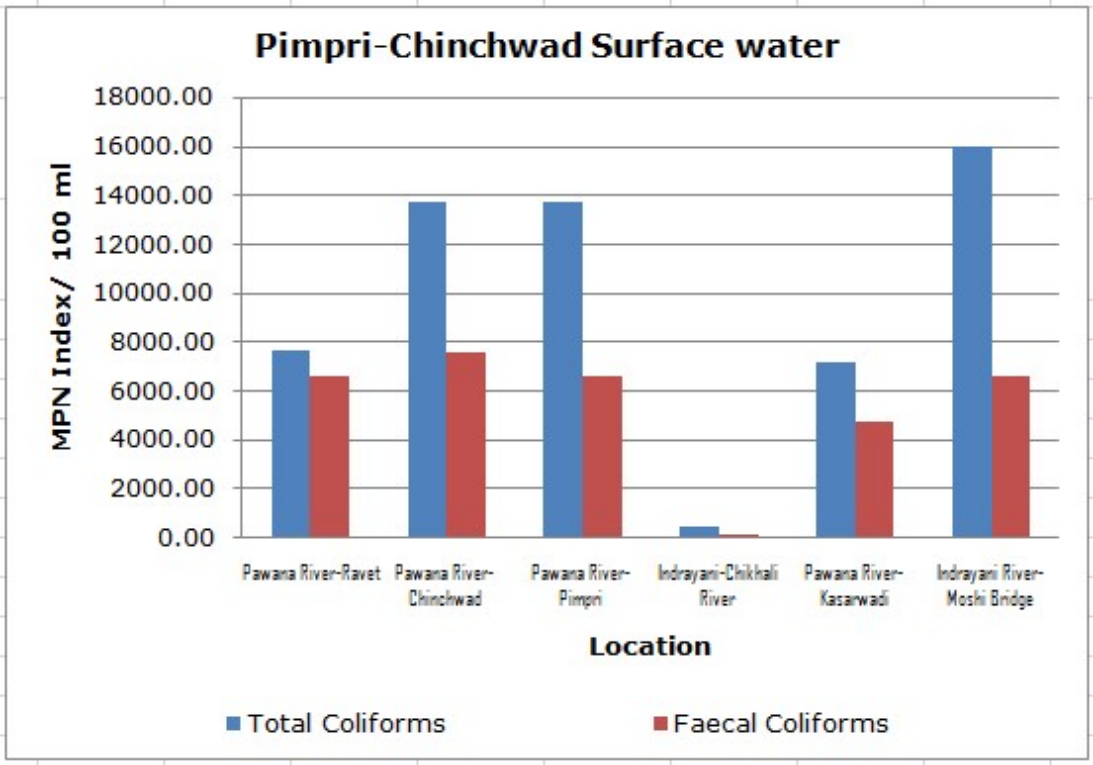
Parameters	Unit	Std. Limit	Results		
			Round-1 (18.02.2020)	Round-2 (20.02.2020)	Round-3 (22.02.2020)
o,p DDE	µg/L		BDL	BDL	BDL
p,p DDD	µg/L		BDL	BDL	BDL
o,p DDD	µg/L		BDL	BDL	BDL
Alpha Endosulfan	µg/L		BDL	BDL	BDL
Beta Endosulfan	µg/L		BDL	BDL	BDL
Endosulfan Sulphate	µg/L		BDL	BDL	BDL
Y HCH (Lindane)	µg/L		BDL	BDL	BDL
Polynuclear aromatic hydrocarbons (PAH)	µg/L	**0.2**	BDL	BDL	BDL
Polychlorinated Biphenyls (PCB)	µg/L	**0.02**	BDL	BDL	BDL
Zinc (as Zn)	mg/L	**300**	BDL	BDL	BDL
Nickel (as Ni)	mg/L	**200**	BDL	BDL	BDL
Copper (as Cu)	mg/L	**100**	BDL	BDL	BDL
Hexavalent Chromium (as Cr^{6+})	mg/L		BDL	BDL	BDL
Total Chromium (as Cr)	mg/L	**100**	0.046	BDL	BDL
Total Arsenic (as As)	mg/L	**100**	BDL	0.12	BDL
Lead (as Pb)	mg/L	**100**	BDL	BDL	BDL
Cadmium (as Cd)	mg/L	**5**	BDL	BDL	BDL
Mercury (as Hg)	mg/L	**1**	BDL	0.003	0.004
Manganese (as Mn)	mg/L	**2**	0.152	BDL	0.163
Iron (as Fe)	mg/L	**3**	0.217	0.081	0.526

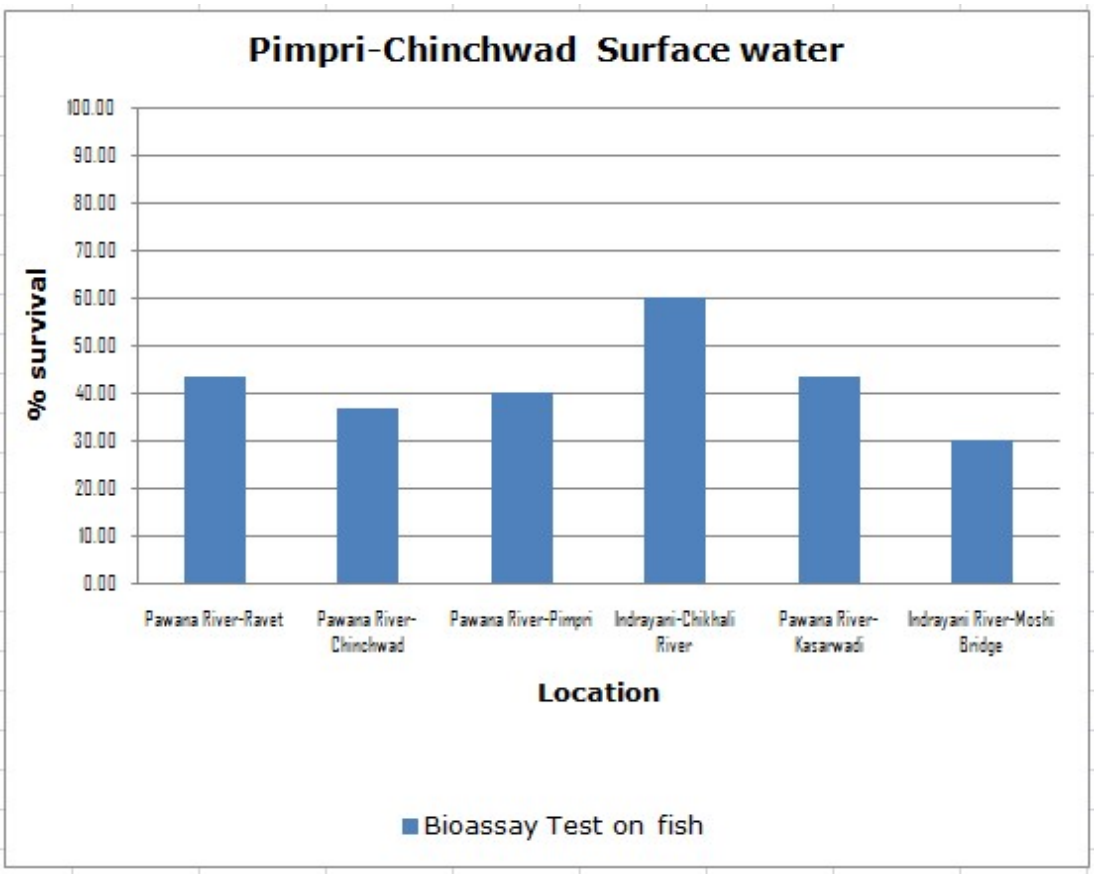
Parameters	Unit	Std. Limit	Results		
			Round-1 (18.02.2020)	Round-2 (20.02.2020)	Round-3 (22.02.2020)
Vanadium (as V)	mg/L	**0.2**	BDL	BDL	BDL
Selenium (as Se)	mg/L	**0.05**	BDL	BDL	BDL
Boron (as B)	mg/L		BDL	BDL	BDL
Total Nitrogen	mg/L		8.79	3.65	2.7
Bioassay Test on fish	% survival	**90% survival of fish after 96 hours in 100% effluent**	20	30	40

Graphs: Surface Water Quality Monitoring for Pimpri-Chinchwad:




Pimpri-Chinchwad Surface water
Concentration µmho/cm
600.00
500.00
400.00
300.00
200.00
100.00
0.00
Pawana River-Ravet
Pawana River-Chinchwad
Pawana River-Pimpri
Indrayani-Chikhali River
Pawana River-Kasarwadi
Indrayani River-Moshi Bridge
Location
Electrical Conductivity


Pimpri-Chinchwad Surface water
MPN Index/ 100 ml
18000.00
16000.00
14000.00
12000.00
10000.00
8000.00
6000.00
4000.00
2000.00
0.00
Pawana River-Ravet
Pawana River-Chinchwad
Pawana River-Pimpri
Indrayani-Chikhali River
Pawana River-Kasarwadi
Indrayani River-Moshi Bridge
Location
Total Coliforms
Faecal Coliforms



4.4 Ground Water Quality:

Name of the Location: Gandharv Nagari, Moshi

Parameters	Unit	Std. Limit	Results		
			Round-1 (19.02.2020)	**Round-2 (21.02.2020)**	**Round-3 (23.02.2020)**
Colour	Hazen		1	1	1
Smell	-		Agreeable	Agreeable	Agreeable
pH	-	**6.5-9.0**	7.27	6.69	7
Oil & Grease	mg/L		BDL	BDL	BDL
Suspended Solids	mg/L	**100**	8	6	6
Chemical Oxygen Demand	mg/L		10	12	11
Biochemical Oxygen Demand (3 days,27°C)	mg/L		2	3	5
Electrical Conductivity (at 25°C)	µmho/cm	**4000**	1111	772	862

Parameters	Unit	Std. Limit	Results		
			Round-1 (19.02.2020)	**Round-2 (21.02.2020)**	**Round-3 (23.02.2020)**
Nitrite Nitrogen (as NO_2)	mg/L		0.101	BDL	BDL
Nitrate Nitrogen (as NO_3)	mg/L		11.8	11.5	15.2
(NO_2 + NO_3)-Nitrogen	mg/L	**15**	11.9	11.5	15.2
Free Ammonia (as NH_3-N)	mg/L		BDL	BDL	BDL
Total Residual Chlorine	mg/L		BDL	BDL	BDL
Cyanide (as CN)	mg/L		BDL	BDL	BDL
Fluoride (as F)	mg/L		1.3	1.36	0.36
Sulphide (as S^{2-})	mg/L		BDL	BDL	BDL
Dissolved Phosphate (as P)	mg/L		BDL	BDL	BDL
Sodium Absorption Ratio	-		2.3	1.59	0.67
Total Coliforms	MPN index/ 100 mL		240	1.6×10^4	350
Faecal Coliforms	MPN index/ 100 mL		79	5.4×10^3	240
Total Phosphorous (as P)	mg/L	**0.3**	BDL	BDL	BDL
Total Kjeldahl Nitrogen (as N)	mg/L	**3**	7.7	6.94	6.49
Total Ammonia (NH_4+NH_3)-Nitrogen	mg/L	**1.5**	BDL	BDL	BDL
Phenols (as C_6H_5OH)	mg/L	**10**	BDL	BDL	BDL
Surface Active Agents (as MBAS)	mg/L	**200**	BDL	BDL	BDL
Organo Chlorine Pesticides					
Alachlor	µg/L		BDL	BDL	BDL
Atrazine	µg/L		BDL	BDL	BDL
Aldrin	µg/L		BDL	BDL	BDL
Dieldrin	µg/L		BDL	BDL	BDL

Parameters	Unit	Std. Limit	Results		
			Round-1 (19.02.2020)	Round-2 (21.02.2020)	Round-3 (23.02.2020)
Alpha HCH	µg/L		BDL	BDL	BDL
Beta HCH	µg/L		BDL	BDL	BDL
Delta HCH	µg/L		BDL	BDL	BDL
Butachlor	µg/L		BDL	BDL	BDL
Chlorpyriphos	µg/L		BDL	BDL	BDL
p,p DDT	µg/L		BDL	BDL	BDL
o,p DDT	µg/L		BDL	BDL	BDL
p,p DDE	µg/L		BDL	BDL	BDL
o,p DDE	µg/L		BDL	BDL	BDL
p,p DDD	µg/L		BDL	BDL	BDL
o,p DDD	µg/L		BDL	BDL	BDL
Alpha Endosulfan	µg/L		BDL	BDL	BDL
Beta Endosulfan	µg/L		BDL	BDL	BDL
Endosulfan Sulphate	µg/L		BDL	BDL	BDL
Y HCH (Lindane)	µg/L		BDL	BDL	BDL
Polynuclear aromatic hydrocarbons (PAH)	µg/L	**0.2**	BDL	BDL	BDL
Polychlorinated Biphenyls (PCB)	µg/L	**0.02**	BDL	BDL	BDL
Zinc (as Zn)	mg/L	**300**	BDL	BDL	BDL
Nickel (as Ni)	mg/L	**200**	BDL	BDL	BDL
Copper (as Cu)	mg/L	**100**	BDL	BDL	BDL
Hexavalent Chromium (as Cr^{6+})	mg/L		BDL	BDL	BDL
Total Chromium (as Cr)	mg/L	**100**	BDL	BDL	BDL
Total Arsenic (as As)	mg/L	**100**	BDL	BDL	BDL
Lead (as Pb)	mg/L	**100**	BDL	BDL	BDL

