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ANALYSIS OF WATER QUALITY ASPECTS OF WAINGANGA RIVER, MAHARASHTRA

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ABSTRACT

Contaminated water causes severe ill effect on human and animal health. In rural India, rivers are the one of the most important sources of drinking water. Hence, it is essential to know the quality of river water used for human and animal consumption. Wainganga river and its tributaries flow through the eastern part of M.P. and eastern Vidarbha region of Maharashtra. Wainganga river has catchment area of 1,09,000 sq. km. This region comprises of sparely populated rural area. Water of Wainganga river and its tributaries is used for consumption at various villages without proper treatment. The aim of this study is to assess the quality of water in Wainganga basin. The Central water Commission is monitoring water quality in Wainganga basin since last 30 years. There is regular monitoring of water quality at 9 sites in Wainganga Basin. Various water quality parameters such as Physical, Chemical, Bacteriological, Trace & Toxic metals and Pesticides are monitored at these sites. The core parameters like pH, Electrical Conductivity (EC), Dissolve oxygen (DO), Biochemical Oxygen Demand (BOD), Nitrate (NO_3^-), Nitrite (NO_2^-,), Total Coliform(Tcol) and Faecal Coliform (Fcol) give primary indication regarding the quality of water. The assessment of water quality in present study is based on these parameters. For this, the data of five years from 2005-06 to 2009-10 has been used. The results shows that the parameters like pH, EC, DO, NO_3^-,NO_2^-, BOD are within the permissible limit for designated best uses of water for most of sites. However, Total Coliform(Tcol) & Faecal Coliform(Fcol) values are higher at all the sites.

Keywords: *River Basin, Biological Oxygen Demand (BOD), Dissolve oxygen (DO) and Total & Faecal coliform*

INTRODUCTION

As per the United Nations Report published on 22 March 2010, contaminated and polluted water kill more people than all forms of violence including war (1). A report of UNESCO published in 2006 indicates that a vast chunk of population in India has no access to safe drinking water and that about 66 million people still rely on unsafe water for consumption. Water supplies contaminated with faecal matter cause number of diseases. Besides this, various human and animal activities cause pollution in river water. The runoff carrying various agricultural wastes, fertilizers , pesticides, sewage, industrial effluents etc contaminate river water. Bacteriological and physico-chemical studies has been carried out in recent years at different places in Vidarbha and nearby areas viz. Beed Districts, Maharashtra (2), Akola, Maharashtra (3), Hyderabad Andhra Pradesh (4), Aurangabad, Maharashtra (5). These studies also reported that increased urbanization and industrialization have resulted deterioration of water quality due undesirable variation in physico-chemical, bacteriological parameters. Various kinds of such activities are observed in Wainganga basin too. However, no elaborate study has been carried out to ascertain the quality of water in this river basin. Hence an attempt is made to study the water quality in the basin based on primarily the core parameters.

BASIN DESCRIPTION:

The Wainganga (Pranhita) is one of the tributaries of the river Godavari. Wainganga basin lies between longitude 76^0-$0^/$E to 80^0 -$53^/$ E and Latitude 18^0-48^0 to 22^0 – $43^/$N. Wainganga has three principle branches viz. the Penganga, the Wardha and the Wainganga. The Wainganga rises in the Seoni District of Madhya Pradesh at an elevation of 640 m above the Mean Sea Level. The total length of this river is 754 km upto the confluence with Godavari. In the beginning, it flows for a length of about 275 km in Seoni and Balaghat Districts of Madhya Pradesh. Further it flows for a distance of about 479 km in Bhandara, Chandrapur, and Gadchiroli District of Maharashtra before joining the Godavari. The main tributaries viz. the Kanhan, the Andhari, the Wardha and the Peddavagu join Wainganga at right bank. On the left bank, 5 tributaries namely the Bagh, the Chulband, the Garhvi, the Kobragarhi and the Kathani drains into the main river.

The initial reaches of the river basin and the left part of the basin comprises mostly forest area having rural population. There are a few small towns in the right part of the basin. These are Nagpur, Chandrapur, Ballarshah etc. There mines and cement plants in the middle reaches of the basin. The main occupation of the people in the basin is agriculture and has high cattle population. The Wainganga basin lies in the medium rainfall zone of 900 mm to 1600 mm. Most of the rainfall is received during the south west monsoon from June to October. In winter, the minimum temperature varies from 7^0 C to 13^0 C. Maximum temperature varies from 39^0 C to 47^0 C during summer. The month of May is the hottest month and the December is the coldest one. A basin map showing Wainganga river and its tributaries is given as fig. 1.

