



**GOVERNMENT OF MAHARASHTRA
WATER RESOURCE DEPARTMENT**

**HYDROLOGY PROJECT (SW)
Chief Engineer Hydrology Project, Nashik**



Water quality Lab Level-II, Kolhapur

**ANNUAL REPORT
2012-2013**

**Superintending Engineer
Data Collection, Planning & Hydrology Circle, Nashik**

PREFACE

Well equipped (level-II) grade water quality laboratory at Kolhapur, is set up under technical assistance of World-Bank aided Hydrology Project, for monitoring the surface water quality of Krishna basin and west flowing rivers of Konkan region (in Ratanagiri & Sindhudurg district) in Maharashtra state.

The present annual report is prepared for the water - year 01/06/2012 to 31/05/2013 with the consideration of monsoon season from June to September and non-monsoon from October to May.

This report includes water quality data in Krishna Basin and Part of Konkan (west flowing rivers) for the period of June 2012 to May 2013. The data has been interpreted to known the affected locations.

This report attempts to briefly describe an over view and general conclusion based on the basis of water quality data of water samples collected from selected locations for define frequencies for the reported period.

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WQ Lab level - II
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HP Sub- Division
Kolhapur*

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Hydrology Project
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Annual Report
On Water Quality Monitoring through Water Quality Lab Level-II, Kolhapur
for the Year 2012 - 13

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Annual Report

On Water Quality Monitoring through Water Quality Lab Level-II, Kolhapur for the Year 2012 - 13

ANNEXURE

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CHAPTER - I

Executive Summery

Chapter - 1
Executive Summery
Annual Report
On Water Quality Monitoring through Water Quality Lab Level-II, Kolhapur
for the Year 2012- 13

1.1 Preamble:

Water is the most vital resources for life. With the increasing population & changing life patterns, consumption of water has increased many folds particularly for domestic, agriculture, & industrial consumption. “The negative change in physical, chemical & biological properties of natural water due to addition of pollutants causing adverse effect on aquatic life, & other living being, including man is known as water pollution.”

The water quality monitoring in the area of surface water is performed in order to determine the quality of water. There are 26 stations comes under Kolhapur Level – II, from Kolhapur, Sangli, Satara, Ratnagiri & Sindhudurga district. For each station 29 parameters are analyzed in the laboratory and 6 parameters are tested at field level. All these records store monthly in SWDES and used for preparing the annual report. These data are considered in order to specify the quality of water at each location. This also helps to identify concentration of water pollution in each source of water at each station.

1.2 Water Quality Monitoring – Objectives

The main objectives of surface water quality monitoring in Maharashtra state is to collect the comprehensive data on the status of present health of important water resources i.e. rivers & reservoirs so as:

- 1) To establish Base Line water quality.
- 2) To detect the trends in water quality changes.
- 3) To provide warning of potentially deleterious changes.
- 4) Surveillance of available resources for drinking and/or irrigation use.

Observations of analysis of physical & chemical parameters as per “Uniform Protocol for Water Quality Monitoring Order 2005” for each location followed by Operation and Maintenance of Water Quality Laboratory Level-II, Kolhapur as per Standard Guidelines and mandates including collection, transportation and analysis of samples , data entry in SWDES Software. Preparation of the Annual Report as per specific guidelines issued by Superintending Engineer, Hydrology Project Circle (Collection), Nashik,

1.3 Water Quality Monitoring

The Annual Report is prepared for the year 2012 - 13 in combined. The Table below shows the number of sample analyzed during the reported period. In order to study water quality status station wise, all locations covered under this lab during the year 2012- 13 are considered.

TABLE SHOWING SAMPLES ANALYSED DURING THE REPORTING PERIOD

Sr. No.	Year	Baseline Sample	Flux Sample	Trend Sample	Dam Sample	Total
1	2012 - 13	14	16	211	22	263

Seasonal averages of all analyzed parameters are calculated for study of seasonal water quality trend at each location.

1.4 Methodology:

Analysis of Physical and Chemical parameters is done in the laboratory on the basis of Standard Analytical Methods, Instrument Operating Instructions, Water Quality Manuals, CPCB Guidelines and APHA, 21st Ed., 2005.

Every month after analysis of sample data is collected, validated & entry is carried out in rough data sheet. This finally validated data is entered in SWDES software & then send it to the Data Storage Center, Nashik by mail for storage as per instructions of water quality manual.

1.5 Result and Observation:

After observing all this data it is clear that most of the physical parameters are within tolerance limit.

Most of the chemical parameters are also within tolerance limits.

Bacteriological parameters like Total Coliform and Faecal Coliforms are also exceeding the limits.

1.6 Conclusion

Biological parameter in all locations contain higher bacterial count is due to the discharge of sewage, drainage waste in to the water sources. Even human activities also increase number of various type of bacteria in the water, which increase the number of count in the water.

1.7 Recommendations/Remedial Measures:

- Domestic effluents should be treated and disinfected before discharging.
- Effluents from the non-point sources should be identified. These are required to be collected and treated.
- Use of water of such polluted locations may be useful for salt tolerance crop and is recommended based on special study.
- Use of direct source of water should be avoided.
- Bathing at such location should be restricted.

1.8 Suggestions:

- Create mass awareness in general public regarding surface and ground water quality aspects.
- Water quality Annual Report shall be publicly published every year.

CHAPTER - II

Introduction

Chapter - 2

Introduction

2.1 General

To check the pollution load & water safety for different uses there is need to regularly monitor water quality by using laboratory analysis method. The tests includes physico-chemical parameters & biological parameters.

The water quality monitoring in the area of surface water is performed in order to determine the quality of water. There are 26 stations come under Kolhapur lab Level – II, from Kolhapur, Sangli, Satara, Ratnagiri & Sindhudurga district. For each station 29 parameters are analyzed in the laboratory and 6 parameters are tested at field level. All these records store monthly in SWDES and used for preparing the annual report. These data are considered in order to specify the quality of water at each location. This also helps to identify concentration of water pollution in each source of water at each station.

2.2 Water Quality Monitoring - Objectives

The main objectives of surface water quality monitoring in Maharashtra state is to collect the comprehensive data on the status of present health of important water resources i.e. rivers & reservoirs so as:

- 1) To establish Base Line water quality.
- 2) To detect the trends in water quality changes.
- 3) To provide warning of potentially deleterious changes.
- 4) Surveillance of available resources for drinking and/or irrigation use.

Observations of analysis of physical & chemical parameters as per “Uniform Protocol for Water Quality Monitoring Order 2005” for each location followed by Operation and Maintenance of Water Quality Laboratory Level-II, Kolhapur as per Standard Guidelines and mandates including collection, transportation and analysis of samples , data entry in SWDES

Software and preparation of the said Annual Report as per specific guidelines issued by Superintending Engineer, Hydrology Project Circle(Collection), Nashik.

2.3 Water Quality Monitoring – Scope

- Seasonal averages of all analyzed parameters are calculated for study of seasonal water quality trend at each location.
- Used analysed data for preparation of annual report or study purpose.
- Find out major pollutants in river water at each station.
- Identify remedial measures for water quality.

2.4 Other activities

Other than working of regular Water Quality Monitoring for Water Quality lab level II at Kolhapur, we also analysed water sample of Government, Semi Government, and Private sector.

Apart from HP sample drinking water, industrial effluent, bore water, lake water, and irrigation water analysis is carried out in lab. Most of the students are also approach for analysis of water for study purpose.

During the year 2012 - 13 many clients approached to the laboratory. Are as follows -

- 1) Kolhapur Irrigation Division
- 2) Caspro metal Industry, MIDC Kolhapur.
- 3) Aadhar nursing home, Kolhapur
- 4) Shivaji University Students, Kolhapur.
- 5) Dudhaganga Canal Division.
- 6) Podar Education Trust, Kolhapur.
- 7) Ichalkaranji Nagarparishad, STP Sample.
- 8) Hotel Eligant Greenland, Kolhapur
- 9) Equinox Environment (India) Pvt.Ltd.,Kolhapur

The revenue collected during the reported period is as follows.

Sr. No	Year	Amount
1.	2012 - 2013	1,18,021/-

2.5 Extra activity

Water Quality Lab Level – II @ Kolhapur is achieved 70% marks in CPCB AQC February 2013.

**SALIENT FEATURES OF WATER QUALITY LABORATORY,
AT RAJARAM TANK, KOLHAPUR.**

Address	:	Hydrology Project Sub-Division, Kolhapur Water Quality Lab Level- II. At Rajaram Tank, Opp. Shivaji University, Sarnobat wadi Road Kolhapur – 416 004.
Latitude	:	16 ⁰ 42' 41''
Longitude	:	74 ⁰ 17' 00''
Year of Establishment	:	1 st - February-2003.
No. of Baseline Sample locations	:	4 Nos.
No. of Flux locations	:	2 Nos.
No. of Trend Sample locations	:	19 Nos.
No. of Reservoir locations	:	1 No.
No. of Parameters Analysed	:	34 Nos.
Staff Position	:	Work of Operation & Maintenance of Lab. on annual contract basis.
Government officer/ staff related to the laboratory	:	Er. U.V.Parvate Executive Engineer Er. S. S. Magdum. Assistant Executive Engineer – I Er. M.T. Chougule. Govt. Analyst Sectional Engineer
Agency Staff related to the laboratory	:	M/S Papilon Enviro Engineers,Aurangabad. Mr.Avinash Balankhe. Managing Director.

		<p>Miss. S. S. Sadarekar. Chief Chemist.</p> <p>Miss. S. V. Mudgal Senior Research. Assistant.</p> <p>Miss. M. C. Kalekar. Chemist.</p> <p>Mr. P. R.Mali. Field Chemist.</p>
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Scope of Work: Operation and Maintenance of water Quality Laboratory Level - II, Kolhapur

Outdoor Work :

Collection of surface water and transporting the sample from selected Water Quality network sampling points
as per schedule of sampling during the said period.

The Surface Water sampling includes:

- a) Field determination as per standard guideline.
- b) Field parameters to be tested on site & entry to be taken on ID form.
- c) Sample to be transported to laboratory within prescribed time limit.

Indoor Work:

- Day to Day Operation and Maintenance of Water Quality Laboratory Level II.
- The work includes analysis of water samples as per the test procedures.
- Operating the instruments as per specified instruction manual.
- Entry of data in SWDES Software.
- Participating in Analytical Quality Control Exercise (AQC) round.
 - i) Within Laboratory AQC ii) Intra Laboratory AQC

The Laboratory staff employed;

- 1) Chief Chemist: 1 No.
- 2) Sr. Research Officers: 1 No.
- 3) Research Assistant: 2 Nos.
- 4) Lab. Assistant: 1 No.
- The Indoor work also includes keeping data record.
- Log book of Lab equipment
- Preparation of monthly sampling Schedule.
- Keeping sampling record, instruments operation, Laboratory Management, demonstration Training to Departmental staff as and when required. Information to visitors & Customer Satisfaction. Work is carried out as per flow chart.

Hydrology Project Circle (Collection), Nashik

Water Quality Lab, Level – II, Kolhapur

Organisation Chart

**SUPRINTENDING ENGINEER,
HYDROLOGY PROJECT CIRCLE (COLLECTION), NASHIK**

**EXECUTIVE ENGINEER,
H.P.DIVISION, PUNE**

ASST. ENGINEER GRADE – I H. P. SUB

GOVT. ANALYST

OPERATING AGENCY

CHIEF CHEMIST

ASSISTANT CHEMIST

Table showing No. of Location Covered under the jurisdiction of Water Quality Lab Level-II, Kolhapur.