Parameters	Unit	Std. Limit	Results		
			Round-1 (19.02.2020)	Round-2 (21.02.2020)	Round-3 (23.02.2020)
Cadmium (as Cd)	mg/L	**5**	BDL	BDL	BDL
Mercury (as Hg)	mg/L	**1**	BDL	0.006	BDL
Manganese (as Mn)	mg/L		0.064	BDL	BDL
Iron (as Fe)	mg/L		0.087	BDL	BDL
Vanadium (as V)	mg/L		0.032	0.023	0.027
Selenium (as Se)	mg/L		0.005	BDL	0.008
Total Nitrogen	mg/L		BDL	9.47	9.83
Boron (as B)	mg/L		10.3	BDL	BDL
Bioassay Test on fish	% survival		70	40	60

Name of the Location: Sai Dham Landewadi, Bhosari

Parameters	Unit	Std. Limit	Results		
			Round-1 (19.02.2020)	Round-2 (21.02.2020)	Round-3 (23.02.2020)
Colour	Hazen		1	1	1
Smell	-		Agreeable	Agreeable	Agreeable
pH	-	**6.5-9.0**	7.73	6.81	8.92
Oil & Grease	mg/L		BDL	BDL	BDL
Suspended Solids	mg/L	**100**	10	4	BDL
Chemical Oxygen Demand	mg/L		5	5	7
Biochemical Oxygen Demand (3 days,27^{o}C)	mg/L		1	2	3
Electrical Conductivity (at 25^{o}C)	µmho/cm	**4000**	720	520	586
Nitrite Nitrogen (as NO_2)	mg/L		BDL	BDL	BDL
Nitrate Nitrogen (as NO_3)	mg/L		4.97	4	4.95
(NO_2 + NO_3)-Nitrogen	mg/L	**15**	4.97	4	4.95

Parameters	Unit	Std. Limit	Results		
			Round-1 (19.02.2020)	**Round-2 (21.02.2020)**	**Round-3 (23.02.2020)**
Free Ammonia (as NH_3-N)	mg/L		BDL	BDL	BDL
Total Residual Chlorine	mg/L		BDL	BDL	BDL
Cyanide (as CN)	mg/L		BDL	BDL	BDL
Fluoride (as F)	mg/L		1	0.5	0.8
Sulphide (as S^{2-})	mg/L		BDL	BDL	BDL
Dissolved Phosphate (as P)	mg/L		0.3	BDL	BDL
Sodium Absorption Ratio	-		0.89	1.31	1.2
Total Coliforms	MPN index/ 100 mL		BDL	350	9.2×10^3
Faecal Coliforms	MPN index/ 100 mL		BDL	350	4.7×10^2
Total Phosphorous (as P)	mg/L	**0.3**	0.8	BDL	BDL
Total Kjeldahl Nitrogen (as N)	mg/L	**3**	1.1	3.24	6.27
Total Ammonia (NH_4+NH_3)-Nitrogen	mg/L	**1.5**	BDL	BDL	BDL
Phenols (as C_6H_5OH)	mg/L	**10**	BDL	BDL	BDL
Surface Active Agents (as MBAS)	mg/L	**200**	BDL	BDL	BDL
Organo Chlorine Pesticides					
Alachlor	µg/L		BDL	BDL	BDL
Atrazine	µg/L		BDL	BDL	BDL
Aldrin	µg/L		BDL	BDL	BDL
Dieldrin	µg/L		BDL	BDL	BDL
Alpha HCH	µg/L		BDL	BDL	BDL
Beta HCH	µg/L		BDL	BDL	BDL
Delta HCH	µg/L		BDL	BDL	BDL

Parameters	Unit	Std. Limit	Results		
			Round-1 (19.02.2020)	Round-2 (21.02.2020)	Round-3 (23.02.2020)
Butachlor	µg/L		BDL	BDL	BDL
Chlorpyriphos	µg/L		BDL	BDL	BDL
p,p DDT	µg/L		BDL	BDL	BDL
o,p DDT	µg/L		BDL	BDL	BDL
p,p DDE	µg/L		BDL	BDL	BDL
o,p DDE	µg/L		BDL	BDL	BDL
p,p DDD	µg/L		BDL	BDL	BDL
o,p DDD	µg/L		BDL	BDL	BDL
Alpha Endosulfan	µg/L		BDL	BDL	BDL
Beta Endosulfan	µg/L		BDL	BDL	BDL
Endosulfan Sulphate	µg/L		BDL	BDL	BDL
Y HCH (Lindane)	µg/L		BDL	BDL	BDL
Polynuclear aromatic hydrocarbons (PAH)	µg/L	**0.2**	BDL	BDL	BDL
Polychlorinated Biphenyls (PCB)	µg/L	**0.02**	BDL	BDL	BDL
Zinc (as Zn)	mg/L	**300**	BDL	BDL	BDL
Nickel (as Ni)	mg/L	**200**	BDL	BDL	BDL
Copper (as Cu)	mg/L	**100**	BDL	BDL	BDL
Hexavalent Chromium (as Cr^{6+})	mg/L		BDL	BDL	BDL
Total Chromium (as Cr)	mg/L	**100**	BDL	BDL	BDL
Total Arsenic (as As)	mg/L	**100**	BDL	BDL	BDL
Lead (as Pb)	mg/L	**100**	BDL	BDL	BDL
Cadmium (as Cd)	mg/L	**5**	BDL	BDL	BDL
Mercury (as Hg)	mg/L	**1**	BDL	0.001	BDL
Manganese (as Mn)	mg/L		BDL	BDL	BDL

Parameters	Unit	Std. Limit	Results		
			Round-1 (19.02.2020)	Round-2 (21.02.2020)	Round-3 (23.02.2020)
Iron (as Fe)	mg/L		BDL	BDL	BDL
Vanadium (as V)	mg/L		0.024	0.021	0.026
Selenium (as Se)	mg/L		BDL	0.006	BDL
Total Nitrogen	mg/L		BDL	5.01	7.35
Boron (as B)	mg/L		2.19	BDL	BDL
Bioassay Test on fish	% survival		100	60	50

Name of the Location: Near Sarita Kunj Building, Kasarwadi

Parameters	Unit	Std. Limit	Results		
			Round-1 (19.02.2020)	Round-2 (21.02.2020)	Round-3 (23.02.2020)
Colour	Hazen		1	1	1
Smell	-		Agreeable	Agreeable	Agreeable
pH	-	**6.5-9.0**	7.79	6.62	7.09
Oil & Grease	mg/L		BDL	BDL	BDL
Suspended Solids	mg/L	**100**	BDL	4	6
Chemical Oxygen Demand	mg/L		BDL	BDL	7
Biochemical Oxygen Demand (3 days,27°C)	mg/L		BDL	BDL	3
Electrical Conductivity (at 25°C)	µmho/cm	**4000**	801	562	645
Nitrite Nitrogen (as NO_2)	mg/L		0.07	BDL	BDL
Nitrate Nitrogen (as NO_3)	mg/L		3.31	2.95	3.81
(NO_2 + NO_3)-Nitrogen	mg/L	**15**	3.38	2.95	3.81
Free Ammonia (as NH_3-N)	mg/L		BDL	BDL	BDL
Total Residual Chlorine	mg/L		BDL	BDL	BDL
Cyanide (as CN)	mg/L		BDL	BDL	BDL

Parameters	Unit	Std. Limit	Results		
			Round-1 (19.02.2020)	**Round-2 (21.02.2020)**	**Round-3 (23.02.2020)**
Fluoride (as F)	mg/L		0.2	1.2	0.4
Sulphide (as S^{2-})	mg/L		BDL	BDL	BDL
Dissolved Phosphate (as P)	mg/L		BDL	BDL	BDL
Sodium Absorption Ratio	-		1.84	1.08	1.17
Total Coliforms	MPN index/ 100 mL		4.5	1.6×10^4	BDL
Faecal Coliforms	MPN index/ 100 mL		BDL	1.6×10^4	BDL
Total Phosphorous (as P)	mg/L	**0.3**	BDL	BDL	BDL
Total Kjeldahl Nitrogen (as N)	mg/L	**3**	9.4	4.7	5.4
Total Ammonia (NH_4+NH_3)-Nitrogen	mg/L	**1.5**	BDL	BDL	BDL
Phenols (as C_6H_5OH)	mg/L	**10**	BDL	BDL	BDL
Surface Active Agents (as MBAS)	mg/L	**200**	BDL	BDL	BDL
Organo Chlorine Pesticides					
Alachlor	µg/L		BDL	BDL	BDL
Atrazine	µg/L		BDL	BDL	BDL
Aldrin	µg/L		BDL	BDL	BDL
Dieldrin	µg/L		BDL	BDL	BDL
Alpha HCH	µg/L		BDL	BDL	BDL
Beta HCH	µg/L		BDL	BDL	BDL
Delta HCH	µg/L		BDL	BDL	BDL
Butachlor	µg/L		BDL	BDL	BDL
Chlorpyriphos	µg/L		BDL	BDL	BDL
p,p DDT	µg/L		BDL	BDL	BDL

Parameters	Unit	Std. Limit	Results		
			Round-1 (19.02.2020)	Round-2 (21.02.2020)	Round-3 (23.02.2020)
o,p DDT	µg/L		BDL	BDL	BDL
p,p DDE	µg/L		BDL	BDL	BDL
o,p DDE	µg/L		BDL	BDL	BDL
p,p DDD	µg/L		BDL	BDL	BDL
o,p DDD	µg/L		BDL	BDL	BDL
Alpha Endosulfan	µg/L		BDL	BDL	BDL
Beta Endosulfan	µg/L		BDL	BDL	BDL
Endosulfan Sulphate	µg/L		BDL	BDL	BDL
Y HCH (Lindane)	µg/L		BDL	BDL	BDL
Polynuclear aromatic hydrocarbons (PAH)	µg/L	**0.2**	BDL	BDL	BDL
Polychlorinated Biphenyls (PCB)	µg/L	**0.02**	BDL	BDL	BDL
Zinc (as Zn)	mg/L	**300**	0.054	BDL	BDL
Nickel (as Ni)	mg/L	**200**	BDL	BDL	BDL
Copper (as Cu)	mg/L	**100**	BDL	BDL	BDL
Hexavalent Chromium (as Cr^{6+})	mg/L		BDL	BDL	BDL
Total Chromium (as Cr)	mg/L	**100**	BDL	BDL	BDL
Total Arsenic (as As)	mg/L	**100**	BDL	BDL	BDL
Lead (as Pb)	mg/L	**100**	BDL	BDL	BDL
Cadmium (as Cd)	mg/L	**5**	BDL	BDL	BDL
Mercury (as Hg)	mg/L	**1**	BDL	0.001	BDL
Manganese (as Mn)	mg/L		0.4	0.351	0.400'
Iron (as Fe)	mg/L		0.238	BDL	BDL
Vanadium (as V)	mg/L		0.062	0.05	0.057
Selenium (as Se)	mg/L		BDL	BDL	0.016

Parameters	Unit	Std. Limit	Results		
			Round-1 (19.02.2020)	Round-2 (21.02.2020)	Round-3 (23.02.2020)
Total Nitrogen	mg/L		0.164	5.35	6.23
Boron (as B)	mg/L		10.1	0.15	0.126
Bioassay Test on fish	% survival		80	50	80

Name of the Location: Near Kashiba Shinde Sabhagruha Pimpri

Parameters	Unit	Std. Limit	Results		
			Round-1 (19.02.2020)	Round-2 (21.02.2020)	Round-3 (23.02.2020)
Colour	Hazen		1	8	1
Smell	-		Agreeable	Disagreeable	Agreeable
pH	-	**6.5-9.0**	7.68	6.49	7
Oil & Grease	mg/L		BDL	BDL	BDL
Suspended Solids	mg/L	**100**	BDL	22	BDL
Chemical Oxygen Demand	mg/L		7	12	6
Biochemical Oxygen Demand (3 days,27^{o}C)	mg/L		2	4	2
Electrical Conductivity (at 25^{o}C)	µmho/cm	**4000**	773	578	683
Nitrite Nitrogen (as NO_2)	mg/L		0.27	BDL	BDL
Nitrate Nitrogen (as NO_3)	mg/L		2.29	2.86	3.69
(NO_2 + NO_3)-Nitrogen	mg/L	**15**	2.56	2.86	3.69
Free Ammonia (as NH_3-N)	mg/L		BDL	BDL	BDL
Total Residual Chlorine	mg/L		BDL	BDL	BDL
Cyanide (as CN)	mg/L		BDL	BDL	BDL
Fluoride (as F)	mg/L		0.4	0.52	0.4
Sulphide (as S^{2-})	mg/L		BDL	BDL	BDL
Dissolved Phosphate (as P)	mg/L		BDL	BDL	BDL

