1.0 Introduction

1.1 General

This water year book presents data of seven hydrological observation stations, alongwith general information about basins and trend analysis for annual runoff, for the water year 2012-13 in Purna, Vaitarna, Ambica, Dhadhar, Kim, Wagh and Damanganga rivers. The data of 07 sites which are included in this book are collected by Tapi division, Central Water Commission, Surat under Hydrological Observation Circle, Gandhinagar. Jurisdiction map of Tapi division, CWC, Surat is enclosed at **Plate-1**. Central Water commission is conducting hydrological observations on major west flowing river basins under various schemes viz national network (NNW), 80-key stations, 163- key stations and flood forecasting (FF). The scheme wise distributions of sites are shown in the **table-1**.

Table-1: Scheme wise distributions of sites

Sl. No.	Name of Site	Station Code	Scheme	Type
1.	Purna at Mahuwa	01 02 19 001	NNW	GDS WQ
2.	Vaitarna At Durvesh	01 02 25 001	NNW	GDS WQ
3.	Ambica at Gadat	01 02 20 001	80 Key stations	GDSWQ
4.	Dhadhar At Pingalwada	01 02 14 001	163 Key stations	GD WQ
5.	Kim at Motinaroli	01 02 16 001	163 Key stations	GDWQ
6.	Wagh at Ozerkheda	01 02 24 002	FF	GD
7.	Damanganga at Nanipalsan	01 02 24 001	FF	GD

2.0 Description of River Basins

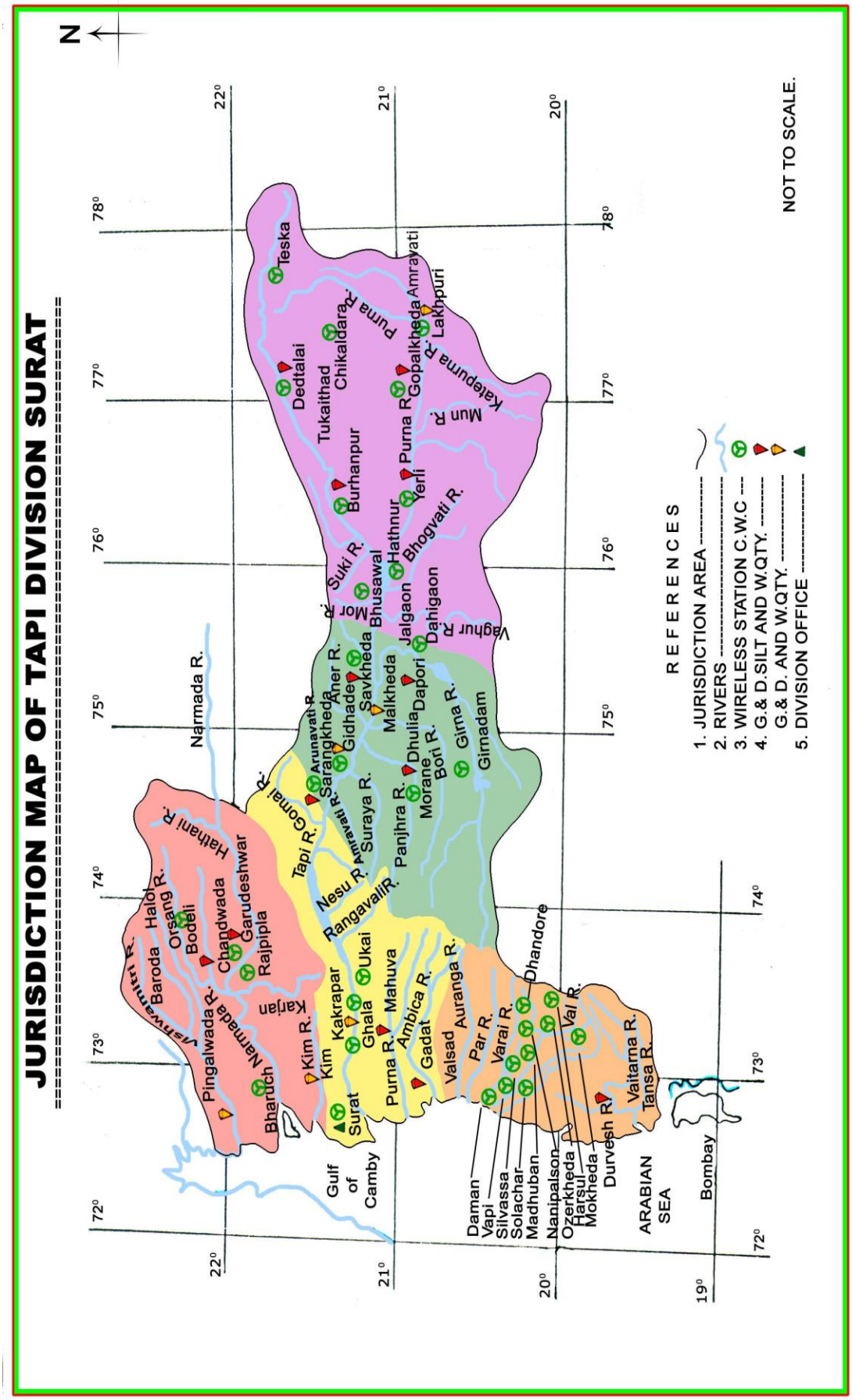
There are 6 independent river basins as given below under the jurisdiction of Tapi Division, Central Water Commission, Surat,

1. Purna Basin
2. Ambica Basin
3. Vaitarna Basin
4. Dhadhar Basin
5. Damanganga Basin
6. Kim Basin

Description of these river basin is given in subsequent sections of this year book.

1.2 Jurisdiction Map of Tapi division, CWC, Surat.

Plate – 1



2.1 Purna Basin

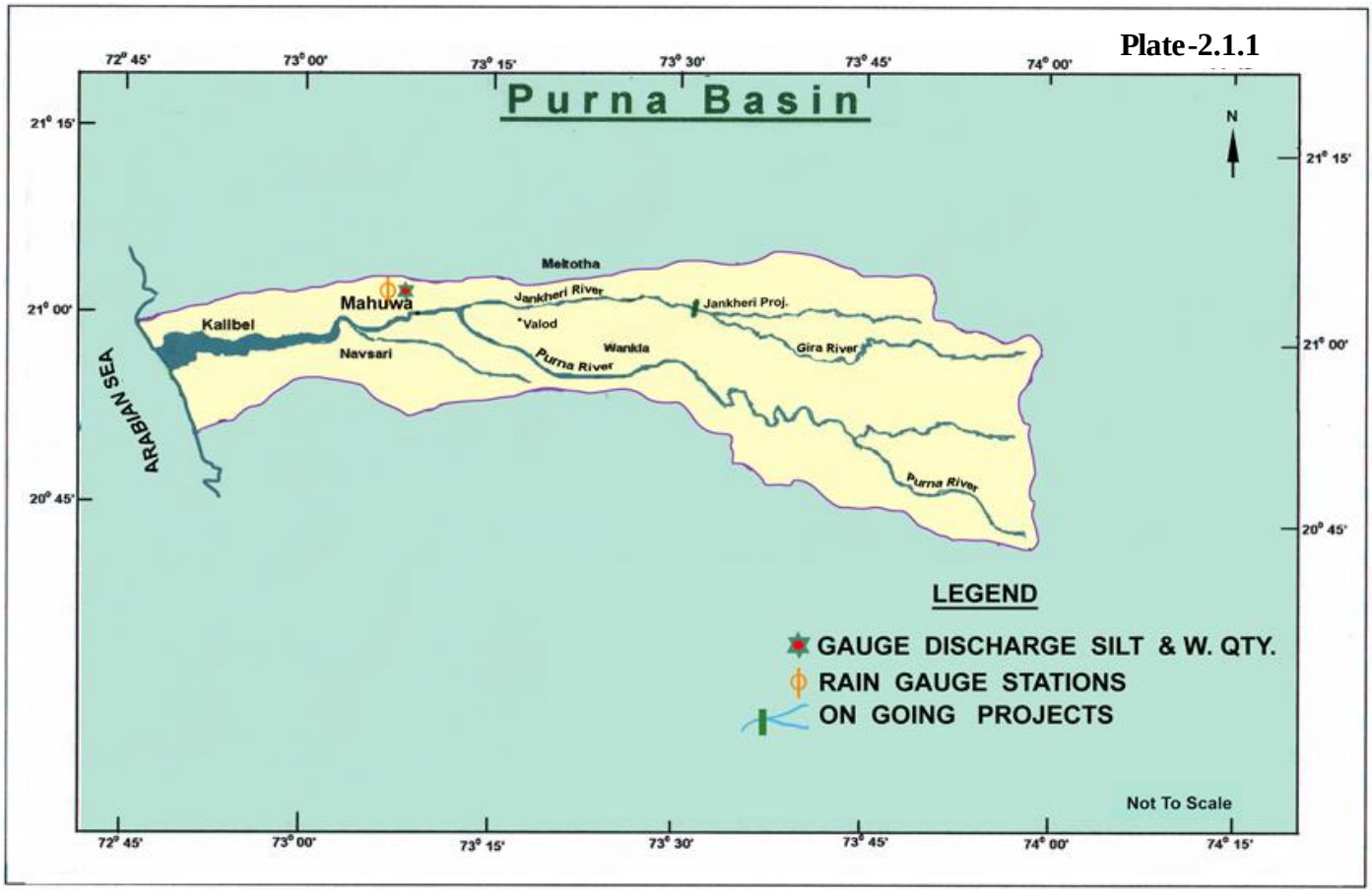
2.1.1 Geographical setting of Purna Bain

Purna River is an important west flowing river with its catchment lying in Ahwaa,Valsad and Navsari districts of Gujarat and in Nasik district of Maharashtra. The Purna basin can be divided into three prominent physiographic regions, i.e.

i) eastern parts, (ii) the middle reaches and (iii) the coastal zones.

The eastern parts of the basin cover a chain of rugged mountain ranges of the Western Ghats running at an elevation of above 1300 m and descending to an elevation of about 100 m at the edges of uplands of the Surat district. The middle reaches of the basin area are marked by high relief zone with ridges and valleys. The hilly zone then merges into the plains through an undulating piedmont coastal zone running parallel to the sea. Basin map of Purna River is shown in **Plate-2.1.1.**

Plate-2.1.1



2.1.2 River System

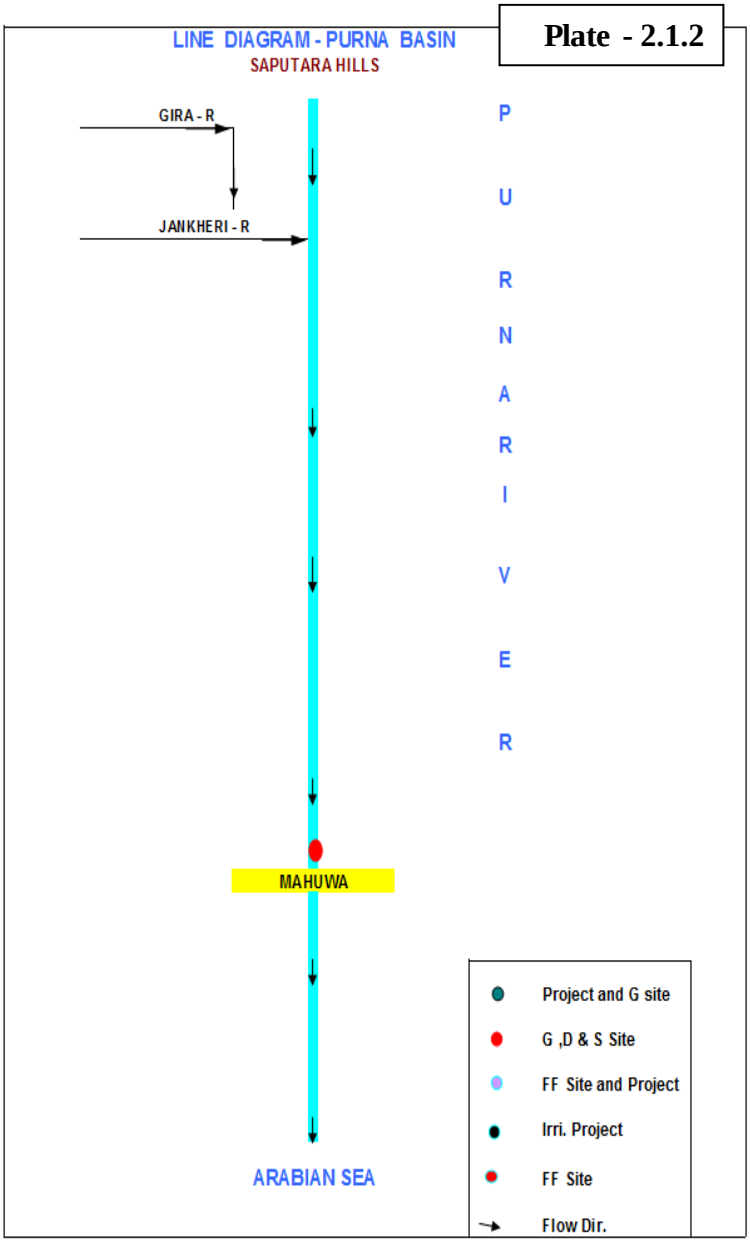
The river Purna rises in the Saputara hills of the Western Ghats near the village Chinchi in Maharashtra. The length of the river from its source to outflow in the Arabian Sea is about 180 km.

The important tributaries of the Purna River are Dhodar nala, Bardanala, Nagihpar nala, Girna River, Zankari River and Dumas khadi. The catchment area of the Purna basin is 2431 Sq. km. The basin lies between 72^0 45' to 74^0 00' East longitude and 20^0 41' to 21^0 05' North latitude. State wise distribution of drainage area is shown in **Table-2.1.1** and line diagram of Purna river system is shown in **Plate - 2.1.2**

Table -2.1.1**:** State wise distribution of catchments area of the Purna basin

Sl.No	State	C.A .in Sq. km.	% Of the total C.A.
1	Maharashtra	58	2.39
2	Gujarat	2373	97.61
	Total	2431	100.00

Plate - 2.1.2



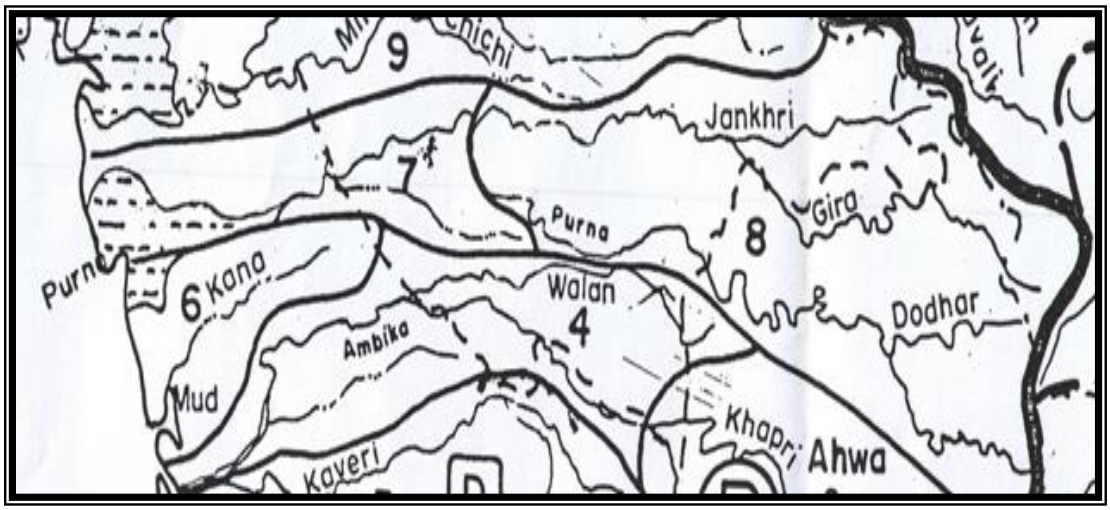
2.1.3 Purna Basin as per Watershed Atlas of India

As per Watershed Atlas of India, Published by Department of Agriculture and Cooperation, Ministry of agriculture, Krishi Bhavan New Delhi (1990), the sub catchments under 5B2D pertain to Purna Basin.

2.1.3.1 Subcatchment -5B2D (5B2D7 & 5B2D8)

This Sub Catchment is situated in the plain and hilly region of Gujarat, and Maharashtra drained by Dhodar nala, Bardanala, Nagihpar nala, Girna River, Zankari River and Dumas khadi. The total area of this Sub-Catchment is 2431 Sqkm. Subcatchment area of Purna Basin is shown in **Fig.-2.1.1**

Fig-2.1.1: Sub catchment area of Purna Basin as per water shed Atlas of India.



Source: Watershed Atlas of India, Published by Department of Agriculture and Cooperation, Ministry of agriculture, Krishi Bhavan New Delhi (1990)

2.1.4 Climate

Accordingly to Koeppan's Scheme, the climate of the basin is classified as AW-Tropical Savannah as most of the peninsular plateau, south of Tropic of Cancer is classified. In the initial reaches, the climate is influenced by the Western Ghats which becomes continued as the river reaches the coastal plains. The climatic variations are experienced in the patterns of temperature, rainfall & winds, rhythm of seasons and degree of wetness or dryness. These are described as follows:

2.1.4.1 Temperature

The Temperature is maximum in the month of May and Minimum in the month of December to January. The maximum, minimum temperatures observed at site

Mahuwa varies from 27^0 C to 46^0 C and 30^0 C to 10^0 C respectively. The temperature profile in the basin is given in the **Table -2.1.2**

Table-2.1.2: Mean monthly Temperature (^{0}C) during water year at site Mahuwa

Month	Mean Monthly Maximum Temperature (°C)	Mean Monthly Minimum Temperature (°C)
Jun-12	33.4	26.8
Jul-12	29.4	25.3
Aug-12	29.3	24.4
Sep-12	29.3	24.0
Oct-12	32.6	23.2
Nov-12	33.4	17.2
Dec-12	32.1	17.2
Jan-13	31.2	14.7
Feb-13	32.9	18.0
Mar-13	38.2	20.2
Apr-13	35.7	23.9
May-13	37.6	26.1
Annual mean	32.9	21.8

2.1.4.2 Rainfall

The basin receives most of the rainfall from the South West monsoon from June to September. Average annual rainfall in the basin is 1584 mm. The rainfall at site Mahuwa in Purna Basin shown in **Table - 2.1.3.**

Table -2.1.3 Mean annual rainfall at site Mahuwa in Purna Basin

Sl.No	Name of Site	Data available (No of Years)	Average Annual Rainfall (mm)	Average no of rainy days	Rainfall in the year 2012-13	No of rainy days in 2012-13
1	Mahuwa	27	1583.8	73	1081.2	72

Table-2.1.4: Seasonal Rainfall during Water Year 2012-13 at Mahuwa in Purna basin

Sl No	Name of Site	Seasonal Rainfall (mm) in 2012-13				Total Annual Rainfall
		Winter monsoon	Pre monsoon	South-West monsoon	Post monsoon	
		(Jan-Feb)	(Mar-May)	(June-Sept)	(Oct-Dec)	
1	Mahuwa	0	0	1068.8	12.4	1081.2

2.1.4.3 Wind

The wind speed and direction profile at site Mahuwa, based on collected data is given in **table -2.1.5**. The average monthly wind speed varies from 2.9 km/h to 0.2 km/h .In the pre and post-monsoon period, the wind speed is generally higher. The pre dominant wind direction is NE followed by SE and W.