Sr. no	Station	Name of River	Frequency of sampling	No. Of Samples
				2012 - 13
KOLHAPUR DISTRICT				
1.	Radhanagari I	Bhogawati	Monthly	12
SANGLI DISTRICT				
1.	Mhaisal	Krishna	Monthly	12
2.	Shigaon	Warana	Monthly	12
SATARA DISTRICT				
1.	Ambwade	Yerala	Monthly	00
2.	Bhuinj	Krishna	Monthly	12
3.	Parli	Urmodi	Monthly	04
4.	Rasati	Koyana	Monthly	12
5.	Shivade	Krishna	Monthly	12
SOLAPUR DISTICT				
1.	Devikavathe	Bhima	Monthly	06
RATNAGIRI DISTRICT				
1.	Anjanari	Kajavi	Monthly	11
2.	Barewadi	Bav	Monthly	04
3.	Chatav	Jagbudi	Monthly	08
4.	Kumbharkhani	Gad	Monthly	10
5.	Latwan	Bharaja	Monthly	04
6.	Pastewadi	Kajavi	Monthly	08
7.	Pawarwadi	Bhambedi	Monthly	12
8.	Raipatan	Arjuna	Monthly	12
SINDHUDURGA DISTRICT				
1.	Araye	Achara	Monthly	11
2.	Banda	Terekhol	Monthly	12
3.	Baparde	Local Nala	Monthly	10
4.	Belane	Gad	Monthly	12
5.	Ghonsari-L	Devghar	Monthly	12
6.	Kerawade	Karli	Monthly	11
7.	Kudal	Bhansari	Monthly	12
8.	Shirshingi	Terekhol	Monthly	11
9.	Shivdav	Gad	Monthly	12

Total No. of Samples collected and analyzed during Reported Period (i.e. June 2012 to May 2013) = 254

CHAPTER - III

Methodology

Chapter - 3

Methodology

3.1 General :

Water, is the most essential element to life on earth, for survival of all living organisms. Water on earth is present in two forms i.e. fresh water & marine water. Fortunately almost the entire country is criss-crossed by rivers. Geographical area of the state is divided in five river basins viz. Godavari, Tapi, Narmada, Krishna and west flowing rivers in Konkan region.

In the last century the water sources increasingly polluted due to industrilization urbnization & population explision.

3.2 Aim and Objective

The Hydrology Project goals & main objectives of water quality monitoring in Krishna basin & West Flowing River Tapi from Konkan region are -

- Establish base line quality
- Observe the trend in water quality over a period of time
- To create public awareness as regards water pollution & its prevention.
- Surveillance over pollution through to water quality.

3.3 Monitoring Frequency

Previously the frequency of sample collection for Baseline Stations was once in a month and that of trend stations was twice in a month.

There has been change in the frequency of sample collection from August 2003 given below.

Base Line : Once in a month (June to September)

Trend stations : once in a month

Flux stations : Once in month

Reservoirs : Fortnightly

3.4 Sampling Details

The water samples were collected stations from the main flowing stream of river at depth of 30 cm from the surface. The samples thus collected were transported to the laboratory within 48 hours from the time of collection.

The samples collected in this lab from Kolhapur, Sangli, Satara, Ratnagiri and Sindhudurga district.

3.5 Methodology

Analysis of Physical and Chemical parameters is done in the laboratory on the basis of Standard Analytical Methods, Instrument Operating Instructions, APHA, 21st Ed., 2005.

Data analyzed further validated with prescribed method as per Water Quality Manuals to verify various Ratios manually and is entered in SWDES Software for Water Quality Data Entry. Further the data is sent to State Data Center for further dissemination to user end.

Furthermore to get an idea of about data generated for the period it is decided and instructed to analyzed the generated data for the said period in the form of Annual report with the help of various tools in SWDES Software to find out critical parameters and critical locations in the jurisdiction of this Lab.

The Annual Report is prepared for the year 2012 - 13 in combined. The Table below shows the number of sample analyzed during the reported period. In order to study water quality status station wise, all locations covered under this lab during the year 2012 - 2013 are considered.

TABLE SHOWING SAMPLES ANALYSED DURING THE REPORTING PERIOD

Sr. No.	Year	Baseline Sample	Flux Sample	Trend Sample	Dam Sample	Total
1.	2012 - 13	16	19	215	12	262
Total Samples analyzed during reporting period						262

3.6 Flow Chart

The work of analysis of sample is being monitored on the basis of flow chart generated in the lab as per standard guidelines and analysis of sample is performed as per guidelines of world bank with APHA, 21st Ed, 2005 as a standard procedure for analysis of samples.

As well refers BIS standards IS:10500 and other relevant BIS standards for analysis of various samples received from users for various purposes like Drinking, Irrigation, Ice preparation, Bathing (Swimming Tank), Construction, study and various Research & Development Activities.

FLOW CHART OF ANALYSIS OF HP WATER SAMPLE



```
graph TD; A[Sample Collection from Sampling Source with the help of Depth Sampler] --> B["Treatment: D.O. Fixing, Preservation of MPN Sample, Colour, Odour Temp, pH, EC, tested at field, and fill up ID form."]; B --> C["At Laboratory: Inward the Sample, Giving the Sr. No. to the sample noted into sample entry register"]; C --> D[ID form entry taken into SWEDS Software]; D --> E["Tests are carried out in lab as per Protocols. These tests are: Microbiological test, Chlorophyll-Temp, pH, EC, D.O., B.O.D, Ammonia, Nitrate, Nitrite, TDS, TSS, C.O.D., Turbidity, Alkalinity, Carbonate & Bicarbonate, Chloride, Fluoride, Boron, Iron, Sodium, Potassium, Total Hardness, Phosphorous, and Calcium etc."]; E --> F["Observations & calculations of all Analyzed Parameters are entered in the Data Sheet"]; F --> G["The results of parameters are checked & validated"]; G --> H["After Validation Check, all the data is entered in to Data Record and Validation Register"]; H --> I["This data is finally entered in to SWEDS Software"]; I --> J["Data sent to Executive Engineer, HDP Division, Nashik for further action"];
```

The flowchart illustrates the process of analyzing an HP water sample. It begins with sample collection using a depth sampler, followed by field treatment and preservation of various parameters. The sample is then brought to the laboratory, where it is registered and entered into the SWEDS software. A series of tests are performed in the lab, including microbiological, chemical, and physical tests. The results are recorded in a data sheet, checked for validation, and then entered into a data record and validation register. Finally, the data is entered back into the SWEDS software and sent to the Executive Engineer for further action.

Sample Collection from Sampling Source with the help of Depth Sampler

Treatment: D.O. Fixing, Preservation of MPN Sample, Colour, Odour Temp, pH, EC, tested at field, and fill up ID form.

At Laboratory: Inward the Sample, Giving the Sr. No. to the sample noted into sample entry register

ID form entry taken into SWEDS Software

Tests are carried out in lab as per Protocols. These tests are: Microbiological test, Chlorophyll-Temp, pH, EC, D.O., B.O.D, Ammonia, Nitrate, Nitrite, TDS, TSS, C.O.D., Turbidity, Alkalinity, Carbonate & Bicarbonate, Chloride, Fluoride, Boron, Iron, Sodium, Potassium, Total Hardness, Phosphorous, and Calcium etc.

Observations & calculations of all Analyzed Parameters are entered in the Data Sheet

The results of parameters are checked & validated

After Validation Check, all the data is entered in to Data Record and Validation Register

This data is finally entered in to SWEDS Software

Data sent to Executive Engineer, HDP Division, Nashik for further action

Methodology For the analysis of Water Quality samples the following parameters were analyzed during the Period 2012 - 13

Table showing List of parameters and the methodology used for the analysis.

Sr. No	Parameters	Methodology
1.	Colour	APHA, 21 st Ed., 2005, 2120-B, 2-2
2.	Odour	IS 3025 (Part 5): 1983, Reaffirmed 2006
3.	Temperature	APHA, 21 st Ed., 2005, 2550-B, 2-61
4.	pH	APHA, 21 st Ed., 2005, 4500-H ⁺ - B, 4-90
5.	Electric Conductivity	APHA, 21 st Ed., 2005, 2510- B, 2-47
6.	Dissolved Oxygen	IS 3025 (Part 38): 1989, Reaffirmed 2003
7.	Turbidity	APHA, 21 st Ed., 2005, 2130-B, 2-9
8.	Total Solids	IS 3025 (Part 15): 1984, Reaffirmed 2003, Amds.1
9.	Dissolved Solids	IS 3025 (Part 16): 1984, Reaffirmed 2006, Ed.2.1 (1999-12)
10.	Suspended Solids	IS 3025 (Part 17): 1984, Reaffirmed 2006, Amds.1
11.	NH ₃ -N	APHA, 21 st Ed., 2005, 4500-NH ₃ F, 4-110
12.	NO ₂ ⁻	APHA, 21 st Ed., 2005, 4500-NO ₂ -B, 4-118
13.	NO ₃ ⁻	APHA, 21 st Ed., 2005, 4500-NO ₃ , B -4 -120
14.	Total Phosphorous	APHA, 21 st Ed., 2005, 4500 P, E, 4-153
15.	Biochemical Oxygen Demand	IS 3025 (Part 44): 1993, Reaffirmed 2003, Amds.1
16.	Chemical Oxygen Demand	APHA, 21 st Ed., 2005, 5220-B, 5-15
17.	Potassium K ⁺	IS 3025 (Part 45): 1993, Reaffirmed 2003, Amds.1
18.	Sodium Na ⁺	IS 3025 (Part 45):1993, Reaffirmed 2003, Amds.1
19.	Calcium Ca ⁺⁺	APHA, 21 st Ed., 2005, 3500-B, 3-65
20.	Magnesium Mg ⁺⁺	APHA, 21 st Ed., 2005, 3500-Mg, B, 3-84
21.	Iron (as Fe)	APHA, 21 st Ed., 2005, 3111-B, 3-17
22.	Carbonate CO ₃	APHA, 21 st Ed., 2005, 2320-B, 2-27, 5 -1 & 4500-CO ₂ -D, 4-34
23.	Bi-Carbonate H CO ₃	APHA, 21 st Ed., 2005, 2320-B, 2-27, 5 -3 & 4500-CO ₂ -D, 4-34
24.	Chloride Cl	APHA, 21 st Ed., 2005, 4500-Cl, B, 4-70
25.	Fluoride F	APHA, 21 st Ed., 2005, 4500-F ⁻ , D, 4-85
26.	Boron B	APHA, 21 st Ed., 2005, 4500-B-C, 4-23

27.	Total Coliforms	APHA, 21 st Ed., 2005, 9221-B, 9-49
28.	Faecal Coliforms	APHA, 21 st Ed., 2005, 9221-E, 9-56
29.	Alkalinity	IS 3025 (Part 23): 1986, Reaffirmed 2003, Amds.1

Annual Report
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Kolhapur for the Year 2012 - 13

TABLE SHOWING SAMPLES ANALYSED DURING THE REPORTING PERIOD

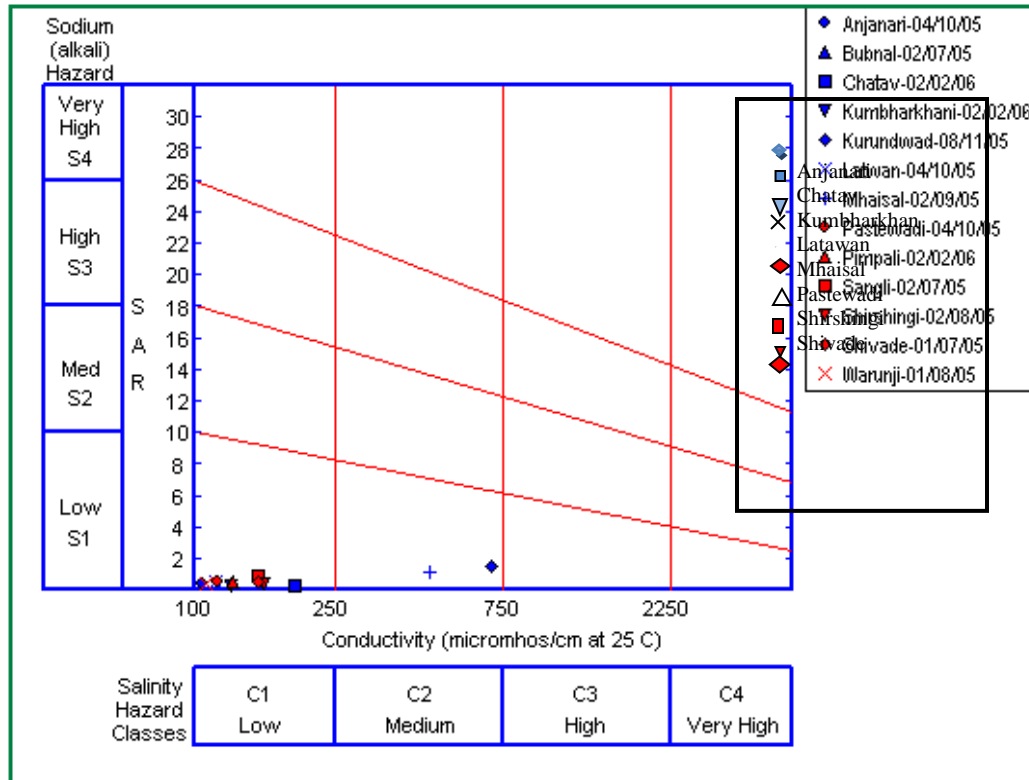
Sr. No.	Year	Baseline Sample	Flux Sample	Trend Sample	Dam Sample	Total
1.	2012 - 13	16	19	215	12	262
Total Samples analyzed during reporting period						262