Parameters	Unit	Std. Limit	Results		
			Round-1 (19.02.2020)	Round-2 (21.02.2020)	Round-3 (23.02.2020)
Sodium Absorption Ratio	-		2.21	1.4	1.20
Total Coliforms	MPN index/ 100 mL		540	1600	140
Faecal Coliforms	MPN index/ 100 mL		110	920	39
Total Phosphorous (as P)	mg/L	**0.3**	BDL	BDL	BDL
Total Kjeldahl Nitrogen (as N)	mg/L	**3**	12.3	4.25	7.7
Total Ammonia (NH_4+NH_3)-Nitrogen	mg/L	**1.5**	BDL	BDL	BDL
Phenols (as C_6H_5OH)	mg/L	**10**	BDL	BDL	BDL
Surface Active Agents (as MBAS)	mg/L	**200**	BDL	BDL	BDL
Organo Chlorine Pesticides					
Alachlor	µg/L		BDL	BDL	BDL
Atrazine	µg/L		BDL	BDL	BDL
Aldrin	µg/L		BDL	BDL	BDL
Dieldrin	µg/L		BDL	BDL	BDL
Alpha HCH	µg/L		BDL	BDL	BDL
Beta HCH	µg/L		BDL	BDL	BDL
Delta HCH	µg/L		BDL	BDL	BDL
Butachlor	µg/L		BDL	BDL	BDL
Chlorpyriphos	µg/L		BDL	BDL	BDL
p,p DDT	µg/L		BDL	BDL	BDL
o,p DDT	µg/L		BDL	BDL	BDL
p,p DDE	µg/L		BDL	BDL	BDL
o,p DDE	µg/L		BDL	BDL	BDL

Parameters	Unit	Std. Limit	Results		
			Round-1 (19.02.2020)	Round-2 (21.02.2020)	Round-3 (23.02.2020)
p,p DDD	µg/L		BDL	BDL	BDL
o,p DDD	µg/L		BDL	BDL	BDL
Alpha Endosulfan	µg/L		BDL	BDL	BDL
Beta Endosulfan	µg/L		BDL	BDL	BDL
Endosulfan Sulphate	µg/L		BDL	BDL	BDL
Y HCH (Lindane)	µg/L		BDL	BDL	BDL
Polynuclear aromatic hydrocarbons (PAH)	µg/L	**0.2**	BDL	BDL	BDL
Polychlorinated Biphenyls (PCB)	µg/L	**0.02**	BDL	BDL	BDL
Zinc (as Zn)	mg/L	**300**	BDL	BDL	BDL
Nickel (as Ni)	mg/L	**200**	BDL	BDL	BDL
Copper (as Cu)	mg/L	**100**	BDL	BDL	BDL
Hexavalent Chromium (as Cr^{6+})	mg/L		BDL	BDL	BDL
Total Chromium (as Cr)	mg/L	**100**	BDL	BDL	BDL
Total Arsenic (as As)	mg/L	**100**	BDL	BDL	BDL
Lead (as Pb)	mg/L	**100**	BDL	BDL	BDL
Cadmium (as Cd)	mg/L	**5**	BDL	BDL	BDL
Mercury (as Hg)	mg/L	**1**	BDL	0.003	BDL
Manganese (as Mn)	mg/L		0.331	BDL	0.448
Iron (as Fe)	mg/L		BDL	BDL	BDL
Vanadium (as V)	mg/L		0.035	0.032	0.048
Selenium (as Se)	mg/L		0.015	BDL	BDL
Total Nitrogen	mg/L		BDL	4.87	8.51
Boron (as B)	mg/L		12.9	BDL	BDL

Parameters	Unit	Std. Limit	Results		
			Round-1 (19.02.2020)	Round-2 (21.02.2020)	Round-3 (23.02.2020)
Bioassay Test on fish	% survival		70	60	80

Name of the Location: Rohit Park-I, Tapkir Nagar Kalewadi

Parameters	Unit	Std. Limit	Results		
			Round-1 (19.02.2020)	Round-2 (21.02.2020)	Round-3 (23.02.2020)
Colour	Hazen		1	1	1
Smell	-		Agreeable	Agreeable	Agreeable
pH	-	**6.5-9.0**	7.39	7.23	6.86
Oil & Grease	mg/L		BDL	BDL	BDL
Suspended Solids	mg/L	**100**	7	BDL	6
Chemical Oxygen Demand	mg/L		BDL	BDL	BDL
Biochemical Oxygen Demand (3 days,27^{o}C)	mg/L		BDL	BDL	BDL
Electrical Conductivity (at 25^{o}C)	µmho/cm	**4000**	855	612	1734
Nitrite Nitrogen (as NO_2)	mg/L		0.01	BDL	BDL
Nitrate Nitrogen (as NO_3)	mg/L		13.5	14.2	14.1
(NO_2 + NO_3)-Nitrogen	mg/L	**15**	13.5	14.2	14.1
Free Ammonia (as NH_3-N)	mg/L		BDL	BDL	BDL
Total Residual Chlorine	mg/L		BDL	BDL	BDL
Cyanide (as CN)	mg/L		BDL	BDL	BDL
Fluoride (as F)	mg/L		4.6	0.9	0.62
Sulphide (as S^{2-})	mg/L		BDL	BDL	BDL
Dissolved Phosphate (as P)	mg/L		BDL	BDL	BDL
Sodium Absorption Ratio	-		0.61	1.52	9.58

Parameters	Unit	Std. Limit	Results		
			Round-1 (19.02.2020)	**Round-2 (21.02.2020)**	**Round-3 (23.02.2020)**
Total Coliforms	MPN index/ 100 mL		140	1.6×10^4	1600
Faecal Coliforms	MPN index/ 100 mL		110	9.2 x 103	350
Total Phosphorous (as P)	mg/L	**0.3**	BDL	0.34	BDL
Total Kjeldahl Nitrogen (as N)	mg/L	**3**	1.45	1.68	7.3
Total Ammonia (NH_4+NH_3)-Nitrogen	mg/L	**1.5**	BDL	0.11	BDL
Phenols (as C_6H_5OH)	mg/L	**10**	BDL	BDL	BDL
Surface Active Agents (as MBAS)	mg/L	**200**	BDL	BDL	BDL
Organo Chlorine Pesticides					
Alachlor	µg/L		BDL	BDL	BDL
Atrazine	µg/L		BDL	BDL	BDL
Aldrin	µg/L		BDL	BDL	BDL
Dieldrin	µg/L		BDL	BDL	BDL
Alpha HCH	µg/L		BDL	BDL	BDL
Beta HCH	µg/L		BDL	BDL	BDL
Delta HCH	µg/L		BDL	BDL	BDL
Butachlor	µg/L		BDL	BDL	BDL
Chlorpyriphos	µg/L		BDL	BDL	BDL
p,p DDT	µg/L		BDL	BDL	BDL
o,p DDT	µg/L		BDL	BDL	BDL
p,p DDE	µg/L		BDL	BDL	BDL
o,p DDE	µg/L		BDL	BDL	BDL
p,p DDD	µg/L		BDL	BDL	BDL

Parameters	Unit	Std. Limit	Results		
			Round-1 (19.02.2020)	Round-2 (21.02.2020)	Round-3 (23.02.2020)
o,p DDD	µg/L		BDL	BDL	BDL
Alpha Endosulfan	µg/L		BDL	BDL	BDL
Beta Endosulfan	µg/L		BDL	BDL	BDL
Endosulfan Sulphate	µg/L		BDL	BDL	BDL
Y HCH (Lindane)	µg/L		BDL	BDL	BDL
Polynuclear aromatic hydrocarbons (PAH)	µg/L	**0.2**	BDL	BDL	BDL
Polychlorinated Biphenyls (PCB)	µg/L	**0.02**	BDL	BDL	BDL
Zinc (as Zn)	mg/L	**300**	BDL	BDL	BDL
Nickel (as Ni)	mg/L	**200**	BDL	BDL	BDL
Copper (as Cu)	mg/L	**100**	BDL	BDL	BDL
Hexavalent Chromium (as Cr^{6+})	mg/L		BDL	BDL	BDL
Total Chromium (as Cr)	mg/L	**100**	0.02	BDL	BDL
Total Arsenic (as As)	mg/L	**100**	BDL	BDL	BDL
Lead (as Pb)	mg/L	**100**	BDL	BDL	BDL
Cadmium (as Cd)	mg/L	**5**	BDL	BDL	BDL
Mercury (as Hg)	mg/L	**1**	BDL	0.003	BDL
Manganese (as Mn)	mg/L		BDL	BDL	BDL
Iron (as Fe)	mg/L		0.077	BDL	0.066
Vanadium (as V)	mg/L		0.051	0.046	0.055
Selenium (as Se)	mg/L		BDL	0.118	0.007
Total Nitrogen	mg/L		BDL	4.8	10.4
Boron (as B)	mg/L		4.24	BDL	BDL
Bioassay Test on fish	% survival		40	60	50

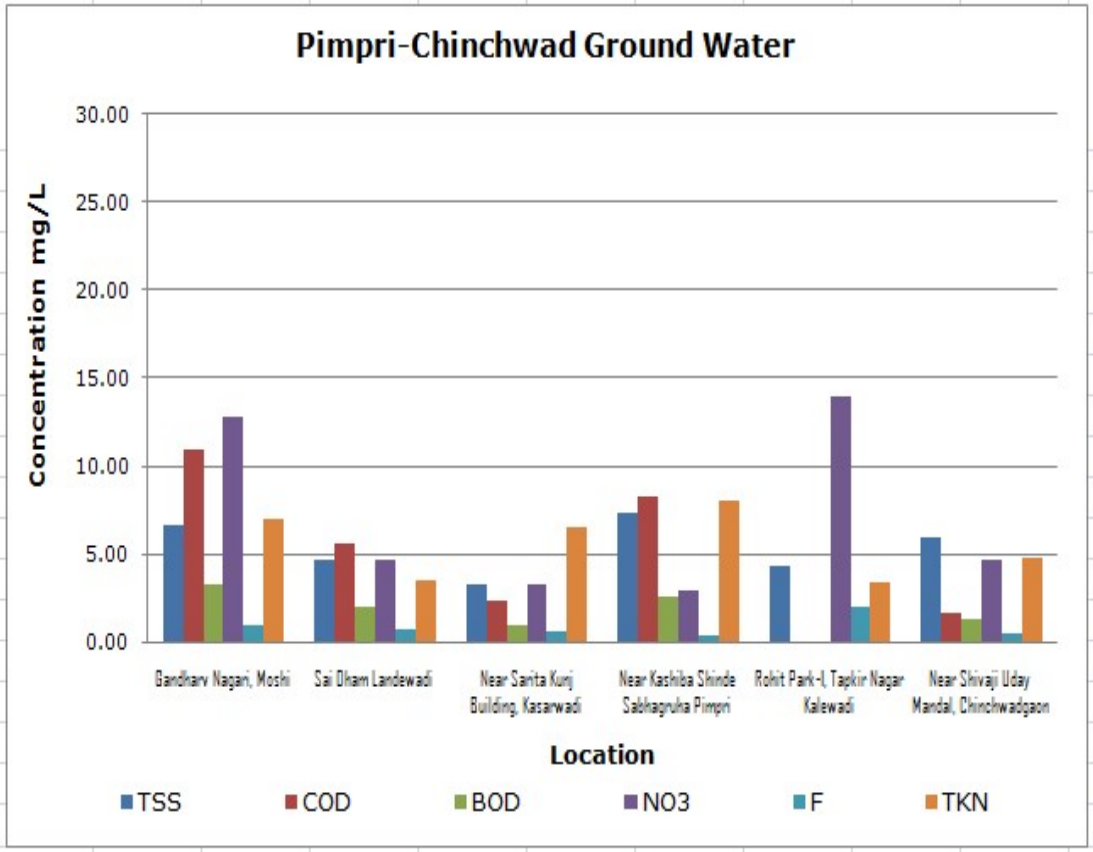
Name of the Location: Near Shivaji Uday Mandal, Chinchwadgaon