Table 2.1.5: Wind Speed at site Mahuwa in Purna basin during Water Year 2012-13

Month	Mean monthly wind Speed (km/h)
June	2.1
July	0.5
August	No data
September	0.2
October	0.2
November	0.2
December	0.2
January	0.6
February	0.6
March	0.6
April	0.8
May	1.2

2.1.4.4 Humidity

The relative Humidity in Purna basin at site Mahuwa varies between 97.7% and 81.2% depending upon the season. It is naturally maximum in the monsoon period and is around 84.2 to 97.7%. In the winter months of November and December, the relative humidity decreases. The relative humidity profile at station Mahuwa in Purna Basin is given in **table -2.1.6**

Table 2.1.6: Mean monthly Relative Humidity at site Mahuwa in Purna Basin during Water Year 2012-13

Month	Relative Humidity (%)
June	90.2
July	96.8
August	97.7
September	96.7
October	89.0
November	79.1
December	80.4
January	76.1
February	81.0
March	75.2
April	82.0
May	82.8
Annual Mean	85.6

2.1.5 Geology

The whole basin can be divided in to three prominent physiographic zones viz. i) the Eastern zone ii) the middle zone and ii) the coastal zone. The Eastern zone of the basin covers a chain of rugged mountain ranges of the Western Ghats. The middle zone of the basin is marked by high relief zone with ridges and valleys. The hilly region then merges in to the plains through a coastal piedmont coastal zone running parallel to the sea. Deccan traps occupy the most parts of the basin. In the East there are high ridges and deep valleys and towards the west, they merge into the lower reach composed of recent and sub recent alluvium and blown sand. The straight graphical sequences of the rocks found in the basin are Neogene's, Palaeogene and early Palaeogene.

2.1.6 Soil

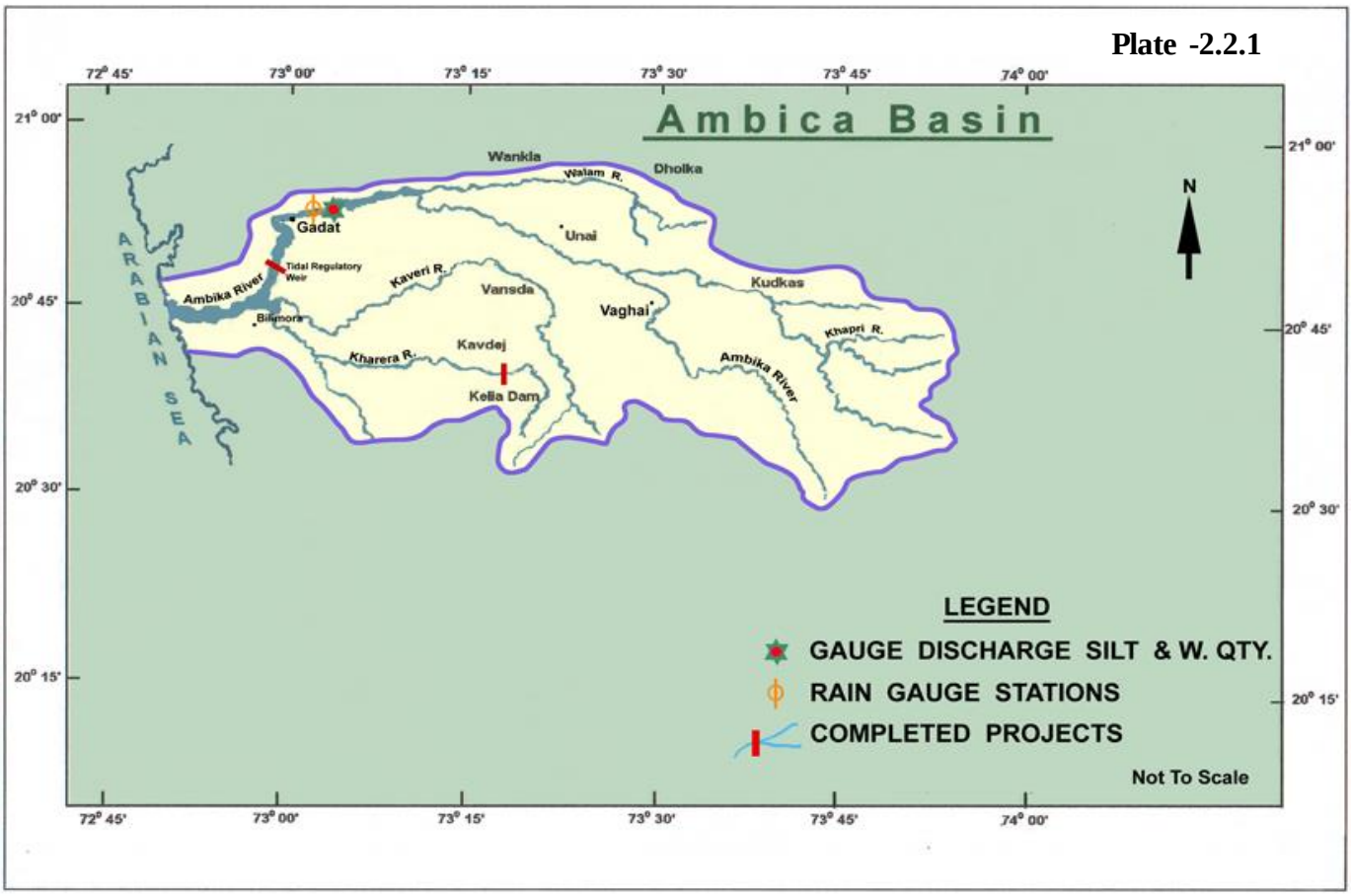
Soils of Purna basin can be classified into three groups viz lateritic soils, deep black soils and coastal alluvial soils.

2.2 Ambica Basin

2.2.1 Geographical setting of Ambica Basin

Ambica River is one of the important west flowing rivers with its catchment in Gujarat and Maharashtra. The Ambica basin which is adjacent to the Auranga basin can be divided in to two prominent physiographic zones. The eastern part comes under a rugged mountain chain of the Sahyadri Western Ghats and descending on the western side to the edge of the uplands of Surat district. This region is situated at general elevation ranging from 1050 m to 100 m. The western part consists of hills and valleys which generally lie below 100 m elevation. Its basin map is shown in **Plate -2.2.1.**

Plate -2.2.1



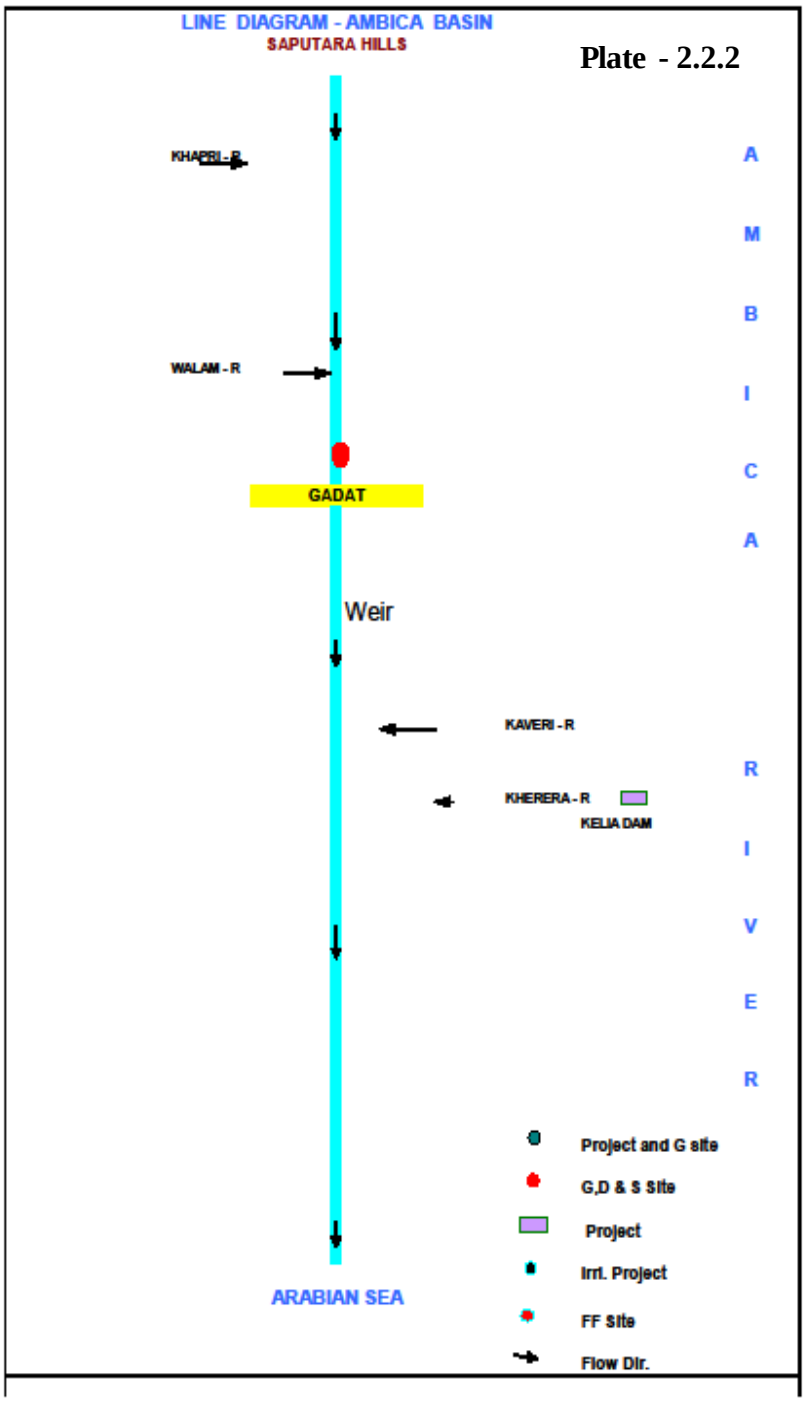
2.2.2 River System

It originates from Saputara Hill ranges near village Kotambi of Surgana taluka in the Nasik district of Maharashtra. After flowing for a length of 136 km it drains in to the Arabian Sea. The important tributaries of the Ambica River are Kapri, Wallan, Kaveri and Kharera. The river Ambica basin lies between 20° 31’ and 20° 57’ North latitude

and 72° 48' and 73° 52' East longitude with a drainage area of 2715 Sq.km. The Valsad, Dangs and Surat Districts of Gujarat and a small portion of the Nasik district of Maharashtra falls in the basin, drainage area of Ambica River basin is shown in **Table-2.2.1** and line diagram of Ambica river system is shown in **Plate - 2.2.2.**

Table -2.2.1: State wise distribution of catchments area of the Ambica basin

Sl.No	State	Catchment Area (sq km)	% Of the total C.A.
1	Maharashtra	102	3.76
2	Gujarat	2613	97.24
	Total	2715	100.00



2.2.3 Ambica Basin as per Watershed Atlas of India

As per Watershed Atlas of India, Published by Department of Agriculture and Cooperation, Ministry of agriculture, Krishi Bhavan New Delhi (1990), the sub catchments from **5B2D** pertain to Ambica Basin, as shown in **Fig.-2.2.1.**

2.2.3.1 Sub-catchment -5B2D (5B2D3, 5B2D4 & 5B2D5)

This Sub Catchment is situated in the plain and hilly region of Gujarat, and Maharashtra drained by Kapri, Wallan, Kaveri and Kharera. The total area of this Sub-Catchment is 2715 Sqkm. Subcatchment area of Ambica Basin is shown in **Fig. 2.2.1**

Fig-2.2.1: Sub- catchment area of Ambica Basin as per water shed Atlas of India.

Source: Watershed Atlas of India, Published by Department of Agriculture and Cooperation, Ministry of agriculture, Krishi Bhavan New Delhi (1990)

2.2.4 Climate

Accordingly to Koeppan's Scheme, the climate of the basin is classified as AW-Tropical Savannah, as most of the peninsular plateau, south of Tropic of Cancer, is classified. In the initial reaches, the climate is influenced by the Western Ghats which gradually changes as the river reaches the coastal plains. The climatic variations are experienced in the patterns of temperature, rainfall & winds, rhythm of seasons and degree of wetness or dryness. These are described as follows.

2.2.4.1 Temperature

The Temperature is maximum in the month of May and Minimum in the month of December to January. The maximum, minimum temperatures observed vary from 32^0C to 40^0C and 25^0C to 8^0 C respectively. The temperature profile in the basin is given in the **table 2.2.2**

Table-2.2.2: Mean monthly Temperature (^{0}C) during water year at site Gadat

Month	Mean Monthly Maximum Temperature (°C)	Mean Monthly Minimum Temperature (°C)
Jun-12	33.7	26.7
Jul-12	29.8	26.3
Aug-12	29.5	25.5
Sep-12	30.1	25.3
Oct-12	34.2	22.6
Nov-12	32.0	16.4
Dec-12	30.9	15.4
Jan-13	27.8	12.2
Feb-13	30.0	15.3
Mar-13	35.5	18.4
Apr-13	33.6	22.1
May-13	36.4	26.6
Annual mean	32.0	21.1

2.2.4.2 Rainfall

The basin receives most of the rainfall from the South West monsoon from June to September. Average annual rainfall in the basin is 1737 mm. The rainfall at site in Ambica Basin shown in **Table -2.2.3 & 2.2.4.**

Table -2.2.3: Mean annual rainfall of Ambica Basin at site Gadat

Sl. No	Name of Site	Data available (No of Years)	Average Rainfall (mm)	Average no of rainy days	Rainfall in the year 2012-13	No of rainy days in 2012-13
1	Gadat	30	1737.3	74	1176.1	67

Table-2.2.4: Seasonal Rainfall during Water Year 2012-13 at site Gadat in Ambica Basin

Sl No	Name of Site	Seasonal Rainfall (mm) in 2012-13				Total Annual Rainfall
		Winter monsoon	Pre monsoon	South-West monsoon	Post monsoon	
		(Jan-Feb)	(Mar-May)	(June-Sept)	(Oct-Dec)	
1	Gadat	0	0	1164.7	11.4	1176.1

2.2.4.3 Wind

The wind speed and direction profile at site Gadat based on collected data is given in T**able -2.2.5**.The average monthly wind speed varies from 0.5 km/h to 2.5 km/h .In the pre and post-monsoon period, the wind speed is generally higher. The pre dominant wind direction is S/SE.

Table 2.2.5: Wind Speed and Direction at site Gadat in Ambica basin during Water Year 2012-13

Month	Mean monthly wind Speed (km/h)	Dominant Direction
June	2.9	S
July	2.0	S
August	1.6	S
September	1.0	S
October	0.5	SE
November	0.3	SE
December	0.4	SW
January	0.6	SE
February	0.7	SW
March	0.8	N/SW
April	1.2	NE
May	2.0	N
Annual Mean	1.2	-

2.2.4.4 Humidity

The relative Humidity in Ambica basin varies between 92 % to 82.0 % depending upon the season the humidity is naturally maximum in the monsoon period and is around 90 to 92 %. In the winter months of November and December the relative humidity comes down. The relative humidity at station of CWC representative of Purna Basin is given in T**able- 2.2.6**

Table -2.2.6: Mean monthly Relative Humidity at site Gadat in Ambica Basin during Water Year 2012-13

Month	Relative Humidity (%)
June	92.0
July	92.0
August	92.0
September	92.0
October	91.3
November	89.6
December	89.0
January	88.4
February	89.2
March	90.3
April	91.3
May	82.0
Annual Mean	89.9

2.2.5 Geology

The basin can be divided into two prominent physiographic zones. The eastern part comes under rugged mountain chains of the Saputara Hills and descends on the western side to the edge of the uplands of Surat district. This region is placed at a general elevation of 1050 m to 100 m. The western part, barring the coastal plain, is essentially in the sub Sahyadrin zone of hills and valleys generally below 100 m elevation. Deccan traps and intermediate amphitheatres have developed out of the alluvial debris washed from the hills. The lower reaches of the basin upto the coastal margins are mainly alluvial plains

2.2.6 Soil

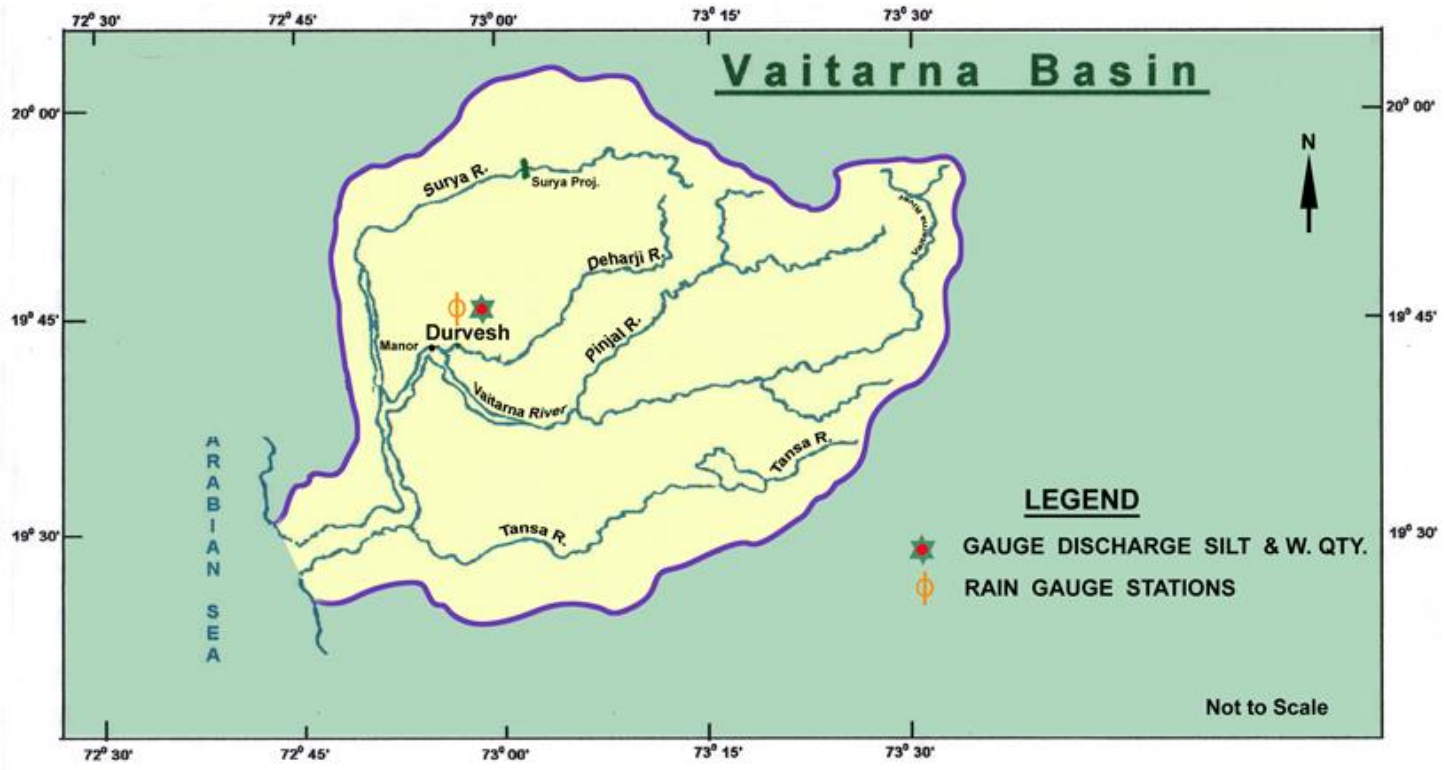
Soil of Ambica basin can be broadly classified into three group viz. Laterite soil, deep black soil and alluvial soil.

