सत्यमेव जयते

नर्मदा व तापी बेसिन संगठन

NARMADA & TAPI BASIN ORGANIZATION

केन्द्रीय जल आयोग

CENTRAL WATER COMMISSION

गाँधीनगर (गुजरात)

GANDHINAGAR (GUJARAT)

जल गुणवत्ता वार्षिकी

WATER QUALITY YEAR BOOK

(2012-13)

माही, साबरमती, तापी एवं अन्य पश्चिम प्रवाही नदियाँ

Mahi, Sabarmati, Tapi & Other West Flowing Rivers

प्रकाशक **PUBLISHED BY**

जल विज्ञानीय प्रेक्षण परिमण्डल **Hydrological Observation Circle**

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केन्द्रीय जल आयोग **Central Water Commission**

गाँधीनगर (गुजरात) **Gandhinagar (Gujarat)**

मार्च 2014 **March 2014**

आमुख

पृथ्वी पर प्राकृतिक एवं पर्यावरण संतुलन बनाए रखने हेतु शुद्ध जल एक मूल आवश्यकता है। बढते हुए उद्योगों एवं शहरीकरण से जल गुणवत्ता दिन प्रतिदिन धटती जा रही है । ऐसी स्थिति में शुद्ध जल गुणवत्ता बनाए रखने हेतु प्राकृतिक स्रोतों की नियमित जल गुणवत्ता जाँच आवश्यक हो गई है ताकि उद्योगों एवं शहरीकरण पर आवश्यकतानुसार सीमा निर्धारण कर जल की गुणवता को बचाए रखा जा सके।

केन्द्रीय जल आयोग जल संसाधनों के विकास में संलग्न भारत सरकार, जल संसाघन मंत्रालय के अन्तर्गत देश की एक शीर्षस्थ तकनीकी संस्था है, जो जल विज्ञानीय आँकडों के एकत्रीकरण से लेकर परियोजनाओं का मूल्यांकन, अभिकल्पन, प्रबोधन तथा परिचालन करती है।

जल विज्ञानीय प्रेक्षण परिमंडल, गाँधीनगर,नर्मदा तापी बेसिन संगठन के अन्तर्गत केन्द्रीय जल आयोग की एक क्षेत्रीय ईकाई है जिसके अन्तर्गत माही मंडल, गाँधीनगर एवं तापी मंडल, सूरत द्वारा मध्य प्रदेश, राजस्थान एवं गुजरात से होकर पश्चिम की ओर बहने वाली नदियों पर अधिसूचित महत्वपूर्ण स्थलों पर जल नमूने एकत्रित किए जाते हैं तथा जल गुणवत्ता से संबंधित परीक्षण फील्ड में तथा उपरोक्त मण्डल कार्यालयों में स्थापित प्रयोगशालाओं में किया जा रहा है। जल नमूने मासिक एंव द्विमासिक आवृति से माह अगस्त **2004** से नियमित रूप से एकत्र किए जा रहे हैं।इनका विश्लेषण, भारतीय मानक संस्था द्वारा निर्धारित मानकों के अनुसार किया जाता है।प्रभावी प्रबोधन हेतु, माही, साबरमती, तापी एवं पश्चिम की ओर प्रवाहित ग्यारह नदियों पर स्थापित कुल **19** जल गुणवत्ता स्थलों के वर्ष **2012-13** के संकलित आंकडे इस वार्षिकी द्वारा प्रकाशित किए जा रहे हैं। इसके अलावा प्रेक्षण तकनीक, आकलन रीति, जल गुणवत्ता विश्लेषण जल गुणवत्ता प्रबोधन स्थलों की हिस्ट्री शीट, रासायनिक घटकों का विश्लेषण, विभिन्न उपयोगों हेतु लागू होने वाले विभिन्न गुणवत्ता मानक आदि का भी इसमें समावेश है।

इस वार्षिकी में दी गयी सूचना एवं संकलित आंकड़े उन सभी के लिये उपयोगी होंगे जो जलगुणवत्ता में रूचि रखते हैं. ऐसी आशा है। इसे और उपयोगी बनाने हेतु सुझाव आमंत्रित हैं।

वार्षिकी में प्रकाशित आंकडों के संकलन, विश्लेषण तथा प्रकाशन हेतु नर्मदा - तापी बेसिन संगठन के अधिकारियों एवं कर्मचारियों ने जिस समर्पण एवं लगन से कार्य संपादित किया है, वह प्रशंसनीय है। मैं उन सभी का आभार व्यक्त करता हूँ।

(धीरेन्द्र कुमार तिवारी)
अधीक्षण अभियंता

गाँधीनगर (गुजरात)
मार्च **2014**

P R E F A C E

Water is the life sustaining ingredient on planet Earth. It is also essential for growth and sustenance of flora and fauna, agriculture, industries etc. Growth in its wake brings in pollution. Degradation of water quality is caused not only by increasing inflow of domestic and industrial waste to water streams, but also by excessive drawal of water increasing concentration of pollutants. Therefore, monitoring and control of water quality has become an important aspect of effective management of water resources.

Central Water Commission (CWC) is an apex organization of the country involved in planned development and measurement of water resources sector. CWC has been managing a Hydrological Observation & Flood Forecasting Network, which covers almost all the interstate rivers of India. Water quality assessment is being done by collection of water samples through this vast network.

Hydrological Observation Circle, Gandhinagar, a field unit in Narmada Tapi Basin Organization of the Central Water Commission, is entrusted with the assessment of water quality of west flowing rivers draining through the states of Gujarat, Madhya Pradesh, Maharashtra and Rajasthan. Water samples are collected by two divisions: viz Mahi and Tapi Divisions, headquartered at Gandhinagar and Surat respectively. Analysis of water samples are done at Field (Level-I) and Divisional (Level-II) Laboratories. These water samples are collected on monthly or bi-monthly basis since August 2004.

Water Quality Data Year Book is published as per the guidelines issued under the Hydrology Project. This volume presents water quality data of 19 stations on 11 west flowing river basins for the year 2012-13 arranged in alphabetical order. Short notes on observation technique and estimation procedures, water quality analysis, history sheet of water quality monitoring station, chemical parameters, basic water quality standards for different uses such as irrigation, pisciculture, domestic and recreation, have also been included.

It is hoped that the information and data compiled herein will be useful to user agencies concerned with water quality. Comments and suggestion for improvement of this volume are welcome.

The efforts put in by all the concerned officers and staff of NTBO is gratefully acknowledged.

Gandhinagar
March 2014

(Dhirendra Kumar Tiwary)
Superintending Engineer

LIST OF OFFICERS

1	Shri. R.K. Suryawanshi	:	Chief Engineer, NTBO, Gandhinagar
2	Shri. D.K. Tiwary	:	Superintending Engineer, HOC, Gandhinagar
3	Shri. B.N. Prusty	:	Executive Engineer, Mahi Division, Gandhinagar
4	Shri. Y.S. Varshney	:	Executive Engineer, Tapi Division, Surat
5	Shri. Satish Dave	:	Junior Engineer, HOC, Gandhinagar
6	Shri. A.R. Patel	:	Senior Draftsman, HOC, Gandhinagar
7	Shri. Krishna Choudary	:	Assistant Research Officer, Tapi Division, Surat
8	Shri. K. P. Gireendran	:	Senior Research Assistant, Mahi Division, Gandhinagar
9	Shri. D.S. Rajput	:	Observer Gr- II, Tapi Division, Surat
10	R.R. Parmar	:	SWA, Mahi Division, Gandhinagar

C O N T E N T S

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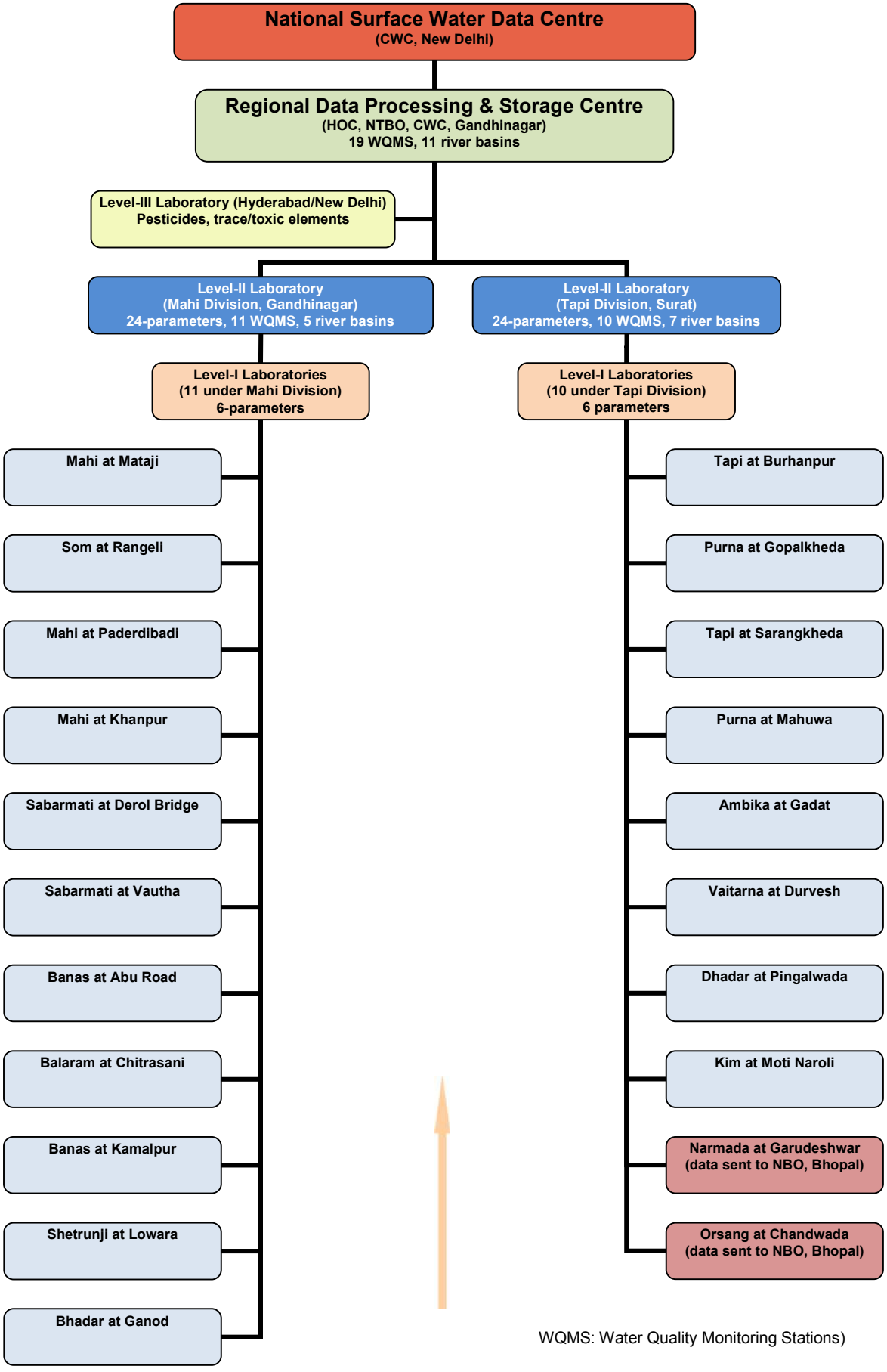
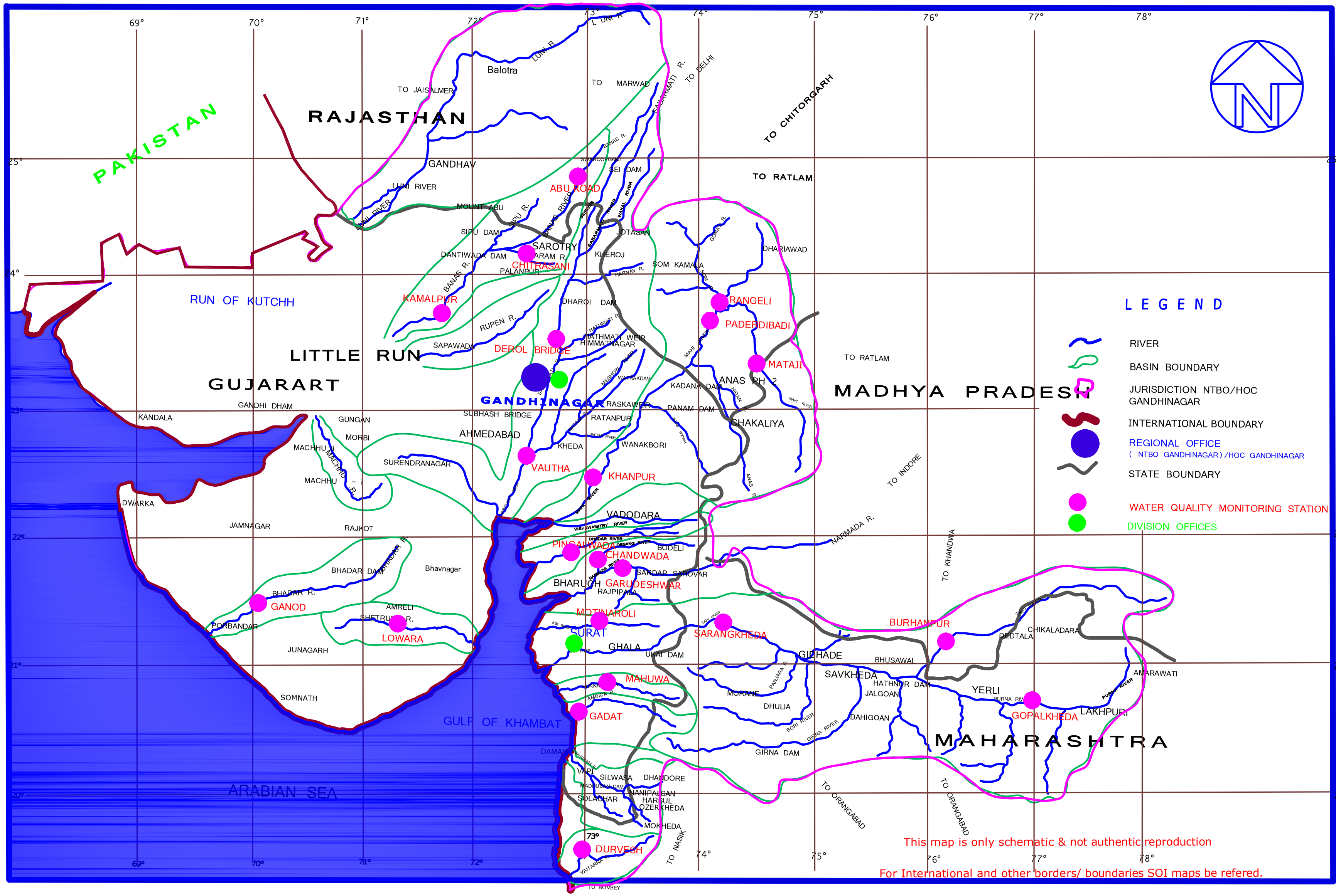
Water Quality Analysis- Flow of Data



WQMS: Water Quality Monitoring Stations)



Water Quality Monitoring Stations under NTBO CWC Gandhinagar

ABBREVIATIONS AND SYMBOLS

General

W. Year, WY	:	Water Year
cumec	:	Cubic meters per second
μ.mhos	:	Micro mhos per centi metre
+	:	Cation
-	:	Anion
PPM	:	Parts Per Million
meq/litre	:	Milli equivalent per litre
$Temp^0 C$	:	Temperature in degree centigrade
K^+	:	Potassium ion
Na^+	:	Sodium ion
Ca^{++}	:	Calcium ion
Mg^{++}	:	Magnesium ion
Al^{+++}	:	Aluminium ion
Fe^{+++}	:	Ferric ion
$NH4^+$	:	Ammonium ion
$CO3^{- -}$	:	Carbonate ion
$HCO3^-$	:	Bicarbonate ion
Cl^-	:	Chloride ion
F^-	:	Fluoride ion
$SO4^{--}$	:	Sulphate ion
$SO3^{--}$	:	Sulphite ion
$NO3^-$	:	Nitrate ion
$NO2^-$	:	Nitrite ion
$PO4^{---}$	:	Phosphate ion

$SiO3^{--}$	:	Silicate ion
D.O.	:	Dissolved Oxygen
B.O.D.	:	Biochemical Oxygen Demand
Sod % age	:	Sodium Percentage
S.A.R.	:	Sodium Adsorption Ratio
R.S.C.	:	Residual Sodium Carbonate
TDN/ TD	:	Tapi Division
MDN/MD	:	Mahi Division
HOC	:	Hydrological Observation Circle
MNP	:	Most Probable Number
mg/l	:	Milligram per litre
Max	:	Maximum
Min	:	Minimum
W.Q.	:	Water Quality
sq. kms	:	Square Kilometre
m	:	Metre
T.D.S.	:	Total Dissolved Solids
SNR	:	Sample Not Received
NF	:	No Flow
RD	:	River Dry
F	:	Float observation

Water quality parameters used in test results

FLD	**Field Determinations**
Colour_Cod	Colour
DO	Dissolved oxygen
EC_FLD	Electrical Conductivity_Field
Odour_Code	Odour
pH_FLD	pH_Field
Temp	Temperature
General parameters	
DO_SAT%	Dissolved Oxygen Saturation %
EC_GEN	Elecrtical Conductivity
pH_GEN	pH
SS	Solids, Suspended
TDS	Solids, Total Dissolved
TS	Solids, Total
Turb	Turbidity
Nutrients	
NH3-N	Nitrogen, ammonia
NO2+NO3	Nitrogen, Total Oxidised (NO2+NO3)
NO2-N	Nitrogen, Nitrite
NO3-N	Nitrogen, Nitrate
P-Tot	Phosphorus, total

Organic Matter

BOD3-27	Biochemical Oxygen demand (3days)
COD	Chemical Oxygen Demand

Alkallnity

Alk-Phen	Alkalinity, phenolphthalein
ALK-TOT	Alkalinity, total

Hardness

HAR_Ca	Hardness, Calcium
HAR_Total	Hardness , Total

Major Ions

Ca	Calcium
Cl	Chloride
CO3	Carbonate
HCO3	Bicarbonate
K	Potassium
Mg	Magnesium
Na	Sodium
Na%	Percent Sodium
RSC	Residual Sodium Carbonate
SO4	Sulphate

Other inorganics

Al	Aluminium
B	Boron
F	Fluoride
Fe	Iron

SAR	Sodium Adsorption Ratio
SiO2	Silicate

Trace and Toxic

Ag	Silver
As	Arsenic
Cd	Cadmium
Cr	Chromium
Cu	Copper
Hg	Mercury
Mn	Manganese
Ni	Nickel
Pb	Lead
Se	Selenium
Zn	Zinc

Pesticides

24D	2,4-D
Aldrin	Aldrin
BHC	gamma-BHC (Benzene Hexa Chloride)
DDT	DDT
Dieldrin	Dieldrin
Endos	Endosulphan

1 Introduction

1.1 Scope

Central Water Commission maintains adequate hydrological observation network including select water quality monitoring stations through a three tier laboratory system at 371 key locations covering all the major river basins of India. Under Narmada & Tapi Basin Organization (NTBO), there are 21 field water quality monitoring stations or sites in 12 river basins in the states of Madhya Pradesh, Maharastra, Rajasthan and Gujarat, where physical parameters such as temperature, colour, odour, specific conductivity, total dissolved solids, pH and dissolved oxygen of river water are observed. There are two Level–II laboratories to analyse twenty five physico-chemical and bacteriological parameters of river water. Other parameters like heavy metals / toxic parameters and pesticides etc are also tested including isotope fingerprinting. This *Water Quality Data Year Book* contains water quality data collected at the above network during 2012-13. Data collected from 19 of these stations in 11 river basins is compiled and presented in this Year Book along with trends of major quality parameters which are used as criteria to determine class of water for designated best use. The data has been compiled basin-wise. The data pertaining to two stations in one basin viz the Narmada is published by Narmada Basin Organization of Central Water Commission. Location of these stations is shown in **Map-1**.

A list of the stations where water quality observations were conducted during the year 2012 - 13 are given in **table-1**.

Table-1: Water quality monitoring Stations or Sites during the water year 2012 - 13

SI.NO.	Name of Station	Code No.	River / Tributary	Basin
1	Mahi at Mataji	01 02 13 001	Mahi	Mahi
2	Som at Rangeli	01 02 13 005	Som	Mahi
3	Mahi at Paderdibadi	01 02 13 006	Mahi	Mahi
4	Mahi at Khanpur	01 02 13 012	Mahi	Mahi
5	Sabarmati at Derol Bridge	01 02 12 006	Sabarmati	Sabarmati
6	Sabarmati at Vautha	01 02 12 013	Sabarmati	Sabarmati
7	Tapi at Burhanpur	01 02 17 002	Tapi	Tapi
8	Purna at Gopalkheda	01 02 17 004	Purna	Tapi
9	Tapi at Sarangkheda	01 02 17 015	Tapi	Tapi
10	Banas at Abu road	01 02 02 002	Banas	Banas

11	Banas at Kamalpur	01 02 02 007	Banas	Banas
12	Balaram at Chitrasani	01 02 02 004	Balaram	Banas
13	Shetrunji at Luwara	01 02 09 001	Shetrunji	Shetrunji
14	Bhadar at Ganod	01 02 07 001	Bhadar	Bhadar
15	Purna at Mahuwa	01 02 19 001	Purna	Purna
16	Ambika at Gadat	01 02 20 001	Ambika	Ambika
17	Vaitarna at Durvesh	01 02 25 001	Vaitarna	Vaitarna
18	Dhadar at Pingalwada	01 02 14 001	Dhadar	Dhadar
19	Kim at Motinaroli	01 02 16 001	Kim	Kim
20	Narmada at Garudeshwar	01 02 15 030	Narmada	Narmada
21	Orsang at Chandwada	01 02 15 032	Orsang	Narmada

1.2 Sources of Information

Samples of river water have been collected by the field offices of two divisions, viz. Mahi Division, Gandhinagar and Tapi Division, Surat under the Hydrological Observation Circle, Gandhinagar. These samples are tested for various parameters at three tier network of laboratories fiz Level-I at Filed monitoring station itself, level-II at the Divisional Headquarters at Gandhinagar and Surat and Level-III at New Delhi. The Division wise distribution of stations is as under:

SI.NO.	Name Of Division	No. Of Water Quality Station
1.	Mahi Division,Gandhinagar	11
2.	Tapi Division, Surat	10*

** Data of 2 sites published by NBO, CWC, Bhopal.*

Division-wise list of Water Quality Monitoring Stations is given as under:

SI.NO	**Stations under Mahi Division**	**SI.No**	**Stations under Tapi Division**
1.	Mahi at Mataji	1	Tapi at Burhanpur
2.	Som at Rangeli	2.	Purna at Gopalkheda
3.	Mahi at Paderdibadi	3.	Tapi at Sarangkheda
4.	Mahi at Khanpur	4.	Purna at Mahuwa
5.	Sabarmati at Derol Bridge	5.	Ambika at Gadat
6.	Sabarmati at Vautha	6.	Vaitarna at Durvesh
7.	Banas at Abu road	7.	Dhadar at Pingalwada
8.	Banas at Kamalpur	8.	Kim at Motinaroli

9.	Balaram at Chitrasani	9.	Narmada at Garudeshwar
10.	Shetrunji at Luwara	10.	Orsang at Chandwada
11.	Bhadar at Ganod		

1.3 Laboratories & Parameters

As stated above, various parameters are tested in laboratories divided in three levels. There is no Level-III laboratory under NTBO. Therefore, parameters designated for test at Level-III lab are sent to Delhi. The level of the laboratory is an indication of the analytical capacity of the laboratory as given below. A few photographs of Level-II laboratories at Gandhinagar and Surat are given in subsequent pages of this report

Level I	Laboratory located in the field, generally analysing Temperature, pH, Conductivity, Dissolved Oxygen, colour and odour
Level II	Laboratory has facilities to analyse basic water quality parameters, nutrients, indicators of organic and bacteriological pollution etc.
Level II+	Laboratory has facilities to analyse basic water quality parameters, nutrients, indicators of organic and bacteriological pollution etc. Laboratory is in possession of advanced equipment, such as Atomic Adsorption Spectrophotometer (AAS), Gas Chromatograph (GC), UV-Visible Spectrophoto-meter etc.

Details of parameters tested at different Laboratories are given at **Annex-I.**

1.4 Methodology

Water samples are collected at a regular frequency- of once a month or bimonthly, usually on the first working day of the month at all Water Quality Monitoring Stations. Monthly /bimonthly collection of water samples started from August 2004 onwards. These water samples are usually collected from a point, 15 to 20 cm below the water surface having maximum depth of flow along the cross-section of river. Water samples are collected in clean and pre rinsed polythene bottles of 1 liter capacity and bottles are filled up to their full capacity without any air bubble.

The samples, thus collected, are sent to Divisional Laboratories located at Gandhinagar and Surat by special messenger so as to reach within 24 - 48 hours of collection. Their

particulars like in-situ temperature, depth, velocity etc. written on paper slip are pasted on the polythene bottles. Five physical parameters are tested either in situ or at the field water quality monitoring station i e Level-III lab. Various methods and procedure adopted for testing physical and chemical characteristics are as follows.

1.4.1 Physical Characteristics

- Discharge by current meter or float method.
- Temperature in degree centigrade in situ by thermometer.
- Conductivity in micro- mhos/cm measured with the help of Electric conductivity meter.
- p^H values determined using p^H meter.

1.4.2 Chemical Characteristics

- **Titrimetric Method**

Parameters determined by this technique are Carbonate, Bicarbonate, Chloride, Calcium and Magnesium. In this procedure, determining the volume of a solution of accurately known concentration, which is required to tract quantitatively with the solution of the substance to be determined, carries out quantitative chemical analysis.

- **Spectro- photometric / colorimetric Method**

Parameters analysed are Aluminium, Iron, Ammonium, Fluoride, Nitrate, Nitrite Phosphate and Silicate. In this technique, the instruments used are Colorimeter/Spectro-photometer, based on the phenomenon of absorption/ transmission of light. A series of standard solution of known concentrations are prepared and treated with appropriate reagents to produce coloured solution. Then the light of specific wavelength is passed through the standard solution. A calibration curve is drawn with concentration against measured absorbance transmittance. Water samples are treated with the same reagents for colour development and absorbance/transmittance are measured. Concentration is then determined from calibration curve.

- **Flame photometric method.**

The parameters estimated through this technique are sodium and potassium. The emission intensity from standard solution is measured by aspirating with the flame and calibration

curve of emission intensity against concentration of standard solution is plotted. Then the test samples are aspirated for flame emission. The amount of element present (sodium and potassium) in the sample is determined from the calibration curve drawn with the result of standard solutions.

- **Nephelometric Method.**

The parameter estimated by this instrument is Sulphate. The degree of the light scattered by a series of standard solutions treated with Barium Chloride is measured. A Calibration curve of scattered intensity against concentration of solution is plotted. Then the test samples are allowed for scattering. The concentration of Sulphate in the sample is determined from the calibration curve drawn with the results of standard solutions.

1.5 Method of Presentation

Presentation of water quality data is arranged according to the basin. At the outset, basin description and basin map showing locations of water quality monitoring stations is give. Site-wise availabulty of data is then dealt with followed by analysis of data aand inferences. Subsequently, water quality data is given site-wise. Water quality data are arranged by water quality monitoring station (WQMS). It comprises history sheet of WQMS and test results obtained from various samples collected at that WQMS. The series of WQMS is arranged from the origin of the river to downstream giving inter se priority to intermediate tributary stations in a similar fashion. Explanatory notes are given Section-2.2.2 to help readers of this year book.

History sheet gives brief historical and technical details of the WQMS. The water quality analysis tables are given for the river water only. For all the WQMS, some of the parameters may not have been analyzed owing to factors beyond control.

The tables showing tolerance limits of water quality parameters for various use of water as per **IS:-10500:1991, IS-13891:1994, IS-3328:1993, IS-11624:1986** are appended at the end, for ready reference.

1.6 Explanatory Notes

The explanatory notes described hereunder are designed to assist in the interpretation of various parameter contained in the data presented subsequently. The notes are valid so far data presented in this book.

1. The water samples are collected at regular frequency of twice in a month at all Water Quality Monitoring Stations, under Tapi Division, Surat and Mahi Division, Gandhinagar, usually from the main flow portion of the stream. Collection of water samples on monthly & once in two month basis started from August 2004 onwards

2. Parameters presented for different stations in the book are analysed in Divisional laboratories located at Gandhinagar and Surat during the period.

3. Parameters viz. Specific Conductivity, p^H Potassium Sodium, Calcium, Magnesium, Aluminium, Iron, Ammonium, Carbonate, Bicarbonate , Chloride , Fluoride, Sulphate, Nitrate, Nitrite, Phosphate and Silicate were analysed in divisional laboratories of Mahi Division , Gandhinagar and Tapi Division, Surat .

4. Chemical indices namely Hardness number , Sodium percentage , Sodium Adsorption ratio and Residual Sodium Carbonate are Calculated as follows:-

(a) Hardness number (H.No.) is calculated by adding the total Calcium and Magnesium in the expressed as equivalent parts of $CaCO_3$.

(b) Sodium percentage is as given below:

$$S.P. = \frac{Na^+ \times 100}{Ca^{++} + Mg^{++} + Na^+ + K^+}$$

Where ionic concentration being in m.eq./litre.

(c) Sodium Adsorption ratio (SAR) is given by

$$S.A.R. = \frac{Na^+}{[(Ca^{++} + Mg^{++})/2]^{1/2}}$$

Where, ionic concentration being m.eq./litre.

(d) Residual Sodium Carbonate (RSC) is given below by

$$R.S.C. = (CO_3^{--} + HCO_3^-) - (Ca^{++} + Mg^{++})$$

Where, concentration of all the ions being in m.eq./litre.

5. Water year ranges from June 1st of one calendar year to May 31st of the next calendar year and covers one complete hydrological cycle.

6. Measuring authority refers to the field division responsible for the collection of water samples. The name of the division is abbreviated by taking first alphabet of each word followed by alphabets “DN” or “D” for division. Thus Mahi Division is denoted as “MDN” or “MD” and Tapi Division is denoted as “TDN” or “TD”.

7. The gauging station code number is a unique Nine-figure numeric reference number of the form XX XX XX XXX, which facilitates storage and retrieval of water quality data in data The first two digits indicates the measuring authority who is wholly responsible for R&M of site, next two digits show the basin/zone and river identification, for example, 01 for west coast, Gujarat or 02 for west coast, Maharastra. Further two digits indicate name of River in Basin, for example, 13 is for Mahi Basin and the last three digits represent the site number, for example 005 is for Rangeli site of Mahi Basin.

2. Water Quality Analysis

This section deals with analysis of the temporal variability of data sets on selected observed water quality parameters viz. pH, DO, NH3-Nitrogen, BOD and Electrical Conductivity which together (apart from Boron and coliforms which are at present not tested by this organization) are generally used to assess fitness of water for its designated best uses of drinking water, irrigation and support to aquatic life. Given the nature of some of the streams which have water flows for only a limited period of the year, coupled with frequency of sample collection i e once a month, not much data is available for the total period of observation from 2005 to 2013, to conclude validly any trends. Therefore, based on the length of the data series available, trends have been analysed for Mahi, Sabarmati, Tapi, Dhadar and Kim basins only.

- **Methodology**

Statistical parameters such as mean, median, 75^{th} percentile and 25^{th} percentile, minimum and maximum have been computed for all the sites for 11 parametrs as given in **Annex-II**. In addition, 11 sites in five basins, viz Mahi, Sabarmati, Tapi, Dhadar and Kim, have been selected for further analysis based on data availability for six parameters. Details of such analysis are given under the sections dealing with respective basins. These parameters have been selected on the basis of Central Pollution Control Board (CPCB) criteria which are used to determine Class of Water for Designated Best Use. Time series graphs with linear trend-line for these 6 major water quality parameters have been drawn irrespective

of the seasons. In addition, it has also been determined how many samples are found to be beyond the tolerance limits stipulated for designated best use based on CPCB criteria. The CPCB criteria are as given in **table-2.**

Level-II Laboratory at Gandhinagar

Various equipment at Level-II Lab

UV Visible Spectro-photometer

Level-II Lab- Reagent Area

Flame photometer

Table-2: Water Quality Criteria as per Central Pollution Control Board

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

Note: (i) Boron and Total Coliforms have not been tested by this organization.
(ii) BOD in this report is taken for 3 days at 27^0C.

- **General Conclusion**

Results of statistical analysis for 11 parameters for all the basins are given in **Annex-II.** As regards physical. Chemical and bacteriological characteristics, it is generally seen that

during WY:2012-13, physical characteristics such as pH, conductivity have remained more or less within tolerance limits while pollution by organic and chemical sources is indicated by exceedence of tolerance limits in respect of BOD and free ammonia. As already stated earlier, specific basin-wise details are given in the sections dealing with respective basins for which data of sufficient length is available.

3.0 Mahi Basin

3.1 Basin description

The river Mahi is third major west flowing interstate river of India, draining into the Gulf of Cambay. Its basin map is enclosed. It originates in the northern slopes of Vindhya hill range near village Sardarpur in Dhar district of Madhya Pradesh at an elevation of 500 m above mean sea level. Its length is 583 km, traversing 167 km in Madhya Pradesh, 174 km in Rajasthan and the remaining 242 km in Gujarat. It flows initially in North West direction through Dhar and Jhabua districts of Madhya Pradesh. Thereafter, it takes turn to the left and flows in south – west direction through Banswara district of Rajasthan, Panchmahal and Kheda districts of Gujarat State before draining into Gulf of Cambay. It drains an area of 34,842 sq.km, spread over Rajasthan (47%), Madhya Pradesh (19%) and Gujarat (34%). The basin lies between the geographical co-ordinates of 73^0 00' to 74^0 20' east longitudes and 22^0 30' to 24^0 20' north latitudes. The basin is bound by the Aravalli hills in north and north-west, by the ridge separating it from Chambal basin in the east, by the Vindhya hill range in the south and finally by Gulf of Cambay in the west. In Rajasthan, the basin consists of hills, forests and eroded terrain. In Gujarat upto the confluence of Mahi and Panam, the basin comprises semi developed lands. Below Wanakbori Weir and up to the mouth, the basin is flat, fertile and well developed alluvial track.

The Mahi river receives several tributaries on both banks out of which the main tributaries are Som, Anas and Panam. The Som River joins the main river on the right Bank in Rajasthan. The Anas and Panam join the main river on the left Bank in the Rajasthan & Gujarat respectively.

The average rainfall in Mahi basin is 785 mm. In the dry cool winter, the minimum temperature varies from 5°C to 20°C. Maximum temperature varies from 30°c to 50°c during the hottest month of May.

At present there are 15 completed major / medium projects in Mahi basin. The two main projects across Mahi are Mahi Bajaj Sagar and Kadana reservoir. A weir at Wanakbori is also constructed across the main river. Other 11 projects are on different tributaries of Mahi River.

3.2 Availability of Data

There are four Water Quality Monitoring Stations in Mahi basin. Availability of data at these stations/sites is given in the following **Table-3**. The detailed data are given in Section- 3.3.

Table-3: Availability of WQ data (in SWDES format) in Mahi basin

Sl. No.	Site name	River/Tributary	Period of sample collection	No. of samples analysed
Mahi Basin				
1	Mataji	Mahi	2005-06 to 2012-13	48
2	Rangeli	Som	2005-06 to 2012-13	40
3	Paderdibadi	Mahi	2005-06 to 2012-13	77
4	Khanpur	Mahi	2005-06 to 2012-13	94

3.3 Water Quality Data

HISTORY SHEET

		Water Year	**: 2012-13**
Site	**: Mahi at Mataji**	**Code**	**:** 01 02 13 001
State	: Madhya Pradesh	District	Ratlam
Basin	: Mahi	Independent River	: Mahi
Tributary	: Mahi	Sub Tributary	:
Sub-Sub Tributary	:	Local River	: Mahi
Division	: Mahi Division, Gandhinagar	Sub-Division	: Mahi S-Div Kadana
Drainage Area	: 3880 Sq. Km.	Bank	: Left
Latitude	: 23°20'57" N	Longitude	: 74°43'31" E
	Opening Date	Closing Date	
Gauge	: 21-07-1982		
Discharge	: 21-07-1982		
Sediment	: 21-07-1982		
Water Quality	: 21-07-1982		

Water Quality Datasheet for the period : 2012-2013

Station Name : Mahi at Mataji (01 02 13 001) **Division : Mahi Division, Gandhinagar**

Local River : Mahi **River Water Analysis** **Sub-Division : Mahi Sub Divn., Kadana**

S.No	Parameters	01-06-2012	02-07-2012	01-08-2012	01-09-2012	01-10-2012	01-11-2012	01-12-2012	01-01-2013	01-02-2013	01-03-2013	01-04-2013	01-05-2013
	PHYSICAL												
1	Q (cumec)	0.000	0.000	278.7 #	629.3	105.0 #	4.444	0.638	0.589	0.588	0.540	0.050 #	0.000
2	Colour_Cod (-)			Light Brown	Brown	Clear	Clear	Clear	Clear	Clear	Clear	Clear	Clear
3	EC_FLD (µmho/cm)			358	357	507	538	489	474	484	347	340	396
4	EC_GEN (µmho/cm)			274	324	404	492	446	382	337	326	307	443
5	Odour_Code (-)			odour free	odour free	odour free	odour free	odour free	odour free	odour free	odour free	odour free	odour free
6	pH_FLD (pH units)			7.2	7.4	7.8	7.1	7.3	7.2	7.3	7.9	7.8	7.8
7	pH_GEN (pH units)			7.9	7.7	8.2	8.3	8.2	8.3	8.4	8.3	8.4	8.4
8	SS (mg/L)			82	68	40	44	46	46	52	44	48	60
9	TDS (mg/L)			170	204	268	306	282	246	222	196	190	278
10	Temp (deg C)			27.8	29.1	31.3	24.3	18.0	18.0	17.3	19.0	24.0	28.0
11	Turb (NTU)			106.0	302.0	68.0	3.0	6.0	5.0	4.0	5.0	4.0	5.0
	CHEMICAL												
1	Alk-Phen (mgCaCO3/L)			0.0	0.0	0.0	0.0	0.0	1.7	1.7	0.0	1.7	1.7
2	ALK-TOT (mgCaCO3/L)			92	112	144	152	160	155	143	144	139	155
3	Ca (mg/L)			34	46	48	58	58	58	53	51	48	51
4	Cl (mg/L)			14.0	22.0	28.0	62.0	34.0	32.0	30.0	28.0	30.0	38.0
5	CO3 (mg/L)			0.0	0.0	0.0	0.0	0.0	2.0	2.0	0.0	2.0	2.0
6	F (mg/L)			0.57	0.46	0.54	0.36	0.44	0.40	0.44	0.42	0.44	0.55
7	Fe (mg/L)			0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.2	0.3	0.3
8	HCO3 (mg/L)			112	137	176	185	195	185	171	176	166	185
9	K (mg/L)			0.8	1.0	0.9	1.0	0.9	0.8	0.7	0.7	0.7	0.7
10	Mg (mg/L)			7.8	7.8	10.7	10.7	9.7	9.7	9.7	8.8	9.7	10.7
11	Na (mg/L)			10.2	15.4	21.6	40.4	25.8	22.7	20.6	19.6	19.6	26.8
12	NH3-N (mg N/L)			0.76	0.48	0.21	0.11	0.10	0.09	0.10	0.15	0.14	0.18
13	NO2+NO3 (mg N/L)			2.79	6.33	4.69	5.79	5.74	5.62	5.12	2.21	2.22	2.29
14	NO2-N (mgN/L)			0.17	0.14	0.01	0.03	0.03	0.02	0.02	0.02	0.02	0.03
15	NO3-N (mgN/L)			2.62	6.19	4.68	5.76	5.71	5.60	5.10	2.19	2.20	2.26
16	P-Tot (mgP/L)			0.060	0.070	0.060	0.060	0.070	0.080	0.080	0.070	0.080	0.090
17	SiO2 (mg/L)			45.9	31.6	43.4	42.4	42.7	36.9	34.9	38.3	38.7	39.1
18	SO4 (mg/L)			9.3	9.9	9.9	10.0	10.0	9.8	9.5	9.1	9.5	10.0
	BIOLOGICAL/BACTERIOLOGICAL												
1	BOD3-27 (mg/L)			1.4	0.7	2.4	1.3	2.6	0.4	2.0	1.5	1.8	2.4
2	DO (mg/L)			7.2	6.7	8.7	9.8	11.3	10.0	11.3	8.1	8.9	6.2
3	DO_SAT% (%)			90	87	117	116	119	106	117	87	106	79
	TRACE & TOXIC												
1	Al (mg/L)			0.03	0.03	0.04	0.04	0.04	0.03	0.03	0.02	0.03	0.03
	CHEMICAL INDICES												
1	HAR_Ca (mgCaCO3/L)			84	116	120	144	144	144	132	128	120	128
2	HAR_Total (mgCaCO3/L)			117	149	165	189	185	185	173	165	161	173
3	Na% (%)			16	18	22	32	23	21	21	21	21	25
4	RSC (-)			0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	SAR (-)			0.4	0.6	0.7	1.3	0.8	0.7	0.7	0.7	0.7	0.9
	PESTICIDES												

POOLING CONDITION

Monthly basis IWIN sample started from 01.07.2008 onwords and stopped w.e.f 31.03.2013

Note. : # Discarded and estimated discharge

Pesticides , Trace and Toxic element analysis

Station Name : Mahi at Mataji (01 02 13 001) **Division : Mahi Division, Gandhinagar**

Local River : Mahi **Sub Divi. : Mahi Sub Div., Kadana**

Sl. No.	Parameter ID	Parameter Name	unit	Date of sampling												
a	Trace and Toxic			01.04.2006	02.04.2007	02.04.2008	01.04.2009	01.04.2010	01.04.2011	01.09.2011	01.02.2012	02.04.2012	28.05.2012	01.10.2012	01.03.2013	01.04.2013
				Analysis done by WQL-III Lab, UGD, Hyderabad	Analysis done by WQL-III Lab, UGD, Hyderabad	Analysis done by WQL-III Lab, UGD, Hyderabad	Analysis done by WQL-III Lab, UGD, Hyderabad	Analysis done by WQL-III Lab, UGD, Hyderabad	Analysis done by WQL-III Lab, UGD, Hyderabad	Analysis done by NRWQL, New Delhi	Analysis done by NRWQL, New Delhi	Analysis done by WQL-III Lab, UGD,Hyderabad	Analysis done by NRWQL, New Delhi	Analysis done by NRWQL, New Delhi	Analysis done by NRWQL, New Delhi	Analysis done by WQL-III Lab, UGD, Hyderabad
1	As	Arsenic	microgram / l	-	-	-			-	0.25				9.05	0.11	0.00
2	Cd	Cadmium	microgram / l	8.0	7.00	0.40			0	0.06				0.11	0.20	3.11
3	Cr	Chromium	microgram / l	23.0	12.00	0			0	4.28				1.94	2.61	2.01
4	Cu	Copper	microgram / l	-	-	-			-	19.03				6.01	4.24	-
5	Hg	Mercury	microgram / l	-	6.021	0			-	3.49				-	0.26	0.171
6	Ni	Nickel	microgram / l	0	0	5.80			0	-				0.52	7.95	0.85
7	Pb	Lead	microgram / l	186	14.00	9.31			30.81	2.84				3.04	4.86	0.00
8	Zn	Zinc	microgram / l	107	29.00	19.19			24.16	31.62				17.97	4.30	18.52
b	Pesticides		microgram / l				R I V E R D R Y	R I V E R D R Y			R I V E R D R Y	R I V E R D R Y	R I V E R D R Y			
1	Aldrin	Aldrin	microgram / l	0.017	0.01	0			0	-				-	-	Pesticides value not reported .
2	Alpha- BHC	Alpha- BHC	microgram / l	0.031	0.01	0.02			0.226	-				-	-	
3	Beta-BHC	Beta-BHC	microgram / l	0	0.01	-			-	-				-	-	
4	Gama- BHC	gamma-BHC (Benzene HexaChloride)	microgram / l	0.042	0.01	-			-	-				-	-	
5	D- BHC	D- BHC	microgram / l	-	0.02	-			-	-				-	-	
6	DDT	DDT	microgram / l	0	0.03	0			0	-				-	-	
7	Dieldrin	Dieldrin	microgram / l	0.005	0.08	0			0.025	-				-	-	
8	Endos-I	Endosulphan I	microgram / l	0.003	0.01	0.02			0.412	-				-	-	
9	Endos-II	Endosulphan II	microgram / l	0.005	0.02	-			-	-				-	-	
10	Endos-s	Endosulphan s	microgram / l	0.006	0.01	-			-	-				-	-	

WQL - III Lab at UGD, Hyderabad conducts the analysis of Trace and Toxic element and Pesticides

NRWQ Lab at HOC, Noida, New Delhi conducts the analysis of Trace and Toxic element only, which started from September 2011 onwords

Water Quality Summary for the period : 2012-2013

Station Name : Mahi at Mataji (01 02 13 001) **Division : Mahi Division, Gandhinagar**

Local River : Mahi **Sub-Division : Mahi Sub Divn., Kadana**

River Water Summary

S.No	Parameters	Number of Observations	Maximum	Minimum	Mean
	PHYSICAL				
1	Q (cumec)	365	2631	0.000	70.36
2	EC_FLD (µmho/cm)	10	538	340	429
3	EC_GEN (µmho/cm)	10	492	274	374
4	pH_FLD (pH units)	10	7.9	7.1	7.5
5	pH_GEN (pH units)	10	8.4	7.7	8.2
6	SS (mg/L)	10	82	40	53
7	TDS (mg/L)	10	306	170	236
8	Temp (deg C)	10	31.3	17.3	23.7
9	Turb (NTU)	10	302.0	3.0	50.8
	CHEMICAL				
1	Alk-Phen (mgCaCO3/L)	10	1.7	0.0	0.7
2	ALK-TOT (mgCaCO3/L)	10	160	92	140
3	Ca (mg/L)	10	58	34	51
4	Cl (mg/L)	10	62.0	14.0	31.8
5	CO3 (mg/L)	10	2.0	0.0	0.8
6	F (mg/L)	10	0.57	0.36	0.46
7	Fe (mg/L)	10	0.3	0.2	0.3
8	HCO3 (mg/L)	10	195	112	169
9	K (mg/L)	10	1.0	0.7	0.8
10	Mg (mg/L)	10	10.7	7.8	9.5
11	Na (mg/L)	10	40.4	10.2	22.3
12	NH3-N (mg N/L)	10	0.76	0.09	0.23
13	NO2+NO3 (mg N/L)	10	6.33	2.21	4.28
14	NO2-N (mgN/L)	10	0.17	0.01	0.05
15	NO3-N (mgN/L)	10	6.19	2.19	4.23
16	P-Tot (mgP/L)	10	0.090	0.060	0.072
17	SiO2 (mg/L)	10	45.9	31.6	39.4
18	SO4 (mg/L)	10	10.0	9.1	9.7
	BIOLOGICAL/BACTERIOLOGICAL				
1	BOD3-27 (mg/L)	10	2.6	0.4	1.6
2	DO (mg/L)	10	11.3	6.2	8.8
3	DO_SAT% (%)	10	119	79	103
	TRACE & TOXIC				
1	Al (mg/L)	10	0.04	0.02	0.03
	CHEMICAL INDICES				
1	HAR_Ca (mgCaCO3/L)	10	144	84	126
2	HAR_Total (mgCaCO3/L)	10	189	117	166
3	Na% (%)	10	32	16	22
4	RSC (-)	10	0.0	0.0	0
5	SAR (-)	10	1.3	0.4	0.7
	PESTICIDES				

Water Quality Seasonal Average for the period: 2005-2013

Station Name : Mahi at Mataji (01 02 13 001) **Division : Mahi Division, Gandhinagar**

Local River : Mahi **River Water** **Sub-Division : Mahi Sub Divn., Kadana**

S.No	Parameters	Flood								Winter								Summer							
		Jun - Oct								Nov - Feb								Mar - May							
		2005	2006	2007	2008	2009	2010	2011	2012	2005-2006	2006-2007	2007-2008	2008-2009	2009-2010	2010-2011	2011-2012	2012-2013	2006	2007	2008	2009	2010	2011	2012	2013
	PHYSICAL																								
1	Q (cumec)	324.0	358.5	59.58	6.477	33.82	58.57	341.0	202.6	0.431	1.975	2.220	0.591	1.619	1.785	0.772	1.565	0.030	0.406	0.419	0.045	0.000	0.163	0.000	0.197
2	EC_FLD (µmho/cm)	246	334	360	321	333	326	382	407	350	414	385	392	395	461	434	496	306	364	298			334		361
3	EC_GEN (µmho/cm)	245	333	347	319	310	329	347	334	310	399	369	378	379	401	488	414	295	359	299			307		359
4	pH_FLD (pH units)	7.4	7.3	7.5	8.0	7.9	7.7	7.7	7.5	7.8	7.2	7.6	7.9	8.0	8.3	7.1	7.2	7.9	6.9	7.7			8.2		7.9
5	pH_GEN (pH units)	8.0	8.0	8.2	8.1	8.2	7.7	7.3	7.9	8.3	8.3	8.3	8.2	8.1	8.2	7.7	8.3	8.1	8.1	8.5			7.5		8.4
6	SS (mg/L)	23	74	34	22	25	57	57	63	17	20	19	28	20	23	84	47	22	26	12			26		51
7	TDS (mg/L)	171	248	227	205	199	208	219	214	203	239	233	245	242	254	314	264	194	228	194			199		221
8	Temp (deg C)	27.6	28.6	30.1	29.4	29.5	28.9	29.2	29.4	22.1	24.1	20.4	24.4	24.4	25.1	27.1	19.4	27.0	28.0	29.0			27.5		23.7
9	Turb (NTU)	1.5	94.0	21.0	89.3	18.0	256.3	456.0	158.7	3.0	6.0	3.0	1.5	1.0	4.5	4.0	4.5	2.0	4.0	1.0			6.0		4.7
	CHEMICAL																								
1	Alk-Phen (mgCaCO3/L)	0.8	0.0	0.0	1.0	1.4	0.0	0.0	0.0	1.2	1.7	2.1	0.0	0.0	0.4	0.0	0.8	0.0	0.0	1.7			0.0		1.1
2	ALK-TOT (mgCaCO3/L)	124	160	151	178	98	112	113	116	182	171	124	204	116	126	152	152	180	189	148			98		146
3	Ca (mg/L)	28	29	31	31	37	40	41	43	32	30	30	33	40	44	59	57	32	30	26			34		50
4	Cl (mg/L)	18.0	22.0	28.0	24.5	28.0	31.3	22.7	21.3	25.0	29.0	29.0	25.0	36.0	39.5	32.0	39.5	26.0	36.0	22.0			29.0		32.0
5	CO3 (mg/L)	1.0	0.0	0.0	1.3	1.7	0.0	0.0	0.0	1.5	2.0	2.5	0.0	0.0	0.5	0.0	1.0	0.0	0.0	2.0			0.0		1.3
6	F (mg/L)	0.22	0.39	0.61	0.57	0.76	0.43	0.37	0.52	0.19	0.51	0.30	0.56	0.41	0.42	0.33	0.41	0.22	0.40	0.31			0.43		0.47
7	Fe (mg/L)	0.0	0.0	0.1	0.6	0.3	0.3	0.3	0.3	0.0	0.0	0.1	0.5	0.3	0.3	0.2	0.3	0.0	0.0	0.0			0.2		0.3
8	HCO3 (mg/L)	97	98	128	107	116	137	138	142	110	103	100	125	142	153	185	184	110	115	88			120		176
9	K (mg/L)	1.0	0.6	0.1	0.9	0.9	1.0	0.8	0.9	1.0	0.8	0.4	1.4	1.1	1.3	0.7	0.9	1.0	0.4	0.9			0.9		0.7
10	Mg (mg/L)	4.4	5.1	12.6	6.8	7.5	7.8	7.8	8.8	7.3	4.6	7.8	8.8	11.7	9.7	7.8	10.0	7.8	7.3	5.8			8.3		9.7
11	Na (mg/L)	12.0	15.5	20.0	17.0	19.3	23.7	16.5	15.7	15.0	21.0	20.5	18.0	24.0	29.3	23.7	27.4	16.0	28.0	16.0			21.5		22.0
12	NH3-N (mg N/L)	0.0	0.0	0.06	0.72	0.28	0.26	0.16	0.48	0.0	0.0	0.05	0.24	0.07	0.09	0.05	0.10	0.0	0.0	0.14			0.07		0.16
13	NO2+NO3 (mg N/L)	0.12	0.74	0.64	1.93	3.52	2.12	3.49	4.60	0.12	0.17	1.46	1.81	4.16	1.88	6.39	5.57	0.03	0.33	0.68			1.43		2.24
14	NO2-N (mgN/L)	0.02	0.01	0.03	0.09	0.04	0.05	0.03	0.11	0.01	0.01	0.05	0.03	0.03	0.02	0.01	0.02	0.00	0.01	0.01			0.01		0.02
15	NO3-N (mgN/L)	0.10	0.73	0.61	1.84	3.47	2.07	3.46	4.50	0.11	0.16	1.42	1.78	4.13	1.86	6.38	5.54	0.03	0.32	0.67			1.41		2.22
16	P-Tot (mgP/L)	0.010	0.025	0.010	0.100	0.087	0.070	0.067	0.063	0.030	0.015	0.025	0.055	0.100	0.060	0.070	0.072	0.020	0.010	0.020			0.060		0.080
17	SiO2 (mg/L)	11.7	19.0	37.7	29.1	32.9	32.9	39.5	40.3	17.8	16.4	27.4	33.8	36.2	31.5	60.1	39.2	17.6	22.5	24.6			34.0		38.7
18	SO4 (mg/L)	6.9	11.4	16.6	5.5	11.0	12.8	9.5	9.7	10.0	11.3	14.0	7.7	12.1	19.2	9.1	9.8	10.2	12.4	12.4			18.1		9.5
	BIOLOGICAL/BACTERIOLOGICAL																								
1	BOD3-27 (mg/L)	0.4	1.5	1.2	1.5	1.9	2.1	3.0	1.5	0.4	1.4	1.7	2.0	1.3	1.6	2.8	1.6	0.4	1.4	2.9			2.6		1.9
2	DO (mg/L)	6.9	7.0	6.9	7.3	8.1	7.4	7.5	7.5	9.1	9.8	9.2	9.9	8.4	9.1	10.9	10.6	7.2	8.2	9.5			8.5		7.7
3	DO_SAT% (%)	86	91	91	95	106	95	98	98	104	116	101	118	100	108	137	115	90	105	124			106		91
	TRACE & TOXIC																								
1	Al (mg/L)	0.02	0.05	0.02	0.02	0.01	0.02	0.03	0.03	0.01	0.01	0.02	0.01	0.02	0.02	0.03	0.03	0.01	0.01	0.01			0.02		0.03
	CHEMICAL INDICES																								
1	HAR_Ca (mgCaCO3/L)	71	72	78	77	92	99	102	107	80	76	76	82	100	109	148	141	80	74	64			84		126
2	HAR_Total (mgCaCO3/L)	89	93	131	105	123	131	134	143	111	95	109	119	149	150	181	183	113	105	88			119		166
3	Na% (%)	21	25	25	26	25	26	20	19	23	32	29	25	26	30	22	24	23	37	28			28		22
4	SAR (-)	0.5	0.7	0.8	0.7	0.8	0.9	0.6	0.6	0.6	0.9	0.9	0.7	0.9	1.0	0.8	0.9	0.7	1.2	0.7			0.9		0.7
	PESTICIDES																								

POOLING CONDITION / SNR

POOLING CONDITION

POOLING CONDITION / SNR

HISTORY SHEET

		Water Year	**: 2012-2013**
Site	**: Som at Rangeli**	**Code**	**: 01 02 13 005**
State	: Rajasthan	District	Dungarpur
Basin	: Mahi	Independent River	: Mahi
Tributary	: Som	Sub Tributary	:
Sub-Sub Tributary	:	Local River	: Som
Division	: Mahi Division, Gandhinagar	Sub-Division	: Mahi Sub Divn., Kadana
Drainage Area	: 8329 Sq. Km.	Bank	: Right
Latitude	: 23°52'22" N	Longitude	: 74°13'25" E
	Opening Date	Closing Date	
Gauge	: 15-07-1978		
Discharge	: 15-07-1978		
Sediment	:		
Water Quality	: 01-07-1988		

Water Quality Datasheet for the period : 2012-2013

Station Name : Som at Rangeli (01 02 13 005) **Division : Mahi Division, Gandhinagar**

Local River : Som **River Water Analysis** **Sub-Division : Mahi Sub Divn., Kadana**

S.No	Parameters	01-06-2012	02-07-2012	01-08-2012	01-09-2012	01-10-2012	01-11-2012	01-12-2012	01-01-2013	01-02-2013	01-03-2013	01-04-2013	01-05-2013
	PHYSICAL												
1	Q (cumec)	0.000	0.000	2.720 #	247.0	56.56	4.921	4.648	4.906	4.913	3.014	2.758	2.047
2	Colour_Cod (-)			Clear		Clear		Clear		Clear		Clear	
3	EC_FLD (µmho/cm)									575		585	
4	EC_GEN (µmho/cm)			493		547		540		604		563	
5	Odour_Code (-)			odour free		odour free		odour free		odour free		odour free	
6	pH_FLD (pH units)									7.4		7.8	
7	pH_GEN (pH units)			8.1		8.2		8.2		8.3		8.5	
8	SS (mg/L)			48		36		42		44		34	
9	TDS (mg/L)			324		360		346		386		360	
10	Temp (deg C)			26.0		27.0		19.0		16.0		20.8	
11	Turb (NTU)			1.0		5.0		5.0		4.0		3.0	
	CHEMICAL												
1	Alk-Phen (mgCaCO3/L)			0.0		0.0		0.0		0.0		1.7	
2	ALK-TOT (mgCaCO3/L)			144		172		168		220		235	
3	Ca (mg/L)			55		58		63		77		83	
4	Cl (mg/L)			46.0		44.0		42.0		58.0		60.0	
5	CO3 (mg/L)			0.0		0.0		0.0		0.0		2.0	
6	F (mg/L)			0.92		0.60		0.81		0.98		0.91	
7	Fe (mg/L)			0.4		0.5		0.4		0.5		0.5	
8	HCO3 (mg/L)			176		210		205		268		283	
9	K (mg/L)			0.6		0.8		0.8		0.9		1.0	
10	Mg (mg/L)			8.8		11.7		9.7		11.7		10.7	
11	Na (mg/L)			27.9		32.0		31.0		38.3		40.4	
12	NH3-N (mg N/L)			0.68		0.21		0.09		0.36		0.38	
13	NO2+NO3 (mg N/L)			0.94		2.31		2.44		1.09		1.10	
14	NO2-N (mgN/L)			0.02		0.01		0.03		0.03		0.03	
15	NO3-N (mgN/L)			0.92		2.30		2.41		1.06		1.07	
16	P-Tot (mgP/L)			0.080		0.100		0.090		0.100		0.100	
17	SiO2 (mg/L)			28.5		24.2		34.4		17.6		18.6	
18	SO4 (mg/L)			13.9		15.6		8.7		8.9		10.5	
	BIOLOGICAL/BACTERIOLOGICAL												
1	BOD3-27 (mg/L)			0.6		1.2		1.1		1.3		2.0	
2	DO (mg/L)			6.6		8.0		9.0		9.6		8.1	
3	DO_SAT% (%)			81		100		97		97		89	
	TRACE & TOXIC												
1	Al (mg/L)			0.02		0.03		0.05		0.06		0.07	
	CHEMICAL INDICES												
1	HAR_Ca (mgCaCO3/L)			136		144		156		192		208	
2	HAR_Total (mgCaCO3/L)			173		193		197		241		253	
3	Na% (%)			26		27		25		26		26	
4	RSC (-)			0.0		0.0		0.0		0.0		0.0	
5	SAR (-)			0.9		1.0		1.0		1.1		1.1	
	PESTICIDES												

POOLING OF CINDITION

Note. : # Discarded and estimated discharge

Pesticides , Trace and Toxic element analysis

Station Name : Mahi at Rangeli (01 02 13 005) **Division : Mahi Division, Gandhinagar**

Local River : Som **Sub Divi. : Mahi Sub Div., Kadana**

Sl. No.	Parameter ID	Parameter Name	unit	Date of sampling											
a	**Trace and Toxic**			**01.04.2006**	**02.04.2007**	**02.04.2008**	**01.04.2009**	**01.04.2010**	**01.04.2011**	**01.09.2011**	**01.02.2012**	**02.04.2012**	**28.05.2012**	**01.10.2012**	**01.03.2013**	**01.04.2013**
				Analysis done by WQL-III Lab, UGD, Hyderabad	Analysis done by WQL-III Lab, UGD, Hyderabad	Analysis done by WQL-III Lab, UGD, Hyderabad	Analysis done by WQL-III Lab, UGD, Hyderabad	Analysis done by WQL-III Lab, UGD, Hyderabad	Analysis done by WQL-III Lab, UGD, Hyderabad	Analysis done by NRWQL, New Delhi	Analysis done by NRWQL, New Delhi	Analysis done by WQL-III Lab, UGD, Hyderabad	Analysis done by NRWQL, New Delhi	Analysis done by NRWQL, New Delhi	Analysis done by NRWQL, New Delhi	Analysis done by WQL-III Lab, UGD, Hyderabad
1	As	Arsenic	microgram / l	-	-	-			-	1.55	3.72	5.65	4.95	11.98	1.32	0.82
2	Cd	Cadmium	microgram / l	0.0	8.00	0.72			0	0.03	0.13	0.42	0.16	0.14	0.38	3.51
3	Cr	Chromium	microgram / l	0.0	52.00	0			0	1.31	10.59	0	13.18	5.19	1.79	1.51
4	Cu	Copper	microgram / l	-	-	-			-	5.02	53.04	-	29.4	11.51	5.54	-
5	Hg	Mercury	microgram / l	-	2.252	0			-	0.58	-	0	-	-	0.27	0.132
6	Ni	Nickel	microgram / l	0	0	7.48			1.34	-	12.4	0	14.24	4.32	13.34	2.26
7	Pb	Lead	microgram / l	116	12.00	16.23			32.61	2.10	3.46	26.7	5.03	3.08	2.61	0.00
8	Zn	Zinc	microgram / l	0	27.00	10.50	R I V E R	R I V E R	20.76	9.20	112.5	15.87	49.00	23.73	6.10	19.72
b	**Pesticides**		microgram / l													
1	Aldrin	Aldrin	microgram / l	0	0.01	0			0	-	-	0.0015	-	-	-	Pesticides value not reported .
2	Alpha- BHC	Alpha- BHC	microgram / l	0.006	0.01	0.01			0	-	-	0.0039	-	-	-	
3	Beta-BHC	Beta-BHC	microgram / l	0	0.01	-	D R Y	D R Y	-	-	-	-	-	-	-	
4	Gama- BHC	gamma-BHC (Benzene HexaChloride)	microgram / l	0	0	-			-	-	-	-	-	-	-	
5	D- BHC	D- BHC	microgram / l	-	0.01	-			-	-	-	-	-	-	-	
6	DDT	DDT	microgram / l	0	0.02	0			0	-	-	0.0004	-	-	-	
7	Dieldrin	Dieldrin	microgram / l	0.026	0.03	0			0	-	-	0.0008	-	-	-	
8	Endos-I	Endosulphan I	microgram / l	0	0.01	0.01			0.421	-	-	0.0691	-	-	-	
9	Endos-II	Endosulphan II	microgram / l	0.046	0.03	-			-	-	-	-	-	-	-	
10	Endos-s	Endosulphan s	microgram / l	0.005	0.04	-			-	-	-	-	-	-	-	

WQL - III Lab at UGD, Hyderabad conducts the analysis of Trace and Toxic element and Pesticides

NRWQ Lab at HOC, Noida, New Delhi conducts the analysis of Trace and Toxic element only, which started from September 2011 onwords

Water Quality Summary for the period : 2012-2013

Station Name : Som at Rangeli (01 02 13 005) **Division : Mahi Division, Gandhinagar**

Local River : Som **Sub-Division : Mahi Sub Divn., Kadana**

River Water Summary

S.No	Parameters	Number of Observations	Maximum	Minimum	Mean
	PHYSICAL				
1	Q (cumec)	365	344.8	0.000	29.96
2	EC_FLD (µmho/cm)	2	585	575	580
3	EC_GEN (µmho/cm)	5	604	493	549
4	pH_FLD (pH units)	2	7.8	7.4	7.6
5	pH_GEN (pH units)	5	8.5	8.1	8.3
6	SS (mg/L)	5	48	34	41
7	TDS (mg/L)	5	386	324	355
8	Temp (deg C)	5	27.0	16.0	21.8
9	Turb (NTU)	5	5.0	1.0	3.6
	CHEMICAL				
1	Alk-Phen (mgCaCO3/L)	5	1.7	0.0	0.3
2	ALK-TOT (mgCaCO3/L)	5	235	144	188
3	Ca (mg/L)	5	83	55	67
4	Cl (mg/L)	5	60.0	42.0	50
5	CO3 (mg/L)	5	2.0	0.0	0.4
6	F (mg/L)	5	0.98	0.60	0.84
7	Fe (mg/L)	5	0.5	0.4	0.5
8	HCO3 (mg/L)	5	283	176	228
9	K (mg/L)	5	1.0	0.6	0.8
10	Mg (mg/L)	5	11.7	8.8	10.5
11	Na (mg/L)	5	40.4	27.9	33.9
12	NH3-N (mg N/L)	5	0.68	0.09	0.34
13	NO2+NO3 (mg N/L)	5	2.44	0.94	1.58
14	NO2-N (mgN/L)	5	0.03	0.01	0.02
15	NO3-N (mgN/L)	5	2.41	0.92	1.55
16	P-Tot (mgP/L)	5	0.100	0.080	0.094
17	SiO2 (mg/L)	5	34.4	17.6	24.7
18	SO4 (mg/L)	5	15.6	8.7	11.5
	BIOLOGICAL/BACTERIOLOGICAL				
1	BOD3-27 (mg/L)	5	2.0	0.6	1.2
2	DO (mg/L)	5	9.6	6.6	8.3
3	DO_SAT% (%)	5	100	81	93
	TRACE & TOXIC				
1	Al (mg/L)	5	0.07	0.02	0.05
	CHEMICAL INDICES				
1	HAR_Ca (mgCaCO3/L)	5	208	136	168
2	HAR_Total (mgCaCO3/L)	5	253	173	211
3	Na% (%)	5	27	25	26
4	RSC (-)	5	0.0	0.0	0
5	SAR (-)	5	1.1	0.9	1
	PESTICIDES				

Water Quality Seasonal Average for the period: 2005-2013

Station Name : Som at Rangeli (01 02 13 005) **Division : Mahi Division, Gandhinagar**

Local River : Som **River Water** **Sub-Division : Mahi Sub Divn., Kadana**

S.No	Parameters	Flood								Winter								Summer							
		Jun - Oct								Nov - Feb								Mar - May							
		2005	2006	2007	2008	2009	2010	2011	2012	2005-2006	2006-2007	2007-2008	2008-2009	2009-2010	2010-2011	2011-2012	2012-2013	2006	2007	2008	2009	2010	2011	2012	2013
	PHYSICAL																								
1	Q (cumec)	31.31	320.2	27.17	9.405	21.76	5.227	76.25	61.25	3.060	7.012	3.267	2.428	4.846	5.552	13.75	4.847	1.462	1.847	2.454	0.228	0.541	2.121	3.730	2.607
2	EC_FLD (µmho/cm)																575								585
3	EC_GEN (µmho/cm)	508	261	639	456	498	439	453	520	493	538	513		569	590	535	572	493	623	593			755	486	563
4	pH_FLD (pH units)												O				7.4				O	O			7.8
5	pH_GEN (pH units)	8.2	7.9	8.3	8.1	8.2	7.9	7.5	8.2	8.2	8.3	8.5	N	8.2	8.2	8.0	8.2	8.0	8.5	8.5	N	N	7.3	8.1	8.5
6	SS (mg/L)	43	103	32	20	39	35	44	42	18	45	34	C	50	51	39	43	20	20	10	C	C	50	48	34
7	TDS (mg/L)	335	207	411	302	327	281	291	342	302	343	333	E	353	374	334	366	338	416	360	E	E	482	304	360
8	Temp (deg C)	30.8	27.7	28.0	26.0	27.0	28.0	26.7	26.5	24.5	18.0	21.5		21.0	23.5	20.0	17.5	23.0	21.0	26.0			28.0	26.0	20.8
9	Turb (NTU)	1.5	123.5	1.3	36.5	25.0	8.5	14.7	3.0	9.0	14.0	3.0	I	1.0	4.5	3.0	4.5	8.0	6.0	2.0	I	I	2.0	1.0	3.0
	CHEMICAL												N								N	N			
1	Alk-Phen (mgCaCO3/L)	1.0	0.0	1.9	4.2	0.0	0.0	0.0	0.0	0.0	1.7	7.1		0.8	0.8	0.0	0.0	0.0	5.0	4.2			0.0	0.0	1.7
2	ALK-TOT (mgCaCO3/L)	200	158	284	213	158	144	144	158	225	270	254	2	182	186	162	194	236	310	281	2	2	208	160	235
3	Ca (mg/L)	33	27	40	37	51	48	51	56	35	35	46		57	63	59	70	39	42	37			77	55	83
4	Cl (mg/L)	38.0	22.0	66.7	43.0	65.0	43.0	36.0	45.0	40.0	73.5	56.0		69.0	72.0	41.0	50.0	42.0	80.0	60.0			92.0	40.0	60.0
5	CO3 (mg/L)	1.3	0.0	2.3	5.0	0.0	0.0	0.0	0.0	0.0	2.0	8.5	M	1.0	1.0	0.0	0.0	0.0	6.0	5.0	M	M	0.0	0.0	2.0
6	F (mg/L)	0.27	0.25	0.79	0.76	0.79	0.49	0.55	0.76	0.67	0.67	0.48	O	0.61	0.61	0.63	0.90	0.66	0.78	0.42	O	O	0.86	0.65	0.91
7	Fe (mg/L)	0.0	0.0	0.0	0.6	0.5	0.4	0.4	0.4	0.0	0.0	0.1	N	0.3	0.5	0.5	0.5	0.0	0.0	0.1	N	N	0.5	0.4	0.5
8	HCO3 (mg/L)	121	97	171	125	193	176	176	193	137	163	147	T	220	225	198	237	144	183	166	T	T	254	195	283
9	K (mg/L)	1.3	1.9	1.7	1.8	1.4	0.6	0.6	0.7	2.0	1.1	0.8	H	0.9	2.2	0.8	0.9	1.0	1.1	1.7	H	H	1.7	0.8	1.0
10	Mg (mg/L)	6.8	6.8	15.5	8.3	10.2	9.7	9.4	10.2	9.3	13.1	9.2	/	13.1	11.2	11.7	10.7	8.7	13.6	17.5	/	/	11.7	11.7	10.7
11	Na (mg/L)	27.0	15.1	50.9	32.8	47.6	31.9	25.6	29.9	29.0	57.0	42.5		50.8	51.7	28.4	34.6	30.0	62.0	45.4			60.8	26.8	40.3
12	NH3-N (mg N/L)	0.0	0.0	0.06	0.75	0.44	0.11	0.17	0.45	0.06	0.0	0.06	P	0.08	0.15	0.23	0.23	0.0	0.0	0.10	P	P	0.38	0.38	0.38
13	NO2+NO3 (mg N/L)	0.17	0.98	1.06	1.23	0.54	1.01	1.26	1.62	0.03	1.04	0.91	O	0.44	0.28	1.89	1.76	0.03	1.02	1.99	O	O	1.06	1.80	1.10
14	NO2-N (mgN/L)	0.03	0.05	0.03	0.05	0.04	0.04	0.04	0.01	0.00	0.01	0.04	O	0.01	0.01	0.01	0.03	0.00	0.02	0.01	O	O	0.01	0.02	0.03
15	NO3-N (mgN/L)	0.15	0.93	1.03	1.18	0.50	0.97	1.21	1.61	0.03	1.03	0.87	L	0.43	0.26	1.88	1.74	0.03	1.00	1.98	L	L	1.05	1.78	1.07
16	P-Tot (mgP/L)	0.010	0.030	0.017	0.095	0.090	0.070	0.087	0.090	0.030	0.035	0.010	I	0.095	0.070	0.095	0.095	0.040	0.040	0.010	I	I	0.070	0.090	0.100
17	SiO2 (mg/L)	11.0	21.7	27.2	22.7	28.2	27.6	22.9	26.3	19.4	24.2	21.7	N	23.3	27.8	21.3	26.0	22.0	28.4	20.8	N	N	17.0	8.9	18.6
18	SO4 (mg/L)	10.5	15.3	25.8	12.8	14.6	18.3	14.6	14.8	15.6	20.4	25.5	G	13.7	24.6	15.8	8.8	15.9	20.5	25.0	G	G	25.8	16.4	10.5
	BIOLOGICAL/BACTERIOLOGICAL																								
1	BOD3-27 (mg/L)	0.7	1.3	2.1	2.2	2.0	2.0	3.1	0.9	0.8	1.6	0.9	C	0.4	1.6	1.2	1.2	0.5	2.6	3.0	C	C	1.6	3.6	2.0
2	DO (mg/L)	5.3	5.9	7.5	8.2	8.5	6.2	7.4	7.3	8.4	10.0	11.4	O	8.7	8.6	9.2	9.3	6.5	9.1	9.6	O	O	6.1	7.8	8.1
3	DO_SAT% (%)	72	76	96	101	107	79	93	91	101	105	127	N	98	101	101	97	76	102	118	N	N	78	96	89
	TRACE & TOXIC												D								D	D			
1	Al (mg/L)	0.01	0.06	0.02	0.02	0.01	0.01	0.02	0.02	0.01	0.02	0.02	I	0.02	0.01	0.03	0.05	0.01	0.02	0.03	I	I	0.02	0.03	0.07
	CHEMICAL INDICES												T								T	T			
1	HAR_Ca (mgCaCO3/L)	82	68	99	92	126	120	127	140	87	87	116	I	142	156	146	174	97	106	92	I	I	192	136	208
2	HAR_Total (mgCaCO3/L)	110	96	164	127	169	161	166	183	126	142	155	O	197	203	195	219	133	163	165	O	O	241	185	253
3	Na% (%)	34	25	39	36	38	28	25	26	33	47	37	N	36	35	24	26	33	45	37	N	N	35	24	26
4	SAR (-)	1.1	0.7	1.7	1.3	1.6	1.1	0.9	1.0	1.1	2.1	1.5		1.6	1.6	0.9	1.0	1.1	2.1	1.5			1.7	0.9	1.1
	PESTICIDES																								

HISTORY SHEET

		Water Year	**: 2012-2013**
Site	**: Mahi at Paderdibadi**	**Code**	**: 01 02 13 006**
State	: Rajasthan	District	Dungarpur
Basin	: Mahi	Independent River	: Mahi
Tributary	: Mahi	Sub Tributary	:
Sub-Sub Tributary	:	Local River	: Mahi
Division	: Mahi Division, Gandhinagar	Sub-Division	: Mahi Sub Divn., Kadana
Drainage Area	: 16247 Sq. Km.	Bank	: Right
Latitude	: 23°46'02" N	Longitude	: 74°08'12" E

	Opening Date	Closing Date
Gauge	: 17-09-1977	
Discharge	: 24-06-1978	
Sediment	: 21-07-1980	
Water Quality	: 01-07-1978	

Water Quality Datasheet for the period : 2012-2013

Station Name : Mahi at Paderdibadi (01 02 13 006) **Division : Mahi Division, Gandhinagar**

Local River : Mahi **River Water Analysis** **Sub-Division : Mahi Sub Divn., Kadana**