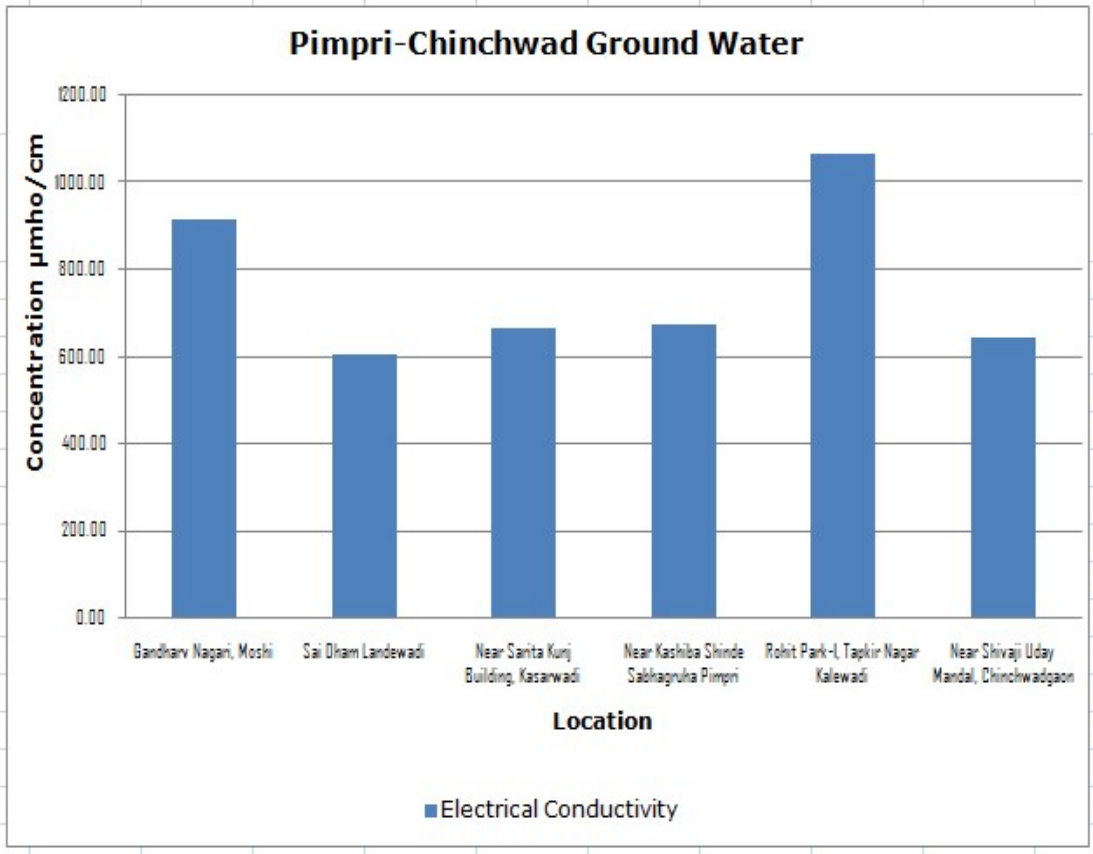
Parameters	Unit	Std. Limit	Results		
			Round-1 (19.02.2020)	**Round-2 (21.02.2020)**	**Round-3 (23.02.2020)**
Colour	Hazen		1	1	1
Smell	-		Agreeable	Agreeable	Agreeable
pH	-	**6.5-9.0**	7.69	6.83	7.51
Oil & Grease	mg/L		BDL	BDL	BDL
Suspended Solids	mg/L	**100**	8	4	6
Chemical Oxygen Demand	mg/L		5	BDL	BDL
Biochemical Oxygen Demand (3 days,27^{o}C)	mg/L		2	1	1
Electrical Conductivity (at 25^{o}C)	µmho/cm	**4000**	778	573	586
Nitrite Nitrogen (as NO_2)	mg/L		0.03	BDL	BDL
Nitrate Nitrogen (as NO_3)	mg/L		8.61	2.9	2.71
(NO_2 + NO_3)-Nitrogen	mg/L	**15**	8.64	2.9	2.71
Free Ammonia (as NH_3-N)	mg/L		BDL	BDL	BDL
Total Residual Chlorine	mg/L		BDL	BDL	BDL
Cyanide (as CN)	mg/L		BDL	BDL	BDL
Fluoride (as F)	mg/L		0.2	0.98	0.3
Sulphide (as S^{2-})	mg/L		BDL	BDL	BDL
Dissolved Phosphate (as P)	mg/L		BDL	BDL	0.1
Sodium Absorption Ratio	-		1.64	1.39	0.6
Total Coliforms	MPN index/ 100 mL		49	9.2 x 10^3	220
Faecal Coliforms	MPN index/ 100 mL		49	9.2 x 10^3	130
Total Phosphorous (as P)	mg/L	**0.3**	BDL	BDL	0.26

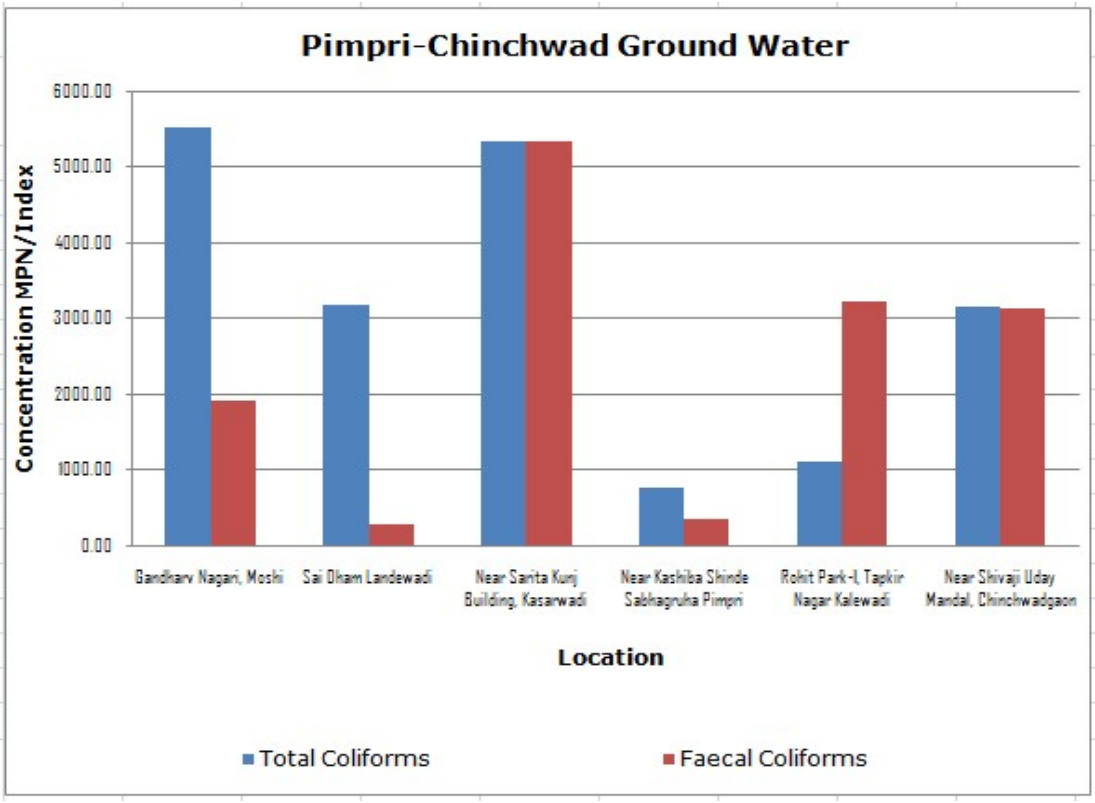
Parameters	Unit	Std. Limit	Results		
			Round-1 (19.02.2020)	Round-2 (21.02.2020)	Round-3 (23.02.2020)
Total Kjeldahl Nitrogen (as N)	mg/L	**3**	5.38	3.24	5.9
Total Ammonia (NH_4+NH_3)-Nitrogen	mg/L	**1.5**	BDL	BDL	BDL
Phenols (as C_6H_5OH)	mg/L	**10**	BDL	BDL	BDL
Surface Active Agents (as MBAS)	mg/L	**200**	BDL	BDL	BDL
Organo Chlorine Pesticides					
Alachlor	µg/L		BDL	BDL	BDL
Atrazine	µg/L		BDL	BDL	BDL
Aldrin	µg/L		BDL	BDL	BDL
Dieldrin	µg/L		BDL	BDL	BDL
Alpha HCH	µg/L		BDL	BDL	BDL
Beta HCH	µg/L		BDL	BDL	BDL
Delta HCH	µg/L		BDL	BDL	BDL
Butachlor	µg/L		BDL	BDL	BDL
Chlorpyriphos	µg/L		BDL	BDL	BDL
p,p DDT	µg/L		BDL	BDL	BDL
o,p DDT	µg/L		BDL	BDL	BDL
p,p DDE	µg/L		BDL	BDL	BDL
o,p DDE	µg/L		BDL	BDL	BDL
p,p DDD	µg/L		BDL	BDL	BDL
o,p DDD	µg/L		BDL	BDL	BDL
Alpha Endosulfan	µg/L		BDL	BDL	BDL
Beta Endosulfan	µg/L		BDL	BDL	BDL
Endosulfan Sulphate	µg/L		BDL	BDL	BDL
Y HCH (Lindane)	µg/L		BDL	BDL	BDL

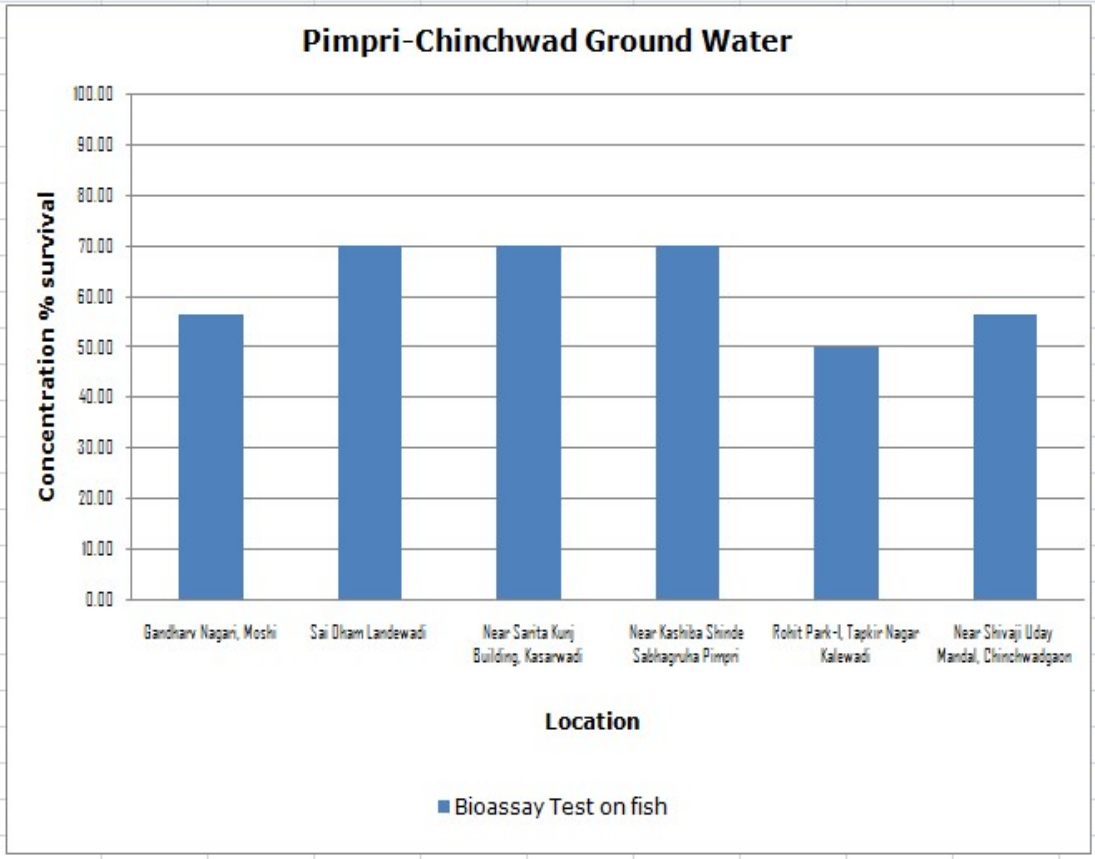
Parameters	Unit	Std. Limit	Results		
			Round-1 (19.02.2020)	**Round-2 (21.02.2020)**	**Round-3 (23.02.2020)**
Polynuclear aromatic hydrocarbons (PAH)	µg/L	**0.2**	BDL	BDL	BDL
Polychlorinated Biphenyls (PCB)	µg/L	**0.02**	BDL	BDL	BDL
Zinc (as Zn)	mg/L	**300**	BDL	BDL	0.051
Nickel (as Ni)	mg/L	**200**	0.01	BDL	BDL
Copper (as Cu)	mg/L	**100**	BDL	BDL	BDL
Hexavalent Chromium (as Cr^{6+})	mg/L		BDL	BDL	BDL
Total Chromium (as Cr)	mg/L	**100**	BDL	BDL	BDL
Total Arsenic (as As)	mg/L	**100**	BDL	BDL	BDL
Lead (as Pb)	mg/L	**100**	BDL	BDL	BDL
Cadmium (as Cd)	mg/L	**5**	BDL	BDL	BDL
Mercury (as Hg)	mg/L	**1**	BDL	BDL	BDL
Manganese (as Mn)	mg/L		0.062	0.104	0.239
Iron (as Fe)	mg/L		BDL	BDL	BDL
Vanadium (as V)	mg/L		0.028	0.027	0.023
Selenium (as Se)	mg/L		0.008	0.008	0.007
Total Nitrogen	mg/L		BDL	3.87	6.49
Boron (as B)	mg/L		7.28	BDL	BDL
Bioassay Test on fish	% survival		60	50	60