2.3 Vaitarna Basin

2.3.1 Geographical setting of Vaitarna Basin

The river Vaitarna is one of the west flowing rivers in the region North of Mumbai and South of the Tapi River. The river rises in the Sahyadri hill range in the Nasik district of Maharashtra State and after traversing a distance of about 120 km in Maharashtra joins the Arabian Sea. Basin map is shown in **Plate -2.3.1**. The Vaitarna basin lies between East longitude of 72^0 45' to 73^0 35' and North latitude of 19^0 25'to 20^0 20'.

Plate -2.3.1



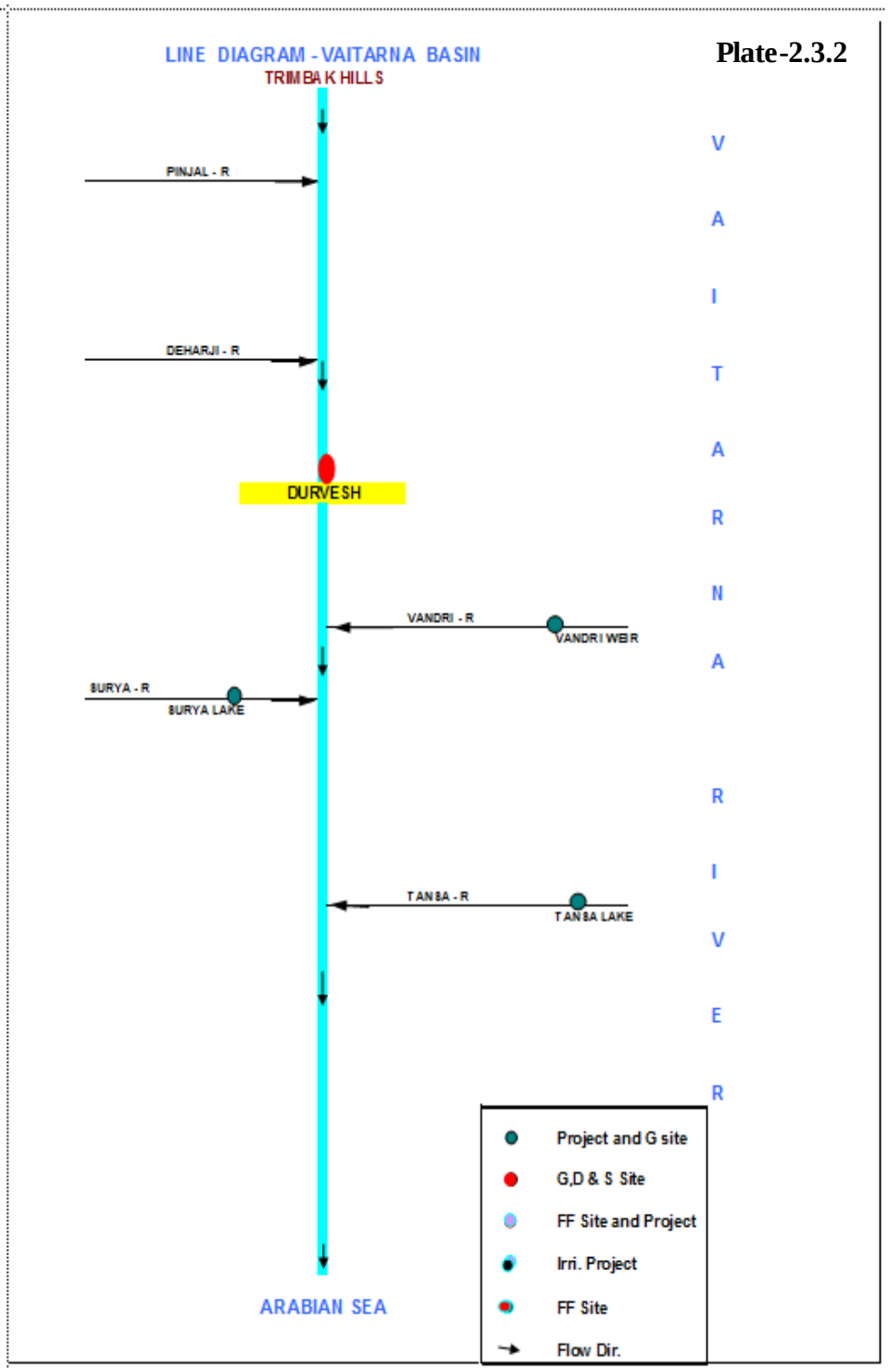
2.3.2 River System

The headstreams of the Vaitarna rise on the southern slopes of the Triambak-Anjaneri range and combine into three southward flowing streams which unite to form the Vaitarna a little north of Dapure. The Vaitarna from here has a very winding course southwards and goes round Zarwad (Jarwar) Budruk.

Due south of it, the river is joined by its tributary Alvand nadi, whose headstreams rise in the same Triambak Anjaneri range on the southern slopes of the Bhaskargad, Phani dongar and Harish dongar, which form the divide between these and those of the Val river flowing northwards. After the confluence with the Alvand river, the Vaitarna turns and flows nearly straight in a south-south-west direction cutting a deep

gorge in the scarp of the Sahyadris. A small tributary from the northwest to south-east in a gorge continues the course of the Vaitarna in a remarkably deeply cut valley.

The main tributaries of Vaitarna river are Pinjal, Ganjai, Surya, Daharji, Tansa. The catchment area of Vaitarna basin completely lies in Thane and Nasik districts of Maharashtra. The Vaitarna drains an area of 2019 sq km before it falls in Gulf of Khambhat. A line diagram of Vaitarna river system is shown in **Plate -2.3.2**.



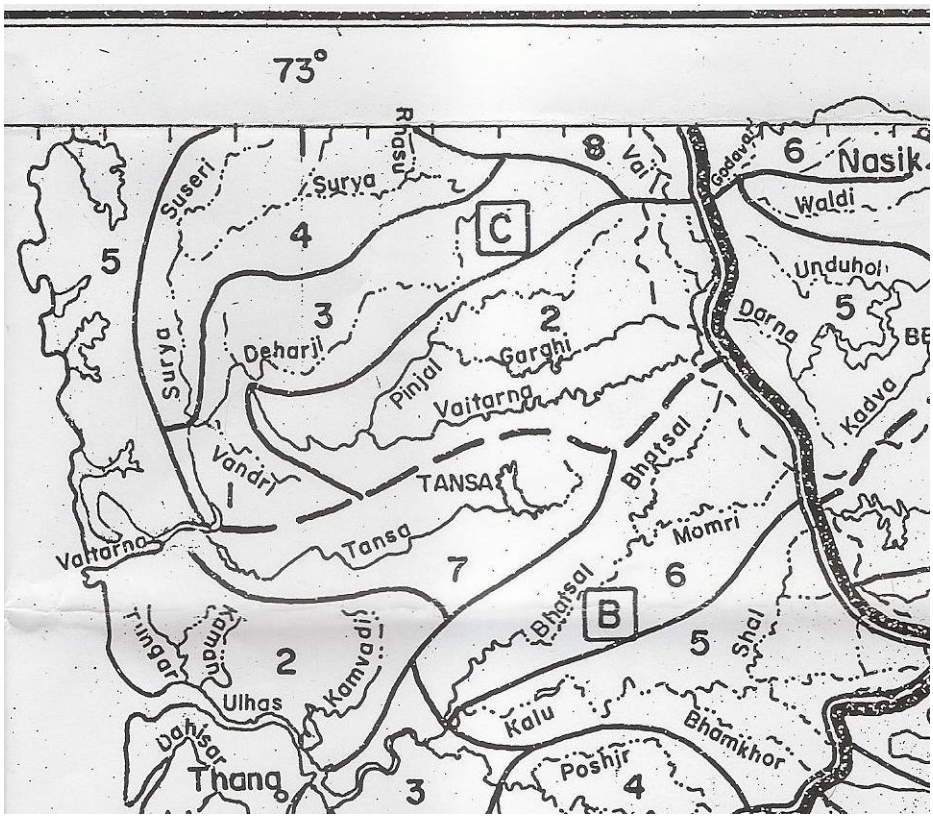
2.3.3 Vaitarna Basin as per Watershed Atlas of India

As per Watershed Atlas of India, Published by Department of Agriculture and Cooperation, Ministry of agriculture, Krishi Bhavan New Delhi (1990), the sub catchments from 5B2C pertain to Vaitarna Basin as shown in **Fig 2.3.1**.

2.3.3.1 Sub-catchment -5B2C (5B2C2 to 5B2C5)

This Sub Catchment is situated in the plain region of Maharashtra. Drained by main tributaries of Vaitarana River , Pinjal, Surya, Daharji, Tansa. The total area of this Sub-Catchment is 2019 sq km.

Fig 2.3.1 **Sub catchment area of Vaitarna Basin as per water shed Atlas of India.**



Source: Watershed Atlas of India, Published by Department of Agriculture and Cooperation, Ministry of agriculture, Krishi Bhavan New Delhi (1990)

2.3.4 Climate

Accordingly to Koeppan's Scheme, the climate of the basin is classified as AW-Tropical Savannah, as most of the peninsular plateau, south of Tropic of Cancer is classified. In the initial reaches, the climate is influenced by the Western Ghats that becomes coastal as the river reaches coastal plains. The climatic variations are

experienced in the patterns of temperature, rainfall & winds, rhythm of seasons and degree of wetness or dryness. These are described as follows.

2.3.4.1 Temperature

The Temperature is maximum in the month of May and Minimum in the month of December to January. The temperature profile in the basin is given in the Table-2.3.1.

Table-2.3.1: Mean monthly Temperature (^{0}C) during water year at site Durvesh

Month	Mean Monthly Maximum Temperature (°C)	Mean Monthly Minimum Temperature (°C)
Jun-12	35.7	26.9
Jul-12	30.8	25.6
Aug-12	30.1	25.4
Sep-12	30.9	24.9
Oct-12	35.3	23.6
Nov-12	35.2	18.1
Dec-12	34.6	16.3
Jan-13	34.2	14.0
Feb-13	34.6	17.8
Mar-13	35.3	19.0
Apr-13	35.6	23.4
May-13	37.5	27.8
Annual mean	34.2	21.9

2.3.4.2 Rainfall

The basin receives most of the rainfall from the South West monsoon during June to October. Almost 98% of the annual rainfall of the basin is received during this period. The rainfall at site in Vaitarna Basin shown in **Table-2.3.2** and **Table-2.3.3**.

Table-2.3.2 Mean annual rainfall of Vaitarna Basin at site Durvesh

Sl. No	Name of Site	Data available (No of Years)	Average Rainfall (mm)	Average no of rainy days	Rainfall in the year 2012-13	No of rainy days in 2012-13
1	Durvesh	31	2576.8	97	2345.0	97

Table-2.3.3: Seasonal Rainfall during Water Year 2012-13 at site Durvesh in Vaitarna basin

Sl No	Name of Site	Seasonal Rainfall (mm) in 2012-13				Total Annual Rainfall
		Winter monsoon	Pre monsoon	South-West monsoon	Post monsoon	
		(Jan-Feb)	(Mar-May)	(June-Sept)	(Oct-Dec)	
1	Durvesh	0	0	2302.4	42.6	2345.0

2.3.4.3 Wind

The wind speed and direction profile at site Gadat based on collected data is given in **Table-2.3.4**. The average wind speed in the Vaitarna basin varies about 1.7 km/h to 6.8 km/h. In the pre and post-monsoon period, the wind speed is generally higher. The predominant wind direction is SW.

Table-2.3.4:Wind Speed at site Durvesh inVaitarna basin during Water Year 2012-13

Month	Mean monthly wind Speed (km/h)
June	5.6
July	*
August	4.2
September	3.5
October	2.2
November	2.0
December	2.0
January	1.8
February	2.2
March	3.1
April	3.7
May	4.4
Annual Mean	2.9

2.3.4.4 Humidity

The relative Humidity in Vaitarna basin varies between 92% and 70% depending upon the season. Humidity is maximum in the monsoon period about 89 to 92 %. In the winter months of November and December, it decreases. Relative humidity at Durvesh station of CWC is given in **Table-2.3.5**.

Table-2.3.5: Mean monthly Relative Humidity at site Durvesh in Vaitarna Basin during Water Year 2012-13

Month	Relative Humidity (%)
June	89.0
July	91.1
August	91.5
September	92.0
October	85.7
November	80.8
December	82.4
January	78.6
February	73.5
March	70.4
April	85.9
May	86.3
Annual Mean	83.9

2.3.5 Geology

The Great Trap region of the Deccan covers the maximum part of the Basin. It is entirely of volcanic formation. The volcanic portion consists of compact, stratified basalts, and an earthy trap. The basalts are the most conspicuous geological feature. To the west they lie in flat-topped ranges, separated by valleys, trending from west to east. In some flows the- basalt is columnar and then it weathers into the fantastic shapes. The formation at the base of the traps is chiefly amygdaloidal, containing quartz in vertical veins, crystals and zeolitic minerals, especially apophyllite weathering into a gray soil. The absence of laterite, which caps the summits of the hills to the south, is a curious feature in the geology of the area. The basalt is either fine textured or it is coarse and nodular.

2.3.6 Soil

The valleys are filled with disintegrated basalt of various shades from gray to black, washed down by rain. It is of argillaceous nature. This soil is not favorable to the growth of large trees but it is very fertile for cereals and pulses. The black soil contains high alumina and carbonates of calcium and magnesium with variable

amounts of potash, low nitrogen and phosphorus. There are broadly two groups of soils: 1) Red coarse soil & 2) Alluvial soil

The red soil is less common and is suitable for cultivation under a heavy and consistent rainfall. Red coarse soil derived from disintegration of basaltic rock fragments under heavy rainfall. The rock fragments have undergone intensive weathering and beaching with the surface weathered and fragmented materials being carried away with the heavy run off in the monsoon period. The residual soil left behind is usually reddish yellow in colour, shallow in depth, coarse sandy loam to sandy loam in texture, rapidly drained and low in fertility. Alluvial soil formed with the deposition of transported materials brought out by heavy run off. This soil is deep to very deep yellowish brown to grayish brown in colour and clay loam to salty loam in texture. This soil is normally free from salinity and alkalinity.

2.3.7 Major / Medium/ multipurpose/ irrigation projects

The major and medium projects completed / ongoing on Vaitarna river basin are as shown in **Table-2.3.6**

Table-2.3.6: List of major and medium projects completed / on going on Vaitarna river basin

Sl. No	Name of the project	River	Status	Capacity in Mcm		Utilisation
				Gross	Live	
1.	Vaitarn Hydro Electric Project. (upper Vaitarna)	Vaitarna	Major	301.60	295.80	Multipurpose
2.	Surya Project.	Surya	Major	285.31	276.35	Multipurpose
3.	Modak Sagar (Lower Vaitarna)	Vaitarna	Medium	N.A.	N.A.	Irrigation
4.	Wandra Project	Wandria	Medium	37.11	35.938	-do-
5.	Deharji River Project	Deharji	Medium	93.120	89.840	-do-
6.	Tansa Dam	Tansa	Medium	N.A.	N.A.	Multipurpose

2.3.7.1 Vaitarna hydropower project

Vaitarna hydropower project is located near Vaitarna and Alwandi masonry and earthen dam on Vaitarna and Alwandi Rivers, 30 km from Ghoti, in Nashik District, Maharashtra. The catchment area at the dam is 160.8 km2. The height and length of the dam is 47 m and 555 m respectively. The reservoir has a live storage capacity of 35 MCM at FRL 603.5 m and the MDDL is at 580 m. The power house has a unit of 60 MW. It has a firm power of 11 MW with mean annual inflow of 635 MCM. MSEB commissioned the project in 1976.

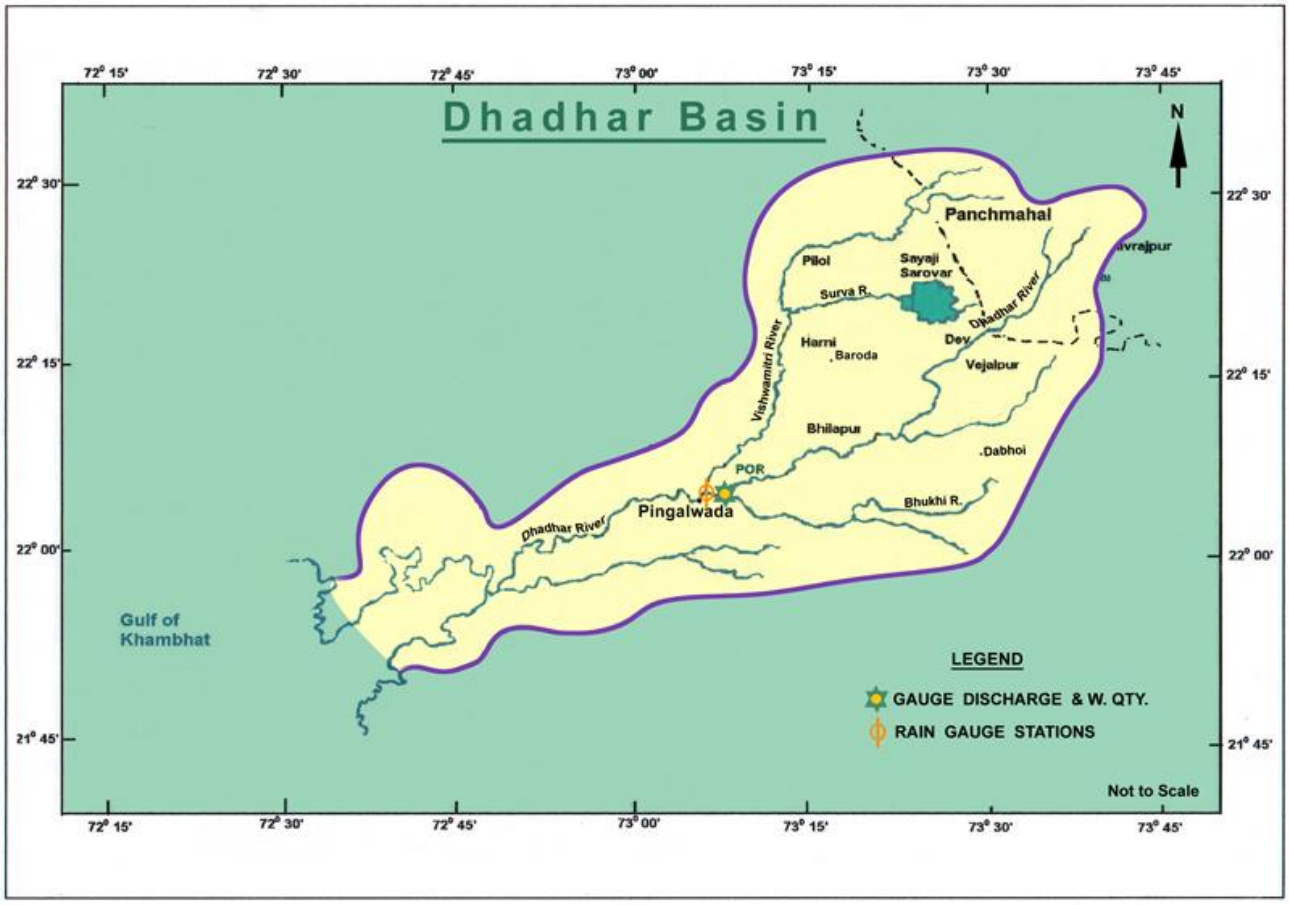
2.4 Dhadhar Basin

2.4.1 Geographical setting of Dhadhar Basin

The Dhadhar River is one of the west flowing rivers in Gujarat state. 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 upstream of Gauge and Discharge site. After flowing another 55 km it falls into the Gulf of Khambhat. The total length of the river from its source to outfall in the Gulf of Khambhat is about 142 km.