S.No	Parameters	01-06-2012	02-07-2012	01-08-2012	01-09-2012	01-10-2012	01-11-2012	01-12-2012	01-01-2013	01-02-2013	01-03-2013	01-04-2013	01-05-2013
	PHYSICAL												
1	Q (cumec)	0.000	0.000	10.97	591.0	230.8	14.19	11.29	9.072	7.827	8.088	6.646	1.306
2	Colour_Cod (-)			Clear	Light Brown	Clear	Clear	Clear	Clear	Clear	Clear	Clear	Clear
3	EC_FLD (µmho/cm)			410	490	380	563	565	525	542	521	495	540
4	EC_GEN (µmho/cm)			379	306	573	520	498	488	485	456	461	485
5	Odour_Code (-)			odour free	odour free	odour free	odour free	odour free	odour free	odour free	odour free	odour free	odour free
6	pH_FLD (pH units)			8.0	7.9	7.2	8.0	7.4	7.4	7.8	7.1	8.0	7.9
7	pH_GEN (pH units)			8.0	7.9	8.2	8.4	8.3	8.3	8.4	8.5	8.5	8.5
8	SS (mg/L)			36	44	44	44	58	36	40	38	40	30
9	TDS (mg/L)			246	192	356	332	308	296	284	280	284	306
10	Temp (deg C)			24.0	23.0	23.0	26.2	20.3	21.5	22.3	23.8	29.9	32.0
11	Turb (NTU)			19.0	207.0	4.0	7.0	4.0	3.0	3.0	4.0	2.0	3.0
	CHEMICAL												
1	Alk-Phen (mgCaCO3/L)	P	P	0.0	0.0	0.0	4.2	1.7	1.7	4.2	1.7	1.7	1.7
2	ALK-TOT (mgCaCO3/L)	O	O	136	124	172	164	163	167	176	167	171	175
3	Ca (mg/L)	O	O	50	40	59	58	59	61	61	61	58	63
4	Cl (mg/L)	L	L	24.0	22.0	46.0	18.0	38.0	36.0	38.0	34.0	40.0	44.0
5	CO3 (mg/L)	I	I	0.0	0.0	0.0	5.0	2.0	2.0	5.0	2.0	2.0	2.0
6	F (mg/L)	N	N	0.57	0.37	0.88	0.44	0.44	0.42	0.81	0.78	0.80	0.83
7	Fe (mg/L)	G	G	0.5	0.5	0.6	0.6	0.6	0.6	0.5	0.5	0.5	0.5
8	HCO3 (mg/L)			166	151	210	190	195	200	205	200	205	210
9	K (mg/L)			0.8	0.8	0.9	0.8	0.7	0.7	0.8	0.8	0.8	0.9
10	Mg (mg/L)	C	C	8.8	9.7	11.7	9.7	8.8	9.7	10.7	9.7	12.6	11.7
11	Na (mg/L)	I	I	17.5	15.4	30.0	13.3	27.9	25.8	24.8	22.7	23.7	25.8
12	NH3-N (mg N/L)	N	N	0.76	0.54	0.05	0.11	0.23	0.42	0.42	0.44	0.46	0.48
13	NO2+NO3 (mg N/L)	D	D	0.97	1.81	2.09	2.20	2.20	2.08	2.00	1.09	1.10	1.19
14	NO2-N (mgN/L)	I	I	0.05	0.07	0.02	0.02	0.03	0.02	0.02	0.02	0.03	0.03
15	NO3-N (mgN/L)	T	T	0.92	1.74	2.07	2.18	2.17	2.06	1.98	1.07	1.07	1.16
16	P-Tot (mgP/L)	I	I	0.090	0.080	0.100	0.100	0.100	0.090	0.090	0.080	0.090	0.100
17	SiO2 (mg/L)	O	O	30.4	29.7	34.1	33.8	34.3	33.1	26.9	27.8	28.2	28.5
18	SO4 (mg/L)	N	N	10.5	8.7	11.7	11.4	11.9	11.8	11.5	11.3	11.4	12.1
	BIOLOGICAL/BACTERIOLOGICAL												
1	BOD3-27 (mg/L)			2.2	1.4	1.8	0.4	1.7	0.7	0.8	1.1	1.5	2.4
2	DO (mg/L)			5.8	7.1	7.3	8.4	9.4	8.5	9.4	7.2	7.8	7.1
3	DO_SAT% (%)			69	83	85	104	103	95	108	84	102	97
	TRACE & TOXIC												
1	Al (mg/L)			0.02	0.03	0.04	0.03	0.04	0.03	0.03	0.02	0.03	0.03
	CHEMICAL INDICES												
1	HAR_Ca (mgCaCO3/L)			124	100	148	144	148	152	152	152	144	156
2	HAR_Total (mgCaCO3/L)			161	141	197	185	185	193	197	193	197	205
3	Na% (%)			19	19	25	14	25	23	21	20	21	21
4	RSC (-)			0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	SAR (-)			0.6	0.6	0.9	0.4	0.9	0.8	0.8	0.7	0.7	0.8
	PESTICIDES												

Pesticides , Trace and Toxic element analysis

Station Name : Mahi at Padardibadi (01 02 13 006) **Division : Mahi Division, Gandhinagar**

Local River : Mahi **Sub Divi. : Mahi Sub Div., Kadana**

Sl. No.	Parameter ID	Parameter Name	unit	Date of sampling												
	Trace and Toxic			01.04.2006	02.04.2007	02.04.2008	01.04.2009	01.04.2010	01.04.2011	01.09.2011	01.02.2012	02.04.2012	28.05.2012	01.10.2012	01.03.2013	01.04.2013
a				Analysis done by WQL-III Lab, UGD, Hyderabad	Analysis done by WQL-III Lab, UGD, Hyderabad	Analysis done by WQL-III Lab, UGD, Hyderabad	Analysis done by WQL-III Lab, UGD, Hyderabad	Analysis done by WQL-III Lab, UGD, Hyderabad	Analysis done by WQL-III Lab, UGD, Hyderabad	Analysis done by NRWQL, New Delhi	Analysis done by NRWQL, New Delhi	Analysis done by WQL-III Lab, UGD, Hyderabad	Analysis done by NRWQL, New Delhi	Analysis done by NRWQL, New Delhi	Analysis done by NRWQL, New Delhi	Analysis done by WQL-III Lab, UGD, Hyderabad
1	As	Arsenic	microgram / l	-	-	-			-	0.67	3.01	4.34	1.09	13.86	3.38	0.93
2	Cd	Cadmium	microgram / l	0.0	6.00	0.60			0	0.065	0.07	0.33	1.26	0.15	0.09	3.56
3	Cr	Chromium	microgram / l	0.0	51.00	0			0	3.36	6.95	0	30.94	8.69	2.74	2.47
4	Cu	Copper	microgram / l	-	-	-			-	6.44	6.60	-	94.00	9.40	3.56	-
5	Hg	Mercury	microgram / l	-	1.088	0			-	0.59	-	0	-	-	0.26	0.257
6	Ni	Nickel	microgram / l	0	0	7.30			0.52	-	4.08	0.11	6.80	4.72	9.52	1.94
7	Pb	Lead	microgram / l	57	23.00	15.84			29.68	5.85	1.37	22.78	9.68	2.70	2.03	0.00
8	Zn	Zinc	microgram / l	7	24.00	31.82	R I V E R	R I V E R	23.34	25.80	20.20	18.03	218.0	16.27	3.00	34.5
b	**Pesticides**		microgram / l													
1	Aldrin	Aldrin	microgram / l	0.008	0.01	0			0	-	-	0.0094	-	-	-	Pesticides value not reported .
2	Alpha- BHC	Alpha- BHC	microgram / l	0.015	0.01	0	D R Y	D R Y	0.116	-	-	0.0816	-	-	-	
3	Beta-BHC	Beta-BHC	microgram / l	0	0.01	-			-	-	-	-	-	-	-	
4	Gama- BHC	gamma-BHC (Benzene HexaChloride)	microgram / l	0.016	0.01	-			-	-	-	-	-	-	-	
5	D- BHC	D- BHC	microgram / l	-	0.02	-			-	-	-	-	-	-	-	
6	DDT	DDT	microgram / l	0.003	0	0.01			0.018	-	-	0.0026	-	-	-	
7	Dieldrin	Dieldrin	microgram / l	0.035	0.02	0			0.065	-	-	0.0008	-	-	-	
8	Endos-I	Endosulphan I	microgram / l	0.007	0.01	0.01			0.209	-	-	0.6913	-	-	-	
9	Endos-II	Endosulphan II	microgram / l	0	0.01	-			-	-	-		-	-	-	
10	Endos-s	Endosulphan s	microgram / l	0.021	0.05	-			-	-	-		-	-	-	

WQL - III Lab at UGD, Hyderabad conducts the analysis of Trace and Toxic element and Pesticides

NRWQ Lab at HOC, Noida, New Delhi conducts the analysis of Trace and Toxic element only, which started from September 2011 onwords

Water Quality Summary for the period : 2012-2013

Station Name : Mahi at Paderdibadi (01 02 13 006) **Division : Mahi Division, Gandhinagar**

Local River : Mahi **Sub-Division : Mahi Sub Divn., Kadana**

River Water Summary

S.No	Parameters	Number of Observations	Maximum	Minimum	Mean
	PHYSICAL				
1	Q (cumec)	365	2469	0.000	103.7
2	EC_FLD (µmho/cm)	10	565	380	503
3	EC_GEN (µmho/cm)	10	573	306	465
4	pH_FLD (pH units)	10	8.0	7.1	7.7
5	pH_GEN (pH units)	10	8.5	7.9	8.3
6	SS (mg/L)	10	58	30	41
7	TDS (mg/L)	10	356	192	288
8	Temp (deg C)	10	32.0	20.3	24.6
9	Turb (NTU)	10	207.0	2.0	25.6
	CHEMICAL				
1	Alk-Phen (mgCaCO3/L)	10	4.2	0.0	1.7
2	ALK-TOT (mgCaCO3/L)	10	176	124	162
3	Ca (mg/L)	10	63	40	57
4	Cl (mg/L)	10	46.0	18.0	34
5	CO3 (mg/L)	10	5.0	0.0	2
6	F (mg/L)	10	0.88	0.37	0.63
7	Fe (mg/L)	10	0.6	0.5	0.5
8	HCO3 (mg/L)	10	210	151	193
9	K (mg/L)	10	0.9	0.7	0.8
10	Mg (mg/L)	10	12.6	8.8	10.3
11	Na (mg/L)	10	30.0	13.3	22.7
12	NH3-N (mg N/L)	10	0.76	0.05	0.39
13	NO2+NO3 (mg N/L)	10	2.20	0.97	1.67
14	NO2-N (mgN/L)	10	0.07	0.02	0.03
15	NO3-N (mgN/L)	10	2.18	0.92	1.64
16	P-Tot (mgP/L)	10	0.100	0.080	0.092
17	SiO2 (mg/L)	10	34.3	26.9	30.7
18	SO4 (mg/L)	10	12.1	8.7	11.2
	BIOLOGICAL/BACTERIOLOGICAL				
1	BOD3-27 (mg/L)	10	2.4	0.4	1.4
2	DO (mg/L)	10	9.4	5.8	7.8
3	DO_SAT% (%)	10	108	69	93
	TRACE & TOXIC				
1	Al (mg/L)	10	0.04	0.02	0.03
	CHEMICAL INDICES				
1	HAR_Ca (mgCaCO3/L)	10	156	100	142
2	HAR_Total (mgCaCO3/L)	10	205	141	185
3	Na% (%)	10	25	14	21
4	RSC (-)	10	0.0	0.0	0
5	SAR (-)	10	0.9	0.4	0.7
	PESTICIDES				

Water Quality Seasonal Average for the period: 2005-2013

Station Name : Mahi at Paderdibadi (01 02 13 006) **Division : Mahi Division, Gandhinagar**

Local River : Mahi **River Water** **Sub-Division : Mahi Sub Divn., Kadana**

S.No	Parameters	Flood								Winter								Summer							
		Jun - Oct								Nov - Feb								Mar - May							
		2005	2006	2007	2008	2009	2010	2011	2012	2005-2006	2006-2007	2007-2008	2008-2009	2009-2010	2010-2011	2011-2012	2012-2013	2006	2007	2008	2009	2010	2011	2012	2013
	PHYSICAL																								
1	Q (cumec)	29.08	696.5	66.61	14.29	34.32	6.077	218.7	166.6	7.551	13.05	7.068	0.716	10.10	2.605	38.04	10.59	4.263	5.189	3.291	1.535	1.408	1.564	10.16	5.347
2	EC_FLD (µmho/cm)	514	467	516	456	425	405	520	427	684	618	536	553	515	516	693	549	587	557	496	556	572	578	497	519
3	EC_GEN (µmho/cm)	474	439	460	418	422	402	429	419	517	544	487	472	506	440	520	498	521	510	472	437	571	470	432	467
4	pH_FLD (pH units)	8.4	8.5	8.9	8.6	8.6	8.4	9.1	7.7	8.1	8.6	8.8	8.8	8.3	8.9	9.7	7.6	8.3	8.8	9.0	8.9	7.9	8.4	8.9	7.7
5	pH_GEN (pH units)	8.2	7.7	8.3	8.2	8.1	7.9	7.6	8.0	8.1	8.3	8.4	8.1	8.0	8.3	8.0	8.4	8.1	8.4	8.5	8.1	7.7	7.9	8.4	8.5
6	SS (mg/L)	45	56	24	24	27	43	47	41	18	25	20	24	25	35	35	45	21	23	15	20	28	41	48	36
7	TDS (mg/L)	315	287	300	264	275	257	271	265	334	343	312	292	319	266	331	305	339	313	291	272	366	296	268	290
8	Temp (deg C)	30.6	29.3	30.1	28.4	29.1	24.7	25.2	23.3	21.7	23.5	21.8	23.0	26.3	20.5	24.3	22.6	27.3	28.4	26.1	23.5	25.0	22.0	28.1	28.6
9	Turb (NTU)	2.2	103.6	69.0	77.0	12.0	9.3	84.3	76.7	8.0	9.3	1.3	2.0	2.0	7.0	6.3	4.3	7.3	3.7	2.0	2.0	3.0	4.0	4.0	3.0
	CHEMICAL																								
1	Alk-Phen (mgCaCO3/L)	1.0	0.0	1.5	1.9	0.0	0.0	0.0	0.0	0.0	1.2	5.0	0.0	0.4	0.4	2.1	2.9	0.6	3.3	2.8	0.0	0.0	0.0	0.6	1.7
2	ALK-TOT (mgCaCO3/L)	194	212	222	188	131	132	131	144	237	246	246	233	167	127	185	168	240	231	211	216	196	144	151	171
3	Ca (mg/L)	32	35	38	36	42	44	45	50	37	36	44	42	55	45	69	60	38	37	40	40	63	50	52	60
4	Cl (mg/L)	35.2	32.8	47.2	34.0	54.7	46.0	34.0	30.7	40.0	54.5	43.0	36.0	61.0	48.0	40.0	32.5	44.0	58.7	36.0	34.0	66.0	47.0	35.3	39.3
5	CO3 (mg/L)	1.2	0.0	1.8	2.3	0.0	0.0	0.0	0.0	0.0	1.5	6.0	0.0	0.5	0.5	2.5	3.5	0.7	4.0	3.3	0.0	0.0	0.0	0.7	2.0
6	F (mg/L)	0.29	0.41	0.72	0.78	0.87	0.51	0.77	0.61	0.26	0.72	0.67	0.34	0.75	0.53	0.66	0.53	0.29	0.78	0.62	0.33	0.67	0.83	0.61	0.80
7	Fe (mg/L)	0.0	0.1	0.1	0.5	0.6	0.5	0.5	0.5	0.0	0.0	0.1	0.2	0.4	0.6	0.6	0.6	0.0	0.0	0.1	0.2	0.4	0.7	0.6	0.5
8	HCO3 (mg/L)	117	129	134	112	159	161	159	176	145	149	144	142	202	154	221	198	146	137	125	132	239	176	182	205
9	K (mg/L)	1.2	1.9	0.7	1.2	1.2	0.7	0.8	0.8	1.6	1.1	0.5	1.2	1.1	1.4	0.8	0.8	1.3	0.7	0.8	0.7	0.9	2.0	0.7	0.8
10	Mg (mg/L)	6.7	8.4	9.1	6.8	9.1	8.4	9.4	10.0	9.7	11.4	10.7	6.8	11.9	8.0	8.5	9.7	9.5	9.6	10.7	5.8	14.6	10.2	11.0	11.3
11	Na (mg/L)	24.8	24.6	35.9	21.8	40.3	33.7	23.8	20.9	29.1	41.8	31.6	27.8	46.9	36.2	27.6	22.9	32.7	45.1	24.5	24.3	48.3	35.2	23.4	24.1
12	NH3-N (mg N/L)	0.0	0.20	0.05	0.39	0.41	0.23	0.49	0.45	0.09	0.0	0.06	0.32	0.08	0.29	0.35	0.29	0.09	0.0	0.12	0.29	0.12	0.40	0.22	0.46
13	NO2+NO3 (mg N/L)	0.19	1.16	0.75	0.55	0.42	0.46	1.81	1.62	0.57	0.25	1.41	0.84	0.55	0.57	2.30	2.12	0.29	0.19	0.60	0.77	0.84	0.80	0.72	1.13
14	NO2-N (mgN/L)	0.04	0.05	0.03	0.04	0.09	0.03	0.02	0.05	0.00	0.03	0.02	0.01	0.02	0.02	0.02	0.02	0.04	0.01	0.01	0.01	0.02	0.01	0.02	0.03
15	NO3-N (mgN/L)	0.14	1.11	0.72	0.50	0.33	0.42	1.79	1.58	0.57	0.22	1.39	0.83	0.53	0.55	2.29	2.10	0.25	0.17	0.59	0.76	0.82	0.79	0.70	1.10
16	P-Tot (mgP/L)	0.012	0.036	0.020	0.090	0.110	0.100	0.097	0.090	0.047	0.020	0.020	0.070	0.120	0.098	0.105	0.095	0.043	0.010	0.020	0.070	0.130	0.100	0.107	0.090
17	SiO2 (mg/L)	12.1	24.5	28.5	29.9	26.2	32.1	30.2	31.4	19.1	26.8	26.7	20.5	24.8	30.5	29.4	32.0	20.2	29.6	23.1	20.9	22.2	21.5	9.0	28.2
18	SO4 (mg/L)	10.1	12.8	21.9	13.7	15.1	15.8	10.8	10.3	18.2	18.4	23.2	11.0	20.3	20.6	12.8	11.6	20.1	19.8	23.1	10.2	20.9	21.4	14.2	11.6
	BIOLOGICAL/BACTERIOLOGICAL																								
1	BOD3-27 (mg/L)	0.6	0.8	1.4	2.5	2.2	2.5	1.7	1.8	0.7	1.5	1.7	1.6	1.7	1.5	1.5	0.9	0.6	1.9	2.7	2.5	2.3	2.0	1.9	1.7
2	DO (mg/L)	6.1	6.1	7.2	9.6	8.0	7.7	8.0	6.7	7.7	8.6	10.4	9.8	8.8	8.8	9.3	8.9	7.2	8.8	8.8	8.1	7.9	8.9	8.1	7.4
3	DO_SAT% (%)	81	79	95	122	105	92	96	79	87	101	116	114	109	98	110	103	90	113	109	95	96	101	101	94
	TRACE & TOXIC																								
1	Al (mg/L)	0.01	0.05	0.04	0.02	0.03	0.02	0.02	0.03	0.01	0.01	0.03	0.02	0.03	0.03	0.03	0.03	0.02	0.02	0.02	0.02	0.03	0.04	0.03	0.03
	CHEMICAL INDICES																								
1	HAR_Ca (mgCaCO3/L)	81	87	94	91	106	111	112	124	93	90	111	104	137	113	172	149	96	93	99	100	156	124	131	151
2	HAR_Total (mgCaCO3/L)	109	122	132	119	143	146	151	166	133	137	156	133	187	147	208	190	135	133	143	124	217	167	177	198
3	Na% (%)	32	28	37	28	38	33	26	21	32	40	31	31	35	35	22	21	34	42	27	30	33	31	22	21
4	SAR (-)	1.0	0.9	1.4	0.9	1.5	1.2	0.8	0.7	1.1	1.6	1.1	1.1	1.5	1.3	0.8	0.7	1.2	1.7	0.9	0.9	1.4	1.2	0.8	0.7
	PESTICIDES																								

HISTORY SHEET

		Water Year	**: 2012-2013**
Site	**: Mahi at Khanpur**	**Code**	**: 01 02 13 012**
State	: Gujarat	District	Anand
Basin	: Mahi	Independent River	: Mahi
Tributary	: Mahi	Sub Tributary	:
Sub-Sub Tributary	:	Local River	: Mahi
Division	: Mahi Division, Gandhinagar	Sub-Division	: Mahi Sub Divn., Kadana
Drainage Area	: 32510 Sq. Km.	Bank	: Right
Latitude	: 22°31'55" N	Longitude	: 73°08'27" E

	Opening Date	Closing Date
Gauge	: 21-12-1978	
Discharge	: 21-12-1978	
Sediment	: 01-05-1988	
Water Quality	: 01-01-1979	

Mahi at Khanpur

Water Quality Datasheet for the period : 2012-2013

Station Name : Mahi at Khanpur (01 02 13 012) **Division : Mahi Division, Gandhinagar**

Local River : Mahi **River Water Analysis** **Sub-Division : Mahi Sub Divn., Kadana**

S.No	Parameters	01-06-2012	02-07-2012	01-08-2012	01-09-2012	01-10-2012	01-11-2012	01-12-2012	01-01-2013	01-02-2013	01-03-2013	01-04-2013	01-05-2013
	PHYSICAL												
1	Q (cumec)	2.362	10.06	68.26	329.1	203.7	36.13	16.23	17.92	14.01	11.76	11.44	9.414
2	Colour_Cod (-)	Clear	Clear	Clear	Clear	Clear	Clear	Clear	Clear	Clear	Clear	Clear	Clear
3	EC_FLD (µmho/cm)	456	418	397	378	415	345	340	380	390	483	492	472
4	EC_GEN (µmho/cm)	580	537	475	263	320	426	488	445	455	446	461	426
5	Odour_Code (-)	odour free	odour free	odour free	odour free	odour free	odour free	odour free	odour free	odour free	odour free	odour free	odour free
6	pH_FLD (pH units)	7.2	6.7	6.8	6.4	6.7	7.2	7.3	7.1	8.3	7.3	8.8	8.8
7	pH_GEN (pH units)	9.0	8.6	8.2	8.1	8.5	8.5	8.4	8.4	8.5	8.6	8.7	8.9
8	SS (mg/L)	42	44	32	50	50	46	44	48	48	50	40	66
9	TDS (mg/L)	370	348	310	168	196	260	298	278	264	276	282	268
10	Temp (deg C)	34.0	30.5	30.0	28.0	30.0	26.0	23.0	18.5	21.5	23.5	28.5	32.0
11	Turb (NTU)	2.0	1.0	1.0	15.0	3.0	5.0	8.0	2.0	4.0	3.0	3.0	2.0
	CHEMICAL												
1	Alk-Phen (mgCaCO3/L)	10.0	1.7	0.0	0.0	4.2	5.8	8.3	10.0	5.8	4.2	4.2	5.8
2	ALK-TOT (mgCaCO3/L)	196	180	152	96	100	131	149	168	167	168	176	176
3	Ca (mg/L)	75	66	51	35	35	45	50	64	59	58	61	61
4	Cl (mg/L)	46.0	44.0	40.0	20.0	22.0	36.0	36.0	34.0	40.0	36.0	38.0	34.0
5	CO3 (mg/L)	12.0	2.0	0.0	0.0	5.0	7.0	10.0	12.0	7.0	5.0	5.0	7.0
6	F (mg/L)	0.83	0.81	0.57	0.37	0.57	0.41	0.40	0.39	0.81	0.77	0.79	0.81
7	Fe (mg/L)	0.2	0.2	0.2	0.1	0.2	0.3	0.3	0.3	0.3	0.2	0.3	0.2
8	HCO3 (mg/L)	215	215	185	117	112	146	161	181	190	195	205	200
9	K (mg/L)	0.8	0.7	0.8	0.5	0.6	0.7	0.6	0.7	0.8	0.7	0.8	0.7
10	Mg (mg/L)	8.8	9.7	9.7	8.8	8.8	9.7	10.7	6.8	11.7	11.7	12.6	10.7
11	Na (mg/L)	30.0	28.9	26.8	14.4	14.4	23.7	25.8	23.7	24.8	23.7	25.8	22.7
12	NH3-N (mg N/L)	0.37	0.27	0.38	0.48	0.05	0.27	0.27	0.48	0.10	0.16	0.18	0.15
13	NO2+NO3 (mg N/L)	1.40	1.17	0.52	2.94	1.57	1.67	1.50	2.07	1.69	1.60	1.62	1.52
14	NO2-N (mgN/L)	0.05	0.03	0.01	0.02	0.01	0.03	0.03	0.03	0.03	0.03	0.03	0.03
15	NO3-N (mgN/L)	1.35	1.14	0.51	2.92	1.56	1.64	1.47	2.04	1.66	1.57	1.59	1.49
16	P-Tot (mgP/L)	0.100	0.100	0.040	0.030	0.050	0.060	0.060	0.060	0.060	0.060	0.060	0.050
17	SiO2 (mg/L)	27.5	29.2	35.3	28.1	27.1	28.8	29.0	26.8	29.9	34.3	34.5	30.7
18	SO4 (mg/L)	18.0	17.7	15.8	12.7	14.5	15.4	15.8	15.3	15.5	15.3	15.5	14.5
	BIOLOGICAL/BACTERIOLOGICAL												
1	BOD3-27 (mg/L)	1.6	1.6	0.7	0.5	2.1	0.5	0.7	2.4	0.9	0.6	1.9	1.9
2	DO (mg/L)	8.8	7.3	6.4	6.0	8.4	8.4	9.3	11.8	10.3	6.4	7.9	8.5
3	DO_SAT% (%)	125	97	85	77	111	104	108	125	116	75	101	116
	TRACE & TOXIC												
1	Al (mg/L)	0.03	0.03	0.02	0.02	0.03	0.03	0.03	0.02	0.02	0.02	0.03	0.02
	CHEMICAL INDICES												
1	HAR_Ca (mgCaCO3/L)	188	164	128	88	88	112	124	160	148	144	152	152
2	HAR_Total (mgCaCO3/L)	225	205	169	125	125	153	169	189	197	193	205	197
3	Na% (%)	22	23	26	20	20	25	25	21	21	21	21	20
4	RSC (-)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	SAR (-)	0.9	0.9	0.9	0.6	0.6	0.8	0.9	0.8	0.8	0.7	0.8	0.7
	PESTICIDES												

Monthly basis IWIN sample started from 01.07.2008 onwords and stopped w.e.f 31.03.2013

Pesticides , Trace and Toxic element analysis

Station Name : Mahi at Khanpur (01 02 13 012) **Division : Mahi Division, Gandhinagar**

Local River : Mahi **Sub Divi. : Mahi Sub Div., Kadana**

Sl. No.	Parameter ID	Parameter Name	unit	Date of sampling												
a	Trace and Toxic			01.04.2006	02.04.2007	02.04.2008	01.04.2009	01.04.2010	01.04.2011	01.09.2011	01.02.2012	02.04.2012	28.05.2012	01.10.2012	01.03.2013	01.04.2013
				Analysis done by WQL-III Lab, UGD, Hyderabad	Analysis done by WQL-III Lab, UGD, Hyderabad	Analysis done by WQL-III Lab, UGD, Hyderabad	Analysis done by WQL-III Lab, UGD, Hyderabad	Analysis done by WQL-III Lab, UGD, Hyderabad	Analysis done by WQL-III Lab, UGD, Hyderabad	Analysis done by NRWQL, New Delhi	Analysis done by NRWQL, New Delhi	Analysis done by WQL-III Lab, UGD, Hyderabad	Analysis done by NRWQL, New Delhi	Analysis done by NRWQL, New Delhi	Analysis done by NRWQL, New Delhi	Analysis done by WQL-III Lab, UGD, Hyderabad
1	As	Arsenic	microgram / l	-	-	-	-	1.977	-	0.43	2.65	0.86	1.65	11.65	3.38	0.27
2	Cd	Cadmium	microgram / l	0.0	5.00	0.60	1.97	0.00	0	0.037	0.14	0.09	0.12	0.17	0.19	3.26
3	Cr	Chromium	microgram / l	0.0	0.00	0	0	0	0.36	2.8	9.02	0	10.36	20.16	2.56	2.02
4	Cu	Copper	microgram / l	-	-	-	-	-	-	9.79	47.64	-	27.6	6.19	2.34	-
5	Hg	Mercury	microgram / l	-	6.284	0	0	0	-	0.57	-	0	-	-	0.24	0.377
6	Ni	Nickel	microgram / l	0	0	7.60	0.00	0.00	0.39	-	9.74	0	7.2	9.39	7.06	1.83
7	Pb	Lead	microgram / l	46.0	39.00	13.48	23.00	0.00	28.53	4.04	0.88	21.7	5.07	1.01	2.11	0.00
8	Zn	Zinc	microgram / l	6.00	29.00	23.26	5.57	7.81	5.70	13.88	0.00	18.13	19.00	10.14	2.80	18.23
b	Pesticides		microgram / l													
1	Aldrin	Aldrin	microgram / l	0	0.01	0	0	0	0	-	-	0.0016	-	-	-	Pesticides value not reported.
2	Alpha- BHC	Alpha- BHC	microgram / l	0	0.01	0.01	0.0029	0.0077	0	-	-	0.0201	-	-	-	
3	Beta-BHC	Beta-BHC	microgram / l	0	0.01	-	-	-	-	-	-	-	-	-	-	
4	Gama- BHC	gamma-BHC (Benzene HexaChloride)	microgram / l	0	0	-	-	-	-	-	-	-	-	-	-	
5	D- BHC	D- BHC	microgram / l	-	0.01	-	-	-	-	-	-	-	-	-	-	
6	DDT	DDT	microgram / l	0	0	0.01	0.0008	0	0	-	-	0	-	-	-	
7	Dieldrin	Dieldrin	microgram / l	0.012	0.01	0	0.0009	0.0025	0	-	-	0.0001	-	-	-	
8	Endos-I	Endosulphan I	microgram / l	0	0.01	0.01	0.0021	0.0118	0.093	-	-	0.037	-	-	-	
9	Endos-II	Endosulphan II	microgram / l	0	0	-	-	-	-	-	-	-	-	-	-	
10	Endos-s	Endosulphan s	microgram / l	0.009	0.03	-	-	-	-	-	-	-	-	-	-	

WQL - III Lab at UGD, Hyderabad conducts the analysis of Trace and Toxic element and Pesticides

NRWQ Lab at HOC, Noida, New Delhi conducts the analysis of Trace and Toxic element only, which started from September 2011 onwords

Water Quality Summary for the period : 2012-2013

Station Name : Mahi at Khanpur (01 02 13 012) **Division : Mahi Division, Gandhinagar**

Local River : Mahi **Sub-Division : Mahi Sub Divn., Kadana**

River Water Summary

S.No	Parameters	Number of Observations	Maximum	Minimum	Mean
	PHYSICAL				
1	Q (cumec)	365	12403	2.346	219.9
2	EC_FLD (µmho/cm)	12	492	340	414
3	EC_GEN (µmho/cm)	12	580	263	444
4	pH_FLD (pH units)	12	8.8	6.4	7.4
5	pH_GEN (pH units)	12	9.0	8.1	8.5
6	SS (mg/L)	12	66	32	47
7	TDS (mg/L)	12	370	168	277
8	Temp (deg C)	12	34.0	18.5	27.1
9	Turb (NTU)	12	15.0	1.0	4.1
	CHEMICAL				
1	Alk-Phen (mgCaCO3/L)	12	10.0	0.0	5
2	ALK-TOT (mgCaCO3/L)	12	196	96	155
3	Ca (mg/L)	12	75	35	55
4	Cl (mg/L)	12	46.0	20.0	35.5
5	CO3 (mg/L)	12	12.0	0.0	6
6	F (mg/L)	12	0.83	0.37	0.63
7	Fe (mg/L)	12	0.3	0.1	0.2
8	HCO3 (mg/L)	12	215	112	177
9	K (mg/L)	12	0.8	0.5	0.7
10	Mg (mg/L)	12	12.6	6.8	10
11	Na (mg/L)	12	30.0	14.4	23.7
12	NH3-N (mg N/L)	12	0.48	0.05	0.26
13	NO2+NO3 (mg N/L)	12	2.94	0.52	1.61
14	NO2-N (mgN/L)	12	0.05	0.01	0.03
15	NO3-N (mgN/L)	12	2.92	0.51	1.58
16	P-Tot (mgP/L)	12	0.100	0.030	0.061
17	SiO2 (mg/L)	12	35.3	26.8	30.1
18	SO4 (mg/L)	12	18.0	12.7	15.5
	BIOLOGICAL/BACTERIOLOGICAL				
1	BOD3-27 (mg/L)	12	2.4	0.5	1.3
2	DO (mg/L)	12	11.8	6.0	8.3
3	DO_SAT% (%)	12	125	75	103
	TRACE & TOXIC				
1	Al (mg/L)	12	0.03	0.02	0.02
	CHEMICAL INDICES				
1	HAR_Ca (mgCaCO3/L)	12	188	88	138
2	HAR_Total (mgCaCO3/L)	12	225	125	179
3	Na% (%)	12	26	20	22
4	RSC (-)	12	0.0	0.0	0
5	SAR (-)	12	0.9	0.6	0.8
	PESTICIDES				

Water Quality Seasonal Average for the period: 2005-2013

Station Name : Mahi at Khanpur (01 02 13 012) **Division : Mahi Division, Gandhinagar**

Local River : Mahi **River Water** **Sub-Division : Mahi Sub Divn., Kadana**

S.No	Parameters	Flood								Winter								Summer							
		Jun - Oct								Nov - Feb								Mar - May							
		2005	2006	2007	2008	2009	2010	2011	2012	2005-2006	2006-2007	2007-2008	2008-2009	2009-2010	2010-2011	2011-2012	2012-2013	2006	2007	2008	2009	2010	2011	2012	2013
	PHYSICAL																								
1	Q (cumec)	387.7	452.2	244.1	23.86	53.32	54.34	329.0	122.7	40.42	38.04	27.17	22.61	9.746	9.095	17.35	21.07	23.31	29.13	23.65	21.10	8.619	8.282	7.026	10.87
2	EC_FLD (µmho/cm)	610	453	391	402	376	577	402	413	484	482	400	410	440	386	474	364	410	451	415	412	585	377	480	482
3	EC_GEN (µmho/cm)	375	367	328	476	481	533	467	435	587	465	505	536	665	593	492	454	410	436	454	555	577	577	428	444
4	pH_FLD (pH units)	8.0	8.0	8.2	8.0	7.8	7.7	7.3	6.8	8.3	8.2	8.1	7.8	7.4	8.1	7.2	7.5	8.5	8.5	8.1	7.9	7.7	6.9	7.3	8.3
5	pH_GEN (pH units)	8.1	7.9	8.2	8.3	8.0	7.8	7.6	8.5	8.2	8.4	8.3	8.0	7.9	8.3	7.9	8.5	8.4	8.5	8.5	8.0	7.9	7.7	8.8	8.7
6	SS (mg/L)	50	39	21	16	30	40	52	44	27	17	25	24	24	28	46	47	16	29	22	36	32	35	48	52
7	TDS (mg/L)	245	230	205	312	307	331	297	278	380	288	325	335	420	382	308	275	271	278	293	351	368	365	281	275
8	Temp (deg C)	28.1	29.4	29.2	29.1	29.6	28.4	16.7	30.5	22.8	24.9	22.1	21.4	22.1	21.2	18.5	22.3	26.8	27.8	25.5	24.8	26.2	19.2	28.0	28.0
9	Turb (NTU)	1.8	59.0	36.8	8.8	2.4	80.0	8.2	4.4	5.8	7.8	4.5	1.5	1.5	5.0	3.3	4.8	5.3	6.3	1.7	1.3	2.0	3.7	2.0	2.7
	CHEMICAL																								
1	Alk-Phen (mgCaCO3/L)	1.2	0.0	1.5	3.3	0.0	0.0	0.0	3.2	0.4	3.5	1.5	1.0	0.0	1.5	0.0	7.5	0.8	5.8	3.9	0.0	0.0	0.0	6.6	4.7
2	ALK-TOT (mgCaCO3/L)	184	192	174	207	178	159	134	145	232	192	275	254	198	166	166	154	203	212	226	259	179	156	156	173
3	Ca (mg/L)	31	32	29	39	41	53	47	53	36	32	46	44	59	60	68	55	33	33	37	46	60	51	57	60
4	Cl (mg/L)	27.5	25.5	34.8	38.8	55.2	52.0	48.4	34.4	40.5	39.3	45.5	41.5	77.5	78.5	38.0	36.5	29.3	50.9	38.7	53.3	66.7	76.0	32.7	36.0
5	CO3 (mg/L)	1.5	0.0	1.8	4.0	0.0	0.0	0.0	3.8	0.5	4.3	1.8	1.3	0.0	1.8	0.0	9.0	1.0	7.0	4.7	0.0	0.0	0.0	8.0	5.7
6	F (mg/L)	0.26	0.33	0.50	0.83	0.43	0.50	0.59	0.63	0.30	0.56	0.52	0.46	0.63	0.49	0.41	0.50	0.25	0.69	0.58	0.42	0.65	0.60	0.51	0.79
7	Fe (mg/L)	0.0	0.0	0.1	0.1	0.2	0.3	0.2	0.2	0.0	0.0	0.1	0.2	0.4	0.3	0.3	0.3	0.0	0.0	0.1	0.2	0.3	0.3	0.2	0.3
8	HCO3 (mg/L)	111	117	104	122	151	194	164	169	141	113	166	154	242	199	203	170	123	122	133	158	218	190	174	200
9	K (mg/L)	1.0	0.7	0.5	1.0	1.1	0.9	1.1	0.7	1.8	0.7	0.5	1.6	1.2	1.3	0.8	0.7	1.0	0.6	1.0	0.8	0.9	1.6	0.6	0.7
10	Mg (mg/L)	5.8	8.1	8.2	7.4	10.3	11.9	9.5	9.1	9.1	7.7	10.5	9.2	16.3	11.2	7.5	9.7	8.0	8.8	9.7	10.7	11.0	11.7	9.4	11.7
11	Na (mg/L)	20.0	19.0	25.6	28.1	38.6	39.3	33.4	22.9	29.3	29.5	33.2	30.7	59.1	57.9	26.8	24.5	19.3	39.2	26.6	35.5	49.5	57.2	22.3	24.1
12	NH3-N (mg N/L)		0.05	0.05	0.71	0.31	0.15	0.20	0.31	0.07		0.07	0.18	0.15	0.30	0.38	0.28	0.05	0.06	0.17	0.29	0.14	0.19	0.44	0.16
13	NO2+NO3 (mg N/L)	0.16	1.12	1.01	1.37	1.24	1.18	1.32	1.52	0.13	1.17	1.95	1.03	0.95	2.51	4.05	1.73	0.04	1.11	1.15	0.91	0.80	1.25	2.12	1.58
14	NO2-N (mgN/L)	0.02	0.03	0.04	0.04	0.02	0.08	0.01	0.02	0.02	0.02	0.08	0.02	0.05	0.02	0.04	0.03	0.00	0.02	0.03	0.03	0.03	0.04	0.05	0.03
15	NO3-N (mgN/L)	0.14	1.09	0.97	1.33	1.22	1.09	1.30	1.50	0.11	1.16	1.88	1.01	0.90	2.50	4.01	1.70	0.04	1.08	1.12	0.88	0.77	1.22	2.07	1.55
16	P-Tot (mgP/L)	0.010	0.022	0.014	0.026	0.044	0.064	0.050	0.064	0.027	0.017	0.025	0.040	0.088	0.063	0.070	0.060	0.013	0.037	0.023	0.043	0.080	0.063	0.067	0.057
17	SiO2 (mg/L)	11.7	19.4	25.8	33.6	33.7	34.2	33.7	29.4	18.7	21.6	26.1	24.1	33.9	30.7	32.4	28.6	19.3	30.1	23.4	26.4	28.2	31.9	13.4	33.2
18	SO4 (mg/L)	9.7	13.8	15.7	18.5	17.9	20.7	18.5	15.7	14.5	13.8	13.4	19.4	21.7	22.9	16.4	15.5	11.2	16.3	13.6	18.8	21.9	23.4	16.8	15.1
	BIOLOGICAL/BACTERIOLOGICAL																								
1	BOD3-27 (mg/L)	0.2	1.0	1.9	1.5	1.6	2.3	1.8	1.3	0.6	1.1	1.9	1.4	1.4	1.6	1.2	1.1	0.4	1.6	1.5	1.1	2.0	1.8	1.3	1.5
2	DO (mg/L)	6.3	7.6	7.2	6.8	6.5	5.9	6.8	7.4	7.1	8.9	9.5	7.7	7.0	6.6	8.7	10.0	7.3	8.5	8.4	5.1	5.9	5.9	9.4	7.6
3	DO_SAT% (%)	79	99	94	89	85	76	70	99	82	107	108	87	80	75	92	113	90	107	101	61	73	63	120	97
	TRACE & TOXIC																								
1	Al (mg/L)	0.02	0.03	0.04	0.02	0.03	0.03	0.02	0.03	0.01	0.01	0.03	0.02	0.03	0.03	0.03	0.02	0.02	0.02	0.02	0.03	0.03	0.03	0.02	0.02
	CHEMICAL INDICES																								
1	HAR_Ca (mgCaCO3/L)	78	79	73	99	103	131	118	131	89	80	116	109	148	149	169	136	83	84	94	116	151	128	143	150
2	HAR_Total (mgCaCO3/L)	102	113	107	129	146	181	158	170	127	112	160	148	216	196	201	177	116	120	134	161	197	177	182	198
3	Na% (%)	29	27	34	32	36	32	30	22	32	36	31	31	37	39	22	23	26	41	30	32	35	41	21	21
4	SAR (-)	0.9	0.8	1.1	1.1	1.4	1.3	1.1	0.8	1.1	1.2	1.1	1.1	1.8	1.8	0.8	0.8	0.8	1.6	1.0	1.2	1.5	1.9	0.7	0.7
	PESTICIDES																								

3.4 Analysis

A summary of statistical analysis on 6 parameters for Mahi basin is given **Table-4**. Time series graphs with linear trend line are shown in **Annex-III**. Number of samples found unfit for designated best use of drinking water, irrigation and support to aquatic life have also been determined and are given in the section dealing with inferences.

Table –4: Summary of Statistical Analysis for period from WY:2005 to WY:2013

Site Name & Code	Site Name	EC_GEN	pH_GEN	DO	BOD3-27	NH3-N
01 02 13 001	**Mataji**					
N (No of samples)		48	48	48	48	36
Average		349.2	8.1	8.4	1.7	0.2
Median		345.0	8.2	8.1	1.7	0.1
Standard Deviation		84.2	0.3	1.5	0.8	0.2
Minimum		130.0	7.2	5.4	0.2	0.1
Maximum		510.0	8.5	11.3	3.5	1.1
CV		24.1	4.2	17.4	46.1	102.5
25th Percentile		302.8	7.8	7.2	1.2	0.1
75th Percentile		415.5	8.3	9.7	2.3	0.3
Linear Trend Line						
Slope /year		9.198	-0.029	0.122	0.149	-0.021
Intercept		308.9	8.19	7.827	1.033	0.337
R2 value		0.068	0.041	0.040	0.211	0.029
01 02 13 005	**Rangeli**					
N		40	40	41	40	28
Average		519.6	8.1	7.9	1.6	0.2
Median		537.0	8.2	8.0	1.6	0.1
Standard Deviation		110.6	0.3	2.0	0.9	0.2
Minimum		240.0	7.3	3.9	0.1	0.1
Maximum		811.0	8.6	14.0	3.6	0.8
CV		21.3	4.0	25.5	59.5	97.4
25th Percentile		483.3	7.9	6.5	0.7	0.1
75th Percentile		564.3	8.4	9.0	2.1	0.4
Linear Trend Line						
Slope /year		6.184	-0.035	0.157	0.105	0.021
Intercept		495.9	8.26	7.28	1.193	0.142
R2 value		0.020	0.074	0.039	0.079	0.030
01 02 13 006	**Padardibadi**					
N		77	77	77	77	59
Average		471.3	8.1	8.1	1.6	0.3
Median		483.0	8.2	8.0	1.5	0.2
Standard Deviation		82.2	0.3	1.7	0.8	0.2
Minimum		221.0	7.3	4.6	0.2	0.1
Maximum		622.0	8.8	14.0	3.4	0.8
CV		17.4	3.8	21.6	52.3	76.4
25th Percentile		437.0	7.9	7.0	0.8	0.1
75th Percentile		510.0	8.4	9.1	2.1	0.4
Linear Trend Line						
Slope /year		-4.408	-0.003	0.146	0.092	0.046
Intercept		488.2	8.15	7.54	1.208	0.043
R2 value		0.017	0.000	0.042	0.077	0.277

01 02 13 012	**Khanpur**					
N		94	94	94	94	74
Average		483.0	8.2	7.4	1.4	0.2
Median		476.5	8.2	7.5	1.4	0.2
Standard Deviation		114.0	0.4	1.6	0.7	0.2
Minimum		242.0	7.1	4.4	0.1	0.1
Maximum		800.0	9.0	11.8	3.1	1.2
CV		23.6	4.5	21.3	51.8	78.0
25th Percentile		404.5	7.9	6.2	0.8	0.1
75th Percentile		556.0	8.4	8.5	1.9	0.3
Linear Trend Line						
Slope /year		7.388	-0.001	0.049	0.088	0.022
Intercept		453.2	8.17	7.198	1.044	0.134
R2 value		0.022	0.000	0.005	0.078	0.057

3.5 Inferences

The percentage of samples that were found to be beyond the tolerance limits prescribed for a designated best use of water for different sites in Mahi basin is as follows:

- **Mataji**

Table- 5: Percentage of Samples found to be beyond the tolerance limits

S No	Charateristics / Parameter	Class of Water as per Designated Best Use		
		A	D	E
1	pH	0	0	0
2	Dissolved Oxygen	2.1	0	-
3	Bio-chemical Oxygen demand	31.3	-	-
4	Ammonia (as free Nitrogen)	-	0	-
5	Electrical Conductivity	-	-	0
6	Sodium Absorption Ratio	-	-	0

- **Rangeli**

Table- 6: Percentage of Samples found to be beyond the tolerance limits

S No	Charateristics / Parameter	Class of Water as per Designated Best Use		
		A	D	E
	pH	2.5	2.5	2.5
2	Dissolved Oxygen	14.6	2.4	-
3	Bio-chemical Oxygen demand	25.0	-	-
4	Ammonia (as free Nitrogen)	-	0	-
5	Electrical Conductivity	-	-	0
6	Sodium Absorption Ratio	-	-	0

- **Paderdibadi**

Table- 7: Percentage of Samples found to be beyond the tolerance limits

S No	Charateristics / Parameter	Class of Water as per Designated Best Use		
		A	D	E
1	pH	6.5	6.5	6.5
2	Dissolved Oxygen	7.8	0	-
3	Bio-chemical Oxygen demand	28.6	-	-
4	Ammonia (as free Nitrogen)	-	0	-
5	Electrical Conductivity	-	-	0
6	Sodium Absorption Ratio	-	-	0

- **Khanpur**

Table- 8: Percentage of Samples found to be beyond the tolerance limits

S No	Charateristics / Parameter	Class of Water as per Designated Best Use		
		A	D	E
1	pH	17.0	17.0	17.0
2	Dissolved Oxygen	19.1	0	-
3	Bio-chemical Oxygen demand	22.3	-	-
4	Ammonia (as free Nitrogen)	-	1.4	-
5	Electrical Conductivity	-	-	0
6	Sodium Absorption Ratio	-	-	0

It is observed that pH generally shows a decreasing trend. DO has increased over the year for all sites except Khanpur where it shows a decreasing trend. BOD and free ammonia (as Nitrogen) are both found to have increased over the years. Conductivity also shows an increasing trend except at Paderdibadi. SAR values are not much significant. This indicates gradually increasing water pollution due to organic matter present in the river.

4.0 Sabarmati Basin

4.1 Basin description

The Sabarmati is one of the major west flowing interstate rivers in India. Its basin map is enclosed. It originates in the foothills of Aravalli range at an elevation of 762 m above mean sea level. It traverses a length of 371 km in southwest direction. It flows initially in Rajasthan for about 48 km and enters Gujarat where it flows for 323 km to join Gulf of Cambay in the Arabian sea. The river drains an area of 21,674 sq.km. The basin is triangular in shape with the main river as the base and Watrak as the apex point. The basin lies in between 72^0 20' and 73^0 30' east longitudes and 20^0 and 25^0 north latitudes

The important tributaries are Sai, Wakal, Harnav, Hathmati and Watrak. The left bank tributary Wakal joins the river at 51 km of its run from the origin. It receives the Sai, a major right bank tributary near Mahuri and then Harnav on the left bank at about 103 km. Below this confluence, the Sabarmati flows through the Dharoi gorge. Emerging from the gorge, it passes through the plains. Two major tributaries viz. Hathmati and Watrak joins on the left bank of main stream at a distance of 170 km and 235 km respectively from the origin

The average annual rainfall in the Sabarmati basin is about 787 mm. The climate varies widely. In winter, the minimum temperature generally varies from 9^0C to 14^0C. However, lower temperatures have also been recorded in several areas. The maximum temperature in the basin varies from 40^0C to 48^0C.

At present, there are 13 major/medium irrigation schemes. However, Dharoi Dam and Watrak project have 80 percent of the storage capacity of all the projects of the basin.

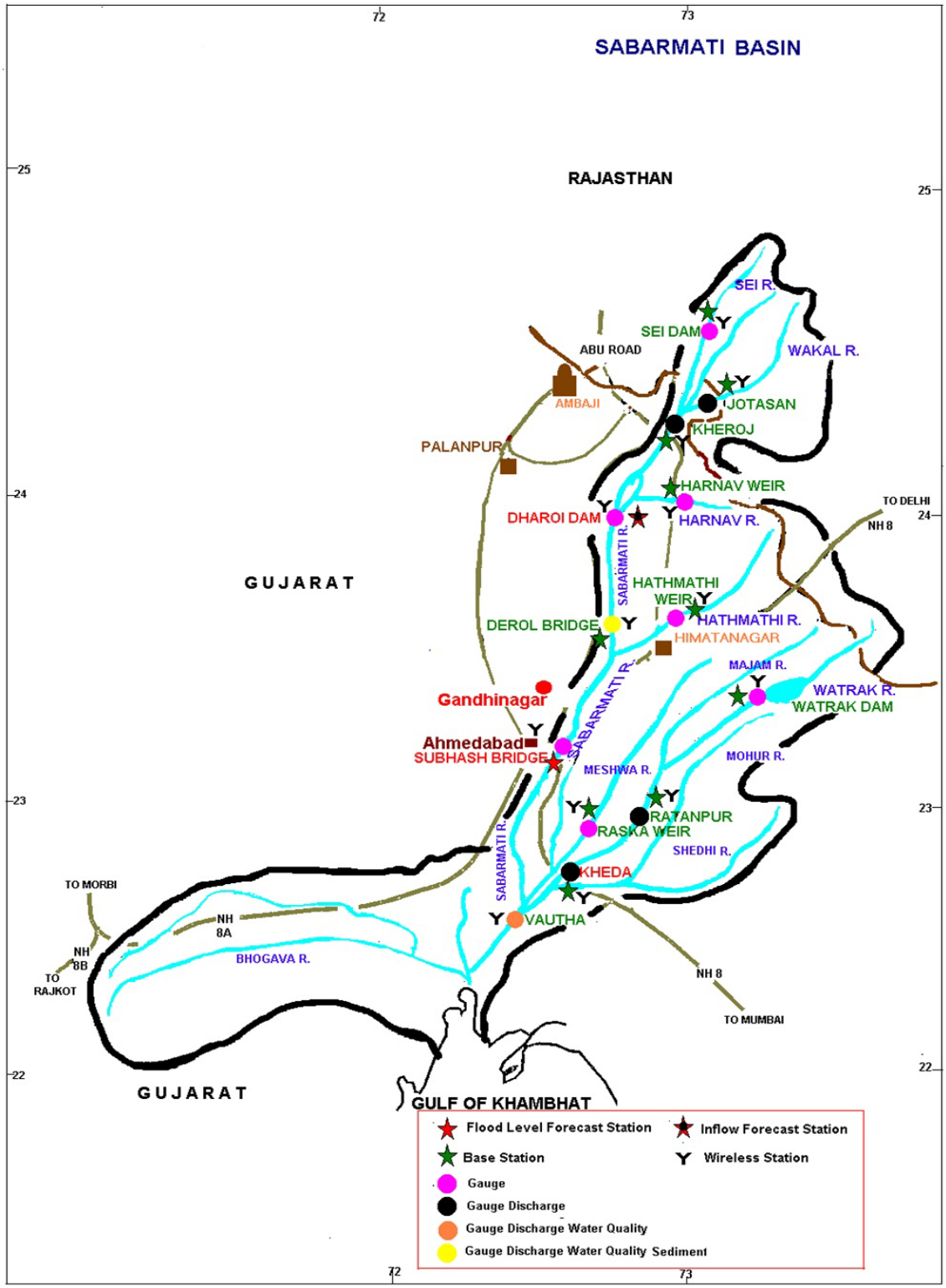
Dharoi Dam is located at Dharoi village, which is about 70km from Mehsana. In the Gujarat State the direct benefits of this project are water supply to Ahmedabad city and providing irrigation facilities. There is provision for 1.4 MW hydropower generations also.

4.2 Availability of W.Q. Data (in SWDES format)

There are two WQ monitoring stations on main river Sabarmati where availability of data is as given below:

Sl. No.	Site name	River/Tributary	Period of sample collection	No. of samples analysed
Sabarmati Basin				
1	Derol bridge	Sabarmati	2005-06 to 2012-13	13
2	Voutha	Sabarmati	2005-06 to 2012-13	94

The detailed data are given in Section- 4.3.



4.3 Water Quality Data

HISTORY SHEET

		Water Year	**: 2012-2013**
Site	**: Sabarmati at Derol Bridge**	**Code**	**: 01 02 12 006**
State	: Gujarat	District	Sabarkantha
Basin	: Sabarmati	Independent River	: Sabarmati
Tributary	: Sabarmati	Sub Tributary	:
Sub-Sub Tributary	:	Local River	: Sabarmati
Division	: Mahi Division, Gandhinagar	Sub-Division	: N.W.R.Sub Div., Himatnagar
Drainage Area	: 6724 Sq. Km.	Bank	: Left
Latitude	: 23°34'24" N	Longitude	: 72°48'25" E

	Opening Date	Closing Date
Gauge	: 19-08-1980	
Discharge	: 01-06-1991	
Sediment	: 25-09-1992	
Water Quality	: 15-07-1992	

Sabarmati at Derol Bridge (Dry)

Water Quality Datasheet for the period : 2012-2013

Station Name : Sabarmati at Derol Bridge (01 02 12 006) **Division : Mahi Division, Gandhinagar**

Local River : Sabarmati **River Water Analysis** **Sub-Division : N.W.R.Sub Div., Himatnagar**

S.No	Parameters	01-06-2012	02-07-2012	01-08-2012	01-09-2012	01-10-2012	01-11-2012	01-12-2012	01-01-2013	01-02-2013	01-03-2013	01-04-2013	01-05-2013
	PHYSICAL												
1	Q (cumec)	0.000	0.000	* 2.440	* 2.440	5.273	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2	Colour_Cod (-)					Clear							
3	EC_FLD (µmho/cm)					989							
4	EC_GEN (µmho/cm)					404							
5	Odour_Code (-)					odour free							
6	pH_FLD (pH units)					7.5							
7	pH_GEN (pH units)					8.4							
8	SS (mg/L)					60							
9	TDS (mg/L)					250							
10	Temp (deg C)					30.6							
11	Turb (NTU)					5.0							
	CHEMICAL												
1	Alk-Phen (mgCaCO3/L)					5.8							
2	ALK-TOT (mgCaCO3/L)					152							
3	Ca (mg/L)					48							
4	Cl (mg/L)					32.0							
5	CO3 (mg/L)					7.0							
6	F (mg/L)					0.57							
7	Fe (mg/L)					0.2							
8	HCO3 (mg/L)					171							
9	K (mg/L)					1.0							
10	Mg (mg/L)					11.7							
11	Na (mg/L)					21.6							
12	NH3-N (mg N/L)					0.14							
13	NO2+NO3 (mg N/L)					1.83							
14	NO2-N (mgN/L)					0.01							
15	NO3-N (mgN/L)					1.82							
16	P-Tot (mgP/L)					0.080							
17	SiO2 (mg/L)					22.9							
18	SO4 (mg/L)					9.7							
	BIOLOGICAL/BACTERIOLOGICAL												
1	BOD3-27 (mg/L)					0.6							
2	DO (mg/L)					7.8							
3	DO_SAT% (%)					103							
	TRACE & TOXIC												
1	Al (mg/L)					0.02							
	CHEMICAL INDICES												
1	HAR_Ca (mgCaCO3/L)					120							
2	HAR_Total (mgCaCO3/L)					169							
3	Na% (%)					22							
4	RSC (-)					0.0							
5	SAR (-)					0.7							
	PESTICIDES												

RIVER DRY

ONCE IN 2 MONTH

POOLING CONDITION/SNR

ONCE IN 2 MONTH

ONCE IN 2 MONTH

POOLING CONDITION

ONCE IN 2 MONTH

RIVER DRY

ONCE IN 2 MONTH

RIVER DRY

ONCE IN 2 MONTH

Note. : * Estimated discharge

Pesticides , Trace and Toxic element analysis

Station Name : Sabarmati at Derol Bridge (01 02 12 006) **Division : Mahi Division, Gandhinagar**

Local River : Sabarmati **Sub Divi. : NWR Sub Div., Himatnagar**

Sl. No.	Parameter ID	Parameter Name	unit	Date of sampling											
a	Trace and Toxic			01.04.2006	02.04.2007	02.04.2008	01.04.2009	01.04.2010	01.04.2011	01.09.2011	01.02.2012	02.04.2012	28.05.2012	01.10.2012	01.03.2013	01.04.2013
				Analysis done by WQL-III Lab, UGD, Hyderabad	Analysis done by WQL-III Lab, UGD, Hyderabad	Analysis done by WQL-III Lab, UGD, Hyderabad	Analysis done by WQL-III Lab, UGD, Hyderabad	Analysis done by WQL-III Lab, UGD, Hyderabad	Analysis done by WQL-III Lab, UGD, Hyderabad	Analysis done by NRWQL, New Delhi	Analysis done by NRWQL, New Delhi	Analysis done by WQL-III Lab, UGD, Hyderabad	Analysis done by NRWQL, New Delhi	Analysis done by NRWQL, New Delhi	Analysis done by NRWQL, New Delhi	Analysis done by WQL-III Lab, UGD, Hyderabad
1	As	Arsenic	microgram / l							0.75				25.28		
2	Cd	Cadmium	microgram / l							0.059				0.12		
3	Cr	Chromium	microgram / l							2.10				4.82		
4	Cu	Copper	microgram / l							5.50				7.22		
5	Hg	Mercury	microgram / l							0.56				-		
6	Ni	Nickel	microgram / l							-				4.27	ONCE IN 2 MONTH	POOLING CONDITION
7	Pb	Lead	microgram / l							3.18				0.760		
8	Zn	Zinc	microgram / l	RIVER DRY	RIVER DRY	RIVER DRY	RIVER DRY	RIVER DRY	RIVER DRY	12.29	RIVER DRY	RIVER DRY	RIVER DRY	12.43		
b	**Pesticides**		microgram / l													
1	Aldrin	Aldrin	microgram / l							-				-		
2	Alpha- BHC	Alpha- BHC	microgram / l							-				-		
3	Beta-BHC	Beta-BHC	microgram / l							-				-		
4	Gama- BHC	gamma-BHC (Benzene HexaChloride)	microgram / l							-				-		
5	D- BHC	D- BHC	microgram / l							-				-		
6	DDT	DDT	microgram / l							-				-		
7	Dieldrin	Dieldrin	microgram / l							-				-		
8	Endos-I	Endosulphan I	microgram / l							-				-		
9	Endos-II	Endosulphan II	microgram / l							-				-		
10	Endos-s	Endosulphan s	microgram / l							-				-		

WQL - III Lab at UGD, Hyderabad conducts the analysis of Trace and Toxic element and Pesticides

NRWQ Lab at HOC, Noida, New Delhi conducts the analysis of Trace and Toxic element only, which started from September 2011 onwords

Water Quality Summary for the period : 2012-2013

Station Name : Sabarmati at Derol Bridge (01 02 12 006) **Division : Mahi Division, Gandhinagar**

Local River : Sabarmati **Sub-Division : N.W.R.Sub Div., Himatnagar**

River Water Summary

S.No	Parameters	Number of Observations	Maximum	Minimum	Mean
	PHYSICAL				
1	Q (cumec)	365	311.7	0.000	2.472
2	EC_FLD (µmho/cm)	1	989	989	989
3	EC_GEN (µmho/cm)	1	404	404	404
4	pH_FLD (pH units)	1	7.5	7.5	7.5
5	pH_GEN (pH units)	1	8.4	8.4	8.4
6	SS (mg/L)	1	60	60	60
7	TDS (mg/L)	1	250	250	250
8	Temp (deg C)	1	30.6	30.6	30.6
9	Turb (NTU)	1	5.0	5.0	5
	CHEMICAL				
1	Alk-Phen (mgCaCO3/L)	1	5.8	5.8	5.8
2	ALK-TOT (mgCaCO3/L)	1	152	152	152
3	Ca (mg/L)	1	48	48	48
4	Cl (mg/L)	1	32.0	32.0	32
5	CO3 (mg/L)	1	7.0	7.0	7
6	F (mg/L)	1	0.57	0.57	0.57
7	Fe (mg/L)	1	0.2	0.2	0.2
8	HCO3 (mg/L)	1	171	171	171
9	K (mg/L)	1	1.0	1.0	1
10	Mg (mg/L)	1	11.7	11.7	11.7
11	Na (mg/L)	1	21.6	21.6	21.6
12	NH3-N (mg N/L)	1	0.14	0.14	0.14
13	NO2+NO3 (mg N/L)	1	1.83	1.83	1.83
14	NO2-N (mgN/L)	1	0.01	0.01	0.01
15	NO3-N (mgN/L)	1	1.82	1.82	1.82
16	P-Tot (mgP/L)	1	0.080	0.080	0.08
17	SiO2 (mg/L)	1	22.9	22.9	22.9
18	SO4 (mg/L)	1	9.7	9.7	9.7
	BIOLOGICAL/BACTERIOLOGICAL				
1	BOD3-27 (mg/L)	1	0.6	0.6	0.6
2	DO (mg/L)	1	7.8	7.8	7.8
3	DO_SAT% (%)	1	103	103	103
	TRACE & TOXIC				
1	Al (mg/L)	1	0.02	0.02	0.02
	CHEMICAL INDICES				
1	HAR_Ca (mgCaCO3/L)	1	120	120	120
2	HAR_Total (mgCaCO3/L)	1	169	169	169
3	Na% (%)	1	22	22	22
4	RSC (-)	1	0.0	0.0	0
5	SAR (-)	1	0.7	0.7	0.7
	PESTICIDES				

Water Quality Seasonal Average for the period: 2005-2013

Station Name : Sabarmati at Derol Bridge (01 02 12 006) **Division : Mahi Division, Gandhinagar**

Local River : Sabarmati **River Water** **Sub-Division : N.W.R.Sub Div., Himatnagar**

S.No	Parameters	Flood								Winter								Summer							
		Jun - Oct								Nov - Feb								Mar - May							
		2005	2006	2007	2008	2009	2010	2011	2012	2005-2006	2006-2007	2007-2008	2008-2009	2009-2010	2010-2011	2011-2012	2012-2013	2006	2007	2008	2009	2010	2011	2012	2013
	PHYSICAL																								
1	Q (cumec)	34.48	88.52	47.55	0.943	0.910	0.476	21.02	2.031	0.992	3.313	0.076	0.047	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2	EC_FLD (µmho/cm)				562			994	989																
3	EC_GEN (µmho/cm)	340	274	482	612	496	407	315	404																
4	pH_FLD (pH units)				7.4			8.4	7.5					O	O	O	O	O	O	O	O	O	O	O	O
5	pH_GEN (pH units)	8.0	7.5	8.2	8.1	8.5	8.3	7.8	8.4					N	N	N	N	N	N	N	N	N	N	N	N
6	SS (mg/L)	30	591	26	17	30	35	73	60	O	O	O	O	C	C	C	C	C	C	C	C	C	C	C	C
7	TDS (mg/L)	238	190	306	390	322	249	196	250	N	N	N	N	E	E	E	E	E	E	E	E	E	E	E	E
8	Temp (deg C)	25.0	22.5	24.5	28.0	26.0	27.5	30.7	30.6	C	C	C	C												
9	Turb (NTU)	2.0	533.0	49.5	14.5	1.0	17.5	95.5	5.0	E	E	E	E	I	I	I	I	I	I	I	I	I	I	I	I
	CHEMICAL													N	N	N	N	N	N	N	N	N	N	N	N
1	Alk-Phen (mgCaCO3/L)	0.0	0.0	0.0	0.0	5.8	0.8	0.0	5.8	I	I	I	I												
2	ALK-TOT (mgCaCO3/L)	180	154	228	280	128	107	96	152	N	N	N	N	2	2	2	2	2	2	2	2	2	2	2	2
3	Ca (mg/L)	31	23	38	46	40	34	30	48	2	2	2	2	M	M	M	M	M	M	M	M	M	M	M	M
4	Cl (mg/L)	26.0	19.0	52.0	79.0	70.0	50.0	25.0	32.0					O	O	O	O	O	O	O	O	O	O	O	O
5	CO3 (mg/L)	0.0	0.0	0.0	0.0	7.0	1.0	0.0	7.0	M	M	M	M	N	N	N	N	N	N	N	N	N	N	N	N
6	F (mg/L)	0.26	0.31	0.86	0.72	0.95	0.55	0.38	0.57	O	O	O	O	T	T	T	T	T	T	T	T	T	T	T	T
7	Fe (mg/L)	0.0	0.1	0.1	0.2	0.2	0.1	0.1	0.2	N	N	N	N	H	H	H	H	H	H	H	H	H	H	H	H
8	HCO3 (mg/L)	110	94	139	171	142	129	118	171	T	T	T	T	/	/	/	/	/	/	/	/	/	/	/	/
9	K (mg/L)	1.0	1.0	0.8	2.0	1.4	1.0	0.9	1.0	H	H	H	H												
10	Mg (mg/L)	5.8	6.3	9.7	12.6	12.6	8.3	9.2	11.7	/	/	/	/	P	P	P	P	P	P	P	P	P	P	P	P
11	Na (mg/L)	20.0	14.0	37.0	55.6	42.8	37.8	16.2	21.6					O	O	O	O	O	O	O	O	O	O	O	O
12	NH3-N (mg N/L)			0.07	0.06	0.46	0.13	0.36	0.14	P	P	P	P	O	O	O	O	O	O	O	O	O	O	O	O
13	NO2+NO3 (mg N/L)	0.20	1.10	1.69	3.43	0.88	0.66	1.36	1.83	O	O	O	O	L	L	L	L	L	L	L	L	L	L	L	L
14	NO2-N (mgN/L)	0.04	0.07	0.03	0.04	0.03	0.03	0.03	0.01	O	O	O	O	I	I	I	I	I	I	I	I	I	I	I	I
15	NO3-N (mgN/L)	0.16	1.03	1.66	3.39	0.85	0.63	1.34	1.82	L	L	L	L	N	N	N	N	N	N	N	N	N	N	N	N
16	P-Tot (mgP/L)	0.010	0.050	0.015	0.105	0.080	0.050	0.075	0.080	I	I	I	I	G	G	G	G	G	G	G	G	G	G	G	G
17	SiO2 (mg/L)	9.8	25.0	31.6	33.8	24.1	24.4	24.2	22.9	N	N	N	N												
18	SO4 (mg/L)	8.6	6.8	16.7	18.5	15.4	16.7	9.6	9.7	G	G	G	G	C	C	C	C	C	C	C	C	C	C	C	C
	BIOLOGICAL/BACTERIOLOGICAL													O	O	O	O	O	O	O	O	O	O	O	O
1	BOD3-27 (mg/L)	0.6	1.8	0.8	0.8	2.5	2.2	2.4	0.6	C	C	C	C	N	N	N	N	N	N	N	N	N	N	N	N
2	DO (mg/L)	7.4	7.7	6.6	6.3	8.5	7.0	7.5	7.8	O	O	O	O	D	D	D	D	D	D	D	D	D	D	D	D
3	DO_SAT% (%)	90	90	79	80	105	89	101	103	N	N	N	N	I	I	I	I	I	I	I	I	I	I	I	I
	TRACE & TOXIC									D	D	D	D	T	T	T	T	T	T	T	T	T	T	T	T
1	Al (mg/L)	0.02	0.11	0.04	0.01	0.02	0.01	0.01	0.02	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I
	CHEMICAL INDICES									O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
1	HAR_Ca (mgCaCO3/L)	76	58	94	114	100	84	76	120	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
2	HAR_Total (mgCaCO3/L)	100	84	135	167	153	119	115	169					/	/	/	/	/	/	/	/	/	/	/	/
3	Na% (%)	30	22	36	42	38	40	23	22																
4	SAR (-)	0.9	0.6	1.3	1.9	1.5	1.5	0.7	0.7					R	R	R	R	R	R	R	R	R	R	R	R
	PESTICIDES													D	D	D	D	D	D	D	D	D	D	D	D

HISTORY SHEET

		Water Year	**: 2012-2013**
Site	**: Sabarmati at Voutha**	**Code**	**: 01 02 12 013**
State	: Gujarat	District	Ahmedabad
Basin	: Sabarmati	Independent River	: Sabarmati
Tributary	: Sabarmati	Sub Tributary	:
Sub-Sub Tributary	:	Local River	: Sabarmati
Division	: Mahi Division, Gandhinagar	Sub-Division	: Sabarmati , Ahmedabad
Drainage Area	: 19636 Sq. Km.	Bank	: Left
Latitude	: 22°38'59" N	Longitude	: 72°32'08" E
	Opening Date	Closing Date	
Gauge	: 05-08-1999		
Discharge	: 24-06-2000		
Sediment	:		
Water Quality	: 01-06-2000		

Water Quality Datasheet for the period : 2012-2013

Station Name : Sabarmati at Voutha (01 02 12 013) **Division : Mahi Division, Gandhinagar**

Local River : Sabarmati **River Water Analysis** **Sub-Division : Sabarmati Sub Divn., Ahmedabad**

S.No	Parameters	01-06-2012	02-07-2012	01-08-2012	01-09-2012	01-10-2012	01-11-2012	01-12-2012	01-01-2013	01-02-2013	01-03-2013	01-04-2013	01-05-2013
	PHYSICAL												
1	Q (cumec)	* 18.38	18.30	17.38	124.9	99.27	19.23	9.367	* 13.56	* 16.93	* 14.21	* 19.13	* 14.20
2	Colour_Cod (-)	Brown	Other	Other	Light Brown	Light Brown	Light Brown	Light Brown	Brown	Brown	Other	Other	Dark Brown
3	EC_FLD (µmho/cm)	1796	2240	2200	665	1077	2240	2310	2450	2590	2520	1906	2950
4	EC_GEN (µmho/cm)	1401	1820	2465	648	1128	2460	2491	2544	2673	2604	1791	3064
5	Odour_Code (-)	other-dis-	other-dis-	other-dis-	odour free	odour free	other-dis-	other-dis-	other-dis-	other-dis-	other-dis-	other-dis-	other-dis-
6	pH_FLD (pH units)	7.8	8.1	8.3	7.0	7.7	8.2	8.2	8.2	8.3	8.3	8.2	8.2
7	pH_GEN (pH units)	8.3	8.0	8.0	7.5	7.7	8.2	7.9	8.0	7.9	8.1	8.2	8.2
8	SS (mg/L)	90	100	68	84	86	126	84	80	82	82	80	88
9	TDS (mg/L)	1002	1228	1762	428	760	1686	1624	1642	2002	1958	1248	2144
10	Temp (deg C)	33.2	31.1	29.0	29.3	32.3	23.1	23.8	22.2	23.6	25.9	30.3	36.6
11	Turb (NTU)	13.0	16.0	52.0	72.0	64.0	10.0	13.0	14.0	48.0	40.0	40.0	48.0
	CHEMICAL												
1	Alk-Phen (mgCaCO3/L)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	ALK-TOT (mgCaCO3/L)	292	456	444	148	260	448	472	488	532	508	428	672
3	Ca (mg/L)	114	156	156	48	66	154	157	165	176	173	156	229
4	Cl (mg/L)	330.0	410.0	462.0	94.0	260.0	462.0	464.0	490.0	522.0	512.0	366.0	588.0
5	CO3 (mg/L)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
6	F (mg/L)	0.57	0.52	1.01	0.55	0.89	0.47	0.91	0.89	0.44	0.38	0.55	0.62
7	Fe (mg/L)	0.3	0.4	0.5	0.2	0.4	0.5	0.5	0.6	0.6	0.5	0.4	0.5
8	HCO3 (mg/L)	356	556	542	181	317	547	576	595	649	620	522	820
9	K (mg/L)	5.4	7.2	9.0	3.6	5.4	8.1	9.0	9.9	10.8	9.9	6.3	11.7
10	Mg (mg/L)	20.4	27.2	21.4	13.6	18.5	22.4	24.3	27.2	29.2	29.2	23.3	33.1
11	Na (mg/L)	243.4	305.8	352.6	71.6	201.8	352.6	357.8	363.0	399.4	378.6	269.4	425.4
12	NH3-N (mg N/L)	25.05	34.80	30.85	7.02	9.30	29.25	31.70	29.60	32.55	32.80	21.90	33.15
13	NO2+NO3 (mg N/L)	1.37	1.73	1.60	0.60	4.41	1.91	1.45	2.12	3.01	2.93	1.63	2.92
14	NO2-N (mgN/L)	0.04	0.18	0.08	0.02	0.03	0.07	0.07	0.07	0.07	0.07	0.06	0.06
15	NO3-N (mgN/L)	1.33	1.55	1.52	0.58	4.38	1.84	1.38	2.05	2.94	2.86	1.57	2.86
16	P-Tot (mgP/L)	0.240	0.250	0.280	0.130	0.240	0.280	0.290	0.290	0.300	0.280	0.240	0.250
17	SiO2 (mg/L)	37.1	43.6	46.6	25.0	40.7	22.2	22.4	21.8	36.2	34.8	39.0	43.6
18	SO4 (mg/L)	108.9	117.0	126.3	45.0	32.7	124.3	128.3	129.7	132.7	128.9	111.9	121.6
	BIOLOGICAL/BACTERIOLOGICAL												
1	BOD3-27 (mg/L)	13.0	15.0	40.0	7.5	11.4	18.0	21.0	27.0	28.0	27.0	18.0	25.0
2	DO (mg/L)	0.0	0.0	0.0	1.8	2.6	0.0	0.4	0.0	0.0	0.0	0.0	0.0
3	DO_SAT% (%)	0	0	0	23	36	0	5	0	0	0	0	0
	TRACE & TOXIC												
1	Al (mg/L)	0.04	0.05	0.05	0.04	0.04	0.06	0.06	0.07	0.07	0.06	0.04	0.05
	CHEMICAL INDICES												
1	HAR_Ca (mgCaCO3/L)	285	389	389	120	164	385	393	413	441	433	389	573
2	HAR_Total (mgCaCO3/L)	370	502	478	177	241	478	494	526	563	555	486	711
3	Na% (%)	59	57	61	46	64	61	61	60	60	59	54	56
4	RSC (-)	0.0	0.0	0.0	0.0	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	SAR (-)	5.5	5.9	7.0	2.3	5.7	7.0	7.0	6.9	7.3	7.0	5.3	7.0
	PESTICIDES												

Note. : * Estimated discharge

Pesticides , Trace and Toxic element analysis

Station Name : Sabarmati at Vautha (01 02 12 013)