Central water Commission conducts hydrological observations in Wainganga basin at 21 Stations. These sites are maintained under Key Hydrological Stations. Out of these 21 sites, water quality is monitored at 9 sites. The details of these sites are given in Table-1. Central Water Commission has been monitoring the water quality of Wainganga river for more than 30 years. The various water quality parameters such as Physical, Chemical, Bacteriological, Trace & Toxic metals and Pesticides are observed at these sites. The data for core parameters viz. pH, Electrical Conductivity (EC), Biochemical Oxygen Demand (BOD), Dissolve oxygen (DO), Nitrate (NO_3^-), Nitrite (NO_2^-,), Total Coliform (Tcol) and Faecal Coliform (Fcol) are considered for the year 2005-06 to 2009-10 at these nine locations in the basin to study the water quality (6).

ANALYTICAL WATER QUALITY PROCEDURES:

Central Water commission follows the standard protocol for sampling, transportation and preservation and analysis of the water samples. The water samples are collected on first working day of every month during monsoon and non-monsoon season between 8.0 to 10.0 AM. The monsoon season considered is June to November while non-monsoon season is considered from December to May. For arriving at average values during the monsoon and non-monsoon periods, the average of monthly values of parameters has been considered. The method of analysis is as prescribed in Standard Analytical Procedures, Water Quality Analysis, Hydrology Project (7). The instruments used are as per the accuracy and precision prescribed in the standard procedure. Chemicals of analytical grade were used during the analysis.

RESULTS AND DISCUSSION:

The river water quality is generally influenced by chemical, biological and environmental factors. Seasonal variations (Monsoon and Non Monsoon) were noticed in physico-chemical properties of water in Wainganga basin. The values of core parameters viz. pH, EC, DO, NO_3^-,NO_2^-, BOD and Total Coliform(Tcol) & Faecal Coliform(Fcol) during monsoon and non-Monsoon season are obtained at various sites. These values are compared with standard values of parameters prescribed for Classification of Inland Surface Waters, IS: 2296-1982 (8) given in Table-2. The results are as discussed below:

pH : Hydrogen ion concentration plays an important role in the biological processes of almost all aquatic organisms. Low pH values indicate acidic water having corrosive properties. High pH values indicate alkaline properties. pH values between 6.5 to 8.5 is considered acceptable. However, no health-based guideline value has been proposed for pH.

The value of pH in Wainganga basin is varying from 7.6 to 8.6 in monsoon season and 7.9 to 8.9 in non monsoon season as shown in Table-3 & 4. The alkaline pH river water might be due to presence of alkalinity minerals in water. The slightly higher pH values during non-monsoon could be ascribed to increased photo synthetic assimilation of dissolved inorganic carbon by planktons (9). As per the Classification of Inland surface waters (IS:2296-1982) it is suitable for A and B class of water.

Electrical Conductivity (or specific conductance): The ability of water to conduct an electric current is known as conductivity or specific conductance and depends on the concentration of ions in solution. It is an index to represent total concentration of soluble salts in water. Electrical conductivity is an estimate of total dissolved salts in water and water with EC values between 2500 and 10000 µmho/cm is not recommended for human consumption and normally not suitable for irrigation (10). The value of conductivity of water in Wainganga basin is varying from 204 µmho/cm to 829 in monsoon and from 299 µmho/cm to 1194 µmho/cm in non-monsoon as shown in Table-3 & 4. The electrical conductivity in both the monsoon and non monsoon season is less than 2250 µmhos/cm and is suitable for use as irrigation water.

Dissolved Oxygen: Dissolved Oxygen (DO) is of considerable importance in water quality investigations as its concentration in water is an indicator of ability of a water body to support a well balanced aquatic life. DO in water is replenished through photosynthesis, dissolution from the atmosphere and addition of oxygen-rich water such as through runoff. Simultaneously, DO is consumed during heterotrophic oxidation of organic matter and respiration by aquatic flora and fauna as well as oxidation of some naturally occurring constituents in water. Thus, equilibrium is maintained between consumption and replenishment of DO. In natural waters the rate of consumption of DO is lower than the rate of replenishment resulting in maintenance of adequate concentrations DO. Oxidizable matter such as sewage and certain pollutants consume more DO than that the water body can replenish thereby degrading the ecological quality.