Basin map is shown in **Plate -2.4.1**.

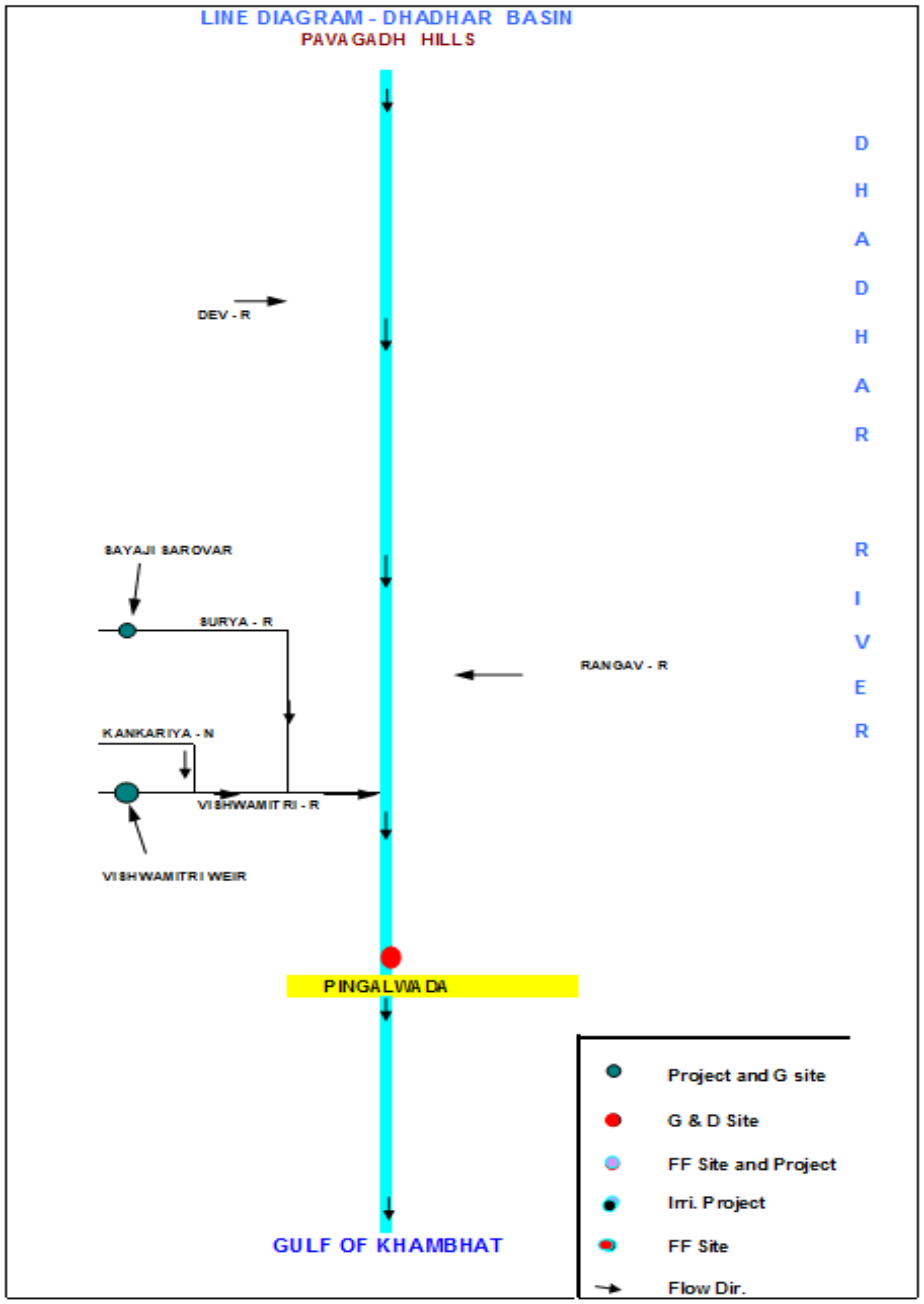
Plate- 2.4.1



2.4.2 River System

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'. Line diagram of Dhadhar river system is shown in **Plate -2.4.2**.

Plate -2.4.2.



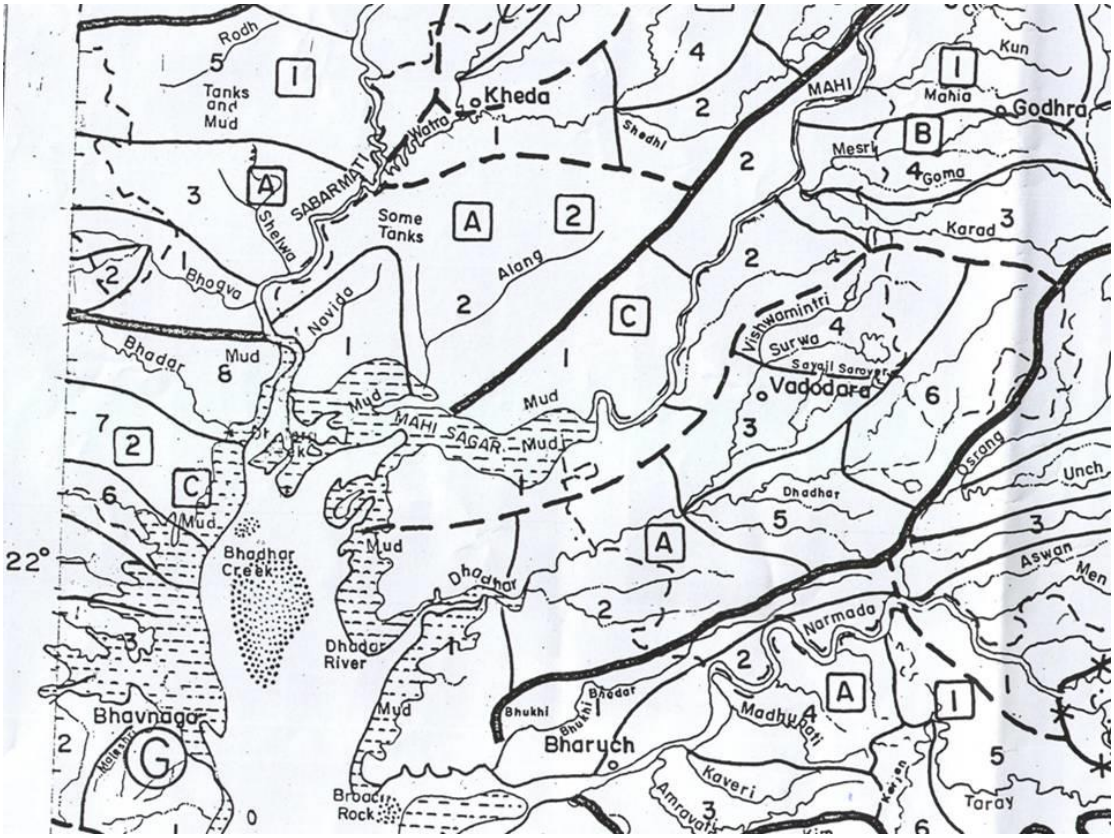
2.4.3 Dhadhar Basin as per Water Shed Atlas of India

As per Watershed Atlas of India, Published by Department of Agriculture and Cooperation, Ministry of agriculture, Krishi Bhavan New Delhi (1990), the sub catchments from 5E1A pertain to Dhadhar Basin as shown in **Fig 2.4.1**.

2.4.3.1 Subcatchment -5E1A (5E1A1 to 5E1A6)

This Sub Catchment is situated in the plain region of Gujarat, The important tributaries of the Dhadhar River are Vishwamitri, Jambuo river, Dev and Surya river. The total area of this Sub-Catchment is 3423 sqkm.

Fig 2.4.1: Sub catchment area of Dhadhar Basin as per water shed Atlas of India.



Source: Watershed Atlas of India, Published by Department of Agriculture and Cooperation, Ministry of Agriculture, Krishi Bhavan New Delhi (1990)

2.4.4 Climate

The Dhadar basin experiences seasons – summer (Mar-May), Monsoon (June-Sep) & winter (Oct-Feb). The major part of basin comprises tropical wet climate, caused mainly due to existence of the Western Ghats. Due to relatively high elevation in forest land, the area of the basin near the origin of the river experiences relatively cooler climate.

Accordingly to Koeppan's Scheme, the climate of the basin is classified as AW-Tropical Savannah as most of the peninsular plates, south of Tropic of Cancer are classified. The climatic variations are experienced in the patterns of temperature, rainfall & winds, whether of seasons and degree of wetness or dryness. These are described as follows.

2.4.4.1 Temperature

The Temperature is maximum in the month of May and Minimum in the month of December to January. The temperature profile in the basin is given in the **table -2.4.1**

Table-2.4.1: Mean monthly Temperature (^{0}C) during water year at site Pingalwada

Month	Mean Monthly Maximum Temperature (^{o}C)	Mean Monthly Minimum Temperature (^{o}C)
Jun-12	37.7	27.5
Jul-12	33.0	26.2
Aug-12	30.2	25.5
Sep-12	29.5	25.2
Oct-12	30.2	23.6
Nov-12	28.0	15.1
Dec-12	26.8	13.9
Jan-13	24.7	11.0
Feb-13	29.3	15.6
Mar-13	33.0	17.4
Apr-13	36.8	22.4
May-13	38.8	26.9
Annual mean	31.5	20.9

2.4.4.2 Rainfall

The basin receives most of the rainfall from the South West monsoon during June to October. Almost 98% of the annual rainfall of the basin is received during this period. The average annual rainfall in the Dhadar basin is 860 mm. The South - West monsoon sets in by the middle of June and withdraws by the first week of October. The rainfall is mainly influenced by the southwest monsoon. The effect is most pronounced in Vadodara lying on the windward side of the Western Ghats.

The rainfall at site Pingalwada in Dhadhar Basin is shown in **Table -2.4.2** and **Table-2.4.3.**

Table-2.4.2 Mean annual rainfall of Dhadhar Basin at site Pingalwada

Sl. No	Name of Site	Data available (No of Years)	Average Annual Rainfall (mm)	Average no of rainy days	Rainfall in the year 2012-13	No of rainy days in 2012-13
1	Pingalwada	22	859.5	43	670.9	46

Table-2.4.3 Seasonal Rainfall during Water Year 2012-13 at site Pingalwada

Sl No	Name of Site	Seasonal Rainfall (mm) in 2012-13				Total Annual Rainfall
		Winter monsoon	Pre monsoon	South-West monsoon	Post monsoon	
		(Jan-Feb)	(Mar-May)	(June-Sept)	(Oct-Dec)	
1	Pingalwada	0	0	670.9	0	670.9

2.4.4.3 Wind

The wind speed data of the Dhadhar basin is given in table -2.4.4. The monthly average wind speed in the Dhadhar basin varies about 1.7 km/h and 6.8 km/h. in the pre and post monsoon period. During monsoon the monthly average wind speed is generally higher than 4.2 km/h.

In general, wind speed is the lowest in post monsoon period (Oct-Nov) & the highest in June. The pre dominant wind direction is NE/SE. The wind direction remains uniform from post monsoon till early winter i.e. Oct – Feb. Change of direction takes place in March/April. It is observed at site that the dominant wind direction is from North east and east respectively during post monsoon and in winter changes to Westerly and South westerly.

Table-2.4.4: Wind Speed and Direction at site Pingalwada in Dhadhar basin basin during Water Year 2012-13

Month	Mean monthly wind Speed (km/h)
June	No data
July	No data
August	No data
September	No data
October	No data
November	No data
December	No data
January	No data
February	No data
March	No data
April	No data
May	No data
Annual Mean 2011-12	3.3

2.4.4.4 Humidity

The relative Humidity in Dhadhar basin varies between 89.7 % to 66.8 % depending upon the season. Humidity is maximum in the monsoon period and is around 89.7 to 73.8 %. In the winter months of November and December, it decreases. Relative humidity at station Pingalwada in Dhadhar Basin is given in table -2.4.5.

Table-2.4.5: Mean monthly Relative Humidity at site Pingalwada in Dhadhar Basin during Water Year 2012-13

Month	Relative Humidity (%)
June	73.8
July	85.8
August	86.5
September	89.7
October	85.1
November	75.5
December	81.1
January	78.3
February	74.4
March	66.8
April	72.2
May	68.5
Annual Mean	78.1

2.4.5 Geology

The Late Pleistocene fluvial succession is exposed as 18–20 m high incised vertical cliffs all along the Dhadhar River basin in western India. The major fluvial sedimentary facies of the Late Pleistocene deposits in the Dhadhar River basin have preserved evidence of palaeo-drainage and could provide an important link between the sub-humid Narmada basin in the south and the semi-arid Mahi basin in the north. The sedimentary facies documented include overbank fines, which are associated with crevasse splays. Fine grained overbank sediments are interpreted as having formed by sheet flow of sediments over the banks of minor distributary channels during the flood stage. The overlying thinly stratified fluvial sands and silts, at the top of the exposed sediment succession show a thin cap of aeolian sediments suggesting less intense aeolian activity than that observed in Sabarmati, Mahi and Orsang basins, though a

significant reduction in fluvial activity is suggested during the arid phase of the LGM. However, the river may still have been perennial assuming that it retained the larger part of the catchment.

2.4.6 Major/Medium/Multipurpose/Irrigation projects

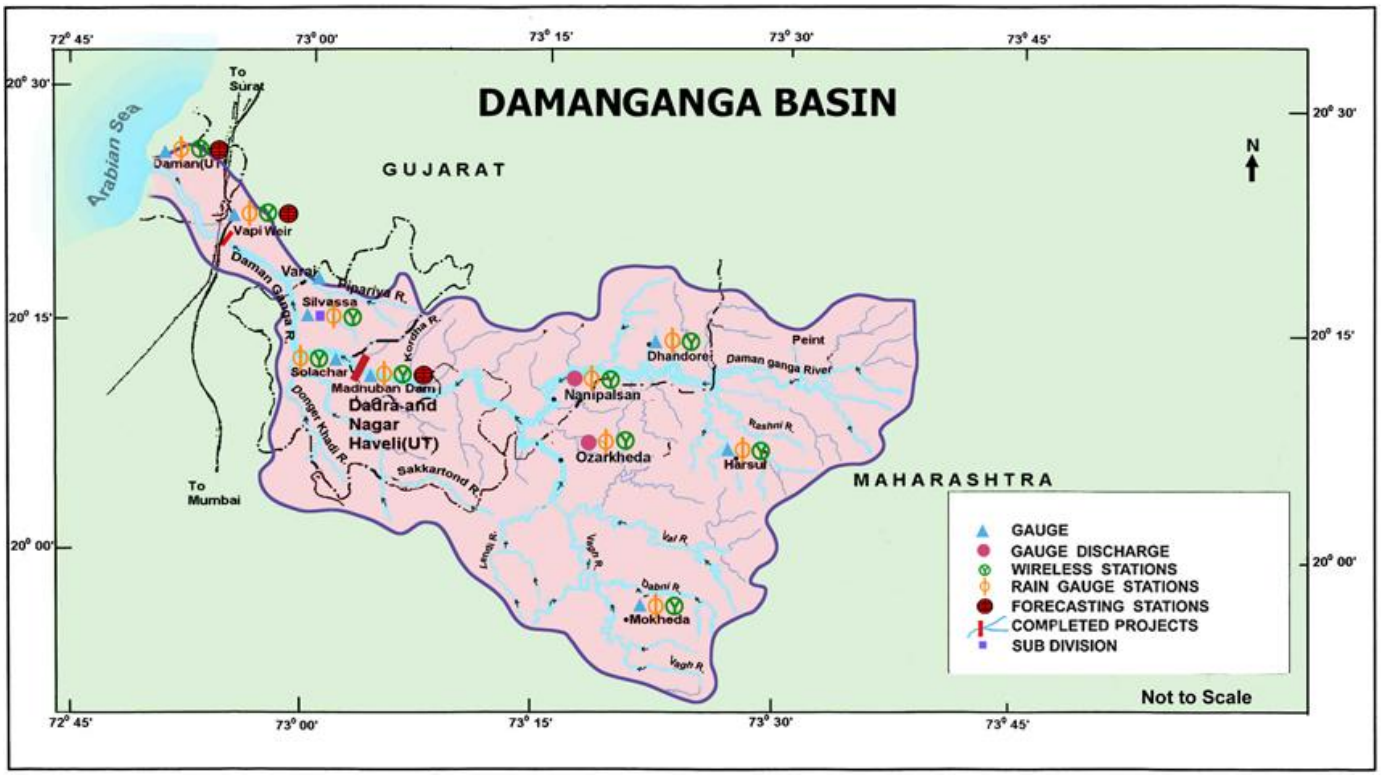
Ajwa tank, Pratap pura, Uma Bhariara, Dhanora, Ghansarva, Haripura, Vadodara, Deo Dam are the medium existing/ongoing projects in the basin.

2.5 Damanganga Basin

2.5.1 Geographical setting of Damanganga Basin

The Damanganga river rises in the Sahyadri hill ranges near village Ambegaon in Dindori taluka of Nasik district of Maharashtra State at an elevation of 950 m above MSL and traverses a total distance of about 131.30 km before it drains into the Arabian Sea at Daman. Damanganga along with its tributaries mainly flows through the hilly areas of Maharashtra, Gujarat and Union Territory Dadra and Nagar Haveli and Daman. Basin map is shown in **Plate-2.5.1**. It drains total area of 2318 sq km in Maharashtra State, Gujarat State and the Union Territories of Dadra, Nagar Haveli (DNH) and Daman & Diu before it drains into the Arabian Sea. The Damanganga River flows through Maharashtra State, Gujarat State and U.Ts. of DNH and Daman & Diu, while Vagh river up to Khargihill dam entirely lies in Maharashtra State.