CHAPTER - IV

Result & Observation

Chapter - 4 Result & Observation

Wilcox Diagram



**Table 1 -Classification of location on the basis of Wilcox technique
towards use of water for irrigation purpose**

Sr. No.	Name of Location	Year	Class as per Wilcox technique	Recommendation
I. Krishna River				
1.	Bhuinj	2012 - 13	C2 & S1	Water is suitable for Irrigation purpose.
2.	Mhaisal	2012 – 13	C2 & S1	Water is suitable for Irrigation purpose.
3.	Shivade	2012 – 13	C2 & S1	Water is suitable for Irrigation purpose.
III. Urmodi River				
1.	Parli	2012 - 13	C1 & S1	Water is good for Irrigation purpose.
IV. Koyana River				
1.	Rasati	2012 - 13	S1	Unable to classify because of inadequate data
V. Warana River				
1.	Shigaon	2012 - 13	S1	Unable to classify because of inadequate data

Sr. No.	Name of Location	Year	Class as per Wilcox Technique	Recommendation
VII. West Flowing River (WFR)Konkan				
1.	Araye	2012 - 13	S1	Unable to classify because of inadequate data
2.	Anjanari	2012 – 13	S1	Unable to classify because of inadequate data
3.	Banda	2012 - 13	C1 & S1	Water is good for Irrigation purpose
4.	Baparde	2012 – 13	-	Unable to classify because of inadequate data
5.	Barewadi	2012 – 13	S1	Unable to classify because of inadequate data
6.	Belane	2012 – 13	C1 & S1	Water is good for Irrigation purpose
7.	Chatav	2012 – 13	S1	Unable to classify because of inadequate data
8.	Ghonsari – L	2012 – 13	S1	Unable to classify because of inadequate data

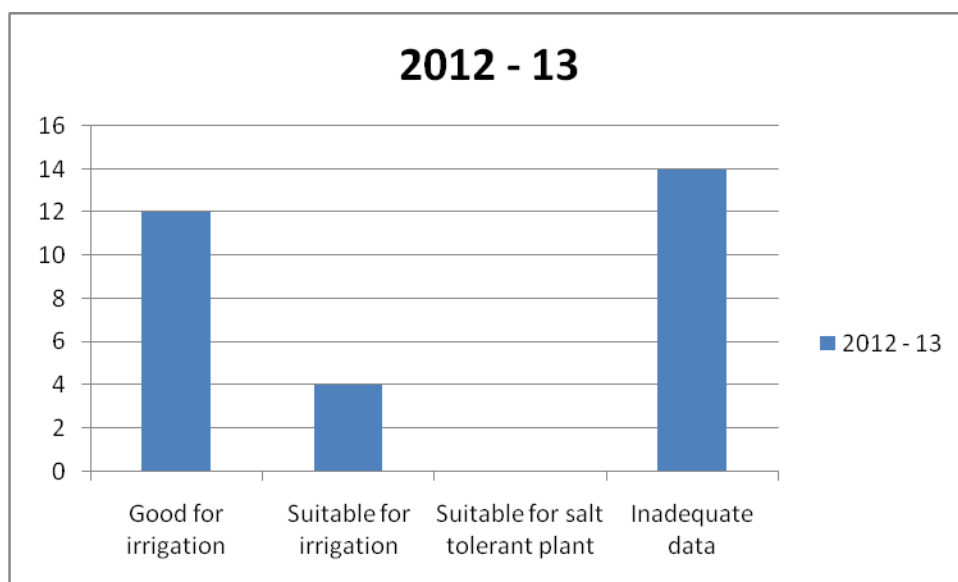
9.	Kerwade	2012 – 13	C1 & S1	Water is good for Irrigation purpose
10.	Kudal	2012 - 13	S1	Unable to classify because of inadequate data
11.	Kumbharkhani	2012 - 13	S1	Unable to classify because of inadequate data
12.	Latwan	2012 - 13	C1 & S1	Water is good for Irrigation purpose
13.	Pastewadi	2012 - 13	C1 & S1	Water is good for Irrigation purpose
14.	Pawarwadi	2012 - 13	S1	Unable to classify because of inadequate data
16.	Raipatan	2012 - 13	S1	Unable to classify because of inadequate data
17.	Shirshingi	2012 - 13	C1 & S1	Water is good for Irrigation purpose
18.	Shivdav	2012 - 13	C1 & S1	Water is good for Irrigation purpose
VIII. Dam location				
1.	Radhanagari	2012 - 13	S1	Unable to classify because of inadequate data

Table 2 - Observation on the basis of classification of location

Sr. No.	River	Year	Observation
1.	Krishna River	2012 – 13	Along the Krishna river there are 5 locations & as per above classification (table – 1) it shows that out of 5 location 4 location such as Bhuinj, Mhaisal, Bubnal & shivade having suitable water for irrigation purpose without any treatment. Sangli (ankali bridge) having a good water for irrigation purpose.
2.	Panchganga River	2012 – 13	Kurundwad & Wadange these 2 locations comes under Panchganga river. As per above classification (table – 1) it show that. Water is good for irrigation purpose at both the locations.
3.	Urmodi River	2012 – 13	Only one location comes under river Urmodi that is Parali. As per above classification (table - 1) there water is good for irrigation purpose.
4.	Koyana River	2012 – 13	Along the Koyana river there are 2 location namely Rasati & Warunji. Both location water sample unable to classify because of inadequate data.
5.	Warana River	2012 – 13	There is only one location such as Shigaon. There water sample unable to classify because of inadequate data.
6.	West Flowing River Konkan	2012 – 13	Along Waste flowing river there are 18 locations and as per above (table - 1) classification it shows that out of 18 locations 10 locations such as Araye, Anjanari, Baparde, Barewadi, Chatav, Ghonsari – (L). Kudal, Kumbharkhani, Pawarwadi, Raipatan, there water is unable to classify because of inadequate data. And remaining 8 locations i.e. Banda, Belane, Kerwade, Latwan Pastewadi Pimpli, Shirshingi & Shivdav having water is good for irrigation purpose.
7.	Dam Location	2012 – 13	1 locations goes under dam i. e. Radhanagari and as per above (Table - 1) classification it shows that there water is unable for classification because of inadequate data.

Table 3 - Abstract for classification of water towards Irrigation purpose

Sr. No.	Year	Good for irrigation	Suitable for irrigation	Suitable for salt tolerant plant	Inadequate data	Total
1.	2012 - 13	12	5	0	14	31



Data Abstract For 2012 – 13

Table - 1 KOLHAPUR DISTRICT										
Parameter	Unit	Season								
		Monsoon			Winter			Summer		
		Min	Max	Mean	Min	Max	Mean	Min	Max	Mean
Station : Radhanagari										
DO	mg/L	5.0	8.4	6.7	7.4	7.8	7.6	7.4	8.1	7.8
BOD	mg/L	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.2	1.1
COD	mg/L	7.0	9.0	8.0	7.0	8.0	7.5	7.0	9.0	8.0
Total coliforms	MPN/100 ml	15.0	25.0	20.0	17.0	25.0	21.0	12.0	20.0	16.0
Total Dissolved Solids	mg/L	18.0	44.0	31.0	14.0	26.0	20.0	16.0	24.0	20.0
Table - 2 SANGLI DISTRICT										
Parameter	Unit	Season								
		Monsoon			Winter			Summer		
		Min	Max	Mean	Min	Max	Mean	Min	Max	Mean
Station : Shigaon										
DO	mg/L	7.2	7.8	7.5	7.2	7.4	7.3	7.0	8.2	7.6
BOD	mg/L	1.0	1.3	1.2	1.0	1.2	1.1	1.2	1.4	1.3
COD	mg/L	7.0	8.0	7.5	6.0	8.0	7.0	4.0	7.0	5.5
Total coliforms	MPN/100 ml	700.0	1400.0	1050.0	790.0	1200.0	995.0	490.0	700.0	595.0
Total Dissolved Solids	mg/L	42.0	164.0	103.0	25.0	58.0	41.5	46.0	98.0	72.0
Station: Mhaisal										
DO	mg/L	7.0	7.6	7.3	7.0	7.8	7.4	7.0	7.8	7.4
BOD	mg/L	1.2	1.4	1.3	1.2	1.4	1.3	1.0	2.6	1.8
COD	mg/L	7	12	9.5	6	7	6.5	8	8	8
Total coliforms	MPN/100 ml	840.0	2400.0	1620.0	630.0	1500.0	1065.0	840.0	1400.0	1120.0
Total Dissolved Solids	mg/L	84.0	276.0	180.0	42.0	114.0	78.0	124.0	198.0	161.0

Table - 3

SATARA DISTRICT

Parameter	Unit	Season								
		Monsoon			Winter			Summer		
		Min	Max	Mean	Min	Max	Mean	Min	Max	Mean
Station: Bhuinj										
DO	mg/L	7.0	7.2	7.1	7.2	8.4	7.8	7.4	8.6	8.0
BOD	mg/L	1.2	1.2	1.2	1.2	1.4	1.3	1.0	1.4	1.2
COD	mg/L	7.0	8.0	7.5	7.0	8.0	7.5	13.0	6.0	9.5
Total coliforms	MPN/100 ml	1100.0	1700.0	1400.0	840.0	2200.0	1400.0	940.0	2100.0	1520.0
Total Dissolved Solids	mg/L	84.0	215.0	149.5	98.0	174.0	136.0	144.0	168.0	156.0
Station: Parli										
DO	mg/L	7.0	7.2	7.1	-	-	-	-	-	-
BOD	mg/L	1.0	1.2	1.1	-	-	-	-	-	-
COD	mg/L	6.0	8.0	7.0	-	-	-	-	-	-
Total coliforms	MPN/100 ml	3500.0	9200.0	6350.0	-	-	-	-	-	-
Total Dissolved Solids	mg/L	30.0	40.0	35.0	-	-	-	-	-	-
Station: Shivade										
DO	mg/L	7.0	7.4	7.2	7.0	7.4	7.2	7.4	8.1	7.8
BOD	mg/L	1.4	1.4	1.4	1.2	1.2	1.2	1.1	6.0	3.6
COD	mg/L	6.0	12.0	9.0	7.0	9.0	8.0	7.0	9.0	8.0
Total coliforms	MPN/100 ml	840.0	1400.0	1120.0	940.0	2800.0	1870.0	1500.0	2400.0	1950.0
Total Dissolved Solids	mg/L	28.0	168.0	98.0	78.0	214.0	146.0	140.0	184.0	162.0
Station : Rasati										
DO	mg/L	7.0	7.4	7.2	7.0	7.8	7.4	7.0	7.4	7.2
BOD	mg/L	11.0	1.0	1.0	1.0	1.2	1.1	1.0	1.1	1.1
COD	mg/L	5.0	7.0	6.0	5.0	5.0	5.0	5.0	8.0	6.5
Total coliforms	MPN/100 ml	220.0	480.0	350.0	330.0	700.0	515.0	460.0	700.0	580.0
Total Dissolved Solids	mg/L	22.0	92.0	57.0	12.0	48.0	30.0	21.0	42.0	31.5