As per the Classification of Inland surface waters (IS:2296-1982) standard values of DO for class A, B and C waters are minimum 6.0 mgL^{-1}, 5.0 mgL^{-1} and 4.0 mgL^{-1} respectively. The value of DO in Wainganga basin is varying from 3.9 to 8.4 mgL^{-1} in monsoon and 2.9 to 8.6 mgL^{-1} in non-monsoon (Table-3 & 4) . The DO average value at Bamni is varying from 3.9 to 7.0 mgL^{-1} in Monsoon. The average lower value of DO is observed at Bamni and it is varying from 2.9 to 6.6 mgL^{-1} and at Nandgaon, it is varying 5.2 to 7.7 mgL^{-1} in non- monsoon. Hence the water of Bamni and Nandgoan are not suitable as per A, B and C class of Inland surface waters (IS: 2296-1982). In other location generally the value of DO are good and water is as per class A, B, C, D, and E.

Biochemical Oxygen Demand: The biochemical oxygen demand (BOD) is indication of relative oxygen requirements of water for oxidation of organic matter. Micro- organisms use the atmospheric oxygen dissolved in water for biochemical oxidation of organic matter. The BOD is used as an approximate measure of the amount of bio-chemically degradable organic matter present in water. The value of BOD in Wainganga basin is varying from 1.0 to 26.5 mgL^{-1} in monsoon and from 0.6 to 32.9 mgL^{-1} in non-monsoon. Surface water (river, lake) having BOD values 10 mgL^{-1} are considered as moderately polluted and BOD values more than 20 mgL^{-1} are considered as highly polluted (11). A BOD value depends on the dissolved oxygen and oxidizable organic matter in water. The greater the decomposable matter present, higher the oxygen demands and greater the BOD values (12). The average value of BOD at site Bamni is varying from 2.4 to 26.5 mgL^{-1} and at site Nandgaon is varying form 1.2 to 11.2 mgL^{-1} in Monsoon (Table-3 & 4). The average value BOD at Bamni is varying from 4.2 to 32.9 mgL^{-1} and at Nandgaon it is varying form 1.7 to 8.0 mgL^{-1} in Non Monsoon. As per the Classification of Inland surface waters (IS:2296-1982) the BOD value should be maximum 3 mgL^{-1}. Hence the water of Bamni and Nandgoan is not as per class A, B and C of waters.

Nitrate and Nitrite: Nitrate (NO^-_3) is found naturally in the environment and is an important plant nutrient. It is present at varying concentrations in all plants and is a part of the nitrogen cycle. Nitrite (NO^-_2) is not usually present in significant concentrations except in a reducing environment. Nitrate is the most stable oxidation state of N, it can be formed by the microbial reduction of nitrite. Nitrate can reach surface water as a consequence of agricultural activity from wastewater disposal and from oxidation of nitrogenous waste products in human and animal excreta, including septic tanks. Surface water nitrate concentrations can change rapidly due to surface runoff of fertilizer, uptake by phytoplankton and de-nitrification by bacteria. The values of NO_3^- in Wainganga basin are varying from 0.11 mgL^{-1} to 3.13 mgL^{-1} in monsoon and 0.12 mgL^{-1} to 1.89 mgL^{-1} in Non monsoon (Table-3 & 4). The value of NO_2^- is varying from 0. 11 mgL^{-1} to 3.13 mgL^{-1} in monsoon and 0.0 mgL^{-1} to 0.35 mgL^{-1} in Non Monsoon. Hence the value of NO_2^- and NO_3^- are within described limit of 50 mg/l for class C of water(8).