Graphs: Ground Water Quality Monitoring for Pimpri-Chinchwad:






Pimpri-Chinchwad Ground Water
Concentration MPN/Index
6000.00
5000.00
4000.00
3000.00
2000.00
1000.00
0.00
Gandharv Nagari, Moshi
Sai Dham Landewadi
Near Sarita Kunj Building, Kasarwadi
Near Kashiba Shinde Sabhagruha Pimpri
Rohit Park-I, Tapkir Nagar Kalewadi
Near Shivaji Uday Mandal, Chinchwadgaon
Location
Total Coliforms
Faecal Coliforms


Pimpri-Chinchwad Ground Water
Concentration % survival
100.00
90.00
80.00
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
Gandharv Nagari, Moshi
Sai Dham Landewadi
Near Sarita Kunj Building, Kasarwadi
Near Kashiba Shinde Sabhagruha Pimpri
Rohit Park-I, Tapkir Nagar Kalewadi
Near Shivaji Uday Mandal, Chinchwadgaon
Location
Bioassay Test on fish

5. Summary and Conclusion

Based on the study done, the results are summarised and concluded as follows:

5.1 Stack Emission Monitoring:

Six industries from Pimpri-Chinchwad were selected for Stack emission monitoring.

1. **Particulate matter (PM):** The concentration of Particulate matter in all 6 stacks monitored at Pimpri-Chinchwad was well within the limit.

2. **Sulphur dioxide (SO_2):** Emission of SO_2.was well within the limit in all 6 stacks sampled. The highest level of SO_2 was observed at Amphenol Interconnect stack with 26.2 mg/Nm^3 emission.

3. **Nitrogen dioxide (NO_2):** Emission of NO_2.also was well within the limit in all 6 stacks sampled. The highest level of NO_2 was observed at Alicon Atlas Cast Alloy stack with 21.7 mg/Nm^3 emission.

5.2 Ambient Air Quality Monitoring:

Eight ambient air samples were collected from Pimpri-Chinchwad region. The parameters monitored were studied as per the NAAQ standards. The variations of each parameter within the area under study are discussed below:

1. **Sulphur dioxide (SO_2):** The concentration of SO_2 was below detectable limit at all 8 locations monitored.

2. **Nitrogen dioxide (NO_2):** Values of nitrogen dioxide are also observed below the standard limit of 80 µg/m^3 at all the 8 locations. The highest level of NO_2 was observed at MIDC Pimpri Area Yashvant Nagar Chowk Tata Motors Training Hostel with a result of 2.9 µg/m^3.

3. **Particulate Matter (PM_{10}):** PM_{10} concentration of all 8 locations was higher than the standard limit of 100 µg/m^3. The highest concentration of PM_{10} was observed at Charoli Moshi Crusher Area with 1657.3 µg/m^3

4. **Particulate Matter ($PM_{2.5}$):** Values of $PM_{2.5}$ of all 8 locations higher than the standard limit of 60 µg/m^3. The highest level of $PM_{2.5}$ was observed at Charoli Moshi Crusher Area with a result of 310 µg/m^3.

5. **Ozone (O_3):** Ozone was found to be below detectable limit in all location.

6. **Lead (Pb):** at all 8 locations monitored, the concentration of lead was well within the NAAQS standard.

7. **Carbon Monoxide (CO):** Concentration of carbon monoxide has been found to well within the limits in all 8 locations monitored with the highest concentration at Thergaon Near Pudmjee Industries with 0.45 mg/m^3.

8. **Ammonia (NH_3):** Ammonia was below the detectable limit at all 8 locations monitored.

9. **Benzene (C_6H_6):** The Benzene concentration was higher than 5 µg/m^3 which is the standard limit as per NAAQS at only MIDC Pimpri Area Yashvant Nagar Chowk Tata Motors Training Hostel with 6.9 ng/m^3.

10. **Benzo(a)pyrene (BaP):** BaP was below detectable limit at all 8 locations monitored.

11. **Arsenic (As):** The concentration of Arsenic was well within the standard limit of 6 ng/m^3 at all 8 locations monitored.

12. **Nickel (Ni):** The concentration of Nickel was also well within the standard limit of 20 ng/m^3 at all 8 locations monitored.

5.3 Surface Water Quality Monitoring:

To understand the quality of surface water, samples were collected from 6 surface water bodies of Pimpri-Chinchwad. Considering the general parameters of all the industries mentioned, following are the conclusions:

1. **Colour:** Colour units are found well within the limits at all 6 water samples collected.

2. **Odour**: odour of 3 samples is found disagreeable out of 6 water samples collected.

3. **pH**: it is observed in between 6.5 and 7.8 which is well within the range.

4. **Suspended Solids**: Suspended solids of all 6 water samples is well within the limits and ranged in between 13.3 mg/L to 63.3 mg/l.

5. **Chemical Oxygen Demand**: All samples collected, were well within the limit required as per standard. The highest COD was observed at Pawana River-Pimpri with 41.3 mg/L concentration.

6. **Biochemical Oxygen Demand** All samples collected, were well within the limit required as per standard. The highest BOD was observed at Pawana River-Pimpri with 11 mg/L concentration.

7. **Sulphide**: All 6 samples collected were found to have below detectable limit.

8. **Total Ammonia**: Higher concentration of total ammonia was observed at 2 out of 6 water samples collected.

9. **Total Kjeldahl Nitrogen**: All samples collected, were well within the limit required as per standard.

10. **Fish Bioassay**: 100% Survival was not attained in any of the 6 water samples collected.

11. **Heavy metals**: All the heavy metals are found below the standard limits in all the samples.

5.4 Ground Water Quality Monitoring:

Six ground water samples were collected from Pimpri-Chinchwad region.

1) **Colour** (Hazen Units): Colour units are below the acceptable standard of all water samples collected.

2) **Odour**: odour of all the samples is found agreeable.

3) **Chemical Oxygen Demand:** The COD of all 6 samples was found in the range between 1.7 mg/L to 11 mg/L.

4) **Biological Oxygen Demand:** BOD of all 6 samples was found in the range between 1 mg/L to 3.3 mg/L.

5) **Nitrite:** Values of Nitrite at all location was well within the standard.

6) **Nitrate:** Results of Nitrate are also observed below standard limit.

7) **Residual Free Chlorine:** Values are below the detectable limit in all 6 samples collected.

8) **Total Ammonia:** Values are below the detectable limit in all samples collected.

9) **Fluoride:** Values are below the detectable limit at all 6 water samples collected.

10) **Sulphide:** All the readings of sulphide are below detectable limit in all 6 samples collected.

11) **Sodium Absorption Ratio:** These values fit within range of water quality criteria of CPCB.

12) **Total Kjeldahl nitrogen:** All 6 water samples collected exceeded the standard limit of TKN and ranged in between 3.5mg/L to 8.1 mg/L concentration.

13) **Fish Bioassay:** 100% survival was not observed at any of the six locations monitored.

14) **Boron:** 5 out of the 6 water samples collected had Boron concentration higher than the prescribed value of 0.01 mg/L.

15) **Surface Active Agents:** All 6 samples showed below detectable limit.

16) **Metals:** All the metals except Copper, Lead and Total Chromium at few locations are observed within the acceptable limits of drinking water standards.

6. 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.

CPCB had evolved certain methodology to calculate CEPI, in which a score has been fixed for different environmental components based on the level of pollution. The scoring system involves an algorithm that takes into account the basic selection criteria. This approach is based on the basic hazard assessment logic that can be summarized as below.

Hazard = pollutant source, pathways, and receptor

CPCB has calculated CEPI for the identified critically polluted industrial clusters. It is calculated separately for air, water, and land. The basic framework and scoring system of the CEPI – based on three factors namely pollutant, pathway, and receptor – has been described further under this section.

To overcome the subjectivity, revised concept is proposed by eliminating the subjective factors as described in the previous section but retaining the factors which can be measured precisely.

I. Revised concept is prepared by eliminating the debatable factors but retaining the factors which can be measured precisely.

II. It is decided to develop the Comprehensive Environmental Pollution Index (CEPI) retaining the existing algorithm of Source, Pathway and Receptor.

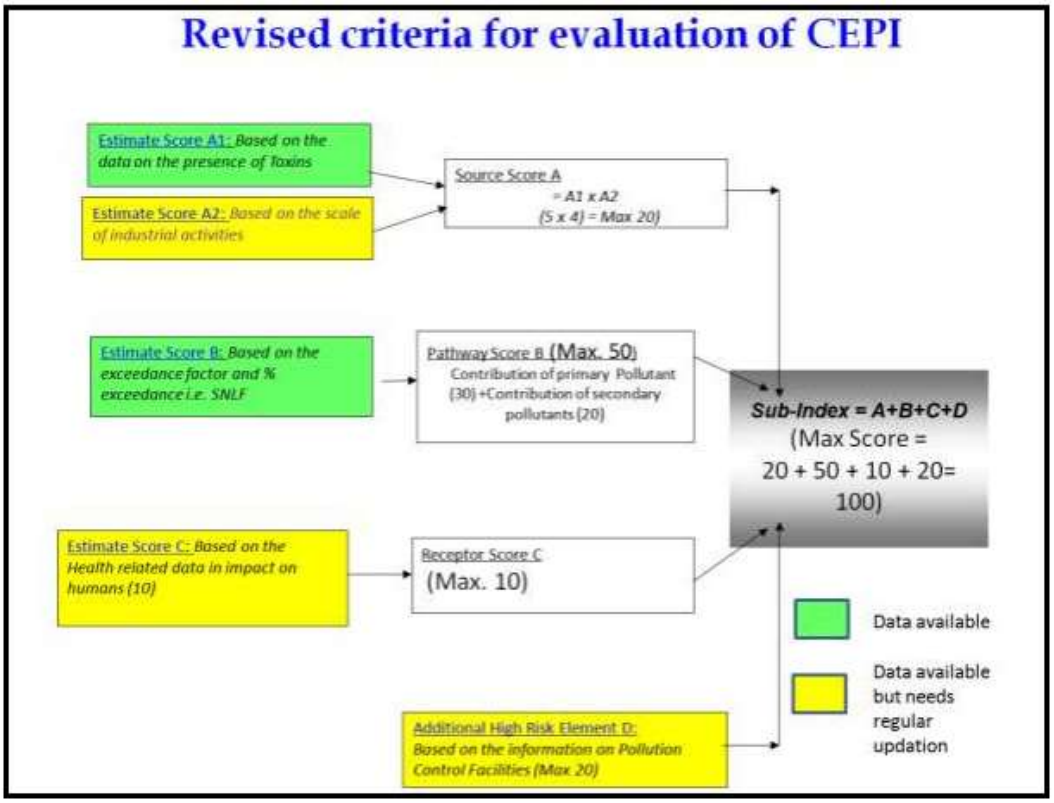
III. Health component was also retained in the revised concept in line with the suggestions of Secretary, MoEFCC during the meeting held in MoEF.

Outlines of revised CEPI 2016 criteria

The outlines of the revised CEPI criteria are as follows:

1. It is proposed to develop the Comprehensive Environmental Pollution Index (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.
2. For assessment of the environmental quality of the area i.e. CEPI score, the concept of SNLF i.e. a surrogate number which represents the level of exposure (a function of percentage sample Exceedance & Exceedance Factor) shall be used.
3. Health component to be evaluated based on the health data available from major hospitals in the area was also retained in the revised concept.

The evaluation criterion of the revised CEPI version 2016 is described in the flowchart given below:



Here, health data collected for Receptor Score C is included in **Annexure I**

Based on Sub-Index Score (score of individual environmental component like air, water etc.):

- **Score more than 63:** A Critical Level of Pollution in the respective level of environmental component
- **Score between 51-63:** Severe to critical level of pollution with reference to respective environmental component

Cut-off Score

- **Score 50:** Severely Polluted Industrial Clusters/areas
- **Score 60:** Critically Polluted Industrial Clusters/areas

Based on Aggregated CEPI Score (score includes sub-index score of all individual environmental components together):

- **Aggregated CEPI score >70:** Critically polluted areas
- **Aggregated CEPI score between 60-70:** Severely polluted areas

Since the inception of the programme, MPCB has also formulated Action Plans to mitigate the environmental pollution problems for each of the 8 Critically Polluted Areas (CPAs) in Maharashtra. Based on available information, parameters selected and monitored in continuation with this, CEPI has been calculated and Short-Term Action Plan (STAP) as well as Long Term Action Plan (LTAP) was prepared in 2010 and every year review was taken on the same.