Plate-2.5.1



2.5.2 River System

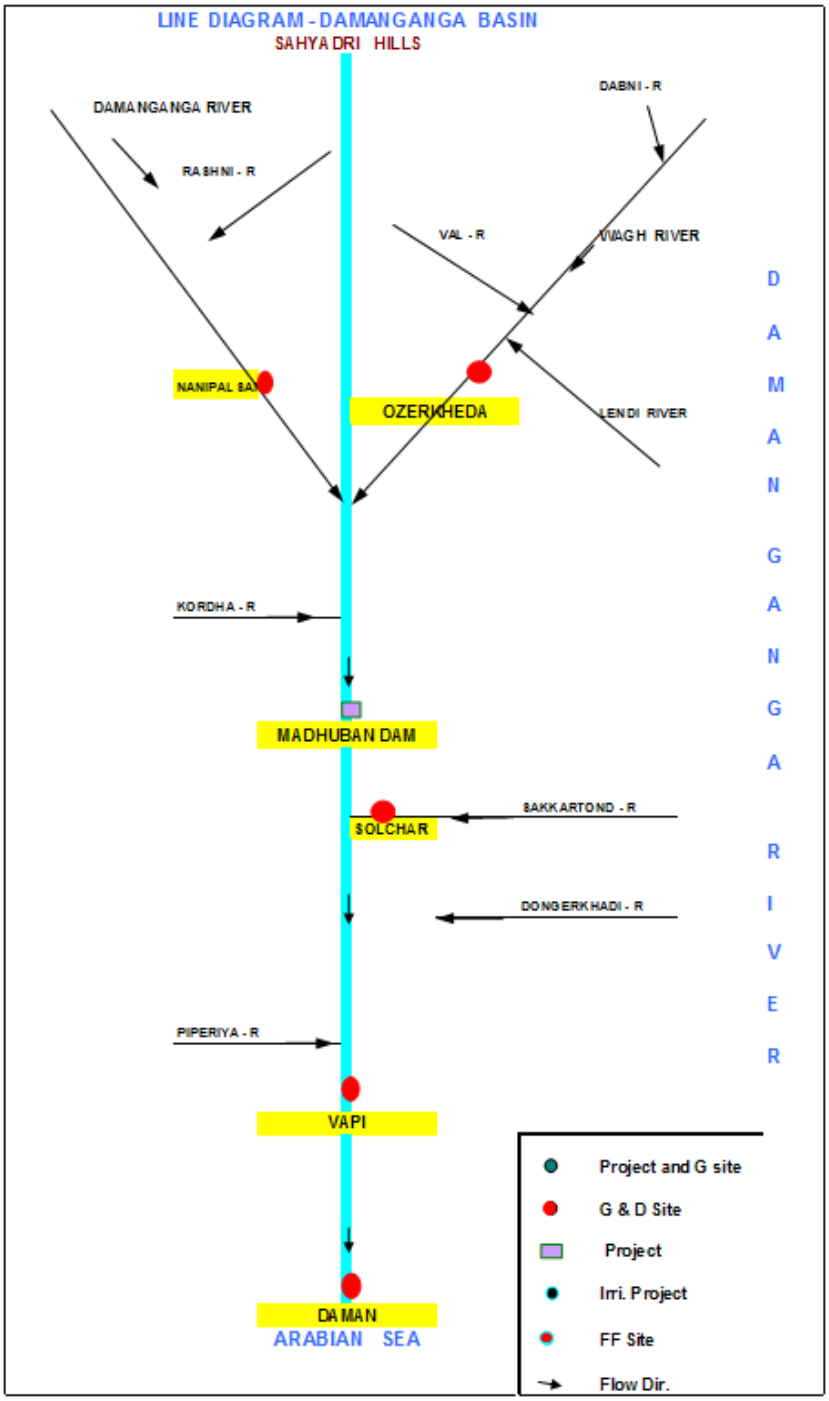
The catchment of the river is fan shaped and the river is prone to severe flashy floods The important tributaries of the Damanganga river are Dawan, Shrimant, Val, Rayte, Lendi, Vagh, Sakartond, Dongarkhadi, Roshni and Dudhni. The Damanganga river

drains total 2318 sq km. Drainage area of Damanganga River basin is shown in **Table-2.5.1** and line diagram of Damanganga river system is shown in **Plate-2.5.2**.

Table -2.5.1: State wise Distribution of drainage area of Damanganga River

Sl. No	Name of District / State	Catchment area (Sq km)	% of total catchment area
1	Nasik / Maharashtra	1408	60.74
2	Valsad / Gujarat	495	21.36
3	Dadara & Nagar Havali & Daman U.T.	415	17.90
	Total	2318	100.00

Plate-2.5.2



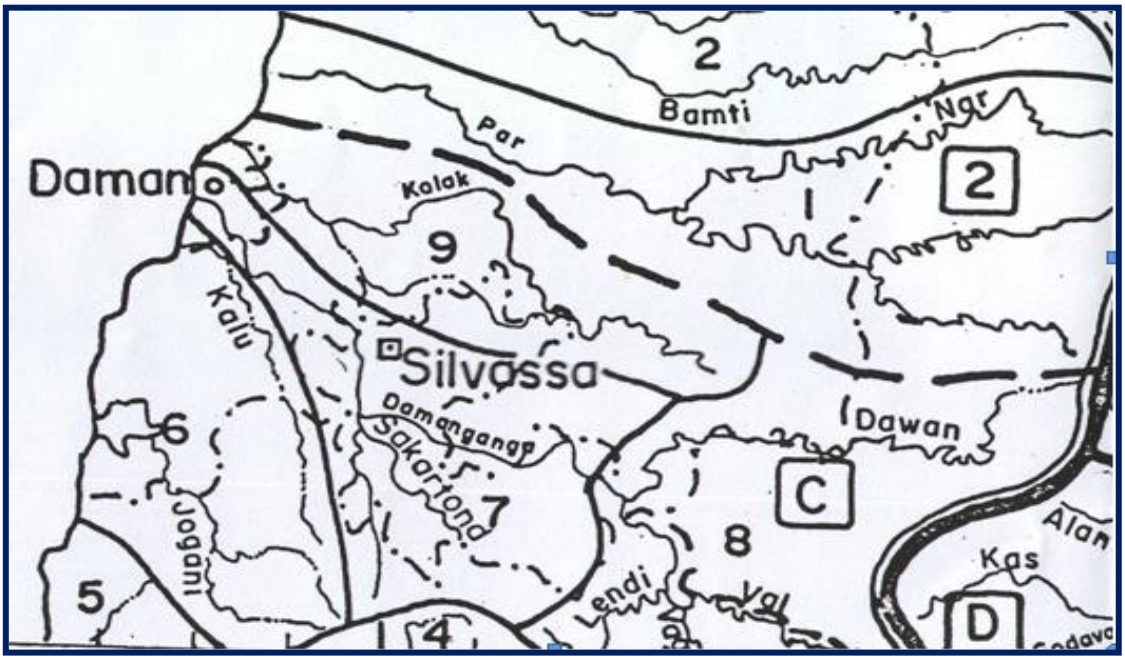
2.5.3 Damanganga Basin as per Watershed Atlas of India

As per Watershed Atlas of India, Published by Department of Agriculture and Cooperation, Ministry of agriculture, Krishi Bhavan New Delhi (1990), the sub catchments from 5B2C pertain to Damanganga Basin. Shown in **Fig-2.5.1**.

2.5.3.1 Sub catchment -5B2C (5B2C7 & 5B2C8)

This Sub Catchment is situated in the plain and hilly region of Gujarat, Maharashtra and Union territory (DNH) drained by Lendi, Sakkartond, Rashni, Val, Vagh, Donger Khadi, Pipariya, and Varai. The total area of this Sub-Catchment is 2318 sq km.

Fig-2.5.1: Sub-catchment area of Damanganga Basin as per watershed Atlas of India.



Source: Watershed Atlas of India, Published by Department of Agriculture and Cooperation, Ministry of agriculture, Krishi Bhavan New Delhi (1990)

2.5.4 The Climate

The entire Damanganga Basin lies in the Western Ghats region. It is bound on the west by Arabian Sea and on the east by Sahyadri ranges. The climate of the basin is characterised by a hot summer, which is generally dry except the southwest monsoon during June to September.

Accordingly to Koeppan's Scheme, the climate of the basin is classified as AW-Tropical Savannah as most of the peninsular plateau, south of Tropic of Cancer, is

classified. The climatic variations are experienced in the patterns of temperature, rainfall & winds, whether of seasons and degree of wetness or dryness. These are described as follows

2.5.4.1 Temperature

The Temperature is maximum in the month of May and Minimum in the month of December to January. The temperature profile in the basin is given in the Table-2.5.2

Table-2.5.2; Mean monthly Temperature (^{0}C) during water year at site Nanipalsan & Ozerkheda in Damanganga Basin

Name of Site	Nanipalsan		Ozerkheda	
Month	Mean Monthly Maximum Temperature (°C)	Mean Monthly Minimum Temperature (°C)	Mean Monthly Maximum Temperature (°C)	Mean Monthly Minimum Temperature (°C)
Jun-12	33.9	25.6	33.5	24.5
Jul-12	28.9	24.4	27.6	23.4
Aug-12	28.1	24.1	26.6	23.2
Sep-12	29.3	23.4	27.3	23.3
Oct-12	33.7	20.5	29.8	20.9
Nov-12	33.1	14.8	27.8	13.9
Dec-12	32.5	13.7	26.9	11.6
Jan-13	31.9	11.7	28.8	9.2
Feb-13	33.5	15.8	31.2	14.4
Mar-13	38.8	17.3	35.8	18.5
Apr-13	37.7	21.0	35.9	20.9
May-13	37.6	25.5	39.3	24.9
Annual mean	33.3	19.8	30.9	19.1

2.5.4.2 Rainfall

The basin receives most of the rainfall from the South West monsoon during June to October. Almost 98% of the annual rainfall of the basin is received during this period. The rainfall at site in Damanganga Basin as shown in Table -**2.5.3**. & table **2.5.4**

Table -2.5.3: Mean annual rainfall of Damanganga Basin

Sl. No	Name of Site	Data available (No of Years)	Average Rainfall (mm)	Average no of rainy days	Rainfall in the year 2012-13	No of rainy days in 2012-13
1	Ozerkheda	27	2116.0	91	1722.8	92

2	Nanipalsan	27	2145.2	90	1809.6	103

Table-2.5.4: Seasonal Rainfall during Water Year 2012-13 at site Nanipalsan & Ozerkheda in Damanganga Basin

Sl No	Name of Site	Seasonal Rainfall (mm) in 2012-13				Total Annual Rainfall
		Winter monsoon (Jan-Feb)	Pre monsoon (Mar-May)	South-West monsoon (June-Sept)	Post monsoon (Oct-Dec)	
1	Nanipalsan	0	0	1581.8	141.0	1722.8
2	Ozerkheda	0	0	1718.8	90.8	1809.6

2.5.4.3 Wind

The wind speed data of the Damanganga basin at two sites viz Ozerkheda and Nanipalsan are given in **Table -2.5.5**. The average wind speed in the Damanganga basin varies about 0.8 km/h to 4.3 km/h. in the pre and post monsoon period.

Table -2.5.5: Wind Speed at site Ozerkheda & Nanipalsan in Damanganga basin basin during Water Year 2012-13

Month	Mean monthly wind Speed (km/h)	
	Ozerkheda	Nanipalsan
June	4.0	3.8
July	1.7	2.2
August	1.7	2.1
September	1.1	1.3
October	0.8	1.1
November	0.9	1.0
December	1.1	1.1
January	1.5	1.5
February	2.1	2.2
March	2.8	2.8
April	3.1	3.5
May	4.1	4.3
Annual Mean	2.1	2.2

2.5.4.4 Humidity

The relative Humidity in Damanganga basin varies between 65.5 % and 91.9 %, depending upon the season. Humidity reaches maximum value during the monsoon period in the range of about 91.9to 81.8 %. In the winter months of November and December, it decreases. Relative humidity at Ozerkheda and Nanipalsan stations of CWC in Damanganga Basin is given in **Table-2.5.6**.

Table-2.5.6: Mean monthly Relative Humidity at site Ozerkheda & Nanipalsan in Damanganga Basin during Water Year 2012-13

Month	Relative Humidity (%)	
Name of Site	Ozerkheda	Nanipalsan
June	81.8	No data
July	90.0	90.6
August	91.5	91.4
September	91.6	91.9
October	91.0	90.3
November	85.0	88.6
December	85.1	88.1
January	83.4	84.8
February	85.1	86.3
March	83.7	77.1
April	65.6	77.5
May	81.0	83.6
Annual Mean	84.6	86.1

2.5.5 Geology

The Great Trap region of the Deccan covers substantial part of the Basin. It is entirely of volcanic formation. The volcanic portion consists of compact, stratified basalts, and an earthy trap. The basalts are the most conspicuous geological feature. To the west they lie in flat-topped ranges, separated by valleys, trending from west to east. In some flows the basalt is columnar and then it weathers into the fantastic shapes. The formation at the base of the traps is chiefly amygdaloidal, containing quartz in vertical veins, crystals and zeolitic minerals, especially apophyllite weathering into a gray soil.

The absence of laterite, which caps the summits of the hills to the south, is a curious feature in the geology of the area. The basalt is either fine textured or it is coarse and nodular.

2.5.6 Soil

Soils found in Damanganga basin can broadly be divided in three groups:

1) Red coarse soil
2) Coastal Alluvial soil
3) Black soil

The red soil is less common and is suitable for cultivation under a heavy and consistent rainfall. Red coarse soil is derived from disintegration of basaltic rock fragments under heavy rainfall. It is shallow in depth, coarse sandy loam to sandy loam in texture, rapidly drained and low in fertility. The alluvium is deep to very deep yellowish brown to grayish brown in colour and clay loam to salty loam in texture. This soil is normally free from salinity and alkalinity. The black soil is very fertile for cereals and pulses. The black soil contains high alumina and carbonates of calcium and magnesium with variable amounts of potash, low nitrogen and phosphorus.

2.5.7 Major / Medium/multipurpose/irrigation projects

The important project of this basin is Damanganga project. The salient features of the important components of Madhuban dam of Damanganga projects are as follows.

2.5.7.1 Madhuban Dam

This is a composite dam constructed across the river Damanganga near village Madhuban of Dharampur Taluka, Valsad district of Gujarat state. The main purpose of the project is irrigation, other being water supply for domestic and industrial use and for generation of 2.0 MW of power. The project has a network of canal system on either bank of the river to provide irrigation to an area of 56630-ha of land. The dam has height of 50 m above the deepest foundation to store 567 Mm^3 of water.

2.6 Kim Basin

2.6.1 Geographical setting of Kim Basin

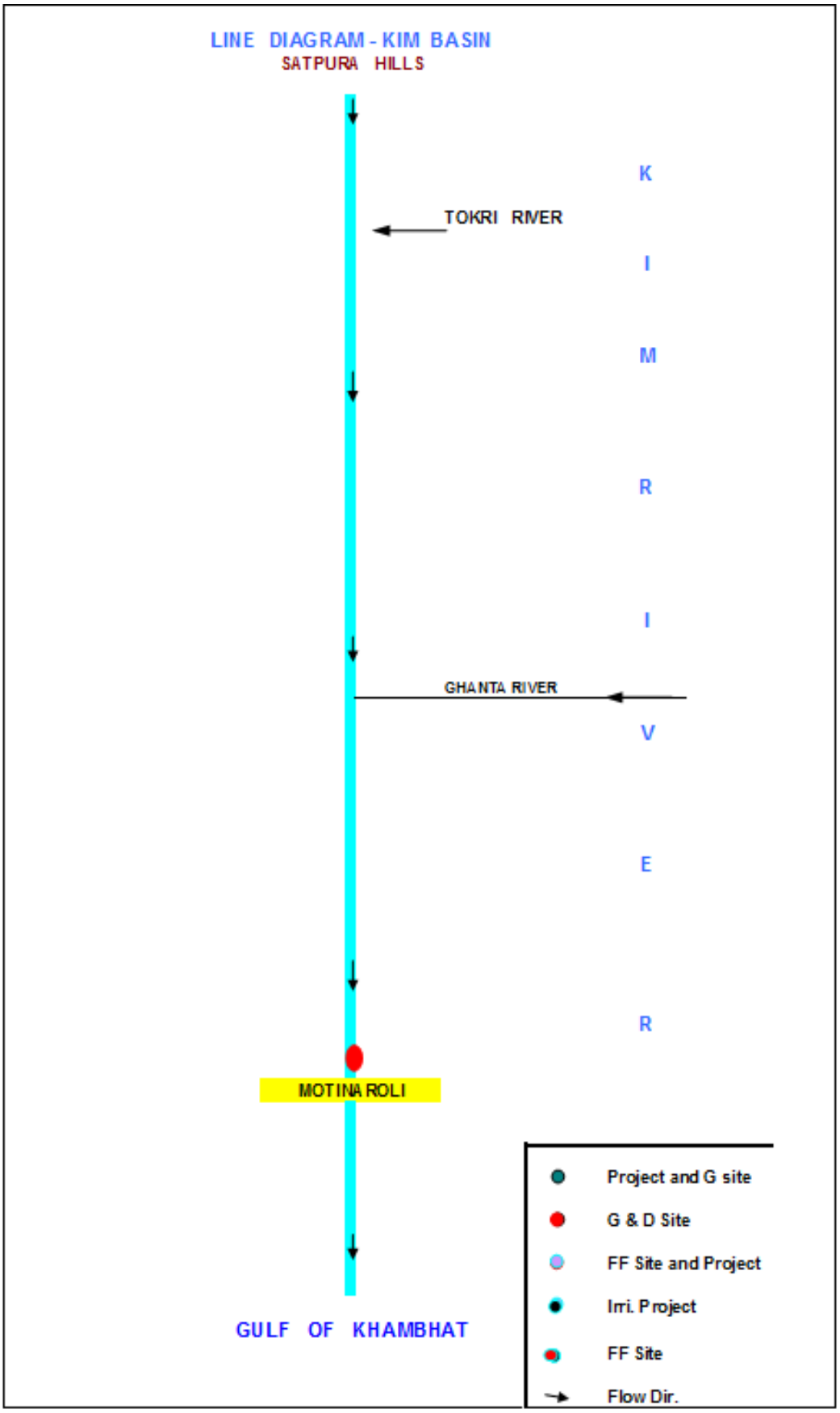
Kim River is one of the west flowing rivers in Gujarat state. It originates from Saputara Hill ranges in Bharuch district and falls in Gulf of Khambhat near village Kantiajal of Hansot taluka of Bharuch district after flowing south west direction for a length of 107 km. The river Kim, for the first 80 km of its course passes through Rajpipala and Valia talukas. For the remaining part, the river flows in a western direction between Ankleshwar and Olpad taluka of Surat District. Basin map is shown in **Plate -2.6.1**.