Total coliforms and Faecal coliforms: The purpose of the total coliform counts in water bodies is to estimate the number of coliforms in water samples as an index of magnitude of biological contamination. Total coliform count in water bodies is an important parameter for checking possible contamination. The Total coliform group comprises several types of bacteria. These bacteria reach water through faeces of humans and other warm-blooded animals, as well as through contaminated soils. This group of bacteria is widely used as a measure of health hazard from faecal contamination. The total coliform group comprises the aerobic and facultative, gram negative, nonspore-forming, rod shaped bacteria that ferment lactose with gas formation within 48 hours at 35 °C. The specific bacterium *Escherichia coli* is part of this group. The test for faecal coliform is at an elevated temperature of 44.5 °C, where growth of other non-faecal bacteria is suppressed.
The average values of Faecal coliforms in Wainganga basin are varying from 100 to 5450 MPN/100 ml in monsoon and from 85 to 1513 MPN/100 ml in non-monsoon. The average values of Total coliforms are varying from 190 to 47000 MPN/100 ml in monsoon and from 100 to 6492 MPN/100 ml in non-monsoon (Table-3 & 4).. During Monsoon season, higher values of total coliforms bacteria observed at all sites in Waingnaga Basin. The higher values of total coliform most probably arise from untreated wastewater discharged into river and animal activities. The presences of coliform organism are taken as an indication that pathogenic organism may also be present. For C class of water the total coliform should not be more than 5000 MPN/100 ml. Hence the water at most of the location in Wainganga basin is fit for human consumption with conventional treatment and disinfection.

nalysis of river water at nine sites in Wainganga basin was carried out for the data of five years from 2005-06 to 2009-10 for both monsoon and non monsoon periods. The values of core parameters viz. pH, EC, DO, BOD, NO_3^- ,NO_2^-,Total Coliform (Tcol) & Faecal Coliform(Fcol) were analysed and compared with the standard values mentioned for classification of Inland Surface Waters (IS:2296-1982). It is observed that the values of pH, EC are generally within the limit at all the sites. The value of DO and BOD are higher than the prescribed limits at sites Bamni and Nandgoan. This may be due to discharge of industrial and the domestic effluent in the river from nearby towns. The value of $^-$,NO_2^- and NO_3 are with in limits in all the sites. However, the presence of Total and Faecal coliform is beyond the prescribed limit for class A, B of water at almost all the sites. These value are higher particularly at sites Satrapur, Nandgaon and Bamni which may be due to discharge of effluent from nearby towns. However considering all the core parameters, water in Wainganga basin is of reasonably good quality and fit for irrigation and can also be used for human consumption with conventional treatment and disinfection.

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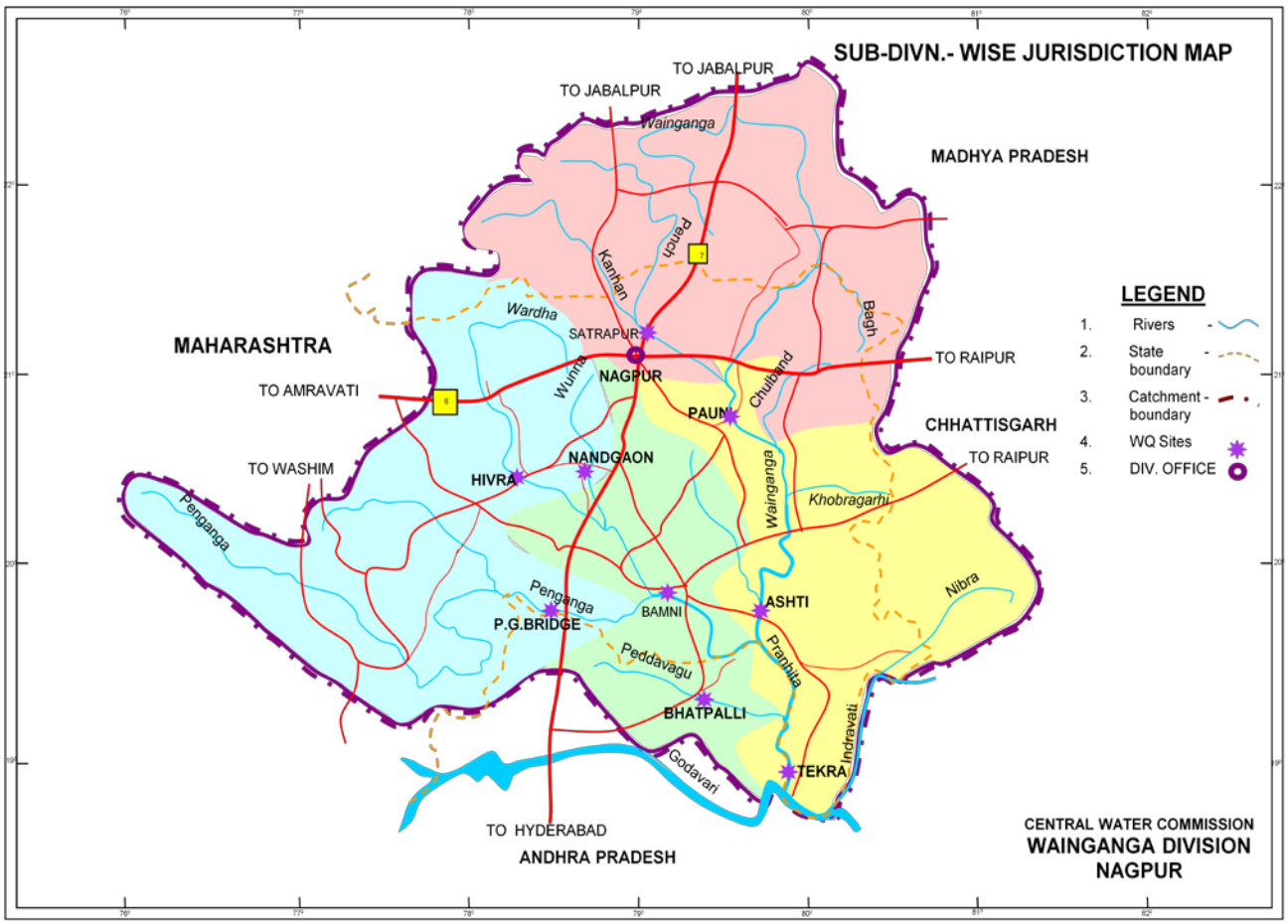