Division : Mahi Division, Gandhinagar

Local River : Sabarmati

Sub Divi. : Sabarmati Sub Div., Ahmedabad

Sl. No.	Parameter ID	Parameter Name	unit	Date of sampling											
a	Trace and Toxic			01.04.2006	02.04.2007	02.04.2008	01.04.2009	01.04.2010	01.04.2011	01.09.2011	01.02.2012	02.04.2012	28.05.2012	01.10.2012	01.03.2013	01.04.2013
				Analysis done by WQL-III Lab, UGD, Hyderabad	Analysis done by WQL-III Lab, UGD, Hyderabad	Analysis done by WQL-III Lab, UGD, Hyderabad	Analysis done by WQL-III Lab, UGD, Hyderabad	Analysis done by WQL-III Lab, UGD, Hyderabad	Analysis done by WQL-III Lab, UGD, Hyderabad	Analysis done by NRWQL, New Delhi	Analysis done by NRWQL, New Delhi	Analysis done by WQL-III Lab, UGD, Hyderabad	Analysis done by NRWQL, New Delhi	Analysis done by NRWQL, New Delhi	Analysis done by NRWQL, New Delhi	Analysis done by WQL-III Lab, UGD, Hyderabad
1	As	Arsenic	microgram / l	-	-	-	-	1.495	-	0.75	2.51	1.61	3.77	10.20	1.65	0.460
2	Cd	Cadmium	microgram / l	0.0	8.00	2.00	3.55	0.67	7.99	0.416	0.36	3.68	0.17	0.20	0.84	7.38
3	Cr	Chromium	microgram / l	0.0	113.0	0	9.40	52.67	53.22	4.98	31.6	25.85	14.08	12.14	20.20	26.29
4	Cu	Copper	microgram / l	-	-	-	-	-	-	26.27	98.8	-	32.50	16.71	85.22	-
5	Hg	Mercury	microgram / l	-	1.466	0	0	0	-	0.48	-	0.295	-	-	0.28	0.636
6	Ni	Nickel	microgram / l	0	0	23.00	15.46	20.01	49.33	-	5.08	31.6	8.50	10.82	122.21	20.17
7	Pb	Lead	microgram / l	48.00	164.0	35.78	59.00	5.52	88.84	5.08	1.73	68.9	5.20	12.48	3.48	0.00
8	Zn	Zinc	microgram / l	16.00	49.00	101.2	49.63	216.0	351.9	54.31	66.00	333.0	55.00	37.77	89.00	299.4
b	Pesticides		microgram / l													
1	Aldrin	Aldrin	microgram / l	0	0.03	0	0.0085	0.0078	0	-	-	0.0126	-	-	-	Pesticides value not reported .
2	Alpha- BHC	Alpha- BHC	microgram / l	0	0.03	0.38	0.1855	2.1837	6.021	-	-	1.4696	-	-	-	
3	Beta-BHC	Beta-BHC	microgram / l	0	0.07	-	-	-	-	-	-	-	-	-	-	
4	Gama- BHC	gamma-BHC (Benzene HexaChloride)	microgram / l	0	0.08	-	-	-	-	-	-	-	-	-	-	
5	D- BHC	D- BHC	microgram / l	-	0.08	-	-	-	-	-	-	-	-	-	-	
6	DDT	DDT	microgram / l	0	0.01	0.01	0.0006	0.0078	0.051	-	-	0.0129	-	-	-	
7	Dieldrin	Dieldrin	microgram / l	0	0.02	0	0.0039	0.0087	0.018	-	-	0.0024	-	-	-	
8	Endos-I	Endosulphan I	microgram / l	0	0.02	0.09	0.01	0.2136	0.438	-	-	0.8465	-	-	-	
9	Endos-II	Endosulphan II	microgram / l	0	0.01	-	-	-	-	-	-	-	-	-	-	
10	Endos-s	Endosulphan s	microgram / l	0	0.01	-	-	-	-	-	-		-	-	-	

WQL - III Lab at UGD, Hyderabad conducts the analysis of Trace and Toxic element and Pesticides

NRWQ Lab at HOC, Noida, New Delhi conducts the analysis of Trace and Toxic element only, which started from September 2011 onwords

Water Quality Summary for the period : 2012-2013

Station Name : Sabarmati at Voutha (01 02 12 013) **Division : Mahi Division, Gandhinagar**

Local River : Sabarmati **Sub-Division : Sabarmati Sub Divn., Ahmedabad**

River Water Summary

S.No	Parameters	Number of Observations	Maximum	Minimum	Mean
	PHYSICAL				
1	Q (cumec)	365	2223	7.106	60.06
2	EC_FLD (µmho/cm)	12	2950	665	2079
3	EC_GEN (µmho/cm)	12	3064	648	2091
4	pH_FLD (pH units)	12	8.3	7.0	8.1
5	pH_GEN (pH units)	12	8.3	7.5	8
6	SS (mg/L)	12	126	68	88
7	TDS (mg/L)	12	2144	428	1457
8	Temp (deg C)	12	36.6	22.2	28.4
9	Turb (NTU)	12	72.0	10.0	35.8
	CHEMICAL				
1	Alk-Phen (mgCaCO3/L)	12	0.0	0.0	0
2	ALK-TOT (mgCaCO3/L)	12	672	148	429
3	Ca (mg/L)	12	229	48	146
4	Cl (mg/L)	12	588.0	94.0	413.3
5	CO3 (mg/L)	12	0.0	0.0	0
6	F (mg/L)	12	1.01	0.38	0.65
7	Fe (mg/L)	12	0.6	0.2	0.4
8	HCO3 (mg/L)	12	820	181	523
9	K (mg/L)	12	11.7	3.6	8
10	Mg (mg/L)	12	33.1	13.6	24.1
11	Na (mg/L)	12	425.4	71.6	310.1
12	NH3-N (mg N/L)	12	34.80	7.02	26.5
13	NO2+NO3 (mg N/L)	12	4.41	0.60	2.14
14	NO2-N (mgN/L)	12	0.18	0.02	0.07
15	NO3-N (mgN/L)	12	4.38	0.58	2.07
16	P-Tot (mgP/L)	12	0.300	0.130	0.256
17	SiO2 (mg/L)	12	46.6	21.8	34.4
18	SO4 (mg/L)	12	132.7	32.7	108.9
	BIOLOGICAL/BACTERIOLOGICAL				
1	BOD3-27 (mg/L)	12	40.0	7.5	20.9
2	DO (mg/L)	12	2.6	0.0	0.4
3	DO_SAT% (%)	12	36	0	5
	TRACE & TOXIC				
1	Al (mg/L)	12	0.07	0.04	0.05
	CHEMICAL INDICES				
1	HAR_Ca (mgCaCO3/L)	12	573	120	364
2	HAR_Total (mgCaCO3/L)	12	711	177	465
3	Na% (%)	12	64	46	58
4	RSC (-)	12	0.4	0.0	0
5	SAR (-)	12	7.3	2.3	6.2
	PESTICIDES				

Water Quality Seasonal Average for the period: 2005-2013

Station Name : Sabarmati at Voutha (01 02 12 013) | **Division : Mahi Division, Gandhinagar**

Local River : Sabarmati | **River Water** | **Sub-Division : Sabarmati Sub Divn., Ahmedabad**

S.No	Parameters	Flood								Winter								Summer							
		Jun - Oct								Nov - Feb								Mar - May							
		2005	2006	2007	2008	2009	2010	2011	2012	2005-2006	2006-2007	2007-2008	2008-2009	2009-2010	2010-2011	2011-2012	2012-2013	2006	2007	2008	2009	2010	2011	2012	2013
	PHYSICAL																								
1	Q (cumec)	694.2	406.9	270.3	31.35	43.37	68.77	215.4	55.64	39.72	19.91	87.95	22.67	17.03	18.96	50.28	14.77	13.87	44.72	34.73	30.76	16.85	14.19	11.73	15.85
2	EC_FLD (µmho/cm)	1512	1056	995	1760	1472	1670	1536	1596	2030	1888	1618	2089	2181	2048	2102	2398	2693	1668	1334	1641	2521	2797	2460	2459
3	EC_GEN (µmho/cm)	1557	1088	987	1865	1556	1859	1665	1492	1927	1844	1710	2001	2174	2330	1911	2542	2689	1652	1424	1832	2568	3207	2200	2486
4	pH_FLD (pH units)	7.2	6.9	6.9	7.4	7.6	7.8	7.9	7.8	7.6	7.5	7.2	7.8	7.8	8.0	8.2	8.2	7.7	7.4	7.3	7.9	7.9	8.3	7.9	8.3
5	pH_GEN (pH units)	7.7	7.4	7.8	7.9	7.8	7.8	8.0	7.9	7.7	7.7	7.7	8.0	7.9	8.1	7.7	8.0	7.9	7.7	7.7	7.8	7.8	7.7	8.1	8.2
6	SS (mg/L)	137	119	36	60	110	121	98	86	32	71	72	88	113	245	78	93	43	69	36	72	127	103	96	83
7	TDS (mg/L)	1074	749	657	1262	1040	1264	1079	1036	1365	1170	1096	1351	1450	1579	1303	1739	1881	1099	957	1250	1750	2233	1479	1783
8	Temp (deg C)	29.3	30.9	32.2	31.6	32.7	32.3	29.0	31.0	23.9	26.8	25.2	24.9	25.1	25.7	24.8	23.2	30.9	31.2	30.8	33.0	33.1	32.7	29.1	30.9
9	Turb (NTU)	6.0	205.0	64.0	46.0	32.2	45.2	55.6	43.4	8.0	16.3	16.5	16.8	23.0	23.5	16.0	21.3	13.3	13.3	12.7	19.3	50.0	42.7	29.3	42.7
	CHEMICAL																								
1	Alk-Phen (mgCaCO3/L)	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4	0.4	0.0	0.0	0.0	0.6	0.0	0.0	0.0	0.0	0.0	0.0
2	ALK-TOT (mgCaCO3/L)	335	279	292	498	361	356	316	320	411	340	340	630	401	430	388	485	449	291	405	542	484	553	393	536
3	Ca (mg/L)	48	46	45	87	100	129	108	108	58	59	61	117	136	157	145	163	75	49	65	108	176	175	149	186
4	Cl (mg/L)	202.5	150.8	155.6	296.0	271.0	335.2	283.2	311.2	292.7	259.8	192.0	370.5	381.5	459.5	370.5	484.5	273.3	267.3	214.7	312.0	490.0	614.7	441.3	488.7
5	CO3 (mg/L)	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.5	0.0	0.0	0.0	0.7	0.0	0.0	0.0	0.0	0.0	0.0
6	F (mg/L)	0.77	0.70	0.63	0.70	0.68	0.89	0.72	0.71	0.69	0.85	0.81	0.88	0.65	0.87	0.66	0.68	0.85	0.79	0.83	0.61	0.86	0.93	0.80	0.52
7	Fe (mg/L)	0.0	0.1	0.3	0.8	1.0	1.0	0.7	0.3	0.0	0.0	0.2	0.8	1.2	0.9	0.5	0.5	0.0	0.1	0.2	1.0	1.1	1.0	0.4	0.4
8	HCO3 (mg/L)	204	170	178	304	300	434	385	390	251	208	207	384	488	523	474	592	274	177	247	330	590	675	480	654
9	K (mg/L)	5.5	7.1	6.3	11.4	10.7	8.9	7.9	6.1	10.0	12.0	6.9	9.5	14.2	13.3	6.3	9.5	12.0	10.9	7.2	15.7	14.8	17.2	7.7	9.3
10	Mg (mg/L)	14.9	14.8	14.8	17.1	24.3	19.4	17.3	20.2	16.7	19.1	13.8	20.9	19.9	19.4	17.5	25.8	18.1	19.4	18.5	17.2	27.5	29.2	22.4	28.5
11	Na (mg/L)	150.0	109.4	118.3	219.8	190.0	239.3	214.3	235.0	221.7	187.0	142.7	272.2	290.2	329.0	285.0	368.2	205.0	191.2	153.9	231.2	332.9	448.7	323.1	357.8
12	NH3-N (mg N/L)	4.38	12.24	10.98	20.64	15.58	19.12	11.22	21.40	26.10	19.88	20.94	23.47	24.15	18.94	13.57	30.78	24.70	19.19	16.55	20.83	26.32	16.12	34.15	29.28
13	NO2+NO3 (mg N/L)	0.65	1.68	1.68	2.48	2.95	1.48	2.69	1.94	0.12	1.79	2.44	3.40	2.68	1.37	2.49	2.12	0.23	2.35	1.69	4.34	2.95	1.74	2.38	2.49
14	NO2-N (mgN/L)	0.09	0.12	0.08	0.02	0.02	0.06	0.07	0.07	0.03	0.14	0.02	0.08	0.02	0.05	0.04	0.07	0.01	0.08	0.02	0.10	0.03	0.07	0.10	0.06
15	NO3-N (mgN/L)	0.57	1.56	1.60	2.46	2.92	1.42	2.62	1.87	0.09	1.64	2.42	3.32	2.66	1.32	2.45	2.05	0.21	2.27	1.67	4.24	2.92	1.68	2.29	2.43
16	P-Tot (mgP/L)	1.460	0.774	0.388	0.154	0.222	0.166	0.198	0.228	1.443	2.645	0.247	0.200	0.198	0.185	0.252	0.290	1.767	0.780	0.133	0.270	0.190	0.247	0.270	0.257
17	SiO2 (mg/L)	18.3	26.2	26.7	43.0	42.5	34.3	44.1	38.6	23.6	29.4	36.9	38.7	36.1	43.6	44.3	25.6	22.3	33.9	34.8	39.9	36.6	54.5	45.5	39.1
18	SO4 (mg/L)	50.8	52.4	50.0	89.5	103.2	80.7	73.1	86.0	84.0	82.0	69.7	112.0	100.3	93.0	121.7	128.8	93.6	78.7	57.2	119.3	92.7	116.3	125.6	120.8
	BIOLOGICAL/BACTERIOLOGICAL																								
1	BOD3-27 (mg/L)	10.1	6.4	5.7	25.8	17.0	18.8	11.1	17.4	13.7	11.8	35.0	13.5	13.3	25.8	18.0	23.5	18.3	11.3	35.0	24.0	25.0	18.0	22.3	23.3
2	DO (mg/L)	5.0	5.5	5.8	6.3	6.5	6.5	6.0	0.9	7.1	5.7	6.7	5.4	6.7	6.5	7.0	0.1	6.0	6.9	6.7	6.1	5.7	6.1	0.0	0.0
3	DO_SAT% (%)	66	74	79	86	90	89	78	12	83	70	81	64	80	79	84	1	80	92	89	84	79	84	0	0
	TRACE & TOXIC																								
1	Al (mg/L)	0.06	0.05	0.06	0.04	0.04	0.05	0.05	0.04	0.05	0.04	0.06	0.04	0.07	0.05	0.05	0.06	0.03	0.05	0.07	0.03	0.07	0.06	0.05	0.05
	CHEMICAL INDICES																								
1	HAR_Ca (mgCaCO3/L)	120	116	113	217	249	323	269	269	146	148	152	292	340	393	362	408	187	122	162	270	440	437	373	465
2	HAR_Total (mgCaCO3/L)	182	177	175	288	351	404	341	354	216	227	210	379	423	474	435	515	262	203	239	341	554	558	466	584
3	Na% (%)	57	49	51	62	53	55	47	57	68	63	58	60	59	59	58	60	62	65	57	58	56	63	60	57
4	RSC (-)	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.6	0.0	0.0
5	SAR (-)	4.6	3.3	3.7	5.7	4.4	5.1	4.5	5.3	6.6	5.4	4.3	6.0	6.1	6.6	5.9	7.1	5.5	5.9	4.3	5.5	6.1	8.3	6.5	6.4
	PESTICIDES																								

4.4 Analysis

As may be seen, the quantum of data available for Derol Bridge site is too short to draw any meaningful conclusions. Therefore, analysis of only one station I e Vautha has been carried out in this year book. A summary of statistical analysis on 6 parameters for Sabarmatibasin is given **Table-9**. Time series graphs with linear trend line are shown in **Annex-IV**. Number of samples found unfit for designated best use of drinking water, irrigation and support to aquatic life have also been determined and are given in the section dealing with inferences.

Table –9: Summary of Statistical Analysis for period from WY:2005 to WY:2013

Site Name & Code	Site Name	EC_GEN	pH_GEN	DO	BOD3-27	NH3-N
01 02 12 013	**Vautha**					
N		94	94	94	94	94
Average		1880.7	7.8	5.3	18.0	19.4
Median		1929.5	7.8	6.2	16.0	19.8
Standard Deviation		738.1	0.3	2.3	11.0	9.2
Minimum		303.0	6.5	0.0	2.0	0.5
Maximum		3436.0	8.4	8.0	58.0	37.5
CV		39.2	3.9	44.5	61.5	47.3
25th Percentile		1402.5	7.7	4.8	10.3	14.1
75th Percentile		2378.8	8.0	6.7	25.0	25.7
Linear Trend Line						
Slope /year		86.89	0.045	-0.536	1.034	1.137
Intercept		1530	7.64	7.417	13.77	14.77
R2 value		0.072	0.113	0.273	0.046	0.080

3.5 Inferences

The percentage of samples that were found to be beyond the tolerance limits prescribed for a designated best use of water for site Vautha in Sabarmati basin is as follows:

- **Vautha**

Table-10: Percentage of Samples found to be beyond the tolerance limits

S No	Charateristics / Parameter	Class of Water as per Designated Best Use		
		A	D	E
1	pH	0	0	0
2	Dissolved Oxygen	32.9	6.1	-
3	Bio-chemical Oxygen demand	98.9	-	-
4	Ammonia (as free Nitrogen)	-	96.8	-
5	Electrical Conductivity	-	-	28.7
6	Sodium Absorption Ratio	-	-	0

Time series plots for the above parameters for the sites in Sabarmati basin are given in **Annex-IV.** There are two water quality monitoring stations of CWC in the basin. However, data of one site viz Derol bridge could not be used owing to inadequate length of the time series. Thus data of site Vautha has been analysed. only It is observed that all the parameters show an increasing trend except DO whose decrease is also an indicator of increasing pollution. Almost all the samples (98.9%) are found to be beyond the tolerance limits as given in subsequent para of this report. This indicates a high level of water pollution due to organic matter. It is also seen, as brought out in subsequent para on percentage of samples found beyond tolerance limits, the river water appears to be highly polluted as pointed out by the high values of ammoniacal nitrogen. Ammoniacal nitrogen (NH_3-N), is a measure for the amount of ammonia, a toxic pollutant often found in landfill leachate and in waste products, such as sewage, liquid manure and other liquid organic waste products. There is also high level of dissolved solids as indicated by high percentage failure of samples to meet standards.

5.0 Tapi Basin

5.1 Basin description

The Tapi is the second largest westward draining interstate river basin. Its basin map is enclosed. It originates near Multai in Betul district at an elevation of 752 m above *msl*. The total length of this west flowing river from its origin to its out- fall into gulf of Cambay is 724 km. It drains an area of 65,145 sq.km, out of which nearly 80% lies in Maharashtra, 15% in Madhya Pradesh and rest 5% in Gujarat .The Tapi basin is the northern most basin of Deccan Plateau and is situated between latitudes 20°N to 22°N approximately. The Satpura range forms its northern boundary and the Ajanta and Satmala hills forms its southern extremity. Mahadeo hills form its eastern boundary and its outlet into the Arabian sea is in the west. Bounded by three sides by the hill ranges, the river Tapi, along with its tributaries flows more or less over the plains of Vidarbha, Khandesh and Gujarat

The Tapi receives several tributaries on both the banks. There are 14 major tributaries having length more than 50 km. Out of which 4 tributaries viz. Vaki, Gomi, Arunavati and Aner join on the right bank. Other 10 tributaries viz. Nesu, Amaravati, Buray, Panjhra, Bori, Girna, Vaghur, Purna, Mona and Sipna drain on left bank of the main channel. The drainage system on the left bank of Tapi is, therefore, more extensive as compared to the right bank area

The Purna and Girna, two important left bank tributaries, together account for nearly 45% of the total catchment area of the Tapi. The Purna is the principal tributary of the Tapi and originates in Betul district near Gawilgarh hills of Satpura range at an elevation of 900 m. It traverses 274 km having catchments area of about 18929 sq km. The Girna, another major tributary, rises in the hill ranges of Western Ghats at an elevation of 900 m. It traverses a distance of about 260 km having a catchment area about 10061 sq km.

The average rainfall in the Tapi basin is 830 mm, Owing to topographical characteristics, the climate is variable. The Purna Sub catchment in the upper half of the Tapi basin is one of the hottest regions in India

At present, there are 40 major and medium Irrigation schemes completed and 15 ongoing schemes in the form of reservoirs or weirs in the Tapi catchment. The main projects on main river are Kakrapar weir, Ukai Dam and Hathnur Dam. The upper Tapi Stage- II project is under progress at Nawtha.


TAPI BASIN
N
ARABIAN SEA
SURAT
GHALA
Tapi River
UKAI DAM
SAGBARA
Gomal River
SARANGKHEDA
GIDHADE
ANER
SAVKHEDA
Buray River
DHULE
MORANE
Bori River
Girna River
Punad Proj.
MALEGAON
GIRNADAM
BHUSAWAL
JALGAON
DAHIGAON
HATHNUR
BURHANPUR
Tapi River
DEDTALAI
CHIKALDARA
TESKA
Tapi River
Purna R.
Van Proj.
Van R.
YERLI
Purna R.
GOPALKHEDA
DARYAPUR
AMRAVATI
LAKHPURI
AKOLA
BULDANA
Mun R.
Murna R.
Katepurna R.
LEGEND
GAUGE
GAUGE DISCHARGE
GAUGE DISCHARGE SILT
GAUGE DISCHARGE SILT & W. QTY.
GAUGE DISCHARGE & W. QTY.
WIRELESS STATIONS
RAIN GAUGE STATIONS
FORECASTING STATIONS
COMPLETED PROJECTS
ON GOING PROJECTS
SUB DIVISION
DIVISION
NOT TO SCALE
73°
74°
75°
76°
77°
78°
22°
21°
20°

5.2 Availability of W.Q. Data (in SWDES format)

There are three WQ monitoring stations or sites in this basin, out of which two stations are on the main river and the one is located on tributary of Purna. The WQ stations and availability of data is as given below:

Sl. No.	Site name	River/Tributary	Period of sample collection	No. of samples analysed
1	Burhanpur	Tapi	2005-06 to 2012-13	86
2	Gopalkheda	Purna	2005-06 to 2012-13	45
3	Sarangkheda	Tapi	2005-06 to 2012-13	17

The detailed data are given in Section- 5.3.

5.3 Water Quality Data

HISTORY SHEET

		Water Year	**: 2012-2013**
Site	**: Tapi at Burhanpur**	**Code**	**: 01 02 17 002**
State	: Madhya Pradesh	District	Khandwa
Basin	: Tapi	Independent River	: Tapi
Tributary	: Tapi	Sub Tributary	:
Sub-Sub Tributary	:	Local River	: Tapi
Division	: Tapi Div., Surat	Sub-Division	: UTSD, Bhusawal
Drainage Area	: 8487 Sq. Km.	Bank	: Right
Latitude	: 21°17'12" N	Longitude	: 76°30'18" E

	Opening Date	Closing Date
Gauge	: 16-06-1972	
Discharge	: 14-09-1972	
Sediment	: 23-12-1972	
Water Quality	: 01-06-1977	

Water Quality Datasheet for the period : 2012-2013

Station Name : Tapi at Burhanpur (01 02 17 002) **Division : Tapi Div., Surat**

Local River : Tapi **River Water Analysis** **Sub-Division : UTSD, Bhusawal**

S.No	Parameters	01-06-2012	02-07-2012	01-08-2012	01-09-2012	01-10-2012	01-11-2012	01-12-2012	01-01-2013	01-02-2013	01-03-2013	01-04-2013	01-05-2013
	PHYSICAL												
1	Q (cumec)	0.000	137.0	1329	956.0	222.1	30.55	3.698 #	4.102	2.125	2.336	0.000 *	0.000
2	Colour_Cod (-)		Light Brown	Light Brown	Light Brown	Light Brown	Clear	Clear	Clear	Clear	Clear		Clear
3	EC_FLD (µmho/cm)		220	187	188	260	189		400				
4	EC_GEN (µmho/cm)		250	280	257	300	400	480	420	592	545		520
5	Odour_Code (-)		odour free	odour free	odour free	odour free	odour free	odour free	odour free	odour free	odour free		odour free
6	pH_FLD (pH units)		7.8		7.8	6.9			8.2	7.8	8.0		
7	pH_GEN (pH units)		7.9	8.0	7.5	6.8	6.9	8.2	8.0	8.0	8.0		8.2
8	SS (mg/L)		92	85	100	98	130	152	135	190	163		170
9	TDS (mg/L)		150	190	200	197	260	312	273	383	349		340
10	Temp (deg C)		26.0	24.0	24.0	27.0	21.0	20.0	18.0	19.0	21.0		28.0
11	TS (mg/L)		292	275	300	295	390	464		573	512		510
12	Turb (NTU)		6.0	6.0	36.0	36.0	1.0	1.0		1.0	1.0		1.0
	CHEMICAL												
1	Alk-Phen (mgCaCO3/L)	P	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	P	0.0
2	ALK-TOT (mgCaCO3/L)	O	95	105	80	90	90	60	86	91	102	O	95
3	Ca (mg/L)	O	30	32	32	32	30	32	30	32	30	O	30
4	Cl (mg/L)	L	24.0	29.0	94.0	85.5	69.2	91.0	70.0	63.5	63.8	L	60.0
5	CO3 (mg/L)	I	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	I	0.0
6	F (mg/L)	N	0.18	0.16	0.30	0.18	0.30	0.18	0.16	0.18	0.16	N	0.18
7	HCO3 (mg/L)	G	116	128	98	110	110	73	105	111	124	G	116
8	K (mg/L)		1.0	4.0	22.0	3.2	2.0	1.0	1.8	4.6	3.2		2.6
9	Mg (mg/L)		7.0	6.6	6.0	6.8	7.2	6.8	7.4	6.8	7.2		7.6
10	Na (mg/L)	C	18.0	21.8	50.0	56.6	48.6	50.2	46.4	45.8	46.1	C	45.0
11	NH3-N (mg N/L)	O	0.15	0.08	0.16	0.14	0.14	0.06	0.10	0.08	0.10	O	0.10
12	NO2+NO3 (mg N/L)	N	0.12	0.20	0.28	0.26	0.26	0.25				N	
13	NO2-N (mgN/L)	D	0.02	0.05	0.12	0.06	0.12	0.05				D	
14	NO3-N (mgN/L)	I	0.10	0.15	0.16	0.20	0.14	0.20		0.18	0.14	I	0.17
15	o-PO4-P (mg P/L)	T		0.060	0.060	0.050	0.060	0.080				T	
16	P-Tot (mgP/L)	I	0.180	0.150	0.180	0.150	0.280	0.400	0.190	0.220	0.240	I	0.260
17	SiO2 (mg/L)	O	8.0	9.0	10.0	10.0	10.0	10.0	8.0	8.0	12.0	O	8.0
18	SO4 (mg/L)	N	5.8	7.6	12.0	15.6	18.0	12.2	10.8	19.4	10.0	N	12.0
	BIOLOGICAL/BACTERIOLOGICAL												
1	BOD3-27 (mg/L)		1.0	0.5	0.8	2.0	0.8	1.0	1.6	0.8	1.4		1.6
	TRACE & TOXIC												
1	Al (mg/L)		0.10	0.12	0.16	0.10	0.10	0.10		0.12	0.10		0.14
	CHEMICAL INDICES												
1	HAR_Ca (mgCaCO3/L)		75	80	80	80	75	80	75	80	75		75
2	HAR_Total (mgCaCO3/L)		104	108	105	108	105	108	106	108	105		107
3	Na% (%)		27	30	45	52	50	50	48	47	48		47
4	RSC (-)		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0
5	SAR (-)		0.8	0.9	2.1	2.4	2.1	2.1	2.0	1.9	2.0		1.9
	PESTICIDES												
	REMARKS												

Monthly basis IWIN sample started from 01.07.2008 onwords and stopped w.e.f 31.03.2013

Note. : # Discarded and estimated discharge, * Estimated discharge

Pesticides , Trace and Toxic element analysis

Station Name : Burhanpur at Tapi (01 02 13 001) **Division : Tapi Division, Surat**

Local River : Tapi **Sub Divi. : UT Sub Div., Bhusawal**

Sl. No.	Parameter ID	Parameter Name	unit	Date of sampling												
a	Trace and Toxic			01.04.2006	02.04.2007	02.04.2008	01.04.2009	01.04.2010	01.04.2011	01.09.2011	01.02.2012	02.04.2012	28.05.2012	01.10.2012	01.03.2013	01.04.2013
				Analysis done by WQL-III Lab, UGD, Hyderabad	Analysis done by WQL-III Lab, UGD, Hyderabad	Analysis done by WQL-III Lab, UGD, Hyderabad	Analysis done by WQL-III Lab, UGD, Hyderabad	Analysis done by WQL-III Lab, UGD, Hyderabad	Analysis done by WQL-III Lab, UGD, Hyderabad	Analysis done by NRWQL, New Delhi	Analysis done by NRWQL, New Delhi	Analysis done by WQL-III Lab, UGD, Hyderabad	Analysis done by NRWQL, New Delhi	Analysis done by NRWQL, New Delhi	Analysis done by NRWQL, New Delhi	Analysis done by WQL-III Lab, UGD, Hyderabad
1	As	Arsenic	microgram / l	-	-	-		0.0007		1.09			0.34	10.9	8.7	
2	Cd	Cadmium	microgram / l	-	-	0.75		0.0638		0.097			0.11	0.33	0.23	
3	Cr	Chromium	microgram / l	-	-	0		0		4.21			37.63	15.22	2.7	
4	Cu	Copper	microgram / l	-	-	-		-		17.55			60.23	12.75	5.3	
5	Hg	Mercury	microgram / l	-	-	0		-		0.5			-	-	0.3	
6	Ni	Nickel	microgram / l	-	-	9.35		0.00	P	-	P	P	5.4	27.45	11.6	P
7	Pb	Lead	microgram / l	-	-	15.13		0.00	O	1.77	O	O	8.7	5.9	1.7	O
8	Zn	Zinc	microgram / l	-	-	22.82		42.17	O	172.2	O	O	88	51.7	4.30	O
b	Pesticides		microgram / l				R		L		L	L				L
1	Aldrin	Aldrin	microgram / l	-	-	0	I	0.0041	I	-	I	I	-	-	-	I
2	Alpha- BHC	Alpha- BHC	microgram / l	-	-	0.01	V	0.006	N	-	N	N	-	-	-	N
3	Beta-BHC	Beta-BHC	microgram / l	-	-	-	E	-	G	-	G	G	-	-	-	G
4	Gama- BHC	gamma-BHC (Benzene HexaChloride)	microgram / l	-	-	-	R	-		-			-	-	-	
5	D- BHC	D- BHC	microgram / l	-	-	-		-	C	-	C	C	-	-	-	C
6	DDT	DDT	microgram / l	-	-	0.01	D	0.0054	O	-	O	O	-	-	-	O
7	Dieldrin	Dieldrin	microgram / l	-	-	0	R	0.0042	N	-	N	N	-	-	-	N
8	Endos-I	Endosulphan I	microgram / l	-	-	0.01	Y	0.0293	D	-	D	D	-	-	-	D
9	Endos-II	Endosulphan II	microgram / l	-	-	-		-	I	-	I	I	-	-	-	I
10	Endos-s	Endosulphan s	microgram / l	-	-	-		-	T	-	T	T	-	-	-	T
									I		I	I				I
									O		O	O				O
									N		N	N				N

WQL - III Lab at UGD, Hyderabad conducts the analysis of Trace and Toxic element and Pesticides

NRWQ Lab at HOC, Noida, New Delhi conducts the analysis of Trace and Toxic element only, which started from September 2011 onwords

Water Quality Summary for the period : 2012-2013

Station Name : Tapi at Burhanpur (01 02 17 002) **Division : Tapi Div., Surat**

Local River : Tapi **Sub-Division : UTSD, Bhusawal**

River Water Summary

S.No	Parameters	Number of Observations	Maximum	Minimum	Mean
	PHYSICAL				
1	Q (cumec)	365	8613	0.000	254.7
2	EC_FLD (µmho/cm)	6	400	187	241
3	EC_GEN (µmho/cm)	10	592	250	404
4	pH_FLD (pH units)	6	8.2	6.9	7.8
5	pH_GEN (pH units)	10	8.2	6.8	7.8
6	SS (mg/L)	10	190	85	132
7	TDS (mg/L)	10	383	150	265
8	Temp (deg C)	10	28.0	18.0	22.8
9	TS (mg/L)	9	573	275	401
10	Turb (NTU)	9	36.0	1.0	9.9
	CHEMICAL				
1	Alk-Phen (mgCaCO3/L)	10	0.0	0.0	0
2	ALK-TOT (mgCaCO3/L)	10	105	60	89
3	Ca (mg/L)	10	32	30	31
4	Cl (mg/L)	10	94.0	24.0	65
5	CO3 (mg/L)	10	0.0	0.0	0
6	F (mg/L)	10	0.30	0.16	0.2
7	HCO3 (mg/L)	10	128	73	109
8	K (mg/L)	10	22.0	1.0	4.5
9	Mg (mg/L)	10	7.6	6.0	6.9
10	Na (mg/L)	10	56.6	18.0	42.8
11	NH3-N (mg N/L)	10	0.16	0.06	0.11
12	NO2+NO3 (mg N/L)	6	0.28	0.12	0.23
13	NO2-N (mgN/L)	6	0.12	0.02	0.07
14	NO3-N (mgN/L)	9	0.20	0.10	0.16
15	o-PO4-P (mg P/L)	5	0.080	0.050	0.062
16	P-Tot (mgP/L)	10	0.400	0.150	0.225
17	SiO2 (mg/L)	10	12.0	8.0	9.3
18	SO4 (mg/L)	10	19.4	5.8	12.3
	BIOLOGICAL/BACTERIOLOGICAL				
1	BOD3-27 (mg/L)	10	2.0	0.5	1.2
	TRACE & TOXIC				
1	Al (mg/L)	9	0.16	0.10	0.12
	CHEMICAL INDICES				
1	HAR_Ca (mgCaCO3/L)	10	80	75	78
2	HAR_Total (mgCaCO3/L)	10	108	104	106
3	Na% (%)	10	52	27	44
4	RSC (-)	10	0.0	0.0	0
5	SAR (-)	10	2.4	0.8	1.8
	PESTICIDES				

Water Quality Seasonal Average for the period: 2005-2013

Station Name : Tapi at Burhanpur (01 02 17 002) | **Division : Tapi Div., Surat**

Local River : Tapi | **River Water** | **Sub-Division : UTSD, Bhusawal**

S.No	Parameters	Flood								Winter								Summer							
		Jun - Oct								Nov - Feb								Mar - May							
		2005	2006	2007	2008	2009	2010	2011	2012	2005-2006	2006-2007	2007-2008	2008-2009	2009-2010	2010-2011	2011-2012	2012-2013	2006	2007	2008	2009	2010	2011	2012	2013
	PHYSICAL																								
1	Q (cumec)	1139	611.0	371.4	79.94	93.12	340.6	358.6	528.7	6.669	7.334	6.985	4.434	10.48	13.32	5.642	10.12	0.705	0.403	3.938	1.513	4.834	0.000	0.000	0.779
2	EC_FLD (µmho/cm)		866	221	225	290	420	291	214		895	373	424	391	305	370	294		463	526	247	132			
3	EC_GEN (µmho/cm)	588	392	363	424	414	667	322	272	379	776	568	499	378	403	498	473	951	623	617	593	520			533
4	pH_FLD (pH units)		7.0	8.0	8.0	8.0	8.1	8.2	7.5		7.5	7.0	7.6	7.3	7.8		8.0	7.0	8.1	7.9	8.0	8.7			8.0
5	pH_GEN (pH units)	8.6	7.9	8.0	7.4	7.6	8.3	7.5	7.6	8.5	8.1	8.1	7.5	7.5	8.3	7.0	7.8	8.1	8.7	7.8	8.0	8.2			8.1
6	SS (mg/L)	74	93	134	141	150	213	108	94	74	175	175	152	121	168	177	152	116	204	195	202	166			167
7	TDS (mg/L)	423	303	246	276	274	461	205	184	266	575	371	319	234	303	338	307	763	502	407	410	350			345
8	Temp (deg C)	28.5	26.9	27.9	19.2	27.8	27.4	29.5	25.3	22.5	24.9	24.0	18.8	21.0	24.8	22.3	19.5	26.8	26.7	21.7	26.3	24.7			24.5
9	TS (mg/L)						674	313	291						470	514	476								511
10	Turb (NTU)	3.6	9.0	10.2	4.3	14.4	10.8	12.5	21.0	1.0	1.0	1.0	2.0	1.0	1.0	1.3	1.0	1.0	1.3	1.0	1.7	1.3			1.0
	CHEMICAL																								
1	Alk-Phen (mgCaCO3/L)	4.5	1.0	1.0	0.0	0.0	3.0	0.0	0.0	5.0	1.2	1.2	0.0	0.0	1.2	0.0	0.0	1.7	3.3	1.7	3.3	1.7			0.0
2	ALK-TOT (mgCaCO3/L)	251	106	118	102	114	117	78	92	220	148	122	107	95	127	87	82	233	132	127	114	107			98
3	Ca (mg/L)	37	33	31	33	33	33	32	32	32	41	33	33	32	34	35	31	35	35	33	35	33			30
4	Cl (mg/L)	80.1	46.7	38.5	42.2	78.9	105.7	62.9	58.1	31.8	87.3	80.0	81.7	52.4	128.8	83.7	73.4	130.5	58.4	77.9	94.0	115.7			61.9
5	CO3 (mg/L)	5.4	1.2	1.2	0.0	0.0	3.6	0.0	0.0	6.0	1.5	1.5	0.0	0.0	1.5	0.0	0.0	2.0	4.0	2.0	4.0	2.0	P	P	0.0
6	F (mg/L)	0.26	0.19	0.19	0.15	0.22	0.19	0.16	0.21	0.23	0.05	0.05	0.28	0.27	0.18	0.23	0.21	0.22	0.05	0.05	0.35	0.35	O	O	0.17
7	HCO3 (mg/L)	295	127	142	124	139	135	95	113	256	178	146	130	116	152	107	100	280	153	151	131	126	O	O	120
8	K (mg/L)		0.9	9.1	0.7	6.2	8.9	6.9	7.6		0.9	6.5	2.0	3.5	16.7	10.3	2.3	0.3	3.8	0.8	2.7	7.7	L	L	2.9
9	Mg (mg/L)	9.3	8.0	7.4	7.2	10.1	8.4	6.9	6.6	7.1	11.0	8.5	10.0	7.8	9.5	7.3	7.1	10.7	11.3	7.1	11.7	10.7	I	I	7.4
10	Na (mg/L)		34.7	26.7	29.7	51.3	73.8	35.5	36.6		66.6	58.4	50.7	36.9	87.1	51.5	47.8	239.4	44.4	57.7	58.5	78.4	N	N	45.5
11	NH3-N (mg N/L)	0.14	0.15	0.08	0.10	0.14	0.15	0.12	0.13	0.19	0.06	0.06	0.19	0.14	0.12	0.06	0.09	0.20	0.05	0.06	0.24	0.21	G	G	0.10
12	NO2+NO3 (mg N/L)	0.58	0.06	0.25	0.20	0.27	0.29	0.26	0.21	0.46	0.01	0.06	0.31	0.29	0.27	0.22	0.25	0.53	0.03	0.09	0.43	0.39			
13	NO2-N (mgN/L)	0.05	0.01	0.02	0.02	0.05	0.05	0.05	0.06	0.05	0.00	0.00	0.04	0.04	0.06	0.06	0.08	0.04	0.00	0.01	0.04	0.04	C	C	
14	NO3-N (mgN/L)	0.52	0.05	0.23	0.18	0.23	0.23	0.21	0.15	0.41	0.01	0.06	0.26	0.25	0.21	0.16	0.17	0.50	0.03	0.08	0.38	0.35	O	O	0.16
15	o-PO4-P (mg P/L)						0.090	0.072	0.057						0.075	0.067	0.070						N	N	0.000
16	P-Tot (mgP/L)	0.322	0.206	0.245	0.360	0.292	0.280	0.360	0.165	0.180	0.293	0.621	0.305	0.250	0.230	0.333	0.273	1.149	0.067	0.067	0.353	0.340	D	D	0.250
17	SiO2 (mg/L)	26.9	23.5	25.2	24.7	24.5	21.5	18.2	9.3	17.5	17.7	24.5	20.5	15.1	20.7	10.0	9.0	18.5	20.1	23.3	25.6	14.8	I	I	10.0
18	SO4 (mg/L)	27.6	15.5	7.0	12.3	16.9	8.9	15.2	10.3	24.4	34.7	11.0	19.2	16.9	11.0	15.5	15.1	30.8	23.8	6.3	21.8	20.8	T	T	11.0
	BIOLOGICAL/BACTERIOLOGICAL																						I	I	
1	BOD3-27 (mg/L)	11.2	1.5	3.3	1.1	1.1	9.3	1.6	1.1	1.0	1.8	0.6	0.7	0.4	0.6	2.4	1.1	3.8	5.9	2.9	1.5	2.5	O	O	1.5
2	DO (mg/L)		7.2								7.3			7.2					5.5			6.0	N	N	
3	DO_SAT% (%)		92								87			79					64			70			
	TRACE & TOXIC																								
1	Al (mg/L)	0.10	0.10	0.08	0.08	0.11	0.12	0.10	0.12	0.04	0.02	0.06	0.11	0.04	0.09	0.08	0.11	0.06	0.07	0.05	0.14	0.09			0.12
	CHEMICAL INDICES																								
1	HAR_Ca (mgCaCO3/L)	91	82	77	83	83	83	80	79	80	102	83	82	80	84	87	78	87	87	81	86	83			75
2	HAR_Total (mgCaCO3/L)	130	116	108	113	125	118	109	106	110	148	119	123	113	124	117	107	131	134	111	135	127			106
3	Na% (%)		25	31	34	43	42	38	39		39	50	43	40	56	46	49	78	39	53	47	55			48
4	RSC (-)	2.4	0.1	0.2	0.1	0.1	0.0	0.0	0.0	2.2	0.1	0.1	0.0	0.0	0.3	0.0	0.0	2.0	0.0	0.3	0.0	0.0			0.0
5	SAR (-)		1.3	1.1	1.2	2.0	3.0	1.5	1.5		2.1	2.3	2.0	1.5	3.4	2.1	2.0	8.7	1.6	2.4	2.2	3.1			1.9
	PESTICIDES																								

HISTORY SHEET

		Water Year	**: 2012-2013**
Site	**: Purna at Gopalkheda**	**Code**	**: 01 02 17 004**
State	: Maharashtra	District	Akola
Basin	: Tapi	Independent River	: Tapi
Tributary	: Purna	Sub Tributary	:
Sub-Sub Tributary	:	Local River	: Purna
Division	: Surat	Sub-Division	: UTSD, Bhusawal
Drainage Area	: 9500 Sq. Km.	Bank	: Left
Latitude	: 20°52'35" N	Longitude	: 76°59'14" E
	Opening Date	Closing Date	
Gauge	: 17-02-1977		
Discharge	: 17-02-1977		
Sediment	: 30-07-1979		
Water Quality	: 01-08-1979		

Water Quality Datasheet for the period : 2012-2013

Station Name : Purna at Gopalkheda (01 02 17 004) **Division : Surat**

Local River : Purna **River Water Analysis** **Sub-Division : Bhusawal**

S.No	Parameters	01-06-2012	02-07-2012	01-08-2012	01-09-2012	01-10-2012	01-11-2012	01-12-2012	01-01-2013	01-02-2013	01-03-2013	01-04-2013	01-05-2013
	PHYSICAL												
1	Q (cumec)	0.000	0.490 *	105.2	506.2	43.75	6.741	0.000	0.000	0.000	0.000	0.000	0.000
2	Colour_Cod (-)			Brown		Light Brown							
3	EC_GEN (µmho/cm)			330		340							
4	Odour_Code (-)			odour free		odour free							
5	pH_GEN (pH units)			8.0		7.0							
6	SS (mg/L)			128		100							
7	TDS (mg/L)			220		200							
8	Temp (deg C)			17.0		20.0							
9	TS (mg/L)			348		300							
10	Turb (NTU)			2.0		19.0							
	CHEMICAL												
1	Alk-Phen (mgCaCO3/L)	P	P	0.0		0.0		P	P	P	P	P	P
2	ALK-TOT (mgCaCO3/L)	O	O	100		55		O	O	O	O	O	O
3	Ca (mg/L)	O	O	30		30		O	O	O	O	O	O
4	Cl (mg/L)	L	L	60.4		150.0		L	L	L	L	L	L
5	CO3 (mg/L)	I	I	0.0		0.0		I	I	I	I	I	I
6	F (mg/L)	N	N	0.30		0.25		N	N	N	N	N	N
7	HCO3 (mg/L)	G	G	122		67		G	G	G	G	G	G
8	K (mg/L)			3.6		4.2							
9	Mg (mg/L)			5.6	S	7.2	S						
10	Na (mg/L)	C	C	42.0	N	88.4	N	C	C	C	C	C	C
11	NH3-N (mg N/L)	O	O	0.14	R	0.10	R	O	O	O	O	O	O
12	NO2+NO3 (mg N/L)	N	N	0.12		0.20		N	N	N	N	N	N
13	NO2-N (mgN/L)	D	D	0.02		0.05		D	D	D	D	D	D
14	NO3-N (mgN/L)	I	I	0.10		0.15		I	I	I	I	I	I
15	o-PO4-P (mg P/L)	T	T	0.080		0.060		T	T	T	T	T	T
16	P-Tot (mgP/L)	I	I	0.260		0.160		I	I	I	I	I	I
17	SiO2 (mg/L)	O	O	10.0		8.0		O	O	O	O	O	O
18	SO4 (mg/L)	N	N	4.0		26.0		N	N	N	N	N	N
	BIOLOGICAL/BACTERIOLOGICAL												
1	BOD3-27 (mg/L)			0.6		0.7							
	TRACE & TOXIC												
1	Al (mg/L)			0.08		0.10							
	CHEMICAL INDICES												
1	HAR_Ca (mgCaCO3/L)			75		75							
2	HAR_Total (mgCaCO3/L)			98		105							
3	Na% (%)			47		64							
4	RSC (-)			0.0		0.0							
5	SAR (-)			1.8		3.8							
	PESTICIDES												
	REMARKS												

Monthly basis IWIN sample started from 01.07.2008 onwords and stopped w.e.f 31.03.2013

Note. : * Estimated discharge

Pesticides , Trace and Toxic element analysis

Station Name : Purna at Gopalkheda (01 02 17 004) **Division : Tapi Division, Surat**

Local River : Purna **Sub Divi. : UT Sub Div., Bhusawal**

Sl. No.	Parameter ID	Parameter Name	unit	Date of sampling												
a	Trace and Toxic			01.04.2006	02.04.2007	02.04.2008	01.04.2009	01.04.2010	01.04.2011	01.09.2011	01.02.2012	02.04.2012	28.05.2012	01.10.2012	01.03.2013	01.04.2013
				Analysis done by WQL-III Lab, UGD, Hyderabad	Analysis done by WQL-III Lab, UGD, Hyderabad	Analysis done by WQL-III Lab, UGD, Hyderabad	Analysis done by WQL-III Lab, UGD, Hyderabad	Analysis done by WQL-III Lab, UGD, Hyderabad	Analysis done by WQL-III Lab, UGD, Hyderabad	Analysis done by NRWQL, New Delhi	Analysis done by NRWQL, New Delhi	Analysis done by WQL-III Lab, UGD, Hyderabad	Analysis done by NRWQL, New Delhi	Analysis done by NRWQL, New Delhi	Analysis done by NRWQL, New Delhi	Analysis done by WQL-III Lab, UGD, Hyderabad
1	As	Arsenic	microgram / l	-	-	-	-	0.2726		1.09			0.80	10.6		
2	Cd	Cadmium	microgram / l	-	-	1.51	3.59	0.0000		0.062			0.170	0.15		
3	Cr	Chromium	microgram / l	-	-	0	0	0		7.42			17.77	13.36		
4	Cu	Copper	microgram / l	-	-	-	-	-		28.54			36.14	10.77		
5	Hg	Mercury	microgram / l	-	-	0	0	-		0.47			-	-		
6	Ni	Nickel	microgram / l	-	-	18.28	11.59	1.04	P	-	P	P	2.30	20.17	P	P
7	Pb	Lead	microgram / l	-	-	28.28	68.42	0.00	O	2.88	O	O	6.03	3.8	O	O
8	Zn	Zinc	microgram / l	-	-	33.95	31.47	9.16	L	23.29	L	L	26.00	14.7	L	L
b	**Pesticides**		microgram / l						I		I	I			I	I
1	Aldrin	Aldrin	microgram / l	-	-	0	0	0	N	-	N	N	-	-	N	N
2	Alpha- BHC	Alpha- BHC	microgram / l	-	-	0.04	0	0	G	-	G	G	-	-	G	G
3	Beta-BHC	Beta-BHC	microgram / l	-	-	-	-	-	C	-	C	C	-	-	C	C
4	Gama- BHC	gamma-BHC (Benzene HexaChloride)	microgram / l	-	-	-	-	-	O	-	O	O	-	-	O	O
5	D- BHC	D- BHC	microgram / l	-	-	-	-	-	N	-	N	N	-	-	N	N
6	DDT	DDT	microgram / l	-	-	0.01	0.0004	0.0022	D	-	D	D	-	-	D	D
7	Dieldrin	Dieldrin	microgram / l	-	-	0	0	0	I	-	I	I	-	-	I	I
8	Endos-I	Endosulphan I	microgram / l	-	-	0.02	0	0.1182	T	-	T	T	-	-	T	T
9	Endos-II	Endosulphan II	microgram / l	-	-	-	-	-	I	-	I	I	-	-	I	I
10	Endos-s	Endosulphan s	microgram / l	-	-	-	-	-	O	-	O	O	-	-	O	O
									N		N	N			N	N

WQL - III Lab at UGD, Hyderabad conducts the analysis of Trace and Toxic element and Pesticides

NRWQ Lab at HOC, Noida, New Delhi conducts the analysis of Trace and Toxic element only, which started from September 2011 onwords

Water Quality Summary for the period : 2012-2013

Station Name : Purna at Gopalkheda (01 02 17 004) **Division : Surat**

Local River : Purna **Sub-Division : Bhusawal**

River Water Summary

S.No	Parameters	Number of Observations	Maximum	Minimum	Mean
	PHYSICAL				
1	Q (cumec)	365	2515	0	43.1
2	EC_GEN (µmho/cm)	2	340	330	335
3	pH_GEN (pH units)	2	8.0	7.0	7.5
4	SS (mg/L)	2	128	100	114
5	TDS (mg/L)	2	220	200	210
6	Temp (deg C)	2	20.0	17.0	18.5
7	TS (mg/L)	2	348	300	324
8	Turb (NTU)	2	19.0	2.0	10.5
	CHEMICAL				
1	Alk-Phen (mgCaCO3/L)	2	0.0	0.0	0
2	ALK-TOT (mgCaCO3/L)	2	100	55	77
3	Ca (mg/L)	2	30	30	30
4	Cl (mg/L)	2	150.0	60.4	105.2
5	CO3 (mg/L)	2	0.0	0.0	0
6	F (mg/L)	2	0.30	0.25	0.28
7	HCO3 (mg/L)	2	122	67	95
8	K (mg/L)	2	4.2	3.6	3.9
9	Mg (mg/L)	2	7.2	5.6	6.4
10	Na (mg/L)	2	88.4	42.0	65.2
11	NH3-N (mg N/L)	2	0.14	0.10	0.12
12	NO2+NO3 (mg N/L)	2	0.20	0.12	0.16
13	NO2-N (mgN/L)	2	0.05	0.02	0.04
14	NO3-N (mgN/L)	2	0.15	0.10	0.13
15	o-PO4-P (mg P/L)	2	0.080	0.060	0.07
16	P-Tot (mgP/L)	2	0.260	0.160	0.21
17	SiO2 (mg/L)	2	10.0	8.0	9
18	SO4 (mg/L)	2	26.0	4.0	15
	BIOLOGICAL/BACTERIOLOGICAL				
1	BOD3-27 (mg/L)	2	0.7	0.6	0.7
	TRACE & TOXIC				
1	Al (mg/L)	2	0.10	0.08	0.09
	CHEMICAL INDICES				
1	HAR_Ca (mgCaCO3/L)	2	75	75	75
2	HAR_Total (mgCaCO3/L)	2	105	98	102
3	Na% (%)	2	64	47	55
4	RSC (-)	2	0.0	0.0	0
5	SAR (-)	2	3.8	1.8	2.8
	PESTICIDES				

Water Quality Seasonal Average for the period: 2005-2013

Station Name : Purna at Gopalkheda (01 02 17 004) **Division : Surat**

Local River : Purna **River Water** **Sub-Division : Bhusawal**

S.No	Parameters	Flood								Winter								Summer							
		Jun - Oct								Nov - Feb								Mar - May							
		2005	2006	2007	2008	2009	2010	2011	2012	2005-2006	2006-2007	2007-2008	2008-2009	2009-2010	2010-2011	2011-2012	2012-2013	2006	2007	2008	2009	2010	2011	2012	2013
	PHYSICAL																								
1	Q (cumec)	487.5	37.74	478.6	9.465	7.690	282.0	48.18	158.6	1.300	3.979	4.010	2.517	1.753	3.125	0.407	1.685	0.000		1.204		0.000	0.000	0.000	0.000
2	EC_FLD (µmho/cm)				492	730							1644	638								1105			
3	EC_GEN (µmho/cm)	556	281	554	1086	639	465	571	335	791	987	1364	2083	833	1084			645	805	1198	2584	1222			
4	pH_FLD (pH units)				7.3	8.1	7.2						8.4	8.1	7.2							7.7			
5	pH_GEN (pH units)	8.6	7.9	8.1	7.4	7.7	7.8	7.8	7.5	8.1	8.3	8.2	7.9	8.0	8.0			8.2	8.7	8.4	7.7	7.8			
6	SS (mg/L)	75	98	157	243	252	157	185	114	77	232	262	488	242	401			79	266	318	528	402			
7	TDS (mg/L)	415	190	377	736	418	316	369	210	634	709	833	1315	504	795			441	552	804	1811	814			
8	Temp (deg C)	26.3	26.7	27.0	26.0	27.0	27.5	27.3	18.5	22.0	24.6	19.0	21.0	17.4	23.5			28.0	31.2	25.0	28.0	28.0			
9	TS (mg/L)						473	554	324						1196										
10	Turb (NTU)	10.5	7.5	2.7	3.5	22.0	9.0	27.5	10.5		1.0	1.0	1.8	1.3	0.6			1.0	2.0	1.0	1.0	2.0			
	CHEMICAL															P	P								
1	Alk-Phen (mgCaCO3/L)	2.5	0.0	1.7	0.0	0.0	0.0	0.0	0.0	0.0	5.0	2.5	0.0	2.5	0.0	O	O	0.0	5.0	5.0	0.0	0.0			
2	ALK-TOT (mgCaCO3/L)	142	137	128	125	107	88	87	77	205	207	167	161	90	110	O	O	180	159	153	184	100			
3	Ca (mg/L)	33	32	34	35	34	32	36	30	32	36	36	34	32	35	L	L	32	32	35	38	34	P	P	P
4	Cl (mg/L)	127.7	16.7	82.3	144.8	113.5	86.0	135.2	105.2	141.1	168.3	150.6	370.7	171.3	234.6	I	I	94.7	143.4	167.0	460.0	250.3	O	O	O
5	CO3 (mg/L)	3.0	0.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0	6.0	3.0	0.0	3.0	0.0	N	N	0.0	6.0	6.0	0.0	0.0	O	O	O
6	F (mg/L)	0.23	0.13	0.23	0.13	0.17	0.16	0.13	0.28	0.05	0.07	0.05	0.24	0.16	0.21	G	G	0.05	0.05	0.07	0.28	0.24	L	L	L
7	HCO3 (mg/L)	167	126	152	152	130	107	106	95	250	240	198	197	104	134			219	182	175	224	122	I	I	I
8	K (mg/L)		1.1	5.4	1.8	6.1	3.8	14.8	3.9		3.4	7.3	5.5	5.8	10.9	C	C		4.4	2.2	8.3	6.3	N	N	N
9	Mg (mg/L)	9.1	8.7	7.8	8.9	10.7	8.3	8.1	6.4	8.3	12.4	8.9	9.5	7.8	8.9	O	O	6.8	7.8	8.7	12.7	10.2	G	G	G
10	Na (mg/L)		12.1	57.4	98.8	73.7	51.4	77.7	65.2		128.0	114.0	240.8	108.3	147.4	N	N		106.9	128.8	286.0	165.0			
11	NH3-N (mg N/L)	0.14	0.61	0.05	0.14	0.16	0.09	0.08	0.12	0.05	0.05	0.08	0.13	0.09	0.08	D	D	0.05	0.05	0.08	0.20	0.19	C	C	C
12	NO2+NO3 (mg N/L)	0.47	0.04	0.10	0.29	0.31	0.30	0.25	0.16	0.03	0.01	0.08	0.23	0.24	0.26	I	I	0.07	0.04	0.21	0.52	0.34	O	O	O
13	NO2-N (mgN/L)	0.03	0.00	0.03	0.04	0.05	0.11	0.05	0.04	0.00	0.00	0.00	0.04	0.05	0.04	T	T	0.00	0.01	0.03	0.02	0.04	N	N	N
14	NO3-N (mgN/L)	0.44	0.04	0.08	0.26	0.27	0.19	0.20	0.13	0.03	0.01	0.08	0.19	0.19	0.23	I	I	0.07	0.03	0.18	0.50	0.30	D	D	D
15	o-PO4-P (mg P/L)						0.080	0.055	0.070						0.070	O	O						I	I	I
16	P-Tot (mgP/L)	0.569	0.474	0.087	0.267	0.253	0.170	0.380	0.210	0.070	0.045	0.233	0.395	0.215	0.180	N	N	0.120	0.040	0.080	0.420	0.300	T	T	T
17	SiO2 (mg/L)	24.2	21.4	23.3	27.3	24.9	14.7	19.4	9.0	18.4	21.8	27.4	25.2	16.3	10.0			22.4	22.4	26.9	25.8	15.7	I	I	I
18	SO4 (mg/L)	9.0	14.1	5.1	26.5	19.2	4.1	12.5	15.0	22.2	16.0	30.1	18.0	16.5	6.8	/	/	13.7	8.7	20.3	20.5	24.5	O	O	O
	BIOLOGICAL/BACTERIOLOGICAL																						N	N	N
1	BOD3-27 (mg/L)	1.4	0.4	2.9	7.7	1.8	0.8	1.6	0.7	4.0	6.5	7.0	9.3	1.3	5.5	S	S	0.6	2.0	6.0	5.0	11.5			
2	DO (mg/L)				7.7	7.7							7.7	6.6		N	N					5.9			
3	DO_SAT% (%)				95	97							94	65		R	R					75			
	TRACE & TOXIC																								
1	Al (mg/L)	0.09	0.08	0.06	0.10	0.07	0.15	0.14	0.09	0.04	0.05	0.08	0.07	0.05	0.11			0.06	0.06	0.04	0.04	0.10			
	CHEMICAL INDICES																								
1	HAR_Ca (mgCaCO3/L)	81	80	84	88	84	80	89	75	80	90	90	85	80	86			80	80	88	95	85			
2	HAR_Total (mgCaCO3/L)	119	117	116	125	129	114	123	102	115	142	127	124	113	124			108	113	124	148	127			
3	Na% (%)		18	50	54	53	34	55	55		66	65	79	65	70				66	69	80	73			
4	RSC (-)	0.5	0.0	0.3	0.2	0.0	0.0	0.0	0.0	1.8	1.3	0.8	0.8	0.0	0.4			1.4	0.9	0.6	0.7	0.0			
5	SAR (-)		0.5	2.3	3.7	2.8	2.0	3.1	2.8		4.7	4.4	9.4	4.4	5.8				4.4	5.0	10.3	6.4			
	PESTICIDES																								

HISTORY SHEET

			Water Year	**:**	**2012-2013**
Site	**:**	**Tapi at Sarangkheda**	**Code**	**:**	**01 02 17 015**
State	:	Maharashtra	District		Nandurbar
Basin	:	Tapi	Independent River	:	Tapi
Tributary	:		Sub Tributary	:	
Sub-Sub Tributary	:		Local River	:	Tapi
Division	:	Surat	Sub-Division	:	Dhule
Drainage Area	:	58400 Sq. Km.	Bank	:	Right
Latitude	:	21°25'55" N	Longitude	:	74°31'37" E
		Opening Date	Closing Date		
Gauge	:	29-07-1976			
Discharge	:	19-10-1977			
Sediment	:	13-07-1984			
Water Quality	:	01-01-1980			

Water Quality Datasheet for the period : 2012-2013

Station Name : Tapi at Sarangkheda (01 02 17 015) **Division : Surat**

Local River : **River Water Analysis** **Sub-Division : Dhule**

S.No	Parameters	01-06-2012	02-07-2012	01-08-2012	01-09-2012	01-10-2012	01-11-2012	01-12-2012	01-01-2013	01-02-2013	01-03-2013	01-04-2013	01-05-2013
	PHYSICAL												
1	Q (cumec)	0.000	0.000	1217	1616	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2	Colour_Cod (-)			Brown									
3	EC_GEN (µmho/cm)			320									
4	Odour_Code (-)			odour free									
5	pH_FLD (pH units)			7.2									
6	pH_GEN (pH units)			8.2									
7	SS (mg/L)			98									
8	TDS (mg/L)			210									
9	Temp (deg C)			22.0									
10	TS (mg/L)			308									
11	Turb (NTU)			8.0									
	CHEMICAL												
1	Alk-Phen (mgCaCO3/L)			0.0									
2	ALK-TOT (mgCaCO3/L)			95									
3	Ca (mg/L)	P	P	32		P	P	P	P	P	P	P	P
4	Cl (mg/L)	O	O	68.8		O	O	O	O	O	O	O	O
5	CO3 (mg/L)	O	O	0.0		O	O	O	O	O	O	O	O
6	F (mg/L)	L	L	0.14		L	L	L	L	L	L	L	L
7	HCO3 (mg/L)	I	I	116		I	I	I	I	I	I	I	I
8	K (mg/L)	N	N	3.2		N	N	N	N	N	N	N	N
9	Mg (mg/L)	G	G	6.0	S	G	G	G	G	G	G	G	G
10	Na (mg/L)	C	C	45.0	N	C	C	C	C	C	C	C	C
11	NH3-N (mg N/L)	O	O	0.12	R	O	O	O	O	O	O	O	O
12	NO2+NO3 (mg N/L)	N	N	0.16		N	N	N	N	N	N	N	N
13	NO2-N (mgN/L)	D	D	0.04		D	D	D	D	D	D	D	D
14	NO3-N (mgN/L)	I	I	0.12		I	I	I	I	I	I	I	I
15	o-PO4-P (mg P/L)	T	T	0.050		T	T	T	T	T	T	T	T
16	P-Tot (mgP/L)	I	I	0.100		I	I	I	I	I	I	I	I
17	SiO2 (mg/L)	O	O	8.0		O	O	O	O	O	O	O	O
18	SO4 (mg/L)	N	N	7.0		N	N	N	N	N	N	N	N
	BIOLOGICAL/BACTERIOLOGICAL												
1	BOD3-27 (mg/L)			0.8									
	TRACE & TOXIC												
1	Al (mg/L)			0.10									
	CHEMICAL INDICES												
1	HAR_Ca (mgCaCO3/L)			80									
2	HAR_Total (mgCaCO3/L)			105									
3	Na% (%)			47									
4	RSC (-)			0.0									
5	SAR (-)			1.9									
	PESTICIDES												
	REMARKS												

Monthly basis IWIN sample started from 01.07.2008 onwords and stopped w.e.f 31.03.2013

Pesticides , Trace and Toxic element analysis

Station Name : Tapi at Sarangkheda (01 02 17 015) **Division : Tapi Division, Surat**

Local River : Tapi **Sub Divi. : UT Sub Div., Dhule**

Sl. No.	Parameter ID	Parameter Name	unit	Date of sampling												
a	Trace and Toxic			01.04.2006	02.04.2007	02.04.2008	01.04.2009	01.04.2010	01.04.2011	01.09.2011	01.02.2012	02.04.2012	28.05.2012	01.10.2012	01.03.2013	01.04.2013
				Analysis done by WQL-III Lab, UGD, Hyderabad	Analysis done by WQL-III Lab, UGD, Hyderabad	Analysis done by WQL-III Lab, UGD, Hyderabad	Analysis done by WQL-III Lab, UGD, Hyderabad	Analysis done by WQL-III Lab, UGD, Hyderabad	Analysis done by WQL-III Lab, UGD, Hyderabad	Analysis done by NRWQL, New Delhi	Analysis done by NRWQL, New Delhi	Analysis done by WQL-III Lab, UGD, Hyderabad	Analysis done by NRWQL, New Delhi	Analysis done by NRWQL, New Delhi	Analysis done by NRWQL, New Delhi	Analysis done by WQL-III Lab, UGD, Hyderabad
1	As	Arsenic	microgram / l		-					1.00						
2	Cd	Cadmium	microgram / l		-					0.157						
3	Cr	Chromium	microgram / l		-					5.5						
4	Cu	Copper	microgram / l		-					23.38						
5	Hg	Mercury	microgram / l		-					0.54						
6	Ni	Nickel	microgram / l		-					-						
7	Pb	Lead	microgram / l		-					4.74						
8	Zn	Zinc	microgram / l		-					32.29						
b	**Pesticides**		microgram / l													
1	Aldrin	Aldrin	microgram / l		-					-						
2	Alpha- BHC	Alpha- BHC	microgram / l		-					-						
3	Beta-BHC	Beta-BHC	microgram / l		-					-						
4	Gama- BHC	gamma-BHC (Benzene HexaChloride)	microgram / l		-					-						
5	D- BHC	D- BHC	microgram / l		-					-						
6	DDT	DDT	microgram / l		-					-						
7	Dieldrin	Dieldrin	microgram / l		-					-						
8	Endos-I	Endosulphan I	microgram / l		-					-						
9	Endos-II	Endosulphan II	microgram / l		-					-						
10	Endos-s	Endosulphan s	microgram / l		-					-						

POOLING CONDITION

WQL - III Lab at UGD, Hyderabad conducts the analysis of Trace and Toxic element and Pesticides

NRWQ Lab at HOC, Noida, New Delhi conducts the analysis of Trace and Toxic element only, which started from September 2011 onwords

Water Quality Summary for the period : 2012-2013

Station Name : Tapi at Sarangkheda (01 02 17 015) **Division : Surat**

Local River : **Sub-Division : Dhule**

River Water Summary

S.No	Parameters	Number of Observations	Maximum	Minimum	Mean
	PHYSICAL				
1	Q (cumec)	365	10481	0.000	263.1
2	EC_GEN (µmho/cm)	1	320	320	320
3	pH_FLD (pH units)	1	7.2	7.2	7.2
4	pH_GEN (pH units)	1	8.2	8.2	8.2
5	SS (mg/L)	1	98	98	98
6	TDS (mg/L)	1	210	210	210
7	Temp (deg C)	1	22.0	22.0	22
8	TS (mg/L)	1	308	308	308
9	Turb (NTU)	1	8.0	8.0	8
	CHEMICAL				
1	Alk-Phen (mgCaCO3/L)	1	0.0	0.0	0
2	ALK-TOT (mgCaCO3/L)	1	95	95	95
3	Ca (mg/L)	1	32	32	32
4	Cl (mg/L)	1	68.8	68.8	68.8
5	CO3 (mg/L)	1	0.0	0.0	0
6	F (mg/L)	1	0.14	0.14	0.14
7	HCO3 (mg/L)	1	116	116	116
8	K (mg/L)	1	3.2	3.2	3.2
9	Mg (mg/L)	1	6.0	6.0	6
10	Na (mg/L)	1	45.0	45.0	45
11	NH3-N (mg N/L)	1	0.12	0.12	0.12
12	NO2+NO3 (mg N/L)	1	0.16	0.16	0.16
13	NO2-N (mgN/L)	1	0.04	0.04	0.04
14	NO3-N (mgN/L)	1	0.12	0.12	0.12
15	o-PO4-P (mg P/L)	1	0.050	0.050	0.05
16	P-Tot (mgP/L)	1	0.100	0.100	0.1
17	SiO2 (mg/L)	1	8.0	8.0	8
18	SO4 (mg/L)	1	7.0	7.0	7
	BIOLOGICAL/BACTERIOLOGICAL				
1	BOD3-27 (mg/L)	1	0.8	0.8	0.8
	TRACE & TOXIC				
1	Al (mg/L)	1	0.10	0.10	0.1
	CHEMICAL INDICES				
1	HAR_Ca (mgCaCO3/L)	1	80	80	80
2	HAR_Total (mgCaCO3/L)	1	105	105	105
3	Na% (%)	1	47	47	47
4	RSC (-)	1	0.0	0.0	0
5	SAR (-)	1	1.9	1.9	1.9
	PESTICIDES				

Water Quality Seasonal Average for the period: 2005-2013

Station Name : Tapi at Sarangkheda (01 02 17 015) **Division : Surat**

Local River : **River Water** **Sub-Division : Dhule**

S.No	Parameters	Flood								Winter								Summer							
		Jun - Oct								Nov - Feb								Mar - May							
		2005	2006	2007	2008	2009	2010	2011	2012	2005-2006	2006-2007	2007-2008	2008-2009	2009-2010	2010-2011	2011-2012	2012-2013	2006	2007	2008	2009	2010	2011	2012	2013
	PHYSICAL																								
1	Q (cumec)	178.9	1552	2676	336.9	270.0	913.0	420.5	566.5	1.685	23.70	10.96	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2	EC_FLD (µmho/cm)			380	370	188	270					334													
3	EC_GEN (µmho/cm)	281	287	367	362	282	318	299	320		391	359							326						
4	pH_FLD (pH units)			8.5	10.5	9.8	8.6	7.0	7.2			7.0													
5	pH_GEN (pH units)	8.3	8.1	8.3	7.9	7.6	8.0	7.6	8.2		8.6	8.6							8.7						
6	SS (mg/L)	66	86	110	146	102	122	90	98		144	109							98						
7	TDS (mg/L)	186	192	224	237	184	215	168	210		265	222							229						
8	Temp (deg C)	26.0	24.5	26.5	26.0	25.5	25.0	23.0	22.0		22.0	17.0							25.0						
9	TS (mg/L)						337	258	308																
10	Turb (NTU)	4.5	8.0	1.5	2.0	14.0	11.1	16.0	8.0		2.0	1.0													
	CHEMICAL																								
1	Alk-Phen (mgCaCO3/L)	1.2	0.0	1.2	1.7	0.0	0.0	0.0	0.0		5.0	5.0							5.0						
2	ALK-TOT (mgCaCO3/L)	123	93	112	87	95	112	66	95		115	110							190						
3	Ca (mg/L)	32	31	32	32	32	31	30	32		32	32	P	P	P	P	P	P	32	P	P	P	P	P	P
4	Cl (mg/L)	15.3	14.4	57.0	46.5	59.1	55.6	104.9	68.8		22.3	56.1	O	O	O	O	O	O	6.9	O	O	O	O	O	O
5	CO3 (mg/L)	1.5	0.0	1.5	2.0	0.0	0.0	0.0	0.0		6.0	6.0	O	O	O	O	O	O	6.0	O	O	O	O	O	O
6	F (mg/L)	0.57	0.15	0.12	0.10	0.15	0.09	0.08	0.14		0.08	0.08	L	L	L	L	L	L	0.08	L	L	L	L	L	L
7	HCO3 (mg/L)	146	114	134	102	116	137	80	116		128	122	I	I	I	I	I	I	110	I	I	I	I	I	I
8	K (mg/L)		0.6	5.6	0.7	3.7	12.6	12.4	3.2		3.2	5.6	N	N	N	N	N	N	3.5	N	N	N	N	N	N
9	Mg (mg/L)	7.8	6.8	6.3	6.8	8.3	8.3	5.8	6.0		8.9	7.8	G	G	G	G	G	G	6.8	G	G	G	G	G	G
10	Na (mg/L)		9.8	36.6	27.7	38.8	36.0	58.7	45.0	S	15.3	40.7							4.0						
11	NH3-N (mg N/L)	0.06	0.41	0.07	0.08	0.08	0.05	0.06	0.12	N	0.07	0.07	C	C	C	C	C	C	0.07	C	C	C	C	C	C
12	NO2+NO3 (mg N/L)	0.11	0.06	0.16	0.14	0.14	0.26	0.12	0.16	R	0.04	0.16	O	O	O	O	O	O	0.04	O	O	O	O	O	O
13	NO2-N (mgN/L)	0.04	0.00	0.04	0.02	0.04	0.08	0.02	0.04		0.00	0.06	N	N	N	N	N	N	0.00	N	N	N	N	N	N
14	NO3-N (mgN/L)	0.08	0.06	0.13	0.11	0.10	0.18	0.10	0.12		0.04	0.10	D	D	D	D	D	D	0.04	D	D	D	D	D	D
15	o-PO4-P (mg P/L)						0.075	0.090	0.050				I	I	I	I	I	I		I	I	I	I	I	I
16	P-Tot (mgP/L)	0.482	0.125	0.113	0.360	0.120	0.095	0.360	0.100		0.080	0.139	T	T	T	T	T	T	0.060	T	T	T	T	T	T
17	SiO2 (mg/L)	23.3	23.3	24.4	21.7	21.9	8.8	20.3	8.0		24.5	24.3	I	I	I	I	I	I	14.4	I	I	I	I	I	I
18	SO4 (mg/L)	12.0	14.3	4.1	11.3	13.4	1.2	10.0	7.0		16.3	2.9	O	O	O	O	O	O	6.1	O	O	O	O	O	O
	BIOLOGICAL/BACTERIOLOGICAL												N	N	N	N	N	N		N	N	N	N	N	N
1	BOD3-27 (mg/L)	0.9	0.6	0.8	1.3	2.4	0.7	2.6	0.8		3.0	1.6							1.4						
2	DO (mg/L)			5.5	6.8		10.5					1.6													
3	DO_SAT% (%)			69	83		129					17													
	TRACE & TOXIC																								
1	Al (mg/L)	0.10	0.12	0.08	0.05	0.06	0.06	0.05	0.10			0.12													
	CHEMICAL INDICES																								
1	HAR_Ca (mgCaCO3/L)	80	78	80	80	80	78	75	80		80	80							80						
2	HAR_Total (mgCaCO3/L)	112	106	106	108	114	113	99	105		117	113							108						
3	Na% (%)		17	41	35	41	32	53	47		22	43							7						
4	RSC (-)	0.3	0.0	0.1	0.0	0.0	0.2	0.0	0.0		0.0	0.0							0.0						
5	SAR (-)		0.4	1.5	1.2	1.6	1.5	2.6	1.9		0.6	1.7							0.2						
	PESTICIDES																								

5.4 Analysis

It is seen that the period of availability of data for site Sarangkheda is too short for any meaningful trend related inferences. Therefore, only two sites viz Burhanpur and Gopalkheda are taken for further analysis. A summary of statistical analysis on 6 parameters for Tapi basin is given **Table-12**. Time series graphs with linear trend line are shown in **Annex-V**. Number of samples found unfit for designated best use of drinking water, irrigation and support to aquatic life have also been determined and are given in the section dealing with inferences.

Table –12: Summary of Statistical Analysis for period from WY:2005 to WY:2013

Site Name & Code	Site Name	EC_GEN	pH_GEN	DO	BOD3-27	NH3-N
01 02 17 002	**Burhanpur**					
N		86	86	10	86	86
Average		499.9	7.9	6.7	2.7	0.1
Median		423.5	8.0	7.1	1.0	0.1
Standard Deviation		308.1	0.6	2.1	7.0	0.1
Minimum		154.0	5.8	2.3	0.2	0.1
Maximum		1976.0	9.1	10.2	48.0	0.4
CV		61.6	7.4	30.7	258.9	58.5
25th Percentile		312.8	7.6	5.7	0.5	0.1
75th Percentile		569.0	8.3	7.7	1.9	0.2
Linear Trend Line						
Slope /year		-24.63	0.089	-0.201	-0.433	-0.002
Intercept		590.1	8.26	7.32	4.286	0.134
R2 value		0.033	0.116	0.027	0.019	0.004
01 02 17 004	**Gopalkheda**					
N		45	45	9	45	45
Average		934.5	7.9	6.9	4.2	0.1
Median		805.0	8.0	6.8	2.0	0.1
Standard Deviation		674.9	0.6	0.8	5.5	0.2
Minimum		238.1	5.9	5.6	0.2	0.1
Maximum		3067.0	9.3	7.7	26.0	1.4
CV		72.2	7.6	11.5	129.7	144.1
25th Percentile		403.0	7.8	6.4	0.9	0.1
75th Percentile		1155.0	8.2	7.7	6.0	0.1
Linear Trend Line						
Slope /year		17.84	-0.099	-1.002	0.014	-0.015
Intercept		875.5	8.27	11.13	4.163	0.189
R2 value		0.003	0.097	0.691	0.000	0.020

5.5 Inferences

The percentage of samples that were found to be beyond the tolerance limits prescribed for a designated best use of water for sites in Tapi basin is as follows:

- **Burhanpur**

Table-13: Percentage of Samples found to be beyond the tolerance limits

S No	Charateristics / Parameter	Class of Water as per Designated Best Use		
		A	D	E
1	pH	12.8	12.8	11.6
2	Dissolved Oxygen	30	10	-
3	Bio-chemical Oxygen demand	22.1	-	-
4	Ammonia (as free Nitrogen)	-	0	-
5	Electrical Conductivity	-	-	0
6	Sodium Absorption Ratio	-	-	0

- **Gopalkheda**

Table-14: Percentage of Samples found to be beyond the tolerance limits

S No	Charateristics / Parameter	Class of Water as per Designated Best Use		
		A	D	E
1	pH	15.6	15.6	15.6
2	Dissolved Oxygen	11.1	0	-
3	Bio-chemical Oxygen demand	46.5	-	-
4	Ammonia (as free Nitrogen)	-	2.2	-
5	Electrical Conductivity	-	-	8.9
6	Sodium Absorption Ratio	-	-	0

Time series plots for the above parameters for two sites in Tapi basin, viz Tapi at Burhanpur on main stream Tapi and Purna at Gopalkheda on its tributary Purna, are given in **Annex-V.** It may be seen that Purna at Gopalkheda appears to be more polluted than Tapi at Burhanpur. It is observed that pH generally shows a decreasing trend at both the sites. DO at Burhanpur does not show any trend but fluctuates while that at Gopalkheda is marked by step decline over the years. Similarly, BOD values at burhanpur show decreasing trend with occasional very high spikes, that at Gopalkheda shows an increasing trend. It is also found that some samples on Puna have failed in Ammonia-nitrogen as well. Purna also has greater amount of dissolved solids as revealed by higher percentage of samples found to be beyond the tolerance limits. However a large number of samples at Burhanpur have failed in DO and pH which is inconsistent with other findings mentioned above.