Table - 4**RATNAGIRI DISTRICT**

Parameter	Unit	Season								
		Monsoon			Winter			Summer		
		Min	Max	Mean	Min	Max	Mean	Min	Max	Mean
Station: Latwan										
DO	mg/L	4.0	7.8	5.9	-	-	-	-	-	-
BOD	mg/L	1.0	1.0	1.0	-	-	-	-	-	-
COD	mg/L	8.0	10.0	9.0	-	-	-	-	-	-
Total coliforms	MPN/100 ml	220.0	580.0	400.0	-	-	-	-	-	-
Total Dissolved Solids	mg/L	56.0	88.0	72.0	-	-	-	-	-	-
Station: Chatav										
DO	mg/L	4.4	8.2	6.3	7.8	8.0	7.9	-	-	-
BOD	mg/L	1.0	1.2	1.1	1.0	1.2	1.1	-	-	-
COD	mg/L	8.0	10.0	9.0	8.0	9.0	8.5	-	-	-
Total coliforms	MPN/100 ml	320.0	1100.0	710.0	430.0	2400.0	1415.0	-	-	-
Total Dissolved Solids	mg/L	46.0	62.0	54.0	28.0	48.0	38.0	-	-	-
Station : Kumbharkhani										
DO	mg/L	4.0	7.6	5.8	7.6	8.0	7.8	7.2	8.0	7.6
BOD	mg/L	1.0	1.4	1.2	1.0	1.2	1.1	1.0	1.0	1.0
COD	mg/L	8.0	9.0	8.5	8.0	10.0	9.0	8.0	8.0	8.0
Total coliforms	MPN/100 ml	2800.0	5400.0	4100.0	840.0	2800.0	1820.0	1100.0	1200.0	1150.0
Total Dissolved Solids	mg/L	50.0	74.0	62.0	20.0	62.0	41.0	44.0	50.0	47.0

Station : Pastewadi										
DO	mg/L	4.0	8.0	6.0	7.6	8.0	7.8	-	-	-
BOD	mg/L	1.0	1.0	1.0	1.0	1.2	1.1	-	-	-
COD	mg/L	8.0	9.0	8.5	9.0	10.0	9.5	-	-	-
Total coliforms	MPN/100 ml	1700.0	2200.0	1950.0	1700.0	2400.0	2050.0	-	-	-
Total Dissolved Solids	mg/L	60.0	84.0	72.0	30.0	52.0	41.0	-	-	-
Station : Raipatan										
DO	mg/L	4.8	8.0	6.4	7.2	8.0	7.6	7.6	8.0	7.8
BOD	mg/L	1.0	1.2	1.1	1.0	1.2	1.1	1.0	1.2	1.1
COD	mg/L	8.0	9.0	8.5	7.0	9.0	8.0	8.0	9.0	8.5
Total coliforms	MPN/100 ml	1200.0	2400.0	1800.0	1300.0	2200.0	1750.0	940.0	1400.0	1170.0
Total Dissolved Solids	mg/L	56.0	66.0	61.0	30.0	62.0	46.0	28.0	38.0	33.0
Station: Pawarwadi										
DO	mg/L	4.4	8.0	6.2	7.4	7.8	7.6	7.8	8.0	7.9
BOD	mg/L	1.0	1.2	1.1	1.0	1.2	1.1	1.2	1.2	1.2
COD	mg/L	8.0	9.0	8.5	7.0	10.0	8.5	8.0	10.0	9.0
Total coliforms	MPN/100 ml	840.0	2200.0	1520.0	1500.0	2800.0	2150.0	1100.0	1700.0	1400.0
Total Dissolved Solids	mg/L	46.0	78.0	62.0	22.0	54.0	38.0	24.0	44.0	34.0
Station: Anjanari										
DO	mg/L	3.8	8.0	5.9	7.4	7.8	7.6	7.2	7.8	7.5
BOD	mg/L	1.0	1.2	1.1	1.0	1.2	1.1	1.0	1.2	1.1
COD	mg/L	7.0	10.0	8.5	8.0	8.0	8.0	8.0	9.0	8.5
Total coliforms	MPN/100 ml	4300.0	9200.0	6750.0	1500.0	2800.0	2150.0	700.0	940.0	820.0
Total Dissolved Solids	mg/L	46.0	80.0	63.0	40.0	72.0	56.0	54.0	80.0	67.0

Station: Barewadi										
DO	mg/L	3.5	8.0	5.8	-	-	-	-	-	-
BOD	mg/L	1.0	1.2	1.1	-	-	-	-	-	-
COD	mg/L	8.0	9.0	8.5	-	-	-	-	-	-
Total coliforms	MPN/100 ml	3500.0	4300.0	3900.0	-	-	-	-	-	-
Total Dissolved Solids	mg/L	34.0	70.0	52.0	-	-	-	-	-	-
Table - 5 SINDHUDURGA DISTRICT										
Parameter	Unit	Season								
		Monsoon			Winter			Summer		
		Min	Max	Mean	Min	Max	Mean	Min	Max	Mean
Station: Shirshingi										
DO	mg/L	4.8	7.8	6.3	7.4	8.0	7.7	7.8	8.2	8.0
BOD	mg/L	1.0	1.2	1.1	1.0	1.2	1.1	1.0	1.2	1.1
COD	mg/L	8.0	9.0	8.5	8.0	9.0	8.5	8.0	9.0	8.5
Total coliforms	MPN/100 ml	1700.0	4300.0	3000.0	1400.0	2400.0	1900.0	1100.0	1400.0	1250.0
Total Dissolved Solids	mg/L	50.0	54.0	52.0	32.0	52.0	42.0	46.0	68.0	57.0
Station: Kerwade										
DO	mg/L	4.4	7.8	6.1	7.4	8.2	7.8	7.4	8.4	7.9
BOD	mg/L	1.0	1.0	1.0	1.0	1.2	1.1	1.0	1.0	1.0
COD	mg/L	8.0	10.0		7.0	9.0		8.0	8.0	8.0
Total coliforms	MPN/100 ml	1700.0	3500.0	2600.0	1700.0	2400.0	2050.0	1400.0	1500.0	1450.0
Total Dissolved Solids	mg/L	32.0	54.0	43.0	26.0	48.0	37.0	30.0	62.0	46.0
Station: Shivdav										
DO	mg/L	4.6	7.8	6.2	7.0	7.8	7.4	7.8	8.0	7.9
BOD	mg/L	1.0	1.2	1.1	1.0	1.2	1.1	1.0	1.2	1.1
COD	mg/L	7.0	8.0	7.5	7.0	8.0	7.5	8.0	8.0	8.0
Total coliforms	MPN/100 ml	400.0	580.0	490.0	700.0	3500.0	2100.0	1100.0	2100.0	1600.0
Total Dissolved Solids	mg/L	60.0	76.0	68.0	48.0	60.0	54.0	50.0	88.0	69.0

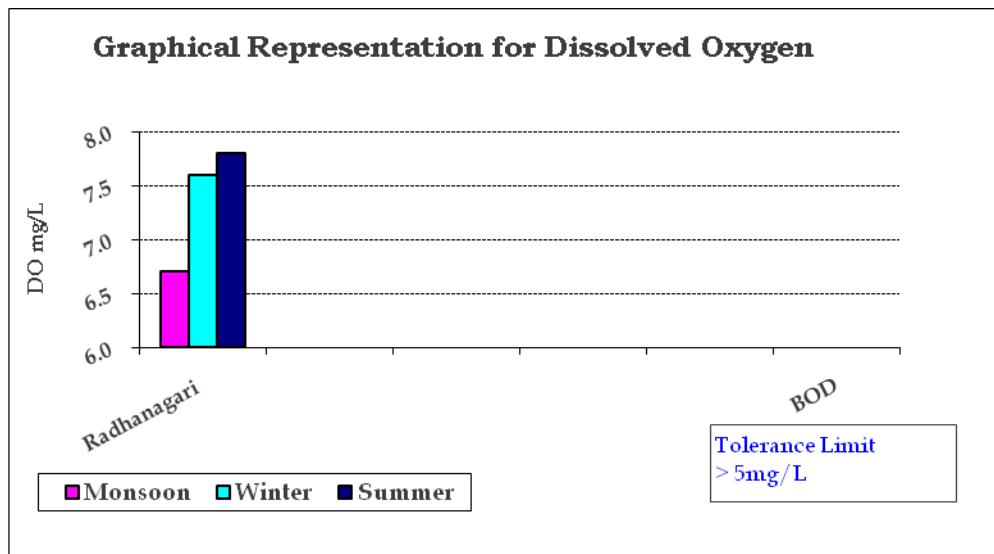
Station: Ghonsaril - L										
DO	mg/L	4.2	8.2	6.2	6.2	8.0	7.1	7.8	7.8	7.8
BOD	mg/L	1.0	1.0	1.0	1.0	1.2	1.1	1.0	1.2	1.1
COD	mg/L	8.0	9.0		8.0	9.0		8.0	9.0	
Total coliforms	MPN/100 ml	1700.0	2800.0	2250.0	940.0	2100.0	1520.0	700.0	2100.0	1400.0
Total Dissolved Solids	mg/L	28.0	54.0	41.0	24.0	34.0	29.0	22.0	26.0	24.0
Station: Banda										
DO	mg/L	4.4	8.0	6.2	7.4	7.8	7.6	7.4	8.3	7.9
BOD	mg/L	1.0	1.0	1.0	1.0	1.2	1.1	1.0	1.2	1.1
COD	mg/L	8.0	9.0	8.5	8.0	10.0	9.0	8.0	9.0	8.5
Total coliforms	MPN/100 ml	3500.0	4500.0	4000.0	2100.0	4300.0	3200.0	700.0	1700.0	1200.0
Total Dissolved Solids	mg/L	48.0	58.0	53.0	30.0	54.0	42.0	36.0	80.0	58.0
Station: Kudal										
DO	mg/L	4.4	7.8	6.1	7.4	8.0	7.7	7.1	7.8	7.5
BOD	mg/L	1.0	1.2	1.1	1.0	1.2	1.1	1.0	1.2	1.1
COD	mg/L	8.0	10.0	9.0	8.0	9.0	8.5	8.0	9.0	8.5
Total coliforms	MPN/100 ml	1700.0	2800.0	2250.0	1700.0	3500.0	2600.0	1700.0	2200.0	1950.0
Total Dissolved Solids	mg/L	48.0	62.0	55.0	36.0	62.0	49.0	22.0	56.0	39.0
Station: Belane										
DO	mg/L	4.4	8.0	6.2	7.6	8.0	7.8	7.2	7.8	7.5
BOD	mg/L	1.0	1.0	1.0	1.0	1.2	1.1	1.0	1.0	1.0
COD	mg/L	7.0	8.0	7.5	8.0	10.0	9.0	8.0	9.0	8.5
Total coliforms	MPN/100 ml	390.0	2800.0	1595.0	2400.0	5400.0	3900.0	1100.0	2200.0	1650.0
Total Dissolved Solids	mg/L	36.0	64.0	50.0	44.0	62.0	53.0	52.0	104.0	78.0
Station : Araye										
DO	mg/L	4.8	8.0	6.4	7.4	8.0	7.7	7.2	7.6	7.4
BOD	mg/L	1.0	1.2	1.1	1.0	1.2	1.1	1.0	1.2	1.1
COD	mg/L	8.0	9.0	8.5	8.0	10.0	9.0	8.0	9.0	8.5
Total coliforms	MPN/100 ml	1400.0	9200.0	5300.0	3500.0	16000.0	9750.0	2100.0	2800.0	2450.0
Total Dissolved Solids	mg/L	26.0	64.0	45.0	14.0	34.0	24.0	16.0	26.0	21.0

Station : Baparde										
DO	mg/L	4.4	7.8	6.1	7.6	7.8	7.7	7.8	7.8	7.8
BOD	mg/L	1.0	1.2	1.1	1.0	1.0	1.0	1.0	1.0	1.0
COD	mg/L	8.0	8.0	8.0	8.0	10.0	9.0	8.0	9.0	8.5
Total coliforms	MPN/100 ml	1700.0	16000.0	8850.0	1300.0	1600.0	1450.0	2200.0	2200.0	2200.0
Total Dissolved Solids	mg/L	26.0	34.0	30.0	22.0	24.0	23.0	28.0	30.0	29.0