Plate -2.6.1

2.6.2 River System

The main tributaries of Kim river are 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. A line diagram of Kim basin is shown in **Plate -2.6.2**.

Plate -2.6.2


LINE DIAGRAM - KIM BASIN
SATPURA HILLS
K
TOKRI RIVER
I
M
R
I
GHANTA RIVER
V
E
R
MOTINA ROLI
GULF OF KHAMBHAT
Project and G site
G & D Site
FF Site and Project
Irri. Project
FF Site
Flow Dir.

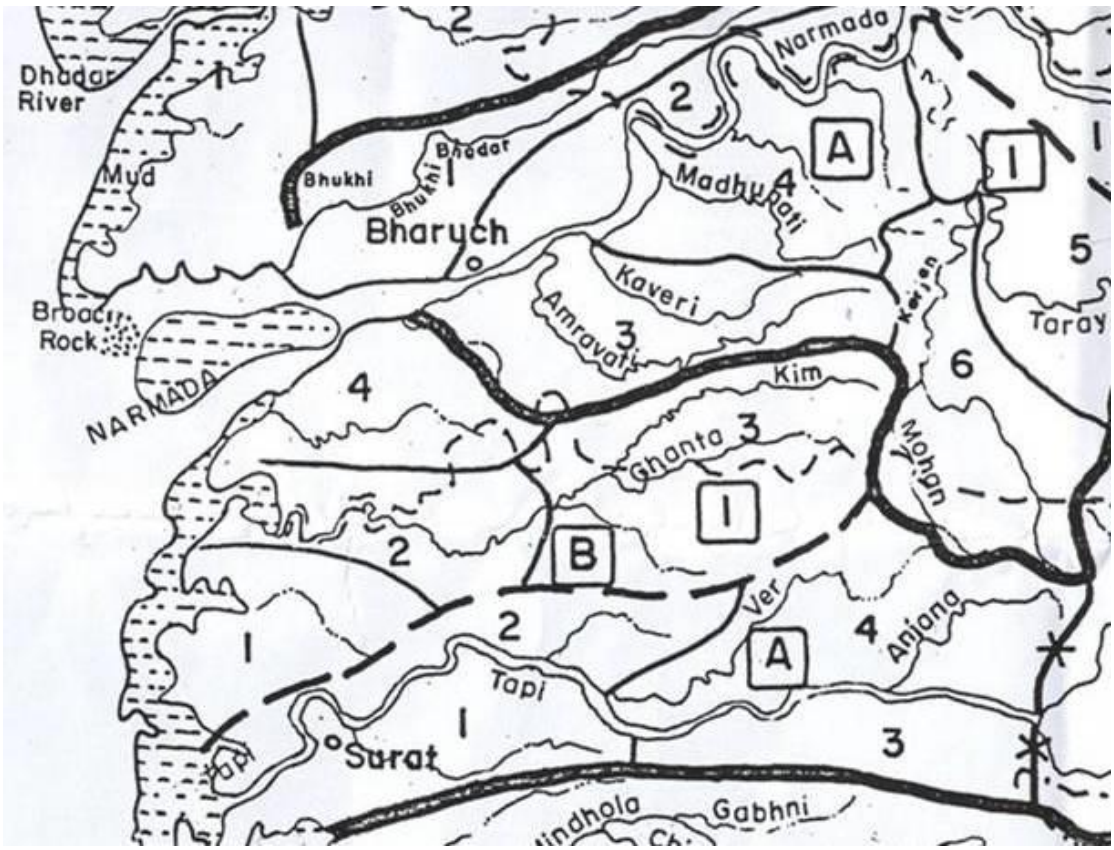
2.6.3 Kim Basin as per Water Shed Atlas of India

As per Watershed Atlas of India, Published by Department of Agriculture and Cooperation, Ministry of agriculture, Krishi Bhavan New Delhi (1990), the sub catchments from 5C1B pertain to Kim Basin as shown in **Fig.-2.6.1**.

2.6.3.1 Subcatchment -5C1B (5C1B2 & 5C1B3)

This Sub Catchment is situated in the plain region of Gujarat, drained by Ghanta and Tokri River. The total area of this Sub-Catchment is 1286 Sqkm.

Fig.-2.6.1: Kim Basin as per water shed Atlas of India.



Source: Watershed Atlas of India, Published by Department of Agriculture and Cooperation, Ministry of agriculture, Krishi Bhavan New Delhi (1990)

2.6.4 The Climate

Most of the Kim Basin lies in coastal plains near the sea, where the climate is moderate and humid. The month of May is the hottest and January is the generally coldest month of the Basin.

Accordingly to Kocppan's Scheme, the climate of the basin is classified as AW-Tropical Savannah, as most of the peninsular plateau, south of Tropic of Cancer, is classified. The climatic variations are experienced in the patterns of temperature,

rainfall & winds, rhythm of seasons and degree of wetness or dryness. These are described as follows

2.6.4.1 Temperature

Temperature is maximum in the month of May and Minimum in the month of December to January. The temperature profile in the basin is given in the **Table-2.6.1**.

Table-2.6.1: Mean monthly Temperature (^{0}C) during water year at site Kim at Motinaroli

Month	Mean Monthly Maximum Temperature	Mean Monthly Minimum Temperature
Jun-12	32.7	26.7
Jul-12	30.1	26.0
Aug-12	29.2	25.3
Sep-12	29.2	24.4
Oct-12	33.7	22.7
Nov-12	35.0	16.9
Dec-12	33.9	15.5
Jan-13	31.9	12.0
Feb-13	33.6	16.1
Mar-13	37.8	18.9
Apr-13	37.2	21.7
May-13	37.3	26.4
Annual mean	33.5	20.1

2.3.4.2 Rainfall

The basin receives most of the rainfall from the South West monsoon during June to October. Almost 98% of the annual rainfall of the basin is received during this period. The rainfall at site in Kim Basin shown in **Table-2.6.2** & **Table-2.6.3**.

Table-2.6.2: Mean annual rainfall of site Kim at Motinaroli

Sl. No	Name of Site	Data available (No of Years)	Average Annual Rainfall (mm)	Average no of rainy days	Rainfall in the year 2012-13	No of rainy days in 2012-13
1	Motinaroli	21	1091.6	52	1377.5	66

Table-2.6.3: Seasonal Rainfall during Water Year 2011-12 at site Motinaroli

Sl No	Name of Site	Seasonal Rainfall (mm) in 2012-13				Total Annual Rainfall
		Winter monsoon (Jan-Feb)	Pre monsoon (Mar-May)	South-West monsoon (June-Sept)	Post monsoon (Oct-Dec)	
1	Motinaroli	0	22.0	1354.5	1.0	1377.5

2.6.4.3 Wind

The wind speed data of the Kim basin is given in Table-2.6.4. The average wind speed in the Kim basin varies about 1.1 km/h to 7.9 km/h. The pre dominant wind direction is NE/ SW

Table-2.6.4: Wind Speed at site Motinaroli in Kim basin during Water Year 2012-13

Month	Mean monthly wind Speed (km/h)
June	6.4
July	5.0
August	4.6
September	2.8
October	0.8
November	1.0
December	1.1
January	1.3
February	1.9
March	2.3
April	3.7
May	6.0
Annual Mean	3.1

2.6.4.4 Humidity

The relative Humidity in Kim basin varies between 97.1% to 78.7% depending upon the season. It is maximum in the monsoon period and is about 78.7to 97.1 %. In the

winter months of November and December, relative humidity comes down. Relative humidity at station Motinaroli of CWC in the Kim Basin is given in Table-2.6.5.

Table-2.6.5: Mean monthly Relative Humidity at site Motinaroli in Kim Basin during Water Year 2012-13

Month	Relative Humidity (%)
June	78.7
July	91.7
August	92.1
September	97.1
October	84.7
November	78.8
December	82.9
January	84.3
February	83.1
March	79.0
April	82.5
May	80.2
Annual Mean	84.6

2.6.5 Soil

The soil found in Kim basin can be broadly classified into three groups i.e.Lateritic soils, deep black soils and coastal alluvial soils.

2.6.6 Major / Medium/multipurpose/irrigation projects

The major and medium projects completed / ongoing on Kim river basin are as shown in Table-2.6.6.

Table-2.6.6: Major and medium projects completed / ongoing in Kim basin

Sl.No.	Name of the project	River	Status	Capacity in Mm^3		Utilisation
				Gross	Live	Irrigation
1	Baldeva Irrigation Scheme	Tokri	Medium	8.15	7.84	Domestic
2	Pigut Irrigation S Scheme	Tokri	Medium	7.52	7.27	-do-

Hydrological observations by State government

Source of information

Apart from the sites maintained by central water commission the state government of Gujarat, Madhya Pradesh, Rajasthan and Maharashtra are also conducting gauge and discharge observations in among 14 Basins. The Basin wise list of sites and the authority maintaining the sites are listed in the following para.

Basin wise list of sites

1	Purna Basin	1 Purna 2 Purna 3 Purna 4 Zankhari 5 Zankhari 6 Zankhari	At Wankla At Navsari At Kalibel At Malotha At Ghat At ZanKhari	Sup. Engineer, WRI Circle LD Engg. College campus, near Gujarat university, Ahmedabad & Executive engineer WRI Divn., Bhadra fort, Laldarwaja, Ahmedabad
2	Ambica Basin	1 Ambica 2 Ambica 3 Khapri 4 Kharera 5 Kharera 6 Kaveri 7 Valam 8 Valam	At Unai At Bilimora At Kundkas At Kavdej At Lalia Dam At Vansda At Wankla At Dholka	Sup. Engineer, WRI Circle LD Engg. College campus, near Gujarat university, Ahmedabad & Executive engineer WRI Divn., Bhadra fort, Laldarwaja, Ahmedabad
3 Vaitarna Basin No state govt. Sites in this Basin				
4	Dhadhar Basin	1 Dhadhar 2 Dhadhar 3 Dhadhar 4 Deo 5 Deo 6 Vishwamitri 7 Vishwamitri 8 Surya	At Bhilapur At Por At Pingalwada At Vejalpur At Shivrajpur At Pilol At Harni At Bhaniyara	Sup. Engineer, WRI Circle LD Eengg. College campus, near Gujarat university, Ahmedabad & Executive engineer WRI Divn., Bhadra fort, Laldarwaja, Ahmedabad
5	Damanganga Basin	1 Damanganga 2 Sakertond	At Vapi Bridge At Khanvel	Water resources investigation Sub Division, Navsari
6	Kim Basin	1 Kim	At Vellachha	Water resources investigation Sub Division, Navsari

3.0 Methodology: Stream flow measurement

3.1 Gauge measurement

Water level or stage of the River is measured as its elevation above the g t s datum. Water level measurement was conducted by reading non-recording gauges. A series of vertical staff gauges as per the specifications laid down in is 4080-1977 have been fixed at three sections at each site i.e. Upstream, station gauge and downstream. The gauge posts are of RCC/wooden/ metallic with cut and edge waters and are fixed securely in position by installing them in m-150 concrete blocks of suitable size. Enameled gauge plate with marking in metric unit is fixed on the gauge posts with least count 0.005 m. Out of the three gauge lines the central line is used as station gauge line and readings of the other two lines are used for calculating the surface slope. The gauges were read hourly during Monsoon season and three hourly i.e. 0800, 1300 and 1800 Hrs during non Monsoon season at station gauge line.

3.2 Discharge observation

Discharge observation is conducted once a day at 0800 Hrs, at all the sites by area velocity method except on Sunday and holidays in non Monsoon period. However additional observations were conducted during floods to cover different stages, irrespective of holidays. The River width is generally divided into 15 to 25 segments based on the degree of accuracy as outlined in is: 1192-1981. The width of the River is measured by steel/metallic tape or wire rope stretched across the River with segment markings indicated thereon, when the River width is quite small and the flow depths permit wading. For larger width and deeper flow conditions and in unmanageable flood conditions segment points vertically are located by measuring the navigation craft with reference to pivot point and segment blocks constructed at sites.the depth measurement is carried out by using sounding rod for depths up to 3 meter and by using long bamboos for depths between 3 meter and 6 meter. For depths exceeding 6 meter sounding reel measurements at segment points are resorted to, and in Some cases, the depths are measured by echo sounder or are computed from the most recent x-sections of the River. The velocity is measured as per is 3918 - 1976 by using a cup type current meter conforming to is 3910 - 1976. The current meter is lowered to the requisite depth i.e. 0.6 of total depth down the vertical at every segment point by suspension equipment as specified in is 6064 - 1981 and where the depth is less than 0.3 meters, the velocity is observed just below the water surface. In medium and high stages with significant flow velocities, boats fitted with power engines are

used. Measurements of velocity are sometimes carried out from the bridges when the River flow condition does not permit the boat to be kept stable for velocity observation. When none of the above procedures are possible, the velocity is measured by float observations.

The data observed as above at the site is entered in the prescribed standard format to compute the total River discharge and it is further scrutinised at various levels before finalisation.

The daily observed/estimated discharge data is presented in this book.

Table-3.1.1 : Equipment used for observation

Sl. No	Name of equipment	By wading	By boat	Bridge	By float
1	Current meter	√	√	√	X
2	Pigmy current meter	√	X	X	X
3	Stop watch	√	√	√	√
4	Wading rod	√	X	X	X
5	Nylon rope & tag	√	X	X	X
6	Measuring tape	√	X	X	X
7	Protractor	√	√	√	X
8	Ranging rod	√	√	X	√
9	Sounding rod	√	√	X	X
10	Automatic battery counter	√	√	√	X
11	Thermometer	√	√	√	√
12	Prismatic compass	X	X	X	√
13	Balloon	X	X	X	√
14	Sounding cable with fish weight	X	√	X	X
15	Echo sounder	X	√	√	X
16	Bridge out fit	X	X	√	X
17	Boat out fit	X	√	X	X

3.3 Explanatory notes

Explanatory notes given here have been designed to assist in the data interpretation of hydrological parameters contained in the data presented. The notes are therefore, applicable in so far as the data presented in this book.

1. Water Year covers the period from June 1st of one calendar year to may 31st of next calendar year and includes one complete hydrological cycle.

2. Discharge is given in cubic meters per second.

3. Discharges given are daily observed / estimated discharges.

4. The zero of gauge is a datum level / RL Fixed for a given site, which is kept 1 or 2 m lower than the lowest water level recorded in a perennial stream. In a non - perennial stream, it is kept 1 or 2 m lower than the lowest bed level of the stream.

5. Maximum and minimum discharges are taken from the daily observed flows / estimated.

6. Runoff in "mm" is the notional depth of water in millimeters over the catchment area equivalent to annual runoff calculated at the discharge measurement station.

$$\textbf{Runoff (mm)} = \frac{\textbf{Annual runoff (Mm3)}}{\textbf{Catchment area (km}^2\textbf{)}} \times 1000$$

7. Peak and lowest flows correspond to the highest and lowest water levels recorded during the period of record.

8. Measuring authority refers to the field division responsible for the operation of the gauge station. The name of the division is abbreviated by taking first alphabet of the River name followed by alphabets "DN" for division. For example Mahi division is denoted by MDN and Tapi division is denoted as TDN. These abbreviations are given cross-reference in the list of abbreviations and symbols.

9. Gauging station code number is a unique nine-digit reference number, which facilitates retrieval of flow data in data bank. The first two digits denote the measuring authority. The third and fourth digits are the Basin/zone identifier and fifth and sixth digits are the independent River Basin identifier. The last three digits of the code number indicate gauging site no. which is given from origin to mouth.

11. The month and the year from which data are available in the data bank are indicated against the record available.

3.4 Method of presentation

The data presented in this book is processed discharge data obtained from application of SWDES/HYMOS software.

The station wise hydrological data is presented comprising history sheet, daily flow table and pictorial summary. The sequence of hydrological station arranged from its outfall to origin giving inter-priority to an intermediate tributary station.

4.0 Hydrological data

The hydrological data presented hereby mainly consist of the following

History sheet

Its manly consist of some salient features of particular site as Site name, state, district, River Basin, tributary, catchment area, latitude / longitude, opening / closing date for various types of data& maximum –minimum discharge values.

Data sheet

It consists of stage- discharge data (both observed & estimated from stage discharge curve for the season), for the current year with mean water level during the discharge observation and peak observed and computed discharge with corresponding water level with date during the year, Lowest discharge with corresponding water level with date during the year, Peak discharge with corresponding water level with date since inception, Lowest discharge with corresponding water level with date since inception.

Stage discharge curve

It gives a relationship between the stage of the river and the corresponding discharge.

Annual run-off

It gives the value of Annual run off in MCM for all the years from the opening of the site.

Water level v/s time graph

Hourly observed water level for one to three important highest peak flood events of current Water Year covering the period well before the start and upto well beyond the completion of these flood events.