6.0 Banas Basin

6.1 Basin description

The Banas river rises near Pindwara village in Sirohi district of Rajasthan at an elevation of 372.5 m above mean sea level. Its basin map is enclosed. The total length of the river from origin to its outfall into the little Rann of Kachchh It drains an area of 8,674 sq km out of which nearly 38 % lies in Rajasthan State and the remaining 62 % falls in Gujarat state. The basin lies between the geographical co-ordinates of $71^0$15' to 73^0 15' east longitudes and 23^0 30' to 24^0 55' north latitudes. The river flows in a south – westerly direction and empties into little Rann of Kachchh. It is bounded by Luni basin in the north, Sarasvati basin in the south, Aravalli Hill ranges in the east and finally, Arabian Sea in the west.

The number of principal tributaries, which contribute significantly, is seven. Sipu is the only major tributary on the right bank. The other six tributaries namely Batria, Sukli, Sewaran, Suket, Balaram and Khari drain into the main channel from left bank. Hence draining system on the left bank of the Banas river is more extensive as compared to the right bank area.

The average rainfall in the Banas basin is 921 mm. Owing to topographical characteristics, the climate is variable. The Mount Abu is one of the coldest regions and is one of the famous hill stations of India.

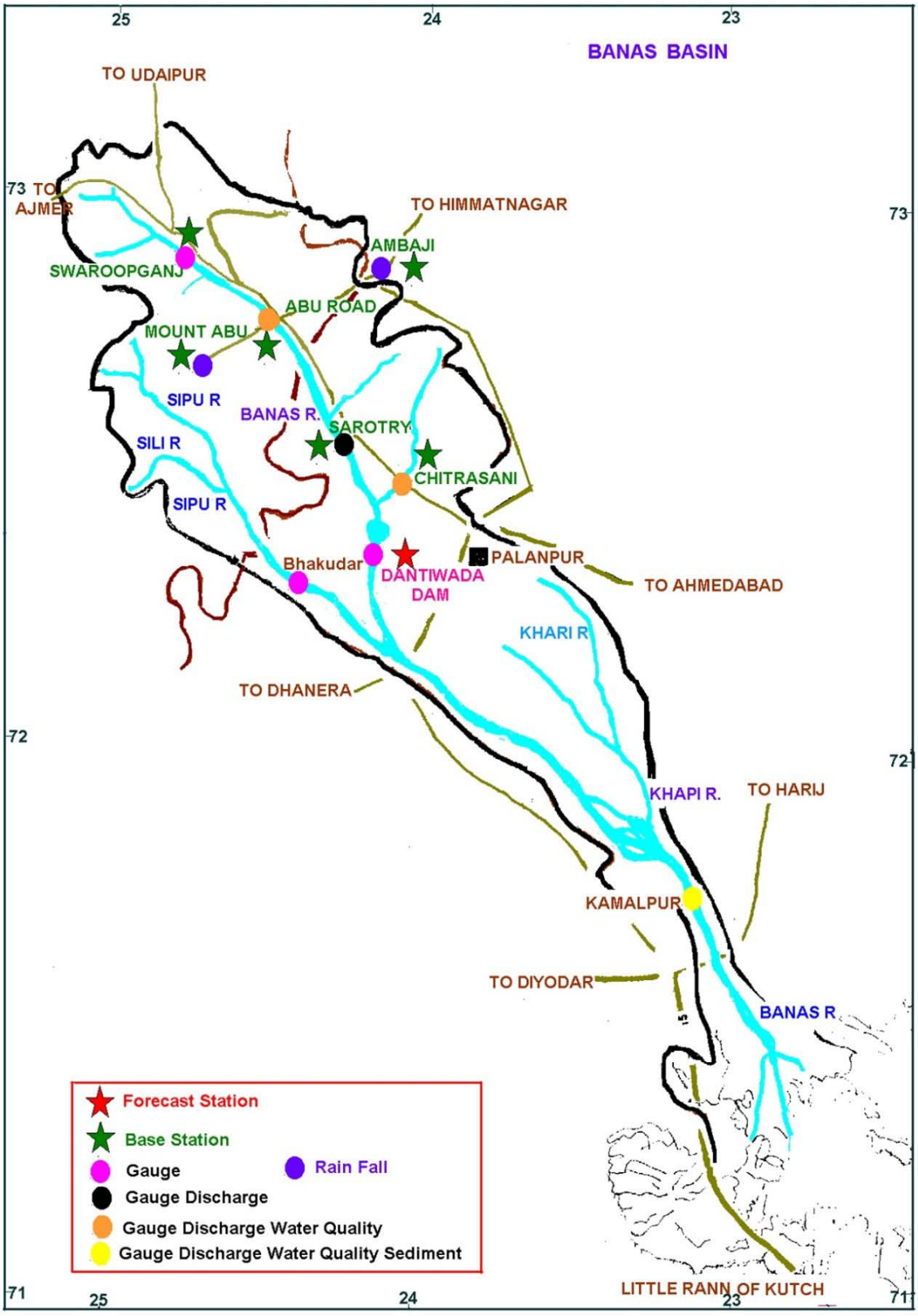
The Dantiwada dam and Swaroopganj dam are two main irrigation structures existing on the main channel of Banas river. The earthen dam on river Sipu, a tributary of Banas, is another project, which is under progress.

6.2 Availability of W.Q. Data (in SWDES format)

There are three WQ monitoring stations at Abu Road and Kamalpur on main stream Banas and Chitrasani on its tributary Balaram. Site-wise availability of data is as follows:

Sl. No.	Site name	River/Tributary	Period of sample collection	No. of samples analysed
1	Abu Road	Banas	2005-06 to 2012-13	15
2	Kamalpur	Banas	2005-06 to 2012-13	8
3	Chitrasani	Balaram	2005-06 to 2012-13	16

The detailed data are given in Section- 6.3.


BANAS BASIN
25
24
23
73
72
71
TO UDAIPUR
TO AJMER
TO HIMMATNAGAR
AMBAJI
SWAROOPGANJ
ABU ROAD
MOUNT ABU
SIPU R
BANAS R.
SAROTRY
SILI R
CHITRASANI
SIPU R
Bhakudar
DANTIWADA DAM
PALANPUR
TO AHMEDABAD
KHARI R
TO DHANERA
KHAPI R.
TO HARIJ
KAMALPUR
TO DIYODAR
BANAS R
LITTLE RANN OF KUTCH
Forecast Station
Base Station
Gauge
Rain Fall
Gauge Discharge
Gauge Discharge Water Quality
Gauge Discharge Water Quality Sediment

6.3 Water Quality Data

HISTORY SHEET

		Water Year	**: 2012-2013**
Site	**: Banas at Abu Road**	**Code**	**: 01 02 02 002**
State	: Rajasthan	District	Sirohi
Basin	: WFR of Kach.-Saur. & Luni	Independent River	: Banas
Tributary	: -	Sub Tributary	:
Sub-Sub Tributary	:	Local River	: Banas
Division	: Mahi Division, Gandhinagar	Sub-Division	: B.L.Sub Divn, Palanpur
Drainage Area	: 1600 Sq. Km.	Bank	: Right
Latitude	: 24°29'38" N	Longitude	: 72°47'30" E
	Opening Date	Closing Date	
Gauge	: 10-05-1978		
Discharge	: 01-06-1990		
Sediment	:		
Water Quality	: 01-07-1988		

Banas at Abu Road

Water Quality Datasheet for the period : 2012-2013

Station Name : Banas at Abu Road (01 02 02 002) **Division : Mahi Division, Gandhinagar**

Local River : Banas **River Water Analysis** **Sub-Division : B.L.Sub Divn, Palanpur**

S.No	Parameters	01-06-2012	02-07-2012	01-08-2012	01-09-2012	01-10-2012	01-11-2012	01-12-2012	01-01-2013	01-02-2013	01-03-2013	01-04-2013	01-05-2013
	PHYSICAL												
1	Q (cumec)	0.000	0.000	* 0.220	5.637	8.808	1.543	0.160	0.000	0.000	0.000	0.000	0.000
2	Colour_Cod (-)					Light Brown							
3	EC_GEN (µmho/cm)					733							
4	Odour_Code (-)					odour free							
5	pH_GEN (pH units)					8.3							
6	SS (mg/L)					44							
7	TDS (mg/L)					470							
8	Temp (deg C)					26.4							
9	Turb (NTU)					10							
	CHEMICAL												
1	Alk-Phen (mgCaCO3/L)					0							
2	ALK-TOT (mgCaCO3/L)					196							
3	Ca (mg/L)					71							
4	Cl (mg/L)					84							
5	CO3 (mg/L)					0							
6	F (mg/L)					0.88							
7	Fe (mg/L)					0.2							
8	HCO3 (mg/L)					239							
9	K (mg/L)					1.6							
10	Mg (mg/L)					12.6							
11	Na (mg/L)					56							
12	NH3-N (mg N/L)					0.07							
13	NO2+NO3 (mg N/L)					4.74							
14	NO2-N (mgN/L)					0.01							
15	NO3-N (mgN/L)					4.73							
16	P-Tot (mgP/L)					0.11							
17	SiO2 (mg/L)					38.9							
18	SO4 (mg/L)					13.3							
	BIOLOGICAL/BACTERIOLOGICAL												
1	BOD3-27 (mg/L)					1.4							
2	DO (mg/L)					8.4							
3	DO_SAT% (%)					104							
	TRACE & TOXIC												
1	Al (mg/L)					0.05							
	CHEMICAL INDICES												
1	HAR_Ca (mgCaCO3/L)					176							
2	HAR_Total (mgCaCO3/L)					229							
3	Na% (%)					35							
4	RSC (-)					0							
5	SAR (-)					1.6							
	PESTICIDES												

POOLING CONDITION

ONCE IN 2 MONTH

POOLING CONDITION/SNR

ONCE IN 2 MONTH

POOLING CONDITION/SNR

ONCE IN 2 MONTH

POOLING CONDITION

ONCE IN 2 MONTH

RIVER DRY

ONCE IN 2 MONTH

Note. : * Estimated discharge

Pesticides , Trace and Toxic element analysis

Station Name : Banas at Abu Road (01 02 02 002)

Division : Mahi Division, Gandhinagar

Local River : Banas

Sub Divi. : BL Sub Div., Palanpur

Sl. No.	Parameter ID	Parameter Name	unit	Date of sampling												
a	Trace and Toxic			01.04.2006	02.04.2007	02.04.2008	01.04.2009	01.04.2010	01.04.2011	01.09.2011	01.02.2012	02.04.2012	28.05.2012	01.10.2012	01.03.2013	01.04.2013
				Analysis done by WQL-III Lab, UGD, Hyderabad	Analysis done by WQL-III Lab, UGD, Hyderabad	Analysis done by WQL-III Lab, UGD, Hyderabad	Analysis done by WQL-III Lab, UGD, Hyderabad	Analysis done by WQL-III Lab, UGD, Hyderabad	Analysis done by WQL-III Lab, UGD, Hyderabad	Analysis done by NRWQL, New Delhi	Analysis done by NRWQL, New Delhi	Analysis done by WQL-III Lab, UGD, Hyderabad	Analysis done by NRWQL, New Delhi	Analysis done by NRWQL, New Delhi	Analysis done by NRWQL, New Delhi	Analysis done by WQL-III Lab, UGD, Hyderabad
1	As	Arsenic	microgram / l	RIVER DRY	RIVER DRY	RIVER DRY	RIVER DRY	RIVER DRY	RIVER DRY	0.58	RIVER DRY	RIVER DRY	RIVER DRY	9.68	ONCE IN 2 MONTH	POOLING CONDITION
2	Cd	Cadmium	microgram / l							0.029				0.12		
3	Cr	Chromium	microgram / l							2.64				4.07		
4	Cu	Copper	microgram / l							4.76				9.86		
5	Hg	Mercury	microgram / l							0.56				-		
6	Ni	Nickel	microgram / l							-				11.28		
7	Pb	Lead	microgram / l							1.440				1.030		
8	Zn	Zinc	microgram / l							14.35				14.16		
b	**Pesticides**		microgram / l													
1	Aldrin	Aldrin	microgram / l							-				-		
2	Alpha- BHC	Alpha- BHC	microgram / l							-				-		
3	Beta-BHC	Beta-BHC	microgram / l							-				-		
4	Gama- BHC	gamma-BHC (Benzene HexaChloride)	microgram / l							-				-		
5	D- BHC	D- BHC	microgram / l							-				-		
6	DDT	DDT	microgram / l							-				-		
7	Dieldrin	Dieldrin	microgram / l							-				-		
8	Endos-I	Endosulphan I	microgram / l							-				-		
9	Endos-II	Endosulphan II	microgram / l							-				-		
10	Endos-s	Endosulphan s	microgram / l							-				-		

WQL - III Lab at UGD, Hyderabad conducts the analysis of Trace and Toxic element and Pesticides

NRWQ Lab at HOC, Noida, New Delhi conducts the analysis of Trace and Toxic element only, which started from September 2011 onwords

Water Quality Summary for the period : 2012-2013 **Division : Mahi Division, Gandhinagar**

Station Name : Banas at Abu Road (01 02 02 002) **Sub-Division : B.L.Sub Divn, Palanpur**

Local River : Banas

River Water Summary

S.No	Parameters	Number of Observations	Maximum	Minimum	Mean
	PHYSICAL				
1	Q (cumec)	365	347.5	0.000	4.722
2	EC_GEN (µmho/cm)	1	733	733	733
3	pH_GEN (pH units)	1	8.3	8.3	8.3
4	SS (mg/L)	1	44	44	44
5	TDS (mg/L)	1	470	470	470
6	Temp (deg C)	1	26.4	26.4	26.4
7	Turb (NTU)	1	10.0	10.0	10
	CHEMICAL				
1	Alk-Phen (mgCaCO3/L)	1	0.0	0.0	0
2	ALK-TOT (mgCaCO3/L)	1	196	196	196
3	Ca (mg/L)	1	71	71	71
4	Cl (mg/L)	1	84.0	84.0	84
5	CO3 (mg/L)	1	0.0	0.0	0
6	F (mg/L)	1	0.88	0.88	0.88
7	Fe (mg/L)	1	0.2	0.2	0.2
8	HCO3 (mg/L)	1	239	239	239
9	K (mg/L)	1	1.6	1.6	1.6
10	Mg (mg/L)	1	12.6	12.6	12.6
11	Na (mg/L)	1	56.0	56.0	56
12	NH3-N (mg N/L)	1	0.07	0.07	0.07
13	NO2+NO3 (mg N/L)	1	4.74	4.74	4.74
14	NO2-N (mgN/L)	1	0.01	0.01	0.01
15	NO3-N (mgN/L)	1	4.73	4.73	4.73
16	P-Tot (mgP/L)	1	0.110	0.110	0.11
17	SiO2 (mg/L)	1	38.9	38.9	38.9
18	SO4 (mg/L)	1	13.3	13.3	13.3
	BIOLOGICAL/BACTERIOLOGICAL				
1	BOD3-27 (mg/L)	1	1.4	1.4	1.4
2	DO (mg/L)	1	8.4	8.4	8.4
3	DO_SAT% (%)	1	104	104	104
	TRACE & TOXIC				
1	Al (mg/L)	1	0.05	0.05	0.05
	CHEMICAL INDICES				
1	HAR_Ca (mgCaCO3/L)	1	176	176	176
2	HAR_Total (mgCaCO3/L)	1	229	229	229
3	Na% (%)	1	35	35	35
4	RSC (-)	1	0.0	0.0	0
5	SAR (-)	1	1.6	1.6	1.6
	PESTICIDES				

Water Quality Seasonal Average for the period: 2005-2013

Station Name : Banas at Abu Road (01 02 02 002) **Division : Mahi Division, Gandhinagar**

Local River : Banas **River Water** **Sub-Division : B.L.Sub Divn, Palanpur**

S.No	Parameters	Flood								Winter								Summer							
		Jun - Oct								Nov - Feb								Mar - May							
		2005	2006	2007	2008	2009	2010	2011	2012	2005-2006	2006-2007	2007-2008	2008-2009	2009-2010	2010-2011	2011-2012	2012-2013	2006	2007	2008	2009	2010	2011	2012	2013
	PHYSICAL																								
1	Q (cumec)	19.96	69.05	3.965	1.237	0.000	1.914	7.048	2.993	0.000	0.552	0.158	0.000	0.000	0.000	0.795	0.426	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2	EC_GEN (µmho/cm)	219	462	734	721	453	425	513	733		1049					896									
3	pH_GEN (pH units)	7.9	7.4	8.2	8.1	8.1	8.1	8.1	8.3	O	7.9	O	O	O	O	7.8	O	O	O	O	O	O	O	O	O
4	SS (mg/L)	46	134	63	19	36	38	42	44	N	58	N	N	N	N	44	N	N	N	N	N	N	N	N	N
5	TDS (mg/L)	152	323	488	463	286	260	329	470	C	645	C	C	C	C	580	C	C	C	C	C	C	C	C	C
6	Temp (deg C)	25.7	28.0	26.0	25.5	24.0	29.0	29.0	26.4	E		E	E	E	E	17.0	E	E	E	E	E	E	E	E	E
7	Turb (NTU)	6.7	150.0	3.5	44.0	16.0	4.0	15.5	10.0		6.5					17.0									
	CHEMICAL									I		I	I	I	I		I	I	I	I	I	I	I	I	I
1	ALK-TOT (mgCaCO3/L)	173	182	296	288	136	120	144	196	N	270	N	N	N	N	196	N	N	N	N	N	N	N	N	N
2	Ca (mg/L)	30	27	55	49	46	42	51	71	2	36	2	2	2	2	77	2	2	2	2	2	2	2	2	2
3	Cl (mg/L)	20.7	45.0	82.0	81.0	62.0	50.0	52.0	84.0		89.0					112.0									
4	F (mg/L)	0.24	0.73	0.86	0.99	0.95	0.54	0.77	0.88	M	0.85	M	M	M	M	1.02	M	M	M	M	M	M	M	M	M
5	Fe (mg/L)	0.0	0.0	0.2	0.7	0.4	0.1	0.1	0.2	O	0.0	O	O	O	O	0.2	O	O	O	O	O	O	O	O	O
6	HCO3 (mg/L)	106	111	181	176	166	146	176	239	N	165	N	N	N	N	239	N	N	N	N	N	N	N	N	N
7	K (mg/L)	1.0	1.2	1.0	2.8	2.3	2.6	1.7	1.6	T	1.7	T	T	T	T	2.7	T	T	T	T	T	T	T	T	T
8	Mg (mg/L)	5.1	6.6	18.0	14.6	10.7	6.8	9.7	12.6	H	10.2	H	H	H	H	15.6	H	H	H	H	H	H	H	H	H
9	Na (mg/L)	14.7	34.0	49.0	57.4	47.1	35.1	35.8	56.0	/	69.0	/	/	/	/	86.1	/	/	/	/	/	/	/	/	/
10	NH3-N (mg N/L)		0.05		0.53	0.29	0.22	0.43	0.07							0.25									
11	NO2+NO3 (mg N/L)	0.14	1.20	1.67	2.95	2.16	0.53	3.28	4.74	P	0.47	P	P	P	P	4.54	P	P	P	P	P	P	P	P	P
12	NO2-N (mgN/L)	0.05	0.05	0.03	0.05	0.09	0.02	0.03	0.01	O	0.06	O	O	O	O	0.02	O	O	O	O	O	O	O	O	O
13	NO3-N (mgN/L)	0.10	1.16	1.65	2.91	2.07	0.51	3.25	4.73	O	0.41	O	O	O	O	4.52	O	O	O	O	O	O	O	O	O
14	P-Tot (mgP/L)	0.010	0.040	0.025	0.045	0.030	0.040	0.100	0.110	L	0.045	L	L	L	L	0.120	L	L	L	L	L	L	L	L	L
15	SiO2 (mg/L)	11.0	21.6	32.4	23.4	20.5	29.0	37.4	38.9	I	25.9	I	I	I	I	26.7	I	I	I	I	I	I	I	I	I
16	SO4 (mg/L)	9.1	8.4	31.5	33.5	31.0	14.4	12.2	13.3	N	17.7	N	N	N	N	44.8	N	N	N	N	N	N	N	N	N
	BIOLOGICAL/BACTERIOLOGICAL									G		G	G	G	G		G	G	G	G	G	G	G	G	G
1	BOD3-27 (mg/L)	0.5	1.0	1.1	1.0	1.9	2.1	0.5	1.4	C	0.7	C	C	C	C	0.7	C	C	C	C	C	C	C	C	C
2	DO (mg/L)	5.4	5.4	6.9	6.8	4.5	8.3	6.8	8.4	O	9.3	O	O	O	O	8.2	O	O	O	O	O	O	O	O	O
3	DO_SAT% (%)	66	70	85	82	53	108	88	104	N		N	N	N	N	85	N	N	N	N	N	N	N	N	N
	TRACE & TOXIC									D		D	D	D	D		D	D	D	D	D	D	D	D	D
1	Al (mg/L)	0.02	0.06	0.06	0.02	0.03	0.05	0.04	0.05	I		I	I	I	I		I	I	I	I	I	I	I	I	I
	CHEMICAL INDICES									T	0.03	T	T	T	T	0.06	T	T	T	T	T	T	T	T	T
1	HAR_Ca (mgCaCO3/L)	76	67	136	122	116	104	126	176	I		I	I	I	I		I	I	I	I	I	I	I	I	I
2	HAR_Total (mgCaCO3/L)	98	94	211	183	161	133	167	229	O	89	O	O	O	O	192	O	O	O	O	O	O	O	O	O
3	Na% (%)	24	34	34	40	39	36	32	35	N	132	N	N	N	N	257	N	N	N	N	N	N	N	N	N
4	RSC (-)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	/	53	/	/	/	/	42	/	/	/	/	/	/	/	/	/
5	SAR (-)	0.6	1.4	1.5	1.8	1.6	1.3	1.2	1.6	R	0.1	R	R	R	R	0.0	R	R	R	R	R	R	R	R	R
	PESTICIDES									D	2.6	D	D	D	D	2.3	D	D	D	D	D	D	D	D	D

HISTORY SHEET

		Water Year	**: 2012-2013**
Site	**: Banas at Kamalpur**	**Code**	**: 01 02 02 007**
State	: Gujarat	District	Banaskantha
Basin	: WFR of Kach.-Saur. & Luni	Independent River	: Banas
Tributary	: -	Sub Tributary	:
Sub-Sub Tributary	:	Local River	: Banas
Division	: Mahi Division, Gandhinagar	Sub-Division	: B.L.Sub Divn, Palanpur
Drainage Area	: 6960 Sq. Km.	Bank	: Right
Latitude	: 23°47'59" N	Longitude	: 71°45'00" E
	Opening Date	Closing Date	
Gauge	: 21-07-1971		
Discharge	: 25-07-1971		
Sediment	: 25-08-1973		
Water Quality	: 01-06-1977		

Water Quality Datasheet for the period : 2012-2013

Station Name : Banas at Kamalpur (01 02 02 007) **Division : Mahi Division, Gandhinagar**

Local River : Banas **River Water Analysis** **Sub-Division : B.L.Sub Divn, Palanpur**

S.No	Parameters	01-06-2012	02-07-2012	01-08-2012	01-09-2012	01-10-2012	01-11-2012	01-12-2012	01-01-2013	01-02-2013	01-03-2013	01-04-2013	01-05-2013
	PHYSICAL												
1	Q (cumec)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2	Colour_Cod (-)												
3	EC_GEN (µmho/cm)												
4	Odour_Code (-)												
5	pH_GEN (pH units)												
6	SS (mg/L)												
7	TDS (mg/L)												
8	Temp (deg C)												
9	Turb (NTU)												
	CHEMICAL												
1	Alk-Phen (mgCaCO3/L)												
2	ALK-TOT (mgCaCO3/L)												
3	Ca (mg/L)												
4	Cl (mg/L)		O		O		O		O		O		
5	CO3 (mg/L)		N		N		N		N		N		
6	F (mg/L)		C		C		C		C		C		ONCE IN 2 MONTH
7	Fe (mg/L)	R	E	R	E	R	E	R	E	R	E	R	
8	HCO3 (mg/L)	I		I		I		I		I		I	
9	K (mg/L)	V	I	V	I	V	I	V	I	V	I	V	
10	Mg (mg/L)	E	N	E	N	E	N	E	N	E	N	E	
11	Na (mg/L)	R		R		R		R		R		R	
12	NH3-N (mg N/L)		2		2		2		2		2		
13	NO2+NO3 (mg N/L)												
14	NO2-N (mgN/L)	D		D		D		D		D		D	
15	NO3-N (mgN/L)	R	M	R	M	R	M	R	M	R	M	R	
16	P-Tot (mgP/L)	Y	O	Y	O	Y	O	Y	O	Y	O	Y	
17	SiO2 (mg/L)		N		N		N		N		N		
18	SO4 (mg/L)		T		T		T		T		T		
	BIOLOGICAL/BACTERIOLOGICAL		H		H		H		H		H		
1	BOD3-27 (mg/L)												
2	DO (mg/L)												
3	DO_SAT% (%)												
	TRACE & TOXIC												
1	Al (mg/L)												
	CHEMICAL INDICES												
1	HAR_Ca (mgCaCO3/L)												
2	HAR_Total (mgCaCO3/L)												
3	Na% (%)												
4	RSC (-)												
5	SAR (-)												
	PESTICIDES												

Pesticides , Trace and Toxic element analysis

Station Name : Banas at Kamalpur (01 02 02 007) **Division : Mahi Division, Gandhinagar**

Local River : Banas **Sub Divi. : BL Sub Div., Palanpur**

Sl. No.	Parameter ID	Parameter Name	unit	Date of sampling											
a	Trace and Toxic			01.04.2006	02.04.2007	02.04.2008	01.04.2009	01.04.2010	01.04.2011	01.09.2011	01.02.2012	02.04.2012	28.05.2012	01.10.2012	01.03.2013	01.04.2013
				Analysis done by WQL-III Lab, UGD, Hyderabad	Analysis done by WQL-III Lab, UGD, Hyderabad	Analysis done by WQL-III Lab, UGD, Hyderabad	Analysis done by WQL-III Lab, UGD, Hyderabad	Analysis done by WQL-III Lab, UGD, Hyderabad	Analysis done by WQL-III Lab, UGD, Hyderabad	Analysis done by NRWQL, New Delhi	Analysis done by NRWQL, New Delhi	Analysis done by WQL-III Lab, UGD, Hyderabad	Analysis done by NRWQL, New Delhi	Analysis done by NRWQL, New Delhi	Analysis done by NRWQL, New Delhi	Analysis done by WQL-III Lab, UGD, Hyderabad
1	As	Arsenic	microgram / l							0.66						
2	Cd	Cadmium	microgram / l							0						
3	Cr	Chromium	microgram / l							2.22						
4	Cu	Copper	microgram / l							4.74						
5	Hg	Mercury	microgram / l							0.56						
6	Ni	Nickel	microgram / l							-						
7	Pb	Lead	microgram / l							0.87						
8	Zn	Zinc	microgram / l	R I V E R	R I V E R	R I V E R	R I V E R	R I V E R	R I V E R	11.34	R I V E R	R I V E R	R I V E R	R I V E R	R I V E R	R I V E R
b	**Pesticides**		microgram / l													
1	Aldrin	Aldrin	microgram / l							-						
2	Alpha- BHC	Alpha- BHC	microgram / l	D R Y	D R Y	D R Y	D R Y	D R Y	D R Y	-	D R Y	D R Y	D R Y	D R Y	D R Y	D R Y
3	Beta-BHC	Beta-BHC	microgram / l							-						
4	Gama- BHC	gamma-BHC (Benzene HexaChloride)	microgram / l							-						
5	D- BHC	D- BHC	microgram / l							-						
6	DDT	DDT	microgram / l							-						
7	Dieldrin	Dieldrin	microgram / l							-						
8	Endos-I	Endosulphan I	microgram / l							-						
9	Endos-II	Endosulphan II	microgram / l							-						
10	Endos-s	Endosulphan s	microgram / l							-						

WQL - III Lab at UGD, Hyderabad conducts the analysis of Trace and Toxic element and Pesticides

NRWQ Lab at HOC, Noida, New Delhi conducts the analysis of Trace and Toxic element only, which started from September 2011 onwords

Water Quality Datasheet for the period : 2012-2013 **Division : Mahi Division, Gandhinagar**

Station Name : Banas at Kamalpur (01 02 02 007) **Sub-Division : B.L.Sub Divn, Palanpur**

Local River : Banas **River Water Analysis**

S.No	Parameters	Number of Observations	Maximum	Minimum	Mean
	PHYSICAL				
1	Q (cumec)	RIVER IN DRY CONDITION DURING THE WHOLE W.Q. OBSERVATION PERIOD			
2	EC_GEN (µmho/cm)				
3	pH_GEN (pH units)				
4	SS (mg/L)				
5	TDS (mg/L)				
6	Temp (deg C)				
7	Turb (NTU)				
	CHEMICAL				
1	Alk-Phen (mgCaCO3/L)				
2	ALK-TOT (mgCaCO3/L)				
3	Ca (mg/L)				
4	Cl (mg/L)				
5	CO3 (mg/L)				
6	F (mg/L)				
7	Fe (mg/L)				
8	HCO3 (mg/L)				
9	K (mg/L)				
10	Mg (mg/L)				
11	Na (mg/L)				
12	NH3-N (mg N/L)				
13	NO2+NO3 (mg N/L)				
14	NO2-N (mgN/L)				
15	NO3-N (mgN/L)				
16	P-Tot (mgP/L)				
17	SiO2 (mg/L)				
18	SO4 (mg/L)				
	BIOLOGICAL/BACTERIOLOGICAL				
1	BOD3-27 (mg/L)				
2	DO (mg/L)				
3	DO_SAT% (%)				
	TRACE & TOXIC				
1	Al (mg/L)				
	CHEMICAL INDICES				
1	HAR_Ca (mgCaCO3/L)				
2	HAR_Total (mgCaCO3/L)				
3	Na% (%)				
4	RSC (-)				
5	SAR (-)				
	PESTICIDES				

Water Quality Seasonal Average for the period: 2005-2013

Station Name : Banas at Kamalpur (01 02 02 007) **Division : Mahi Division, Gandhinagar**

Local River : Banas **River Water** **Sub-Division : B.L.Sub Divn, Palanpur**

S.No	Parameters	Flood								Winter								Summer							
		Jun - Oct								Nov - Feb								Mar - May							
		2005	2006	2007	2008	2009	2010	2011	2012	2005-2006	2006-2007	2007-2008	2008-2009	2009-2010	2010-2011	2011-2012	2012-2013	2006	2007	2008	2009	2010	2011	2012	2013
	PHYSICAL																								
1	Q (cumec)	8.748	0.022	0.000	0.000	1.763	0.713	8.345	0.000	0.000	0.000	0.000	0.000	3.146	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2	EC_GEN (µmho/cm)	160	369			253	252	233						220											
3	pH_GEN (pH units)	8.1	6.9			7.9	8.1	8.3						8.4											
4	SS (mg/L)	42	32	O	O	26	26	28		O	O	O	O	27	O	O		O	O	O	O	O	O	O	
5	TDS (mg/L)	116	264	N	N	160	149	134		N	N	N	N	132	N	N		N	N	N	N	N	N	N	
6	Temp (deg C)	27.0	28.0	C	C	28.6	28.4	30.0		C	C	C	C	19.1	C	C		C	C	C	C	C	C	C	
7	Turb (NTU)	4.0	21.0	E	E	25.0	17.0	13.0		E	E	E	E	16.0	E	E		E	E	E	E	E	E	E	
	CHEMICAL																								
1	Alk-Phen (mgCaCO3/L)	0.0	0.0	I	I	0.0	2.9	0.0		I	I	I	I	2.9	I	I		I	I	I	I	I	I	I	
2	ALK-TOT (mgCaCO3/L)	161	167	N	N	76	88	92		N	N	N	N	82	N	N		N	N	N	N	N	N	N	
3	Ca (mg/L)	29	22	2	2	29	27	32		2	2	2	2	33	2	2		2	2	2	2	2	2	2	
4	Cl (mg/L)	18.0	24.0	M	M	30.0	21.0	12.0	O	M	M	M	M	20.0	M	M	O	M	M	M	M	M	M	M	O
5	CO3 (mg/L)	0.0	0.0	O	O	0.0	3.5	0.0	N	O	O	O	O	3.5	O	O	N	O	O	O	O	O	O	O	N
6	F (mg/L)	0.26	0.61	N	N	0.68	0.50	0.19	C	N	N	N	N	0.76	N	N	C	N	N	N	N	N	N	N	C
7	Fe (mg/L)	0.1	0.0	T	T	0.3	0.3	0.1	E	T	T	T	T	0.3	T	T	E	T	T	T	T	T	T	T	E
8	HCO3 (mg/L)	98	102	H	H	93	100	112		H	H	H	H	93	H	H		H	H	H	H	H	H	H	
9	K (mg/L)	1.0	0.7	/	/	0.8	0.5	0.7	I	/	/	/	/	0.8	/	/	I	/	/	/	/	/	/	/	I
10	Mg (mg/L)	4.8	8.3			5.8	8.8	6.8	N					4.9			N								N
11	Na (mg/L)	10.0	18.0	P	P	19.3	15.4	8.4	2	P	P	P	P	13.5	P	P	2	P	P	P	P	P	P	P	2
12	NH3-N (mg N/L)			O	O	0.17	0.28	0.14		O	O	O	O	0.12	O	O		O	O	O	O	O	O	O	
13	NO2+NO3 (mg N/L)	0.12	0.21	O	O	0.80	1.01	1.10	M	O	O	O	O	1.20	O	O	M	O	O	O	O	O	O	O	M
14	NO2-N (mgN/L)	0.02	0.01	L	L	0.03	0.01	0.03	O	L	L	L	L	0.01	L	L	O	L	L	L	L	L	L	L	O
15	NO3-N (mgN/L)	0.10	0.20	I	I	0.77	0.99	1.07	N	I	I	I	I	1.19	I	I	N	I	I	I	I	I	I	I	N
16	P-Tot (mgP/L)	0.010	0.020	N	N	0.050	0.050	0.080	T	N	N	N	N	0.060	N	N	T	N	N	N	N	N	N	N	T
17	SiO2 (mg/L)	9.8	18.3	G	G	26.1	25.3	34.4	H	G	G	G	G	24.4	G	G	H	G	G	G	G	G	G	G	H
18	SO4 (mg/L)	7.4	9.9	/		11.0	11.8	12.4	/	/	/	/	/	12.7	/	/	/	/	/	/	/	/	/	/	/
	BIOLOGICAL/BACTERIOLOGICAL			C	C					C	C	C	C		C	C		C	C	C	C	C	C	C	
1	BOD3-27 (mg/L)	0.5	1.4	O	O				R	O	O	O	O		O	O	R	O	O	O	O	O	O	O	R
2	DO (mg/L)	5.2	5.0	N	N	0.7	0.8	2.2	D	N	N	N	N	0.3	N	N	D	N	N	N	N	N	N	N	D
3	DO_SAT% (%)	65	64	D	D	6.5	6.0	9.0		D	D	D	D	8.7	D	D		D	D	D	D	D	D	D	
	TRACE & TOXIC			I	I	83	77	119		I	I	I	I	94	I	I		I	I	I	I	I	I	I	
1	Al (mg/L)	0.02	0.01	T	T					T	T	T	T		T	T		T	T	T	T	T	T	T	
	CHEMICAL INDICES			I	I					I	I	I	I		I	I		I	I	I	I	I	I	I	
1	HAR_Ca (mgCaCO3/L)	72	56	O	O	0.02	0.03	0.02		O	O	O	O	0.03	O	O		O	O	O	O	O	O	O	
2	HAR_Total (mgCaCO3/L)	92	91	N	N					N	N	N	N		N	N		N	N	N	N	N	N	N	
3	Na% (%)	19	30	/	/	72	68	80		/	/	/	/	82	/	/		/	/	/	/	/	/	/	
4	SAR (-)	0.5	0.8	R	R	96	105	108		R	R	R	R	102	R	R		R	R	R	R	R	R	R	
	PESTICIDES			D	D	30	24	14		D	D	D	D	22	D	D		D	D	D	D	D	D	D	
						0.9	0.7	0.3						0.6											

HISTORY SHEET

		Water Year	**: 2012-2013**
Site	**: Balaram at Chitrasani**	**Code**	**: 01 02 02 004**
State	: Gujarat	District	Banaskantha
Basin	: WFR of Kach.-Saur. & Luni	Independent River	: Banas
Tributary	: Balaram	Sub Tributary	:
Sub-Sub Tributary	:	Local River	: Balaram
Division	: Mahi Division, Gandhinagar	Sub-Division	: B.L.Sub Divn, Palanpur
Drainage Area	: 345 Sq. Km.	Bank	: Left
Latitude	: 24°17'20" N	Longitude	: 72°29'54" E
	Opening Date	Closing Date	
Gauge	: 08-05-1978		
Discharge	: 01-06-1990		
Sediment	:		
Water Quality	: 15-07-1988		

Water Quality Datasheet for the period : 2012-2013

Station Name : Balaram at Chitrasani (01 02 02 004) **Division : Mahi Division, Gandhinagar**

Local River : Balaram **River Water Analysis** **Sub-Division : B.L.Sub Divn, Palanpur**

S.No	Parameters	01-06-2012	02-07-2012	01-08-2012	01-09-2012	01-10-2012	01-11-2012	01-12-2012	01-01-2013	01-02-2013	01-03-2013	01-04-2013	01-05-2013
	PHYSICAL												
1	Q (cumec)	0.000	0.000	* 0.767	* 1.410	1.421	0.657	*0.250	0.000	0.000	0.000	0.000	0.000
2	Colour_Cod (-)					Clear							
3	EC_GEN (µmho/cm)					505							
4	Odour_Code (-)					odour free							
5	pH_GEN (pH units)					8.4							
6	SS (mg/L)					56							
7	TDS (mg/L)					318							
8	Temp (deg C)					27							
9	Turb (NTU)					4							
	CHEMICAL												
1	Alk-Phen (mgCaCO3/L)					5.8							
2	ALK-TOT (mgCaCO3/L)					167							
3	Ca (mg/L)					55							
4	Cl (mg/L)					52							
5	CO3 (mg/L)					7							
6	F (mg/L)					0.97							
7	Fe (mg/L)					0.2							
8	HCO3 (mg/L)					190							
9	K (mg/L)					1.1							
10	Mg (mg/L)					10.7							
11	Na (mg/L)					37.2							
12	NH3-N (mg N/L)					0.07							
13	NO2+NO3 (mg N/L)					1.5							
14	NO2-N (mgN/L)					0.01							
15	NO3-N (mgN/L)					1.49							
16	P-Tot (mgP/L)					0.07							
17	SiO2 (mg/L)					38.9							
18	SO4 (mg/L)					15.1							
	BIOLOGICAL/BACTERIOLOGICAL												
1	BOD3-27 (mg/L)					2.4							
2	DO (mg/L)					9.1							
3	DO_SAT% (%)					114							
	TRACE & TOXIC												
1	Al (mg/L)					0.06							
	CHEMICAL INDICES												
1	HAR_Ca (mgCaCO3/L)					136							
2	HAR_Total (mgCaCO3/L)					181							
3	Na% (%)					31							
4	RSC (-)					0							
5	SAR (-)					1.2							
	PESTICIDES												

RIVER DRY ONCE IN 2 MONTH POOLING CONDITION

Note. : * Estimated discharge

Pesticides , Trace and Toxic element analysis

Station Name : Balaram at Chitrasani (01 02 02 004) **Division : Mahi Division, Gandhinagar**

Local River : Balaram **Sub Divi. : BL Sub Div., Palanpur**

Sl. No.	Parameter ID	Parameter Name	unit	Date of sampling												
a	Trace and Toxic			01.04.2006	02.04.2007	02.04.2008	01.04.2009	01.04.2010	01.04.2011	01.09.2011	01.02.2012	02.04.2012	28.05.2012	01.10.2012	01.03.2013	01.04.2013
				Analysis done by WQL-III Lab, UGD,Hyderaba	Analysis done by WQL-III Lab, UGD,Hyderaba	Analysis done by WQL-III Lab, UGD,Hyderaba	Analysis done by WQL-III Lab, UGD,Hyderaba	Analysis done by WQL-III Lab, UGD,Hyderaba	Analysis done by WQL-III Lab, UGD,Hyderaba	Analysis done by NRWQL, New Delhi	Analysis done by NRWQL, New Delhi	Analysis done by WQL-III Lab, UGD,Hyderaba	Analysis done by NRWQL, New Delhi	Analysis done by NRWQL, New Delhi	Analysis done by NRWQL, New Delhi	Analysis done by WQL-III Lab, UGD, Hyderabad
1	As	Arsenic	microgram / l							0.52				9.30		
2	Cd	Cadmium	microgram / l							0.043				0.13		
3	Cr	Chromium	microgram / l							7.17				4.22		
4	Cu	Copper	microgram / l							7.81				10.37		
5	Hg	Mercury	microgram / l							0.46				-		
6	Ni	Nickel	microgram / l							-				3.67		
7	Pb	Lead	microgram / l							1.890				5.110		
8	Zn	Zinc	microgram / l							8.10				BDL		
b	**Pesticides**		microgram / l													
1	Aldrin	Aldrin	microgram / l							-				-		
2	Alpha- BHC	Alpha- BHC	microgram / l							-				-		
3	Beta-BHC	Beta-BHC	microgram / l							-				-		
4	Gama- BHC	gamma-BHC (Benzene HexaChloride)	microgram / l							-				-		
5	D- BHC	D- BHC	microgram / l							-				-		
6	DDT	DDT	microgram / l							-				-		
7	Dieldrin	Dieldrin	microgram / l							-				-		
8	Endos-I	Endosulphan I	microgram / l							-				-		
9	Endos-II	Endosulphan II	microgram / l							-				-		
10	Endos-s	Endosulphan s	microgram / l							-				-		

WQL - III Lab at UGD, Hyderabad conducts the analysis of Trace and Toxic element and Pesticides

NRWQ Lab at HOC, Noida, New Delhi conducts the analysis of Trace and Toxic element only, which started from September 2011 onwords

Water Quality Summary for the period : 2012-2013

Station Name : Balaram at Chitrasani (01 02 02 004) **Division : Mahi Division, Gandhinagar**

Local River : Balaram **Sub-Division : B.L.Sub Divn, Palanpur**

River Water Summary

S.No	Parameters	Number of Observations	Maximum	Minimum	Mean
	PHYSICAL				
1	Q (cumec)	365	7.515	0.000	0.578
2	EC_GEN (µmho/cm)	1	505	505	505
3	pH_GEN (pH units)	1	8.4	8.4	8.4
4	SS (mg/L)	1	56	56	56
5	TDS (mg/L)	1	318	318	318
6	Temp (deg C)	1	27.0	27.0	27
7	Turb (NTU)	1	4.0	4.0	4
	CHEMICAL				
1	Alk-Phen (mgCaCO3/L)	1	5.8	5.8	5.8
2	ALK-TOT (mgCaCO3/L)	1	167	167	167
3	Ca (mg/L)	1	55	55	55
4	Cl (mg/L)	1	52.0	52.0	52
5	CO3 (mg/L)	1	7.0	7.0	7
6	F (mg/L)	1	0.97	0.97	0.97
7	Fe (mg/L)	1	0.2	0.2	0.2
8	HCO3 (mg/L)	1	190	190	190
9	K (mg/L)	1	1.1	1.1	1.1
10	Mg (mg/L)	1	10.7	10.7	10.7
11	Na (mg/L)	1	37.2	37.2	37.2
12	NH3-N (mg N/L)	1	0.07	0.07	0.07
13	NO2+NO3 (mg N/L)	1	1.50	1.50	1.5
14	NO2-N (mgN/L)	1	0.01	0.01	0.01
15	NO3-N (mgN/L)	1	1.49	1.49	1.49
16	P-Tot (mgP/L)	1	0.070	0.070	0.07
17	SiO2 (mg/L)	1	38.9	38.9	38.9
18	SO4 (mg/L)	1	15.1	15.1	15.1
	BIOLOGICAL/BACTERIOLOGICAL				
1	BOD3-27 (mg/L)	1	2.4	2.4	2.4
2	DO (mg/L)	1	9.1	9.1	9.1
3	DO_SAT% (%)	1	114	114	114
	TRACE & TOXIC				
1	Al (mg/L)	1	0.06	0.06	0.06
	CHEMICAL INDICES				
1	HAR_Ca (mgCaCO3/L)	1	136	136	136
2	HAR_Total (mgCaCO3/L)	1	181	181	181
3	Na% (%)	1	31	31	31
4	RSC (-)	1	0.0	0.0	0
5	SAR (-)	1	1.2	1.2	1.2
	PESTICIDES				

Water Quality Seasonal Average for the period: 2005-2013

Station Name : Balaram at Chitrasani (01 02 02 004) **Division : Mahi Division, Gandhinagar**

Local River : Balaram **River Water** **Sub-Division : B.L.Sub Divn, Palanpur**

S.No	Parameters	Flood								Winter								Summer							
		Jun - Oct								Nov - Feb								Mar - May							
		2005	2006	2007	2008	2009	2010	2011	2012	2005-2006	2006-2007	2007-2008	2008-2009	2009-2010	2010-2011	2011-2012	2012-2013	2006	2007	2008	2009	2010	2011	2012	2013
	PHYSICAL																								
1	Q (cumec)	2.026	4.150	2.160	0.110	0.226	1.532	2.028	0.720	0.000	0.086	0.000	0.000	0.000	0.000	0.000	0.227	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2	EC_GEN (µmho/cm)	241	610	522	736	567	410	466	505		702														
3	pH_GEN (pH units)	7.9	7.3	8.4	7.9	8.1	8.1	8.2	8.4		8.3														
4	SS (mg/L)	41	36	52	17	18	48	69	56	O	59	O	O	O	O	O	O	O	O	O	O	O	O	O	O
5	TDS (mg/L)	165	380	317	465	368	254	296	318	N	427	N	N	N	N	N	N	N	N	N	N	N	N	N	N
6	Temp (deg C)	25.3	27.0	28.5	27.2	26.8	27.1	27.5	27.0	C	18.5	C	C	C	C	C	C	C	C	C	C	C	C	C	C
7	Turb (NTU)	5.0	10.0	7.5	1.5	1.0	39.5	6.0	4.0	E	9.5	E	E	E	E	E	E	E	E	E	E	E	E	E	E
	CHEMICAL									I		I	I	I	I	I	I	I	I	I	I	I	I	I	I
1	Alk-Phen (mgCaCO3/L)	0.0	0.0	3.7	0.0	0.0	0.0	0.0	5.8	N	1.7	N	N	N	N	N	N	N	N	N	N	N	N	N	N
2	ALK-TOT (mgCaCO3/L)	164	233	251	304	156	114	144	167		241														
3	Ca (mg/L)	29	31	39	52	30	34	49	55	2	33	2	2	2	2	2	2	2	2	2	2	2	2	2	2
4	Cl (mg/L)	20.0	68.0	61.0	80.0	76.0	47.0	49.0	52.0		69.0														
5	CO3 (mg/L)	0.0	0.0	4.5	0.0	0.0	0.0	0.0	7.0	M	2.0	M	M	M	M	M	M	M	M	M	M	M	M	M	M
6	F (mg/L)	0.25	0.76	0.94	1.02	0.96	0.85	0.85	0.97	O	0.77	O	O	O	O	O	O	O	O	O	O	O	O	O	O
7	Fe (mg/L)	0.0	0.0	0.2	0.3	0.2	0.1	0.2	0.2	N	0.0	N	N	N	N	N	N	N	N	N	N	N	N	N	N
8	HCO3 (mg/L)	100	142	149	186	190	139	176	190	T	145	T	T	T	T	T	T	T	T	T	T	T	T	T	T
9	K (mg/L)	1.0	0.9	1.1	2.6	2.1	1.0	1.1	1.1	H	1.5	H	H	H	H	H	H	H	H	H	H	H	H	H	H
10	Mg (mg/L)	5.2	9.7	11.7	11.2	22.4	8.3	8.8	10.7	/	9.7	/	/	/	/	/	/	/	/	/	/	/	/	/	/
11	Na (mg/L)	14.0	52.0	42.4	59.7	55.6	35.6	35.7	37.2		53.0														
12	NH3-N (mg N/L)			0.05	0.28	0.46	0.54	0.30	0.07	P	0.05	P	P	P	P	P	P	P	P	P	P	P	P	P	P
13	NO2+NO3 (mg N/L)	0.14	0.19	0.83	0.81	0.10	0.57	0.91	1.50	O	0.21	O	O	O	O	O	O	O	O	O	O	O	O	O	O
14	NO2-N (mgN/L)	0.03	0.01	0.02	0.01	0.03	0.04	0.01	0.01	L	0.03	L	L	L	L	L	L	L	L	L	L	L	L	L	L
15	NO3-N (mgN/L)	0.12	0.18	0.81	0.80	0.07	0.53	0.90	1.49	I	0.18	I	I	I	I	I	I	I	I	I	I	I	I	I	I
16	P-Tot (mgP/L)	0.013	0.010	0.030	0.055	0.040	0.050	0.070	0.070	N	0.020	N	N	N	N	N	N	N	N	N	N	N	N	N	N
17	SiO2 (mg/L)	12.9	20.5	37.9	29.0	21.6	28.8	35.6	38.9	G	19.4	G	G	G	G	G	G	G	G	G	G	G	G	G	G
18	SO4 (mg/L)	9.0	14.5	16.1	23.1	22.8	8.2	15.0	15.1		17.4														
	BIOLOGICAL/BACTERIOLOGICAL									C		C	C	C	C	C	C	C	C	C	C	C	C	C	C
1	BOD3-27 (mg/L)	0.5	0.7	1.6	2.2	2.6	2.5	2.1	2.4	O	0.8	O	O	O	O	O	O	O	O	O	O	O	O	O	O
2	DO (mg/L)	6.2	5.9	8.7	7.5	7.4	8.4	8.7	9.1	N	9.8	N	N	N	N	N	N	N	N	N	N	N	N	N	N
3	DO_SAT% (%)	76	74	112	93	91	105	110	114	D	105	D	D	D	D	D	D	D	D	D	D	D	D	D	D
	TRACE & TOXIC									I		I	I	I	I	I	I	I	I	I	I	I	I	I	I
1	Al (mg/L)	0.02	0.01	0.05	0.01	0.02	0.06	0.06	0.06	T	0.04	T	T	T	T	T	T	T	T	T	T	T	T	T	T
	CHEMICAL INDICES									I		I	I	I	I	I	I	I	I	I	I	I	I	I	I
1	HAR_Ca (mgCaCO3/L)	73	78	98	130	76	86	122	136	O	83	O	O	O	O	O	O	O	O	O	O	O	O	O	O
2	HAR_Total (mgCaCO3/L)	94	119	147	177	169	121	159	181	N	124	N	N	N	N	N	N	N	N	N	N	N	N	N	N
3	Na% (%)	23	49	39	42	41	37	33	31	/	48	/	/	/	/	/	/	/	/	/	/	/	/	/	/
4	RSC (-)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	R	0.0	R	R	R	R	R	R	R	R	R	R	R	R	R	R
5	SAR (-)	0.6	2.1	1.5	2.0	1.9	1.4	1.2	1.2	D	2.1	D	D	D	D	D	D	D	D	D	D	D	D	D	D
	PESTICIDES																								

6.4 Analysis

It is seen that the period of availability of data, that the sample size is too small to draw any meaningful conclusion regarding trend etc. Therefore, only statistical analysis has been carried out which is given at **Annex-II**.

7.0 Shetrunji Basin

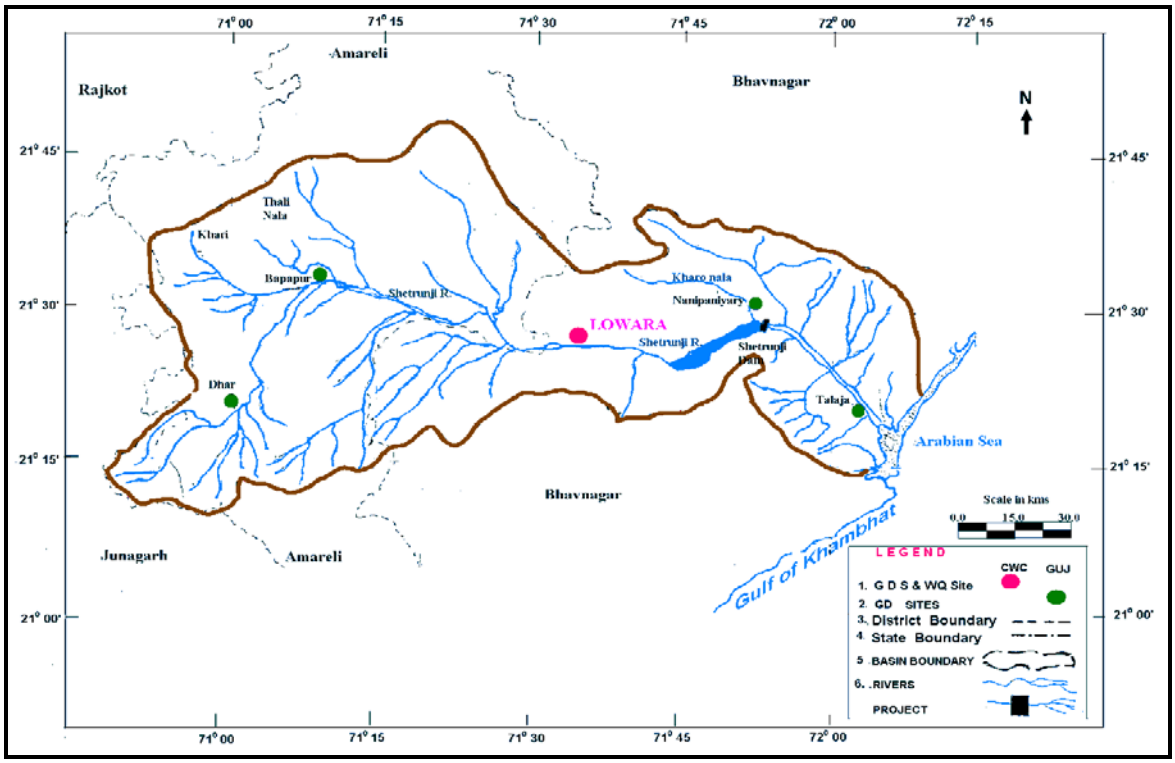
7.1 Basin description

The Shetrunji is one of the major rivers of Saurashtra. Its basin map is enclosed. It rises at Chachai hills in Gir Forest of Junagadh district of Gujarat at an elevation of 380 m above mean sea level. It flows towards east direction and empties into the gulf of Cambay. The total length of this east flowing river from its origin to the outfall is 182 km. The river drains an area of 5514 sq.km. The basin is situated approximately between east longitudes of 700 50' and 72^0 10' and between north latitudes of 21^0 00' and 21^0 47'.

The Shetrunji receives several tributaries on both the banks. There are 9 tributaries having length more than 15 km. Out of which Safara, Shel, Kharai and Talaji are four tributaries on the right bank and remaining five tributaries viz. Stali, Thebu, Gagadia, Rajawal and Kharo are on the left bank. The drainage system on left bank of Shetrunji is more extensive as compared to the right bank area.

The average rainfall in the Shetrunji basin is 604 mm. In winter, the minimum temperature varies from 60^oC to 180^oC.

At present, there are 16 completed irrigation schemes. "Shetrunji Irrigation Scheme" is a major project and remaining 15 projects are medium irrigation schemes.



7.2 Availability of W.Q. Data (in SWDES format)

There is only one WQ monitoring station at Lowara in the basin where availability of data is as follows:

Sl. No.	Site name	River/Tributary	Period of sample collection	No. of samples analysed
1	Lowara	Shetrunji	2005-06 to 2012-13	25

The detailed data are given in Section- 7.3.

7.3 Water Quality Data

HISTORY SHEET

		Water Year	**: 2012-2013**
Site	**: Shetrunji at Lowara**	**Code**	**: 01 02 09 001**
State	: Gujarat	District	Bhavnagar
Basin	: WFR of Kach.-Saur. & Luni	Independent River	: Shetrunji
Tributary	: Shetrunji	Sub Tributary	:
Sub-Sub Tributary	:	Local River	: Shetrunji
Division	: Mahi Division, Gandhinagar	Sub-Division	: Sabarmati, Ahmedabad
Drainage Area	: 3953 Sq. Km.	Bank	: Left
Latitude	: 21°26'36" N	Longitude	: 71°33'42" E
	Opening Date	Closing Date	
Gauge	: 29-11-1970		
Discharge	: 29-11-1970		
Sediment	: 25-07-1973		
Water Quality	: 01-07-1977		

Water Quality Datasheet for the period : 2012-2013

Station Name : Shetrunji at Lowara (01 02 09 001) **Division : Mahi Division, Gandhinagar**

Local River : Shetrunji **River Water Analysis** **Sub-Division : Sabarmati Sub Divn., Ahmedabad**

S.No	Parameters	01-06-2012	02-07-2012	01-08-2012	01-09-2012	01-10-2012	01-11-2012	01-12-2012	01-01-2013	01-02-2013	01-03-2013	01-04-2013	01-05-2013
	PHYSICAL												
1	Q (cumec)	0.000	0.000	0.000	* 0.460	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2	Colour_Cod (-)					Clear							
3	EC_GEN (µmho/cm)					1406							
4	Odour_Code (-)					odour free							
5	pH_GEN (pH units)					8.4							
6	SS (mg/L)					154							
7	TDS (mg/L)					1006							
8	Temp (deg C)					23.0							
9	Turb (NTU)					12.0							
	CHEMICAL												
1	Alk-Phen (mgCaCO3/L)					1.7							
2	ALK-TOT (mgCaCO3/L)					255							
3	Ca (mg/L)					87							
4	Cl (mg/L)					358.0							
5	CO3 (mg/L)			POOLING		2.0							
6	F (mg/L)		ONCE		ONCE	0.84	ONCE		ONCE		ONCE		ONCE
7	Fe (mg/L)					0.2							
8	HCO3 (mg/L)	RIVER				307		RIVER		RIVER		RIVER	
9	K (mg/L)					2.7							
10	Mg (mg/L)		IN		IN	11.7	IN		IN		IN		IN
11	Na (mg/L)					269.4							
12	NH3-N (mg N/L)		2	CONDITION	2	0.14	2		2		2		2
13	NO2+NO3 (mg N/L)					5.39							
14	NO2-N (mgN/L)	DRY	MONTH		MONTH	0.01	MONTH	DRY	MONTH	DRY	MONTH	DRY	MONTH
15	NO3-N (mgN/L)					5.38							
16	P-Tot (mgP/L)					0.060							
17	SiO2 (mg/L)					18.6							
18	SO4 (mg/L)					14.3							
	BIOLOGICAL/BACTERIOLOGICAL												
1	BOD3-27 (mg/L)					2.4							
2	DO (mg/L)					6.3							
3	DO_SAT% (%)					73							
	TRACE & TOXIC												
1	Al (mg/L)					0.05							
	CHEMICAL INDICES												
1	HAR_Ca (mgCaCO3/L)					216							
2	HAR_Total (mgCaCO3/L)					265							
3	Na% (%)					69							
4	RSC (-)					0.0							
5	SAR (-)					7.2							
	PESTICIDES												

Note. : * Estimated discharge

Pesticides , Trace and Toxic element analysis

Station Name : Shetrunji at Luwara (01 02 09 001) **Division : Mahi Division, Gandhinagar**

Local River : Shetrunji **Sub Divi. : Sabarmati Sub Div., Ahmedabad**

Sl. No.	Parameter ID	Parameter Name	unit	Date of sampling												
a	Trace and Toxic			01.04.2006	02.04.2007	02.04.2008	01.04.2009	01.04.2010	01.04.2011	01.09.2011	01.02.2012	02.04.2012	28.05.2012	01.10.2012	01.03.2013	01.04.2013
				Analysis done by WQL-III Lab, UGD, Hyderabad	Analysis done by WQL-III Lab, UGD, Hyderabad	Analysis done by WQL-III Lab, UGD, Hyderabad	Analysis done by WQL-III Lab, UGD, Hyderabad	Analysis done by WQL-III Lab, UGD, Hyderabad	Analysis done by WQL-III Lab, UGD, Hyderabad	Analysis done by NRWQL, New Delhi	Analysis done by NRWQL, New Delhi	Analysis done by WQL-III Lab, UGD, Hyderabad	Analysis done by NRWQL, New Delhi	Analysis done by NRWQL, New Delhi	Analysis done by NRWQL, New Delhi	Analysis done by WQL-III Lab, UGD, Hyderabad
1	As	Arsenic	microgram / l							0.44				14.80		
2	Cd	Cadmium	microgram / l							0.023				0.16		
3	Cr	Chromium	microgram / l							5.15				7.08		
4	Cu	Copper	microgram / l							6.87				17.87		
5	Hg	Mercury	microgram / l							0.51				-		
6	Ni	Nickel	microgram / l							-				20.73		
7	Pb	Lead	microgram / l							1.360				1.620		
8	Zn	Zinc	microgram / l							13.18				BDL		
b	**Pesticides**		microgram / l													
1	Aldrin	Aldrin	microgram / l							-				-		
2	Alpha- BHC	Alpha- BHC	microgram / l							-				-		
3	Beta-BHC	Beta-BHC	microgram / l							-				-		
4	Gama- BHC	gamma-BHC (Benzene HexaChloride)	microgram / l							-				-		
5	D- BHC	D- BHC	microgram / l							-				-		
6	DDT	DDT	microgram / l							-				-		
7	Dieldrin	Dieldrin	microgram / l							-				-		
8	Endos-I	Endosulphan I	microgram / l							-				-		
9	Endos-II	Endosulphan II	microgram / l							-				-		
10	Endos-s	Endosulphan s	microgram / l							-				-		

RIVER DRY

ONCE IN 2 MONTH

WQL - III Lab at UGD, Hyderabad conducts the analysis of Trace and Toxic element and Pesticides

NRWQ Lab at HOC, Noida, New Delhi conducts the analysis of Trace and Toxic element only, which started from September 2011 onwords

Water Quality Summary for the period : 2012-2013

Station Name : Shetrunji at Lowara (01 02 09 001) **Division : Mahi Division, Gandhinagar**

Local River : Shetrunji **Sub-Division : Sabarmati Sub Divn., Ahmedabad**

River Water Summary

S.No	Parameters	Number of Observations	Maximum	Minimum	Mean
	PHYSICAL				
1	Q (cumec)	365	250.4	0.000	1.711
2	EC_GEN (µmho/cm)	1	1406	1406	1406
3	pH_GEN (pH units)	1	8.4	8.4	8.4
4	SS (mg/L)	1	154	154	154
5	TDS (mg/L)	1	1006	1006	1006
6	Temp (deg C)	1	23.0	23.0	23
7	Turb (NTU)	1	12.0	12.0	12
	CHEMICAL				
1	Alk-Phen (mgCaCO3/L)	1	1.7	1.7	1.7
2	ALK-TOT (mgCaCO3/L)	1	255	255	255
3	Ca (mg/L)	1	87	87	87
4	Cl (mg/L)	1	358.0	358.0	358
5	CO3 (mg/L)	1	2.0	2.0	2
6	F (mg/L)	1	0.84	0.84	0.84
7	Fe (mg/L)	1	0.2	0.2	0.2
8	HCO3 (mg/L)	1	307	307	307
9	K (mg/L)	1	2.7	2.7	2.7
10	Mg (mg/L)	1	11.7	11.7	11.7
11	Na (mg/L)	1	269.4	269.4	269.4
12	NH3-N (mg N/L)	1	0.14	0.14	0.14
13	NO2+NO3 (mg N/L)	1	5.39	5.39	5.39
14	NO2-N (mgN/L)	1	0.01	0.01	0.01
15	NO3-N (mgN/L)	1	5.38	5.38	5.38
16	P-Tot (mgP/L)	1	0.060	0.060	0.06
17	SiO2 (mg/L)	1	18.6	18.6	18.6
18	SO4 (mg/L)	1	14.3	14.3	14.3
	BIOLOGICAL/BACTERIOLOGICAL				
1	BOD3-27 (mg/L)	1	2.4	2.4	2.4
2	DO (mg/L)	1	6.3	6.3	6.3
3	DO_SAT% (%)	1	73	73	73
	TRACE & TOXIC				
1	Al (mg/L)	1	0.05	0.05	0.05
	CHEMICAL INDICES				
1	HAR_Ca (mgCaCO3/L)	1	216	216	216
2	HAR_Total (mgCaCO3/L)	1	265	265	265
3	Na% (%)	1	69	69	69
4	RSC (-)	1	0.0	0.0	0
5	SAR (-)	1	7.2	7.2	7.2
	PESTICIDES				

Water Quality Seasonal Average for the period: 2005-2013

Station Name : Shetrunji at Lowara (01 02 09 001) | **Division : Mahi Division, Gandhinagar**

Local River : Shetrunji | **River Water** | **Sub-Division : Sabarmati Sub Divn., Ahmedabad**

S.No	Parameters	Flood								Winter								Summer							
		Jun - Oct								Nov - Feb								Mar - May							
		2005	2006	2007	2008	2009	2010	2011	2012	2005-2006	2006-2007	2007-2008	2008-2009	2009-2010	2010-2011	2011-2012	2012-2013	2006	2007	2008	2009	2010	2011	2012	2013
	PHYSICAL																								
1	Q (cumec)	32.08	29.29	263.6	11.55	0.493	207.7	88.54	0.092	0.175	0.000	2.110	0.760	0.000	0.678	0.199	0.000	0.000	0.000	0.000	0.187	0.000	0.000	0.000	0.000
2	EC_GEN (µmho/cm)	695	1669	564	766	5494	680	880	1406	4951	7280	5592	4995		2452	4784									
3	pH_GEN (pH units)	8.2	7.6	8.4	8.2	8.0	8.1	7.9	8.4	8.0	7.9	8.0	8.1		8.1	8.0									
4	SS (mg/L)	74	318	188	172	732	178	254	154	77	273	234	424	O	218	200		O	O	O	O	O	O	O	
5	TDS (mg/L)	463	1171	390	516	3759	430	597	1006	3356	5016	4037	3612	N	1566	3820		N	N	N	N	N	N	N	
6	Temp (deg C)	26.5	28.5	26.5	27.0	28.0	24.5	22.7	23.0	16.5	21.5	15.5	21.0	C	20.0	18.0		C	C	C	C	C	C	C	
7	Turb (NTU)	3.0	264.0	385.5	94.0	3.5	566.5	476.7	12.0	6.0	6.5	7.0	10.0	E	11.0	10.0		E	E	E	E	E	E	E	
	CHEMICAL																								
1	Alk-Phen (mgCaCO3/L)	0.0	0.0	2.1	0.0	0.0	2.1	0.0	1.7	0.0	0.0	0.0	0.0	I	0.0	0.0		I	I	I	I	I	I	I	
2	ALK-TOT (mgCaCO3/L)	242	382	257	304	606	132	186	255	560	876	957	1368	N	400	696		N	N	N	N	N	N	N	
3	Ca (mg/L)	35	60	51	63	147	46	59	87	98	139	191	257	2	149	205		2	2	2	2	2	2	2	
4	Cl (mg/L)	65.0	216.0	63.0	91.0	1534.5	104.0	194.0	358.0	503.0	654.0	1204.0	952.0		640.0	1161.0	O								O
5	CO3 (mg/L)	0.0	0.0	2.5	0.0	0.0	2.5	0.0	2.0	0.0	0.0	0.0	0.0	M	0.0	0.0	N	M	M	M	M	M	M	M	N
6	F (mg/L)	0.37	0.66	0.48	0.67	1.07	0.56	0.78	0.84	0.94	1.15	0.66	1.04	O	0.88	1.03	C	O	O	O	O	O	O	O	C
7	Fe (mg/L)	0.0	0.1	0.3	1.2	0.7	0.2	0.1	0.2	0.0	0.1	0.1	0.8	N	0.5	0.3	E	N	N	N	N	N	N	N	E
8	HCO3 (mg/L)	148	233	154	186	740	156	226	307	464	534	584	834	T	488	849		T	T	T	T	T	T	T	
9	K (mg/L)	1.5	2.3	1.7	1.7	20.0	2.4	1.5	2.7	6.0	12.5	1.2	5.2	H	3.3	18.0	I	H	H	H	H	H	H	H	I
10	Mg (mg/L)	8.8	16.0	8.8	9.7	78.7	9.2	12.0	11.7	45.4	45.7	46.7	71.0	/	33.0	48.6	N	/	/	/	/	/	/	/	N
11	Na (mg/L)	49.0	167.0	47.2	63.8	1097.0	78.5	139.5	269.4	387.0	503.0	840.3	672.0		432.3	871.5	2								2
12	NH3-N (mg N/L)		0.25	0.05	0.50	0.29	0.19	0.34	0.14	0.56	0.11	0.20	0.36	P	0.40	0.36		P	P	P	P	P	P	P	
13	NO2+NO3 (mg N/L)	0.25	2.27	3.47	5.22	4.63	4.82	3.79	5.39	0.48	5.30	5.27	9.36	O	4.98	4.54	M	O	O	O	O	O	O	O	M
14	NO2-N (mgN/L)	0.05	0.06	0.06	0.03	0.06	0.02	0.03	0.01	0.06	0.49	0.11	0.32	O	0.10	0.02	O	O	O	O	O	O	O	O	O
15	NO3-N (mgN/L)	0.20	2.21	3.42	5.19	4.57	4.80	3.76	5.38	0.42	4.81	5.16	9.04	L	4.88	4.52	N	L	L	L	L	L	L	L	N
16	P-Tot (mgP/L)	0.020	0.050	0.020	0.105	0.155	0.050	0.060	0.060	0.045	0.070	0.025	0.050	I	0.130	0.150	T	I	I	I	I	I	I	I	T
17	SiO2 (mg/L)	15.7	34.4	29.0	29.1	24.9	30.9	26.8	18.6	19.0	35.2	31.1	35.1	N	33.7	42.6	H	N	N	N	N	N	N	N	H
18	SO4 (mg/L)	13.7	66.9	24.3	27.9	91.2	19.5	14.0	14.3	178.0	253.0	124.8	158.2	G	79.4	133.0	/	G	G	G	G	G	G	G	/
	BIOLOGICAL/BACTERIOLOGICAL													C				C	C	C	C	C	C	C	
1	BOD3-27 (mg/L)	0.6	1.3	2.4	2.5	2.3	1.8	0.8	2.4	0.5	0.8	1.8	0.9	O	1.2	2.0		O	O	O	O	O	O	O	
2	DO (mg/L)	7.1	9.1	7.3	9.4	7.9	7.8	7.1	6.3	7.5	6.9	10.0	9.2	N	6.8	7.2	R	N	N	N	N	N	N	N	R
3	DO_SAT% (%)	88	117	91	117	102	94	82	73	77	78	100	103	D	75	76	D	D	D	D	D	D	D	D	D
	TRACE & TOXIC													I				I	I	I	I	I	I	I	
1	Al (mg/L)	0.03	0.10	0.11	0.02	0.05	0.05	0.03	0.05	0.01	0.04	0.04	0.03	T	0.04	0.07		T	T	T	T	T	T	T	
	CHEMICAL INDICES													I				I	I	I	I	I	I	I	
1	HAR_Ca (mgCaCO3/L)	87	150	126	156	367	114	148	216	245	348	477	641	O	373	513		O	O	O	O	O	O	O	
2	HAR_Total (mgCaCO3/L)	123	217	163	197	695	153	198	265	434	538	671	937	N	510	716		N	N	N	N	N	N	N	
3	Na% (%)	44	53	36	40	75	46	48	69	66	66	71	61	/	65	72		/	/	/	/	/	/	/	
4	RSC (-)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	R	0.0	0.0		R	R	R	R	R	R	R	
5	SAR (-)	1.9	4.3	1.5	1.9	17.8	2.6	3.7	7.2	8.1	9.4	13.5	9.6	D	8.3	14.2		D	D	D	D	D	D	D	
	PESTICIDES																								

7.4 Analysis

It is seen from the period of availability of data, that the sample size is too small to draw any meaningful conclusion regarding trend etc. Therefore, only statistical analysis has been carried out which is given at **Annex-II**.

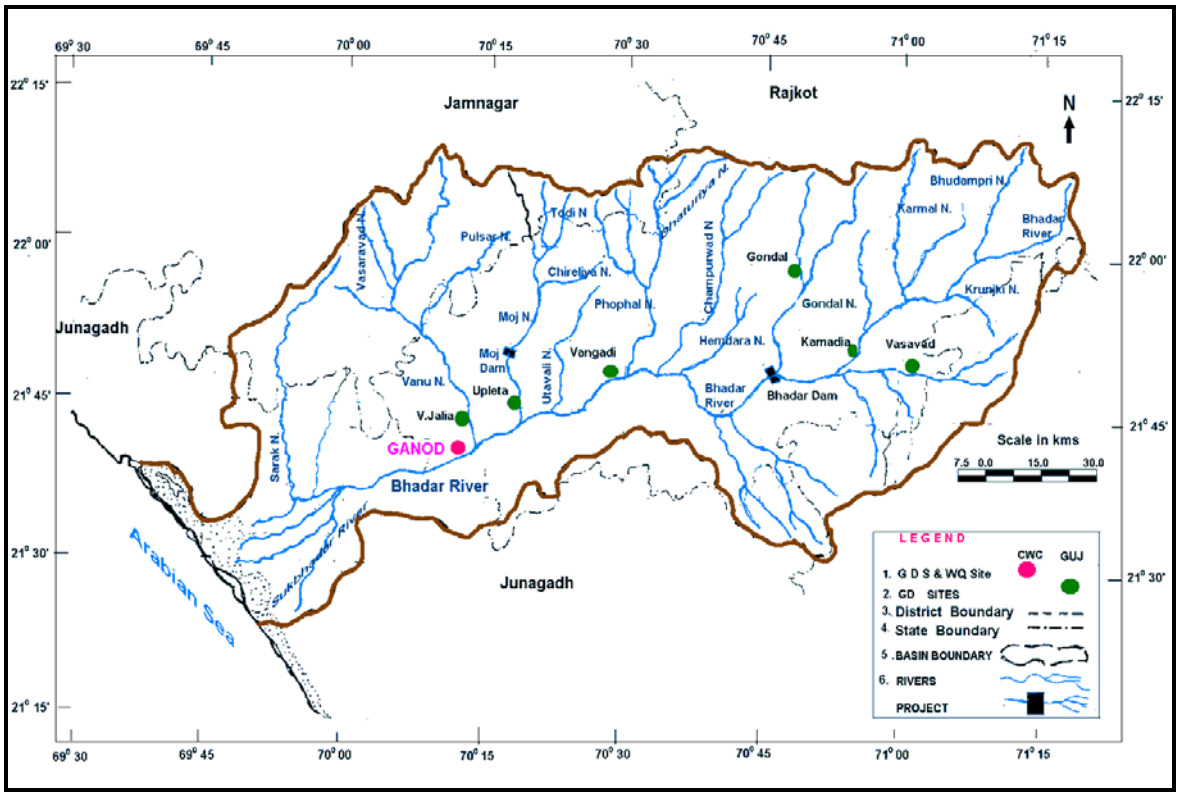
8.0 Bhadar Basin

8.1 Basin description

The Bhadar is one of the major rivers of Kathaiwar (Saurashtra) peninsula in Gujarat. Its basin map is enclosed. It originates near Vaddi (Aniali Village) about 26 km north – west of Jasdan in Rajkot district at an elevation of 261 m above mean sea level.