PART I: RESULT OBTAINED DURING 2012 – 2013

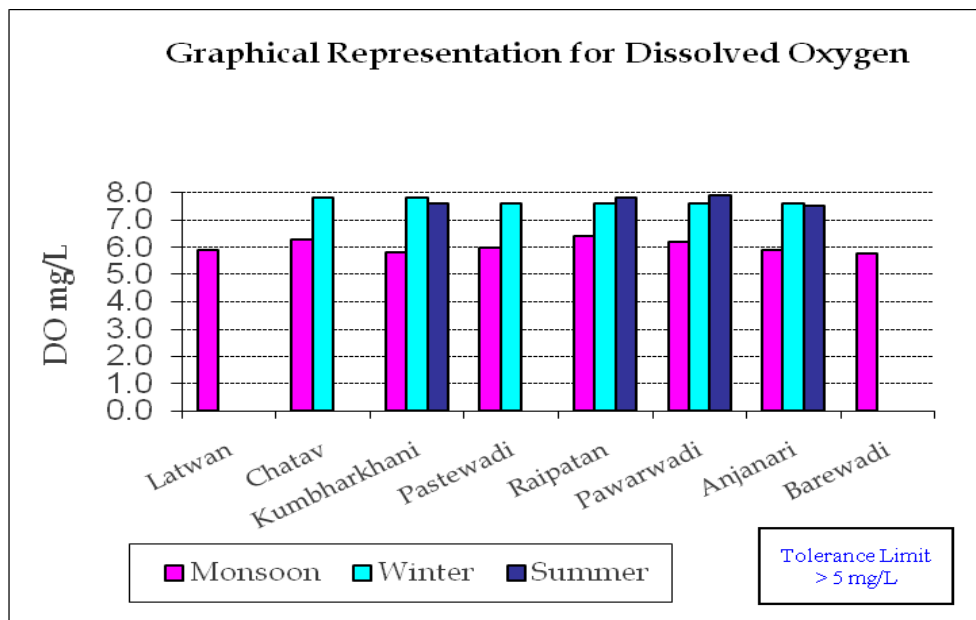
I) Dissolved Oxygen

1) Kolhapur District



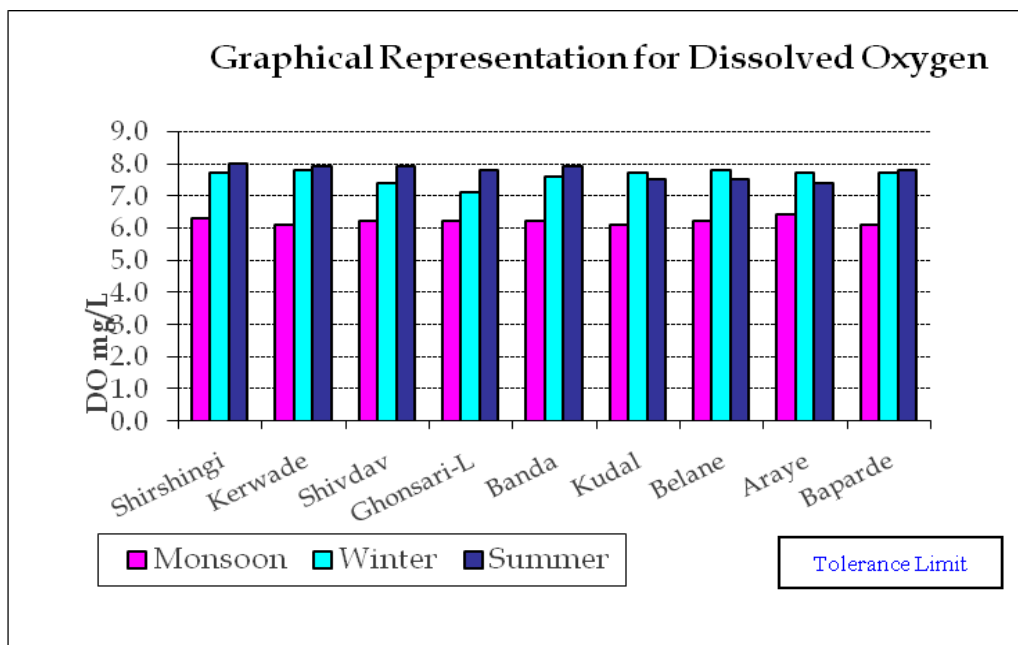
From the above graph, it can be observed that DO level of Radhanagari is within tolerance limit during all the seasons.

2) Ratnagiri District



From the above graph, it is observed that DO level of all other stations is within desirable limit.

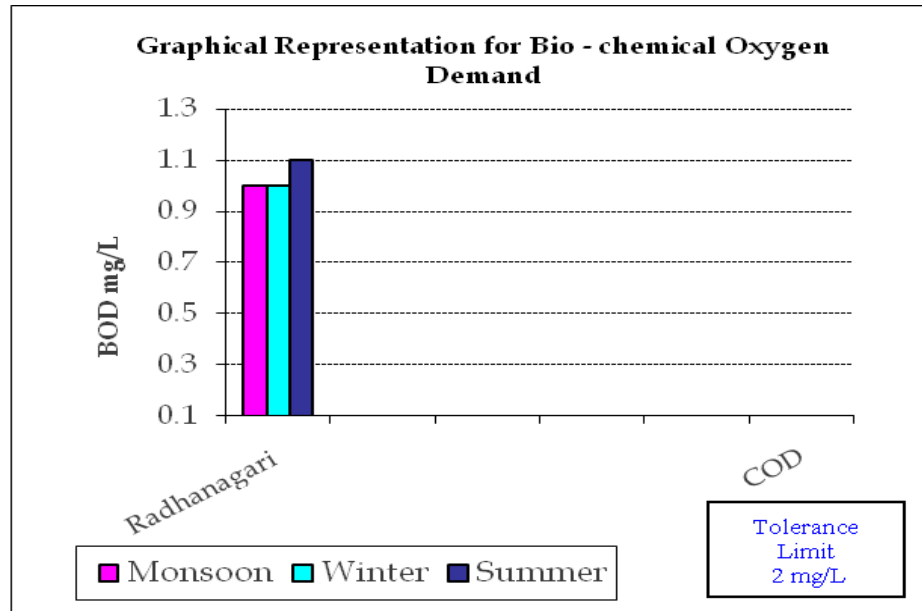
3) Sindhudurga District



From the above graph, it is observed that DO level of all the stations is within limit.

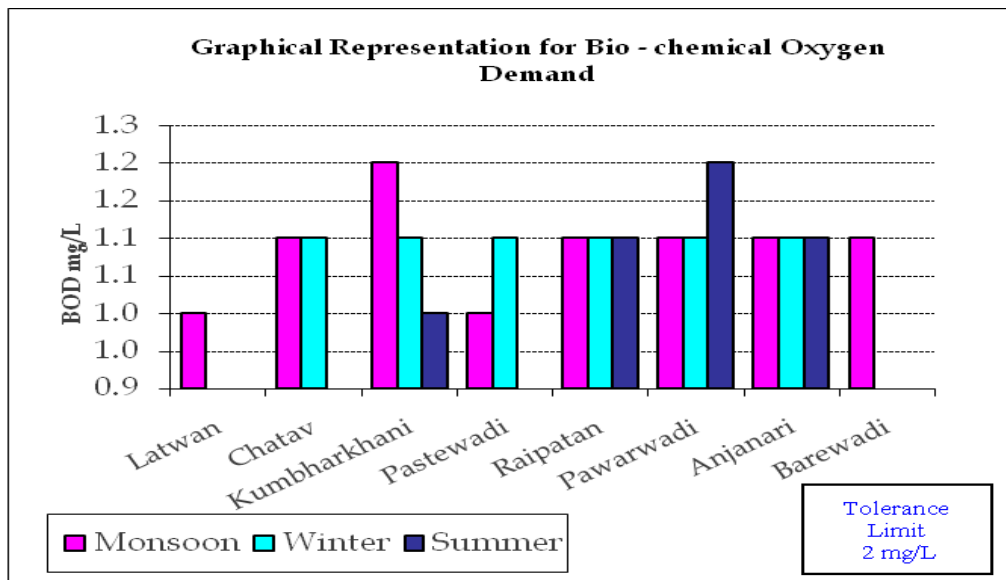
II) Bio – chemical Oxygen Demand

1) Kolhapur District



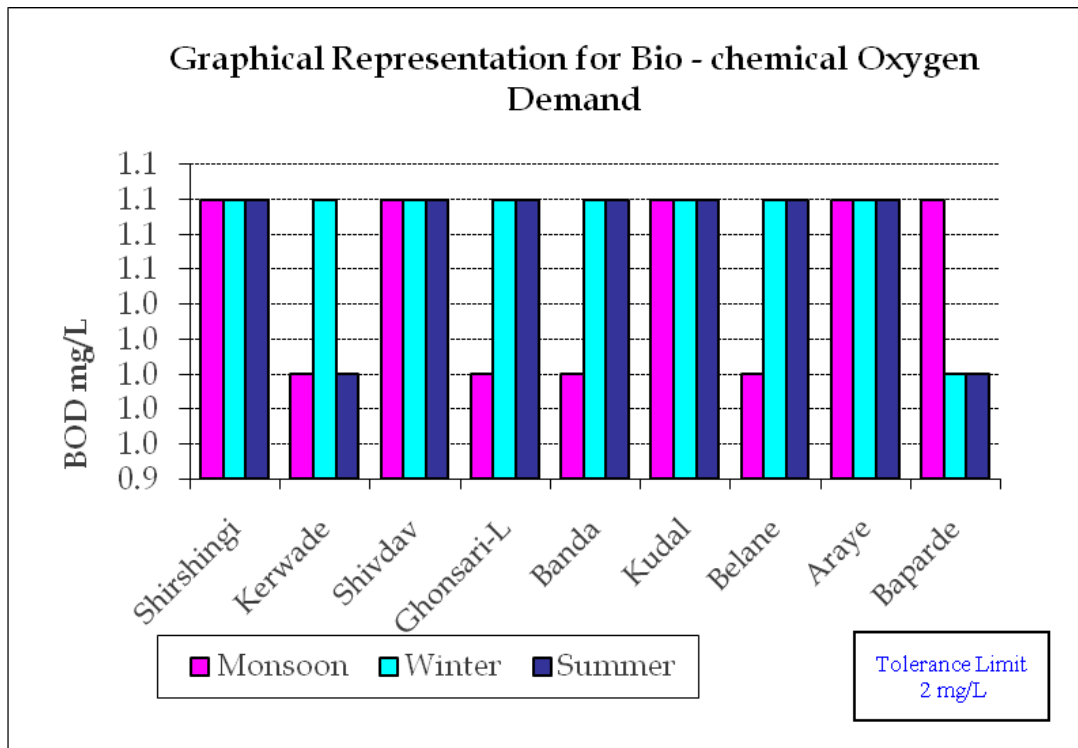
From the above graph, it is observed that BOD level of Radhanagari station is within limit.

2) Ratnagiri District



From the above graph, it is observed that, BOD level of all the stations is within desirable limit during all the seasons.

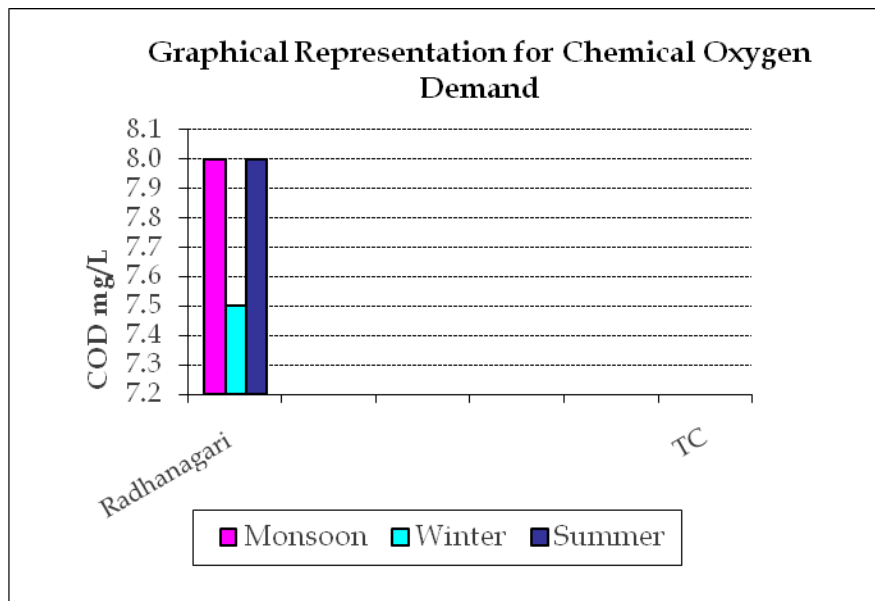
3) Sindhudurga District



From the above graph, it is observed that BOD level is within desirable limit for all the stations.