MAP SHOWING WATER QUALITY SITES OF WAINGANGA RIVER

Figure 1

Table 1: Details of Water Quality sites of Wainganga Sub Basin

S. NO.	Name of site	State	District	Catchment Area (Sq. Km.)	Latitude	Longitude
1	Satrapur	Maharashtra	Nagpur	11100	$21^0$13"04'	$79^0$14"06'
2	Tekra	Maharashtra	Gadchiroli	108780	$18^0$57"06'	$79^0$57"45'
3	Ashti	Maharashtra	Gadchiroli	50990	$19^0$41"05'	$79^0$47"19'
4	Pauni	Maharashtra	Bhandara	35520	$20^0$47"46'	$79^0$38"32'
5	Bhatpalli	Maharashtra	Adilabad	3100	$19^0$18"47'	$79^0$27"57'
6	Bamni	Maharashtra	Chandrapur	46020	$19^0$48"48'	$79^0$22"58'
7	Hivra	Maharashtra	Wardha	10240	$20^0$32"54'	$78^0$19"29'
8	Nandgaon	Maharashtra	Wardha	4580	$20^0$31"01'	$78^0$48"21'
9	P.G.Bridge	Maharashtra	Yeotmal	18441	$19^0$49"08'	$78^0$34"11'

Table 2: The Designated Best Use Classification of Inland Surface Water -CPCB (IS:2296-1982)

Designated-Best-Use	Class of Water	Criteria
Drinking Water Source without conventional treatment but after disinfections	A	1. Total Coliforms Organisms MPN/100 ml shall be 50 or less 2. pH between 6.5 and 8.5 3. Dissolved oxygen 6 mg/l or more 4. Biochemical Oxygen Demand 5 days 20^0 C 2 mg/l or less
Outdoor bathing (Organized)	B	1. Total Coliforms Organisms MPN/100 ml shall be 500 or less 2. pH between 6.5 and 8.5 3. Dissolved oxygen 5 mg/l or more 4. Biochemical Oxygen Demand 5 days 20^0 C 3 mg/l or less
Drinking Water Source after conventional treatment and disinfection	C	1. Total Coliforms Organisms MPN/100 ml shall be 5000 or less 2. pH between 6 and 9 3. Dissolved oxygen 4 mg/l or more 4. Biochemical Oxygen Demand 5 days 20^0 C 3 mg/l or less
Propagation of Wild life and Fisheries	D	1. pH between 6.5 and 8.5 2. Dissolved oxygen 4 mg/l or more 3. Free Ammonia (as N) 1.2 mg/l or less
Irrigation, Industrial Cooling, Controlled Waste disposal	E	1. pH between 6.0 and 8.5 2. Electrical Conductivity at 25^0C micromhos/cm Max. 2250 3. Sodium absorption ration Max. 26 4. Boron Max. 2 mg/l
	Below-E	Not meeting A,B,C,D & E Criteria