Subsequently NAAQS 2009 came in force. List of parameters to be considered increased and expanded including more critical and hazardous pollutants like benzene, BaP, Metals, etc. existing in the environment. There was revision of standards (limiting values) as well. In this present report of February, 2019 prepared by MPCB, CEPI is calculated considering all these revised standards' limiting values, list of parameters and complete scope of monitoring.

6.1 Comparison of CEPI scores:

The result shows that CEPI score of present report is 44.7. The present study is the compilation of post monsoon season, which also affects the score value. This time CEPI is observed lower than the CPCB CEPI score February 2018.

Aggregated CEPI

	Air Index	**Water Index**	**Land Index**	**CEPI**
CEPI score March 2020	43.1	7.5	38.1	**44.7**
CPCB CEPI score Feb 2018	52	6.25	5.25	**52.16**

7. Conclusion

PM_{10} and $PM_{2.5}$ values were exceeding the limit of NAAQS in some of the ambient air samples collected. This is mainly due to the vehicular emission in the region.

The pollution concentration in the surface water samples collected from the region was very less. The concentration of BOD was found to be beyond the limit in some of the samples identified. We can correct this by taking better measures in the treatment plant so that the outlet water is in the prescribed limit for disposal.

In the ground water samples collected, all the samples were well within the limits of the drinking water.

The pollution load in the region is reduced and continuous efforts have been inputted by the Regional pollution control board and state pollution control board in brining the pollution lesser. Each civic department provides data about the status of environment related to their department which is compiled as the environment status report. There are several suggestions given to improve the environment concerning various subjects like air, water and noise pollution. Each department concerned will make budgetary provision to implement the suggestions

	A1	**A2**	**A**	**B**	**C**	**D**	**CEPI**
Air Index	1.25	2.5	3.13	40	0	0	**43.1**
Water Index	1	2.5	2.5	5	0	0	**7.5**
Land Index	3.25	2.5	8.13	30	0	0	**38.1**
						Aggregated CEPI	**44.7**

8. Annexures

Annexure I Health related data in impact on humans

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, Diarrhea, 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.

INFORMATION ON HEALTH STATISTICS IN PIA

1. Name of the Polluted Industrial Area (PIA): **Pimpri Chinchwad Municipal Corporation area.**
2. Name of the major health center/organization : ADITYA BIRLA MEMORIAL HOSPITAL
3. Name and designation of the contact person : Dr. Ashutosh Srivastava.
4. Address : **Pimpri Chinchwad Municipal Corporation, Pimpri, Tal. Haveli, Dist. Pune.**
5. Year of establishment : 2006

Sr.No.	Air Borne Diseases	No. of patients reported for the years				
		2017-2016	2016-2015	2015-2014	2014-2013	2013-2012
1.	Asthma	145	160	140	125	159
2.	Acute Respiratory Infection	390	436	515	498	645
3.	Bronchitis	74	192	281	248	119
4.	Cancer	1258	790	548	218	143
	Water Borne	-	-	-	-	-
5.	Gastroenteritis	430	596	1272	1092	853
6.	Diarrhea	215	242	230	218	119
7.	Renal diseases	680	476	458	418	324
8.	Cancer	-	-	-	-	-

ADITYA BIRLA HEALTH SERVICES LTD. PUNE 411033

LOKMANYA HOSPITALS PVT. LTD
Sec. No. 24, Tilak Road, Pradhikaran, Nigdi, Pune - 411 044. Tel. : 020 - 30612001 / 2 / 3

Date: 27/09/2018

Annexure -B

INFORMATION ON HEALTH STATISTICS IN PIA

1. Name of the Polluted Industrial Area (PIA) :
2. Name of the major health centre/organization :
3. Name and designation of the contract person :
4. Address :
5. Year of Establishment :

Health Status data received from the Hospital:

Sr. No	Air Borne Diseases	No. of Patients reported for the years					
		2018-2017	2017-2016	2016-2015	2015-2014	2014-2013	2013-2012
1.	Asthma	27	-22	12	15	36	32
2.	Acute Respiratory Infection	153	66	14	36	32	2
3.	Bronchitis	6	16	34	39	56	27
4.	Cancer	6	2	7	16	6	4
	Water Borne Diseases						
5.	Gastroenteritis	104	93	76	82	62	58
6.	Diarrhea	33	49	63	47	36	73
7.	Renal diseases	52	27	15	32	26	22
8.	Cancer	6	2	7	16	03	4

Signature of Hospital Head/Superintendent

GP. Head HR
Lokmanya Hospitals
Nigdi, Pune - 411 044.

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Annexure-B

INFORMATION ON HEALTH STATISTICS IN PIA

1. Name of the polluted industrial area (PIA) :
2. Name of the major health center/organization:
3. Name and designation of the contact person :
4. Address: Pcmc Medical Department
5. Year of establishment:

Sl. No.	Air Borne Diseases	No. of patients reported for the years				
		2017-2016	2016-2015	2015-2014	2014-2013	2013-2012
1.	Asthma	830	570	421	335	
2.	Acute Respiratory Infection	94116	79140	87283	61753	
3.	Bronchitis	—	—	—	—	
4.	Cancer	—	—	—	—	
		—	—	—	—	
	Water Borne Diseases		—	—	—	
5.	Gastroenteritis	1007	1124	1460	775	
6.	Diarrhea	22077	23959	26341	28068	
7.	Renal diseases	—	—	—	—	
8.	Cancer	—	—	—	—	

Health status data received from the Hospital

Signature of Hospital Head/Superintend

Annexure II: Stack Emission Sampling and Analysis Methodology

Sr.	Parameters	Method References	Techniques	Detection Limit
1.	Acid Mist (as Sulphuric Acid)	US EPA Method no.m-8	Barium thorine titration Method	0.6 mg/Nm^3
2.	Ammonia	IS 11255 (Part 6):1999, Reaffirmed 2003	Titration/ Nessler Reagent/ Spectrophotometric Method	1 mg/Nm^3
3.	Carbon Monoxide	USEPA Method 10B	GC-FID Method	0.2 mg/Nm^3
4.	Chlorine	US EPA Method 26 for sampling	Titrimetric	0.001 mg/Nm^3
5.	Fluoride (Gaseous)	US EPA Method 13 A	SPADNS Zirconium Lake Spectrophotometric Method	0.025 mg/Nm^3
6.	Fluoride (Particulate)	US EPA Method 13 A	SPADNS Zirconium Lake Spectrophotometric Method	0.005 mg/Nm^3
7.	Hydrogen Chloride	US EPA Method 26 for sampling	Titrimetric	0.25 mg/Nm^3
8.	Hydrogen Sulphide	IS 11255 (Part 4):1985	Titrimetric	1 mg/Nm^3
9.	Oxides of Nitrogen	IS 11255 (Part 7): 2005	PDSA Colorimetric Method	10 mg/Nm^3
10.	Oxygen	IS 13270 : 1992	ORSAT Apparatus	1 %
11.	Poly Aromatic Hydrocarbons (Particulate)	IS 5182 (Part 12) : 2004, Reaffirmed 2009 CPCB Guidelines, May 2011, Page No.39	GC-FID Method	0.25 mg/Nm^3
12.	Suspended Particulate Matter	IS 11255 (Part 1):1985, Reaffirmed 2003	Gravimetric Method	10 mg/Nm^3
13.	Sulphur Dioxide	IS 11255 (Part 2): 1985, Reaffirmed 2003	Titrimetric IPA thorine Method	5.0 mg/Nm^3 0.02 kg/day

Sr.	Parameters	Method References	Techniques	Detection Limit
14.	BTX (Benzene, Toluene, Xylene)	NIOSH (NMAM) 1501	Adsorption and Desorption followed by GC-FID analysis	0.001 mg/Nm^3
15.	VOC (Volatile Organic Compounds)	NIOSH (NMAM) 1501 for sampling	Adsorption and Desorption followed by GC-FID or GC/ MS analysis	-
i	Methyl Isobutyl Ketone	-	-	0.001 mg/Nm^3
ii	Benzene	-	-	0.001 mg/Nm^3
iii	Toluene	-	-	0.001 mg/Nm^3
iv	Xylene	-	-	0.001 mg/Nm^3
v	Ethyl Benzene	-	-	0.001 mg/Nm^3
vi	Ethyl Acetate	-	-	0.001 mg/Nm^3

Annexure III: Ambient Air Sampling and Analysis Methodology

Sr.	Parameters	Method References	Techniques	Detection Limit
1.	Sulphur Dioxide (SO_2)	CPCB Guidelines for the Measurement of Ambient Air Pollutants, Volume I, May 2011, Page No.1	Improved West & Gaeke Method	4 µg/m^3
2.	Nitrogen Dioxide (NO_2)	CPCB Guidelines for the Measurement of Ambient Air Pollutants, Volume I, May 2011, Page No.7	Modified Jacob & Hochheiser Method	3 µg/m^3
3.	Particulate Matter (size less than 10 µm) or PM_{10}	CPCB Guidelines for the Measurement of Ambient Air Pollutants, Volume I, May 2011, Page No.11	Gravimetric Method	2 µg/m^3
4.	Particulate Matter (size less than 2.5 µm) or $PM_{2.5}$	CPCB Guidelines for the Measurement of Ambient Air Pollutants, Volume I, May 2011, Page No. 15	Gravimetric Method	0.4 µg/m^3
5.	Ozone (O_3)	APHA, Method No. 820, Page no. 836	Chemical Method	19.6 µg/m^3
6.	Lead (Pb)	CPCB Guidelines for the Measurement of Ambient Air Pollutants, Volume I, May 2011, Page No. 47	AAS Method	0.02 µg/m^3
7.	Carbon Monoxide (CO)	CPCB Guidelines for the Measurement of Ambient Air Pollutants, Volume II, May 2011, Page No. 16	Non Dispersive Infra Red (NDIR) spectroscopy	0.05 mg/m^3
8.	Ammonia (NH_3)	CPCB Guidelines for the Measurement of Ambient Air Pollutants, Volume I, May 2011, Page No. 35	Indophenol Blue Method	4.0 µg/m^3
9.	Benzene (C_6H_6)	IS 5182 (Part 11):2006	Adsorption and Desorption followed by GC-FID analysis	1.0 µg/m^3
10.	Benzo (a) Pyrene (BaP) – particulate phase only,	CPCB Guidelines for the Measurement of Ambient Air Pollutants, Volume I, May 2011, Page No. 39	Solvent extraction followed by GC-FID analysis	0.2 ng/m^3

Sr.	Parameters	Method References	Techniques	Detection Limit
11.	Arsenic (As)	CPCB Guidelines for the Measurement of Ambient Air Pollutants, Volume I, May 2011, Page No. 47	AAS Method	0.3 ng/m^3
12.	Nickel (Ni)	CPCB Guidelines for the Measurement of Ambient Air Pollutants, Volume I, May 2011, Page No. 47	AAS Method	3.0 ng/m^3

Annexure IV: Water/Wastewater Sampling and Analysis Methodology

Sr.	Parameters	Methods References	Techniques	Detection Limit
1.	Sampling Procedure for Chemical Parameters	IS 3025 (Part 1): 1987, Reaffirmed 1998, Amds.1& APHA, 22nd Ed., 2012, 1060 B, 1-39	-	-
2.	Sampling Procedure for Microbiological Parameters	APHA, 22nd Ed., 2012, 1060 B, 1-39, 9040, 9-17, and 9060B, 9-35	-	-
3.	Temperature	APHA, 22nd Ed., 2012, 2550-B, 2-69	By Thermometer	-
4.	Colour	APHA, 22nd Ed., 2012, 2120-B, 2-26	Visible Comparison Method	1 Hazen Unit
5.	Odour	IS 3025 (Part 5): 1983, Reaffirmed 2006	Qualitative Method	-
6.	pH	APHA, 22nd Ed., 2012, 4500-H^+- B, 4-92	By pH Meter	1
7.	Oil & Grease	APHA, 22nd Ed., 2012, 5520-B, 5-40	Liquid -liquid Partition-Gravimetric Method	1.0 mg/l
8.	Suspended Solids	IS 3025 (Part 17): 1984, Reaffirmed 2006, Amds.1	Filtration /Gravimetric Method	5.0 mg/l
9.	Dissolved Oxygen	IS 3025 (Part 38): 1989, Reaffirmed 2009	Iodometric Method-Azide modification	0.05 mg/l
10.	Chemical Oxygen Demand	APHA, 22nd Ed., 2012, 5220-B, 5-17	Open Reflux Method	5.0 mg/l
11.	Biochemical Oxygen Demand	IS 3025 (Part 44): 1993, Reaffirmed 2009, Amds.1	Iodometric Method	5.0 mg/l
12.	Electrical Conductivity	APHA, 22nd Ed., 2012, 2510- B, 2-54	By Conductivity Meter	0.1 µmho/cm
13.	Nitrite-Nitrogen	APHA, 22nd Ed., 2012, 4500-NO_2-B, 4-120	Colorimetric Method	0.006 mg/l