It flows towards South up to Jasdan and turns towards south - west upto Jetpur and finally changes its direction towards west till its confluence with Arabian sea at Naviobandar (Porbandar). The total length of this river is 198 km. It has a drainage area of 7094 sq.km out of which 706 sq km is in hilly and the rest in plain regions of Saurashtra. The basin lies between geographical co-ordinates of 21^0 25' and 22^0 10' north latitudes and 69^0 45' and 71^0 20' east longitudes. It drains about $1/7^{th}$ of the area of Saurashtra.

The Bhadar receives several tributaries on both the banks. There are 9 major tributaries having lengths more than 25 km out of which 6 tributaries namely Gandali, Chapparwadi, Phopal, Utawali, Moj and Venu are feeding from the right and the remaining 3 tributaries namely Vasavadi, Surwa and Galolio from the left. The drainage system of the river on right bank is more extensive as compared to the left bank.



The average rainfall in Bhadar basin is 625 mm. In winter the temperature vary between 4^0C and 15^0C in different Parts of the region. May is the hottest month. Maximum temperature varies between 40^0C and 45^0C.

At present, there are 12 completed structures, either reservoirs or weirs, in Bhadar catchment.

8.2 Availability of W.Q. Data (in SWDES format)

There is only one WQ monitoring station at Ganod in the basin where availability of data is as follows:

Sl. No.	Site name	River/Tributary	Period of sample collection	No. of samples analysed
1	Ganod	Bhadar	2005-06 to 2012-13	16

The detailed data are given in Section- 8.3.

8.3 Water Quality Data

HISTORY SHEET

		Water Year	**: 2012-2013**
Site	**: Bhadar at Ganod**	**Code**	**: 01 02 07 001**
State	: Gujarat	District	Rajkot
Basin	: WFR of Kach.-Saur. & Luni	Independent River	: Bhadar
Tributary	: Bhadar	Sub Tributary	:
Sub-Sub Tributary	:	Local River	: Bhadar
Division	: Mahi Division, Gandhinagar	Sub-Division	: Sabarmati , Ahmedabad
Drainage Area	: 6266 Sq. Km.	Bank	: Right
Latitude	: 21°39'53" N	Longitude	: 70°10'52" E
	Opening Date	Closing Date	
Gauge	: 14-11-1970		
Discharge	: 14-11-1970		
Sediment	: 07-07-1973		
Water Quality	: 01-07-1973		

Water Quality Datasheet for the period : 2012-2013

Station Name : Bhadar at Ganod (01 02 07 001) **Division : Mahi Division, Gandhinagar**

Local River : Bhadar **River Water Analysis** **Sub-Division : Sabarmati Sub Divn., Ahmedabad**

S.No	Parameters	01-06-2012	02-07-2012	01-08-2012	01-09-2012	01-10-2012	01-11-2012	01-12-2012	01-01-2013	01-02-2013	01-03-2013	01-04-2013	01-05-2013
	PHYSICAL												
1	Q (cumec)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2	Colour_Cod (-)												
3	EC_GEN (µmho/cm)												
4	Odour_Code (-)												
5	pH_GEN (pH units)												
6	SS (mg/L)												
7	TDS (mg/L)												
8	Temp (deg C)												
9	Turb (NTU)												
	CHEMICAL												
1	Alk-Phen (mgCaCO3/L)												
2	ALK-TOT (mgCaCO3/L)												
3	Ca (mg/L)												
4	Cl (mg/L)												
5	CO3 (mg/L)												
6	F (mg/L)												ONCE IN 2 MONTH
7	Fe (mg/L)	R	R	R	R	R	R	R	R	R	R	R	
8	HCO3 (mg/L)	I	I	I	I	I	I	I	I	I	I	I	
9	K (mg/L)	V	V	V	V	V	V	V	V	V	V	V	
10	Mg (mg/L)	E	E	E	E	E	E	E	E	E	E	E	
11	Na (mg/L)	R	R	R	R	R	R	R	R	R	R	R	
12	NH3-N (mg N/L)												
13	NO2+NO3 (mg N/L)												
14	NO2-N (mgN/L)	D	D	D	D	D	D	D	D	D	D	D	
15	NO3-N (mgN/L)	R	R	R	R	R	R	R	R	R	R	R	
16	P-Tot (mgP/L)	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	
17	SiO2 (mg/L)												
18	SO4 (mg/L)												
	BIOLOGICAL/BACTERIOLOGICAL												
1	BOD3-27 (mg/L)												
2	DO (mg/L)												
3	DO_SAT% (%)												
	TRACE & TOXIC												
1	Al (mg/L)												
	CHEMICAL INDICES												
1	HAR_Ca (mgCaCO3/L)												
2	HAR_Total (mgCaCO3/L)												
3	Na% (%)												
4	RSC (-)												
5	SAR (-)												
	PESTICIDES												

Monthly basis IWIN sample started from 01.07.2008 onwords and stopped w.e.f 31.03.2013

Pesticides , Trace and Toxic element analysis

Station Name : Bhadar at Ganod (01 02 07 001) **Division : Mahi Division, Gandhinagar**

Local River : Bhadar **Sub Divi. : Sabarmati Sub Div., Ahmedabad**

Sl. No.	Parameter ID	Parameter Name	unit	Date of sampling												
a	Trace and Toxic			01.04.2006	02.04.2007	02.04.2008	01.04.2009	01.04.2010	01.04.2011	01.09.2011	01.02.2012	02.04.2012	28.05.2012	01.10.2012	01.03.2013	01.04.2013
				Analysis done by WQL-III Lab, UGD, Hyderabad	Analysis done by WQL-III Lab, UGD, Hyderabad	Analysis done by WQL-III Lab, UGD, Hyderabad	Analysis done by WQL-III Lab, UGD, Hyderabad	Analysis done by WQL-III Lab, UGD, Hyderabad	Analysis done by WQL-III Lab, UGD, Hyderabad	Analysis done by NRWQL, New Delhi	Analysis done by NRWQL, New Delhi	Analysis done by WQL-III Lab, UGD, Hyderabad	Analysis done by NRWQL, New Delhi	Analysis done by NRWQL, New Delhi	Analysis done by NRWQL, New Delhi	Analysis done by WQL-III Lab, UGD, Hyderabad
1	As	Arsenic	microgram / l							0.54						
2	Cd	Cadmium	microgram / l							0.233						
3	Cr	Chromium	microgram / l							6.32						
4	Cu	Copper	microgram / l							11.48						
5	Hg	Mercury	microgram / l							0.56						
6	Ni	Nickel	microgram / l							-						
7	Pb	Lead	microgram / l							3.22						
8	Zn	Zinc	microgram / l	R I V E R	R I V E R	R I V E R	R I V E R	R I V E R	R I V E R	29.30	R I V E R	R I V E R	R I V E R	R I V E R	R I V E R	R I V E R
b	**Pesticides**		microgram / l													
1	Aldrin	Aldrin	microgram / l							-						
2	Alpha- BHC	Alpha- BHC	microgram / l	D R Y	D R Y	D R Y	D R Y	D R Y	D R Y	-	D R Y	D R Y	D R Y	D R Y	D R Y	D R Y
3	Beta-BHC	Beta-BHC	microgram / l							-						
4	Gama- BHC	gamma-BHC (Benzene HexaChloride)	microgram / l							-						
5	D- BHC	D- BHC	microgram / l							-						
6	DDT	DDT	microgram / l							-						
7	Dieldrin	Dieldrin	microgram / l							-						
8	Endos-I	Endosulphan I	microgram / l							-						
9	Endos-II	Endosulphan II	microgram / l							-						
10	Endos-s	Endosulphan s	microgram / l							-						

WQL - III Lab at UGD, Hyderabad conducts the analysis of Trace and Toxic element and Pesticides

NRWQ Lab at HOC, Noida, New Delhi conducts the analysis of Trace and Toxic element only, which started from September 2011 onwords

Water Quality Datasheet for the period : 2012-2013 **Division : Mahi Division, Gandhinagar**

Station Name : Bhadar at Ganod (01 02 07 001) **Sub-Division: Sabarmati Sub Divn.,Ahmedabad**

Local River : Bhadar **River Water Analysis**

S.No	Parameters	Number of Observations	Maximum	Minimum	Mean
	PHYSICAL				
1	Q (cumec)				
2	EC_GEN (µmho/cm)	RIVER IN DRY CONDITION DURING THE WHOLE W.Q. OBSERVATION PERIOD			
3	pH_GEN (pH units)				
4	SS (mg/L)				
5	TDS (mg/L)				
6	Temp (deg C)				
7	Turb (NTU)				
	CHEMICAL				
1	Alk-Phen (mgCaCO3/L)				
2	ALK-TOT (mgCaCO3/L)				
3	Ca (mg/L)				
4	Cl (mg/L)				
5	CO3 (mg/L)				
6	F (mg/L)				
7	Fe (mg/L)				
8	HCO3 (mg/L)				
9	K (mg/L)				
10	Mg (mg/L)				
11	Na (mg/L)				
12	NH3-N (mg N/L)				
13	NO2+NO3 (mg N/L)				
14	NO2-N (mgN/L)				
15	NO3-N (mgN/L)				
16	P-Tot (mgP/L)				
17	SiO2 (mg/L)				
18	SO4 (mg/L)				
	BIOLOGICAL/BACTERIOLOGICAL				
1	BOD3-27 (mg/L)				
2	DO (mg/L)				
3	DO_SAT% (%)				
	TRACE & TOXIC				
1	Al (mg/L)				
	CHEMICAL INDICES				
1	HAR_Ca (mgCaCO3/L)				
2	HAR_Total (mgCaCO3/L)				
3	Na% (%)				
4	RSC (-)				
5	SAR (-)				
	PESTICIDES				

Water Quality Seasonal Average for the period: 2005-2013

Station Name : Bhadar at Ganod (01 02 07 001) | **Division : Mahi Division, Gandhinagar**

Local River : Bhadar | **River Water** | **Sub-Division : Sabarmati Sub Divn., Ahmedabad**

S.No	Parameters	Flood								Winter								Summer							
		Jun - Oct								Nov - Feb								Mar - May							
		2005	2006	2007	2008	2009	2010	2011	2012	2005-2006	2006-2007	2007-2008	2008-2009	2009-2010	2010-2011	2011-2012	2012-2013	2006	2007	2008	2009	2010	2011	2012	2013
	PHYSICAL																								
1	Q (cumec)	15.77	27.08	395.3	7.406	4.716	392.9	51.19	0.000	0.031	0.000	2.907	0.588	0.000	0.000	37.77	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2	EC_FLD (µmho/cm)	474	532	218																					
3	EC_GEN (µmho/cm)	460	552	649	629	670	597	746				1624	1881												
4	pH_FLD (pH units)	8.8	8.3	8.3																					
5	pH_GEN (pH units)	8.4	7.5	8.3	8.3	8.4	8.1	8.2				8.1	8.1												
6	SS (mg/L)	50	96	34	32	63	35	94				66	70												
7	TDS (mg/L)	301	419	421	417	438	371	493				1036	1282												
8	Temp (deg C)	27.8	28.0	28.3	27.8	28.0	27.5	26.0				21.0	23.0												
9	Turb (NTU)	1.5	174.0	9.5	129.0	20.5	196.0	31.0				15.0	10.0												
	CHEMICAL																								
1	Alk-Phen (mgCaCO3/L)	2.1	0.0	2.1	2.1	2.9	0.0	0.0				0.0	0.0												
2	ALK-TOT (mgCaCO3/L)	204	216	284	232	138	128	182				289	520												
3	Ca (mg/L)	33	31	55	46	62	46	75				74	101												
4	Cl (mg/L)	39.0	57.0	74.0	64.0	119.0	98.0	128.0				206.0	320.0												
5	CO3 (mg/L)	2.5	0.0	2.5	2.5	3.5	0.0	0.0				0.0	0.0												
6	F (mg/L)	0.31	0.72	0.60	0.69	0.90	0.60	0.50				0.70	0.33												
7	Fe (mg/L)	0.0	0.1	0.2	1.1	1.0	0.1	0.1				0.1	0.9												
8	HCO3 (mg/L)	122	132	171	139	161	157	222				176	317												
9	K (mg/L)	1.5	1.4	0.7	2.6	3.6	1.9	2.0				0.3	4.6												
10	Mg (mg/L)	7.2	6.8	10.7	9.7	14.6	7.3	7.8				10.7	26.2												
11	Na (mg/L)	28.0	43.0	51.9	43.0	73.3	74.8	85.2				147.0	216.7												
12	NH3-N (mg N/L)			0.05	0.56	0.38	0.25	0.49					0.47												
13	NO2+NO3 (mg N/L)	0.21	0.77	2.74	2.38	3.09	3.70	4.86				3.40	8.61												
14	NO2-N (mgN/L)	0.04	0.05	0.06	0.04	0.04	0.10	0.10				0.06	0.62												
15	NO3-N (mgN/L)	0.17	0.72	2.68	2.34	3.05	3.60	4.76				3.35	7.99												
16	P-Tot (mgP/L)	0.010	0.045	0.020	0.065	0.065	0.050	0.090				0.030	0.080												
17	SiO2 (mg/L)	11.0	28.3	29.0	33.3	23.2	26.5	38.4				44.0	22.5												
18	SO4 (mg/L)	11.6	8.9	29.2	30.6	41.5	13.5	15.6				61.4	80.0												
	BIOLOGICAL/BACTERIOLOGICAL																								
1	BOD3-27 (mg/L)	0.5	1.2	1.4	1.9	2.3	1.9	2.5				1.9	3.3												
2	DO (mg/L)	5.3	6.8	7.2	7.3	7.2	8.3	9.0				7.8	8.1												
3	DO_SAT% (%)	68	87	92	93	92	104	112				87	94												
	TRACE & TOXIC																								
1	Al (mg/L)	0.02	0.06	0.07	0.05	0.02	0.03	0.03				0.02	0.03												
	CHEMICAL INDICES																								
1	HAR_Ca (mgCaCO3/L)	82	78	136	116	154	114	186				184	253												
2	HAR_Total (mgCaCO3/L)	112	107	181	157	215	145	219				229	362												
3	Na% (%)	35	42	38	37	40	44	43				58	56												
4	RSC (-)	0.0	0.1	0.0	0.0	0.0	0.0	0.0				0.0	0.0												
5	SAR (-)	1.1	1.7	1.7	1.5	2.1	2.4	2.4				4.2	5.0												
	PESTICIDES																								

RIVER DRY

ONCE IN 2 MONTH/ POOLING CONDITION/RD

POOLING CONDITION/RD

ONCE IN 2 MONTH/ POOLING CONDITION/RD

POOLING CONDITION/RD

RIVER DRY

ONCE IN 2 MONTH/ POOLING CONDITION/RD

POOLING CONDITION/RD

ONCE IN 2 MONTH/ POOLING CONDITION/RD

8.4 Analysis

It is seen from the period of availability of data, that the sample size is too small to draw any meaningful conclusion regarding trend etc. Therefore, only statistical analysis has been carried out which is given at **Annex-II**.

9.0 Purna Basin

9.1 Basin description

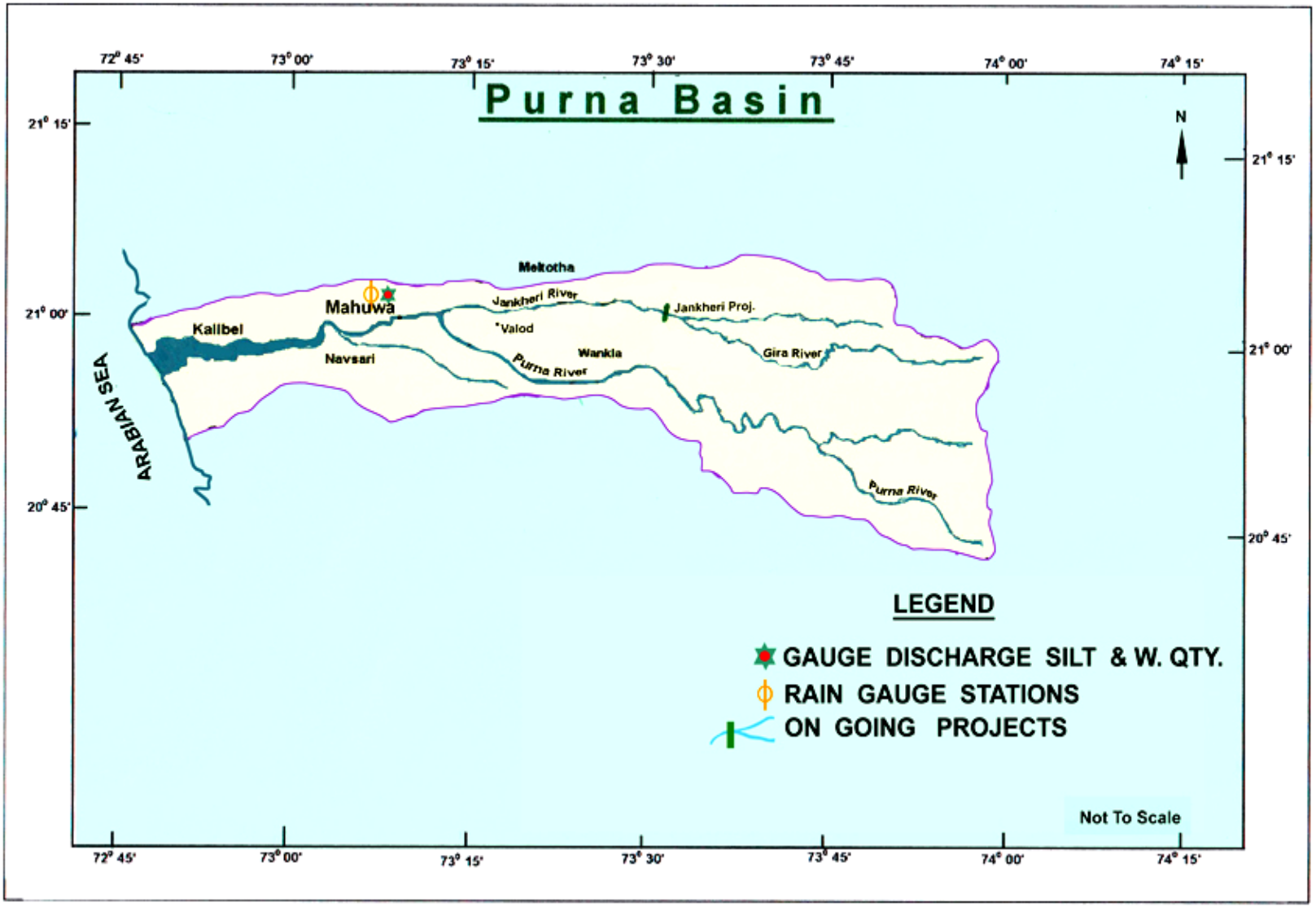
The river Purna is one of the important west flowing rivers in Gujarat state. Its basin map is enclosed. It originates from Saputara hill ranges and after flowing in Dang, Valsad and Surat districts of Gujarat state for a length of 142-km falls into the Arabian sea. The catchment area of the Purna basin is 2431 sq.km. It lies between 72^0 45' and 74^0 east longitudes and 20^0 40' and 21^0 15' north latitudes. It has only one main tributary namely Jankhari.

9.2 Availability of W.Q. Data (in SWDES format)

There is only one WQ monitoring station at Mahuwa in the basin where availability of data is as follows:

Sl. No.	Site name	River/Tributary	Period of sample collection	No. of samples analysed
1	Mahuwa	Purna	2005-06 to 2012-13	45

The detailed data are given in Section- 9.3.


Purna Basin
72° 45'
73° 00'
73° 15'
73° 30'
73° 45'
74° 00'
74° 15'
21° 15'
21° 00'
20° 45'
N
Mekotha
Jankheri River
Jankheri Proj.
Mahuwa
Valod
Kalibel
Navsari
Purna River
Wankla
Gira River
Purna River
ARABIAN SEA
LEGEND
GAUGE DISCHARGE SILT & W. QTY.
RAIN GAUGE STATIONS
ON GOING PROJECTS
Not To Scale

9.3 Water Quality Data

HISTORY SHEET

			Water Year	**:**	**2012-2013**
Site	**:**	**Purna at Mahuwa**	**Code**	**:**	**01 02 19 001**
State	:	Gujarat	District		Surat
Basin	:	WFR South of Tapi	Independent River	:	Purna
Tributary	:		Sub Tributary	:	
Sub-Sub Tributary	:		Local River	:	
Division	:	Tapi Division, Surat	Sub-Division	:	LTSD,CWC,Surat
Drainage Area	:	1995 Sq. Km.	Bank	:	Left
Latitude	:	21°00'52" N	Longitude	:	73°08'25" E
		Opening Date	Closing Date		
Gauge	:	04-10-1970			
Discharge	:	12-11-1970			
Sediment	:	18-06-1973			
Water Quality	:	15-06-1977			

Purna at Mahuwa

Water Quality Datasheet for the period : 2012-2013

Station Name : Purna at Mahuwa (01 02 19 001) **Division : Tapi Division, Surat**

Local River : **River Water Analysis** **Sub-Division : LTSD,CWC,Surat**

S.No	Parameters	01-06-2012	02-07-2012	01-08-2012	01-09-2012	01-10-2012	01-11-2012	01-12-2012	01-01-2013	01-02-2013	01-03-2013	01-04-2013	01-05-2013
	PHYSICAL												
1	Q (cumec)	0.000	0.711	447.6	340.4	10.02	7.841	1.562	1.174	* 1.790	* 1.100	* 1.200	* 1.500
2	Colour_Cod (-)	Clear		Brown		Clear		Clear		Clear			
3	EC_FLD (µmho/cm)	500				290							
4	EC_GEN (µmho/cm)	537		320		340		360		290			
5	Odour_Code (-)	odour free		odour free		odour free		odour free		odour free			
6	pH_FLD (pH units)	7.0		7.0		7.0				7.2			
7	pH_GEN (pH units)	7.3		8.2		7.1		8.0		8.2			
8	SS (mg/L)	160		170		130		162		95			
9	TDS (mg/L)	350		220		265		280		240			
10	Temp (deg C)	28.0		27.0		29.0		25.0		19.0			
11	TS (mg/L)	510		390		395		442		335			
12	Turb (NTU)	2.0		24.0		5.0		1.0		1.0			
	CHEMICAL												
1	Alk-Phen (mgCaCO3/L)	0.0		0.0		0.0		0.0		0.0			
2	ALK-TOT (mgCaCO3/L)	100		87		90		70		82			
3	Ca (mg/L)	34		32		32		36		32			
4	Cl (mg/L)	435.0		68.5		62.0		84.8		102.6		POOLING CONDITION	
5	CO3 (mg/L)	0.0	ONCE IN 2 MOTH	0.0	ONCE IN 2 MOTH	0.0	ONCE IN 2 MOTH	0.0	ONCE IN 2 MOTH	0.0	ONCE IN 2 MOTH		ONCE IN 2 MOTH
6	F (mg/L)	0.26		0.14		0.10		0.08		0.12			
7	HCO3 (mg/L)	122		106		110		85		100			
8	K (mg/L)	10.2		2.6		2.4		3.8		3.4			
9	Mg (mg/L)	6.1		6.8		7.8		8.3		7.6			
10	Na (mg/L)	287.3		40.4		40.0		48.4		69.2			
11	NH3-N (mg N/L)	0.08		0.10		0.12		0.08		0.06			
12	NO2+NO3 (mg N/L)	0.13		0.28		0.14		0.12					
13	NO2-N (mgN/L)	0.03		0.08		0.02		0.02					
14	NO3-N (mgN/L)	0.10		0.20		0.12		0.10		0.10			
15	o-PO4-P (mg P/L)	0.120		0.060		0.080		0.050					
16	P-Tot (mgP/L)	0.100		0.140		0.160		0.500		0.400			
17	SiO2 (mg/L)	10.0		10.0		16.0		16.0		10.0			
18	SO4 (mg/L)	14.2		2.0		12.1		22.0		16.4			
	BIOLOGICAL/BACTERIOLOGICAL												
1	BOD3-27 (mg/L)	0.6		0.6		1.0		2.0		0.6			
2	DO (mg/L)	8.2		8.0		7.9							
3	DO_SAT% (%)	105		100		103							
	TRACE & TOXIC												
1	Al (mg/L)	0.10		0.10		0.16		0.10		0.08			
	CHEMICAL INDICES												
1	HAR_Ca (mgCaCO3/L)	85		80		80		90		80			
2	HAR_Total (mgCaCO3/L)	110		108		113		125		112			
3	Na% (%)	84		44		43		45		57			
4	RSC (-)	0.0		0.0		0.0		0.0		0.0			
5	SAR (-)	11.9		1.7		1.6		1.9		2.9			
	PESTICIDES												
	REMARKS												

Note. : * Estimated discharge

Pesticides , Trace and Toxic element analysis

Station Name : Purna at Mahuwa (01 02 19 001) **Division : Tapi Division, Surat**

Local River : Purna **Sub Divi. : LT Sub Div., Surat**

Sl. No.	Parameter ID			Date of sampling												
a	Trace and Toxic	Parameter Name	unit	01.04.2006 Analysis done by WQL-III Lab, UGD, Hyderabad	02.04.2007 Analysis done by WQL-III Lab, UGD, Hyderabad	02.04.2008 Analysis done by WQL-III Lab, UGD, Hyderabad	01.04.2009 Analysis done by WQL-III Lab, UGD, Hyderabad	01.04.2010 Analysis done by WQL-III Lab, UGD, Hyderabad	01.04.2011 Analysis done by WQL-III Lab, UGD, Hyderabad	01.09.2011 Analysis done by NRWQL, New Delhi	01.02.2012 Analysis done by NRWQL, New Delhi	02.04.2012 Analysis done by WQL-III Lab, UGD, Hyderabad	28.05.2012 Analysis done by NRWQL, New Delhi	01.10.2012 Analysis done by NRWQL, New Delhi	01.03.2013 Analysis done by NRWQL, New Delhi	01.04.2013 Analysis done by WQL-III Lab, UGD, Hyderabad
1	As	Arsenic	microgram / l	-	-	-	-	0.195	POOLING CONDITION	1.07	2.84	0.5245	0.81	9.99	11.21	POOLING CONDITION
2	Cd	Cadmium	microgram / l	-	-	0.73	1.91	0.000		0.051	0.06	0.260	0.22	0.16	0.1000	
3	Cr	Chromium	microgram / l	-	-	0	0	0.000		5.41	9.18	0.000	9.60	4.25	1.21	
4	Cu	Copper	microgram / l	-	-	-	-	-		18.46	32.42	-	3.98	8.31	7.99	
5	Hg	Mercury	microgram / l	-	-	0	-	-		0.52	-	0.1075	-	-	0.98	
6	Ni	Nickel	microgram / l	-	-	8.23	0.00	1.077		-	10.50	0.490	9.20	6.9	25.68	
7	Pb	Lead	microgram / l	-	-	13.42	28.42	0.000		1.54	3.34	22.16	5.28	2.39	2.23	
8	Zn	Zinc	microgram / l	-	-	33.41	18.01	7.615		16.06	11.90	32.14	44.00	13.69	4.10	
b	**Pesticides**		microgram / l													
1	Aldrin	Aldrin	microgram / l	-	-	0	0.0028	0.000		-	-	0.0024	-	-	-	
2	Alpha- BHC	Alpha- BHC	microgram / l	-	-	0.01	0.0193	0.000		-	-	0.0300	-	-	-	
3	Beta-BHC	Beta-BHC	microgram / l	-	-	-	-	-		-	-	-	-	-	-	
4	Gama- BHC	gamma-BHC (Benzene HexaChloride)	microgram / l	-	-	-	-	-		-	-	-	-	-	-	
5	D- BHC	D- BHC	microgram / l	-	-	-	-	-		-	-	-	-	-	-	
6	DDT	DDT	microgram / l	-	-	0	0	0.000		-	-	0.0065	-	-	-	
7	Dieldrin	Dieldrin	microgram / l	-	-	0	0.0009	0.0025		-	-	0.0001	-	-	-	
8	Endos-I	Endosulphan I	microgram / l	-	-	0.02	0.0098	0.1056		-	-	0.0250	-	-	-	
9	Endos-II	Endosulphan II	microgram / l	-	-	-	-	-		-	-	-	-	-	-	
10	Endos-s	Endosulphan s	microgram / l	-	-	-	-	-		-	-	-	-	-	-	

WQL - III Lab at UGD, Hyderabad conducts the analysis of Trace and Toxic element and Pesticides

NRWQ Lab at HOC, Noida, New Delhi conducts the analysis of Trace and Toxic element only, which started from September 2011 onwords

Water Quality Summary for the period : 2012-2013

Station Name : Purna at Mahuwa (01 02 19 001) **Division : Tapi Division, Surat**

Local River : **Sub-Division : LTSD,CWC,Surat**

River Water Summary

S.No	Parameters	Number of Observations	Maximum	Minimum	Mean
	PHYSICAL				
1	Q (cumec)	365	692.4	0.000	16.55
2	EC_FLD (µmho/cm)	2	500	290	395
3	EC_GEN (µmho/cm)	5	537	290	369
4	pH_FLD (pH units)	4	7.2	7.0	7
5	pH_GEN (pH units)	5	8.2	7.1	7.8
6	SS (mg/L)	5	170	95	143
7	TDS (mg/L)	5	350	220	271
8	Temp (deg C)	5	29.0	19.0	25.6
9	TS (mg/L)	5	510	335	414
10	Turb (NTU)	5	24.0	1.0	6.6
	CHEMICAL				
1	Alk-Phen (mgCaCO3/L)	5	0.0	0.0	0
2	ALK-TOT (mgCaCO3/L)	5	100	70	86
3	Ca (mg/L)	5	36	32	33
4	Cl (mg/L)	5	435.0	62.0	150.6
5	CO3 (mg/L)	5	0.0	0.0	0
6	F (mg/L)	5	0.26	0.08	0.14
7	HCO3 (mg/L)	5	122	85	105
8	K (mg/L)	5	10.2	2.4	4.5
9	Mg (mg/L)	5	8.3	6.1	7.3
10	Na (mg/L)	5	287.3	40.0	97.1
11	NH3-N (mg N/L)	5	0.12	0.06	0.09
12	NO2+NO3 (mg N/L)	4	0.28	0.12	0.17
13	NO2-N (mgN/L)	4	0.08	0.02	0.04
14	NO3-N (mgN/L)	5	0.20	0.10	0.12
15	o-PO4-P (mg P/L)	4	0.120	0.050	0.077
16	P-Tot (mgP/L)	5	0.500	0.100	0.26
17	SiO2 (mg/L)	5	16.0	10.0	12.4
18	SO4 (mg/L)	5	22.0	2.0	13.3
	BIOLOGICAL/BACTERIOLOGICAL				
1	BOD3-27 (mg/L)	5	2.0	0.6	1
2	DO (mg/L)	3	8.2	7.9	8
3	DO_SAT% (%)	3	105	100	103
	TRACE & TOXIC				
1	Al (mg/L)	5	0.16	0.08	0.11
	CHEMICAL INDICES				
1	HAR_Ca (mgCaCO3/L)	5	90	80	83
2	HAR_Total (mgCaCO3/L)	5	125	108	113
3	Na% (%)	5	84	43	54
4	RSC (-)	5	0.0	0.0	0
5	SAR (-)	5	11.9	1.6	4
	PESTICIDES				

Water Quality Seasonal Average for the period: 2005-2013

Station Name : Purna at Mahuwa (01 02 19 001) **Division : Tapi Division, Surat**

Local River : **River Water** **Sub-Division : LTSD,CWC,Surat**

S.No	Parameters	Flood								Winter								Summer							
		Jun - Oct								Nov - Feb								Mar - May							
		2005	2006	2007	2008	2009	2010	2011	2012	2005-2006	2006-2007	2007-2008	2008-2009	2009-2010	2010-2011	2011-2012	2012-2013	2006	2007	2008	2009	2010	2011	2012	2013
	PHYSICAL																								
1	Q (cumec)	804.3	122.3	646.9	35.48	23.32	61.68	84.75	159.8	4.275	4.568	4.640	5.805	2.152	5.099	1.658	3.092	1.703	2.113	2.561	2.704	0.000	0.182	0.320	1.267
2	EC_FLD (µmho/cm)		287	306	272	371	292		395	413	400	447	451	401	425			418	362	382	435	410			
3	EC_GEN (µmho/cm)	293	311	375	392	440	432	376	399	395	463	664	505	453	432	532	325	443	499	460	443	478		600	
4	pH_FLD (pH units)		8.0	8.2	7.0	7.0	7.0		7.0	8.0	8.3	7.8	7.0	7.0	7.6	7.0	7.2	7.1	8.2	7.7	7.0	7.0		7.0	
5	pH_GEN (pH units)	8.2	8.3	8.4	7.4	8.0	7.6	7.4	7.5	8.3	8.3	8.0	7.9	8.1	8.1	7.3	8.1	8.2	8.6	8.3	8.3	7.8		7.6	
6	SS (mg/L)	65	103	158	138	175	163	128	153	77	132	179	188	163	152	185	129	85	121	117	176	152		170	
7	TDS (mg/L)	204	210	251	264	292	312	220	278	275	292	433	319	285	294	324	260	294	304	306	309	310		500	
8	Temp (deg C)	29.2	27.3	28.0	28.0	29.2	29.0	27.5	28.0	21.5	20.5	21.0	21.5	20.5	24.0	20.5	22.0	25.0	29.0	26.0	23.0	26.0		21.5	
9	TS (mg/L)						475	367	432						445	508	389							516	
10	Turb (NTU)	26.5	4.0	3.0	2.0	6.0	1.7	16.5	10.3	1.0	1.0	1.0	2.0	1.0	1.5	1.5	1.0	1.0	1.0	1.0	1.0	1.0		2.0	
	CHEMICAL																								
1	Alk-Phen (mgCaCO3/L)	1.1	1.7	5.0	1.7	1.7	0.0	0.0	0.0	1.2	2.5	2.5	0.0	5.0	0.0	0.0	0.0	0.0	5.0	0.0	5.0	0.0		0.0	
2	ALK-TOT (mgCaCO3/L)	152	97	118	123	97	106	92	92	212	110	130	130	105	100	75	76	220	120	100	125	120		90	
3	Ca (mg/L)	32	30	32	33	32	31	33	33	32	34	34	33	32	32	31	34	32	34	32	32	34		34	
4	Cl (mg/L)	22.4	25.4	66.0	30.2	92.3	90.0	90.7	188.5	72.5	41.8	80.6	100.7	81.4	137.7	96.4	93.7	52.1	50.1	63.0	184.0	155.3		220.6	
5	CO3 (mg/L)	1.3	2.0	6.0	2.0	2.0	0.0	0.0	0.0	1.5	3.0	3.0	0.0	6.0	0.0	0.0	0.0	0.0	6.0	0.0	6.0	0.0		0.0	
6	F (mg/L)	0.05	0.11	0.09	0.07	0.08	0.07	0.07	0.17	0.13	0.05	0.05	0.19	0.18	0.07	0.08	0.10	0.22	0.05	0.05	0.22	0.22		0.14	
7	HCO3 (mg/L)	183	114	132	110	114	129	112	112	256	128	153	158	116	122	91	93	268	134	122	140	146		110	
8	K (mg/L)		0.5	2.4	0.2	3.4	9.5	11.5	5.1		0.7	3.9	2.1	2.8	4.8	4.0	3.6		4.0	0.3	3.0	1.2		8.8	
9	Mg (mg/L)	7.8	6.5	8.1	6.1	7.8	7.2	7.2	6.9	8.3	8.3	8.8	8.7	7.8	8.5	9.0	8.0	7.8	8.7	6.8	8.7	8.7		6.6	
10	Na (mg/L)		18.1	40.0	20.1	62.5	64.1	53.5	122.6		30.5	55.9	71.7	56.5	98.0	52.0	58.8		37.4	45.0	118.6	109.2		132.7	
11	NH3-N (mg N/L)	0.05	0.16	0.08	0.06	0.07	0.05	0.06	0.10	0.13	0.05	0.05	0.06	0.06	0.07	0.10	0.07	0.19	0.05	0.05	0.18	0.05		0.10	
12	NO2+NO3 (mg N/L)	0.66	0.06	0.17	0.09	0.14	0.15	0.12	0.18	0.23	0.02	0.06	0.17	0.18	0.11	0.14	0.12	0.40	0.01	0.08	0.24	0.20		0.12	
13	NO2-N (mgN/L)	0.15	0.00	0.03	0.01	0.03	0.03	0.02	0.04	0.01	0.00	0.00	0.04	0.03	0.03	0.03	0.02	0.05	0.00	0.02	0.06	0.02		0.01	
14	NO3-N (mgN/L)	0.51	0.06	0.14	0.08	0.11	0.11	0.10	0.14	0.22	0.02	0.06	0.13	0.15	0.08	0.11	0.10	0.35	0.01	0.06	0.18	0.18		0.11	
15	o-PO4-P (mg P/L)						0.047	0.080	0.087						0.050	0.055	0.050							0.160	
16	P-Tot (mgP/L)	0.410	0.099	0.100	0.305	0.127	0.093	0.325	0.133	0.146	0.050	0.175	0.130	0.160	0.090	0.320	0.450	0.160	0.040	0.036	0.220	0.220		0.360	
17	SiO2 (mg/L)	21.3	23.3	20.0	23.6	19.0	12.2	8.8	12.0	14.3	14.3	22.3	16.6	13.3	16.4	15.1	13.0	14.9	15.1	20.2	18.3	12.8		8.0	
18	SO4 (mg/L)	23.5	14.5	3.4	5.7	15.4	6.4	7.8	9.4	20.3	13.7	9.0	14.8	14.2	10.4	7.4	19.2	23.9	14.2	4.0	14.4	13.3		10.0	
	BIOLOGICAL/BACTERIOLOGICAL																								
1	BOD3-27 (mg/L)	0.5	0.3	0.6	0.5	1.1	0.4	0.7	0.7	0.7	0.8	1.0	0.6	0.3	1.4	0.7	1.3	0.4	1.6	2.1	0.7	1.9		0.5	
2	DO (mg/L)		6.0	6.7	8.8	7.3	7.8		8.0		6.6		5.3	6.6	9.0				6.6	6.2	5.0	10.3			
3	DO_SAT% (%)		76	86	111	95	100		103		73		59	74	103				86	76	58	127			
	TRACE & TOXIC																								
1	Al (mg/L)	0.09	0.07	0.04	0.05	0.09	0.05	0.08	0.12	0.02	0.02	0.06	0.04	0.02	0.06	0.14	0.09	0.01	0.02	0.04	0.08	0.02		0.08	
	CHEMICAL INDICES																								
1	HAR_Ca (mgCaCO3/L)	80	76	80	81	80	78	83	82	80	84	84	82	80	80	78	85	80	84	80	80	84		85	
2	HAR_Total (mgCaCO3/L)	113	103	114	107	113	108	112	110	115	118	120	118	113	115	115	118	113	120	108	116	120		113	
3	Na% (%)		27	43	29	50	49	48	57		36	49	51	51	61	49	51		39	47	68	66		70	
4	RSC (-)	1.2	0.0	0.2	0.0	0.0	0.1	0.0	0.0	2.0	0.0	0.2	0.4	0.0	0.0	0.0	0.0	2.2	0.0	0.0	0.2	0.0		0.0	
5	SAR (-)		0.8	1.6	0.8	2.6	2.7	2.2	5.1		1.2	2.2	2.9	2.3	4.0	2.1	2.4		1.5	1.9	4.8	4.3		5.5	
	PESTICIDES																								

ONCE IN 2 MONTH / POOLING CONDITION

ONCE IN 2 MONTH / SNR

9.4 Analysis

It is seen from the period of availability of data, that the sample size is too small to draw any meaningful conclusion regarding trend etc. Therefore, only statistical analysis has been carried out which is given at **Annex-II**.

10.0 Ambika Basin

10.1 Basin description

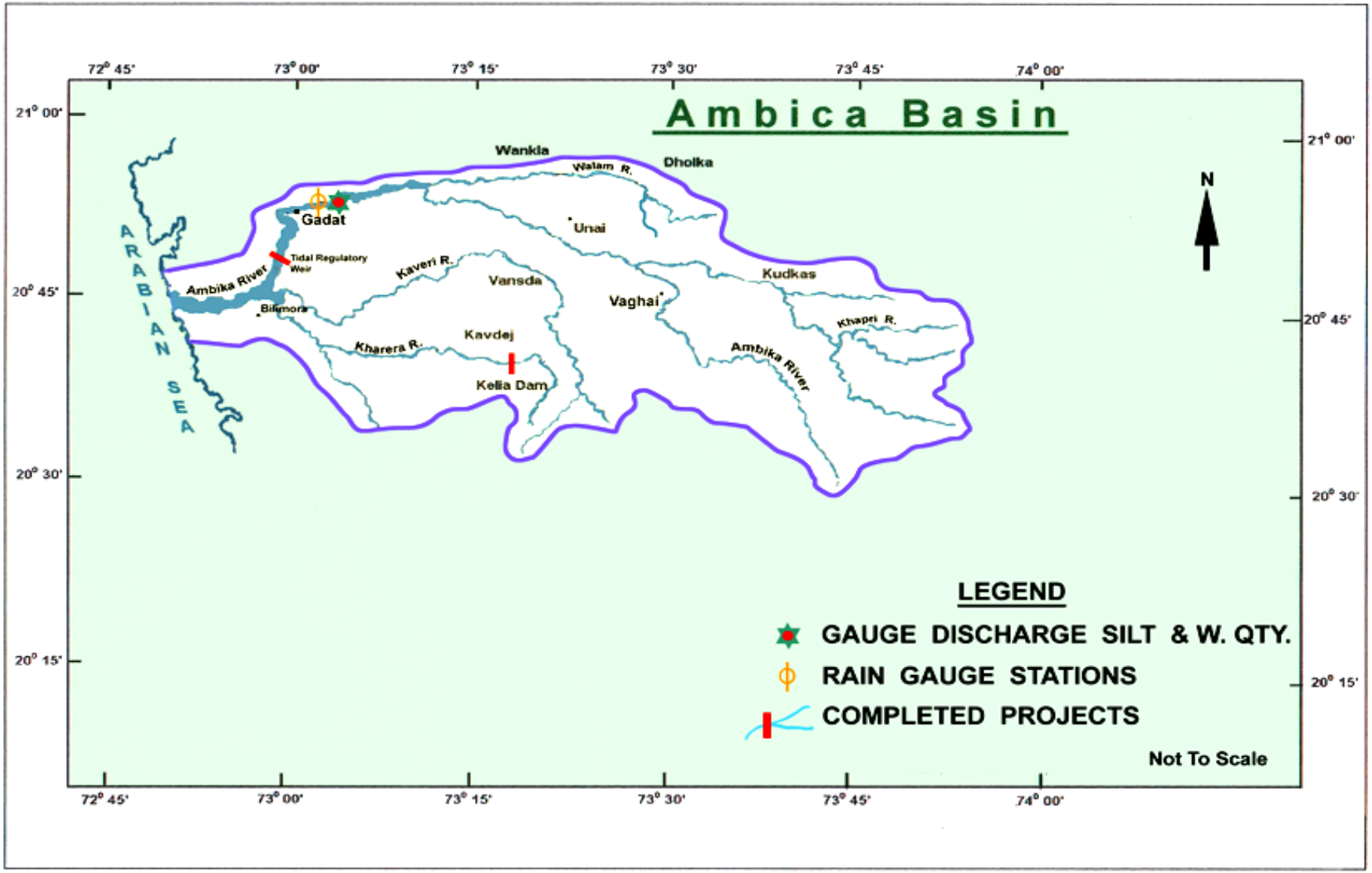
The river Ambika is one of the west flowing rivers in Gujarat State. Its basin map is enclosed. It originates from Satapura hill ranges and flows through Dangs and Valsad districts of Gujarat. After flowing for a length of 136 km, it falls into the Arabian Sea. The catchment area of Ambika basin is 2715 sq.km. The basin lies between $72^0$50' and 73^0 50' east longitudes and 20^0 03' and 21^0 08' north latitudes. The important tributaries of Ambika are Khapri and Walam.

10.2 Availability of W.Q. Data (in SWDES format)

There is only one WQ monitoring station at Gadat in the basin where availability of data is as follows:

Sl. No.	Site name	River/Tributary	Period of sample collection	No. of samples analysed
1	Gadat	Ambika	2005-06 to 2012-13	39

The detailed data are given in Section- 10.3.


Ambica Basin
72° 45'
73° 00'
73° 15'
73° 30'
73° 45'
74° 00'
21° 00'
20° 45'
20° 30'
20° 15'
Wankla
Walam R.
Dholka
Gadat
Unai
Tidal Regulatory Weir
Ambika River
Kaveri R.
Vansda
Vaghai
Kudkas
Khapri R.
Bilimora
Kharera R.
Kavdej
Kelia Dam
Ambika River
ARABIAN SEA
N
LEGEND
GAUGE DISCHARGE SILT & W. QTY.
RAIN GAUGE STATIONS
COMPLETED PROJECTS
Not To Scale

10.3 Water Quality Data

HISTORY SHEET

			Water Year	**:**	**2012-2013**
Site	**:**	**Ambica at Gadat**	**Code**	**:**	**01 02 20 001**
State	:	Gujarat	District		Valsad
Basin	:	WFR South of Tapi	Independent River	:	Ambika
Tributary	:		Sub Tributary	:	
Sub-Sub Tributary	:		Local River	:	
Division	:	Surat	Sub-Division	:	LTSD, Surat
Drainage Area	:	1510 Sq. Km.	Bank	:	Right
Latitude	:	20°51'22" N	Longitude	:	72°59'05" E
		Opening Date	Closing Date		
Gauge	:	14-01-1979			
Discharge	:	12-03-1979			
Sediment	:	01-02-1985			
Water Quality	:	01-04-1980			

Ambica at Gadat (partially blocked)

Water Quality Datasheet for the period : 2012-2013

Station Name : Ambica at Gadat (01 02 20 001) **Division : Surat**

Local River : **River Water Analysis** **Sub-Division : Surat**

S.No	Parameters	01-06-2012	02-07-2012	01-08-2012	01-09-2012	01-10-2012	01-11-2012	01-12-2012	01-01-2013	01-02-2013	01-03-2013	01-04-2013	01-05-2013
	PHYSICAL												
1	Q (cumec)	0.000	0.000	203.5	222.6	13.34	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2	Colour_Cod (-)			Brown		Clear							
3	EC_FLD (µmho/cm)					480							
4	EC_GEN (µmho/cm)			290		400							
5	Odour_Code (-)			odour free		odour free							
6	pH_GEN (pH units)			7.8		7.1							
7	SS (mg/L)			110		110							
8	TDS (mg/L)			180		260							
9	Temp (deg C)			25.0		26.0							
10	TS (mg/L)			290		370							
11	Turb (NTU)			20.0		3.0							
	CHEMICAL												
1	Alk-Phen (mgCaCO3/L)	P	O	0.0	O	0.0	O	P	O	P	O	P	O
2	ALK-TOT (mgCaCO3/L)	O	N	100	N	110	N	O	N	O	N	O	N
3	Ca (mg/L)	O	C	32	C	32	C	O	C	O	C	O	C
4	Cl (mg/L)	L	E	45.0	E	54.6	E	L	E	L	E	L	E
5	CO3 (mg/L)	I		0.0		0.0		I		I		I	
6	F (mg/L)	N		0.28		0.18		N		N		N	
7	HCO3 (mg/L)	G	I	122	I	134	I	G	I	G	I	G	I
8	K (mg/L)		N	2.8	N	2.0	N		N		N		N
9	Mg (mg/L)			7.6		8.4							
10	Na (mg/L)	C	2	32.0	2	42.2	2	C	2	C	2	C	2
11	NH3-N (mg N/L)	O		0.13		0.08		O		O		O	
12	NO2+NO3 (mg N/L)	N		0.29		0.12		N		N		N	
13	NO2-N (mgN/L)	D	M	0.06	M	0.02	M	D	M	D	M	D	M
14	NO3-N (mgN/L)	I	O	0.23	O	0.10	O	I	O	I	O	I	O
15	o-PO4-P (mg P/L)	T	N	0.080	N	0.050	N	T	N	T	N	T	N
16	P-Tot (mgP/L)	I	T	0.200	T	0.080	T	I	T	I	T	I	T
17	SiO2 (mg/L)	O	H	8.0	H	10.0	H	O	H	O	H	O	H
18	SO4 (mg/L)	N	S	8.6	S	14.6	S	N	S	N	S	N	S
	BIOLOGICAL/BACTERIOLOGICAL												
1	BOD3-27 (mg/L)			0.5		0.6							
	TRACE & TOXIC												
1	Al (mg/L)			0.08		0.10							
	CHEMICAL INDICES												
1	HAR_Ca (mgCaCO3/L)			80		80							
2	HAR_Total (mgCaCO3/L)			112		115							
3	Na% (%)			38		44							
4	RSC (-)			0.0		0.0							
5	SAR (-)			1.3		1.7							
	PESTICIDES												
	REMARKS												

Pesticides , Trace and Toxic element analysis

Station Name : Ambika at Gadat (01 02 20 001) **Division : Tapi Division, Surat**

Local River : Ambika **Sub Divi. : LT Sub Div., Surat**

Sl. No.	Parameter ID	Parameter Name	unit	Date of sampling												
a	Trace and Toxic			01.04.2006	02.04.2007	02.04.2008	01.04.2009	01.04.2010	01.04.2011	01.09.2011	01.02.2012	02.04.2012	28.05.2012	01.10.2012	01.03.2013	01.04.2013
				Analysis done by WQL-III Lab, UGD, Hyderabad	Analysis done by WQL-III Lab, UGD, Hyderabad	Analysis done by WQL-III Lab, UGD, Hyderabad	Analysis done by WQL-III Lab, UGD, Hyderabad	Analysis done by WQL-III Lab, UGD, Hyderabad	Analysis done by WQL-III Lab, UGD, Hyderabad	Analysis done by NRWQL, New Delhi	Analysis done by NRWQL, New Delhi	Analysis done by WQL-III Lab, UGD, Hyderabad	Analysis done by NRWQL, New Delhi	Analysis done by NRWQL, New Delhi	Analysis done by NRWQL, New Delhi	Analysis done by WQL-III Lab, UGD, Hyderabad
1	As	Arsenic	microgram / l	-	-	-	-	0.5259		1.10		0.6201	0.67	10.27		
2	Cd	Cadmium	microgram / l	-	-	0.74	2.11	0.0108		0.008		0.0400	0.04	0.21		
3	Cr	Chromium	microgram / l	-	-	0	0	0		1.92		0	6.97	4.62		
4	Cu	Copper	microgram / l	-	-	-	-	-		7.87		-	2.89	12.82		
5	Hg	Mercury	microgram / l	-	-	0	-	-		0.52		0.147	-	-		
6	Ni	Nickel	microgram / l	-	-	8.11	0.00	2.290	P	-	P	0.070	5.48	8.83	P	P
7	Pb	Lead	microgram / l	-	-	12.27	29.03	0.00	O	0.52	O	20.22	4.64	2.46	O	O
8	Zn	Zinc	microgram / l	-	-	3.99	21.29	15.43	O	5.78	O	14.21	34.00	32.9	O	O
b	**Pesticides**		microgram / l						L		L				L	L
1	Aldrin	Aldrin	microgram / l	-	-	0	0.0013	0.0038	I	-	I	0.0039	-	-	I	I
2	Alpha- BHC	Alpha- BHC	microgram / l	-	-	0.01	0.0066	0.0132	N	-	N	0.2896	-	-	N	N
3	Beta-BHC	Beta-BHC	microgram / l	-	-	-	-	-	G	-	G	-	-	-	G	G
4	Gama- BHC	gamma-BHC (Benzene HexaChloride)	microgram / l	-	-	-	-	-		-		-	-	-		
5	D- BHC	D- BHC	microgram / l	-	-	-	-	-	C	-	C	-	-	-	C	C
6	DDT	DDT	microgram / l	-	-	0.01	0.0008	0.0043	O	-	O	0.0037	-	-	O	O
7	Dieldrin	Dieldrin	microgram / l	-	-	0	0.0006	0.0110	N	-	N	0.0042	-	-	N	N
8	Endos-I	Endosulphan I	microgram / l	-	-	0.02	0.0055	0.0134	D	-	D	0.0906	-	-	D	D
9	Endos-II	Endosulphan II	microgram / l	-	-	-	-	-	I	-	I	-	-	-	I	I
10	Endos-s	Endosulphan s	microgram / l	-	-	-	-	-	T	-	T	-	-	-	T	T
									I		I				I	I
									O		O				O	O
									N		N				N	N

WQL - III Lab at UGD, Hyderabad conducts the analysis of Trace and Toxic element and Pesticides

NRWQ Lab at HOC, Noida, New Delhi conducts the analysis of Trace and Toxic element only, which started from September 2011 onwords

Water Quality Summary for the period : 2012-2013

Station Name : Ambica at Gadat (01 02 20 001) **Division : Surat**

Local River : **Sub-Division : Surat**

River Water Summary

S.No	Parameters	Number of Observations	Maximum	Minimum	Mean
	PHYSICAL				
1	Q (cumec)	365	548.7	0.000	20.84
2	EC_FLD (µmho/cm)	1	480	480	480
3	EC_GEN (µmho/cm)	2	400	290	345
4	pH_GEN (pH units)	2	7.8	7.1	7.5
5	SS (mg/L)	2	110	110	110
6	TDS (mg/L)	2	260	180	220
7	Temp (deg C)	2	26.0	25.0	25.5
8	TS (mg/L)	2	370	290	330
9	Turb (NTU)	2	20.0	3.0	11.5
	CHEMICAL				
1	Alk-Phen (mgCaCO3/L)	2	0.0	0.0	0
2	ALK-TOT (mgCaCO3/L)	2	110	100	105
3	Ca (mg/L)	2	32	32	32
4	Cl (mg/L)	2	54.6	45.0	49.8
5	CO3 (mg/L)	2	0.0	0.0	0
6	F (mg/L)	2	0.28	0.18	0.23
7	HCO3 (mg/L)	2	134	122	128
8	K (mg/L)	2	2.8	2.0	2.4
9	Mg (mg/L)	2	8.4	7.6	8
10	Na (mg/L)	2	42.2	32.0	37.1
11	NH3-N (mg N/L)	2	0.13	0.08	0.1
12	NO2+NO3 (mg N/L)	2	0.29	0.12	0.2
13	NO2-N (mgN/L)	2	0.06	0.02	0.04
14	NO3-N (mgN/L)	2	0.23	0.10	0.17
15	o-PO4-P (mg P/L)	2	0.080	0.050	0.065
16	P-Tot (mgP/L)	2	0.200	0.080	0.14
17	SiO2 (mg/L)	2	10.0	8.0	9
18	SO4 (mg/L)	2	14.6	8.6	11.6
	BIOLOGICAL/BACTERIOLOGICAL				
1	BOD3-27 (mg/L)	2	0.6	0.5	0.6
	TRACE & TOXIC				
1	Al (mg/L)	2	0.10	0.08	0.09
	CHEMICAL INDICES				
1	HAR_Ca (mgCaCO3/L)	2	80	80	80
2	HAR_Total (mgCaCO3/L)	2	115	112	113
3	Na% (%)	2	44	38	41
4	RSC (-)	2	0.0	0.0	0
5	SAR (-)	2	1.7	1.3	1.5
	PESTICIDES				

Water Quality Seasonal Average for the period: 2005-2013

Station Name : Ambica at Gadat (01 02 20 001) **Division : Surat**

Local River : **River Water** **Sub-Division : Surat**

S.No	Parameters	Flood								Winter								Summer							
		Jun - Oct								Nov - Feb								Mar - May							
		2005	2006	2007	2008	2009	2010	2011	2012	2005-2006	2006-2007	2007-2008	2008-2009	2009-2010	2010-2011	2011-2012	2012-2013	2006	2007	2008	2009	2010	2011	2012	2013
	PHYSICAL																								
1	Q (cumec)	609.4	117.8	476.1	82.01	43.46	142.0	184.7	87.89	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2	EC_FLD (µmho/cm)			486	455	440	386	435	480			493	524	310	470					437	464	475			
3	EC_GEN (µmho/cm)	271	286	378	381	397	356	370	345	405	483	556	495	446	355			423	530	486	442	410		541	
4	pH_FLD (pH units)			8.0	7.8	7.8	7.9	7.7				8.0	7.9	7.2	7.9					7.8	7.8	7.0			
5	pH_GEN (pH units)	8.2	8.3	8.2	7.6	8.0	8.0	7.4	7.5	8.2	8.3	7.9	7.3	8.1	8.2			8.4	8.8	8.4	8.4	7.9		6.5	
6	SS (mg/L)	64	91	138	120	155	120	123	110	90	119	192	165	163	122			78	104	166	183	139		180	
7	TDS (mg/L)	191	195	245	246	261	240	215	220	285	303	351	306	283	244			276	333	317	310	272		350	
8	Temp (deg C)	28.3	24.0	27.3	26.3	26.3	26.3	24.5	25.5	20.5	22.5	22.0	23.5	21.5	26.0			24.0	27.0	27.0	23.0	24.0		25.0	
9	TS (mg/L)						360	359	330						366									530	
10	Turb (NTU)	9.3	3.5	5.0	1.5	4.0	2.3	7.0	11.5	1.0	1.0	1.0	1.0	1.0	1.0			1.0	1.0	1.0	1.0	1.0		3.0	
	CHEMICAL																								
1	Alk-Phen (mgCaCO3/L)	1.1	3.3	3.3	1.7	1.7	5.5	0.0	0.0	0.0	2.5	2.5	0.0	5.0	0.0			5.0	5.0	5.0	5.0	0.0		0.0	
2	ALK-TOT (mgCaCO3/L)	149	93	110	128	107	104	82	105	215	116	122	95	95	80			240	126	108	108	120		90	
3	Ca (mg/L)	32	30	32	32	33	32	32	32	32	34	34	32	32	36			34	36	32	32	34		36	
4	Cl (mg/L)	24.2	21.0	55.9	29.8	87.8	85.5	84.1	49.8	25.8	37.9	73.5	44.9	84.1	145.9			31.3	43.5	63.0	48.0	127.7		222.0	
5	CO3 (mg/L)	1.3	4.0	4.0	2.0	2.0	6.7	0.0	0.0	0.0	3.0	3.0	0.0	6.0	0.0			6.0	6.0	6.0	6.0	0.0		0.0	
6	F (mg/L)	0.09	0.05	0.14	0.06	0.15	0.17	0.05	0.23	0.05	0.05	0.07	0.16	0.21	0.18			0.05	0.05	0.07	0.32	0.24		0.16	
7	HCO3 (mg/L)	179	106	126	116	126	114	101	128	262	135	143	116	104	98			280	142	120	120	146		110	
8	K (mg/L)		0.4	4.9	0.3	2.2	13.3	9.6	2.4		0.7	2.9	1.9	2.6	4.2				4.4	0.3	2.6	1.1		10.2	
9	Mg (mg/L)	8.4	7.1	7.8	7.1	8.7	8.2	7.1	8.0	8.3	9.2	7.9	8.8	7.7	8.3			9.7	9.8	5.8	7.8	9.7		8.6	
10	Na (mg/L)		14.5	36.7	18.3	58.6	49.3	45.7	37.1		27.0	48.0	29.3	52.0	77.4				29.8	44.0	30.0	84.6		130.0	
11	NH3-N (mg N/L)	0.06	0.11	0.08	0.06	0.07	0.06	0.07	0.10	0.05	0.06	0.08	0.07	0.05	0.06			0.05	0.05	0.07	0.16	0.05		0.12	
12	NO2+NO3 (mg N/L)	0.84	0.02	0.17	0.13	0.19	0.20	0.13	0.20	0.04	0.01	0.11	0.24	0.19	0.16			0.07	0.01	0.16	0.18	0.24		0.11	
13	NO2-N (mgN/L)	0.18	0.00	0.01	0.03	0.03	0.04	0.03	0.04	0.00	0.00	0.01	0.05	0.04	0.06			0.00	0.00	0.03	0.02	0.04		0.01	
14	NO3-N (mgN/L)	0.67	0.02	0.16	0.10	0.16	0.17	0.10	0.17	0.04	0.01	0.10	0.19	0.15	0.10			0.07	0.01	0.13	0.16	0.20		0.10	
15	o-PO4-P (mg P/L)						0.073	0.080	0.065						0.060									0.100	
16	P-Tot (mgP/L)	0.304	0.107	0.127	0.265	0.200	0.120	0.360	0.140	0.111	0.060	0.182	0.170	0.140	0.140			0.080	0.060	0.062	0.280	0.240		0.240	
17	SiO2 (mg/L)	21.8	22.3	21.1	26.6	20.2	20.1	18.1	9.0	14.8	14.8	21.6	17.8	13.6	20.6			15.1	15.1	24.3	17.7	12.7		8.0	
18	SO4 (mg/L)	24.1	10.1	6.2	7.4	17.3	7.1	8.0	11.6	16.6	16.3	6.3	16.6	12.9	4.8			13.8	13.0	1.0	13.3	14.4		12.0	
	BIOLOGICAL/BACTERIOLOGICAL																								
1	BOD3-27 (mg/L)	0.5	0.4	0.7	0.3	0.7	0.8	0.9	0.6	0.4	0.7	0.5	0.7	0.6	0.5			0.6	1.4	0.7	0.6	2.5		0.7	
2	DO (mg/L)													6.8								10.4			
3	DO_SAT% (%)													81								124			
	TRACE & TOXIC																								
1	Al (mg/L)	0.08	0.05	0.05	0.06	0.05	0.15	0.06	0.09	0.02	0.02	0.04	0.03	0.05	0.06			0.02	0.02	0.06	0.04	0.02		0.10	
	CHEMICAL INDICES																								
1	HAR_Ca (mgCaCO3/L)	80	76	80	80	81	80	80	80	80	84	84	80	80	90			84	90	80	80	84		90	
2	HAR_Total (mgCaCO3/L)	115	106	113	110	118	114	110	113	115	123	117	117	112	125			125	130	104	113	125		126	
3	Na% (%)		22	40	27	48	40	45	41		32	47	35	49	57				32	48	36	59		67	
4	RSC (-)	1.0	0.0	0.1	0.0	0.0	0.1	0.0	0.0	2.0	0.0	0.1	0.0	0.0	0.0			2.3	0.0	0.1	0.0	0.0		0.0	
5	SAR (-)		0.6	1.5	0.8	2.3	2.0	1.9	1.5		1.1	1.9	1.2	2.1	3.0				1.1	1.9	1.2	3.3		5.1	
	PESTICIDES																								

ONCE IN 2 MONTH/POOLING CONDITION

10.4 Analysis

It is seen from the period of availability of data, that the sample size is too small to draw any meaningful conclusion regarding trend etc. Therefore, only statistical analysis has been carried out which is given at **Annex-II**.

11.0 Vaitarna Basin

11.1 Basin description

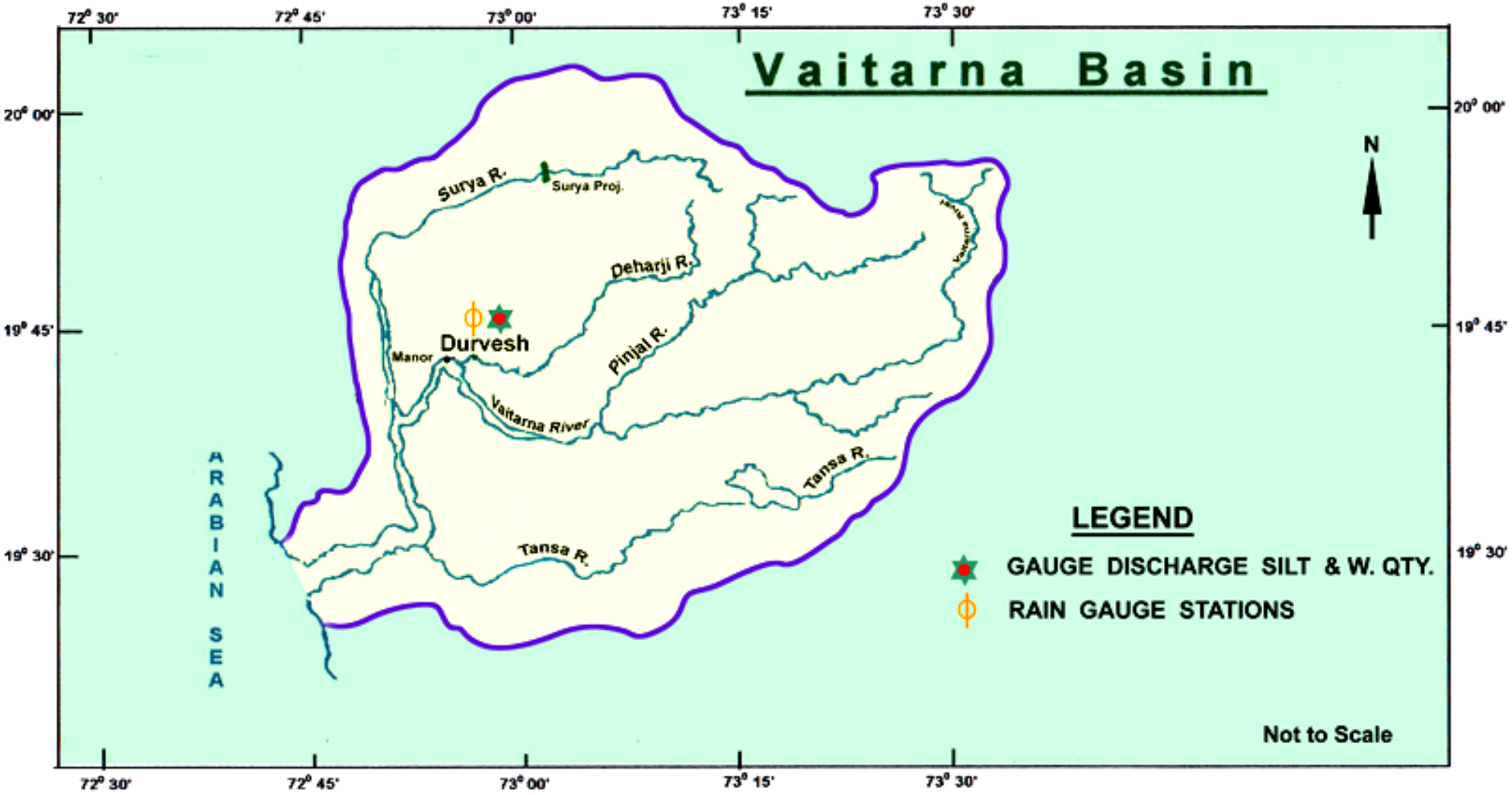
The river Vaitarna originates from hilly terrain of Maharashtra at Trimbak in Nasik district. Its basin map is enclosed. After running for 120 km in Maharashtra towards west, it falls into the Arabian Sea. The catchment area of the basin is 3,637 sq.km. This drainage area is located between east longitudes of 72° 45' and 73° 35' and north latitudes of 19° 30' and 20° 20'. The main tributaries of this river are Pinjal, Garjal, Surya, Daharji and Tansa. There are some irrigation projects under construction namely Surya and Wandri on the tributaries of the Vaitarna river.

11.2 Availability of W.Q. Data (in SWDES format)

There is only one WQ monitoring station at Durvesh in the basin where availability of data is as follows:

Sl. No.	Site name	River/Tributary	Period of sample collection	No. of samples analysed
1	Durvesh	Vaitarna	2005-06 to 2012-13	29

The detailed data are given in Section- 11.3.


Vaitarna Basin
72° 30'
72° 45'
73° 00'
73° 15'
73° 30'
20° 00'
19° 45'
19° 30'
N
Surya R.
Surya Proj.
Deharji R.
Pinjal R.
Durvesh
Manor
Vaitarna River
Tansa R.
Tansa R.
ARABIAN SEA
LEGEND
GAUGE DISCHARGE SILT & W. QTY.
RAIN GAUGE STATIONS
Not to Scale

11.3 Water Quality Data

HISTORY SHEET

		Water Year	**: 2012-2013**
Site	**: Vaitarna at Durvesh**	**Code**	**: 01 02 25 001**
State	: Maharashtra	District	Thane
Basin	: WFR South of Tapi	Independent River	: Vaitarna
Tributary	:	Sub Tributary	:
Sub-Sub Tributary	:	Local River	:
Division	: Tapi Division, Surat	Sub-Division	: DGSD, Silvassa
Drainage Area	: 2019 Sq. Km.	Bank	: Left
Latitude	: 19°42'45" N	Longitude	: 72°55'50" E
	Opening Date	Closing Date	
Gauge	: 26-10-1970		
Discharge	: 26-01-1971		
Sediment	: 26-01-1971		
Water Quality	: 01-06-1977		

Water Quality Datasheet for the period : 2012-2013

Station Name : Vaitarna at Durvesh (01 02 25 001) **Division : Tapi Division, Surat**

Local River : **River Water Analysis** **Sub-Division : DGSD,CWC,Silvassa**

S.No	Parameters	01-06-2012	02-07-2012	01-08-2012	01-09-2012	01-10-2012	01-11-2012	01-12-2012	01-01-2013	01-02-2013	01-03-2013	01-04-2013	01-05-2013
	PHYSICAL												
1	Q (cumec)	0.000	0.000	# 907.0	330.2	43.00	6.788	0.216	0.000	0.000	0.000	0.000	0.000
2	Colour_Cod (-)			Brown		Clear		Clear				Clear	
3	EC_GEN (µmho/cm)			300		237		290				290	
4	Odour_Code (-)			odour free		odour free		odour free				odour free	
5	pH_GEN (pH units)			8.0		7.4		7.8				7.8	
6	SS (mg/L)			90		80		82				100	
7	TDS (mg/L)			200		154		190				230	
8	Temp (deg C)			27.0		27.0		13.0				22.0	
9	TS (mg/L)			290		234		272				330	
10	Turb (NTU)			4.0		6.0		1.0				1.0	
	CHEMICAL												
1	Alk-Phen (mgCaCO3/L)			0.0		0.0		0.0				0.0	
2	ALK-TOT (mgCaCO3/L)			90		100		80				90	
3	Ca (mg/L)			28		34		28				30	
4	Cl (mg/L)	POOLING CONDITION	ONCE IN 2 MOTH	40.0	ONCE IN 2 MOTH	28.5	ONCE IN 2 MOTH	75.2	ONCE IN 2 MOTH	POOLING CONDITION	ONCE IN 2 MOTH	78.0	ONCE IN 2 MOTH
5	CO3 (mg/L)			0.0		0.0		0.0				0.0	
6	F (mg/L)			0.16		0.20		0.30				0.16	
7	HCO3 (mg/L)			110		122		98				110	
8	K (mg/L)			2.4		1.8		2.4				2.6	
9	Mg (mg/L)			6.2		7.5		6.6				6.0	
10	Na (mg/L)			30.0		16.0		53.8				53.8	
11	NH3-N (mg N/L)			0.08		0.14		0.12				0.12	
12	NO2+NO3 (mg N/L)			0.12		0.16		0.16					
13	NO2-N (mgN/L)			0.02		0.06		0.05					
14	NO3-N (mgN/L)			0.10		0.10		0.11				0.12	
15	o-PO4-P (mg P/L)			0.050		0.060		0.160					
16	P-Tot (mgP/L)			0.120		0.300		0.380				0.250	
17	SiO2 (mg/L)			10.0		8.0		10.0				12.0	
18	SO4 (mg/L)			5.0		8.6		10.6				10.2	
	BIOLOGICAL/BACTERIOLOGICAL												
1	BOD3-27 (mg/L)			0.6		0.5		1.4				2.0	
	TRACE & TOXIC												
1	Al (mg/L)			0.12		0.16		0.14				0.10	
	CHEMICAL INDICES												
1	HAR_Ca (mgCaCO3/L)			70		85		70				75	
2	HAR_Total (mgCaCO3/L)			96		116		98				100	
3	Na% (%)			40		23		54				53	
4	RSC (-)			0.0		0.0		0.0				0.0	
5	SAR (-)			1.3		0.6		2.4				2.3	
	PESTICIDES												
	REMARKS												

Note. : # Discarded and estimated discharge

Pesticides , Trace and Toxic element analysis

Station Name : Vaitarna at Durvesh (01 02 25 001) **Division : Tapi Division, Surat**

Local River : Vaitarna **Sub Divi. : DGSD, Silvassa**

Sl. No.	Parameter ID	Parameter Name	unit	Date of sampling												
a	Trace and Toxic			01.04.2006	02.04.2007	02.04.2008	01.04.2009	01.04.2010	01.04.2011	01.09.2011	01.02.2012	02.04.2012	28.05.2012	01.10.2012	01.03.2013	01.04.2013
				Analysis done by WQL-III Lab, UGD, Hyderabad	Analysis done by WQL-III Lab, UGD, Hyderabad	Analysis done by WQL-III Lab, UGD, Hyderabad	Analysis done by WQL-III Lab, UGD, Hyderabad	Analysis done by WQL-III Lab, UGD, Hyderabad	Analysis done by WQL-III Lab, UGD, Hyderabad	Analysis done by NRWQL, New Delhi	Analysis done by NRWQL, New Delhi	Analysis done by WQL-III Lab, UGD, Hyderabad	Analysis done by NRWQL, New Delhi	Analysis done by NRWQL, New Delhi	Analysis done by NRWQL, New Delhi	Analysis done by WQL-III Lab, UGD, Hyderabad
1	As	Arsenic	microgram / l	-	-	-	-	0.1316		1.07			1.09	11.3		
2	Cd	Cadmium	microgram / l	-	-	8.86	35.86	0.1684		0.011			0.23	0.30		
3	Cr	Chromium	microgram / l	-	-	0	11.68	0		3.57			8.23	6.01		
4	Cu	Copper	microgram / l	-	-	-	-	-		7.24			37.36	9.00		
5	Hg	Mercury	microgram / l	-	-	0	-	-		0.53			-	-		
6	Ni	Nickel	microgram / l	-	-	66.59	183.84	0.653	P	-	P	P	4.90	11.77	P	P
7	Pb	Lead	microgram / l	-	-	96.44	305.26	0.000	O	1.30	O	O	4.46	3.89	O	O
8	Zn	Zinc	microgram / l	-	-	16.66	30.35	8.663	O	43.93	O	O	33.00	26.93	O	O
b	**Pesticides**		microgram / l						L		L	L			L	L
1	Aldrin	Aldrin	microgram / l	-	-	0	0	0	I	-	I	I	-	-	I	I
2	Alpha- BHC	Alpha- BHC	microgram / l	-	-	0.01	0	0	N	-	N	N	-	-	N	N
3	Beta-BHC	Beta-BHC	microgram / l	-	-	-	-	-	G	-	G	G	-	-	G	G
4	Gama- BHC	gamma-BHC (Benzene HexaChloride)	microgram / l	-	-	-	-	-	C	-	C	C	-	-	C	C
5	D- BHC	D- BHC	microgram / l	-	-	-	-	-	O	-	O	O	-	-	O	O
6	DDT	DDT	microgram / l	-	-	0	0	0.0032	N	-	N	N	-	-	N	N
7	Dieldrin	Dieldrin	microgram / l	-	-	0	0	0.0027	D	-	D	D	-	-	D	D
8	Endos-I	Endosulphan I	microgram / l	-	-	0	0.0025	0.0926	I	-	I	I	-	-	I	I
9	Endos-II	Endosulphan II	microgram / l	-	-	-	-	-	T	-	T	T	-	-	T	T
10	Endos-s	Endosulphan s	microgram / l	-	-	-	-	-	I	-	I	I	-	-	I	I
									O		O	O			O	O
									N		N	N			N	N

WQL - III Lab at UGD, Hyderabad conducts the analysis of Trace and Toxic element and Pesticides

NRWQ Lab at HOC, Noida, New Delhi conducts the analysis of Trace and Toxic element only, which started from September 2011 onwords

Water Quality Summary for the period : 2012-2013

Station Name : Vaitarna at Durvesh (01 02 25 001) **Division : Tapi Division, Surat**

Local River : **Sub-Division : DGSD,CWC,Silvassa**

River Water Summary

S.No	Parameters	Number of Observations	Maximum	Minimum	Mean
	PHYSICAL				
1	Q (cumec)	365	1394	0.000	78.20
2	EC_GEN (µmho/cm)	4	300	237	279
3	pH_GEN (pH units)	4	8.0	7.4	7.8
4	SS (mg/L)	4	100	80	88
5	TDS (mg/L)	4	230	154	194
6	Temp (deg C)	4	27.0	13.0	22.3
7	TS (mg/L)	4	330	234	282
8	Turb (NTU)	4	6.0	1.0	3
	CHEMICAL				
1	Alk-Phen (mgCaCO3/L)	4	0.0	0.0	0
2	ALK-TOT (mgCaCO3/L)	4	100	80	90
3	Ca (mg/L)	4	34	28	30
4	Cl (mg/L)	4	78.0	28.5	55.4
5	CO3 (mg/L)	4	0.0	0.0	0
6	F (mg/L)	4	0.30	0.16	0.21
7	HCO3 (mg/L)	4	122	98	110
8	K (mg/L)	4	2.6	1.8	2.3
9	Mg (mg/L)	4	7.5	6.0	6.6
10	Na (mg/L)	4	53.8	16.0	38.4
11	NH3-N (mg N/L)	4	0.14	0.08	0.11
12	NO2+NO3 (mg N/L)	3	0.16	0.12	0.15
13	NO2-N (mgN/L)	3	0.06	0.02	0.04
14	NO3-N (mgN/L)	4	0.12	0.10	0.11
15	o-PO4-P (mg P/L)	3	0.160	0.050	0.09
16	P-Tot (mgP/L)	4	0.380	0.120	0.263
17	SiO2 (mg/L)	4	12.0	8.0	10
18	SO4 (mg/L)	4	10.6	5.0	8.6
	BIOLOGICAL/BACTERIOLOGICAL				
1	BOD3-27 (mg/L)	4	2.0	0.5	1.1
	TRACE & TOXIC				
1	Al (mg/L)	4	0.16	0.10	0.13
	CHEMICAL INDICES				
1	HAR_Ca (mgCaCO3/L)	4	85	70	75
2	HAR_Total (mgCaCO3/L)	4	116	96	102
3	Na% (%)	4	54	23	42
4	RSC (-)	4	0.0	0.0	0
5	SAR (-)	4	2.4	0.6	1.7
	PESTICIDES				

Water Quality Seasonal Average for the period: 2005-2013

Station Name : Vaitarna at Durvesh (01 02 25 001) **Division : Tapi Division, Surat**

Local River : **River Water** **Sub-Division : DGSD,CWC,Silvassa**

S.No	Parameters	Flood								Winter								Summer							
		Jun - Oct								Nov - Feb								Mar - May							
		2005	2006	2007	2008	2009	2010	2011	2012	2005-2006	2006-2007	2007-2008	2008-2009	2009-2010	2010-2011	2011-2012	2012-2013	2006	2007	2008	2009	2010	2011	2012	2013
	PHYSICAL																								
1	Q (cumec)	480.6	401.8	468.3	401.9	73.39	542.6	460.6	256.0	7.054	6.022	7.717	12.08	15.27	34.19	10.43	1.751	0.000	0.000	1.426	3.141	0.000	0.000	0.000	0.000
2	EC_FLD (µmho/cm)			128	510	137	265				143	165	949	177								1585			
3	EC_GEN (µmho/cm)	166	92	178	182	285	254	297	269	1511	288	763	5166	4433			290	10000	2396	7269	10000	1976			290
4	pH_FLD (pH units)			8.0	8.0	8.1	7.3				7.4	7.5	7.6	8.1								7.0			
5	pH_GEN (pH units)	7.9	8.0	8.0	8.1	7.9	7.5	7.5	7.7	7.7	8.2	8.5	8.0	7.9			7.8	8.0	8.4	8.4	7.6	7.9			7.8
6	SS (mg/L)	52	49	94	79	112	100	98	85	121	83	168	748	1260			82	989	292	622	1607	572			100
7	TDS (mg/L)	117	70	119	121	185	201	230	177	1196	194	488	3570	3002			190	8954	2107	4750	6970	1153			230
8	Temp (deg C)	27.0	27.0	28.6	29.0	29.0	28.5	28.5	27.0	24.0	25.0	24.0	24.0	24.5			13.0	27.0	27.0	28.0	25.0	26.0			22.0
9	TS (mg/L)						301	295	262								272								330
10	Turb (NTU)	3.0	4.0	2.0	2.0	6.5	2.5	11.0	5.0		1.0	1.0	2.0	1.5			1.0		1.0	1.0	1.0	2.0			1.0
	CHEMICAL																								
1	Alk-Phen (mgCaCO3/L)	0.0	0.0	0.0	0.0	2.5	0.0	0.0	0.0	0.0	0.0	5.0	0.0	0.0			0.0	0.0	5.0	5.0	0.0	0.0			0.0
2	ALK-TOT (mgCaCO3/L)	85	68	88	85	95	117	78	95	130	100	131	130	182			80	120	232	172	400	130			90
3	Ca (mg/L)	31	25	29	30	32	31	31	31	31	32	35	39	33			28	39	42	35	40	36			30
4	Cl (mg/L)	6.9	9.1	38.0	13.8	34.6	59.8	110.3	34.3	406.5	31.0	83.7	1194	2156			75.2	5013	591.0	1077	4731	355.2			78.0
5	CO3 (mg/L)	0.0	0.0	0.0	0.0	3.0	0.0	0.0	0.0	0.0	0.0	6.0	0.0	0.0			0.0	0.0	6.0	6.0	0.0	0.0			0.0
6	F (mg/L)	0.05	0.05	0.05	0.07	0.13	0.11	0.06	0.18	0.22	0.05	0.05	0.36	0.09			0.30	0.05	0.09	0.05	0.44	0.28			0.16
7	HCO3 (mg/L)	104	83	107	104	110	143	95	116	159	122	148	159	222			98	146	271	198	488	159			110
8	K (mg/L)		0.1	4.0	0.1	3.1	1.8	9.9	2.1		1.1	5.5	30.6	83.5			2.4		11.1	12.1	440.0	12.4			2.6
9	Mg (mg/L)	6.3	4.8	5.8	6.3	6.9	9.3	6.4	6.8	5.8	7.8	8.7	12.6	9.2			6.6	12.6	12.9	11.7	11.7	12.6			6.0
10	Na (mg/L)		5.6	26.0	7.7	25.7	44.0	60.8	23.0		21.0	64.0	776.0	1490			53.8		383.0	765.0	3078	232.2			53.8
11	NH3-N (mg N/L)	0.05	0.08	0.05	0.07	0.07	0.07	0.09	0.11	0.20	0.05	0.05	0.26	0.10			0.12	0.18	0.08	0.13	0.08	0.08			0.12
12	NO2+NO3 (mg N/L)	0.23	0.01	0.10	0.12	0.14	0.28	0.13	0.14	0.40	0.00	0.09	0.76	0.11			0.16	0.05	0.03	0.33	0.56	0.28			
13	NO2-N (mgN/L)	0.01	0.00	0.00	0.01	0.04	0.08	0.02	0.04	0.04	0.00	0.00	0.06	0.02			0.05	0.00	0.00	0.03	0.06	0.08			
14	NO3-N (mgN/L)	0.22	0.01	0.09	0.11	0.10	0.20	0.11	0.10	0.36	0.00	0.09	0.70	0.09			0.11	0.05	0.03	0.30	0.50	0.20			0.12
15	o-PO4-P (mg P/L)						0.070	0.080	0.055								0.160								
16	P-Tot (mgP/L)	0.255	0.075	0.060	0.404	0.130	0.060	0.405	0.210	0.180	0.050	0.097	0.380	0.120			0.380	0.028	0.080	0.060	0.320	0.200			0.250
17	SiO2 (mg/L)	18.6	19.9	20.4	23.6	20.5	12.1	16.0	9.0	14.8	15.3	22.4	26.8	14.9			10.0	22.2	20.8	28.8	28.5	13.5			12.0
18	SO4 (mg/L)	11.7	5.4	4.4	9.0	13.4	3.7	9.1	6.8	37.5	8.4	5.6	28.8	46.0			10.6	144.1	25.6	55.9	284.9	18.3			10.2
	BIOLOGICAL/BACTERIOLOGICAL																								
1	BOD3-27 (mg/L)	0.2	0.5	0.9	0.7	0.7	0.6	1.8	0.6	2.0	1.3	0.4	9.0	1.1			1.4	4.0	5.0	8.0	5.0	8.0			2.0
2	DO (mg/L)			5.6	5.8	5.8	9.0				6.3	5.9	5.8	7.1								5.5			
3	DO_SAT% (%)			73	75	74	119				76	70	69	88								68			
	TRACE & TOXIC																								
1	Al (mg/L)	0.07	0.12	0.04	0.12	0.07	0.10	0.08	0.14	0.02	0.02	0.04	0.04	0.04			0.14	0.04	0.02	0.08	0.14	0.12			0.10
	CHEMICAL INDICES																								
1	HAR_Ca (mgCaCO3/L)	76	62	73	76	80	78	78	78	76	80	88	97	82			70	97	105	88	100	89			75
2	HAR_Total (mgCaCO3/L)	103	82	97	102	109	117	104	106	100	113	124	150	121			98	150	159	137	149	142			100
3	Na% (%)		13	36	14	32	32	52	31		29	52	90	63			54		83	92	90	76			53
4	RSC (-)	0.1	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.6	0.0	0.2	0.0	1.4			0.0	0.0	1.5	0.7	5.0	0.0			0.0
5	SAR (-)		0.3	1.1	0.3	1.1	1.7	2.6	1.0		0.9	2.5	27.7	54.8			2.4		13.3	28.5	110.1	8.5			2.3
	PESTICIDES																								

ONCE IN 2 MONTH / SNR

ONCE IN 2 MONTH / POOLING CONDITION

11.4 Analysis

It is seen from the period of availability of data, that the sample size is too small to draw any meaningful conclusion regarding trend etc. Therefore, only statistical analysis has been carried out which is given at **Annex-II**.