Table 3 : Water quality data of Wainganga basin (Monsoon)

Parameters	Year	SATRAPUR	PAUNI	ASHTI	HIVERA	NAND GAON	PG BRIDGE	BAMNI	BHAT PALLI	TEKRA
pH (pH units)	05-06	8.2	8.4	8.4	8.3	8.4	8.3	8.3	8.5	8.4
	06-07	8.3	8.2	8.4	8.3	8.5	7.6	8.3	8.4	8.4
	07-08	8.2	8.3	8.4	8.5	8.5	8.5	8.3	8.5	8.4
	08-09	8.1	8.2	8.3	8.6	8.2	8.4	8.1	8.3	8.3
	09-10	8.2	8.2	8.4	8.2	8.1	8.3	8.1	8.3	8.0
EC (µmho/cm)	05-06	344	324	204	401	473	322	789	407	242
	06-07	347	308	252	394	402	346	399	416	249
	07-08	330	282	290	342	391	347	461	427	278
	08-09	403	325	228	398	507	405	667	487	335
	09-10	408	326	259	332	482	275	829	462	314
DO (mg/L)	05-06	7.4	7.2	7.3	6.3	5.7	7.1	6.6	7.4	6.8
	06-07	7.1	7.1	7.0	7.7	7.4	7.4	7.0	7.1	6.9
	07-08	7.2	7.1	6.7	6.9	5.6	7.0	5.8	7.1	7.0
	08-09	7.3	6.8	6.4	6.6	8.4	6.8	4.1	7.2	6.7
	09-10	7.1	7.1	6.8	4.9	5.5	6.8	3.9	6.9	7.0
BOD3-27 (mg/L)	05-06	1.7	3.6	1.6	1.6	4.1	2.8	7.1	1.5	1.2
	06-07	2.6	2.8	1.1	1.1	1.2	2.0	2.4	1.5	1.1
	07-08	2.6	2.4	1.0	1.2	10.9	1.7	10.8	1.1	1.5
	08-09	1.7	2.7	1.5	2.0	7.0	1.9	26.5	1.8	1.3
	09-10	3.3	2.7	1.0	4.7	11.2	2.0	24.7	2.2	1.2
NO3-N (mg/L)	05-06	0.86	0.75	1.79	1.03	1.26	1.79	1.45	1.24	0.78
	06-07	0.68	1.03	1.89	2.07	1.21	1.89	1.87	1.84	0.89
	07-08	1.75	1.40	2.59	2.07	0.50	2.59	3.13	2.38	1.17
	08-09	0.33	0.48	0.21	0.11	0.12	0.21	0.95	0.65	0.44
	09-10	0.28	0.26	0.14	0.19	0.29	0.14	0.75	0.20	0.23
NO2-N (mg/L)	05-06	0.03	0.02	0.05	0.05	0.03	0.03	0.07	1.26	0.21
	06-07	0.03	0.12	1.27	0.09	0.04	0.06	0.07	0.05	0.03
	07-08	0.09	0.12	0.50	0.11	0.07	0.08	0.13	0.09	0.14
	08-09	0.02	0.10	0.04	0.12	0.05	0.09	0.08	0.15	0.24
	09-10	0.01	0.06	0.29	0.09	0.71	0.07	0.08	0.08	0.15
FCol MPN/100 ML	05-06	2501	1016	240	903	1148	962	340	763	301
	06-07	1317	1150	317	100	817	217	517	2433	425
	07-08	1142	1050	317	390	550	667	1333	750	1017
	08-09	617	458	333	130	5450	100	825	567	358

	09-10	1350	1400	300	683	492	300	1708	550	275
Tcol MPN/1OOML	05-06	9725	5558	538	224	5542	3920	1483	2025	1710
	06-07	6083	3633	642	210	2142	342	1483	21258	925
	07-08	6492	3650	642	1070	1225	1475	3367	1975	4767
	08-09	2275	2500	758	280	47000	190	4625	2258	250
	09-10	8008	2908	750	2733	9850	750	6500	2450	608