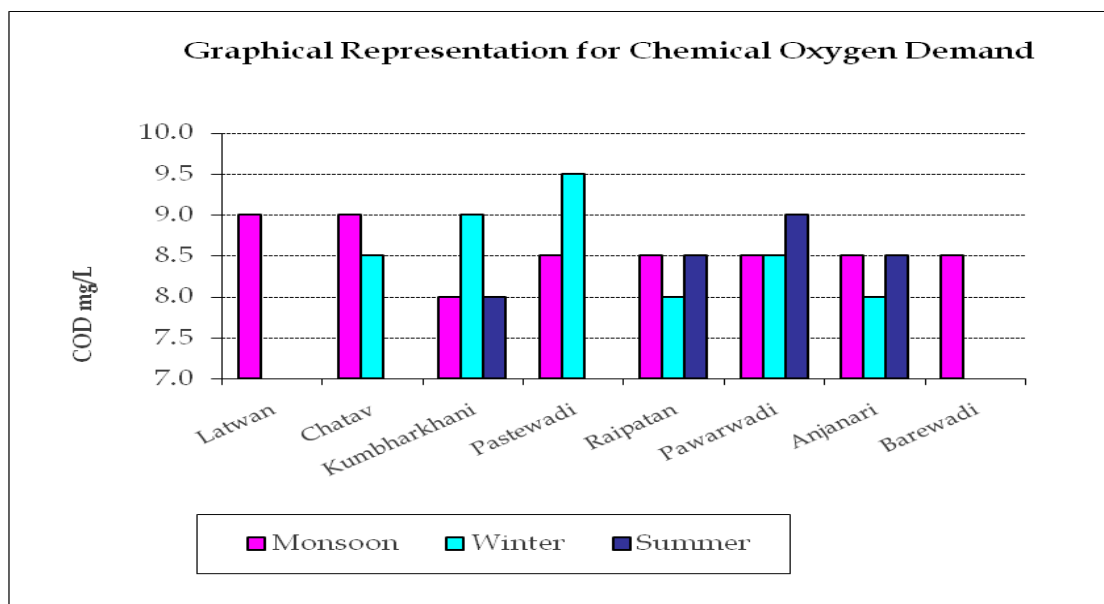
III) Chemical Oxygen Demand

1) Kolhapur District



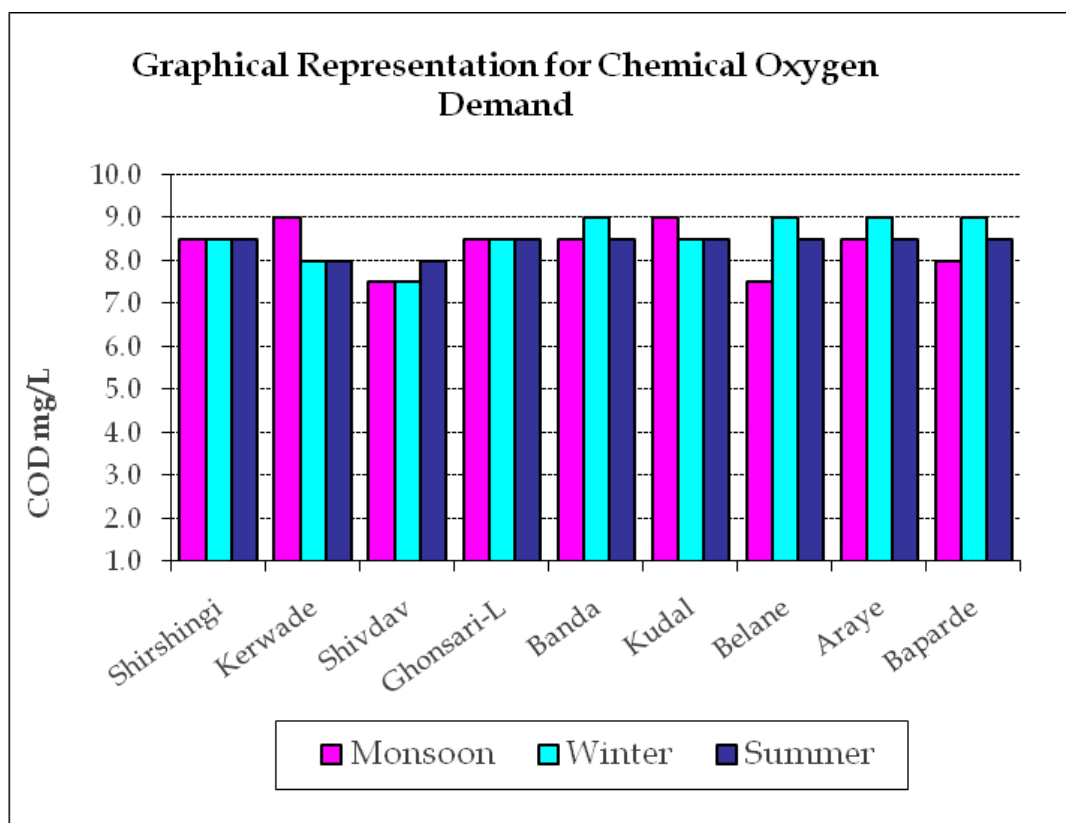
From the above graph, it is observed that, Radhanagari station shows COD level between 3 to 8 mg/L.

2) Ratnagiri District



From the above graph, it is observed that COD level of all stations are above 4 mg/L in all seasons.

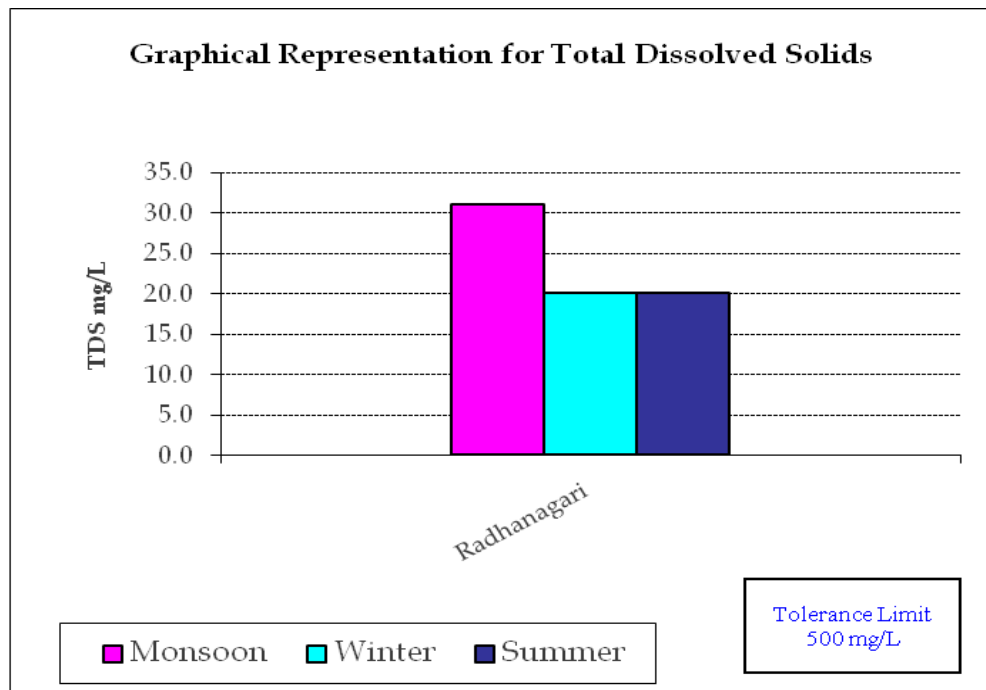
3) Sindhudurga District



From the above graph, it is observed that COD level of all the stations shows high during all seasons.

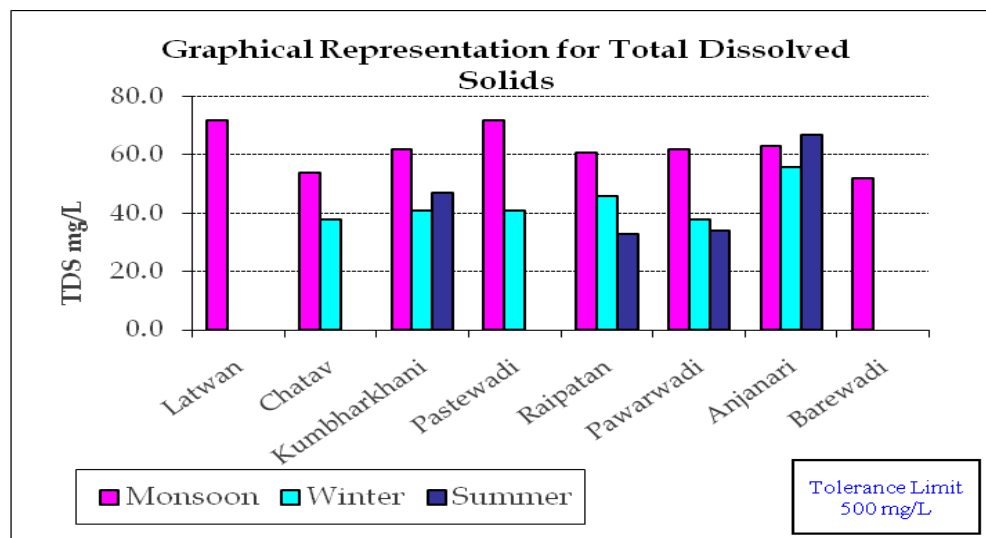
IV) Total Dissolved Solids (TDS)

1) Kolhapur District



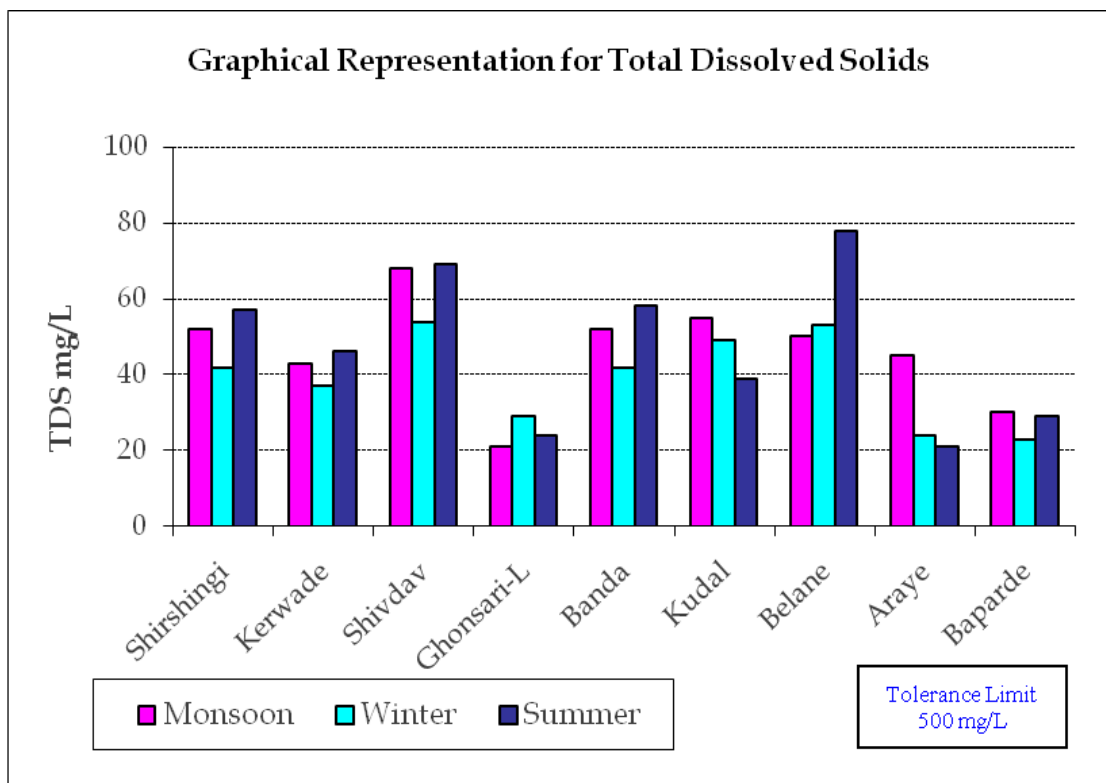
From the above graph, it is observed that, TDS level of Radhanagari station is within desirable limit during all the season.