12.0 Dhadar Basin

12.1 Basin description

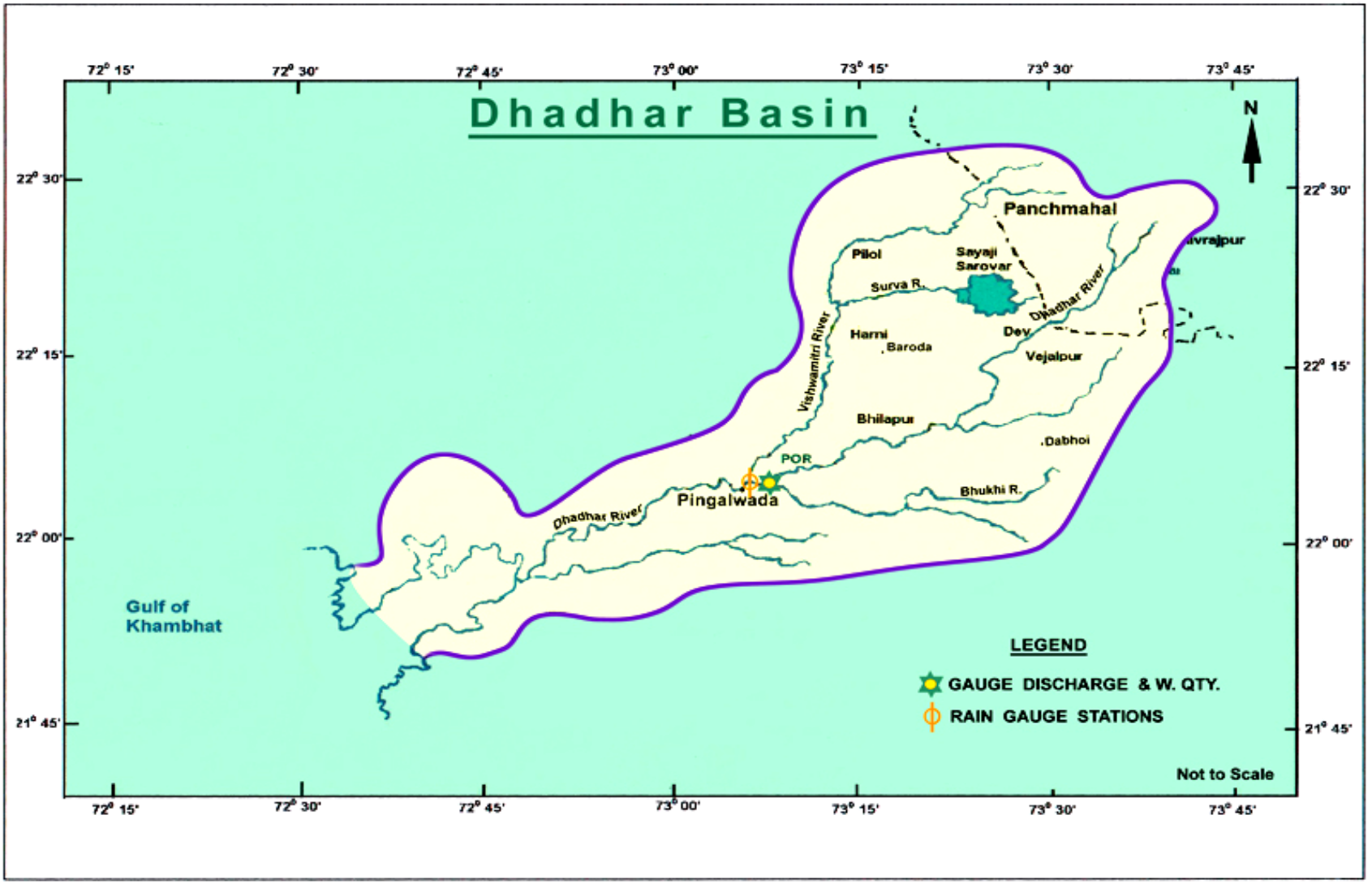
The Dhadhar River is one of the west flowing rivers in Gujarat state. Its basin map is enclosed. It originates from the Pavagadh Hills of Gujarat state and flows through Vadodara and Bharuch districts. The river Dhadhar after flowing 87 Km. receives Vishwamitri tributary from right bank at Pingalwada village 500 m. up stream of Gauge and Discharge site. After flowing another 55 km. it falls in to the Gulf of Khambhat. The total length of the river from its source to outfall in the Gulf of Khambhat is about 142 km.The important tributaries of the Dhadhar River are Vishwamitri, Jambuoriver, Dev and Surya River. The catchment area of the Dhadhar basin is 3423 Sq.km. and catchment area up to the site is 2400 Sq.km. It lies between east longitude 72° 30’ and 73° 45’ and North latitude 21° 45’ and 22° 45’.

12.2 Availability of W.Q. Data (in SWDES format)

There is only one WQ monitoring station at Pingalwada in the basin where availability of data is as follows:

Sl. No.	Site name	River/Tributary	Period of sample collection	No. of samples analysed
1	Pingalwada	Dhadar	2005-06 to 2012-13	92

The detailed data are given in Section- 12.3.


Dhadhar Basin
N
72° 15'
72° 30'
72° 45'
73° 00'
73° 15'
73° 30'
73° 45'
22° 30'
22° 15'
22° 00'
21° 45'
Panchmahal
Pilol
Sayaji Sarovar
Surva R.
Dhadhar River
Harni
Baroda
Dev
Vejalpur
Vishwamitri River
Bhilapur
Dabhoi
POR
Pingalwada
Bhukhi R.
Dhadhar River
Gulf of Khambhat
LEGEND
GAUGE DISCHARGE & W. QTY.
RAIN GAUGE STATIONS
Not to Scale

12.3 Water Quality Data

HISTORY SHEET

		Water Year	**: 2012-2013**
Site	**: Dhadar at Pingalwada**	**Code**	**: 01 02 14 001**
State	: Gujarat	District	Vadodara
Basin	: Narmada	Independent River	: Dhadhar
Tributary	: -	Sub Tributary	: -
Sub-Sub Tributary	: -	Local River	: Dhadhar
Division	: Tapi Dvision, Surat	Sub-Division	: LNSD, Bharuch
Drainage Area	: 2400 Sq. Km.	Bank	: Right
Latitude	: 22°06'37" N	Longitude	: 73°04'44" E
	Opening Date	Closing Date	
Gauge	: 07-04-1989		
Discharge	: 30-06-1989		
Sediment	:		
Water Quality	: 15-03-1990		

Dhadar at Pingalwada- the blackish water with floating muck indicating pollution

Water Quality Datasheet for the period : 2012-2013

Station Name : Pingalwada (01 02 14 001) **Division : Tapi Dvision, Surat**

Local River : Dhadhar **River Water Analysis** **Sub-Division : LNSD Bharuch**

S.No	Parameters	01-06-2012	02-07-2012	01-08-2012	01-09-2012	01-10-2012	01-11-2012	01-12-2012	01-01-2013	01-02-2013	01-03-2013	01-04-2013	01-05-2013
	PHYSICAL												
1	Q (cumec)	0.000	0.000	4.007	14.12	14.10	6.425	3.658	6.261	5.874	5.294	4.649	3.998
2	Colour_Cod (-)	Green	Green	Light Brown	Clear	Green	Clear	Clear	Light Green	Light Green	Clear	Clear	Light Green
3	EC_FLD (µmho/cm)		750		610	850	1000	1100	1050	1100			1100
4	EC_GEN (µmho/cm)	1625	760	560	690	800	1120	1020	1100	1100	1034	990	1050
5	Odour_Code (-)	fishy	fishy	fishy	fishy	septic	fishy	fishy	septic	septic	fishy	fishy	septic
6	pH_FLD (pH units)	6.5	8.0	6.5	6.8	6.5	6.5	7.0	6.8	7.0	7.0	6.8	7.0
7	pH_GEN (pH units)	6.6	8.2	7.2	6.8	6.8	6.6	6.6	6.8	6.8	6.8	6.8	6.8
8	SS (mg/L)	530	110	160	200	320	360	352	320	350	350	330	380
9	TDS (mg/L)	1069	450	360	452	650	732	680	726	650	713	654	690
10	Temp (deg C)	27.0	27.0	25.0	24.0	24.0	20.0	13.0	16.0	14.0	17.0	21.0	24.0
11	TS (mg/L)	1599	685	520	652	970	1092	1032		1000	1063	984	1070
12	Turb (NTU)	2.0	2.0	32.0	50.0	4.0	1.0	3.0		2.0	2.0	2.0	2.0
	CHEMICAL												
1	Alk-Phen (mgCaCO3/L)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	ALK-TOT (mgCaCO3/L)	130	115	107	139	135	75	95	87	140	133	131	107
3	Ca (mg/L)	32	36	34	40	36	34	40	36	36	42	34	34
4	Cl (mg/L)	266.0	115.0	64.0	100.0	170.0	88.6	114.0	91.0	105.0	75.6	78.0	80.2
5	CO3 (mg/L)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
6	F (mg/L)	0.40	0.20	0.14	0.40	0.40	0.30	0.40	0.32	0.28	0.30	0.20	0.24
7	HCO3 (mg/L)	159	140	130	170	165	92	116	106	171	162	160	130
8	K (mg/L)	60.2	5.0	2.0	4.0	12.0	1.8	4.2	2.6	9.2	4.6	2.8	4.2
9	Mg (mg/L)	14.6	9.7	10.0	12.0	13.1	10.4	9.7	6.2	18.2	6.8	10.2	7.6
10	Na (mg/L)	160.0	85.0	40.0	70.0	120.6	52.4	70.2	58.2	62.4	56.2	60.4	60.4
11	NH3-N (mg N/L)	0.18	0.10	0.12	0.20	0.14	0.20	0.18	0.16	0.16	0.18	0.16	0.18
12	NO2+NO3 (mg N/L)	0.28	0.10	0.46	0.38	0.50	0.36	0.30					
13	NO2-N (mgN/L)	0.10	0.02	0.20	0.18	0.15	0.20	0.10					
14	NO3-N (mgN/L)	0.18	0.08	0.26	0.20	0.35	0.16	0.20		0.22	0.20	0.26	0.20
15	o-PO4-P (mg P/L)	0.060		0.080	0.050	0.050	0.100	0.050					
16	P-Tot (mgP/L)	0.240	0.920	0.300	0.360	1.000	0.560	0.580	0.190	0.540	0.480	0.460	0.440
17	SiO2 (mg/L)	10.0	24.0	10.0	8.0	24.0	10.0	20.0	10.0	10.0	8.0	8.0	10.0
18	SO4 (mg/L)	24.8	27.2	9.8	10.6	38.2	36.0	30.2	14.6	12.4	12.0	12.2	14.8
	BIOLOGICAL/BACTERIOLOGICAL												
1	BOD3-27 (mg/L)	8.0	10.0	2.0	6.0	8.0	5.0	0.5	1.4	1.2	1.2	2.2	2.0
2	DO (mg/L)				7.6			7.8	2.8	1.8		5.8	3.5
3	DO_SAT% (%)				90			74	28	17		65	42
	TRACE & TOXIC												
1	Al (mg/L)	0.08	0.14	0.18	0.20	0.18	0.10	0.06		0.18	0.12	0.18	0.08
	CHEMICAL INDICES												
1	HAR_Ca (mgCaCO3/L)	80	90	85	100	90	85	100	90	90	105	85	85
2	HAR_Total (mgCaCO3/L)	141	130	127	150	145	128	140	116	166	133	128	117
3	Na% (%)	62	58	40	50	62	47	51	52	43	47	50	52
4	RSC (-)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0
5	SAR (-)	5.9	3.2	1.6	2.5	4.4	2.0	2.6	2.4	2.1	2.1	2.3	2.4
	PESTICIDES												
	REMARKS												

Pesticides , Trace and Toxic element analysis

Station Name : Dhadar at Pingalwada (01 02 14 001) **Division : Tapi Division, Surat**

Local River : Dhadar **Sub Divi. :LNSD, Bharuch**

Sl. No.	Parameter ID	Parameter Name	unit	Date of sampling												
a	Trace and Toxic			01.04.2006	02.04.2007	02.04.2008	01.04.2009	01.04.2010	01.04.2011	01.09.2011	01.02.2012	02.04.2012	28.05.2012	01.10.2012	01.03.2013	01.04.2013
				Analysis done by WQL-III Lab, UGD, Hyderabad	Analysis done by WQL-III Lab, UGD, Hyderabad	Analysis done by WQL-III Lab, UGD, Hyderabad	Analysis done by WQL-III Lab, UGD, Hyderabad	Analysis done by WQL-III Lab, UGD, Hyderabad	Analysis done by WQL-III Lab, UGD, Hyderabad	Analysis done by NRWQL, New Delhi	Analysis done by NRWQL, New Delhi	Analysis done by WQL-III Lab, UGD, Hyderabad	Analysis done by NRWQL, New Delhi	Analysis done by NRWQL, New Delhi	Analysis done by NRWQL, New Delhi	Analysis done by WQL-III Lab, UGD, Hyderabad
1	As	Arsenic	microgram / l	-	-	-	-	2.375	-	1.48	POOLING CONDITION	1.095	1.07	14.94	8.6	0.1044
2	Cd	Cadmium	microgram / l	-	-	1.78	2.89	2.624	1.380	0.263		0.880	0.05	0.14	0.31	2.190
3	Cr	Chromium	microgram / l	-	-	0	0	0	2.09	6.31		0	13.56	3.27	1.54	2.31
4	Cu	Copper	microgram / l	-	-	-	-	-	-	24.2		-	4.00	4.55	8.13	-
5	Hg	Mercury	microgram / l	-	-	0	-	-	-	0.54		0.5598	-	-	0.36	0.0841
6	Ni	Nickel	microgram / l	-	-	19.67	3.92	8.33	11.34	-		6.56	8.64	6.81	33.51	8.37
7	Pb	Lead	microgram / l	-	-	35.29	52.17	0.00	6.56	9.15		30.76	5.78	2.51	2.45	0.00
8	Zn	Zinc	microgram / l	-	-	31.81	37.05	73.39	355.1	-		37.97	288.0	9.75	23.60	20.16
b	**Pesticides**		microgram / l													
1	Aldrin	Aldrin	microgram / l	-	-	0	0.0034	0.0097	0.03	-		0.0154	-	-	-	Pesticides value not reported.
2	Alpha- BHC	Alpha- BHC	microgram / l	-	-	0.21	0.004	0.0372	0	-		0.0381	-	-	-	
3	Beta-BHC	Beta-BHC	microgram / l	-	-	-	-	-	-	-		-	-	-	-	
4	Gama- BHC	gamma-BHC (Benzene HexaChloride)	microgram / l	-	-	-	-	-	-	-		-	-	-	-	
5	D- BHC	D- BHC	microgram / l	-	-	-	-	-	-	-		-	-	-	-	
6	DDT	DDT	microgram / l	-	-	0.02	0.0034	0.0027	0	-		0.0034	-	-	-	
7	Dieldrin	Dieldrin	microgram / l	-	-	0	0.0033	0.0033	0.026	-		0.0038	-	-	-	
8	Endos-I	Endosulphan I	microgram / l	-	-	0.03	0.005	0.0213	0.165	-		0.1099	-	-	-	
9	Endos-II	Endosulphan II	microgram / l	-	-	-	-	-	-	-		-	-	-	-	
10	Endos-s	Endosulphan s	microgram / l	-	-	-	-	-	-	-		-	-	-	-	

WQL - III Lab at UGD, Hyderabad conducts the analysis of Trace and Toxic element and Pesticides

NRWQ Lab at HOC, Noida, New Delhi conducts the analysis of Trace and Toxic element only, which started from September 2011 onwords

Water Quality Summary for the period : 2012-2013

Station Name : Pingalwada (01 02 14 001) **Division : Tapi Dvision, Surat**

Local River : Dhadhar **Sub-Division : LNSD Bharuch**

River Water Summary

S.No	Parameters	Number of Observations	Maximum	Minimum	Mean
	PHYSICAL				
1	Q (cumec)	365	148.2	0.000	9.272
2	EC_FLD (µmho/cm)	8	1100	610	945
3	EC_GEN (µmho/cm)	12	1625	560	987
4	pH_FLD (pH units)	12	8.0	6.5	6.9
5	pH_GEN (pH units)	12	8.2	6.6	6.9
6	SS (mg/L)	12	530	110	314
7	TDS (mg/L)	12	1069	360	652
8	Temp (deg C)	12	27.0	13.0	21
9	TS (mg/L)	11	1599	520	970
10	Turb (NTU)	11	50.0	1.0	9.3
	CHEMICAL				
1	Alk-Phen (mgCaCO3/L)	12	0.0	0.0	0
2	ALK-TOT (mgCaCO3/L)	12	140	75	116
3	Ca (mg/L)	12	42	32	36
4	Cl (mg/L)	12	266.0	64.0	112.3
5	CO3 (mg/L)	12	0.0	0.0	0
6	F (mg/L)	12	0.40	0.14	0.3
7	HCO3 (mg/L)	12	171	92	142
8	K (mg/L)	12	60.2	1.8	9.4
9	Mg (mg/L)	12	18.2	6.2	10.7
10	Na (mg/L)	12	160.0	40.0	74.7
11	NH3-N (mg N/L)	12	0.20	0.10	0.16
12	NO2+NO3 (mg N/L)	7	0.50	0.10	0.34
13	NO2-N (mgN/L)	7	0.20	0.02	0.14
14	NO3-N (mgN/L)	11	0.35	0.08	0.21
15	o-PO4-P (mg P/L)	6	0.100	0.050	0.065
16	P-Tot (mgP/L)	12	1.000	0.190	0.506
17	SiO2 (mg/L)	12	24.0	8.0	12.7
18	SO4 (mg/L)	12	38.2	9.8	20.2
	BIOLOGICAL/BACTERIOLOGICAL				
1	BOD3-27 (mg/L)	12	10.0	0.5	4
2	DO (mg/L)	6	7.8	1.8	4.9
3	DO_SAT% (%)	6	90	17	53
	TRACE & TOXIC				
1	Al (mg/L)	11	0.20	0.06	0.14
	CHEMICAL INDICES				
1	HAR_Ca (mgCaCO3/L)	12	105	80	90
2	HAR_Total (mgCaCO3/L)	12	166	116	135
3	Na% (%)	12	62	40	51
4	RSC (-)	12	0.1	0.0	0
5	SAR (-)	12	5.9	1.6	2.8
	PESTICIDES				

Water Quality Seasonal Average for the period: 2005-2013

Station Name : Pingalwada (01 02 14 001) **Division : Tapi Dvision, Surat**

Local River : Dhadhar **River Water** **Sub-Division : LNSD Bharuch**

S.No	Parameters	Flood								Winter								Summer							
		Jun - Oct								Nov - Feb								Mar - May							
		2005	2006	2007	2008	2009	2010	2011	2012	2005-2006	2006-2007	2007-2008	2008-2009	2009-2010	2010-2011	2011-2012	2012-2013	2006	2007	2008	2009	2010	2011	2012	2013
	PHYSICAL																								
1	Q (cumec)	161.4	151.8	123.4	9.433	7.448	32.31	12.51	6.445	3.093	3.710	5.235	5.230	2.057	6.178	1.836	5.554	1.752	0.000	4.230	3.351	1.268	3.799	0.000	4.647
2	EC_FLD (µmho/cm)			483	880	1000	902	938	737		1491	909	679	952	1098	1057	1063			1385	1206	1061	1173		1100
3	EC_GEN (µmho/cm)	940	811	521	1246	1093	1044	1150	887	1273	1282	1473	1329	1245	1177	920	1085	1460	1594	1480	1413	1413	1375	1329	1025
4	pH_FLD (pH units)			7.2	6.9	6.8	6.1	6.5	6.9		7.8	7.0	6.7	6.7	6.6	6.5	6.8		7.5	7.2	6.8	6.5	6.6	6.3	6.9
5	pH_GEN (pH units)	8.1	7.8	7.5	7.3	7.4	7.5	7.0	7.1	7.7	7.8	7.9	7.1	7.5	7.5	6.7	6.7	7.8	7.9	7.3	8.0	7.6	7.3	8.0	6.8
6	SS (mg/L)	93	141	146	298	324	350	491	264	99	229	296	353	412	394	333	346	115	237	329	640	467	407	450	353
7	TDS (mg/L)	677	548	373	840	707	688	809	596	987	932	989	828	758	853	593	697	1236	1178	989	1044	946	886	867	686
8	Temp (deg C)	29.9	27.2	25.8	26.6	26.4	26.4	25.6	25.4	21.6	18.0	23.3	23.5	23.8	24.8	24.5	15.8	28.0	23.7	22.0	26.7	25.7	25.7	26.5	20.7
9	TS (mg/L)						1115	1306	885						1247	995	1041						1293	1317	1039
10	Turb (NTU)	1.0	7.5	7.3	2.0	2.8	8.0	2.0	18.0	1.3	1.3	1.0	1.8	1.5	0.8	1.5	2.0	1.3	1.7	1.3	3.0	2.0	1.3	2.0	2.0
	CHEMICAL																								
1	Alk-Phen (mgCaCO3/L)	1.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.2	0.0	0.0	1.2	0.0	0.0	0.0	0.0	0.0	1.7	0.0	0.0	4.2	0.0
2	ALK-TOT (mgCaCO3/L)	317	148	147	139	136	131	131	125	387	193	226	102	101	137	95	99	229	215	209	143	118	103	162	123
3	Ca (mg/L)	37	35	34	37	39	36	38	36	39	40	40	40	39	39	40	37	40	43	39	40	40	43	37	37
4	Cl (mg/L)	200.9	119.5	90.2	222.2	190.2	228.3	208.3	143.0	183.3	163.1	256.1	268.9	208.7	234.9	162.9	99.6	271.4	215.8	256.3	295.0	234.8	284.9	350.5	77.9
5	CO3 (mg/L)	1.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.5	0.0	0.0	1.5	0.0	0.0	0.0	0.0	0.0	2.0	0.0	0.0	5.0	0.0
6	F (mg/L)	0.13	0.11	0.14	0.10	0.37	0.24	0.18	0.31	0.05	0.05	0.06	0.35	0.30	0.23	0.29	0.33	0.11	0.05	0.08	0.35	0.37	0.30	0.60	0.25
7	HCO3 (mg/L)	384	181	179	169	166	160	160	153	472	235	273	125	123	165	116	121	279	262	255	171	143	126	188	151
8	K (mg/L)		4.4	5.8	7.2	10.3	11.5	14.5	16.6		10.3	12.7	18.5	11.6	24.3	24.9	4.4	7.8	12.4	10.6	27.0	16.1	20.0	47.0	3.9
9	Mg (mg/L)	10.7	8.4	9.5	11.7	11.9	12.4	11.1	11.9	11.7	12.3	11.8	12.2	11.9	12.1	8.5	11.1	12.0	13.6	11.7	12.3	12.6	11.6	11.2	8.2
10	Na (mg/L)		87.0	65.5	140.6	133.3	161.5	140.9	95.1		121.5	182.3	165.5	131.6	152.8	102.9	60.8	203.0	152.4	182.0	211.8	153.2	169.0	236.1	59.0
11	NH3-N (mg N/L)	1.39	0.40	0.10	0.29	4.49	0.88	0.74	0.15	0.40	0.05	0.06	4.85	11.26	4.26	0.08	0.18	0.10	0.05	0.09	16.23	11.26	0.38	0.10	0.17
12	NO2+NO3 (mg N/L)	0.62	0.06	0.39	0.23	0.57	1.79	0.23	0.34	0.06	0.01	0.10	0.60	0.55	0.37	0.27	0.33	0.25	0.12	0.22	0.71	0.68	0.34	0.27	
13	NO2-N (mgN/L)	0.15	0.00	0.04	0.04	0.07	0.48	0.04	0.13	0.01	0.00	0.01	0.05	0.09	0.06	0.08	0.15	0.03	0.00	0.05	0.06	0.06	0.05	0.02	
14	NO3-N (mgN/L)	0.48	0.06	0.34	0.20	0.50	1.30	0.19	0.21	0.05	0.01	0.09	0.55	0.46	0.31	0.20	0.19	0.22	0.12	0.17	0.65	0.62	0.29	0.25	0.22
15	o-PO4-P (mg P/L)						0.244	0.058	0.060						0.053	0.070	0.075						0.063	0.090	
16	P-Tot (mgP/L)	1.080	0.624	0.336	0.910	1.120	0.684	0.920	0.564	1.330	1.065	1.313	1.580	1.400	1.190	0.570	0.468	1.087	0.887	0.742	1.993	2.173	1.307	0.440	0.460
17	SiO2 (mg/L)	25.6	25.8	25.6	28.5	26.8	26.5	21.9	15.2	23.8	22.4	27.6	26.1	18.9	23.4	10.0	12.5	21.7	23.6	28.0	24.3	19.0	25.3	10.0	8.7
18	SO4 (mg/L)	13.5	23.9	6.3	24.6	43.9	27.1	18.4	22.1	17.2	28.5	14.3	43.4	43.8	26.9	39.4	23.3	46.3	32.5	15.4	65.0	58.6	22.5	34.4	13.0
	BIOLOGICAL/BACTERIOLOGICAL																								
1	BOD3-27 (mg/L)	10.3	4.2	5.5	6.5	15.2	21.1	4.1	6.8	8.0	6.0	19.5	12.5	8.5	6.5	3.1	2.0	12.7	33.0	37.3	18.0	27.3	12.0	5.3	1.8
2	DO (mg/L)			5.5	5.5	3.6	5.5	4.5	7.6		5.1	6.2	5.0	5.1	5.0	8.0	4.1			7.1	4.5	5.2	4.7		4.7
3	DO_SAT% (%)			70	69	45	68	55	90		62	72	59	60	61	96	40			81	56	63	57		53
	TRACE & TOXIC																								
1	Al (mg/L)	0.13	0.13	0.13	0.07	0.12	0.15	0.12	0.16	0.07	0.08	0.15	0.10	0.10	0.13	0.08	0.11	0.07	0.07	0.26	0.11	0.06	0.11	0.10	0.13
	CHEMICAL INDICES																								
1	HAR_Ca (mgCaCO3/L)	93	87	86	92	98	91	94	89	98	99	100	99	99	98	100	91	99	107	97	100	100	107	93	92
2	HAR_Total (mgCaCO3/L)	138	122	126	141	148	142	140	138	147	150	149	150	148	148	135	138	149	163	146	152	153	155	139	126
3	Na% (%)		50	48	65	63	60	64	54		62	71	66	64	64	57	48	74	65	71	67	66	67	72	50
4	RSC (-)	3.6	0.6	0.5	0.4	0.1	0.4	0.2	0.0	4.8	0.9	1.6	0.0	0.0	0.2	0.0	0.0	1.6	1.0	1.3	0.3	0.0	0.0	0.5	0.0
5	SAR (-)		3.3	2.5	5.1	4.8	5.8	5.1	3.5		4.3	6.5	5.9	4.7	5.5	3.9	2.3	7.3	5.2	6.6	7.5	5.4	5.9	8.8	2.3
	PESTICIDES																								

12.4 Analysis

A summary of statistical analysis on 6 parameters for Dhadar basin is given **Table-15**. Time series graphs with linear trend line are shown in **Annex-VI**. Number of samples found unfit for designated best use of drinking water, irrigation and support to aquatic life have also been determined and are given in the section dealing with inferences.

Table –15: Summary of Statistical Analysis for period from WY:2005 to WY:2013

Site Name & Code	Site Name	EC_GEN	pH_GEN	DO	BOD3-27	NH3-N
01 02 14 001	**Pingalwada**					
N		92	92	58	92	92
Average		1160.3	7.5	5.2	11.4	2.3
Median		1190.3	7.5	5.0	8.0	0.2
Standard Deviation		386.3	0.6	1.8	12.4	5.0
Minimum		115.0	5.7	1.8	0.5	0.1
Maximum		1958.0	9.3	10.5	55.0	16.9
CV		33.3	8.0	34.0	108.0	219.4
25th Percentile		886.0	7.0	4.0	3.0	0.1
75th Percentile		1416.8	7.8	6.5	13.5	1.4
Linear Trend Line						
Slope /year		-9.506	-0.120	-0.131	-0.860	0.150
Intercept		1198	7.92	5.825	14.81	1.699
R2 value		0.003	0.212	0.015	0.025	0.005

12.5 Inferences

The percentage of samples that were found to be beyond the tolerance limits prescribed for a designated best use of water for sites in Dhadar basin is as follows:

- **Pingalwada**

Table-16: Percentage of Samples found to be beyond the tolerance limits

S No	Charateristics / Parameter	Class of Water as per Designated Best Use		
		A	D	E
1	pH	5.4	5.4	5.4
2	Dissolved Oxygen	65.5	22.4	-
3	Bio-chemical Oxygen demand	81.5	-	-
4	Ammonia (as free Nitrogen)	-	29.3	-
5	Electrical Conductivity	-	-	0
6	Sodium Absorption Ratio	-	-	0

Time series plots for the above parameters for the only site in Dhadar basin, viz Pingalwada is given in **Annex-VI.** It is observed that pH generally shows a decreasing trend. DO has also decreased over the years with frequent occurrence of troughs on the lower side. BOD values also show decreasing trend but at the same time, frequent spikes of higher values are seen. Free ammonia (as Nitrogen) is found to have shown very high value-spikes during WY:2009-10 and WY:2010-11. However, no spikes have been seen during the water year under report. Very high percentages of samples have failed in BOD and NH3-N, as may be seen in the subsequent para, which shows very high degree of pollution of organic as well as sewage related origins.

13.0 Kim Basin

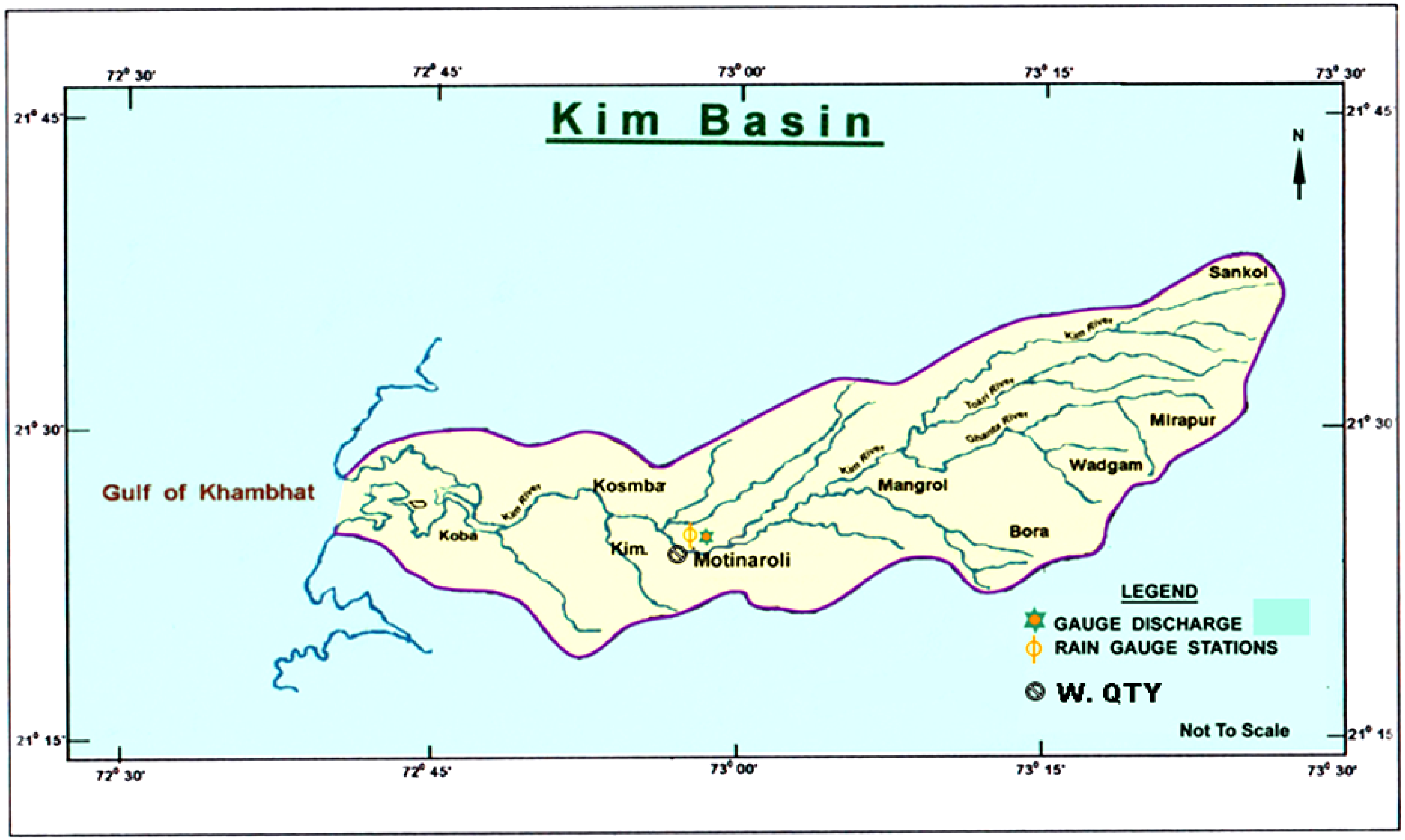
13.1 Basin Description

Kim River is one of the west flowing rivers in Gujarat state. Its basin map is enclosed. It originates from Satpura Hill ranges in Bharuch district and falls in Gulf of Khambhat near village Kantiajal of Hansot taluka of Bharuch district after flowing south west direction for a length of 107 km. The river Kim, for the first 80 km. of its course passes through Rajpipala and Valia talukas. For the remaining the river flows in a western direction between Ankleshwar and Olpad taluka of Surat District. The main tributaries of Kim river is Ghanta river and Tokri river. The river basin extends over an area of 1286 Sq.km. of which the catchment area up to the site is 804 sq km. The river basin lies between21° 19’ to 21° 38’ North latitude and 72° 40’ to 73° 27’ East longitude.

13.2 Availability of W.Q. Data (in SWDES format)

There is only one WQ monitoring station at Moti Naroli in the basin where availability of data is as follows:

Sl. No.	Site name	River/Tributary	Period of sample collection	No. of samples analysed
1	Moti Naroli	Kim	2005-06 to 2012-13	89


Kim Basin
N
72° 30'
72° 45'
73° 00'
73° 15'
73° 30'
21° 45'
21° 30'
21° 15'
Gulf of Khambhat
Sankol
Mirapur
Wadgam
Mangrol
Bora
Kosmba
Kim.
Motinaroli
Koba
LEGEND
GAUGE DISCHARGE
RAIN GAUGE STATIONS
W. QTY
Not To Scale

13.3 Water Quality Data

HISTORY SHEET

		Water Year	**: 2012-2013**
Site	**: Kim at Motinaroli**	**Code**	**: 01 02 16 001**
State	: Gujarat	District	Surat
Basin	: Narmada	Independent River	: Kim
Tributary	: -	Sub Tributary	: -
Sub-Sub Tributary	: -	Local River	:
Division	: Tapi Dvision, Surat	Sub-Division	: LNSD, Bharuch
Drainage Area	: 804 Sq. Km.	Bank	: Right
Latitude	: 21°24'16" N	Longitude	: 72°57'48" E

	Opening Date	Closing Date
Gauge	: 17-10-1990	
Discharge	: 17-10-1990	
Sediment	:	
Water Quality	: 01-07-1991	

Kim at Motinaroli

Water Quality Datasheet for the period : 2012-2013

Station Name : Motinaroli (01 02 16 001) **Division : Tapi Dvision, Surat**

Local River : Kim **River Water Analysis** **Sub-Division : LNSD Bharuch**

S.No	Parameters	01-06-2012	02-07-2012	01-08-2012	01-09-2012	01-10-2012	01-11-2012	01-12-2012	01-01-2013	01-02-2013	01-03-2013	01-04-2013	01-05-2013
	PHYSICAL												
1	Q (cumec)	* 0.726	1.539	7.253	# 15.20	# 3.771	3.149	3.084	* 0.201	* 1.161	1.316	0.000	0.000
2	Colour_Cod (-)	Clear	Clear	Light Brown	Light Brown	Light Brown	Clear	Clear			Clear		Clear
3	EC_FLD (µmho/cm)	650	200	700	700		600	500					950
4	EC_GEN (µmho/cm)	573	180	640	637	710	630	560			616		600
5	Odour_Code (-)	odour free	odour free	odour free	odour free	odour free	odour free	odour free			odour free		odour free
6	pH_FLD (pH units)	6.0	8.0	8.0	8.0	8.0	8.0	8.0			7.8		8.0
7	pH_GEN (pH units)	7.2	7.8	8.6	6.9	8.2	7.4	8.4			8.0		7.8
8	SS (mg/L)	180	80	210	180	250	200	200			210		220
9	TDS (mg/L)	372	116	400	417	508	409	400			408		420
10	Temp (deg C)	31.0	29.0	28.0	30.0	29.0	22.0	19.0			24.0		31.0
11	TS (mg/L)	552	196	610	597	758	609	600			618		640
12	Turb (NTU)	3.0	1.0	2.0	4.0	3.0	2.0	1.0			1.0		1.0
	CHEMICAL												
1	Alk-Phen (mgCaCO3/L)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	P	P	0.0	P	0.0
2	ALK-TOT (mgCaCO3/L)	147	90	99	85	90	90	80	O	O	105	O	75
3	Ca (mg/L)	36	30	34	34	34	36	38	O	O	34	O	34
4	Cl (mg/L)	464.0	88.0	76.0	75.0	136.0	63.8	107.0	L	L	70.2	L	90.0
5	CO3 (mg/L)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	I	I	0.0	I	0.0
6	F (mg/L)	0.30	0.30	0.16	0.20	0.30	0.30	0.30	N	N	0.10	N	0.20
7	HCO3 (mg/L)	179	110	121	104	110	110	98	G	G	128	G	92
8	K (mg/L)	24.0	0.4	2.8	2.4	4.2	2.6	4.0			2.4		3.0
9	Mg (mg/L)	9.7	9.7	9.0	8.5	10.4	8.4	9.2			8.5		7.2
10	Na (mg/L)	319.4	60.0	50.0	45.0	78.6	34.4	62.6	C	C	50.2	C	50.0
11	NH3-N (mg N/L)	0.16	0.14	0.14	0.18	0.16	0.18	0.16	O	O	0.12	O	0.12
12	NO2+NO3 (mg N/L)	0.22	0.14	0.14	0.22	0.24	0.44	0.20	N	N		N	
13	NO2-N (mgN/L)	0.10	0.04	0.02	0.10	0.08	0.18	0.05	D	D		D	
14	NO3-N (mgN/L)	0.12	0.10	0.12	0.12	0.16	0.26	0.15	I	I	0.16	I	0.16
15	o-PO4-P (mg P/L)	0.100		0.050	0.080	0.050	0.060	0.100	T	T		T	
16	P-Tot (mgP/L)	0.360	0.200	0.200	0.240	0.360	0.400	1.300	I	I	0.210	I	0.260
17	SiO2 (mg/L)	8.0	10.0	8.0	20.0	10.0	20.0	10.0	O	O	10.0	O	8.0
18	SO4 (mg/L)	15.0	8.2	8.0	8.6	19.6	15.0	22.0	N	N	14.0	N	10.0
	BIOLOGICAL/BACTERIOLOGICAL												
1	BOD3-27 (mg/L)	0.6	0.6	0.8	2.2	0.8	1.0	1.8			1.3		1.2
2	DO (mg/L)												6.1
3	DO_SAT% (%)												82
	TRACE & TOXIC												
1	Al (mg/L)	0.14	0.16	0.08	0.08	0.14	0.08	0.12			0.14		0.16
	CHEMICAL INDICES												
1	HAR_Ca (mgCaCO3/L)	90	75	85	85	85	90	95			85		85
2	HAR_Total (mgCaCO3/L)	130	115	123	120	128	125	133			120		115
3	Na% (%)	81	53	46	44	56	37	50			47		48
4	RSC (-)	0.3	0.0	0.0	0.0	0.0	0.0	0.0			0.0		0.0
5	SAR (-)	12.2	2.4	2.0	1.8	3.0	1.3	2.4			2.0		2.0
	PESTICIDES												
	REMARKS												

Note. : # Discarded and estimated discharge, * Estimated discharge

Pesticides , Trace and Toxic element analysis

Station Name : Kim at Motinaroli (01 02 16 001) **Division : Tapi Division, Surat**

Local River : Kim **Sub Divi. : LNSD, Bharuch**

Sl. No.	Parameter ID			Date of sampling												
a	Trace and Toxic	Parameter Name	unit	01.04.2006	02.04.2007	02.04.2008	01.04.2009	01.04.2010	01.04.2011	01.09.2011	01.02.2012	02.04.2012	28.05.2012	01.10.2012	01.03.2013	01.04.2013
				Analysis done by WQL-III Lab, UGD, Hyderabad	Analysis done by WQL-III Lab, UGD, Hyderabad	Analysis done by WQL-III Lab, UGD, Hyderabad	Analysis done by WQL-III Lab, UGD, Hyderabad	Analysis done by WQL-III Lab, UGD, Hyderabad	Analysis done by WQL-III Lab, UGD, Hyderabad	Analysis done by NRWQL, New Delhi	Analysis done by NRWQL, New Delhi	Analysis done by WQL-III Lab, UGD, Hyderabad	Analysis done by NRWQL, New Delhi	Analysis done by NRWQL, New Delhi	Analysis done by NRWQL, New Delhi	Analysis done by WQL-III Lab, UGD, Hyderabad
1	As	Arsenic	microgram / l	-	-	-	-	1.30	-	1.23		1.25	0.46	15.9	8.63	
2	Cd	Cadmium	microgram / l	-	-	0.95	2.34	0.00	0.05	0.015		0.52	0.03	0.13	0.12	
3	Cr	Chromium	microgram / l	-	-	0	0	0	0	3.73		0	17.48	4.98	0.59	
4	Cu	Copper	microgram / l	-	-	-	-	-	-	10.04		-	2.95	5.07	7.03	
5	Hg	Mercury	microgram / l	-	-	0	-	-	-	0.53		0.252	-	-	0.46	
6	Ni	Nickel	microgram / l	-	-	11.79	0.00	1.61	1.98	-	P	2.806	1.60	8.96	13.24	P
7	Pb	Lead	microgram / l	-	-	20.81	37.89	0.00	0.00	0.57	O	23.77	5.12	2.84	1.32	O
8	Zn	Zinc	microgram / l	-	-	32.03	16.67	7.29	27.56	11.10	O	16.55	39.0	18.87	9.30	O
b	**Pesticides**		microgram / l								L					L
1	Aldrin	Aldrin	microgram / l	-	-	0	0.0057	0.0044	0	-	I	0.001	-	-	-	I
2	Alpha- BHC	Alpha- BHC	microgram / l	-	-	0	0.0022	0.2075	0.655	-	N	0.007	-	-	-	N
3	Beta-BHC	Beta-BHC	microgram / l	-	-	-	-	-	-	-	G	-	-	-	-	G
4	Gama- BHC	gamma-BHC (Benzene HexaChloride)	microgram / l	-	-	-	-	-	-	-	C	-	-	-	-	C
5	D- BHC	D- BHC	microgram / l	-	-	-	-	-	-	-	O	-	-	-	-	O
6	DDT	DDT	microgram / l	-	-	0	0.0009	0.0034	0	-	N	0.0015	-	-	-	N
7	Dieldrin	Dieldrin	microgram / l	-	-	0	0.0008	0.0028	0	-	D	0	-	-	-	D
8	Endos-I	Endosulphan I	microgram / l	-	-	0	0.0051	0.0509	0.118	-	I	0.0314	-	-	-	I
9	Endos-II	Endosulphan II	microgram / l	-	-	-	-	-	-	-	T	-	-	-	-	T
10	Endos-s	Endosulphan s	microgram / l	-	-	-	-	-	-	-	I	-	-	-	-	I
											O					O
											N					N

WQL - III Lab at UGD, Hyderabad conducts the analysis of Trace and Toxic element and Pesticides

NRWQ Lab at HOC, Noida, New Delhi conducts the analysis of Trace and Toxic element only, which started from September 2011 onwords

Water Quality Summary for the period : 2012-2013

Station Name : Motinaroli (01 02 16 001) **Division : Tapi Dvision, Surat**

Local River : Kim **Sub-Division : LNSD Bharuch**

River Water Summary

S.No	Parameters	Number of Observations	Maximum	Minimum	Mean
	PHYSICAL				
1	Q (cumec)	365	47.64	0.00	2.756
2	EC_FLD (µmho/cm)	7	950	200	614
3	EC_GEN (µmho/cm)	9	710	180	572
4	pH_FLD (pH units)	9	8.0	6.0	7.8
5	pH_GEN (pH units)	9	8.6	6.9	7.8
6	SS (mg/L)	9	250	80	192
7	TDS (mg/L)	9	508	116	383
8	Temp (deg C)	9	31.0	19.0	27
9	TS (mg/L)	9	758	196	576
10	Turb (NTU)	9	4.0	1.0	2
	CHEMICAL				
1	Alk-Phen (mgCaCO3/L)	9	0.0	0.0	0
2	ALK-TOT (mgCaCO3/L)	9	147	75	96
3	Ca (mg/L)	9	38	30	34
4	Cl (mg/L)	9	464.0	63.8	130
5	CO3 (mg/L)	9	0.0	0.0	0
6	F (mg/L)	9	0.30	0.10	0.24
7	HCO3 (mg/L)	9	179	92	117
8	K (mg/L)	9	24.0	0.4	5.1
9	Mg (mg/L)	9	10.4	7.2	9
10	Na (mg/L)	9	319.4	34.4	83.4
11	NH3-N (mg N/L)	9	0.18	0.12	0.15
12	NO2+NO3 (mg N/L)	7	0.44	0.14	0.23
13	NO2-N (mgN/L)	7	0.18	0.02	0.08
14	NO3-N (mgN/L)	9	0.26	0.10	0.15
15	o-PO4-P (mg P/L)	6	0.100	0.050	0.073
16	P-Tot (mgP/L)	9	1.300	0.200	0.392
17	SiO2 (mg/L)	9	20.0	8.0	11.6
18	SO4 (mg/L)	9	22.0	8.0	13.4
	BIOLOGICAL/BACTERIOLOGICAL				
1	BOD3-27 (mg/L)	9	2.2	0.6	1.1
2	DO (mg/L)	1	6.1	6.1	6.1
3	DO_SAT% (%)	1	82	82	82
	TRACE & TOXIC				
1	Al (mg/L)	9	0.16	0.08	0.12
	CHEMICAL INDICES				
1	HAR_Ca (mgCaCO3/L)	9	95	75	86
2	HAR_Total (mgCaCO3/L)	9	133	115	123
3	Na% (%)	9	81	37	51
4	RSC (-)	9	0.3	0.0	0
5	SAR (-)	9	12.2	1.3	3.2
	PESTICIDES				

Water Quality Seasonal Average for the period: 2005-2013

Station Name : Motinaroli (01 02 16 001) **Division : Tapi Dvision, Surat**

Local River : Kim **River Water** **Sub-Division : LNSD Bharuch**

S.No	Parameters	Flood								Winter								Summer							
		Jun - Oct								Nov - Feb								Mar - May							
		2005	2006	2007	2008	2009	2010	2011	2012	2005-2006	2006-2007	2007-2008	2008-2009	2009-2010	2010-2011	2011-2012	2012-2013	2006	2007	2008	2009	2010	2011	2012	2013
	PHYSICAL																								
1	Q (cumec)	100.0	110.7	186.8	11.14	7.799	9.513	11.94	5.698	3.795	3.713	3.124	2.836	2.492	2.968	1.925	1.899	4.529	3.083	3.384	3.184	2.051	1.727	0.851	0.439
2	EC_FLD (µmho/cm)			443	699	653	765	715	563		693	921	777	645	673	726	550		575	561	567	493	717	600	950
3	EC_GEN (µmho/cm)	520	445	480	837	812	790	673	548	882	917	1167	1214	1159	690	765	595	539	790	662	611	632	755	666	608
4	pH_FLD (pH units)			8.0	7.4	7.0	7.0	7.5	7.6		7.9	8.2	7.0	6.9	7.5	8.0	8.0	7.0	8.1	7.4	7.3	7.0	6.7	6.5	7.9
5	pH_GEN (pH units)	8.3	8.0	8.0	7.7	7.9	7.8	7.7	7.7	8.2	8.0	8.2	7.6	7.8	7.9	7.5	7.9	8.0	8.1	7.6	7.8	7.9	7.6	7.8	7.9
6	SS (mg/L)	78	127	172	253	241	205	228	180	84	200	232	337	412	230	245	200	109	205	200	221	228	297	210	215
7	TDS (mg/L)	374	304	311	560	517	534	467	363	733	650	777	758	715	453	488	405	440	485	437	424	422	489	540	414
8	Temp (deg C)	30.9	34.5	32.4	29.2	29.2	29.6	30.3	29.4	24.1	31.3	21.5	22.8	22.5	25.0	27.0	20.5	30.7	29.5	26.0	28.0	26.3	27.3	28.5	27.5
9	TS (mg/L)						739	695	543						683	733	605						872	641	629
10	Turb (NTU)	9.3	20.5	16.3	1.8	4.0	0.6	2.3	2.6	1.0	1.0	1.0	1.3	1.0	0.3	1.5	1.5	1.0	1.0	1.0	2.3	1.0	0.6	1.0	1.0
	CHEMICAL																								
1	Alk-Phen (mgCaCO3/L)	2.7	2.0	1.0	1.0	1.0	0.0	0.0	0.0	2.1	0.0	3.7	0.0	0.0	0.0	0.0	0.0	0.0	1.7	0.0	0.0	0.0	0.0	4.2	0.0
2	ALK-TOT (mgCaCO3/L)	181	103	117	129	110	137	111	102	226	136	181	125	136	103	85	85	174	122	123	120	117	100	134	90
3	Ca (mg/L)	35	32	31	36	37	39	34	34	36	38	38	38	37	37	36	37	37	34	34	37	37	37	37	34
4	Cl (mg/L)	91.1	64.9	51.9	111.8	117.0	257.2	108.6	167.8	154.7	132.2	149.6	243.3	171.7	170.4	132.8	85.4	85.3	121.3	68.0	194.6	145.5	190.6	214.5	80.1
5	CO3 (mg/L)	3.2	2.4	1.2	1.2	1.2	0.0	0.0	0.0	2.5	0.0	4.5	0.0	0.0	0.0	0.0	0.0	0.0	2.0	0.0	0.0	0.0	0.0	5.0	0.0
6	F (mg/L)	0.21	0.19	0.12	0.09	0.28	0.20	0.14	0.25	0.10	0.05	0.06	0.26	0.29	0.22	0.29	0.30	0.05	0.07	0.06	0.37	0.37	0.27	0.15	0.15
7	HCO3 (mg/L)	215	121	140	133	132	167	135	125	271	166	211	152	166	125	104	104	212	144	151	146	142	122	153	110
8	K (mg/L)		0.8	3.1	2.8	4.2	9.1	10.1	6.8		2.0	3.4	10.0	7.4	11.4	12.4	3.3	1.0	4.7	1.0	1.7	10.2	18.2	19.8	2.7
9	Mg (mg/L)	9.9	7.6	7.2	9.5	11.3	11.4	10.3	9.5	10.4	11.2	10.9	11.9	10.4	11.3	7.7	8.8	11.0	9.7	8.8	11.7	11.7	10.4	11.5	7.8
10	Na (mg/L)		46.6	36.2	74.9	76.1	178.4	72.9	110.6		93.4	109.6	150.8	114.3	99.3	82.1	48.5	73.1	83.0	50.5	126.0	95.8	110.4	150.8	50.1
11	NH3-N (mg N/L)	0.53	0.32	0.13	0.26	0.56	0.41	0.23	0.16	0.20	0.10	0.10	0.08	0.07	0.07	0.11	0.17	0.05	0.08	0.08	0.58	0.07	0.08	0.15	0.12
12	NO2+NO3 (mg N/L)	0.56	0.05	0.29	0.14	0.29	0.24	0.15	0.19	0.17	0.02	0.14	0.28	0.30	0.22	0.23	0.32	0.06	0.03	0.16	0.40	0.33	0.22	0.23	
13	NO2-N (mgN/L)	0.08	0.00	0.04	0.03	0.04	0.03	0.03	0.07	0.02	0.00	0.01	0.04	0.03	0.05	0.07	0.12	0.00	0.00	0.03	0.03	0.05	0.06	0.01	
14	NO3-N (mgN/L)	0.48	0.05	0.25	0.11	0.25	0.21	0.12	0.12	0.14	0.02	0.13	0.24	0.27	0.16	0.16	0.20	0.06	0.03	0.13	0.37	0.27	0.16	0.22	0.16
15	o-PO4-P (mg P/L)						0.086	0.057	0.070						0.067	0.055	0.080						0.060	0.080	
16	P-Tot (mgP/L)	0.305	0.162	0.216	0.248	0.484	0.376	0.275	0.272	0.132	0.279	0.674	0.370	0.525	0.295	0.990	0.850	0.087	0.074	0.096	0.745	0.353	0.700	0.810	0.235
17	SiO2 (mg/L)	22.4	23.3	23.4	26.2	24.6	23.6	11.8	11.2	19.3	21.9	26.1	24.2	15.0	17.6	12.8	15.0	18.4	21.8	26.1	20.9	14.6	20.4	12.0	9.0
18	SO4 (mg/L)	30.1	21.7	6.6	17.7	27.1	13.4	19.4	11.9	25.3	37.6	8.4	20.2	26.5	11.4	21.1	18.5	8.7	15.7	6.4	27.1	23.0	13.5	21.3	12.0
	BIOLOGICAL/BACTERIOLOGICAL																								
1	BOD3-27 (mg/L)	2.1	0.6	2.3	3.6	3.6	3.7	1.9	1.0	3.3	2.9	4.5	10.8	2.7	4.3	9.5	1.4	0.6	4.7	0.7	1.5	1.1	3.9	1.1	1.3
2	DO (mg/L)			9.3	8.5						7.0	8.0	8.2	6.7	7.5				6.8	7.8	7.5	7.2			6.1
3	DO_SAT% (%)			129	110						95	93	96	76	84				88	96	97	89			82
	TRACE & TOXIC																								
1	Al (mg/L)	0.09	0.13	0.08	0.06	0.08	0.09	0.10	0.12	0.03	0.03	0.07	0.07	0.03	0.14	0.08	0.10	0.04	0.05	0.09	0.05	0.03	0.08	0.09	0.15
	CHEMICAL INDICES																								
1	HAR_Ca (mgCaCO3/L)	88	80	78	91	92	96	85	84	89	95	95	94	92	92	90	93	92	86	86	93	92	92	91	85
2	HAR_Total (mgCaCO3/L)	129	112	108	130	139	144	128	123	133	142	141	143	136	139	122	129	138	126	123	142	140	136	139	118
3	Na% (%)		38	37	51	53	68	52	56		57	58	67	61	58	56	43	55	57	47	65	58	60	67	47
4	RSC (-)	1.1	0.0	0.3	0.1	0.0	0.3	0.0	0.1	1.9	0.1	0.8	0.1	0.3	0.0	0.0	0.0	0.7	0.0	0.1	0.0	0.0	0.0	0.1	0.0
5	SAR (-)		1.8	1.5	2.8	2.8	6.7	2.9	4.3		3.4	3.9	5.5	4.3	3.7	3.2	1.9	2.8	3.2	2.0	4.6	3.5	4.1	5.6	2.0
	PESTICIDES																								

13.4 Analysis

A summary of statistical analysis on 6 parameters for Kim basin is given **Table-17**. Time series graphs with linear trend line are shown in **Annex-VII**. Number of samples found unfit for designated best use of drinking water, irrigation and support to aquatic life have also been determined and are given in the section dealing with inferences.

Table –17: Summary of Statistical Analysis for period from WY:2005 to WY:2013

Site Name & Code	Site Name	EC_GEN	pH_GEN	DO	BOD3-27	NH3-N
01 02 16 001	**Moti Naroli**					
N		89	89	34	89	89
Average		743.8	7.9	7.8	3.0	0.2
Median		660.0	7.9	7.7	1.7	0.1
Standard Deviation		353.8	0.5	1.7	4.2	0.3
Minimum		63.0	5.9	4.4	0.2	0.1
Maximum		2226.0	9.0	11.4	32.0	1.6
CV		47.6	6.0	21.5	139.3	139.3
25th Percentile		582.0	7.6	6.9	0.6	0.1
75th Percentile		827.0	8.1	8.9	4.0	0.2
Linear Trend Line						
Slope /year		1.258	-0.061	-0.209	0.059	-0.014
Intercept		739.1	8.11	8.44	2.814	0.266
R2 value		0.000	0.085	0.031	0.001	0.010

12.5 Inferences

The percentage of samples that were found to be beyond the tolerance limits prescribed for a designated best use of water for sites in Kim basin is as follows:

- **Moti Naroli**

Table-18: Percentage of Samples found to be beyond the tolerance limits

S No	Charateristics / Parameter	Class of Water as per Designated Best Use		
		A	D	E
1	pH	6.7	6.7	5.6
2	Dissolved Oxygen	14.7	0	-
3	Bio-chemical Oxygen demand	38.2	-	-
4	Ammonia (as free Nitrogen)	-	2.2	-
5	Electrical Conductivity	-	-	0
6	Sodium Absorption Ratio	-	-	0

Time series plots for the above parameters for the only site in Kim basin, viz Moti Naroli is given in **Annex-VII.** It is observed that pH and DO show a decreasing trend. BOD and free ammonia (as Nitrogen) are both found to show cyclical trend with a peak and its dissipation followed by another peak, thus, indicating pollution by point sources. These also indicate pollution of organic and sewage related origins.