Charts / Maps

Basin map showing sites / projects

The site-wise pre – Monsoon and post – Monsoon cross sections

The site-wise pie chart

Site-wise bar charts

The site-wise hydrographs (flood events)

Chapter-4: Hydrological data

4.1 Purna Basin

4.1.1 History sheet

HISTORY SHEET

			Water Year	**:**	**2012-13**
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	:	Right
Latitude	:	21°00'52"	Longitude	:	73°08'25"
Zero of Gauge (m)	:	9 (m.s.l)	04/10/1970		
		Opening Date	Closing Date		
Gauge	:	04/10/1970			
Discharge	:	12/11/1970			
Sediment	:	18/06/1973			
Water Quality	:	15/06/1977			

Annual Maximum / Minimum discharge with corresponding water Level (m.s.l)

	Maximum			Minimum		
Year	Q (cumecs)	WL (m)	Date	Q (cumecs)	WL (m)	Date
1971-1972	682.3	13.655	13/08/1971	0.099	10.055	30/04/1972
1972-1973	454.6	12.800	19/08/1972	0.020	9.895	31/05/1973
1973-1974	1550	13.914	25/09/1973	0.026	9.930	09/06/1973
1974-1975	183.0	11.225	01/10/1974	0.071	10.095	31/05/1975
1975-1976	964.3	13.730	13/08/1975	0.030	10.055	12/06/1975
1976-1977	4380	20.550	31/07/1976	0.040	10.150	02/06/1976
1977-1978	4020	19.765	03/09/1977	0.100	10.060	07/06/1977
1978-1979	1692	15.252	09/07/1978	0.200	10.110	10/06/1978
1979-1980	3378	20.100	10/08/1979	0.200	10.110	13/06/1979
1980-1981	775.0	13.667	02/08/1980	0.480	10.190	15/05/1981
1981-1982	1572	16.430	10/07/1981	0.000	10.050	01/04/1982
1982-1983	2815	20.390	25/07/1982	0.100	10.065	09/05/1983
1983-1984	1818	15.666	20/07/1983	0.100	10.010	02/06/1983
1984-1985	846.3	13.955	13/09/1984	0.500	10.310	08/06/1984
1985-1986	3255	20.560	01/08/1985	0.300	10.060	13/04/1986
1986-1987	527.2	12.775	16/08/1986	0.300	10.125	08/03/1987
1987-1988	873.7	15.260	07/07/1987	0.100	10.035	29/01/1988
1988-1989	1526	15.700	27/07/1988	0.200	9.970	18/04/1989
1989-1990	2362	17.920	25/07/1989	0.600	10.020	07/06/1989
1990-1991	1396	17.625	17/08/1990	1.420	9.870	27/03/1991
1991-1992	300.8	10.970	24/07/1991	0.600	9.850	29/05/1992
1992-1993	1386	17.100	03/09/1992	0.280	9.720	30/05/1993
1993-1994	1254	15.250	10/07/1993	0.385	9.635	13/05/1994
1994-1995	3078	20.470	16/06/1994	0.286	9.755	19/04/1995
1995-1996	404.6	11.995	25/07/1995	0.100	9.720	09/06/1995
1996-1997	781.5	13.330	09/09/1996	0.600	9.720	10/06/1996
1997-1998	2174	17.410	25/08/1997	0.430	9.370	27/05/1998
1998-1999	2359	17.720	08/07/1998	0.350	9.355	08/06/1998
1999-2000	695.6	13.030	16/07/1999	0.598	9.320	17/02/2000
2000-2001	782.8	13.250	14/07/2000	0.061	9.160	27/04/2001
2001-2002	1233	14.400	16/08/2001	0.085	9.075	30/04/2002
2002-2003	2517	17.550	25/08/2002	0.089	9.150	05/06/2002
2003-2004	2946	18.365	28/07/2003	0.071	9.075	05/06/2003
2004-2005	8836	23.490	04/08/2004	0.779	9.230	31/01/2005
2005-2006	5437	21.280	29/06/2005	0.500	9.180	16/06/2005
2006-2007	3273	19.050	05/07/2006	0.827	9.140	26/05/2007
2007-2008	3058	18.350	02/07/2007	1.116	9.160	01/06/2007
2008-2009	1853	16.360	19/09/2008	2.163	9.170	06/06/2008
2009-2010	667.2	12.900	07/09/2009	0.000	9.050	01/06/2009
2010-2011	744.5	13.330	09/09/2010	0.007	9.010	27/03/2011
2011-2012	607.5	12.750	29/08/2011	0.000	9.010	10/06/2011

2012-2013	692.4	13.030	13/08/2012	0.000	9.020	01/06/2012

4.1.2 Annual Maximum flood Peaks

Year	Highest Flood Level (m)	Date	Hour
1970	9.780	13/10/1970	08:00:00
1971	13.655	13/08/1971	08:00:00
1972	14.805	06/07/1972	18:00:00
1973	18.215	25/09/1973	16:00:00
1974	12.035	15/07/1974	03:00:00
1975	18.680	12/08/1975	18:00:00
1976	21.200	12/07/1976	19:00:00
1977	20.550	03/09/1977	11:00:00
1978	17.700	29/08/1978	22:00:00
1979	20.210	10/08/1979	19:00:00
1980	15.330	02/08/1980	15:00:00
1981	16.440	10/07/1981	17:00:00
1982	20.710	25/07/1982	15:00:00
1983	17.130	13/08/1983	18:00:00
1984	22.550	18/07/1984	19:00:00
1985	21.050	01/08/1985	04:00:00
1986	13.120	19/07/1986	21:00:00
1987	15.680	07/07/1987	11:00:00
1988	18.185	29/07/1988	01:00:00
1989	19.890	24/07/1989	07:00:00
1990	19.500	17/08/1990	06:00:00
1991	13.670	24/07/1991	18:00:00
1992	17.810	03/09/1992	07:00:00
1993	19.400	14/07/1993	02:00:00
1994	24.800	16/06/1994	17:00:00
1995	13.660	28/07/1995	15:00:00
1996	17.500	23/07/1996	15:00:00
1997	18.000	31/07/1997	21:00:00
1998	17.840	08/07/1998	10:00:00
1999	13.500	19/07/1999	18:00:00
2000	14.640	14/07/2000	02:00:00
2001	19.300	17/06/2001	22:00:00
2002	19.500	26/06/2002	19:00:00
2003	19.880	28/07/2003	06:00:00
2004	23.900	04/08/2004	00:00:00
2005	21.280	29/06/2005	08:00:00
2006	20.300	05/07/2006	12:00:00

2007	20.500	02/07/2007	12:00:00
2008	18.800	19/09/2008	15:00:00
2009	14.740	22/07/2009	21:00:00
2010	14.400	07/08/2010	15:00:00
2011	14.140	14/08/2011	21:00:00
2012	13.800	13/08/2012	05:00:00

4.1.3 Summary of Discharge Data

Stage –Discharge data for the period 2012-13

Station Name: Purna at Mahuwa (010219001) Division : Tapi Division Surat Local River: Purna Sub -Division : LTSD, CWC, Surat

Day	Jun		Jul		Aug		Sep		Oct		Nov	
	W.L	Q	W.L	Q	W.L	Q	W.L	Q	W.L	Q	W.L	Q
1	9.020	0.000	9.030	0.690 *	12.100	447.6	11.700	340.4	9.590	10.02	9.300	7.841
2	9.020	0.000	9.030	0.711	10.780	176.3	10.220	66.08 *	9.590	9.872	9.290	6.392
3	9.020	0.000	9.030	0.716	10.050	60.64	10.080	71.27	9.580	16.74 *	9.290	6.441
4	9.030	0.000	9.030	0.719	9.840	40.77	10.020	50.21	9.620	11.71	9.280	5.180 *
5	9.030	0.000	9.030	0.708	9.700	23.37 *	10.000	50.03	9.580	9.850	9.270	3.578
6	9.030	0.000	9.040	1.006	9.660	21.18	10.520	131.8	9.480	9.338	9.260	3.051
7	9.030	0.000	9.040	0.417	9.660	19.85	10.620	134.7	9.490	12.53 *	9.250	2.929
8	9.030	0.000	9.050	0.890 *	9.660	19.14	10.160	73.97	9.480	8.848	9.250	2.911
9	9.020	0.000	9.060	1.206	9.640	15.26	10.020	46.91 *	9.470	8.665	9.260	3.061
10	9.020	0.000	9.060	1.257	11.360	244.5 *	10.100	72.68	9.460	8.345	9.260	3.062
11	9.020	0.000	9.505	8.851	10.590	135.0	10.160	74.66	9.460	8.283	9.250	4.400 *
12	9.020	0.000	9.460	8.764	11.340	240.3 *	10.830	163.5	9.440	8.235	9.240	2.540
13	9.230	3.920 *	9.320	6.316 #	13.030	692.4	10.330	90.25	9.430	8.134	9.240	4.160 *
14	9.450	10.86 *	9.230	5.848	11.230	242.7	10.240	80.51	9.430	10.08 *	9.240	2.543
15	9.380	8.250 *	9.220	3.690 *	10.760	135.6 *	10.160	74.49	9.420	7.675	9.210	1.888
16	9.280	5.170 *	9.240	6.007	10.510	146.9	10.120	56.06 *	9.420	7.370	9.210	1.885
17	9.270	4.910 *	9.200	3.255 #	10.200	78.02	9.980	47.30	9.410	7.282	9.200	1.752
18	9.260	4.650 *	9.190	5.046	10.080	70.84	9.880	38.23	9.400	7.262	9.200	3.260 *
19	9.210	3.470 *	9.300	7.648	9.980	43.49 *	9.800	31.13	9.390	7.254	9.210	1.830
20	9.490	5.618	9.480	9.174	10.040	48.67 *	9.740	21.04	9.370	7.198	9.210	1.870

21	9.360	4.157	9.460	7.717	9.880	38.64	9.800	31.07	9.340	6.930 *	9.200	1.790
22	9.220	3.692 #	9.460	11.27 *	9.800	31.10	9.700	20.88	9.320	7.183	9.190	1.744
23	9.090	1.910	9.430	7.181	9.740	21.20	9.660	21.03 *	9.320	7.167	9.180	1.566
24	9.050	0.890 *	9.360	6.837	9.700	20.84	9.620	18.82 #	9.320	6.320 *	9.170	1.464
25	9.040	1.008	9.440	8.208	9.680	20.75	9.600	10.72	9.300	6.981	9.160	2.470 *
26	9.040	0.981	9.730	20.65	9.660	21.03 *	9.620	18.82 #	9.300	6.982	9.160	1.385
27	9.040	0.893	9.520	11.00	9.700	20.98	9.600	17.76 #	9.290	5.450 *	9.150	1.361
28	9.030	0.820	9.410	7.832	9.680	20.81	9.600	17.76 #	9.290	5.450 *	9.160	2.470 *
29	9.030	0.752	9.350	7.250 *	10.050	60.76	9.600	17.76 #	9.280	5.883	9.170	1.490
30	9.030	0.740	9.300	7.821	9.840	41.48	9.600	17.76 *	9.270	3.532	9.180	1.579
31			9.450	8.532	10.620	131.7			9.250	2.671		
Ten-Daily Mean												
I Ten-Daily	9.025	0.000	9.040	0.832	10.245	106.9	10.344	103.8	9.534	10.59	9.271	4.444
II Ten-Daily	9.261	4.685	9.315	6.460	10.776	183.4	10.124	67.72	9.417	7.877	9.221	2.613
III Ten-Daily	9.093	1.584	9.446	9.481	9.850	39.03	9.640	19.24	9.298	5.868	9.172	1.732
Monthly												
Min.	9.020	0.000	9.030	0.417	9.640	15.26	9.600	10.72	9.250	2.671	9.150	1.361
Max.	9.490	10.86	9.730	20.65	13.030	692.4	11.700	340.4	9.620	16.74	9.300	7.841
Mean	9.126	2.09	9.273	5.717	10.276	107.5	10.036	63.59	9.413	8.04	9.221	2.93

Annual Runoff in MCM = 525 **Annual Runoff in mm = 263**

Peak Observed Discharge = 692.4 cumecs on 13/08/2012 **Corres. Water Level :13.03 m**

Lowest Observed Discharge = 0.000 cumecs on 01/06/2012 **Corres. Water Level :9.02 m**

Water Level(m.s.l) in m *:Computed Discharge #:Discarded Discharge (values changed as per rating curve)

Note: River remained in pooling/ no flow condition w.e.f. 01/06/12 to 12/06/12**.**

Stage –Discharge data for the period 2012-13

Station Name: Purna at Mahuwa (010219001) Division: Tapi Division Surat Local River: Purna Sub -Division: LTSD, CWC, Surat

Day	Dec		Jan		Feb		Mar		Apr		May	
	W.L	Q	WL	Q	WL	Q	WL	Q	WL	Q	WL	Q
1	9.180	1.562	9.150	1.174	9.120	1.790 *	9.070	1.100 *	9.080	1.200 *	9.100	1.500 *
2	9.180	2.850 *	9.150	1.164	9.120	1.790 *	9.060	1.000 *	9.070	1.100 *	9.100	1.500 *
3	9.180	2.850 *	9.160	1.254	9.130	1.960 *	9.060	1.000 *	9.070	1.100 *	9.100	1.500 *
4	9.200	3.260 *	9.160	1.216	9.130	1.960 *	9.060	1.000 *	9.070	1.100 *	9.100	1.500 *
5	9.200	1.609	9.170	1.407	9.130	1.960 *	9.060	1.000 *	9.080	1.200 *	9.100	1.500 *
6	9.200	1.601	9.170	2.660 *	9.120	1.790 *	9.070	1.100 *	9.080	1.200 *	9.090	1.360 *
7	9.210	1.740	9.170	1.395	9.120	1.790 *	9.070	1.100 *	9.080	1.200 *	9.090	1.360 *
8	9.210	1.731	9.160	1.212	9.120	1.790 *	9.070	1.100 *	9.080	1.200 *	9.090	1.360 *
9	9.210	3.470 *	9.160	1.188	9.110	1.600 *	9.080	1.200 *	9.070	1.100 *	9.080	1.200 *
10	9.210	1.723	9.140	0.938	9.110	1.600 *	9.080	1.200 *	9.070	1.100 *	9.080	1.200 *
11	9.210	1.716	9.140	0.935	9.100	1.500 *	9.080	1.200 *	9.070	1.100 *	9.080	1.200 *
12	9.210	1.707	9.140	0.930	9.100	1.500 *	9.090	1.360 *	9.070	1.100 *	9.090	1.360 *
13	9.200	3.260 *	9.130	1.960 *	9.100	1.500 *	9.090	1.360 *	9.060	1.000 *	9.090	1.360 *
14	9.200	1.652	9.130	0.854	9.090	1.360 *	9.100	1.500 *	9.060	1.000 *	9.100	1.500 *
15	9.200	1.661	9.130	0.848	9.090	1.360 *	9.100	1.500 *	9.060	1.000 *	9.100	1.500 *
16	9.200	3.260 *	9.130	0.844	9.100	1.500 *	9.110	1.600 *	9.060	1.000 *	9.100	1.500 *
17	9.200	1.652	9.120	1.790 *	9.100	1.500 *	9.110	1.600 *	9.080	1.200 *	9.100	1.500 *
18	9.190	1.646	9.120	1.790 *	9.110	1.600 *	9.120	1.790 *	9.080	1.200 *	9.090	1.360 *
19	9.190	1.636	9.110	1.600 *	9.110	1.600 *	9.120	1.790 *	9.080	1.200 *	9.060	1.000 *
20	9.190	1.631	9.110	1.600 *	9.110	1.600 *	9.110	1.600 *	9.070	1.100 *	9.060	1.000 *

21	9.190	1.624	9.110	1.600 *	9.100	1.500 *	9.110	1.600 *	9.070	1.100 *	9.060	1.000 *
22	9.180	1.563	9.110	1.600 *	9.100	1.500 *	9.100	1.500 *	9.070	1.100 *	9.050	0.900 *
23	9.180	2.850 *	9.110	1.600 *	9.080	1.200 *	9.100	1.500 *	9.070	1.100 *	9.050	0.900 *
24	9.180	1.553	9.100	1.500 *	9.080	1.200 *	9.100	1.500 *	9.090	1.360 *	9.030	0.700 *
25	9.180	2.850 *	9.100	1.500 *	9.080	1.200 *	9.100	1.500 *	9.090	1.360 *	9.030	0.700 *
26	9.180	1.533	9.100	1.500 *	9.070	1.100 *	9.090	1.360 *	9.100	1.500 *	9.020	0.600 *
27	9.160	1.225	9.110	1.600 *	9.070	1.100 *	9.090	1.360 *	9.100	1.500 *	9.020	0.600 *
28	9.160	1.219	9.110	1.600 *	9.070	1.100 *	9.090	1.360 *	9.110	1.600 *	9.020	0.600 *
29	9.160	1.224	9.110	1.600 *			9.080	1.200 *	9.110	1.600 *	9.020	0.600 *
30	9.160	1.200 *	9.110	1.600 *			9.080	1.200 *	9.110	1.600 *	9.010	0.500 *
31	9.150	1.178	9.120	1.790 *			9.080	1.200 *			9.010	0.500 *
Ten-Daily Mean												
I Ten-Daily	9.198	2.240	9.159	1.361	9.121	1.803	9.068	1.080	9.075	1.150	9.093	1.398
II Ten-Daily	9.199	1.982	9.126	1.315	9.101	1.502	9.103	1.530	9.069	1.090	9.087	1.328
III Ten-Daily	9.171	1.638	9.108	1.590	9.081	1.238	9.093	1.389	9.092	1.382	9.029	0.691
Monthly												
Min.	9.150	1.178	9.100	0.844	9.070	1.100	9.060	1.000	9.060	1.000	9.010	0.500
Max.	9.210	3.470	9.170	2.660	9.130	1.960	9.120	1.790	9.110	1.600	9.100	1.500
Mean	9.189	1.943	9.130	1.427	9.102	1.534	9.088	1.335	9.079	1.21	9.068	1.13

Peak Computed Discharge = 244.5 cumecs on 10/08/2012 **Corres. Water Level :11.36 m**

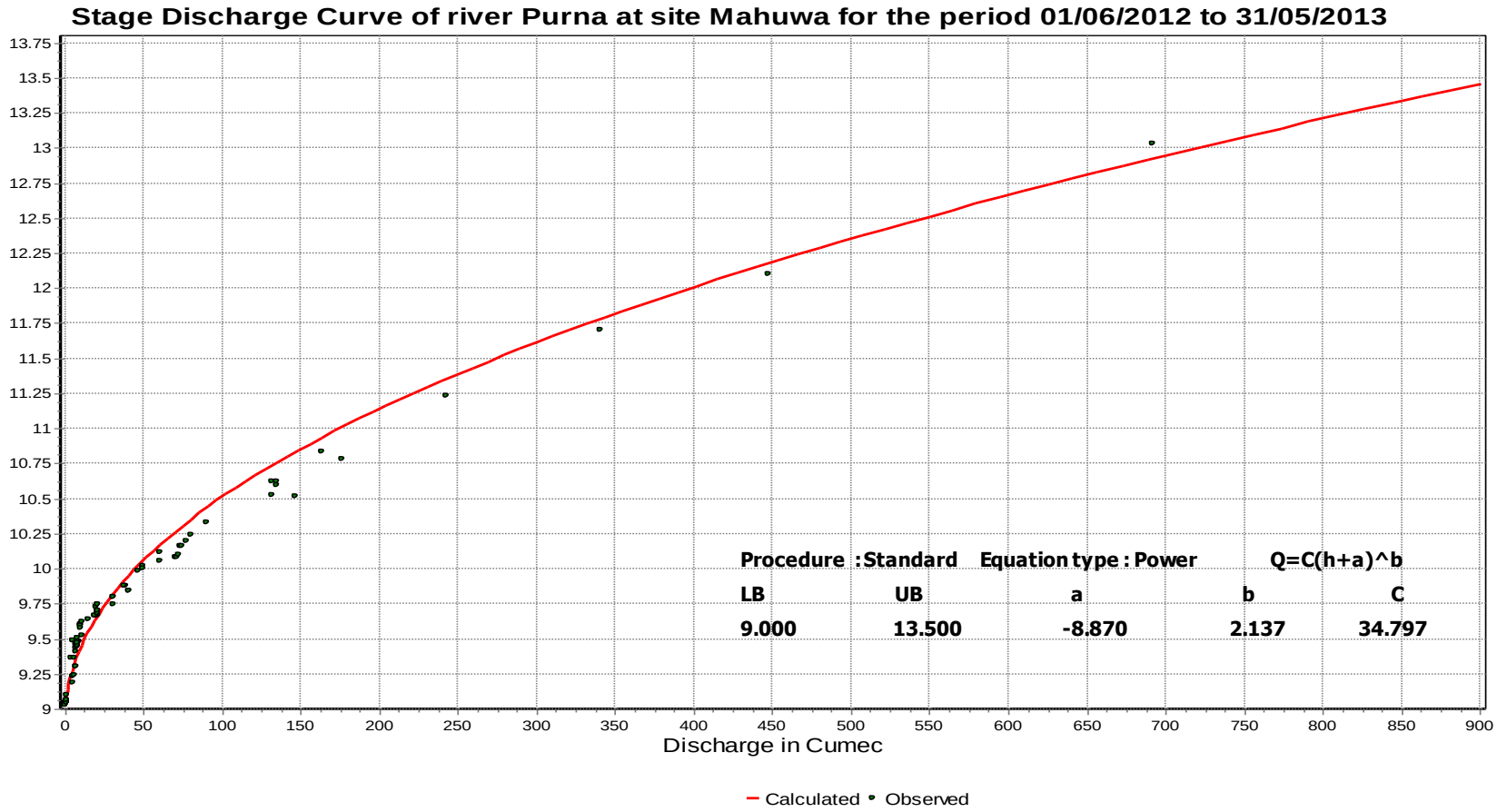
Lowest Computed Discharge = 0.500 cumecs on 30/05/2013 **Corres. Water Level :9.01 m**

Water Level(m.s.l) in m *:Computed Discharge #:Discarded Discharge (values changed as per rating curve)

Note: River remained in pooling/ no flow condition w.e.f. 01/06/12 to 12/06/12.