2) Ratnagiri District



From the above graph, it is observed that, TDS level of all the stations is within desirable limit during all the season.

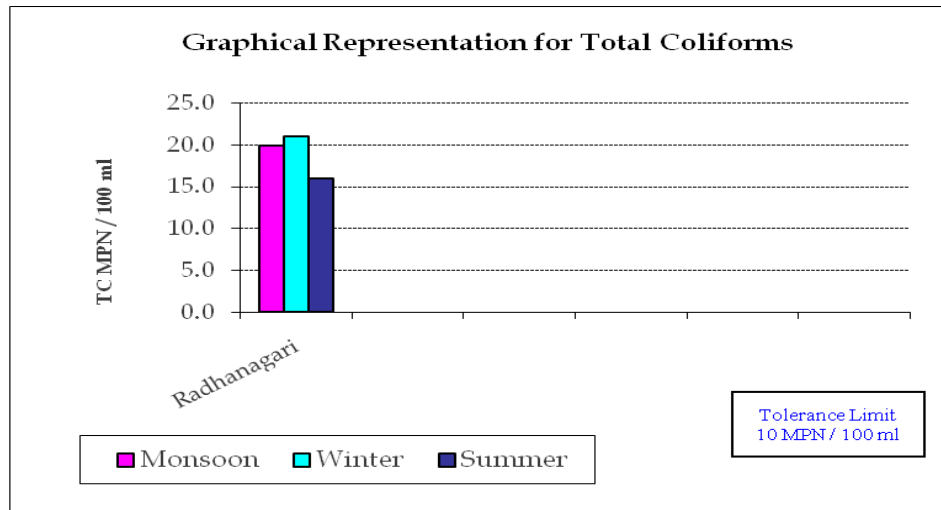
3) Sindhudurga District



From the above graph, it is observed that, TDS level of all the stations is within desirable limit during all the season.

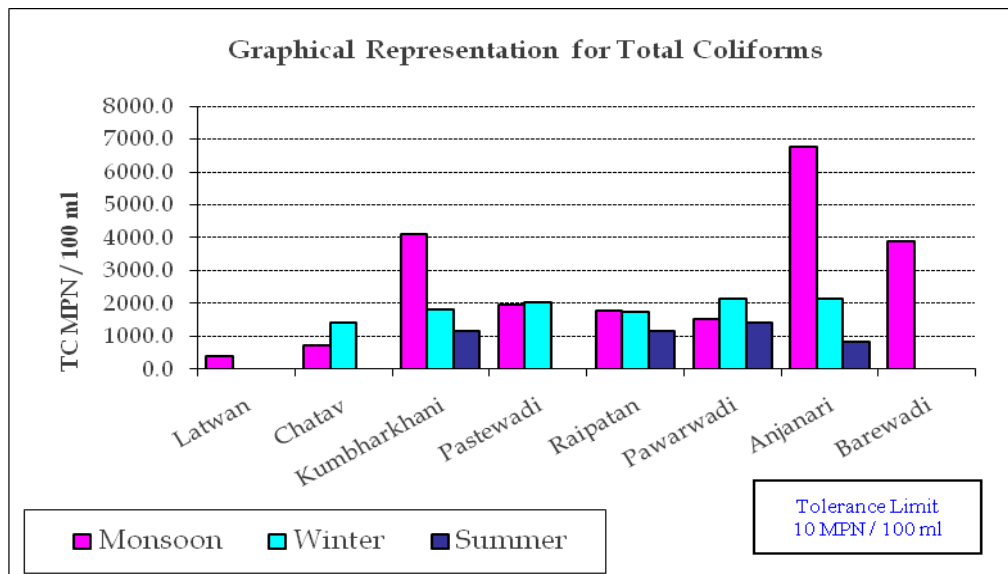
V) Total Coliforms (TC)

1) Kolhapur District



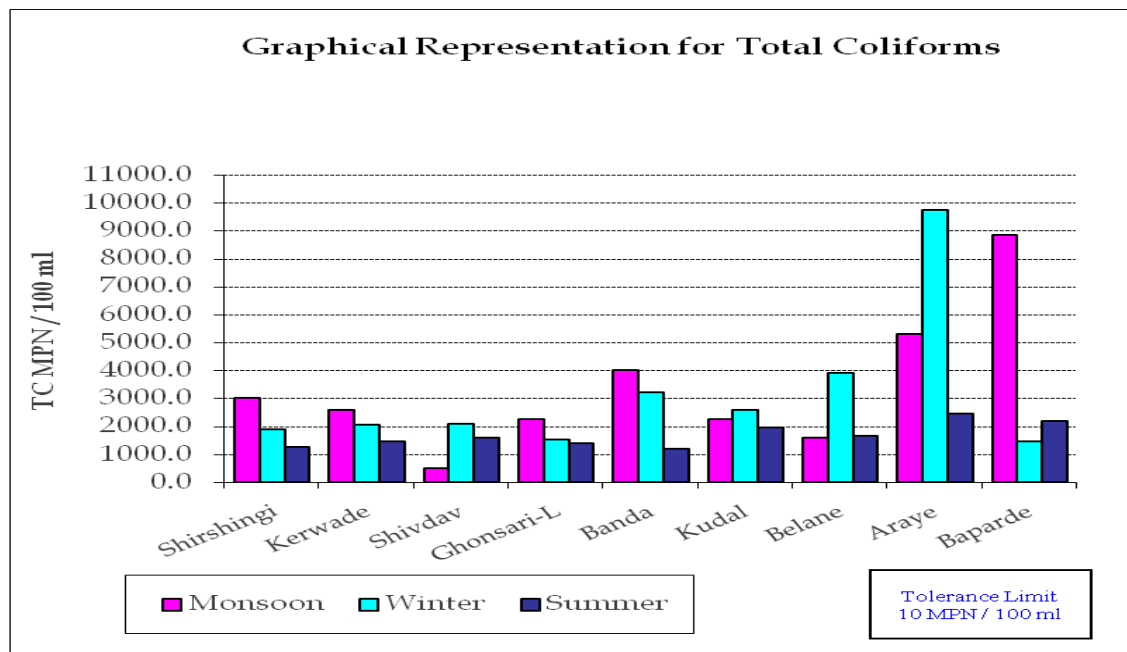
From the above graph, it is observed that, Radhanagari station shows high bacterial count i.e. above the tolerance limit during all the season.

2) Ratnagiri District



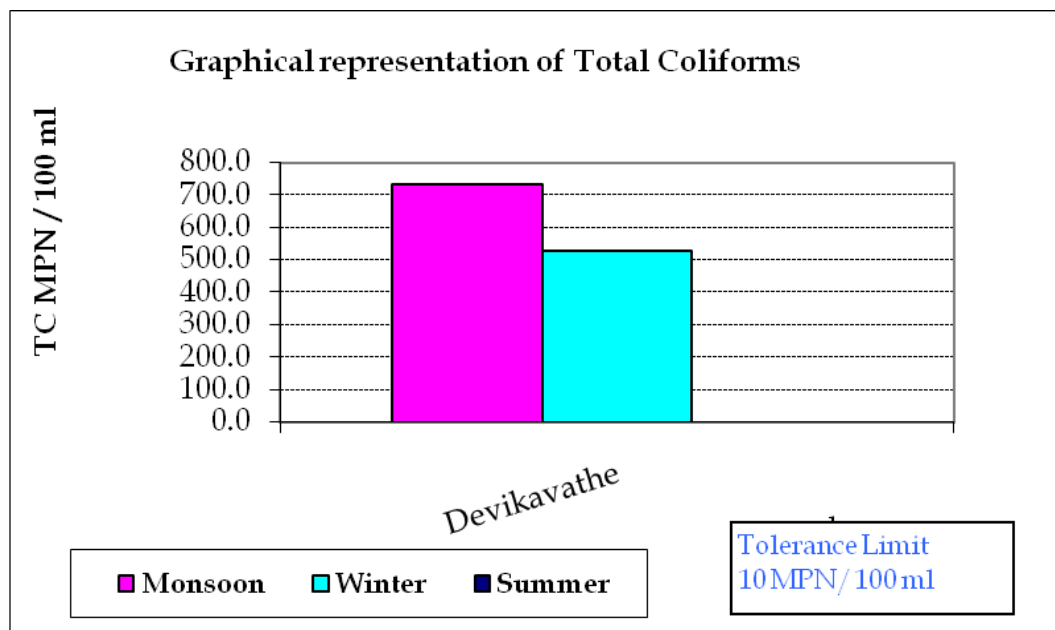
From the above graph, it is observed that, Total coliforms count of all the stations is high than tolerance limit during all the season. But Latwan, Raipatan shows very high coliforms count during monsoon.

3) Sindhudurga District



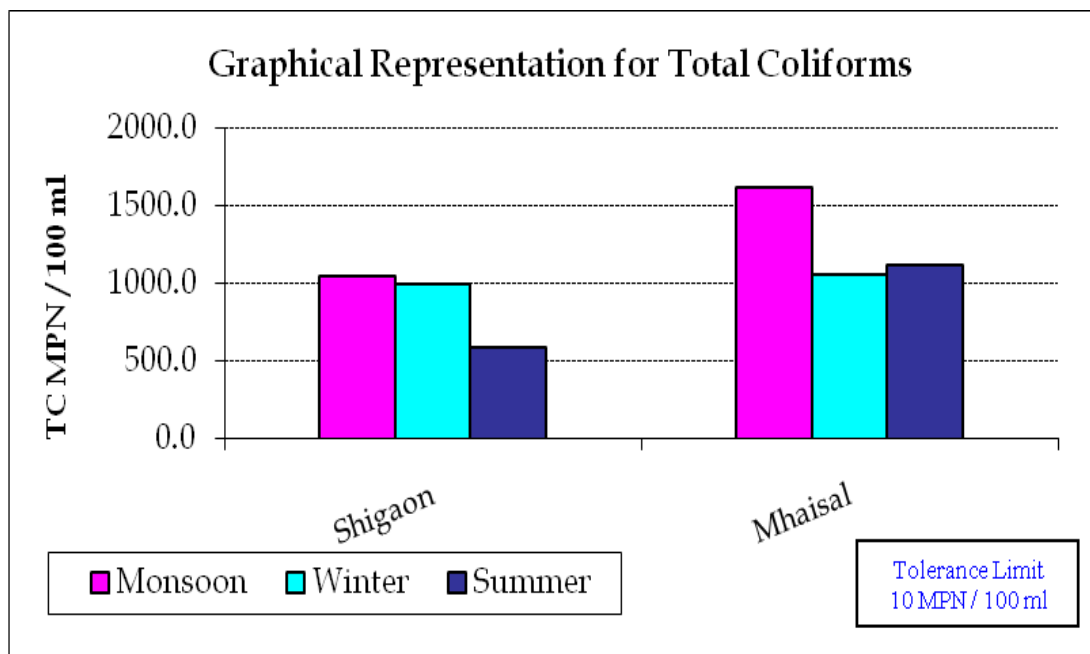
From the above graph, it is observed that, Total coliforms count of all the stations is high than tolerance limit during all the season.