Sr.	Parameters	Methods References	Techniques	Detection Limit
14.	Nitrate-Nitrogen	APHA, 22nd Ed., 2012, 4500-NO_3, B-4-122	UV Spectrophotometer Screening Method	0.2 mg/l
15.	(NO_2 + NO_3)-Nitrogen	APHA, 22nd Ed., 2012, 4500-NO_2-B, 4-120 APHA, 22nd Ed., 2012, 4500-NO_3, B-4-122	Colorimetric Method V Spectrophotometer Screening Method	0.2 mg/l
16.	Free Ammonia	APHA, 22nd Ed., 2012, 4500 NH_3, F, 4 -115	Colorimetric Method	0.006 mg/l
17.	Total Residual Chlorine	IS 3025 (Part 26): 1986, Reaffirmed 2009, Ed. 2.1 (2004-02)	Iodometric Method	0.1 mg/l
18.	Cyanide (CN)	APHA, 22nd Ed., 2012,4500-CN, C & E, 4-41 & 4-43	Colorimetric Method	0.001 mg/l
19.	Fluoride (F)	APHA, 22nd Ed., 2012, 4500-F, D, 4-87	SPADNS Method	0.05 mg/l
20.	Sulphide (S^{2-})	APHA, 22nd Ed., 2012, 4500 –S^2, C-4-175, F-4-178	Iodometric Method	0.08 mg/l
21.	Dissolved Phosphate (P)	APHA, 22nd Ed., 2012, 4500 P,E, 4-155	Ascorbic Acid Method	0.03 mg/l
22.	Sodium Absorption Ratio	IS11624: 1986, Reaffirmed 2006	By Calculation	0.3
23.	Total Phosphorous (P)	APHA,22nd Ed., 2012, 4500 P,E, 4-155	Ascorbic Acid Method	0.03 mg/l
24.	Total Kjeldahl Nitrogen	APHA, 22nd Ed., 2012, 4500 NH_3, B & C, 4 -110, 4-112	Titrimetric Method	0.1 mg/l
25.	Total Ammonia (NH_4 +NH_3)-Nitrogen	APHA, 22nd Ed., 2012, 4500 NH_3, F, 4 - 115	Colorimetric Method	0.001 mg/l
26.	Phenols (C_6H_5OH)	APHA, 22nd Ed., 2012, 5530- B & C, 5-44 & 5-47	Chloroform Extraction Method	0.001 mg/l

Sr.	Parameters	Methods References	Techniques	Detection Limit
27.	Surface Active Agents	APHA, 22nd Ed., 2012, 5540-B & C, 5-50	Methylene Blue Extraction Method	0.1 mg/l
28.	Organo Chlorine Pesticides	APHA, 22nd Ed., 2012, 6410B, 6-74	GC MS-MS Method	0.01 µg/L
29.	Polynuclear aromatic hydrocarbons (PAH)	APHA, 22nd Ed., 2012, 6410B, 6-74	GC MS-MS Method	0.01 µg/L
30.	Polychlorinated Biphenyls (PCB)	APHA, 22nd Ed., 2012, 6410B, 6-74	GC MS-MS Method	0.01 µg/L
31.	Zinc (Zn)	IS 3025 (Part 2): 2004	ICP Method	0.1 mg/l
32.	Nickel (Ni)	IS 3025 (Part 2): 2004	ICP Method	0.05 mg/l
33.	Copper (Cu)	IS 3025 (Part 2): 2004	ICP Method	0.03 mg/l
34.	Hexavalent Chromium (Cr^{6+})	APHA, 22nd Ed., 2012, 3500-Cr, B, 3-69	Colorimetric Method	0.02 mg/l
35.	Total Chromium (Cr)	IS 3025 (Part 2): 2004	ICP Method	0.02 mg/l
36.	Total Arsenic (As)	IS 3025 (Part 2): 2004	ICP Method	0.005 mg/l
37.	Lead (Pb)	IS 3025 (Part 2): 2004	ICP Method	0.008 mg/l
38.	Cadmium (Cd)	IS 3025 (Part 2): 2004	ICP Method	0.002 mg/l
39.	Mercury (Hg)	IS 3025 (Part 2): 2004	ICP Method	0.0008 mg/l
40.	Manganese (Mn)	IS 3025 (Part 2): 2004	ICP Method	0.02 mg/l
41.	Iron (Fe)	IS 3025 (Part 2): 2004	ICP Method	0.06 mg/l
42.	Vanadium (V)	IS 3025 (Part 2): 2004	ICP Method	0.05 mg/l

Sr.	Parameters	Methods References	Techniques	Detection Limit
43.	Selenium (Se)	IS 3025 (Part 2): 2004	ICP Method	0.005 mg/l
44.	Boron (B)	IS 3025 (Part 2): 2004	ICP Method	0.1 mg/l
45.	Total Coliforms	APHA, 22nd Ed., 2012, 9221-B, 9-66	Multiple tube fermentation technique (MPN/100ml)	1.1 MPN/100ml
46.	Faecal Coliforms	APHA, 22nd Ed., 2012, 9221-E, 9-74	Multiple tube fermentation technique (MPN/100ml)	1.1 MPN/100ml
47.	Bioassay (Zebra Fish) Test	IS 6582, 1971, Reaffirmed 1987	Static Technique	-

Annexure V: National Ambient Air Quality Standards, 2009

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National Ambient Air Quality Standards: Central Pollution Control Board

In exercise of the powers conferred by Sub-section (2) (h) of section 16 of the Air (Prevntion and Control of Pollution) Act, 1981 (Act No.14 of 1981), and in suppression of the Notification No(s). S.O.384(E), dated 11th April, 1994 and S.O.935(E), dated 14th October, 1998, the Central Pollution Control Board hereby notify the National Ambient Air Quality Standards **with immediate effect**, namely:

Sr. No.	Pollutant	Time Weighted Average	Concentration in Ambient Air		
			Industrial, Residential, Rural and Other Areas	Ecologically Sensitive Areas (Notified by Central Government)	Methods of Measurement
(1)	(2)	(3)	(4)	(5)	(6)
1	Sulphur Dioxide (SO_2) µg/m³	Annual *	50	20	– Improved West and Gaeke – Ultraviolet fluorescence
		24 hours **	80	80	
2	Nitrogen Dioxide (NO_2) µg/m³	Annual *	40	30	– Modified Jacob & Hochheiser (Na-Arsenite) – Chemilminescence
		24 hours **	80	80	
3	Particulate Matter (size less than 10 µm) or PM_{10} µg/m³	Annual *	60	60	– Gravimetric – TOEM – Beta attenuation
		24 hours **	100	100	
4	Particulate Matter (size less than 2.5 µm) or $PM_{2.5}$ µg/m³	Annual *	40	40	– Gravimetric – TOEM – Beta attenuation
		24 hours **	60	60	
5	Ozone (O_3) µg/m³	8 hours **	100	100	– UV photometric – Chemiluminescence – Chemical Method
		1 hour **	180	180	
6	Lead (Pb) µg/m³	Annual *	0.50	0.50	– AAS/ICP method after sampling on EPM 2000 or equivalent filter paper – EDXRF using Teflon filter
		24 hours **	1.0	1.0	
7	Carbon Monoxide (CO) mg/m³	8 hours **	02	02	– Non Dispersive Infra Red (NDIR) spectroscopy
		1 hour **	04	04	
8	Ammonia (NH_3) µg/m³	Annual *	100	100	– Chemiluminescence – Indophenol blue method
		24 hours **	400	400	
9	Benzene (C_6H_6) µg/m³	Annual *	05	05	– Gas Chromatography based continuous analyzer – Adsorption and Desorption followed by GC analysis
10	Benzo (a) Pyrene (BaP) – particulate phase only, ng/m³	Annual *	01	01	– Solvent extraction followed by HPLC/GC analysis
11	Arsenic (As) ng/m³	Annual *	06	06	– AAS/ICP method after sampling on EPM 2000 or equivalent filter paper.
12	Nickel (Ni) ng/m³	Annual *	20	20	– AAS/ICP method after sampling on EPM 2000 or equivalent filter paper.

* Annual arithmetic mean of minimum 104 measurements in a year at a particular site taken twice a week 24 hourly at uniform intervals.

** 24 hourly or 08 hourly monitored values, as applicable, shall be complied with 98% of the time in a year. 2 % of the time, they may exceed the limits but not on two consecutive days of monitoring.

Note: Whenever and wherever monitoring results on two consecutive days of monitoring exceed the limits specified above for the respective category, it shall be considered adequate reason to institute regular or continuous monitoring and further investigation.

SANT PRASAD GAUTAM, Chairman, Central Pollution Control Board [ADVT-III/4/184/09/Exty.]

Note: The notifications on National Ambient Air Quality Standards were published by the Central Pollution Control Board in the Gazette of India. Extraordinary vide notification No(s). S.O. 384(E), dated 11th April, 1994 and S.O. 935(E), dated 14th October,1998.

µg/m³: micro-gram/m³ i.e. 10^{-6}gm/m³ ng/m³ : nano-gram/m³ i.e. 10^{-9}gm/m³

Annexure VI: General Standards for Discharge of Environmental Pollutants, Part A: Effluents (The Environment (Protection) Rules, 1986, Schedule VI)

Sr.	Parameter	Standards			
		Inland surface Water	**Public Sewers**	**Land for Irrigation**	**Marine Coastal Areas**
1.	Colour and Odour	See Note 1	--	See Note I	See Note 1
2.	Suspended solids, mg/l, Max.	100	600	200	a) For process waste water - 100 b) For cooling water effluent- 10 percent above total suspended mailer of influent cooling water.
3.	Particle size of suspended solids	Shall pass 850 micron IS Sieve			a. Floatable solids, Max 3 mm b. Settleable solids Max 850 microns
4.	Dissolved solids (Inorganic), mg/l, Max.	2100	2100	2100	--
5.	pH value	5.5 -9.0	5.5 -9.0	5.5 -9.0	5.5-9.0
6.	Temperature °C, Max	Shall not exceed 40 in any section of the stream within 15 mts. Downstream from the effluent outlet	45 at the point of discharge	--	45 at the point of discharge

Sr.	Parameter	Standards			
		Inland surface Water	**Public Sewers**	**Land for Irrigation**	**Marine Coastal Areas**
7.	Oil and Grease mg/l, Max	10	20	10	20
8.,	Total Residual chlorine, mg/l, Max	1.0	--	--	1.0
9.	Ammonical Nitrogen (as N), mg/l, Max	50	50	--	50
10.	Total Kjeldahl Nitrogen (as N), mg/l, Max.	100	--	--	100
11.	Free Ammonia (as NH_3), mg/l, Max	5.0	--	--	5.0
12.	Biochemical oxygen demand (5 days, at 20° c) mg/l, Max	30	350	100	100
13.	Chemical oxygen demand, mg/l, Max	250	--	--	250
14.	Arsenic (as As), mg/l, Max	0.2	0.2	0.2	0.2
15.	Mercury (as Hg). Mg/l, Max	0.01	0.01	--	0.01
16.	Lead (as Pb), mg/l, Max	0.1	1.0	-	1.0
17.	Cadmium (as Cd), mg/l,	2.0	1.0	--	2.0
18.	Hexavalent Chromium (as Cr^{+6}) mg/l, Max	1	2.0	--	1.0
19.	Total Chromium (as Cr), mg/l, Max	2.0	2.0	--	2.0

Sr.	Parameter	Standards			
		Inland surface Water	**Public Sewers**	**Land for Irrigation**	**Marine Coastal Areas**
20.	Copper (as Cu), mg/l, Max.	3.0	3.0	--	3.0
21.	Zinc (as Zn), mg/l, Max.	5.0	15	0--	15
22	Selenium (as Se), mg/l, Max.	0.05	0.05	--	0.05
23	Nickel (as Ni), mg/l, Max.	3.0	3.0	--	5.0
24	Boron (as B), mg/l, Max.	2.0	2.0	2.0	--
25.	Percent Sodium, Max.	--	60	60	--
26.	Residual Sodium carbonate, mg/l, Max.	--	--	5.0	--
27.	Cyanide (as Cn), mg/l, Max.	0.2	2.0	0.2	0.2
28.	Chloride (as Cl), mg/l, Max.	1000	1000	600	--
29.	Fluoride (as F), mg/l, Max.	2.0	15	--	15
30.	Dissolved Phosphate (as P), mg/l, Max.	5.0	--	--	--
31.	Sulphate (as SO_4), mg/l, Max.	1000	1000	1000	--
32.	Sulphide (as S), mg/l, Max.	2.0	--	--	5.0
33.	Pesticides	Absent	Absent	Absent	Absent
34.	Phenolic compounds (as C_6H_5OH), mg/l, Max.	1.0	5.0	--	5.0