Annex-I

Details of parameters tested at different Laboratories

Parameter ID	Parameter Name	Category 1	Category 2	Unit	LWL	UWL	Min	Max	Decimal
Level I									
FLD Field Determinations									
Colour_Cod	Colour	Physical	Other	-					
DO	Dissolved oxygen	Biological	Other	mg/L	0	15	0	30	1
EC_FLD	Electrical Conductivity_Field	Physical	Other	µmho/cm	50	5000	5	10000	0
Odour_Code	Odour	Chemical	Other	-					
pH_FLD	pH_Field	Chemical	Other	pH units	5.5	9	2	14	1
Secchi	Secchi Depth	Physical	Other	m	0.01	50	0.005	100	2
Temp	Temperature	Physical	Other	deg C	10	40	0.1	50	1
General parameters									
DO_SAT%	Dissolved Oxygen Saturation %	Chemical	Other	%	0	150	0	300	0
Level II									
GEN General parameters									
EC_GEN	Elecrtical Conductivity	Physical	Other	µmho/cm	50	5000	5	10000	0
pH_GEN	pH	Chemical	Other	pH units	5.5	9	2	14	1
SS	Solids, Suspended	Physical	Solids	mg/L	5	2000	0	3000	0
TDS	Solids, Total Dissolved	Physical	Solids	mg/L	50	5000	5	30000	0
TS	Solids, Total	Physical	Solids	mg/L	50	5000	10	30000	0
Turb	Turbidity	Physical	Other	NTU	1	2000	0.1	10000	1
Nutrients									
NH3-N	Nitrogen, ammonia	Chemical	Nutrients	mg N/L	0.05	100	0.05	1000	2
NO2+NO3	Nitrogen, Total Oxidised (NO2+NO3)	Chemical	Nutrients	mg N/L	0.05	1000	0.05	2000	2
NO2-N	Nitrogen, Nitrite	Chemical	Nutrients	mgN/L	0	0.5	0	10	2
NO3-N	Nitrogen, Nitrate	Chemical	Nutrients	mgN/L	0.05	1000	0.01	2000	2
o-PO4-P	Phosphorus, ortho-phosphate	Chemical	Nutrients	mg P/L	0.05	5	0.01	50	3
Org-N	Nitrogen, Organic	Chemical	Organic	mgN/L	0.1	200	0.01	1000	1
P-Tot	Phosphorus, total	Chemical	Nutrients	mgP/L	0.01	10	0.001	100	3
Organic Matter									
BOD3-27	Biochemical Oxygen demand (3days)	Chemical	Organic	mg/L	0.5	200	0.1	5000	1

COD	Chemical Oxygen Demand	Chemical	Organic	mg/L	5	5000	1	10000	1
Alkallnity									
Alk-Phen	Alkalinity, phenolphthalein	Chemical	Salt	mgCaCO3/L	0	500	0	3000	1
ALK-TOT	Alkalinity, total	Chemical	Salt	mgCaCO3/L	10	1000	5	5000	0
Hardness									
HAR_Ca	Hardness, Calcium	Chemical	Salt	mgCaCO3/L	10	1000	0.1	2000	0
HAR_Total	Hardness , Total	Chemical	Salt	mgCaCO3/L	10	1000	0.1	2000	0
Major Ions									
Ca	Calcium	Chemical	Salt	mg/L	1	1000	0.5	1000	0
Cl	Chloride	Chemical	Salt	mg/L	2	1000	0.5	20000	1
CO3	Carbonate	Chemical	Salt	mg/L	0	200	0	1000	1
HCO3	Bicarbonate	Chemical	Salt	mg/L	10	1000	0.1	2000	0
K	Potassium	Chemical	Salt	mg/L	0.1	500	0.1	1000	1
Mg	Magnesium	Chemical	Salt	mg/L	5	500	0.1	1000	1
Na	Sodium	Chemical	Salt	mg/L	10	2000	1	20000	1
Na%	Percent Sodium	Chemical	Salt	%	1	80	0.1	100	
RSC	Residual Sodium Carbonate	Chemical	Salt	-	1	100	1	100	1
SO4	Sulphate	Chemical	Salt	mg/L	10	500	1	3000	1
Other inorganics									
Al	Aluminium	Chemical	TraceMetal	mg/L	0.05	50	0.01	100	2
B	Boron	Chemical	Other	mg/L	0.1	10	0.001	9	2
F	Fluoride	Chemical	Other	mg/L	0.05	5	0.05	100	2
Fe	Iron	Chemical	TraceMetal	mg/L	0.05	10	0.01	1000	1
SAR	Sodium Adsorption Ratio	Chemical	Salt	-	0.5	40	1	50	1
SiO2	Silicate	Chemical	Nutrients	mg/L	0.1	10	0.02	100	1
Coliforms									
FCol-MPN	Coliforms, Faecal	Biological	Bacteria	MPN/100mL	0	1000000	0	9E+07	0
Tcol-MPN	Coliforms, Total	Biological	Bacteria	MPN/100mL	0	1000000	0	9E+07	0
Biological									
Chlf-a	ChlorophyII-a	Biological	Organic	µg/L	5	500	1	1000	1
Level II+									
Organic Matter									
TOC	Total organic carbon	Chemical	Organic	mg/L	10	1000	0.1	10000	1
Other inorganics									
CN	Cyanide	Chemical	Other	µg/L	0	500	0	2000	2
Trace and Toxic									
Ag	Silver	Chemical	Trace Metal	µg/L	0.1	100	0.1	1000	2

As	Arsenic	Chemical	Trace Metal	µg/L	1	1000	1	1000	2
Cd	Cadmium	Chemical	Trace Metal	µg/L	0.01	500	0.01	1000	2
Cr	Chromium	Chemical	Trace Metal	µg/L	2	500	2	1000	2
Cu	Copper	Chemical	Trace Metal	µg/L	1	500	1	1000	2
Hg	Mercury	Chemical	Trace Metal	µg/L	0.001	10	0.001	1000	2
Mn	Manganese	Chemical	Trace Metal	mg/L	0.1	0.01	0.01	100	2
Ni	Nickel	Chemical	Trace Metal	µg/L	1	1000	1	2000	2
Pb	Lead	Chemical	Trace Metal	µg/L	1	1000	1	1000	2
Se	Selenium	Chemical	Trace Metal	µg/L	2	100	2	1000	2
Zn	Zinc	Chemical	Trace Metal	µg/L	10	5000	0.1	10000	2
Organic Micro Pollutants									
PAH	Fluoranthene	Chemical	Trace Organic	µg/L	1	100	1	1000	3
PCB	PCB-1242	Chemical	Trace Organic	µg/L	1	1000	0.1	1000	3
Phenols	Total phenols	Chemical	Trace Organic	µg/L	0.1	1000	0	10000	2
Pesticides			Trace Organic						
24D	2,4-D	Chemical	Trace Organic	µg/L	0.1	1000	0.1	1000	3
Aldrin	Aldrin	Chemical	Trace Organic	µg/L	0.01	500	0.01	1000	3
BHC	gamma-BHC (Benzene HexaChloride)	Chemical	Trace Organic	µg/L	0.1	1000	0.1	2000	3
DDT	DDT	Chemical	Trace Organic	µg/L	0.1	1000	0.1	2000	3
Dieldrin	Dieldrin	Chemical	Trace Organic	µg/L	0.01	1000	0.01	5000	3
Endos	Endosulphan	Chemical	Trace Organic	µg/L	0.1	1000	0.1	5000	3

Annex-II

Statistical parameters for all the sites for 11 parameters

Site Code	Site Name	EC_GEN	TDS	pH_GEN	Temp	DO	BOD3-27	HAR_Total	HCO3	Na	Cl	NH3-N
01 02 13 001	Mataji											
N		48	48	48	48	48	48	48	48	48	48	36
Average		349.2	224.5	8.1	26.3	8.4	1.7	129.4	131.1	20.4	28.8	0.2
Median		345.0	222.0	8.2	27.8	8.1	1.7	122.6	124.5	20.3	28.0	0.1
Standard Deviation		84.2	53.7	0.3	4.1	1.5	0.8	32.3	34.4	7.1	9.6	0.2
Minimum		130.0	82.0	7.2	17.3	5.4	0.2	82.4	78.0	6.0	10.0	0.1
Maximum		510.0	324.0	8.5	32.0	11.3	3.5	188.8	195.0	40.4	62.0	1.1
CV		24.1	23.9	4.2	15.4	17.4	46.1	24.9	26.2	34.8	33.3	102.5
25th Percentile		302.8	193.0	7.8	24.2	7.2	1.2	104.6	107.0	16.0	24.0	0.1
75th Percentile		415.5	262.5	8.3	29.0	9.7	2.3	157.8	158.5	24.0	34.0	0.3
Linear Trend Line												
Slope /year		9.198	4.280	-0.029	-0.235	0.122	0.149	9.938	10.16	0.999	1.225	-0.021
Intercept		308.9	205.8	8.19	27.33	7.827	1.033	85.98	86.74	16.06	23.44	0.337
R2 value		0.068	0.036	0.041	0.019	0.040	0.211	0.543	0.501	0.113	0.094	0.029
01 02 13 005	Rangeli											
N		40	40	40	41	41	40	40	40	40	40	28
Average		519.6	335.8	8.1	24.9	7.9	1.6	162.8	174.0	37.6	51.8	0.2
Median		537.0	338.0	8.2	26.0	8.0	1.6	156.8	171.0	35.3	48.0	0.1
Standard Deviation		110.6	66.4	0.3	4.3	2.0	0.9	40.1	45.6	14.2	18.6	0.2
Minimum		240.0	164.0	7.3	16.0	3.9	0.1	88.5	93.0	11.1	18.0	0.1
Maximum		811.0	526.0	8.6	33.0	14.0	3.6	253.0	283.0	71.4	94.0	0.8
CV		21.3	19.8	4.0	17.1	25.5	59.5	24.6	26.2	37.7	35.9	97.4
25th Percentile		483.3	302.5	7.9	22.0	6.5	0.7	139.0	142.0	28.0	40.0	0.1
75th Percentile		564.3	360.0	8.4	28.0	9.0	2.1	189.0	205.0	46.9	63.0	0.4
Linear Trend Line												
Slope /year		6.184	2.418	-0.035	-0.544	0.157	0.105	12.54	13.49	0.057	0.637	0.021
Intercept		495.9	326.5	8.26	26.96	7.28	1.193	115.07	122.6	37.41	49.39	0.142
R2 value		0.020	0.009	0.074	0.105	0.039	0.079	0.632	0.566	0.000	0.008	0.030

Site Code	Site Name	EC_GEN	TDS	pH_GEN	Temp	DO	BOD3-27	HAR_Total	HCO3	Na	Cl	NH3-N
01 02 13 006	Padardibadi											
N		77	77	77	77	77	77	77	77	77	77	59
Average		471.3	299.0	8.1	25.9	8.1	1.6	151.4	157.9	30.9	42.6	0.3
Median		483.0	302.0	8.2	25.0	8.0	1.5	144.6	151.0	30.0	40.0	0.2
Standard Deviation		82.2	50.8	0.3	4.0	1.7	0.8	31.7	35.0	9.7	11.9	0.2
Minimum		221.0	154.0	7.3	15.0	4.6	0.2	72.2	81.0	7.0	10.0	0.1
Maximum		622.0	402.0	8.8	34.2	14.0	3.4	224.8	244.0	51.3	66.0	0.8
CV		17.4	17.0	3.8	15.4	21.6	52.3	20.9	22.1	31.4	27.9	76.4
25th Percentile		437.0	274.0	7.9	23.0	7.0	0.8	131.6	132.0	24.8	36.0	0.1
75th Percentile		510.0	328.0	8.4	29.2	9.1	2.1	172.8	190.0	38.6	50.0	0.4
Linear Trend Line												
Slope /year		-4.408	-4.717	-0.003	-0.470	0.146	0.092	9.241	9.859	-0.675	-0.507	0.046
Intercept		488.2	317.1	8.15	27.69	7.54	1.208	115.9	120.0	33.53	44.54	0.043
R2 value		0.017	0.052	0.000	0.084	0.042	0.077	0.515	0.482	0.029	0.011	0.277
01 02 13 012	Khanpur											
N		94	94	94	93	94	94	94	94	94	94	74
Average		483.0	306.8	8.2	25.1	7.4	1.4	154.3	158.8	32.8	45.4	0.2
Median		476.5	302.0	8.2	26.5	7.5	1.4	150.7	156.0	30.0	42.0	0.2
Standard Deviation		114.0	72.2	0.4	4.9	1.6	0.7	39.1	43.5	13.4	17.4	0.2
Minimum		242.0	154.0	7.1	15.0	4.4	0.1	84.4	83.0	14.4	20.0	0.1
Maximum		800.0	498.0	9.0	34.0	11.8	3.1	229.5	254.0	69.3	90.0	1.2
CV		23.6	23.5	4.5	19.6	21.3	51.8	25.3	27.4	40.9	38.3	78.0
25th Percentile		404.5	264.0	7.9	20.5	6.2	0.8	120.6	120.0	23.0	32.0	0.1
75th Percentile		556.0	350.0	8.4	29.2	8.5	1.9	184.8	190.0	39.8	54.0	0.3
Linear Trend Line												
Slope /year		7.388	3.795	-0.001	-0.457	0.049	0.088	11.76	11.23	1.058	1.731	0.022
Intercept		453.2	291.5	8.17	26.99	7.198	1.044	106.9	113.6	28.50	38.44	0.134
R2 value		0.022	0.015	0.000	0.046	0.005	0.078	0.477	0.351	0.033	0.052	0.057

Site Code	Site Name	EC_GEN	TDS	pH_GEN	Temp	DO	BOD3-27	HAR_Total	HCO3	Na	Cl	NH3-N
01 02 12 006	Derol Bridge											
N		13	13	13	13	13	13	13	13	13	13	9
Average		416.7	267.1	8.1	26.8	7.2	1.5	127.7	132.6	31.2	44.5	0.2
Median		404.0	250.0	8.1	26.0	7.4	1.4	128.6	137.0	24.0	32.0	0.1
Standard Deviation		151.4	91.6	0.4	3.0	0.9	0.9	35.9	37.3	17.7	24.9	0.2
Minimum		129.0	120.0	7.0	22.0	5.3	0.3	60.4	61.0	4.0	6.0	0.1
Maximum		648.0	414.0	8.5	31.4	8.5	3.4	173.0	185.0	56.4	80.0	0.5
CV		36.3	34.3	4.9	11.1	12.7	61.5	28.1	28.1	56.7	56.1	77.2
25th Percentile		326.0	198.0	7.9	25.0	6.6	0.6	100.4	107.0	20.1	30.0	0.1
75th Percentile		496.0	322.0	8.3	29.0	7.8	2.2	164.8	171.0	50.1	70.0	0.3
Linear Trend Line												
Slope /year		1.830	-2.713	0.051	1.139	0.059	0.131	5.457	4.747	0.079	0.472	0.037
Intercept		409.9	277.1	7.86	22.54	7.004	1.022	107.5	114.9	30.91	42.71	0.020
R2 value		0.001	0.004	0.086	0.741	0.021	0.101	0.117	0.082	0.000	0.002	0.173
01 02 12 013	Vautha											
N		94	94	94	94	94	94	94	94	94	94	94
Average		1880.7	1275.2	7.8	29.2	5.3	18.0	341.5	363.4	235.4	320.0	19.4
Median		1929.5	1297.0	7.8	29.8	6.2	16.0	327.5	307.5	233.5	313.0	19.8
Standard Deviation		738.1	514.8	0.3	4.2	2.3	11.0	144.5	175.3	106.7	145.8	9.2
Minimum		303.0	196.0	6.5	20.0	0.0	2.0	112.6	105.0	20.0	28.0	0.5
Maximum		3436.0	2377.0	8.4	36.9	8.0	58.0	711.0	820.0	472.2	626.0	37.5
CV		39.2	40.4	3.9	14.4	44.5	61.5	42.3	48.2	45.4	45.5	47.3
25th Percentile		1402.5	938.0	7.7	25.6	4.8	10.3	217.1	208.8	170.5	235.0	14.1
75th Percentile		2378.8	1597.5	8.0	32.3	6.7	25.0	469.9	520.8	307.6	409.5	25.7
Linear Trend Line												
Slope /year		86.89	61.51	0.045	-0.125	-0.536	1.034	45.44	54.24	25.67	34.31	1.137
Intercept		1530	1027	7.64	29.70	7.417	13.77	157.9	144.2	131.6	181.4	14.77
R2 value		0.072	0.074	0.113	0.005	0.273	0.046	0.516	0.499	0.301	0.289	0.080

Site Code	Site Name	EC_GEN	TDS	pH_GEN	Temp	DO	BOD3-27	HAR_Total	HCO3	Na	Cl	NH3-N
01 02 17 002	Burhanpur											
N		86	86	86	85	10	86	86	86	75	86	86
Average		499.9	348.4	7.9	24.7	6.7	2.7	119.3	151.6	52.8	74.3	0.1
Median		423.5	291.5	8.0	25.5	7.1	1.0	112.7	130.0	46.7	64.0	0.1
Standard Deviation		308.1	242.0	0.6	3.9	2.1	7.0	18.4	69.9	42.0	59.1	0.1
Minimum		154.0	107.0	5.8	17.0	2.3	0.2	85.8	73.0	4.2	6.3	0.1
Maximum		1976.0	1673.0	9.1	32.0	10.2	48.0	225.0	512.0	239.4	319.0	0.4
CV		61.6	69.5	7.4	16.0	30.7	258.9	15.5	46.1	79.5	79.6	58.5
25th Percentile		312.8	207.0	7.6	21.0	5.7	0.5	108.5	109.8	25.9	33.4	0.1
75th Percentile		569.0	382.8	8.3	28.0	7.7	1.9	130.1	159.6	60.3	93.4	0.2
Linear Trend Line												
Slope /year		-24.63	-23.76	0.089	-0.290	-0.201	-0.433	-2.133	-17.83	-1.035	1.928	-0.002
Intercept		590.1	435.3	8.26	25.76	7.32	4.286	127.1	216.9	57.10	67.24	0.134
R2 value		0.033	0.044	0.116	0.028	0.027	0.019	0.068	0.332	0.002	0.005	0.004
01 02 17 004	Gopalkheda											
N		45	45	45	45	9	45	45	45	39	45	45
Average		934.5	624.8	7.9	24.4	6.9	4.2	121.2	155.4	111.3	162.7	0.1
Median		805.0	552.0	8.0	26.0	6.8	2.0	116.4	134.1	100.4	143.4	0.1
Standard Deviation		674.9	444.8	0.6	4.3	0.8	5.5	13.9	52.1	78.6	122.0	0.2
Minimum		238.1	162.0	5.9	12.0	5.6	0.2	98.3	61.0	2.3	4.2	0.1
Maximum		3067.0	2100.0	9.3	31.2	7.7	26.0	158.3	258.0	286.0	460.0	1.4
CV		72.2	71.2	7.6	17.7	11.5	129.7	11.4	33.5	70.6	75.0	144.1
25th Percentile		403.0	242.0	7.8	22.2	6.4	0.9	112.7	121.9	57.0	84.7	0.1
75th Percentile		1155.0	792.0	8.2	27.0	7.7	6.0	126.9	195.1	142.2	181.2	0.1
Linear Trend Line												
Slope /year		17.84	3.159	-0.099	0.534	-1.002	0.014	-0.592	-15.18	3.821	10.95	-0.015
Intercept		875.5	614.3	8.27	26.15	11.13	4.163	123.1	205.5	96.95	126.5	0.189
R2 value		0.003	0.000	0.097	0.055	0.691	0.000	0.007	0.306	0.006	0.029	0.020

Site Code	Site Name	EC_GEN	TDS	pH_GEN	Temp	DO	BOD3-27	HAR_Total	HCO3	Na	Cl	NH3-N
01 02 17 015	Sarangkheda											
N		17	17	17	17	6	17	17	17	15	17	17
Average		324.8	210.4	8.1	24.5	6.3	1.3	109.6	120.3	32.3	46.7	0.1
Median		312.0	209.0	8.1	25.0	6.6	0.8	108.5	118.0	40.7	43.6	0.1
Standard Deviation		55.8	34.6	0.4	2.5	2.9	1.1	5.7	23.7	18.9	31.3	0.1
Minimum		253.2	167.0	7.6	17.0	1.6	0.3	99.2	80.0	4.5	6.3	0.1
Maximum		441.0	289.0	8.6	27.0	10.5	4.5	120.6	170.9	67.5	104.9	0.4
CV		17.2	16.5	4.4	10.1	45.6	85.7	5.2	19.7	58.3	67.0	101.2
25th Percentile		284.0	183.0	7.9	24.0	5.7	0.7	105.0	109.7	16.5	17.7	0.1
75th Percentile		360.0	234.0	8.4	26.0	7.0	1.6	112.7	134.1	44.5	68.8	0.1
Linear Trend Line												
Slope /year		0.041	-0.941	-0.091	-0.199	2.281	0.076	-0.604	-3.815	5.645	9.972	-0.017
Intercept		324.7	213.3	8.368	25.16	-1.270	1.073	111.5	132.3	12.38	15.31	0.166
R2 value		0.000	0.003	0.266	0.026	0.721	0.019	0.045	0.106	0.295	0.414	0.089
01 02 02 002	Abu Road											
N		17	17	17	15	17	17	17	17	17	17	10
Average		595.2	385.2	8.0	26.0	6.8	1.0	155.7	160.1	44.6	62.8	0.3
Median		659.0	422.0	8.1	26.4	6.8	0.8	132.7	166.0	47.1	70.0	0.3
Standard Deviation		301.7	187.6	0.3	3.3	1.7	0.6	57.8	48.4	22.9	31.2	0.2
Minimum		132.0	112.0	7.1	17.0	3.4	0.2	64.3	66.0	6.0	10.0	0.1
Maximum		1090.0	668.0	8.3	31.0	10.3	2.1	257.2	239.0	86.1	112.0	0.5
CV		50.7	48.7	3.6	12.5	25.6	67.2	37.1	30.2	51.3	49.6	66.0
25th Percentile		366.0	236.0	7.8	25.0	6.3	0.5	116.6	127.0	25.8	34.0	0.1
75th Percentile		792.0	516.0	8.1	27.5	8.2	1.6	184.9	185.0	58.6	84.0	0.4
Linear Trend Line												
Slope /year		30.41	17.76	0.048	-0.100	0.242	0.063	15.01	13.82	3.639	5.256	0.015
Intercept		500.1	329.6	7.81	26.36	6.05	0.757	108.7	116.8	33.22	46.37	0.217
R2 value		0.060	0.053	0.167	0.006	0.114	0.056	0.399	0.482	0.150	0.168	0.032

Site Code	Site Name	EC_GEN	TDS	pH_GEN	Temp	DO	BOD3-27	HAR_Total	HCO3	Na	Cl	NH3-N
01 02 02 007	Kamalpur											
N		8	8	8	8	8	8	8	8	8	8	6
Average		244.8	154.5	8.0	26.1	6.9	0.9	100.2	98.9	14.2	20.8	0.2
Median		231.0	136.0	8.2	28.0	6.3	0.6	98.5	98.0	13.5	20.0	0.2
Standard Deviation		62.1	48.0	0.5	4.4	1.7	0.7	7.5	9.5	4.5	6.4	0.1
Minimum		160.0	116.0	6.9	18.2	5.0	0.1	90.5	88.0	8.4	12.0	0.1
Maximum		369.0	264.0	8.5	30.0	9.1	2.2	108.6	112.0	20.1	30.0	0.3
CV		25.4	31.1	6.2	16.9	24.1	77.1	7.5	9.6	32.1	30.9	45.7
25th Percentile		214.0	126.0	7.9	25.3	5.8	0.5	95.3	91.8	10.5	17.0	0.1
75th Percentile		261.8	163.0	8.4	28.6	8.5	1.1	108.5	104.5	18.3	25.0	0.2
Linear Trend Line												
Slope /year		-1.132	-7.226	0.120	-0.044	0.521	0.069	2.886	0.720	-0.089	-0.456	0.025
Intercept		249.3	183.3	7.56	26.24	4.82	0.587	88.70	96.01	14.53	22.56	0.057
R2 value		0.001	0.101	0.257	0.000	0.438	0.048	0.657	0.026	0.002	0.023	0.048
01 02 02 004	Chitrasani											
N		16	16	16	16	16	16	16	16	16	16	10
Average		504.7	317.5	8.1	25.9	7.9	1.6	137.8	150.6	40.0	54.3	0.3
Median		534.0	332.0	8.2	27.0	8.1	1.6	138.8	148.5	42.4	61.0	0.3
Standard Deviation		193.1	116.6	0.3	3.3	1.5	0.9	33.8	35.7	17.0	22.3	0.2
Minimum		120.0	80.0	7.3	18.0	5.4	0.2	82.4	85.0	6.0	10.0	0.1
Maximum		823.0	520.0	8.4	30.0	10.2	2.7	197.0	200.0	62.5	86.0	0.6
CV		38.3	36.7	3.6	12.6	18.7	55.5	24.5	23.7	42.5	41.1	75.6
25th Percentile		429.8	276.5	7.9	25.2	7.2	0.9	116.1	135.8	30.0	42.5	0.1
75th Percentile		619.5	384.0	8.3	28.0	9.1	2.4	159.9	175.8	52.9	69.0	0.5
Linear Trend Line												
Slope /year		12.50	7.426	0.051	0.512	0.286	0.303	8.808	9.767	1.582	2.169	0.031
Intercept		465.08	293.9	7.926	24.28	7.04	0.641	109.9	119.6	34.97	47.38	0.152
R2 value		0.023	0.023	0.168	0.136	0.205	0.646	0.378	0.417	0.048	0.053	0.070

Site Code	Site Name	EC_GEN	TDS	pH_GEN	Temp	DO	BOD3-27	HAR_Total	HCO3	Na	Cl	NH3-N
01 02 09 001	Luwara											
N		25	25	25	25	25	25	25	25	25	25	21
Average		2866.2	2002.8	8.1	23.2	7.9	1.5	376.2	382.0	365.2	502.5	0.3
Median		1770.0	1206.0	8.1	24.0	7.4	1.3	321.7	342.0	302.0	390.0	0.3
Standard Deviation		2606.3	1836.9	0.3	4.4	1.5	0.9	260.5	253.2	398.7	560.4	0.2
Minimum		219.0	144.0	7.2	15.0	5.7	0.2	76.6	83.0	20.1	26.0	0.1
Maximum		8840.0	6012.0	8.5	31.0	11.6	3.3	936.9	869.0	1552.0	2119.0	0.7
CV		90.9	91.7	3.1	18.8	19.3	63.7	69.3	66.3	109.2	111.5	61.0
25th Percentile		650.0	442.0	7.9	21.0	6.8	0.9	140.7	163.0	57.0	78.0	0.1
75th Percentile		4784.0	3538.0	8.2	26.0	8.6	2.0	510.5	488.0	438.0	640.0	0.4
Linear Trend Line												
Slope /year		-229.4	-147.2	0.012	-0.093	-0.118	0.108	5.982	11.58	18.02	27.19	-0.004
Intercept		3639	2498	8.01	23.47	8.27	1.120	356.0	343.0	304.5	410.9	0.306
R2 value		0.038	0.032	0.010	0.002	0.030	0.064	0.003	0.010	0.010	0.012	0.002
01 02 07 001	Ganod											
N		16	16	16	16	16	16	16	16	16	16	10
Average		756.8	502.4	8.2	26.9	7.4	1.8	178.7	168.6	72.6	105.3	0.4
Median		649.5	421.0	8.2	27.5	7.4	1.8	162.8	151.0	45.4	70.0	0.4
Standard Deviation		457.9	304.3	0.3	2.2	1.3	0.9	75.7	63.6	57.3	83.9	0.2
Minimum		235.0	140.0	7.2	21.0	4.5	0.4	80.3	93.0	16.0	22.0	0.1
Maximum		1881.0	1282.0	8.5	30.0	10.7	3.8	361.8	317.0	216.7	320.0	0.6
CV		60.5	60.6	3.9	8.2	18.0	50.6	42.4	37.7	78.9	79.7	42.7
25th Percentile		474.8	300.5	8.1	26.0	6.6	1.3	129.5	132.0	37.4	54.0	0.3
75th Percentile		918.3	606.0	8.4	28.0	7.9	2.0	210.8	190.0	112.6	176.0	0.5
Linear Trend Line												
Slope /year		29.57	15.22	0.017	-0.166	0.500	0.304	15.49	12.88	8.878	13.71	0.025
Intercept		661.7	453.4	8.12	27.45	5.78	0.815	128.9	127.2	44.07	61.15	0.281
R2 value		0.016	0.010	0.010	0.021	0.537	0.428	0.159	0.156	0.091	0.102	0.040

Site Code	Site Name	EC_GEN	TDS	pH_GEN	Temp	DO	BOD3-27	HAR_Total	HCO3	Na	Cl	NH3-N
01 02 19 001	Mahuwa											
N		45	45	45	45	26	45	45	45	39	45	45
Average		425.2	285.7	8.0	25.4	7.1	0.8	113.0	134.7	61.0	85.8	0.1
Median		422.0	288.0	8.1	27.0	6.8	0.6	112.7	121.9	46.0	67.0	0.1
Standard Deviation		124.3	84.3	0.6	3.8	1.6	0.5	6.0	48.9	50.4	72.6	0.0
Minimum		122.0	93.0	6.1	16.0	4.2	0.2	96.3	61.0	10.0	4.3	0.1
Maximum		812.0	556.0	8.7	32.5	10.3	2.1	124.6	280.4	287.3	435.0	0.2
CV		29.2	29.5	6.9	15.0	22.8	67.5	5.3	36.3	82.6	84.6	58.2
25th Percentile		340.0	243.0	7.7	22.0	6.1	0.5	108.5	109.7	34.7	46.2	0.1
75th Percentile		501.8	316.0	8.3	28.0	8.1	0.9	116.4	138.0	66.6	96.2	0.1
Linear Trend Line												
Slope /year		7.647	7.188	-0.100	-0.202	0.342	0.039	0.186	-11.13	10.41	15.72	-0.003
Intercept		396.6	258.8	8.32	26.19	5.842	0.633	112.3	176.4	16.69	26.94	0.092
R2 value		0.020	0.038	0.173	0.015	0.141	0.029	0.005	0.272	0.174	0.247	0.018
01 02 20 001	Gadat											
N		39	39	39	39	2	39	39	39	33	39	39
Average		399.8	260.5	8.0	24.9	8.6	0.7	115.0	135.7	42.6	61.4	0.1
Median		410.0	276.0	8.1	25.0	8.6	0.6	112.7	121.9	33.8	48.0	0.1
Standard Deviation		98.1	61.5	0.6	2.9	2.5	0.5	6.9	49.6	26.9	45.9	0.0
Minimum		122.0	89.0	6.3	19.0	6.8	0.2	96.3	73.2	5.0	7.4	0.1
Maximum		581.0	381.0	8.8	31.0	10.4	2.5	130.3	280.4	130.0	222.0	0.2
CV		24.5	23.6	7.2	11.4	29.6	72.1	6.0	36.6	63.0	74.8	50.2
25th Percentile		344.5	225.5	7.7	24.0	7.7	0.3	112.1	109.7	28.0	31.1	0.1
75th Percentile		459.0	301.0	8.4	26.5	9.5	0.8	120.4	139.0	46.9	76.9	0.1
Linear Trend Line												
Slope /year		5.754	1.536	-0.131	0.001	10.75	0.052	0.156	-11.77	7.451	13.02	0.002
Intercept		380.9	255.4	8.39	24.92	-41.62	0.497	114.5	174.1	14.39	18.85	0.067
R2 value		0.015	0.003	0.222	0.000	1.000	0.050	0.002	0.240	0.251	0.344	0.010

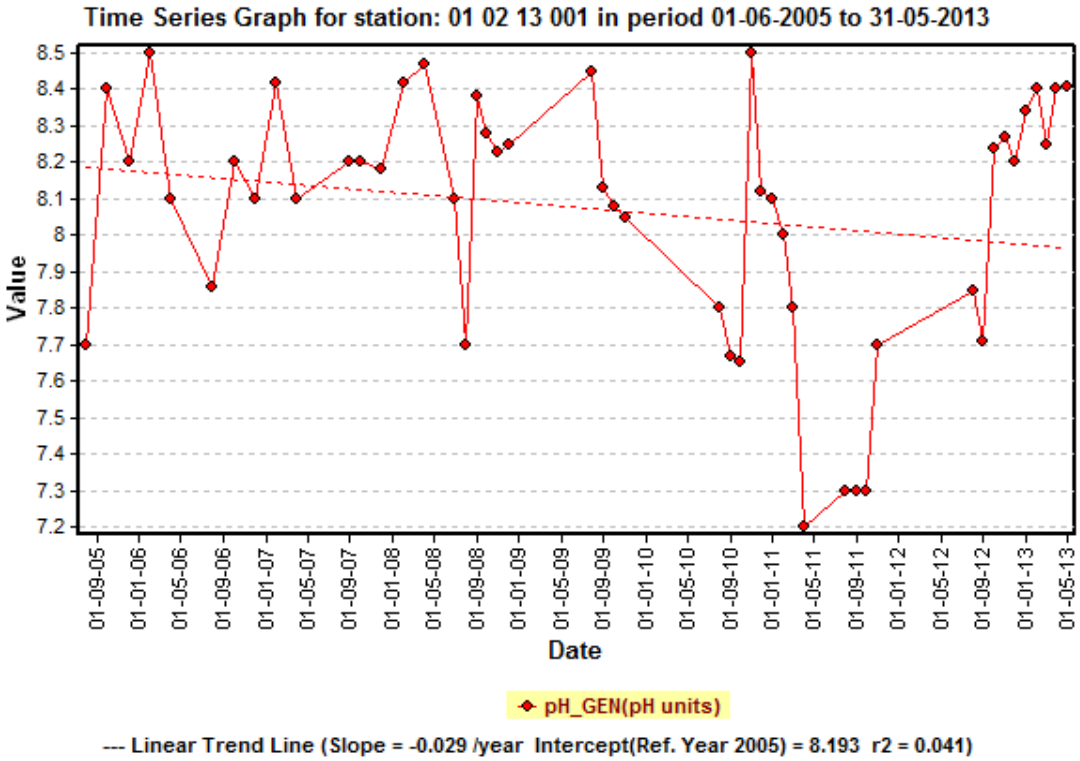
Site Code	Site Name	EC_GEN	TDS	pH_GEN	Temp	DO	BOD3-27	HAR_Total	HCO3	Na	Cl	NH3-N
01 02 25 001	Durvesh											
N		29	29	29	29	11	29	29	29	25	29	29
Average		1802.0	1318.7	7.9	26.3	6.2	2.1	113.8	145.6	351.7	640.0	0.1
Median		290.0	200.0	7.9	27.0	5.9	0.9	104.6	110.0	36.0	48.2	0.1
Standard Deviation		3122.2	2357.7	0.3	3.3	1.0	2.5	21.8	87.1	830.7	1429.1	0.1
Minimum		63.0	51.0	7.3	13.0	5.5	0.2	67.1	68.0	2.3	4.2	0.1
Maximum		10000.0	8954.0	8.5	30.0	9.0	9.0	158.9	487.7	3078.0	5013.1	0.3
CV		173.3	178.8	4.1	12.6	16.5	122.6	19.1	59.8	236.2	223.3	54.9
25th Percentile		201.0	124.0	7.7	25.0	5.7	0.5	100.4	98.0	16.0	21.1	0.1
75th Percentile		1511.0	1153.0	8.1	28.0	6.1	2.0	124.8	148.0	85.6	355.2	0.1
Linear Trend Line												
Slope /year		-196.8	-183.5	-0.057	-0.336	0.441	-0.026	-0.340	-1.027	-14.85	-75.05	0.002
Intercept		2526	1994	8.11	27.67	4.717	2.162	115.0	149.4	414.0	916.3	0.089
R2 value		0.021	0.032	0.159	0.064	0.274	0.001	0.001	0.001	0.001	0.015	0.006
01 02 14 001	Pingalwada											
N		92	92	92	92	58	92	92	92	82	92	92
Average		1160.3	798.9	7.5	24.5	5.2	11.4	142.8	197.8	134.7	200.1	2.3
Median		1190.3	797.5	7.5	26.0	5.0	8.0	144.6	167.5	127.3	193.7	0.2
Standard Deviation		386.3	277.3	0.6	3.7	1.8	12.4	13.6	95.0	66.7	95.4	5.0
Minimum		115.0	72.0	5.7	13.0	1.8	0.5	98.3	91.5	7.3	10.5	0.1
Maximum		1958.0	1351.0	9.3	32.0	10.5	55.0	187.7	536.5	376.5	488.3	16.9
CV		33.3	34.7	8.0	15.2	34.0	108.0	9.5	48.0	49.6	47.7	219.4
25th Percentile		886.0	640.5	7.0	24.0	4.0	3.0	134.5	128.0	88.5	136.5	0.1
75th Percentile		1416.8	986.5	7.8	27.0	6.5	13.5	152.9	246.0	168.6	249.7	1.4
Linear Trend Line												
Slope /year		-9.506	-20.74	-0.120	-0.336	-0.131	-0.860	-0.307	26.49	-3.238	-2.244	0.150
Intercept		1198	880.1	7.92	25.86	5.825	14.81	144.0	301.5	148.7	208.9	1.699
R2 value		0.003	0.029	0.212	0.042	0.015	0.025	0.003	0.407	0.010	0.003	0.005

Site Code	Site Name	EC_GEN	TDS	pH_GEN	Temp	DO	BOD3- 27	HAR_Total	HCO3	Na	Cl	NH3-N
01 02 16 001	Moti Naroli											
N		89	89	89	89	34	89	89	89	78	89	89
Average		743.8	503.4	7.9	28.0	7.8	3.0	131.5	154.7	93.7	137.9	0.2
Median		660.0	448.0	7.9	29.0	7.7	1.7	130.4	146.3	81.1	116.8	0.1
Standard Deviation		353.8	236.8	0.5	4.2	1.7	4.2	15.4	52.0	58.7	83.6	0.3
Minimum		63.0	51.0	5.9	17.0	4.4	0.2	83.3	48.8	5.6	8.0	0.1
Maximum		2226.0	1394.0	9.0	39.0	11.4	32.0	176.7	341.1	319.4	464.0	1.6
CV		47.6	47.0	6.0	15.1	21.5	139.3	11.7	33.6	62.6	60.7	139.3
25th Percentile		582.0	402.0	7.6	26.0	6.9	0.6	124.5	121.9	60.0	84.0	0.1
75th Percentile		827.0	548.0	8.1	30.0	8.9	4.0	140.3	182.9	110.1	168.0	0.2
Linear Trend Line												
Slope /year		1.258	-5.290	-0.061	-0.450	-0.209	0.059	0.570	-11.08	5.645	9.810	-0.014
Intercept		739.1	523.1	8.11	29.72	8.44	2.814	129.4	195.9	70.07	101.4	0.266
R2 value		0.000	0.002	0.085	0.056	0.031	0.001	0.007	0.226	0.036	0.069	0.010

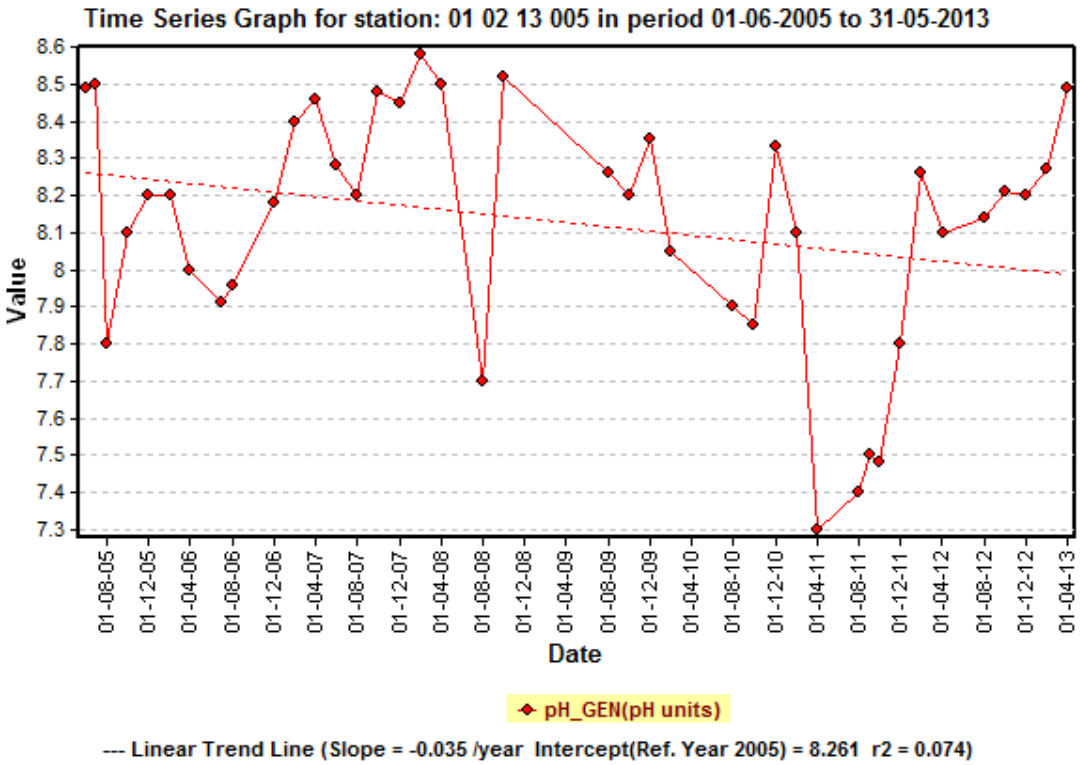
Annex-III

Time series Plots Of Water Quality Data- Mahi Basin

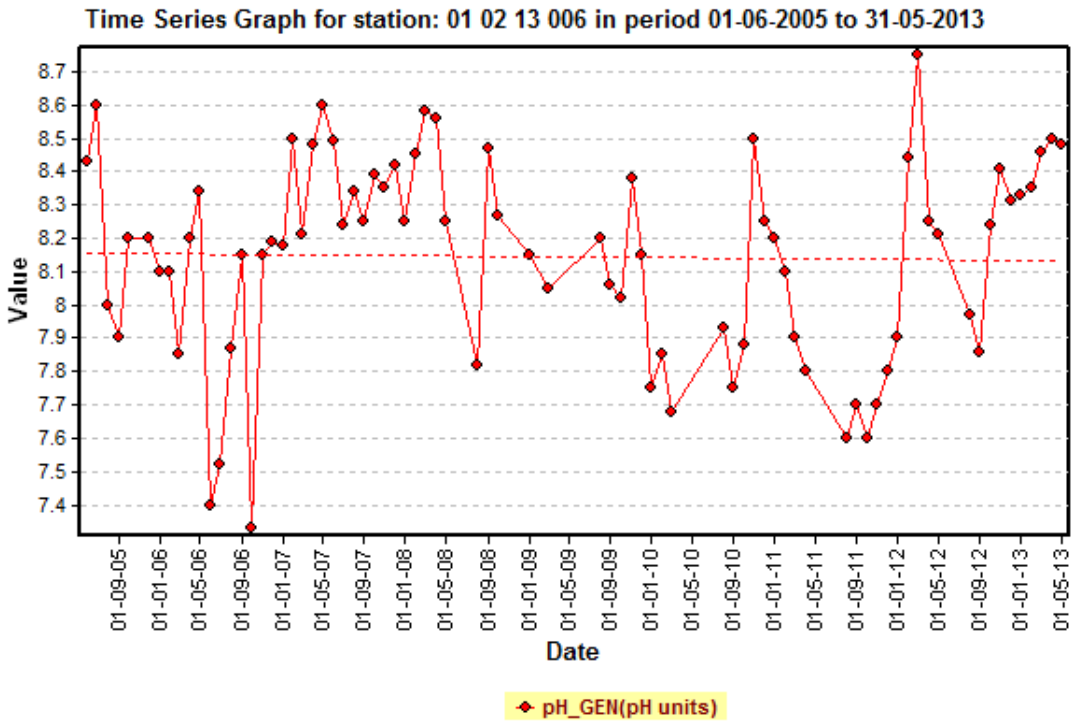
Mataji



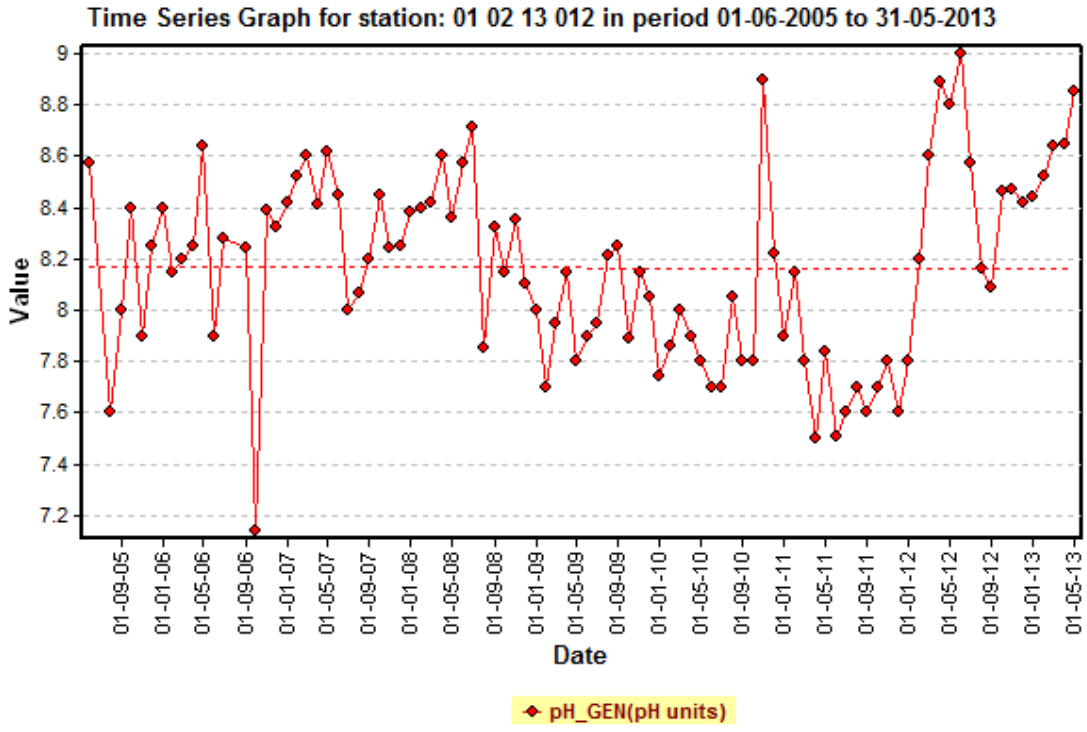
Rangeli



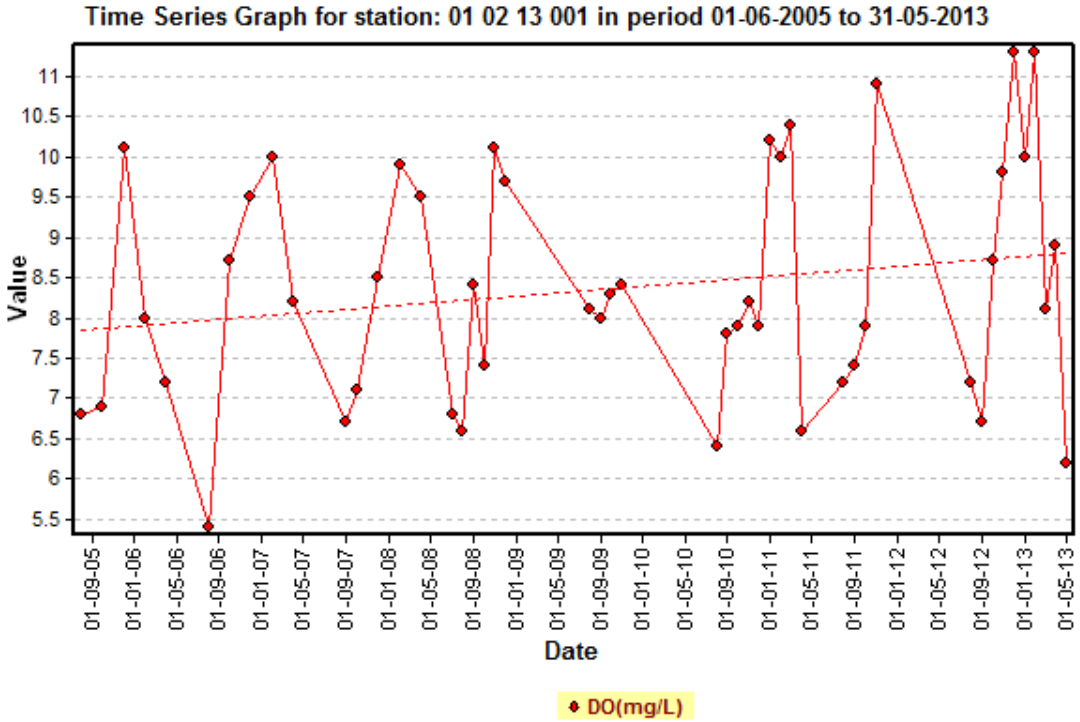
Paderdibadi



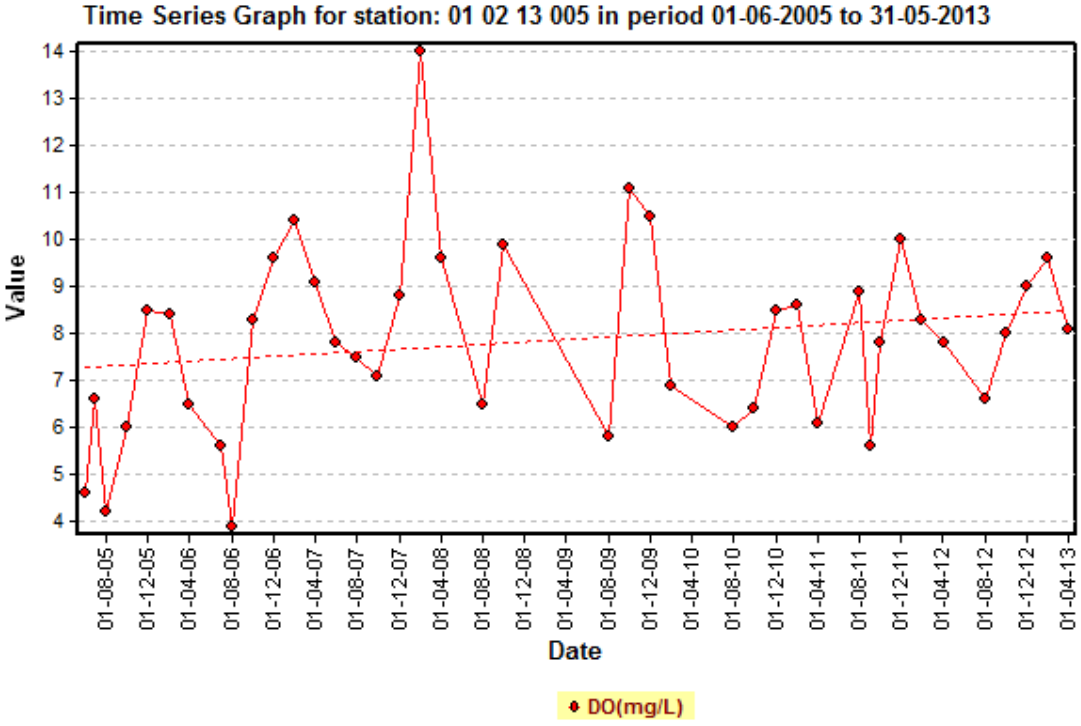
Khanpur



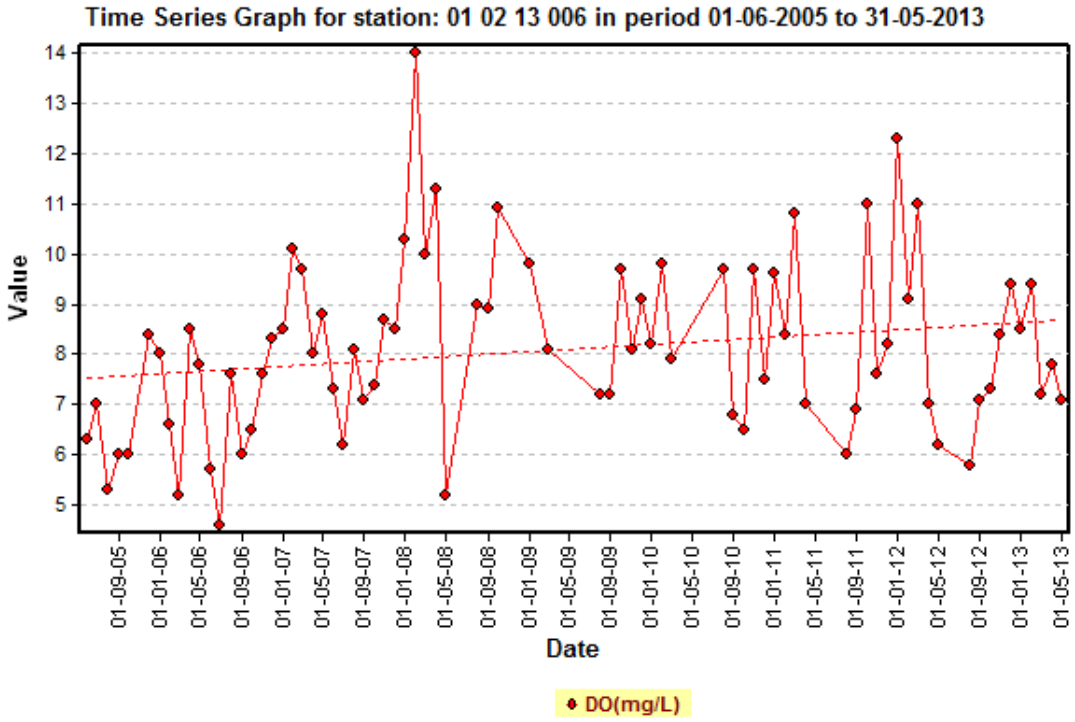
Mataji



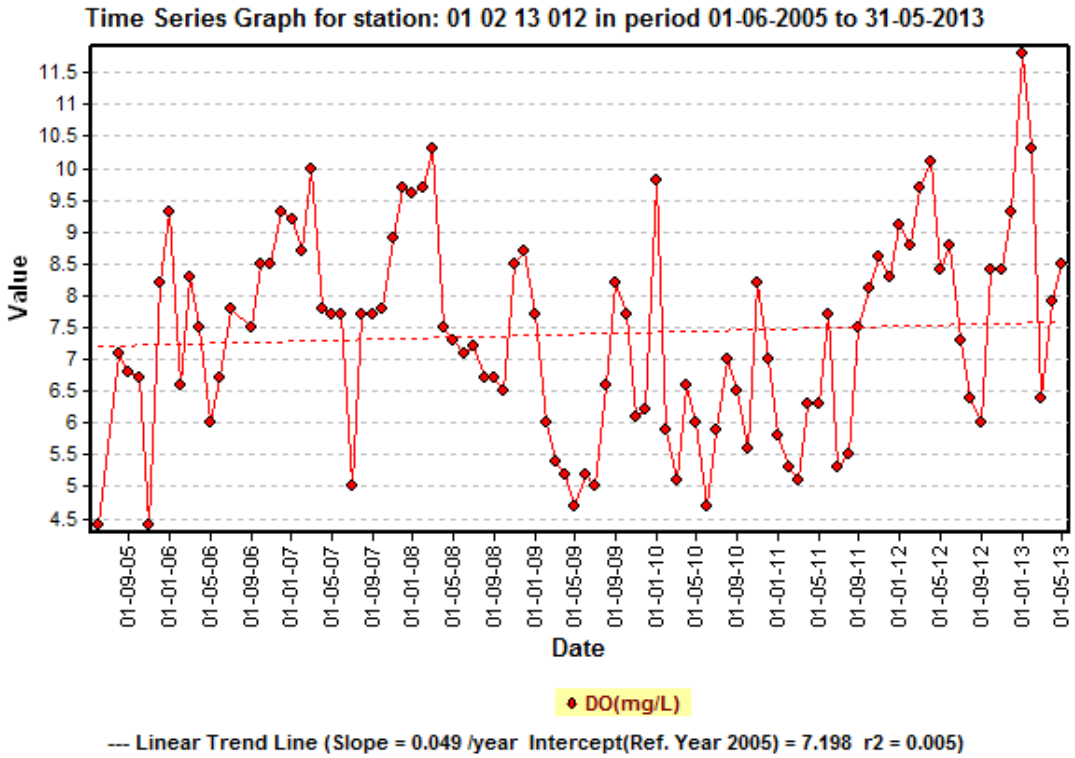
Rangeli



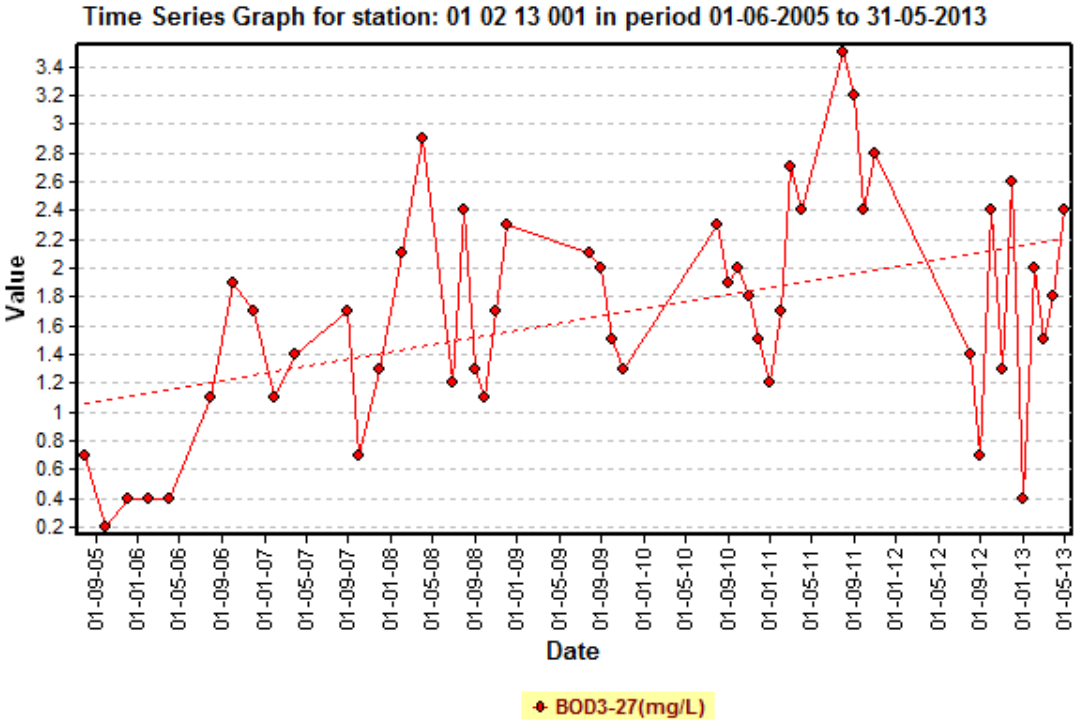
Paderdibadi



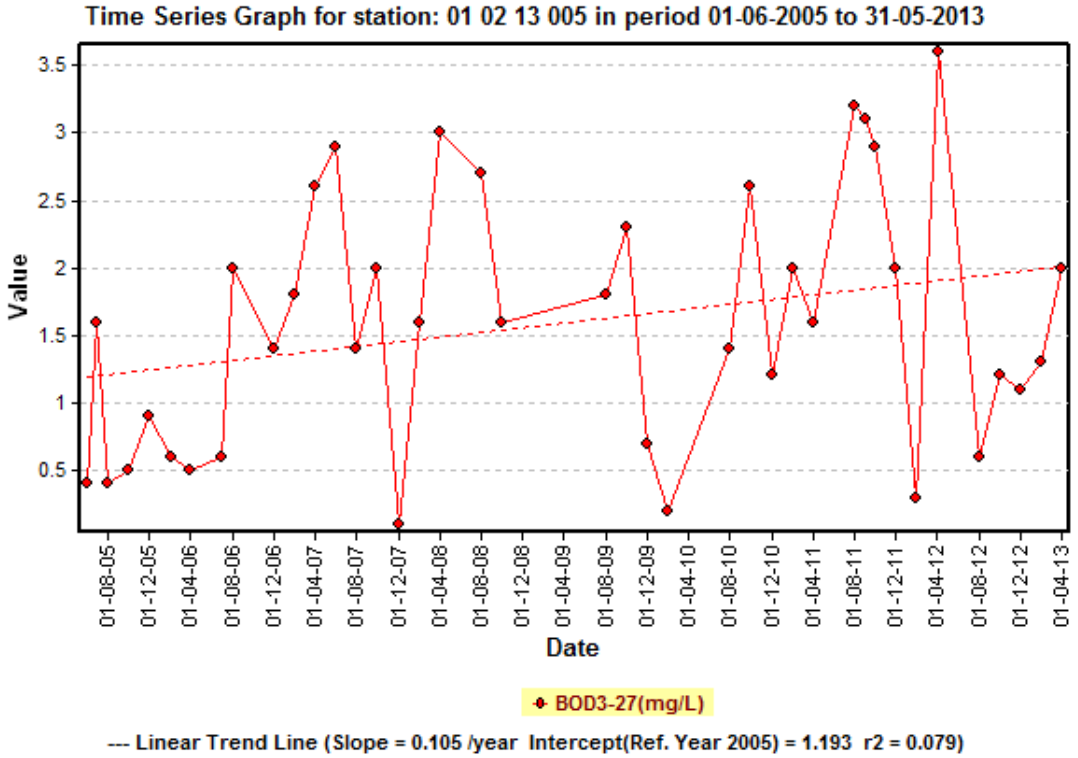
Khanpur



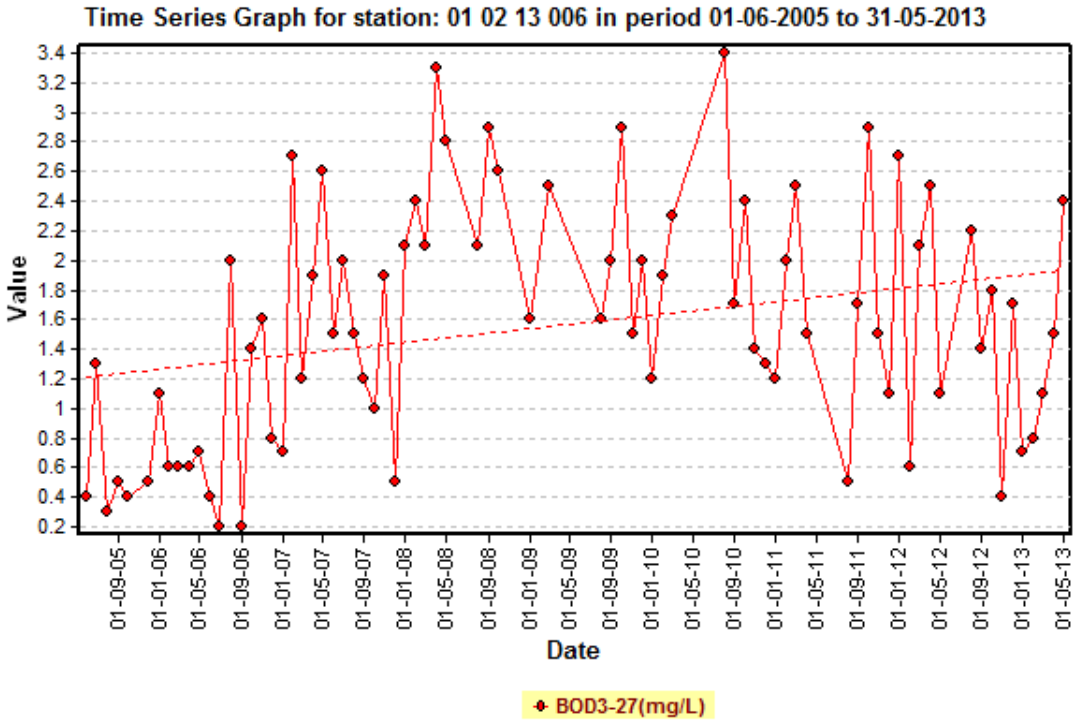
Mataji



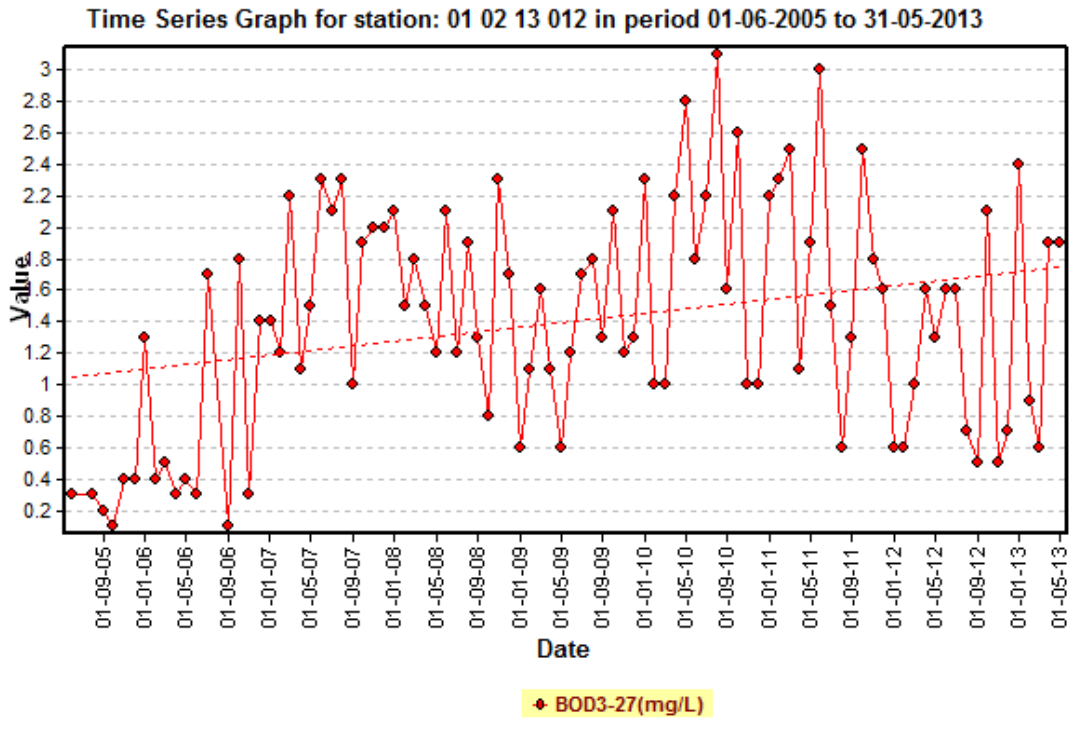
Rangeli



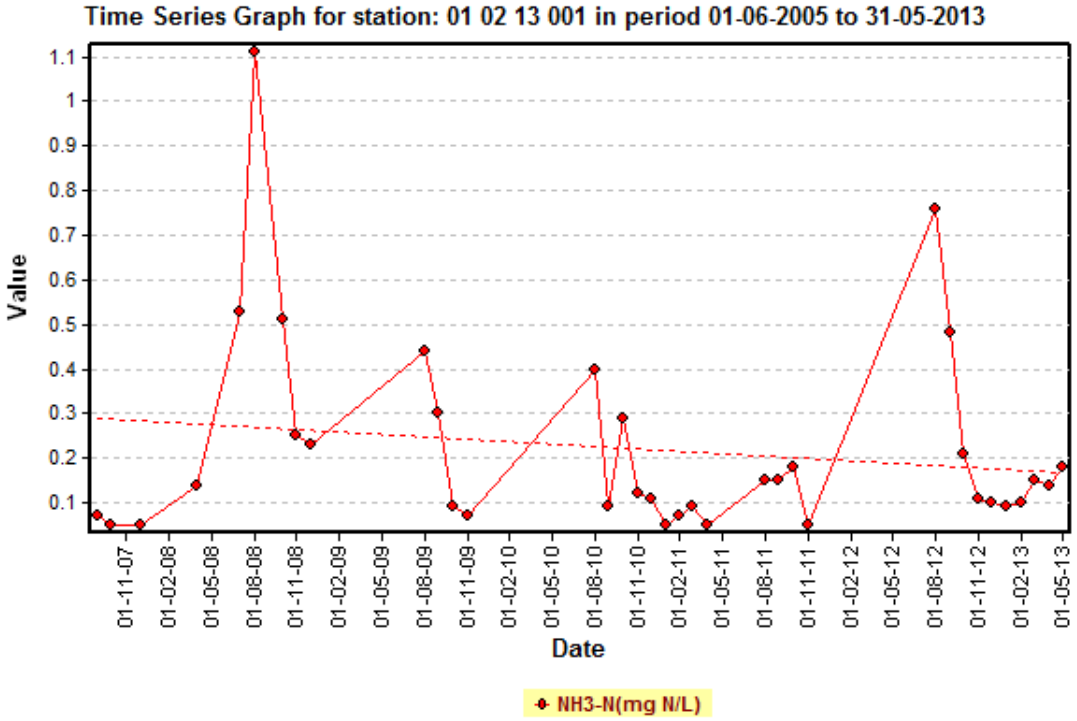
Paderdibadi



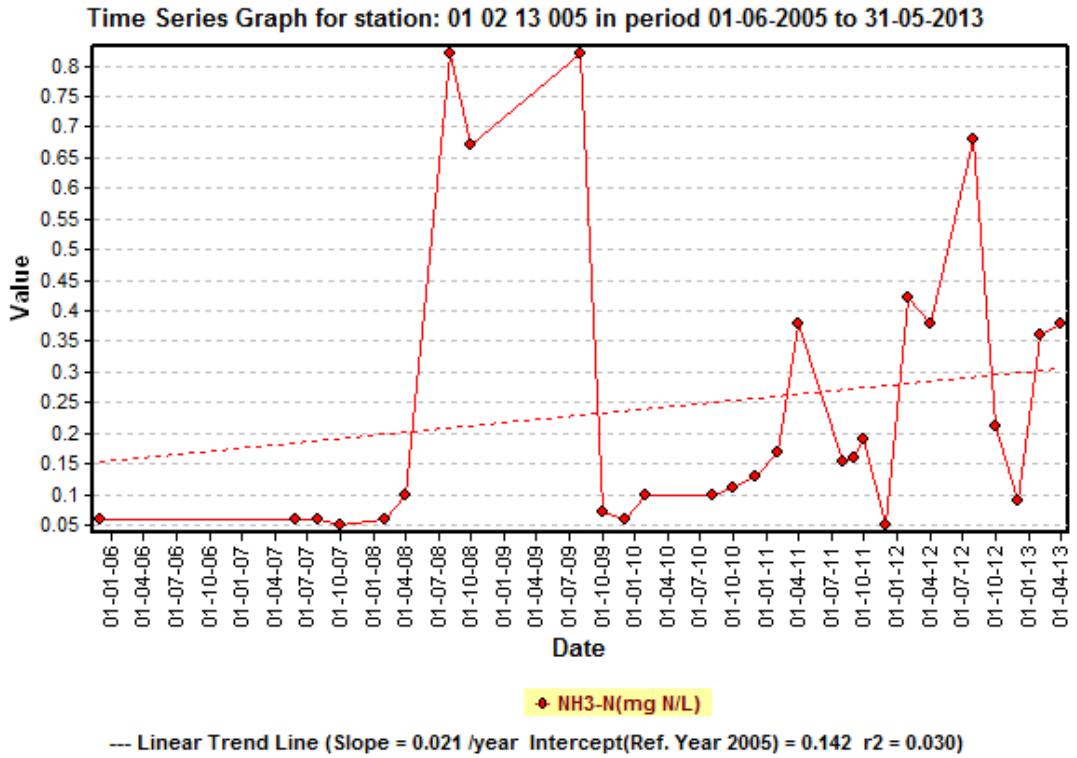
Khanpur



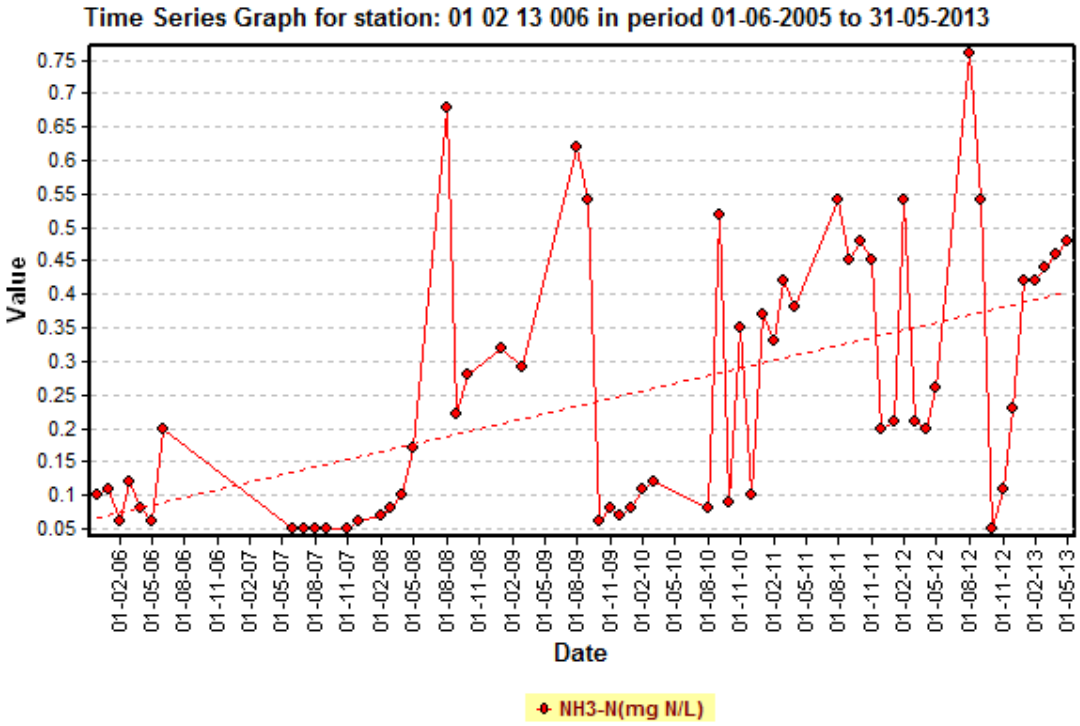
Mataji



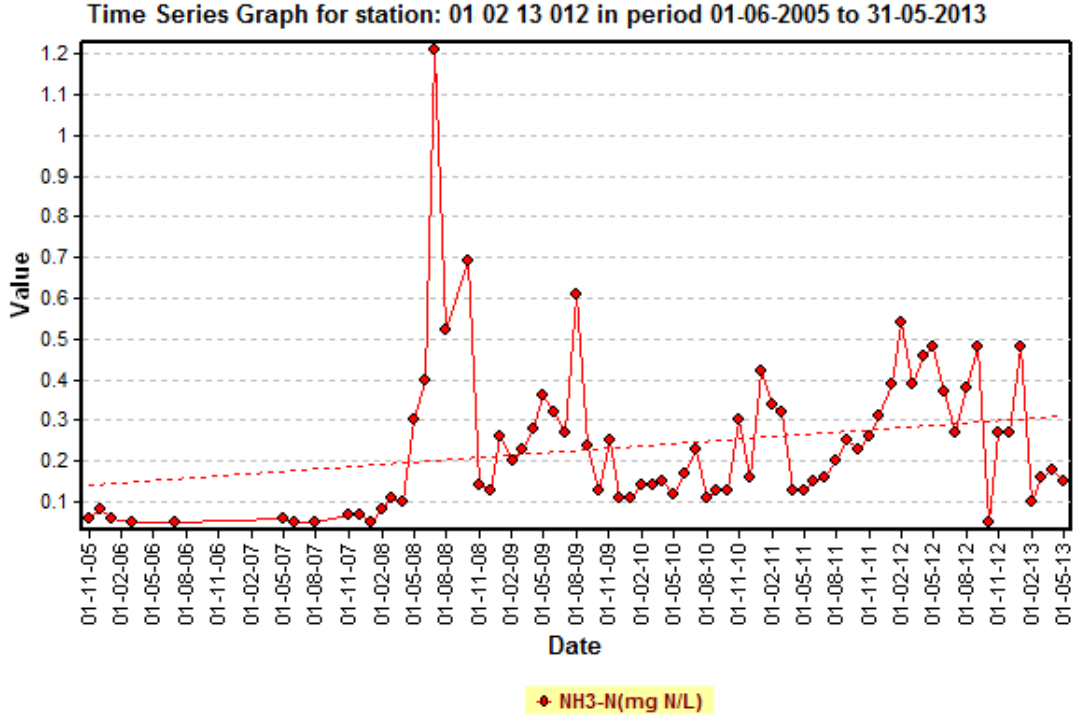
Rangeli



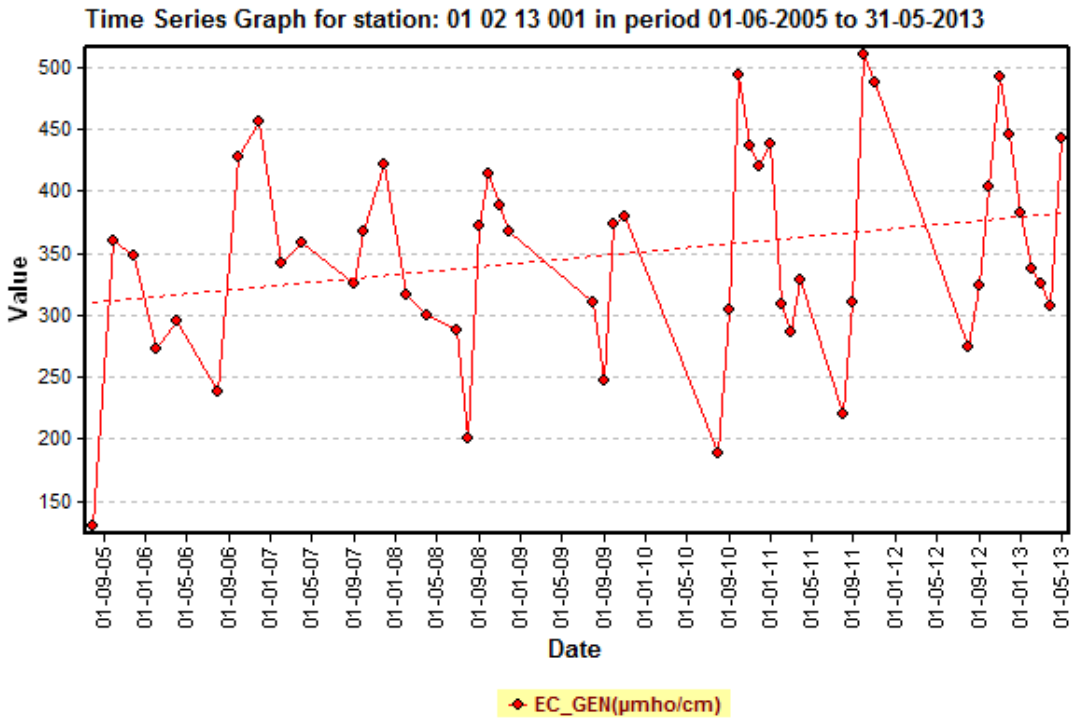
Paderdibadi



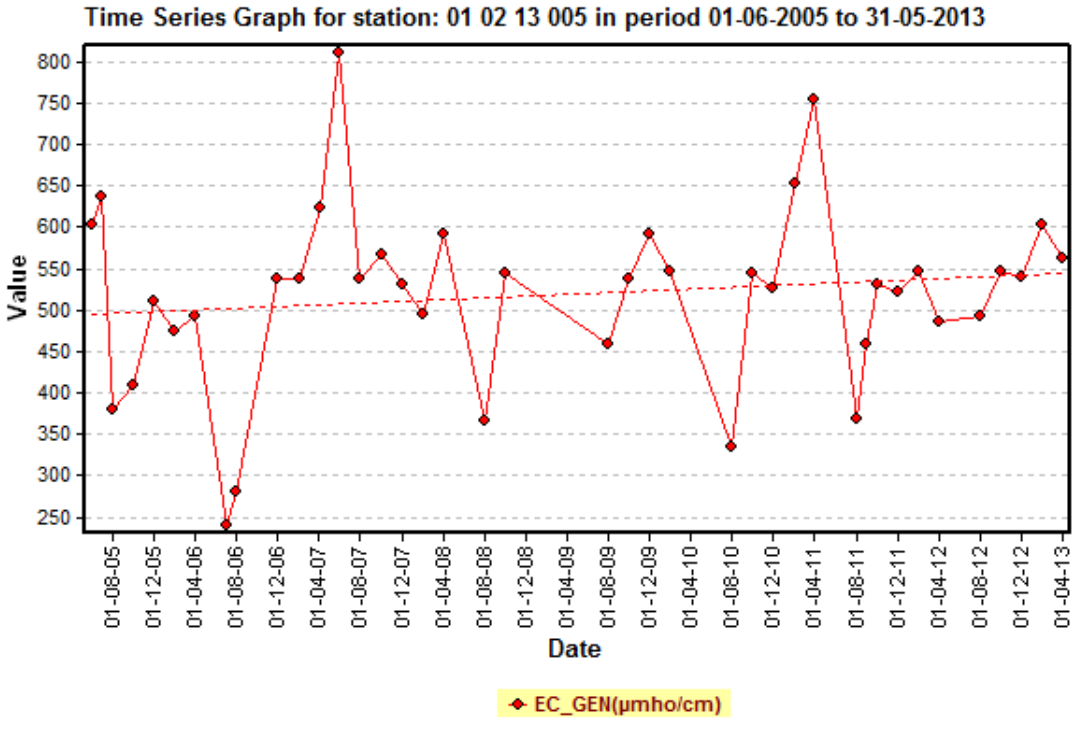
Khanpur



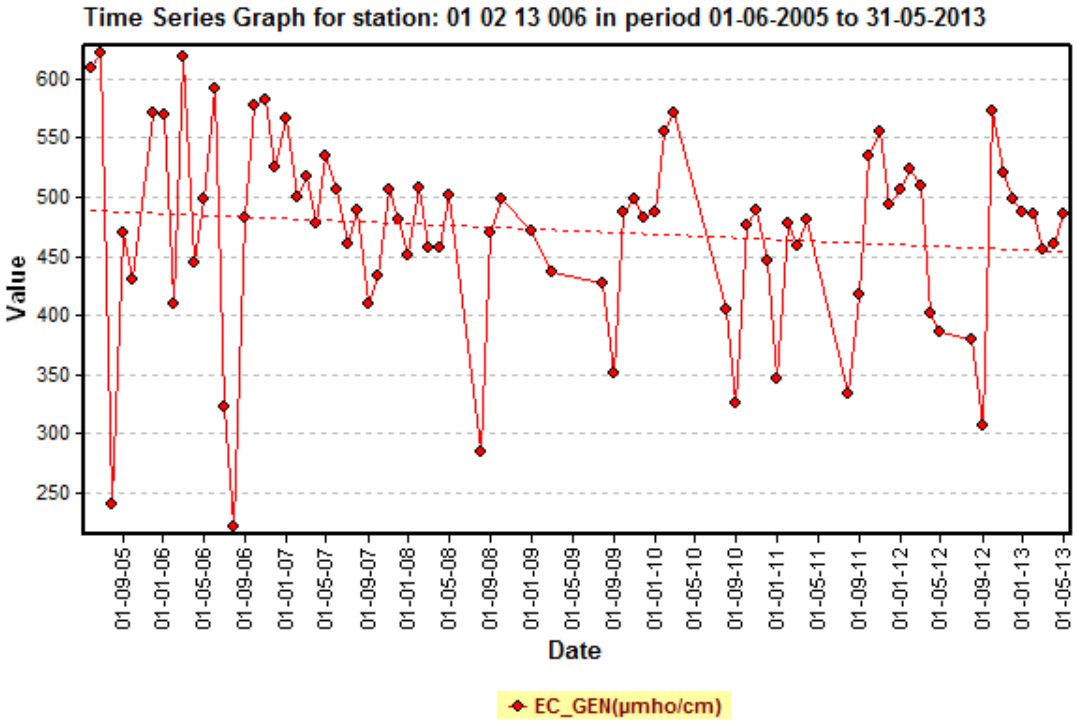
Mataji



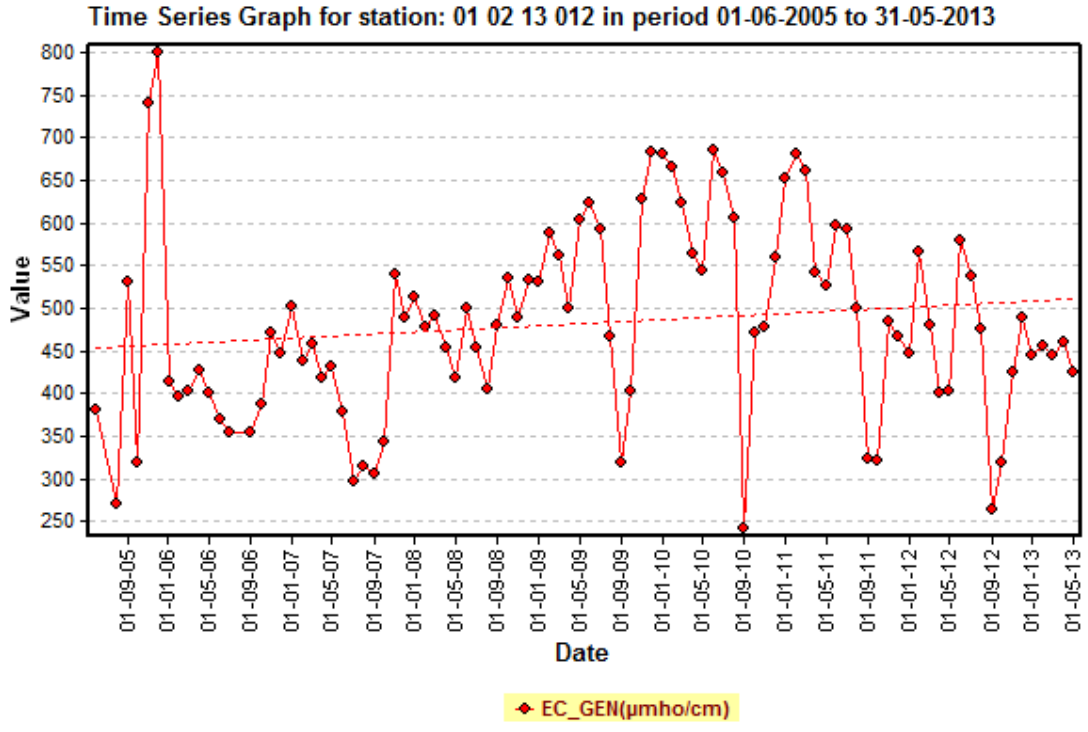
Rangeli



Paderdibadi



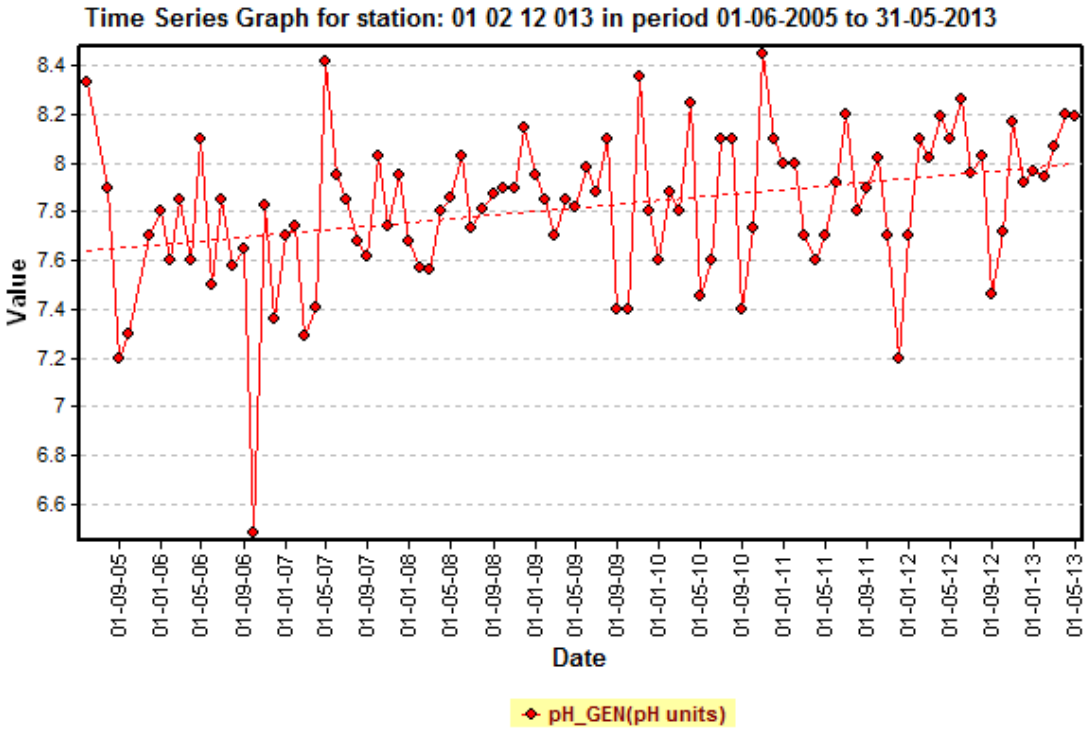
Khanpur

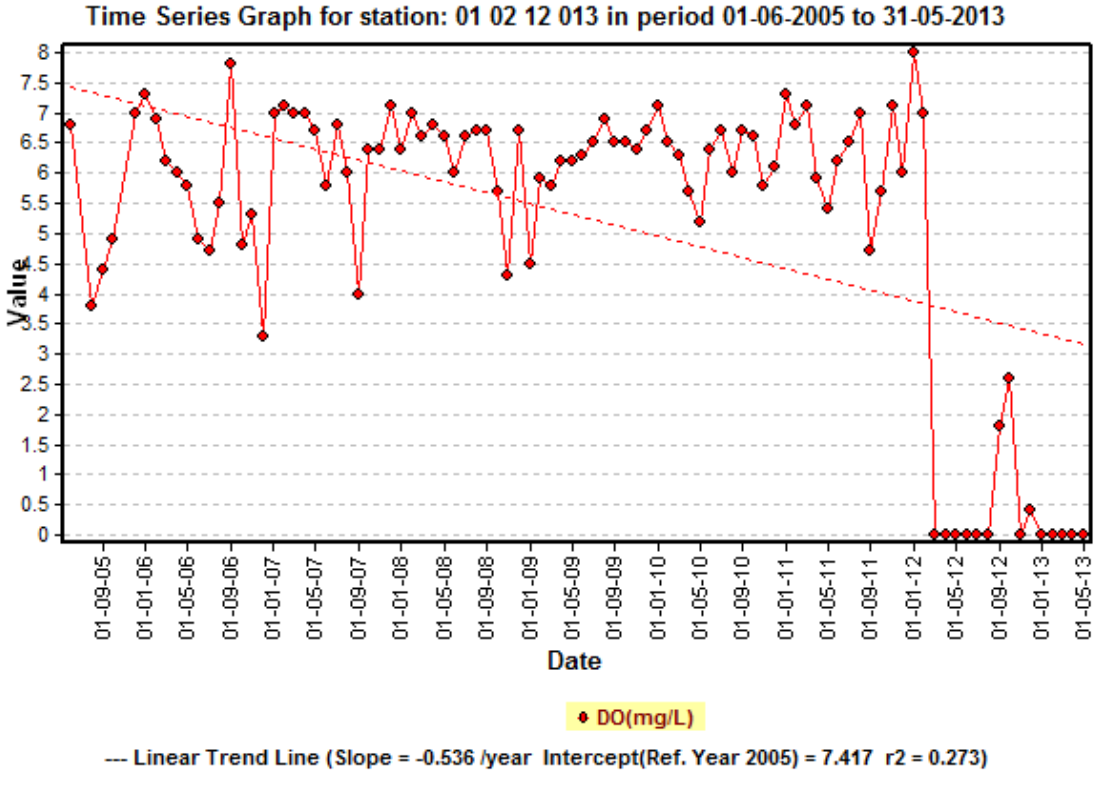


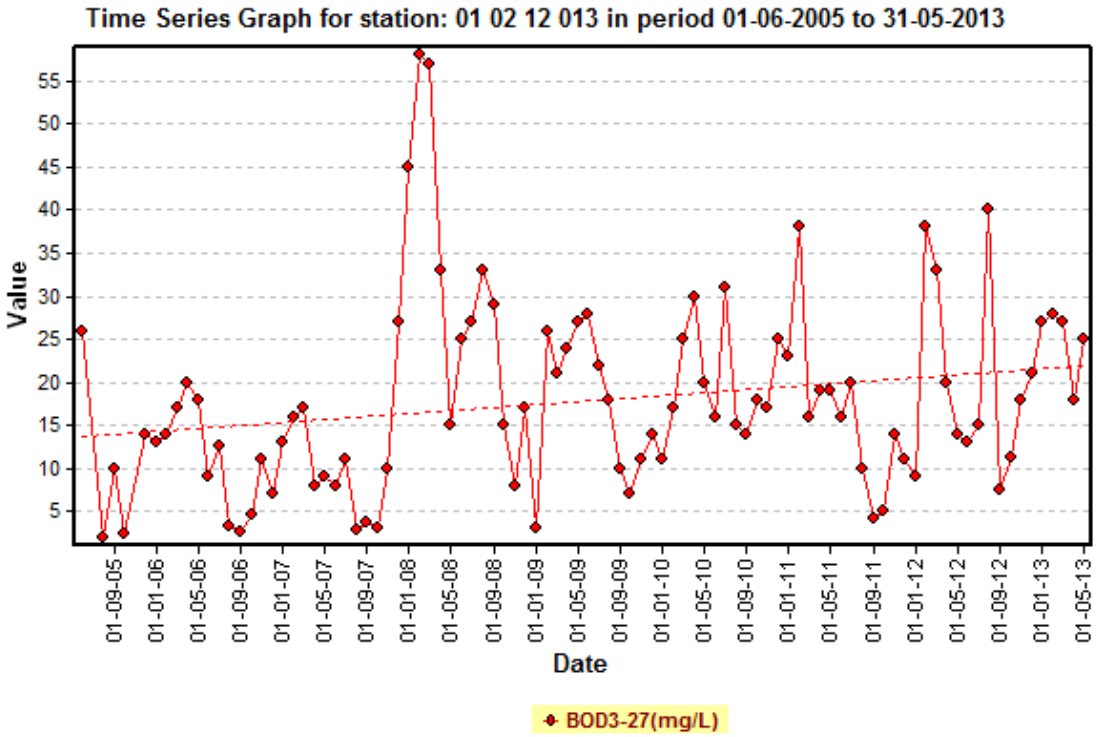
Annex-IV

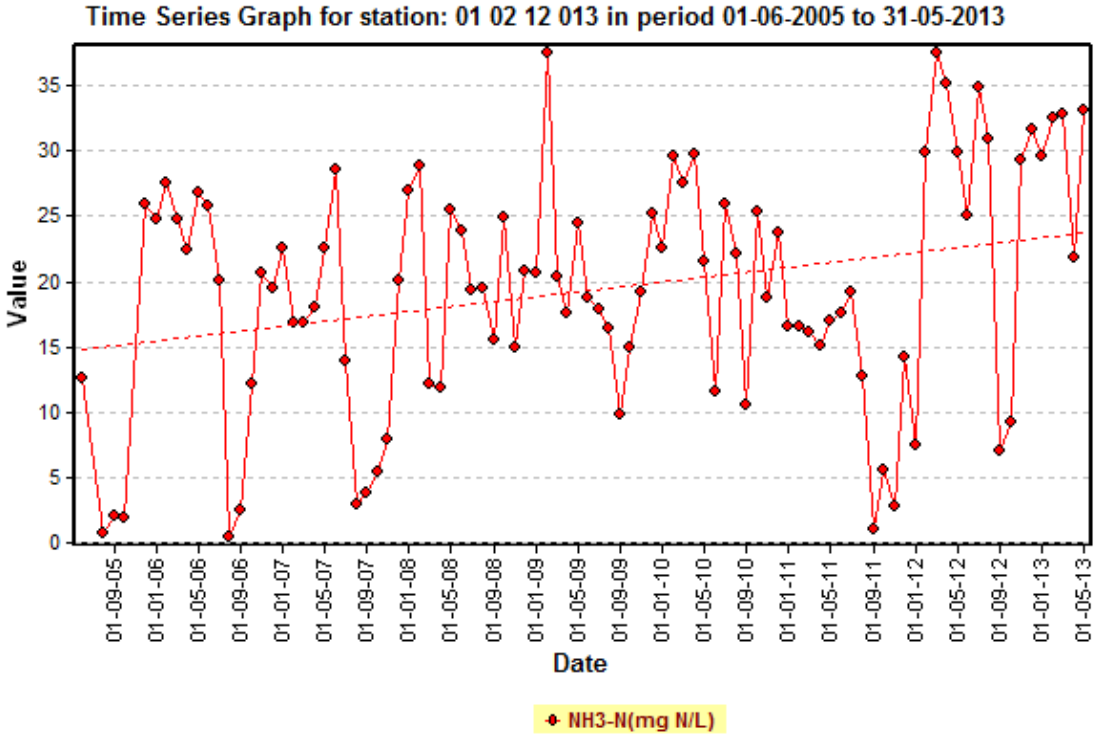
Time series Plots Of Water Quality Data- Sabarmati Basin