4) Solapur District



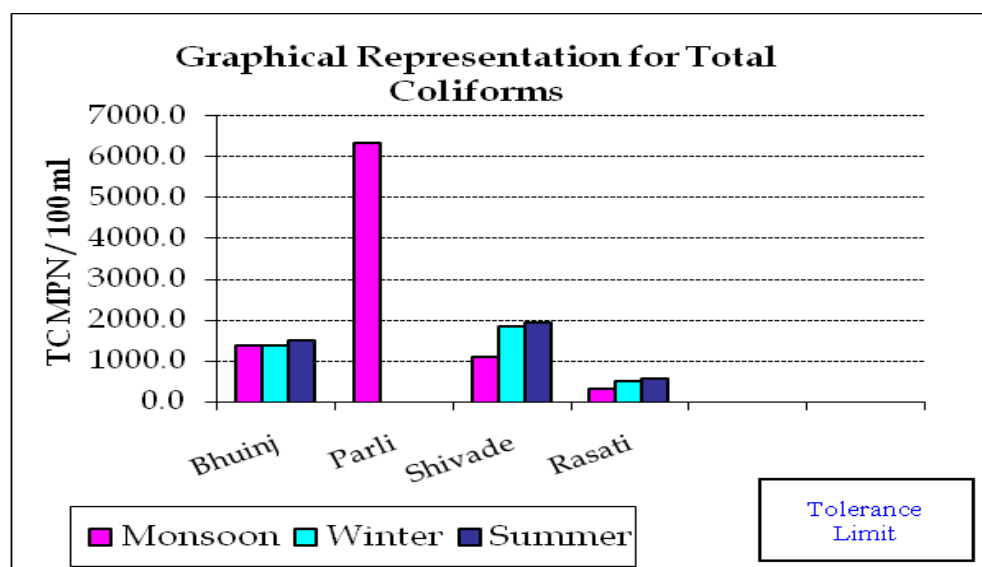
From the above graph, it is observed that, Total coliforms count of Devikavathe station is high than tolerance limit during all the season.

5) Sangli District



From the above graph, it is observed that, Total coliforms count of all the stations is high than tolerance limit during all the season.

6) Satara District



From the above graph, it is observed that, Total coliforms count of all the stations is high than tolerance limit during all the season.

CHAPTER – V

Conclusion

Chapter - 5

Conclusion

CONCLUSION FOR 2012 – 13

Many water quality parameters are used to reflect the impact of various impurities on selected water uses, as well as to quantify the extend of such impact of. Such water quality parameters may be either physical, chemical or biological.

From the previous chapter we concluded that, bacterial count of Ratnagiri district is very high than other stations during all season. This is an indicator of high organic pollution in the river body. Due to the human activity & release of industrial effluent in a river basins, it is very serious problem which dealing with this sites.

The Concentration of coliform bacteria of both faecal & non- faecal origin was found very high. This is a strong indicator of both urban pollution & discharge of city sewage in the water body.

Thus the water is not suitable for drinking purposes without any conventional treatment & disinfection.

REMEDIAL MEASURS

- For Industrial effluent & sewage water give treatment before discharge into river body.
- Use of such water for salt tolerance crop is recommended based on special study.
- Avoid human activities like cattle washing, bathing etc. in river basins.
- Awareness in local people about river water pollution.
- Classification of source may be as per use of water for irrigation based on Sodium Absorption Ratio, Percent Sodium, and Residual Sodium Carbonate.

CHAPTER – VI

Other Activities

Chapter - 6

Other Activities

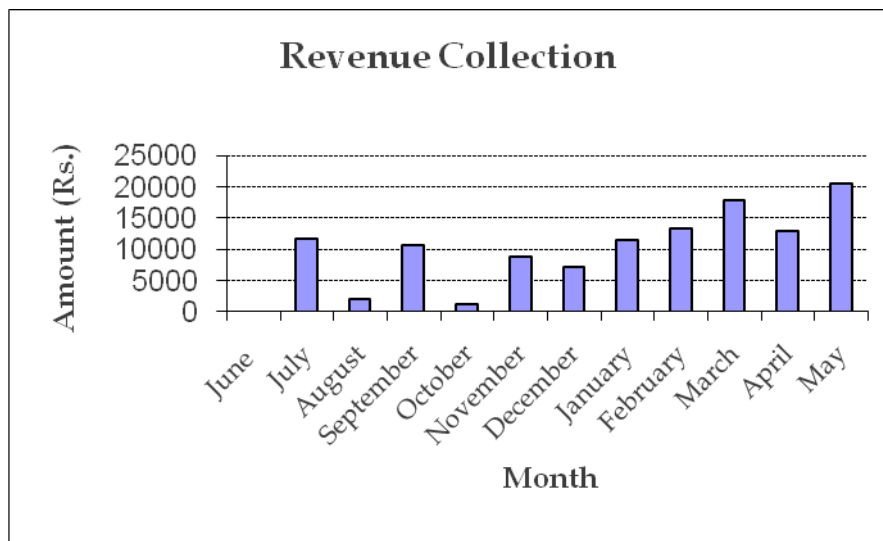
6.1 REVENUE GENERATION TO GOVERNMENT OF MAHARASHTRA

Apart from monitoring of water quality network for Water Quality lab level II at Kolhapur, the infrastructure facility is made available to the users from various Government, Non-Government, as well as individuals.

The revenue collected in this lab during the water year 2012-2013 is as follows.

Sr. No	Month	Amount
1.	June	0/-
2.	July	11,767/-
3.	August	2,095/-
4.	September	10,638/-
5.	October	1,318/-
6.	November	8,909/-
7.	December	7,211/-
8.	January	11,482/-
9.	February	13,420/-
10.	March	17,749/-
11.	April	12,926/-
12.	May	20,506/-
Total Amount		1,18,021/-

Graphical Representation for Revenue Collection



Quality Policy

We at Water Quality Lab – Level II are committed to provide services for all interested parties as per their need & expectations to achieve total customer satisfaction.

This shall be achieved through continual improvement in all process and service quality with the help of implementation of QMS as per the ISO 9001 : 2008

(Er. U.V.Parvate)

Executive Engineer

Hydrology Project Division,

Pune

Management ensures that the Quality Policy :

- a) Is appropriate to the purpose of the organization,
- b) Includes a commitment to comply with requirements and continually improve the effectiveness of the Quality Management System,
- c) Provides a framework for establishing and reviewing Quality Objectives,
- d) Is communicated through display and understood within the organization, and
- e) Is reviewed in each MRM for continuing suitability.

ZERTIFIKAT ♦ CERTIFICATE ♦ 認証証書 ♦ CERTIFICADO ♦ CERTIFICAT



CERTIFICATE

The Certification Body
of TÜV SÜD South Asia Private Limited

certifies that

Water Quality Lab.Level-II
Opp. Shivaji University, Near Rajaram Tank,
Kolhapur - 416 006, INDIA

has established
and applies a Quality Management System for

**Services for Water Testing & River Water Monitoring for
Water Quality**

An audit was performed, Report No. 20055703
Proof has been furnished that the requirements according to
ISO 9001 : 2008

are fulfilled. The certificate is **Valid until 2015-09-21**
Subject to successful completion of the **Annual Audit before 2013-06-06**

The present status of this Certificate can be obtained on www.tuv-sud.in

Further clarifications regarding the scope of this certificate and the applicability of
ISO 9001:2008 requirements may be obtained by consulting the certification body

Certificate Registration No. 99 100 11168

Mumbai

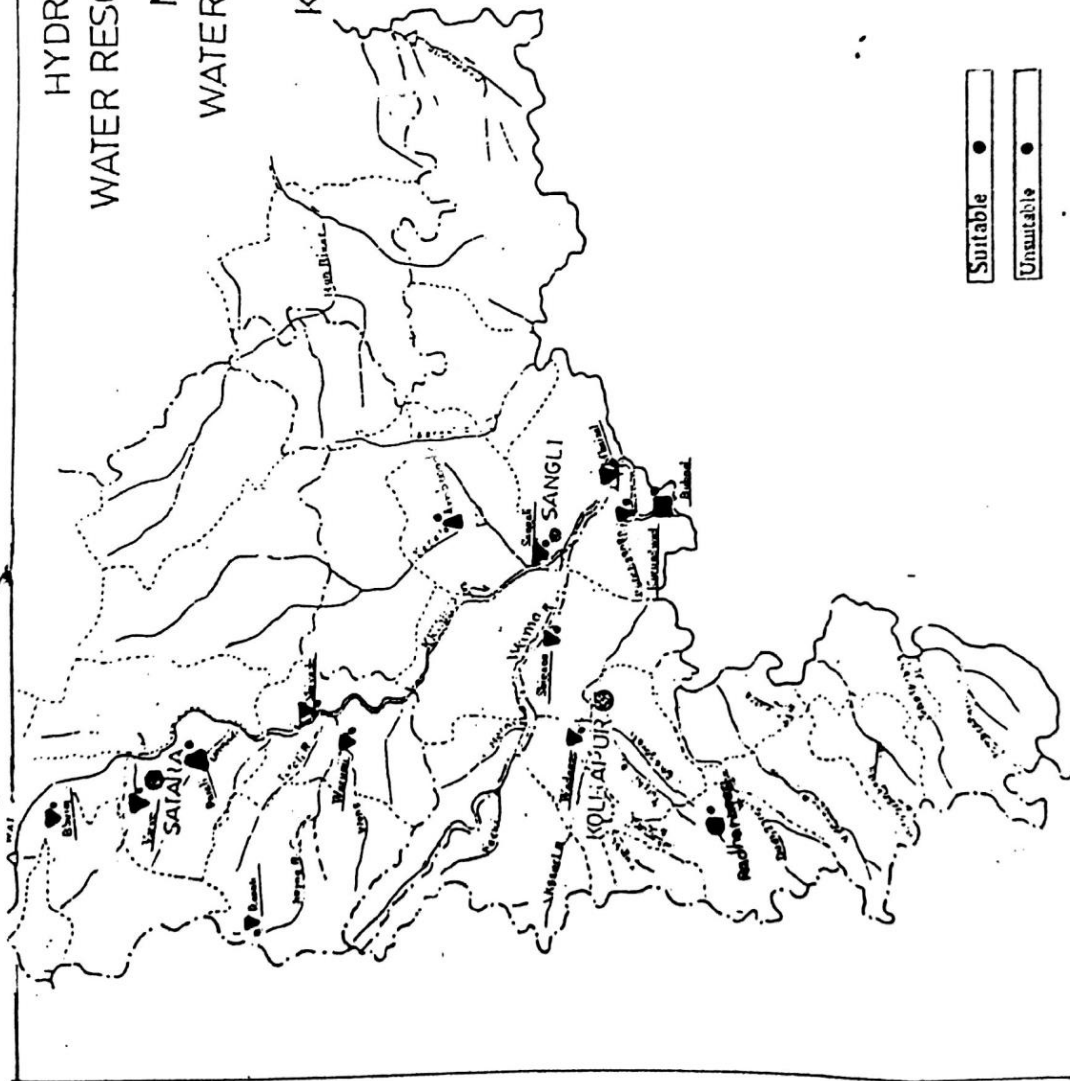
Effective Date: 2012-06-30

Certification Body
of TÜV SÜD South Asia Private Limited
Member of TÜV SÜD Group



Address: Off Saki Vihar Road • Saki Naka • Andheri (East) • Mumbai – 400072 **TUV®**

HYDROLOGY PROJECT WATER RESOURCES DIVISION PUNE 1. MAP SHOWING WATER QUALITY NET WORK, FOR KRISHNA BASIN



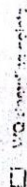
Sr No	W.Q. Station	River	Dist from origin Km.
1)	Bhunj	Krishna	35
2)	Shivade	Krishna	110
3)	Parli	Urmothi	
4)	Vare	Verna	
5)	Rashti	Koyana	
6)	Wanaji	Koyana	
7)	Slugaon	Warna	
8)	Wadange	Panchganga	
9)	Sangali	Krishna	200
10)	Mhasal	Krishna	220
11)	Kurundwad	Krishna	
12)	Bubnal	Krishna	236

Surface Water Quality Net Work of
"KRISHNA" Basin in Maharashtra State

1) Baseline station
2) Trend station
3) Flux station
4) Reservoir

Suitable ●
Unsuitable ●

Figure Map of WQ Sampling locations Under Doordukh Sub division (IPI Division Kathua(Thana)



SINDHUODURGA DISTRICT (KONKAN REGION)

Route map of sampling locations under Phondaghat sub-division (PI Dn Kalwa)