Sr.	Parameter	Standards			
		Inland surface Water	**Public Sewers**	**Land for Irrigation**	**Marine Coastal Areas**
35.	Radioactive materials:				
	a. Alpha emitters MC/ml., Max.	10^{-7}	10^{-7}	10^{-8}	10^{-7}
	b. Beta emitters µc/ml., Max	10^{-6}	10^{-6}	10^{-7}	10^{-6}

Annexure VII: Drinking Water Specification-IS 10500:2012

Sr.	Characteristic	Unit	Requirement (Acceptable Limit)	Permissible Limit in the Absence of Alternate Source
Table 1	**Organoleptic and Physical Parameters**			
1.	Colour	Hazen units	Max 5	Max 15
2.	Odour	-	Agreeable	Agreeable
3.	pH value	-	6.5-8.5	No relaxation
4.	Taste	-	Agreeable	Agreeable
5.	Turbidity	NTU	Max 1	Max 5
6.	Total dissolved solids	mg/l	Max 500	Max 2000
Table 2	**General parameters concerning substances undesirable in excessive amounts**			
7.	Aluminium (as Al)	mg/l	Max 0.03	Max 0.2
8.	Ammonia (as total ammonia- N)	mg/l	Max 0.5	No relaxation
9.	Anionic detergents (as MBAS)	mg/l	Max 0.2	Max 1.0
10.	Barium (as Ba)	mg/l	Max 0.7	No relaxation
11.	Boron (as B)	mg/l	Max 0.5	Max 1.0
12.	Calcium (as Ca)	mg/l	Max 75	Max 200
13.	Chloramines (as $C1_2$)	mg/l	Max 4.0	No relaxation
14.	Chlorides (as Cl)	mg/l	Max 250	Max 1000
15.	Copper (as Cu)	mg/l	Max 0.05	Max 1.5
16.	Fluoride (as F)	mg/l	Max 1.0	Max 1.5
17.	Free residual chlorine	mg/l	Min 0.2	Min 1
18.	Iron (as Fe)	mg/l	Max 0.3	No relaxation

Sr.	Characteristic	Unit	Requirement (Acceptable Limit)	Permissible Limit in the Absence of Alternate Source
19.	Magnesium (as Mg)	mg/l	Max 30	Max100
20.	Manganese (as Mn)	mg/l	Max 0.1	Max 0.3
21.	Mineral Oil	mg/l	Max 0.5	No relaxation
22.	Nitrate (as NO_3)	mg/l	Max 45	No relaxation
23.	Phenolic compounds (as C_6H_5OH)	mg/l	Max 0.001	Max 0.002
24.	Selenium (as Se)	mg/l	Max 0.01	No relaxation
25.	Silver (as Ag)	mg/l	Max 0.1	No relaxation
26.	Sulphate (as SO_4)	mg/l	Max 200	Max 400
27.	Sulphide (as H_2S)	mg/l	Max 0.05	No relaxation
28.	Total Alkalinity as calcium carbonate	mg/l	Max 200	Max600
29.	Total hardness (as $CaCO_3$)	mg/l	Max 200	Max 600
30.	Zinc (as Zn)	mg/l	Max 5	Max15
Table 3	**Parameters Concerning Toxic Substances**			
31.	Cadmium (as Cd)	mg/l	Max 0.003	No relaxation
32.	Cyanide (as CN)	mg/l	Max 0.05	No relaxation
33.	Lead (as Pb)	mg/l	Max 0.01	No relaxation
34.	Mercury (as Hg)	mg/l	Max 0.001	No relaxation
35.	Molybdenum (as Mo)	mg/l	Max 0.07	No relaxation
36.	Nickel (as Ni)	mg/l	Max 0.02	No relaxation
37.	Pesticides	mg/l	See Table 5	No relaxation
38.	Polychlorinated biphenyls	mg/l	Max 0.0005	No relaxation
39.	Poly nuclear aromatic Hydrocarbons (as PAH)	mg/l	Max 0.0001	No relaxation
40.	Total Arsenic (as As)	mg/l	Max 0.01	Max0.05

Sr.	Characteristic	Unit	Requirement (Acceptable Limit)	Permissible Limit in the Absence of Alternate Source
41.	Total Chromium (as Cr)	mg/l	Max 0.05	No relaxation
42.	Trihalomethanes			
a)	Bromoform	mg/l	Max 0.1	No relaxation
b)	Dibromochloro Methane	mg/l	Max 0.1	No relaxation
c)	Bromodichloromethane	mg/l	Max 0.06	No relaxation
d)	Chloroform	mg/l	Max 0.2	No relaxation
Table 4	**Parameters Concerning Radioactive Substances**			
43.	Radioactive Materials			
a)	Alpha emitters	Bq/L	Max 0.1	No relaxation
b)	Beta emitters	Bq/L	Max 1.0	No relaxation
Table 5	**Pesticide Residues Limits and Test Method**			
i)	Alachor	µg/L	20	No relaxation
ii)	Atrazine	µg/L	2	No relaxation
iii)	Aldrin/ Dieldrin	µg/L	0.03	No relaxation
iv)	Alpha HCH	µg/L	0.01	No relaxation
v)	Beta HCH	µg/L	0.04	No relaxation
vi)	Butachlor	µg/L	125	No relaxation
vii)	Chlorpyriphos	µg/L	30	No relaxation
viii)	Delta HCH	µg/L	0.04	No relaxation
ix)	2,4- Dichlorophenoxyacetic acid	µg/L	30	No relaxation
x)	DDT (o,p & p,p — Isomers of DDT, DDE and DDD)	µg/L	1	No relaxation
xi)	Endosulfan (α, β & sulphate)	µg/L	0.4	No relaxation
xii)	Ethion	µg/L	3	No relaxation

Sr.	Characteristic	Unit	Requirement (Acceptable Limit)	Permissible Limit in the Absence of Alternate Source
xiii)	Gamma - HCH (Lindane)	µg/L	2	No relaxation
xiv)	Isoproturon	µg/L	9	No relaxation
xv)	Malathion	µg/L	190	No relaxation
xvi)	Methyl parathion	µg/L	0.3	No relaxation
xvii)	Monocrotophos	µg/L	1	No relaxation
xviii)	Phorate	µg/L	2	No relaxation
Table 6	**Bacteriological Quality of Drinking Water**			
44.	E.coli or thermotolerant coliform bacteria	/100	Not detectable	-
45.	Total coliform bacteria	/100 mL	Not detectable	-
	Virological Requirements			
46.	MS2 phage	/1 L	Absent	-
	Biological Requirements			
47.	Cryptosporidium	/10 L	Absent	-
48.	Giardia	/10 L	Absent	-
49.	Microscopic organisms such as algae, zooplanktons, flagellates, parasites and toxin producing organisms		Free from microscopic organisms	-

Annexure VIII: CPCB Water Quality Criteria:

Designated best use	Quality Class	Primary Water Quality Criteria
Drinking water source without conventional treatment but with chlorination	A	➢ Total coliform organisms (MPN*/100 ml) shall be 50 or less ➢ pH between 6.5 and 8.5 ➢ Dissolved Oxygen 6 mg/l or more, and ➢ Biochemical Oxygen Demand 2 mg/l or less
Outdoor bathing (organized)	B	➢ Total coliform organisms (MPN/100 ml) shall be 500 or less ➢ pH between 6.5 and 8.5 ➢ Dissolved Oxygen 5 mg/l or more, and ➢ Biochemical Oxygen Demand 3 mg/l or less
Drinking water source with conventional treatment	C	➢ Total coliform organisms (MPN/100ml) shall be 5000 or less ➢ pH between 6 and 9 ➢ Dissolved Oxygen 4 mg/l or more, and ➢ Biochemical Oxygen Demand 3 mg/l or less
Propagation of wildlife and fisheries	D	➢ pH between 6.5 and 8.5 ➢ Dissolved Oxygen 4 mg/l or more, and ➢ Free ammonia (as N) 1.2 mg/l or less
Irrigation, industrial cooling, and controlled disposal	E	➢ pH between 6.0 and 8.5 ➢ Electrical conductivity less than 2250 micro mhos/cm, ➢ Sodium Absorption Ratio less than 26, ➢ and Boron less than 2 mg/l.
	Below E	➢ Not Meeting A, B, C, D & E Criteria

Annexure IX: Water Quality Parameters Requirements and Classification

Water quality parameters are classified into three categories, given in Table (i), (ii) and (iii) (Source: CPCB, 2002, "Water Quality Criteria and Goals", Monitoring of Indian National aquatic Resources Series: MINARS/17/2001-2002).

Table: Basic Water Quality Requirement and Classification (Surface Water + Ground Water)

i) Simple Parameters:

Sr.	Parameters	Requirement for Waters of Class		
		A-Excellent	**B-Desirable**	**C-Acceptable**
(i)	Sanitary Survey	Very Clean neighborhood and catchment	Reasonably clean neighborhood	Generally clean neighborhood
(ii)	General Appearance	No floating matter	No floating matter	No floating matter
(iii)	Colour	Absolutely Colourless	Almost colourless, very light shade if any	No colour of anthropogenic origin
(iv)	Smell	Odourless	Almost odourless	No unpleasant odour
(v)	Transparency	>1.0 depth	>0.5 to 0.1m depth	>0.2 to 0.5 m depth
(vi)	Ecological* (Presence of Animals)	Fish & Insects	Fish & Insects	Fish & Insects

* Applicable to only surface water

ii) Regular Monitoring Parameters:

Sr.	Parameters	Requirement for Waters of Class		
		A Excellent	**B-Desirable**	**C-Acceptable**
(i)	pH	7.0 to 8.5	6.5 to 9.0	6.5 to 9.0
(ii)	DO (% Saturation)	90-110	80-120	60-140
(iii)	BOD, mg/l	Below 2	Below 5	Below 8
(iv)	EC, µmhos/cm	<1000	<2250	<4000
(v)	(NO_2+NO_3)-Nitrogen, mg/l	<5	<10	<15
(vi)	Suspended solid, mg/l	<25	<50	<100

Sr.	Parameters	Requirement for Waters of Class		
		A Excellent	**B-Desirable**	**C-Acceptable**
(vii)	Fecal Coliform, MPN/ 100 ml	<20 per 100 ml	<200 per 100 ml	<2000 per 100 ml
(viii)	Bio-assay (Zebra Fish)	No death in 5 days	No death in 3 days	No death in 2 days

Note:

1. Dissolved Oxygen (DO) not applicable for ground waters.
2. Dissolved Oxygen in eutrophicated waters should include measurement for diurnal variation.
3. Suspended solid limit is applicable only during non-monsoon period.
4. Faecal Coliform values should meet for 90% times.
5. Static Bio-Assay method may be adopted.

iii) Specific Parameters: (Only in case of need/apprehensions)

Sr.	Parameters	Requirement for Waters of Class		
		A- Excellent	**B-Desirable**	**C-Acceptable**
(i)	Total Phosphorous	<0.1 mg/l	<0.2 mg/l	<0.3 mg/l
(ii)	T.K.N	<1.0 mg/l	<2.0 mg/l	<3.0 mg/l
(iii)	Total Ammonia (NH4 + NH3)-Nitrogen	<0.5 mg/l	<1.0 mg/l	<1.5 mg/l
(iv)	Phenols	<2 µg/l	<5 µg/l	<10 µg/l
(v)	Surface Active Agents	<20 µg/l	<100 µg/l	<200 µg/l
(vi)	Organo Chlorine Pesticides	<0.05 µg/l	<0.1 µg/l	<0.2 µg/l
(vii)	PAH	<0.05 µg/l	<0.1 µg/l	<0.2 µg/l
(viii)	PCB and PCT	<0.01 µg/l	<0.01 µg/l	<0.02 µg/l
(ix)	Zinc	<100 µg/l	<200 µg/l	<300 µg/l
(x)	Nickel	<50 µg/l	<100 µg/l	<200 µg/l
(xi)	Copper	<20 µg/l	<50 µg/l	<100 µg/l
(xii)	Chromium (Total)	<20 µg/l	<50 µg/l	<100 µg/l

Sr.	Parameters	Requirement for Waters of Class		
		A- Excellent	**B-Desirable**	**C-Acceptable**
(xiii)	Arsenic (Total)	<20 µg/l	<50 µg/l	<100 µg/l
(xiv)	Lead	<20 µg/l	<50 µg/l	<100 µg/l
(xv)	Cadmium	<1.0 µg/l	<2.5 µg/l	<5.0 µg/l
(xvi)	Mercury	<0.2 µg/l	<0.5 µg/l	<1.0 µg/l