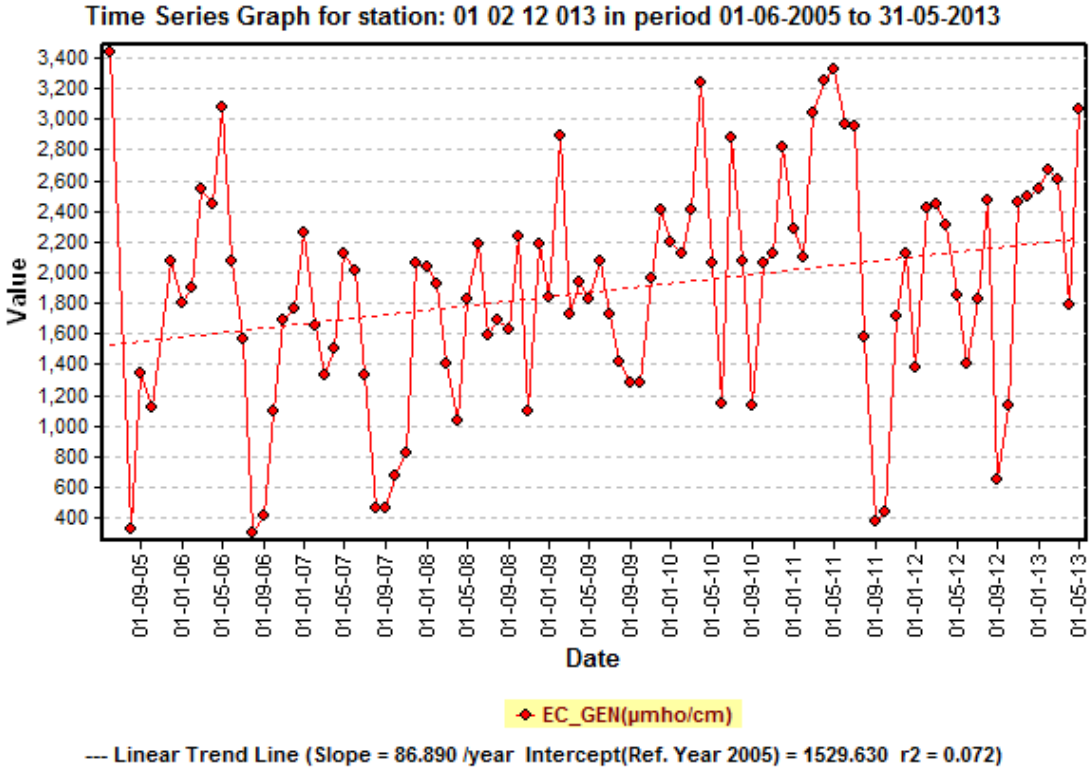
Vautha






Time Series Graph for station: 01 02 12 013 in period 01-06-2005 to 31-05-2013
Value
Date
BOD3-27(mg/L)
--- Linear Trend Line (Slope = 1.034 /year Intercept(Ref. Year 2005) = 13.771 r2 = 0.046)

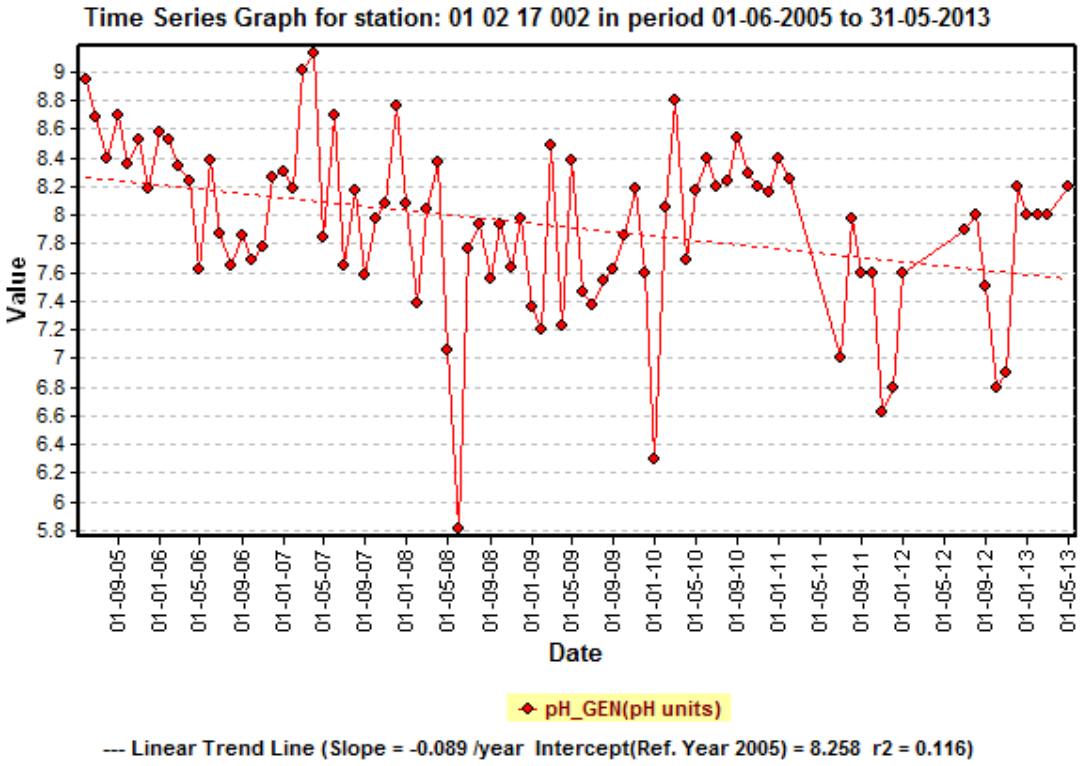

Time Series Graph for station: 01 02 12 013 in period 01-06-2005 to 31-05-2013
Value
Date
NH3-N(mg N/L)
--- Linear Trend Line (Slope = 1.137 /year Intercept(Ref. Year 2005) = 14.769 r2 = 0.080)


Time Series Graph for station: 01 02 12 013 in period 01-06-2005 to 31-05-2013
Value
3,400
3,200
3,000
2,800
2,600
2,400
2,200
2,000
1,800
1,600
1,400
1,200
1,000
800
600
400
01-09-05
01-01-06
01-05-06
01-09-06
01-01-07
01-05-07
01-09-07
01-01-08
01-05-08
01-09-08
01-01-09
01-05-09
01-09-09
01-01-10
01-05-10
01-09-10
01-01-11
01-05-11
01-09-11
01-01-12
01-05-12
01-09-12
01-01-13
01-05-13
Date
EC_GEN(µmho/cm)
--- Linear Trend Line (Slope = 86.890 /year Intercept(Ref. Year 2005) = 1529.630 r2 = 0.072)

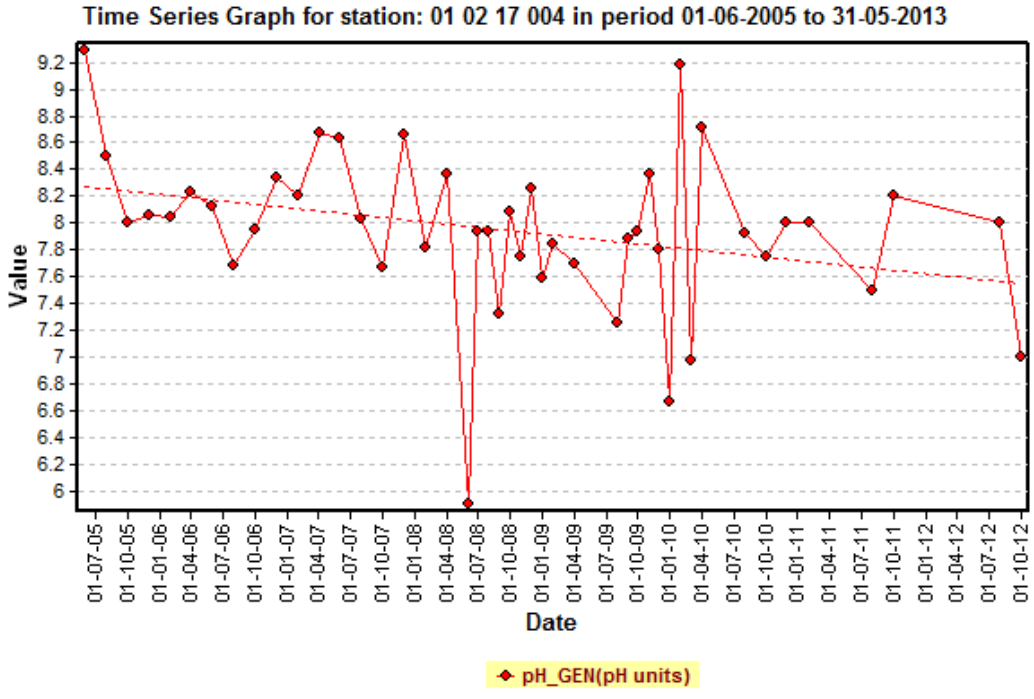
Annex-V

Time series Plots Of Water Quality Data- Tapi Basin

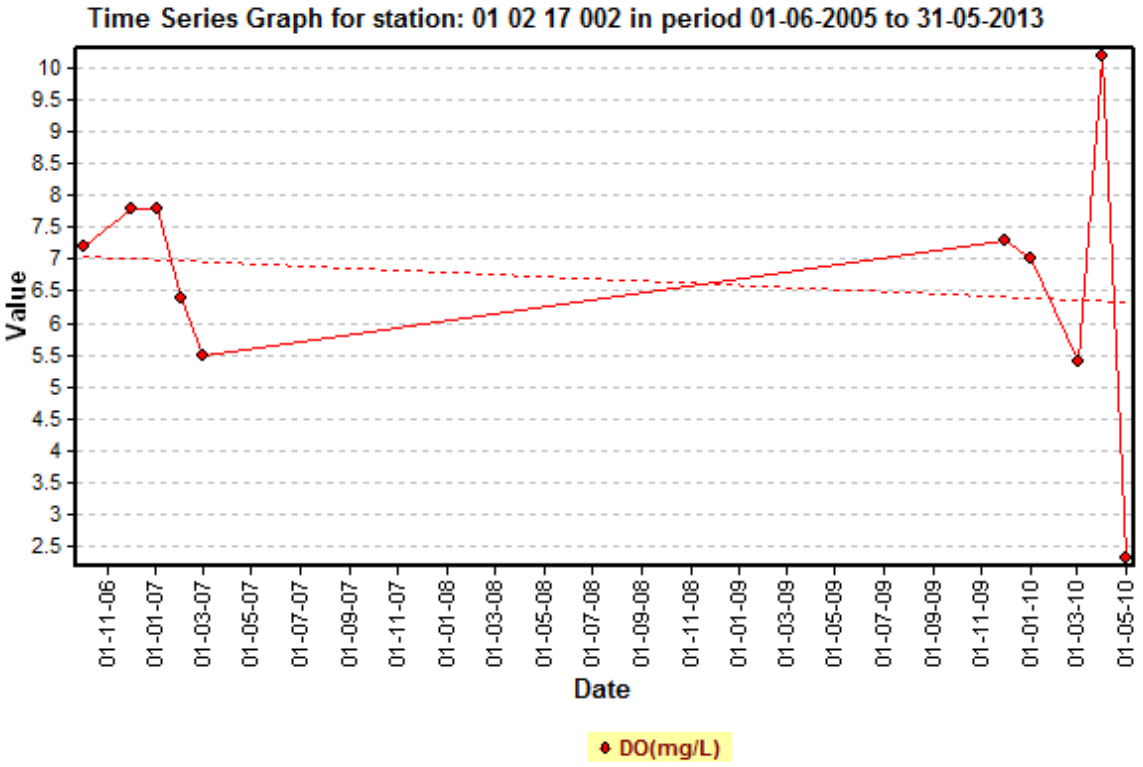
Burhanpur



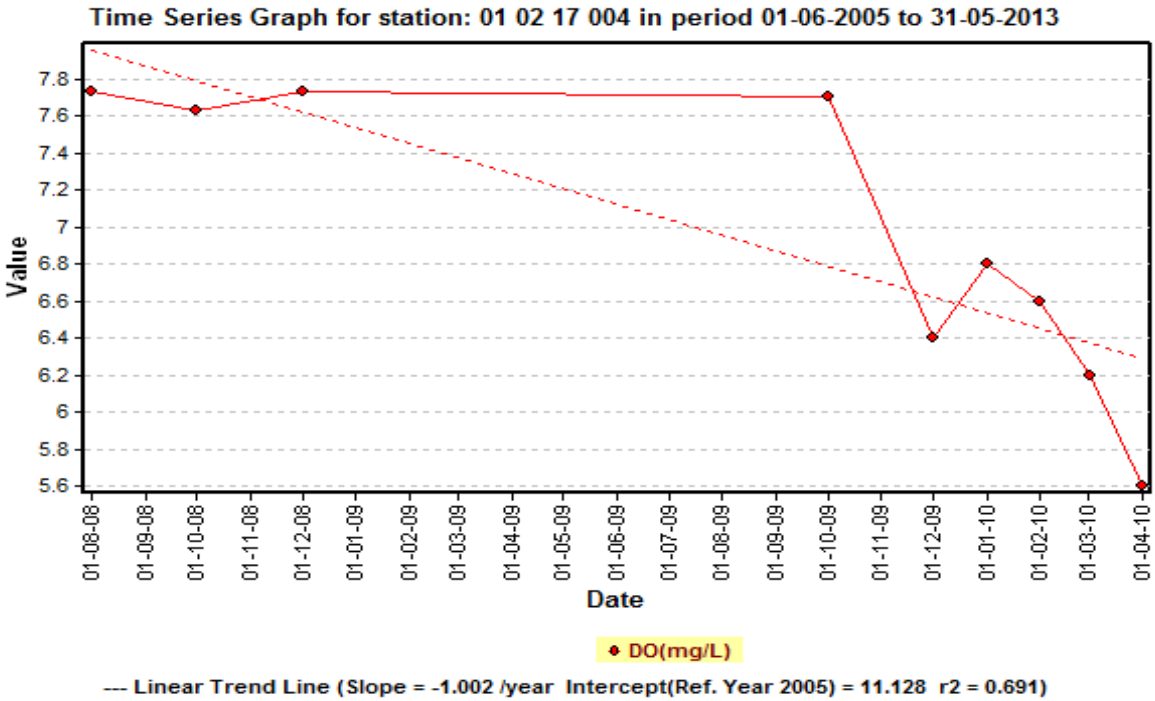
Gopalkheda



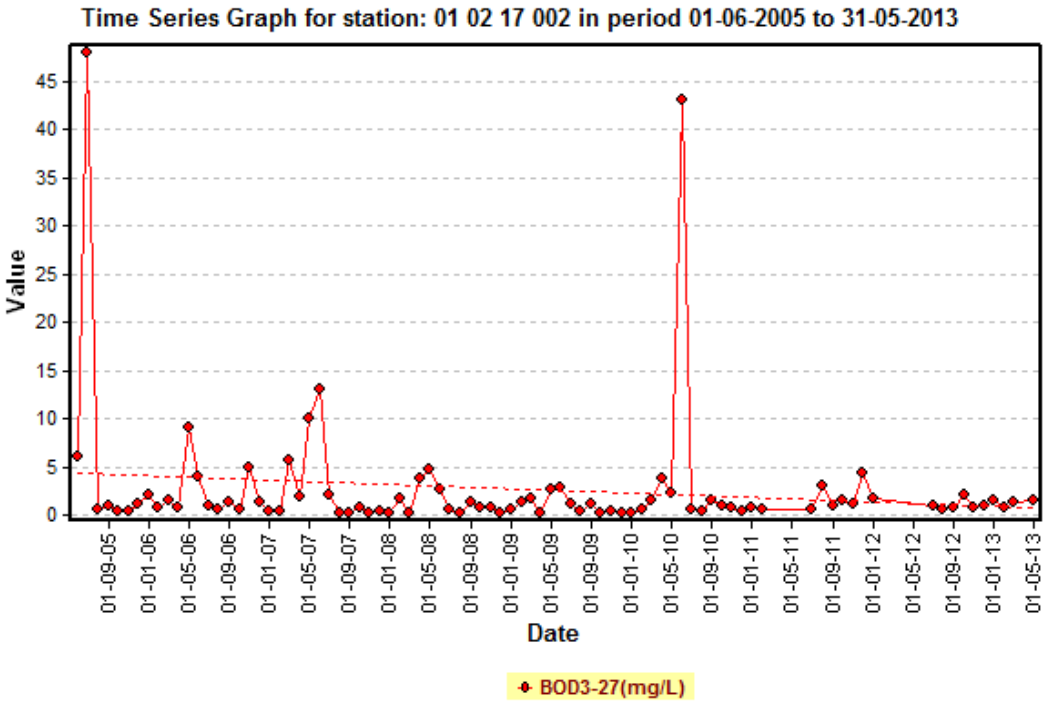
Burhanpur



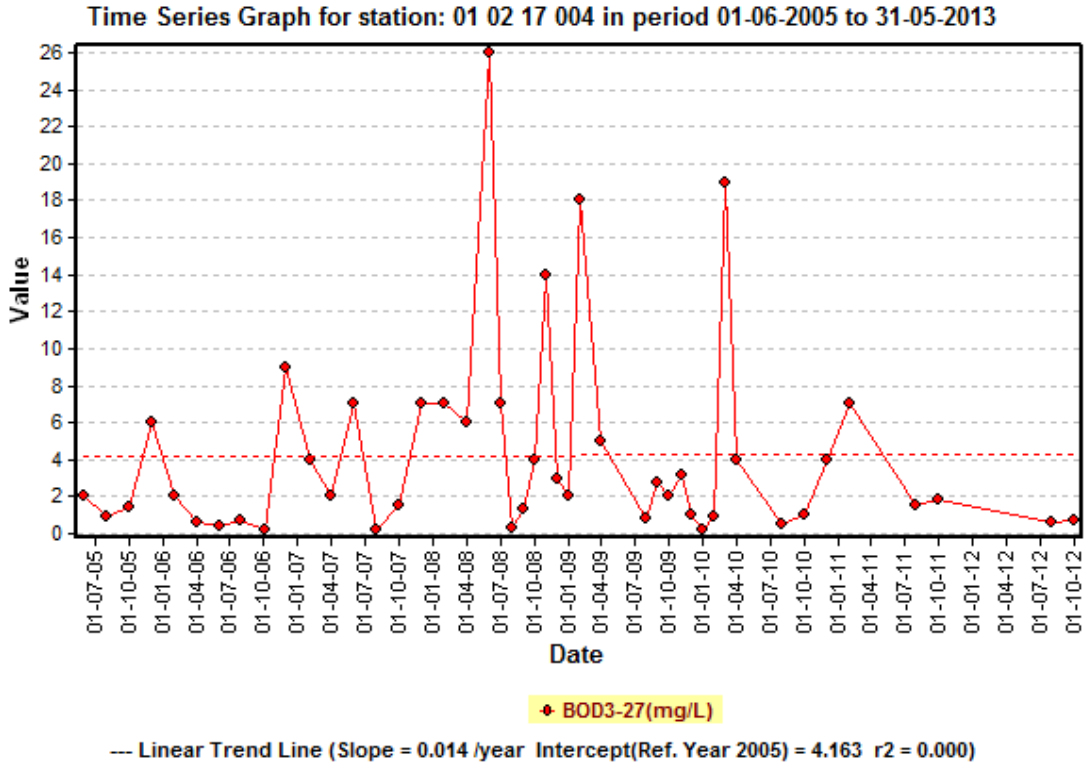
Gopalkheda



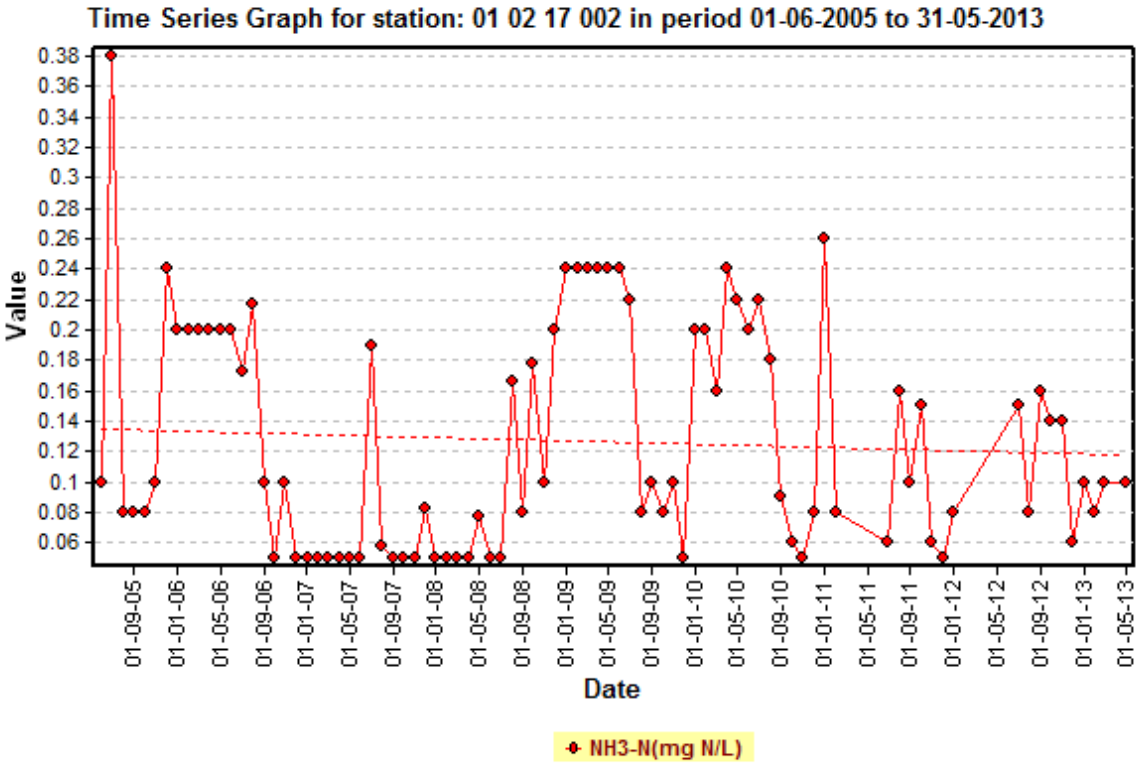
Burhanpur



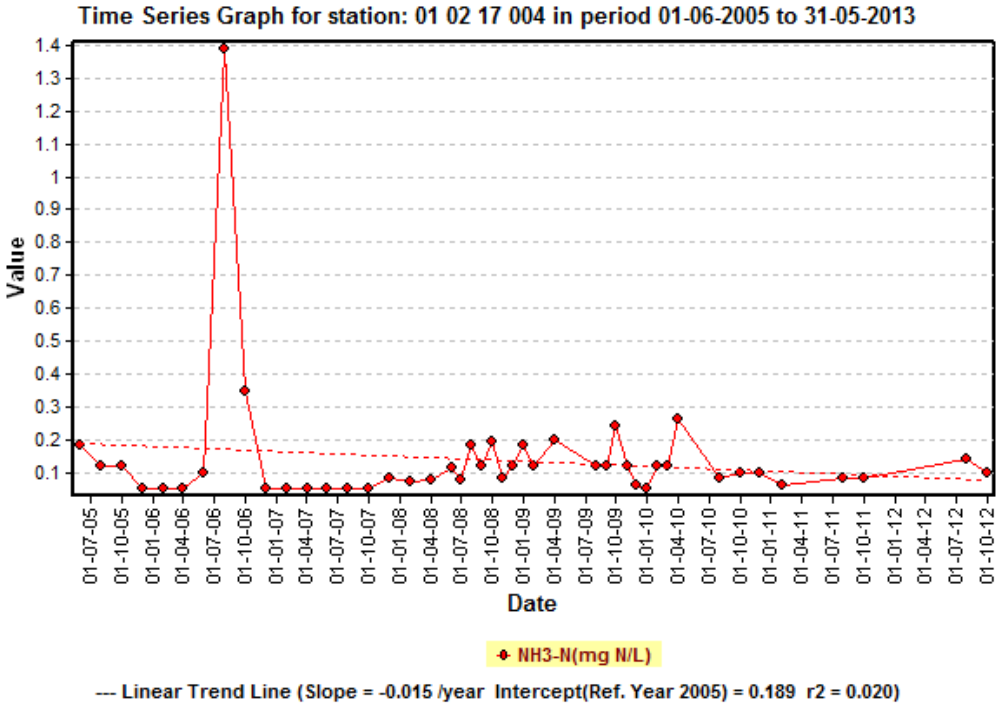
Gopalkheda



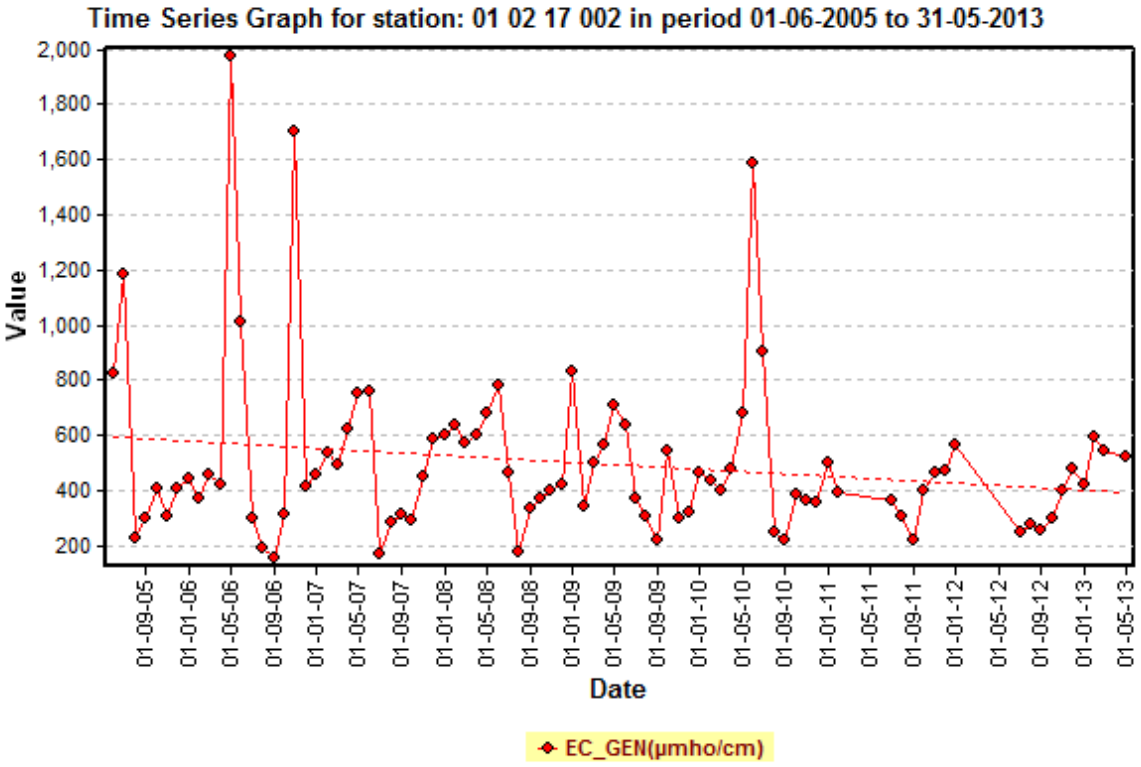
Burhanpur



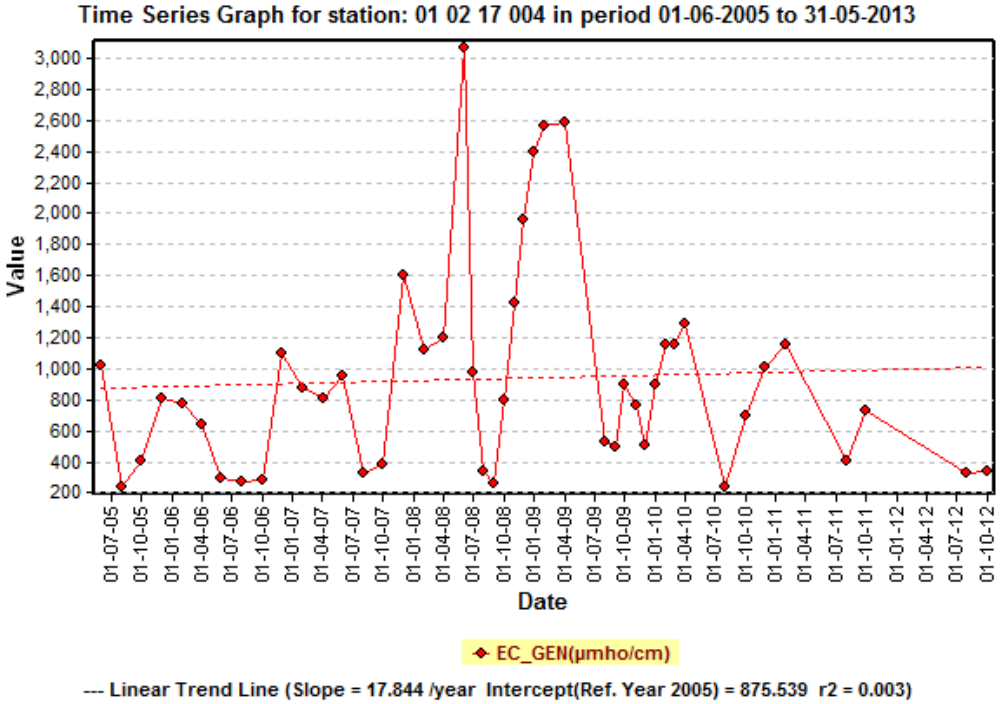
Gopalkheda



Burhanpur



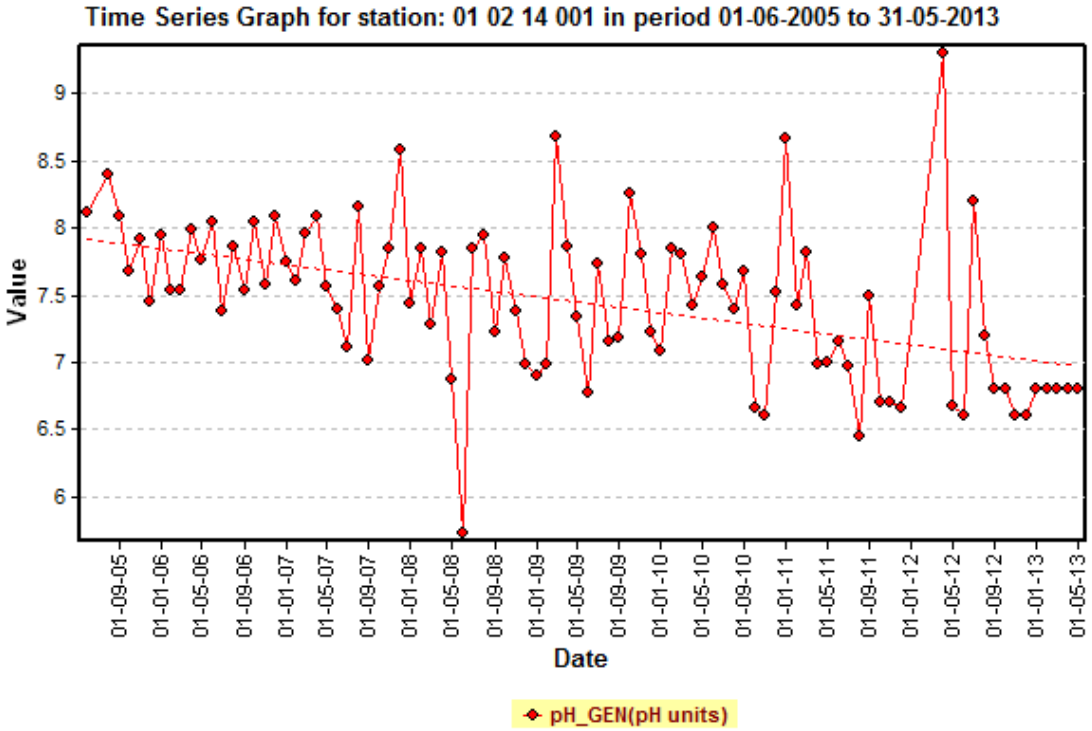
Gopalkheda

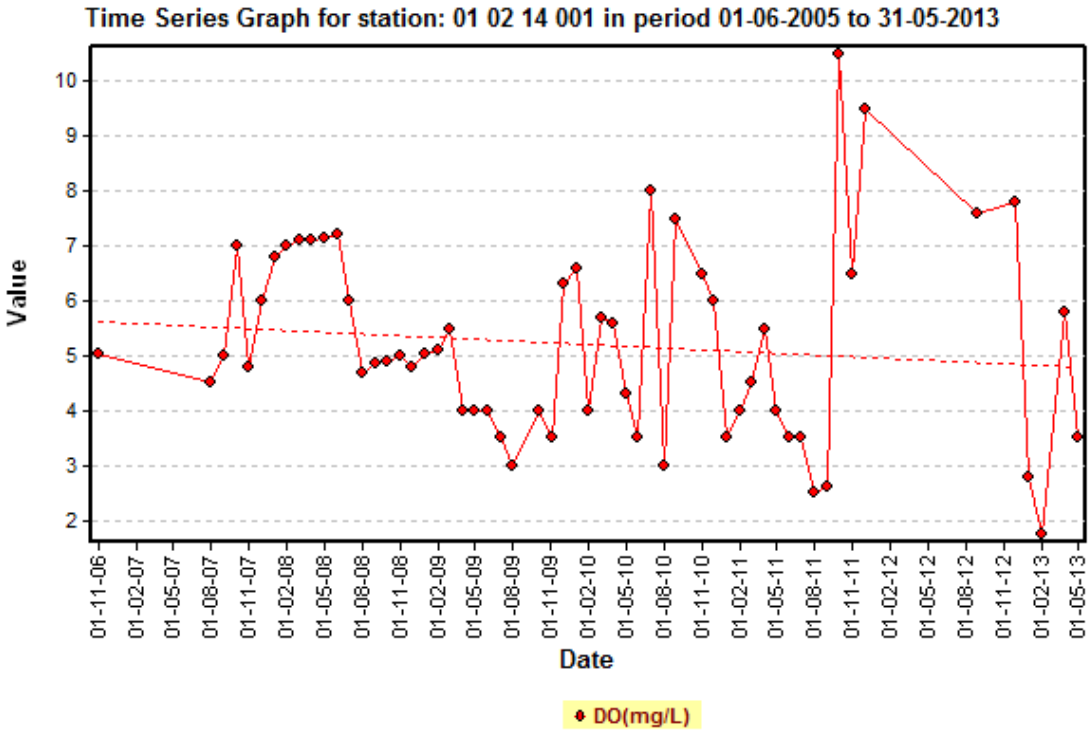


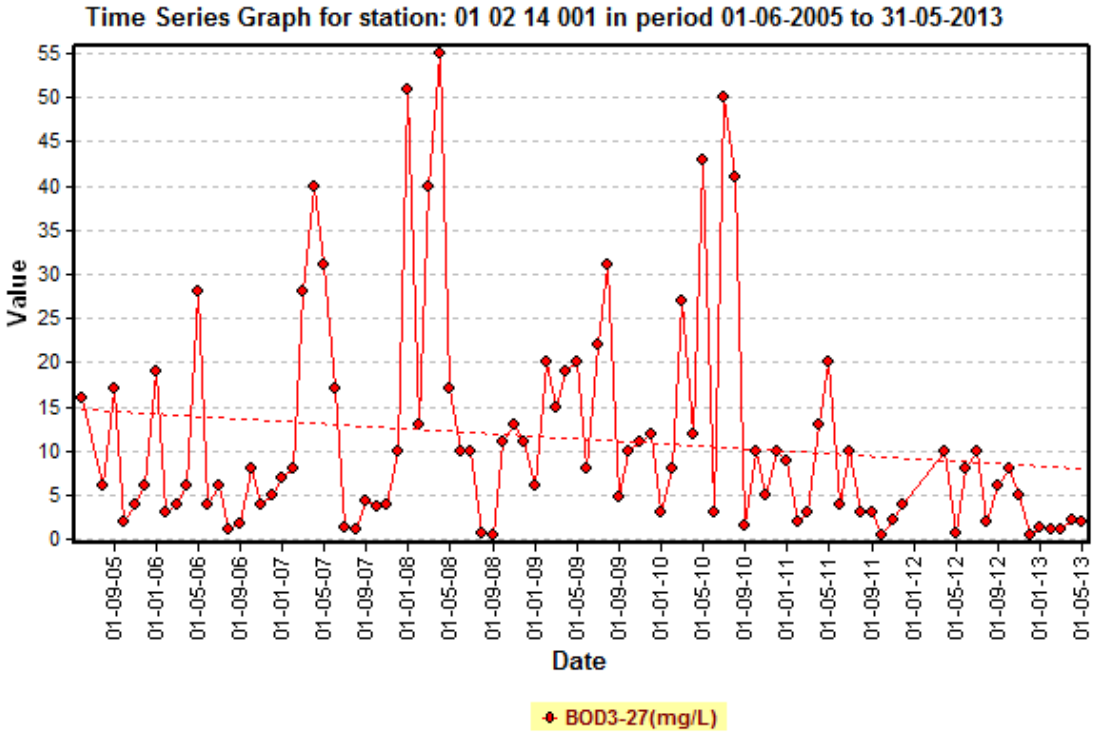
Annex-VI

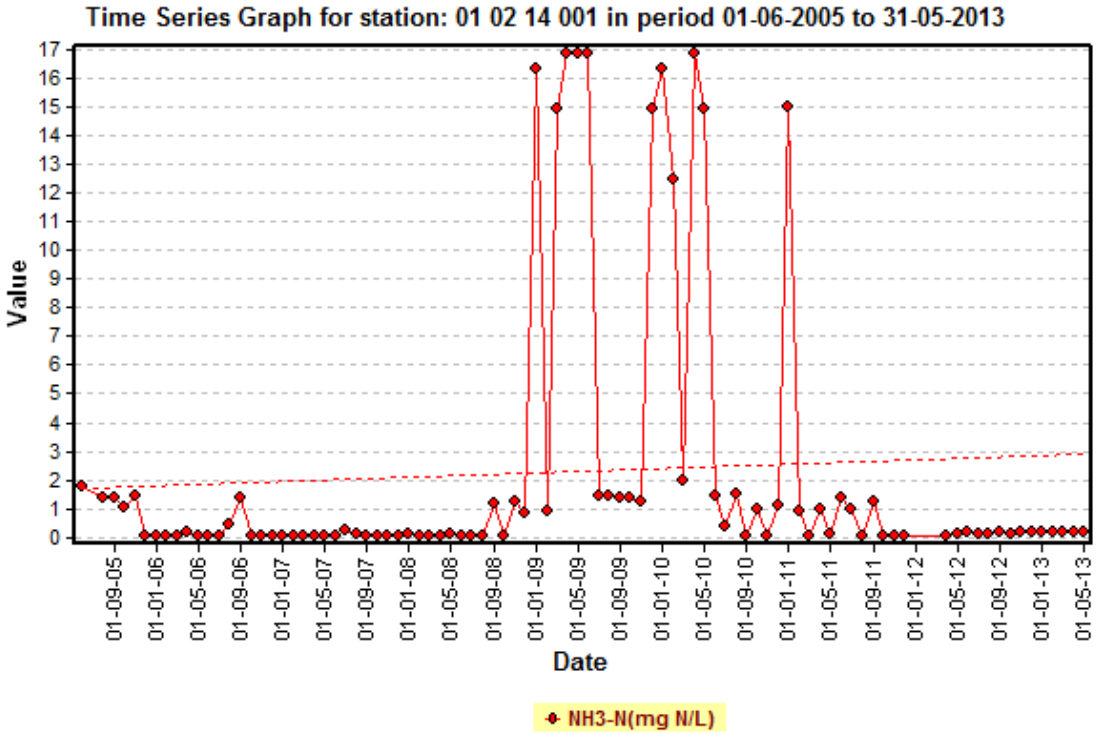
Time series Plots Of Water Quality Data- Dhadar Basin

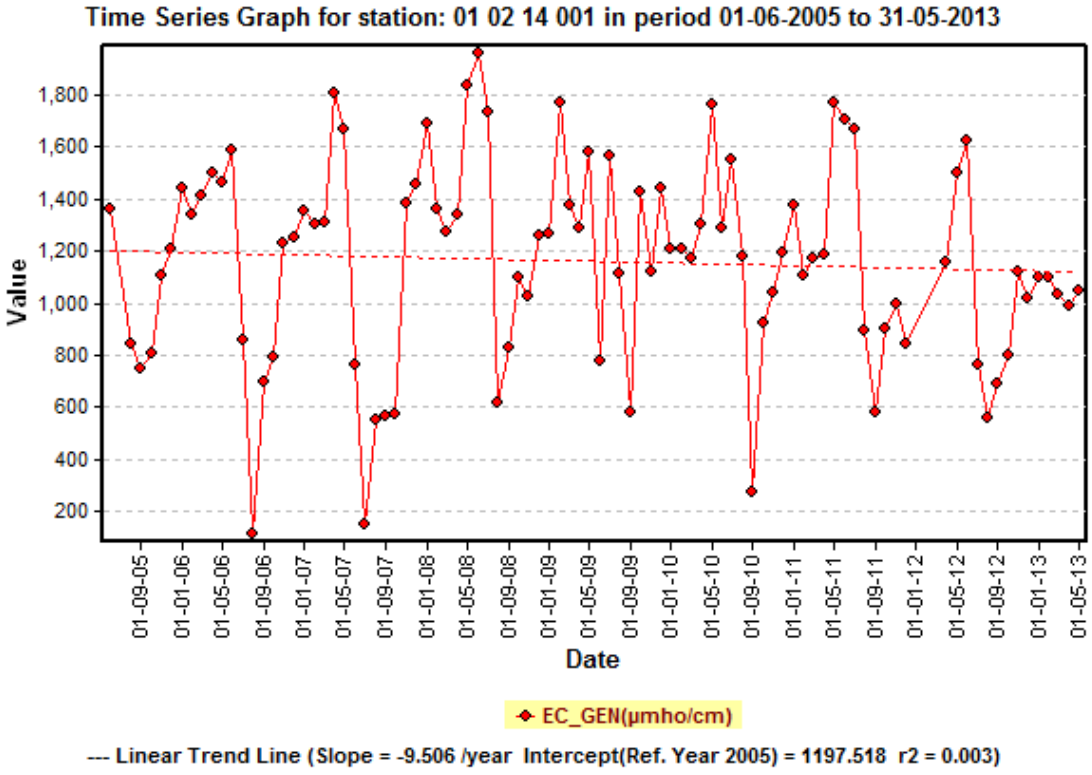
Pingalwada






Time Series Graph for station: 01 02 14 001 in period 01-06-2005 to 31-05-2013
Value
Date
BOD3-27(mg/L)
--- Linear Trend Line (Slope = -0.860 /year Intercept(Ref. Year 2005) = 14.814 r2 = 0.025)

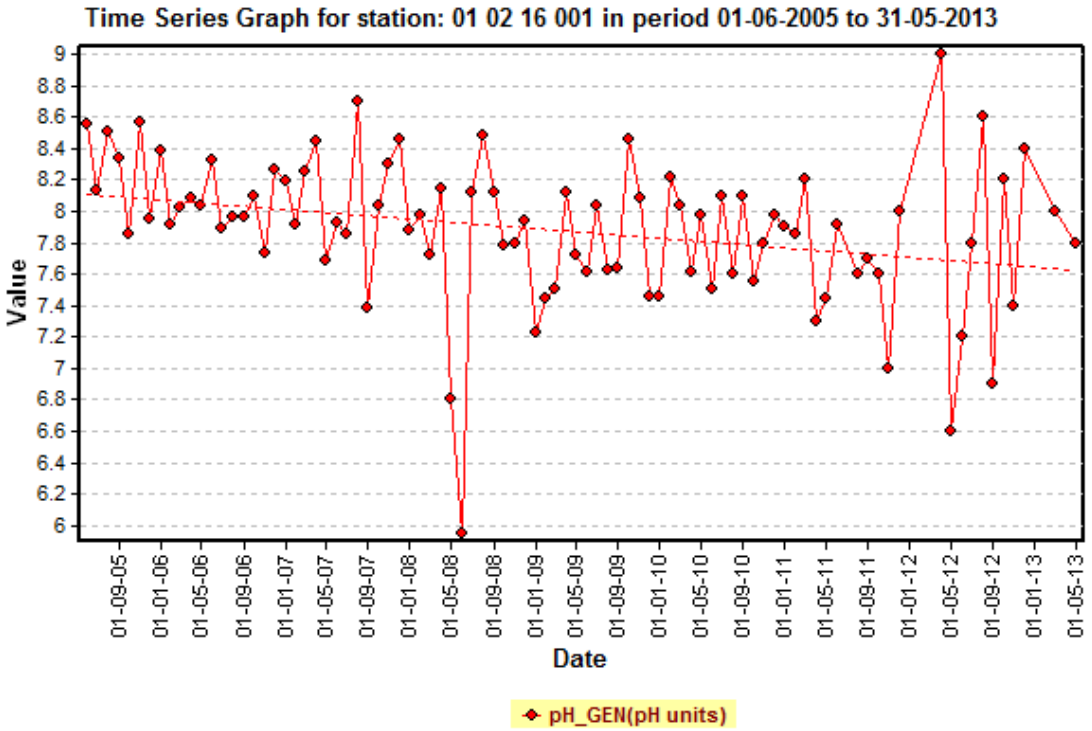

Time Series Graph for station: 01 02 14 001 in period 01-06-2005 to 31-05-2013
Value
Date
NH3-N(mg N/L)
--- Linear Trend Line (Slope = 0.150 /year Intercept(Ref. Year 2005) = 1.699 r2 = 0.005)

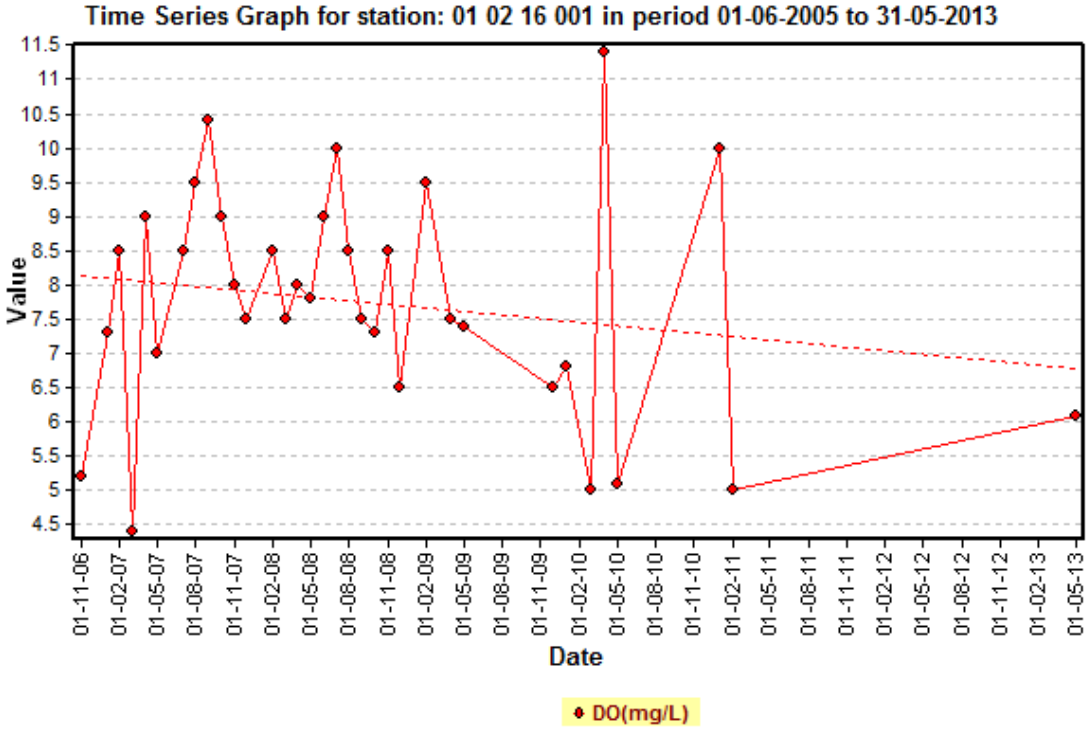

Time Series Graph for station: 01 02 14 001 in period 01-06-2005 to 31-05-2013
Value
1,800
1,600
1,400
1,200
1,000
800
600
400
200
01-09-05
01-01-06
01-05-06
01-09-06
01-01-07
01-05-07
01-09-07
01-01-08
01-05-08
01-09-08
01-01-09
01-05-09
01-09-09
01-01-10
01-05-10
01-09-10
01-01-11
01-05-11
01-09-11
01-01-12
01-05-12
01-09-12
01-01-13
01-05-13
Date
EC_GEN(µmho/cm)
--- Linear Trend Line (Slope = -9.506 /year Intercept(Ref. Year 2005) = 1197.518 r2 = 0.003)

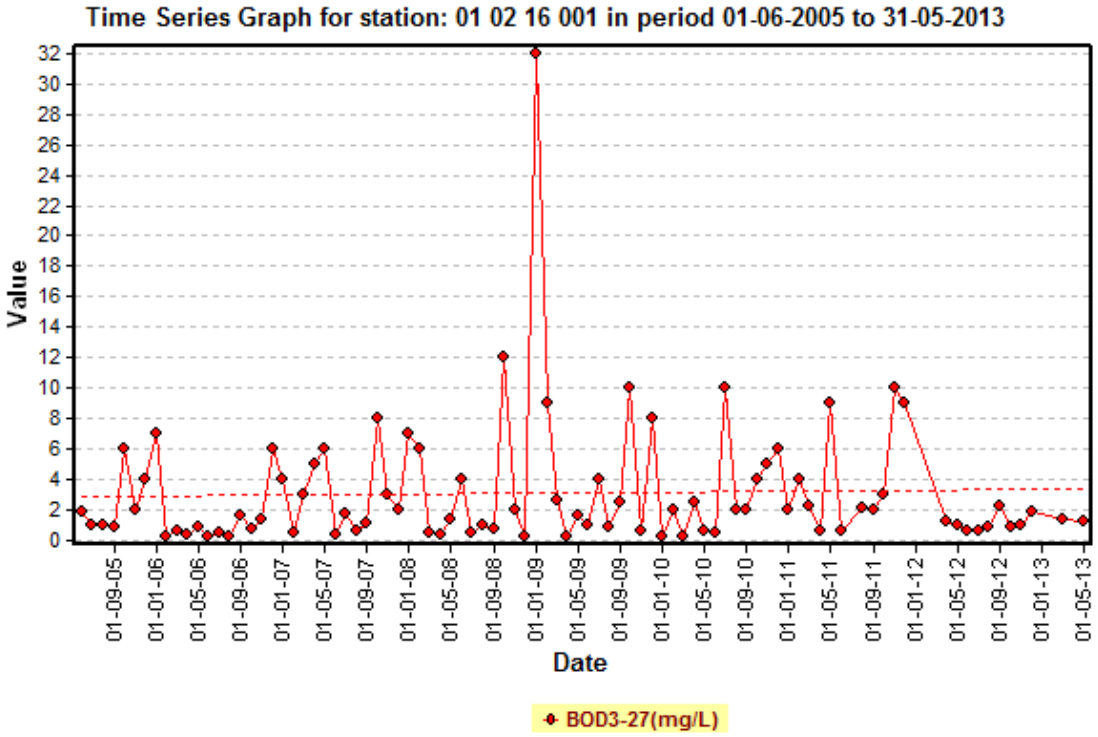
Annex-VII

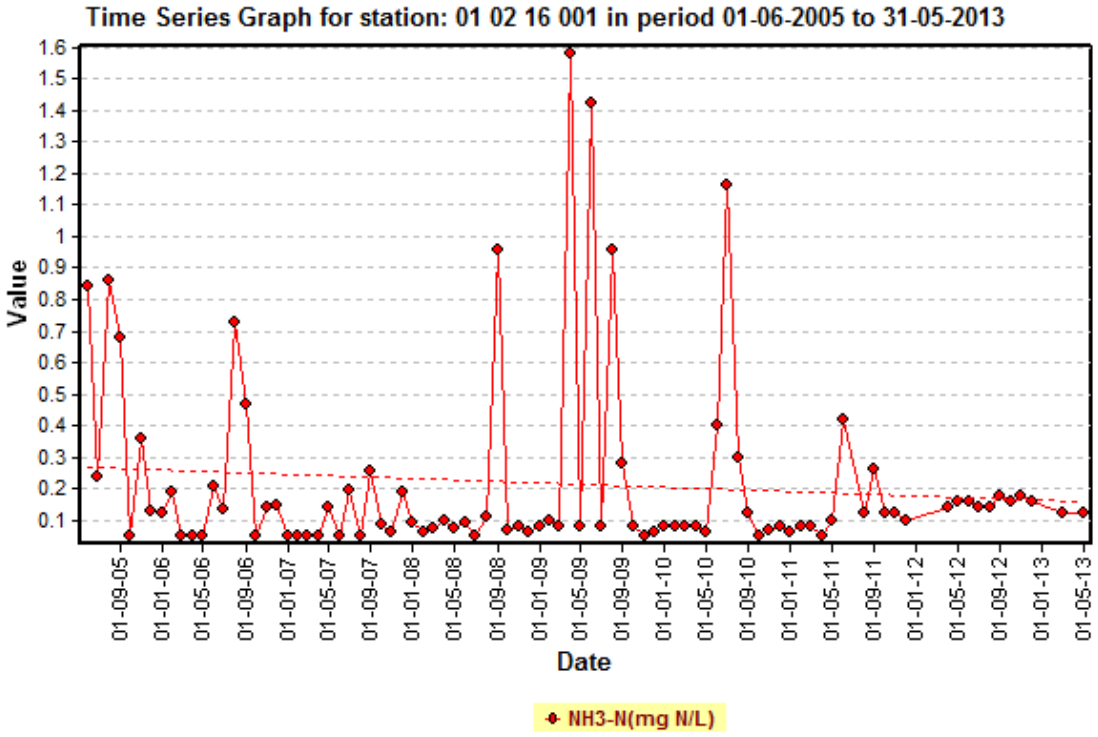
Time series Plots Of Water Quality Data- Kim Basin

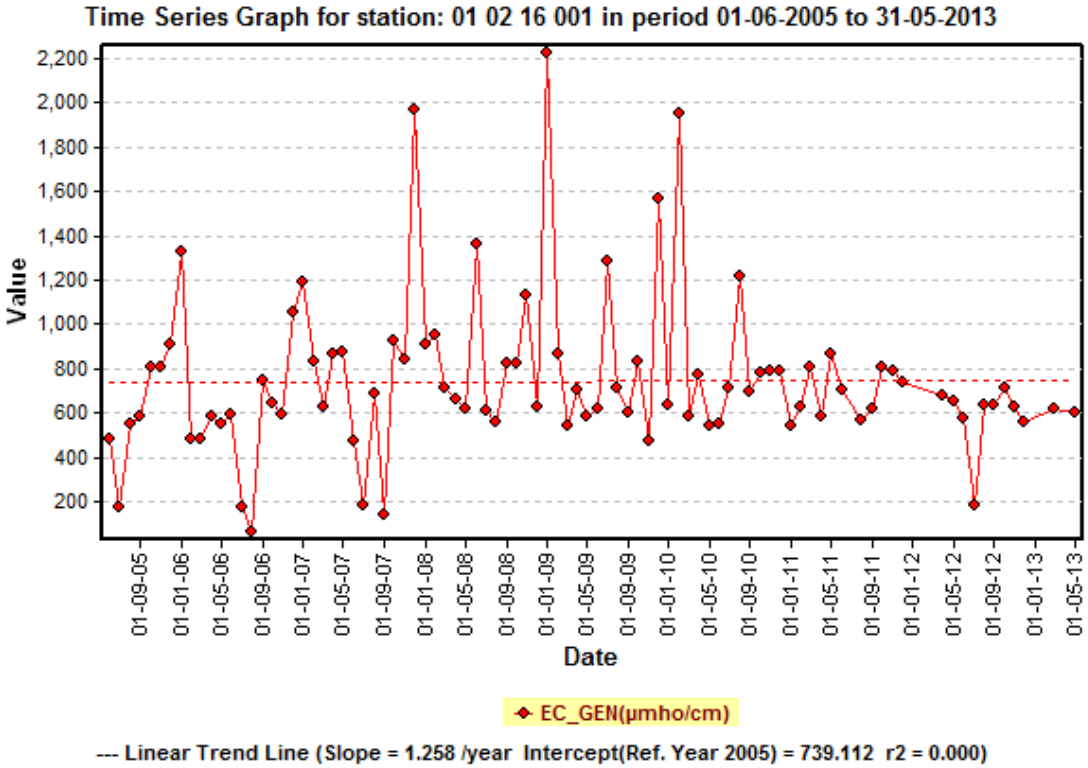
Moti Naroli






Time Series Graph for station: 01 02 16 001 in period 01-06-2005 to 31-05-2013
Value
Date
BOD3-27(mg/L)
--- Linear Trend Line (Slope = 0.059 /year Intercept(Ref. Year 2005) = 2.814 r2 = 0.001)

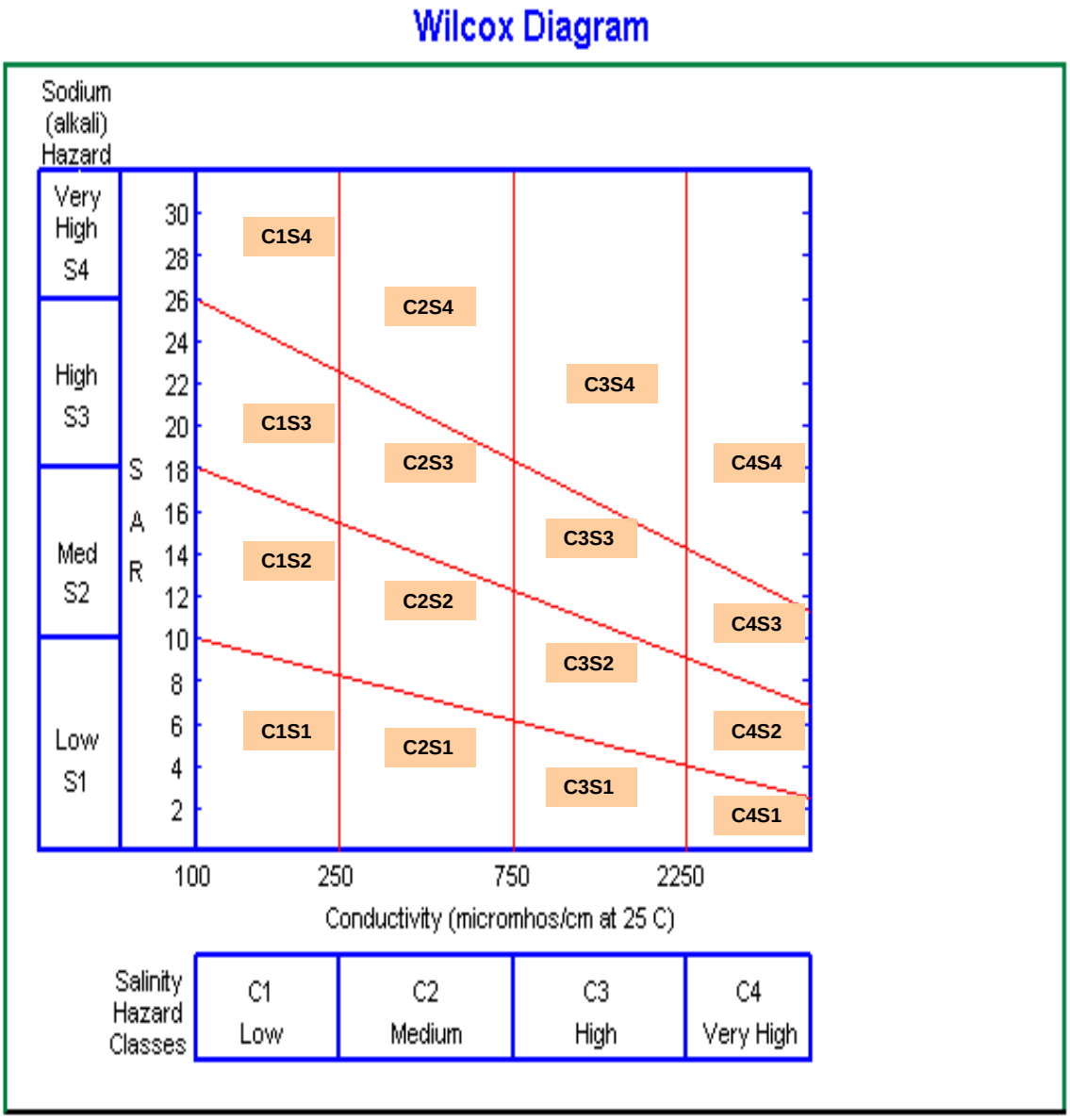

Time Series Graph for station: 01 02 16 001 in period 01-06-2005 to 31-05-2013
Value
Date
NH3-N(mg N/L)
--- Linear Trend Line (Slope = -0.014 /year Intercept(Ref. Year 2005) = 0.266 r2 = 0.010)


Time Series Graph for station: 01 02 16 001 in period 01-06-2005 to 31-05-2013
Value
2,200
2,000
1,800
1,600
1,400
1,200
1,000
800
600
400
200
01-09-05
01-01-06
01-05-06
01-09-06
01-01-07
01-05-07
01-09-07
01-01-08
01-05-08
01-09-08
01-01-09
01-05-09
01-09-09
01-01-10
01-05-10
01-09-10
01-01-11
01-05-11
01-09-11
01-01-12
01-05-12
01-09-12
01-01-13
01-05-13
Date
EC_GEN(µmho/cm)
--- Linear Trend Line (Slope = 1.258 /year Intercept(Ref. Year 2005) = 739.112 r2 = 0.000)

Annex-VIII

U.S. SALINITY DIAGRAM FOR THE

CLASSIFICATION OF IRRIGATION WATERS



NOTE;- (AFTER RICHARDS, E.D.,U.S.D.A. AGR.HANDB.60, 1954, P 807)

- SAR – SODIUM ADSORPTION RATIO

Annex-IX

TOLERANCE LIMITS OF THE SELECTED WATER QUALITY PARAMETERS FOR DIFFERENT USES AS PRESCRIBED BY THE BUREAU OF INDIAN STANDARDS

Sl. No.	Substance or Characteristics	For drinking water (IS 10500 : 1991)			For fish culture (IS 13891 : 1994)	For swimming pools (IS 3328 :1993)	For Irrigation water (IS 11624 :1986)
		Desirable limit	Undesirable effects outside the desirable limit	Permissible limit in the absence of alternate source			
1	Colour, Hazen units, Max	5	Above 5, consumer acceptance decreases	25	-	10	-
2	Odour	Unobjectionable	-	-	-	Odourless	-
3	Taste	Agreeable	-	-	-	Palatable	-
4	Temperature ^{o} C,range	-	-	-	2 to 35		-
5	Turbidity, NTU, Max	5	Above 5, consumer acceptance decreases	10	10	10	-
6	pH value	6.5 to 8.5	Beyond this range the water will affect the mucous membrane and/or water supply system	No relaxation	6.5 to 8.5	7.5 to 8.5	-
7	Total Hardness (as $CaCO_3$),mg/l, Max	300	Encrustation in water supply structure and adverse effects on domestic use	600	-	-	-
8	Iron (as Fe), mg/l, Max	0.3	Beyond this limit taste/appearance are affected, has adverse effect on domestic uses and water supply structures, and promotes iron bacteria	1.0	2.0 Total Iron (as Fe)	0.1	-
9	Chlorides (as Cl),mg/l, Max	250	Beyond this limit, taste, corrosion and palatability are affected	1000	-	500	-
10	Fluoride (as F),mg/l, Max	1.0	Fluoride may be kept as low as possible. High fluoride may cause Fluorosis	1.5	-	-	-
11	Dissolved solids, mg/l, Max	500	Beyond this palatability decreases and may cause gastro intestinal irritation	2000	-	1500	-
12	Specific conductivity at 25 ^{o} C, µmho , Max	-	-	-	$1500x10^{-6}$	-	6000 µmho/ cm

Sl. No.	Substance or Characteristics	For drinking water (IS 10500 : 1991)			For fish culture (IS 13891 : 1994)	For swimming pools (IS 3328 :1993)	For Irrigation water (IS 11624 :1986)
		Desirable limit	Undesirable effects outside the desirable limit	Permissible limit in the absence of alternate source			
13	Calcium (as Ca), mg/l, Max	75	Encrustation in water supply structure and adverse effects on domestic use	200	-	-	-
14	Magnesium (as Mg), mg/l, Max	30	Encrustation to water supply structure and adverse effects on domestic use	100	-	-	-
15	Sulphate (as SO_4), mg/l, Max	200	Beyond this causes gastro intestinal irritation when magnesium or sodium are present	400	-	-	-
16	Nitrate (as NO_3), mg/l, Max	45	Beyond this methaemoglobinema takes place	100	2.0 (as N)	-	-
17	Free ammonia (as N), mg/l, Max	-	-	-	1.5	-	-
18	Alkalinity, mg/l, Max	200	Beyond this limit taste becomes unpleasant	600	100 to 300 as $CaCO_3$ mg/l	50 to 500 Total alkalinity as $CaCO_3$ mg/l, Max	-
19	Aluminium (as Al), mg/l, Max	0.03	Cumulative effect is reported to cause dementia	0.2	-	0.1	-
20	Boron, mg/l, Max	1.0	-	5.0	-	-	4.0
21	Dissolved oxygen, mg/l, Min	-	-	-	4.0	-	-
22	Sodium Adsorption Ratio(SAR) $\frac{}{\sqrt{\text{milli mole/l}}}$						26.0
23	Residual Sodium Carbonate(RSC) m.eq/l						6.0
22	Pesticides, mg/l, Max	Absent	Toxic	0.001	Absent	-	-