Table IV : Water quality data of Wainganga basin (Non Monsoon)

Parameters	Year	SATRAPUR	PAUNI	ASHTI	HIVERA	NAND-GAON	PG - BRIDGE	BAMNI	BHAT-PALLI	TEKRA
pH (pH units)	05-06	8.4	8.4	8.6	8.5	8.6	8.6	8.4	8.5	8.7
	06-07	8.2	8.4	8.6	8.5	8.5	8.6	8.3	8.5	8.5
	07-08	8.5	8.3	8.6	8.6	8.5	8.7	8.4	8.6	8.7
	08-09	8.2	8.4	8.7	8.9	8.3	8.5	8.1	8.5	8.7
	09-10	8.2	7.9	8.6	RD*	8.2	8.6	7.8	8.4	8.4
EC (µmho/cm)	05-06	478	391	299	428	419	419	598	555	399
	06-07	330	366	305	446	404	420	575	530	403
	07-08	512	403	313	471	421	422	623	498	425
	08-09	657	367	375	487	511	453	1180	568	437
	09-10	595	382	317	RD*	484	487	1194	634	401
DO (mg/L)	05-06	8.6	7.5	7.7	7.2	7.7	6.1	5.5	7.8	7.8
	06-07	7.2	7.0	7.3	7.7	5.8	6.4	6.6	7.8	7.5
	07-08	8.0	6.7	7.0	7.3	6.9	6.0	5.1	7.6	7.5
	08-09	7.5	6.8	7.3	7.5	5.2	5.8	4.1	7.8	7.1
	09-10	7.5	6.5	7.6	RD*	6.0	5.5	2.9	8.0	7.4
BOD3-27 (mg/L)	05-06	1.9	3.1	1.2	1.1	1.7	0.6	6.5	1.2	1.2
	06-07	2.6	1.4	0.7	1.1	5.2	1.8	4.7	1.6	1.2
	07-08	2.6	4.0	1.5	1.6	3.1	2.1	9.3	1.8	1.6
	08-09	1.8	2.9	1.6	2.1	5.2	0.9	27.2	1.8	1.1
	09-10	1.8	3.4	1.2	RD*	8.0	1.3	32.9	1.7	1.7
NO3-N (mg/L)	05-06	0.65	0.68	0.19	0.47	0.39	0.91	1.52	0.96	0.63
	06-07	1.75	0.54	0.40	1.15	0.65	1.89	1.66	1.80	0.54
	07-08	0.51	0.61	0.21	1.12	1.38	1.80	1.59	1.10	0.33
	08-09	0.18	0.12	0.11	0.31	0.19	0.18	0.63	0.19	0.14
	09-10	0.48	0.33	0.12	RD*	0.13	0.14	0.38	0.37	0.18
NO2-N (mg/L)	05-06	0.01	0.01	0.02	0.11	0.04	0.02	0.05	0.03	0.03
	06-07	0.03	0.01	0.02	0.14	0.07	0.04	0.03	0.10	0.18
	07-08	0.03	0.01	0.02	0.16	0.03	0.35	0.03	0.03	0.03
	08-09	0.01	0.00	0.01	0.02	0.02	0.01	0.00	0.03	0.08
	09-10	0.00	0.02	0.03	RD*	0.03	0.01	0.04	0.04	0.06
FCol MPN/100 ML	05-06	408	383	100	410	440	150	325	217	100
	06-07	1142	225	150	125	225	192	192	458	100
	07-08	317	317	85	100	314	100	192	342	383
	08-09	225	467	100	235	150	100	100	167	100

	09-10	433	800	100	RD*	1513	100	1258	608	100
Tcol MPN/1OOML	05-06	892	1317	125	1050	950	275	892	425	125
	06-07	6492	508	192	167	567	642	350	1492	150
	07-08	883	692	100	210	1441	117	258	693	142
	08-09	725	5392	142	910	358	100	300	258	100
	09-10	3817	3392	125	RD*	5788	400	2725	2267	100

RD:River Dry

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Certificate

The author(s) certify that the paper titled "**Analysis Of Water Quality Aspects Of Wainganga River, Maharashtra**" and submitted for consideration for Conference on "India Water Week" to be held in New Delhi from 10-14April 2012 is in original and has not been published or presented at any other forum.

Signature of Author(s)

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Dated: 26/03/2012