4.1.4 Stage Discharge Curve

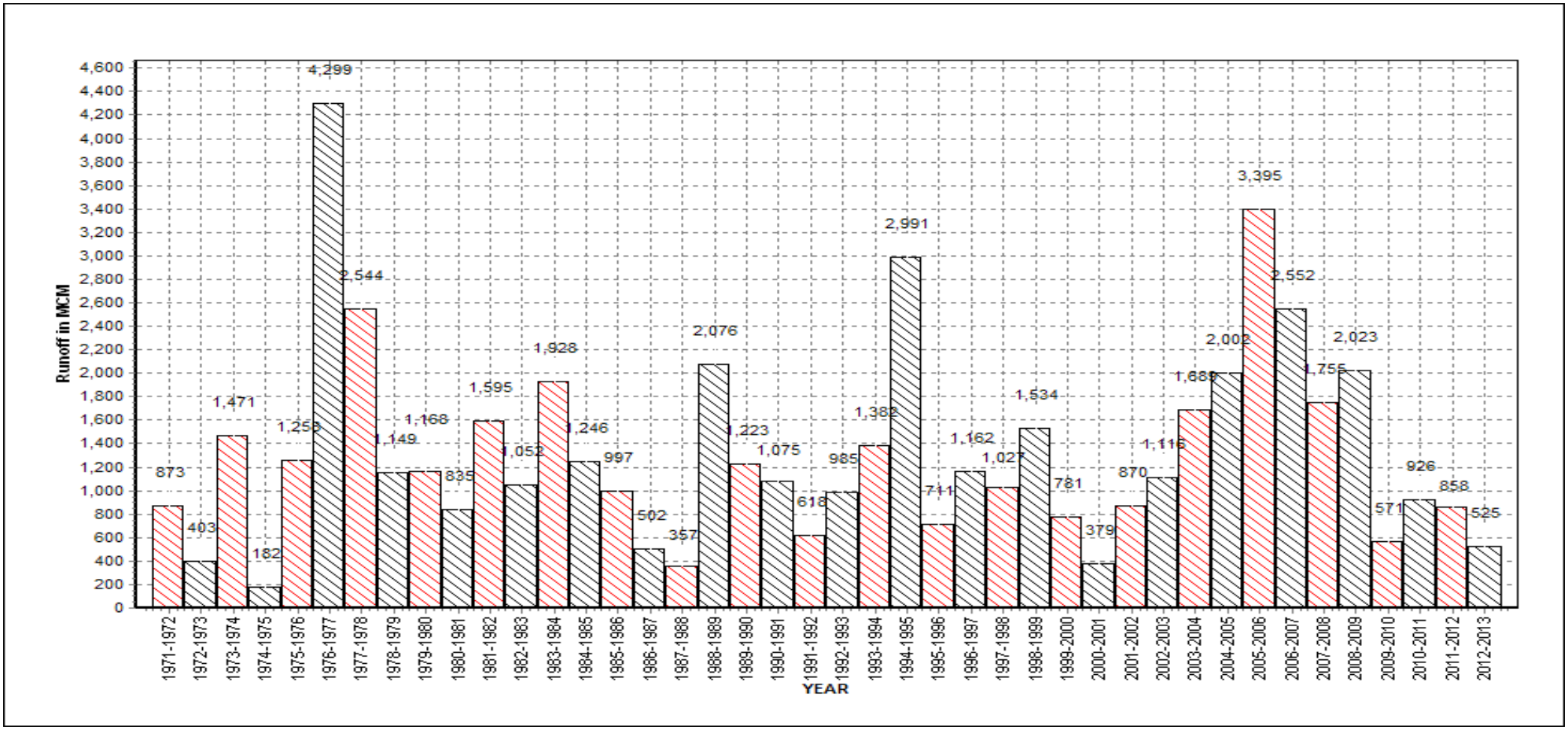
Station Name: Purna at Mahuwa (010219001) Division: Tapi Division Surat Local River: Purna Sub -Division: LTSD, CWC, Surat



4.1.5 Annual runoff

Annual Runoff Values Runoff Based on period 1971 to 2013

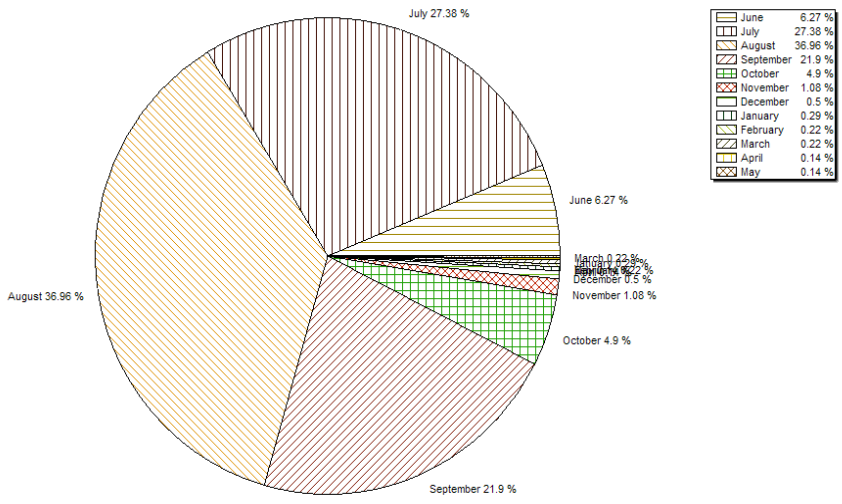
Station Name: Purna at Mahuwa (010219001) Division: Tapi Division Surat Local River: Purna Sub -Division: LTSD, CWC, Surat



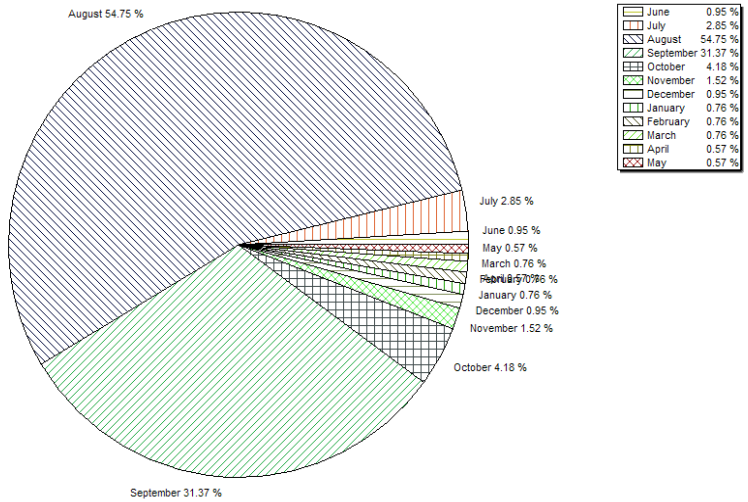
4.1.6 Monthly Average Runoff

Station Name: Purna at Mahuwa (010219001) Division: Tapi Division, Surat Local River: Purna Sub -Division: LTSD, CWC, Surat

Monthly Average Runoff Based on period: 1971 -2012



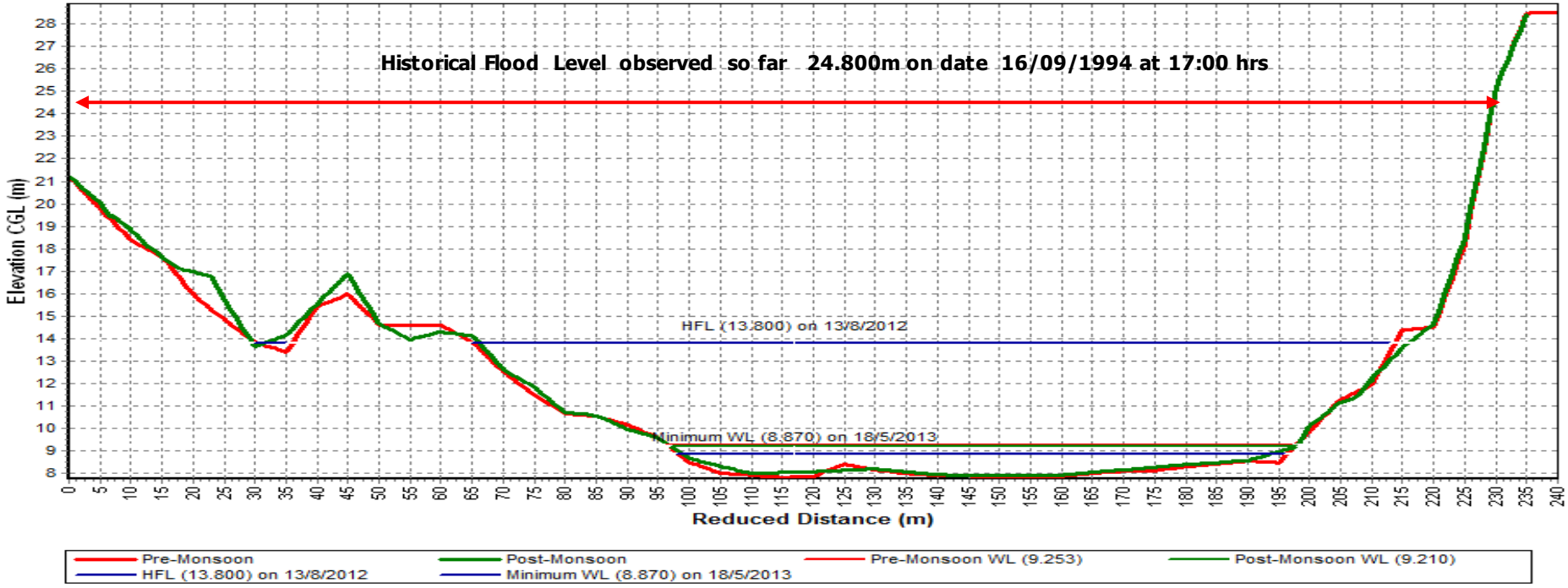
Monthly Average Runoff Based on period: 2012-13



4.1.7 Superimposed cross section

Station Name: Purna at Mahuwa (010219001) Division: Tapi Division Surat Local River:Purna Sub -Division: LTSD, CWC, Surat

Superimposed cross section at SG line



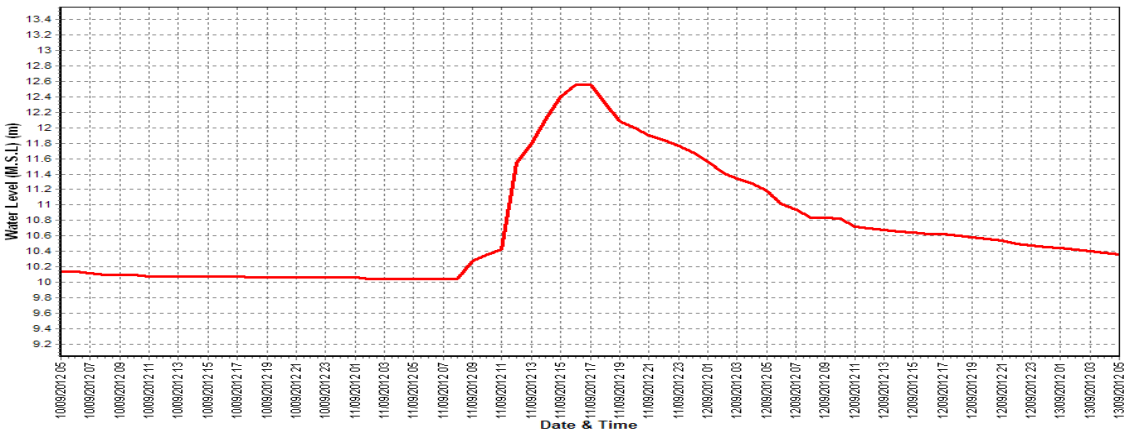
4.1.8 Water Level vs. Time- Graph of Highest Flood Peaks during 2012-13

Station Name: Purna at Mahuwa (010219001) Division : Tapi Division Surat

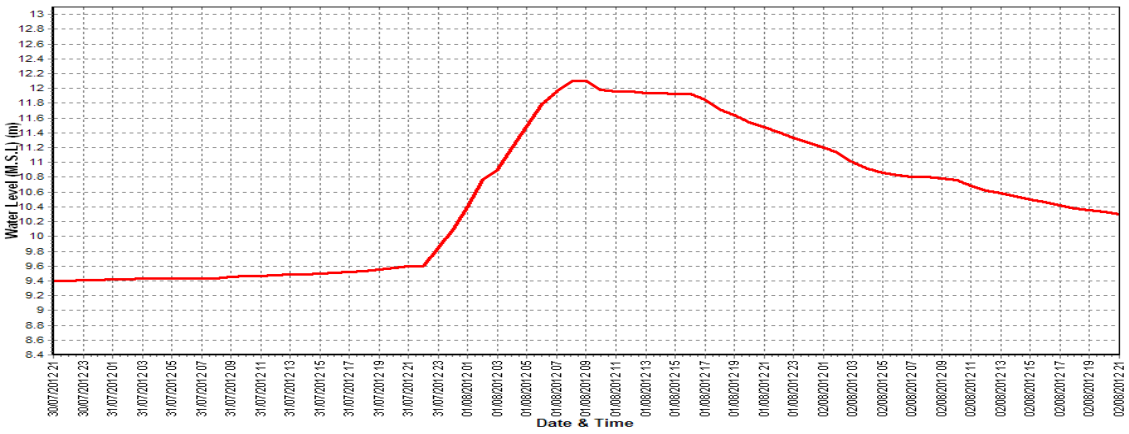
Local River : Purna Sub -Division : LTSD, CWC, Surat

Water Level Vs. Time –Graph of I peak during the year 2012-13

Water Leel Vs. Time –Graph of II peak during the year 2012-13



Water Level Vs. Time –Graph of III peak during the year 2012-13



4.2 Ambica Basin

4.2.1 History sheet

HISTORY SHEET

			Water Year	**:**	**2012-13**
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	:	Surat
Drainage Area	:	1510 Sq. Km.	Bank	:	
Latitude	:	20°51'22"	Longitude	:	72°59'05"
Zero of Gauge (m)	:	1.5 (m.s.l)	14/01/1979		
		Opening Date	Closing Date		
Gauge	:	14/01/1979			
Discharge	:	12/03/1979			
Sediment	:	01/02/1985			
Water Quality	:	01/04/1980			

Annual Maximum / Minimum discharge with corresponding Water Level (m.s.l)

	Maximum			Minimum		
Year	Q (cumecs)	WL (m)	Date	Q (cumecs)	WL (m)	Date
1979-1980	1686	9.900	10/08/1979	0.180	3.350	16/06/1979
1980-1981	1492	9.160	02/08/1980	0.700	3.460	03/06/1980
1981-1982	1449	8.950	02/07/1981	0.000	3.500	13/06/1981
1982-1983	1537	9.400	25/07/1982	0.000	3.410	13/05/1983
1983-1984	1881	10.500	16/08/1983	0.000	1.500	07/06/1983
1984-1985	1551	9.430	06/07/1984	0.390	3.410	13/06/1984
1985-1986	1876	10.255	01/08/1985	0.100	3.315	17/04/1986
1986-1987	658.7	7.005	19/07/1986	0.100	3.315	13/06/1986
1987-1988	825.7	7.955	26/08/1987	0.000	3.200	05/04/1988
1988-1989	2308	10.110	27/07/1988	0.700	3.340	30/04/1989
1989-1990	2508	11.025	24/07/1989	0.456	3.285	08/06/1989
1990-1991	1385	10.220	17/08/1990	1.070	3.240	23/03/1991
1991-1992	450.7	6.440	28/07/1991	0.000	2.940	28/04/1992
1992-1993	1898	11.550	03/09/1992	0.000	3.020	14/06/1992
1993-1994	1245	5.185	25/06/1993	0.433	2.945	09/06/1993
1994-1995	2764	11.500	16/06/1994	0.364	2.940	03/05/1995
1995-1996	750.0	6.900	03/09/1995	0.091	2.810	16/04/1996
1996-1997	1255	8.425	24/07/1996	0.274	2.700	10/06/1996
1997-1998	1350	8.730	25/08/1997	0.465	2.200	30/05/1998
1998-1999	1200	8.800	08/07/1998	0.446	2.190	08/06/1998
1999-2000	2989	11.395	16/07/1999	0.783	2.130	26/04/2000
2000-2001	910.8	8.450	14/07/2000	0.748	2.425	13/01/2001
2001-2002	1873	9.810	20/07/2001	2.385	2.255	06/11/2001
2002-2003	1217	8.605	28/06/2002	2.210	3.955	21/10/2002
2003-2004	3650	10.075	28/07/2003	0.000	3.020	10/06/2003
2004-2005	2700	12.170	04/08/2004	1.812	3.700	30/10/2004
2005-2006	2894	13.010	29/06/2005	0.000	6.465	25/02/2006
2006-2007	1783	9.840	29/07/2006	0.000	6.460	02/03/2007
2007-2008	1601	9.400	02/07/2007	5.400	3.710	29/10/2007
2008-2009	1295	9.640	12/08/2008	40.43	3.840	30/08/2008
2009-2010	599	7.090	21/07/2009	0.000	4.820	01/06/2009
2010-2011	870.2	7.815	09/09/2010	0.000	4.590	01/06/2010
2011-2012	1594	9.67	29/08/2011	0.000	3.550	07/07/2011
2012-2013	548.7	6.930	13/08/2012	0.000	4.930	01/06/2012

4.2.2 Annual Maximum Flood Peak

Year	Highest Flood Level (m)	Date	Hour
1979	12.180	11/08/1979	01:00:00
1980	10.690	02/08/1980	16:00:00
1981	9.980	10/07/1981	15:00:00
1982	10.950	25/07/1982	14:00:00
1983	11.070	16/08/1983	06:00:00
1984	13.470	18/07/1984	20:00:00
1985	13.020	01/08/1985	00:00:00
1986	7.780	19/07/1986	00:00:00
1987	9.870	26/08/1987	03:00:00
1988	11.650	27/07/1988	16:00:00
1989	11.490	24/07/1989	13:00:00
1990	10.270	17/08/1990	09:00:00
1991	6.710	28/07/1991	18:00:00
1992	11.950	03/09/1992	12:00:00
1993	11.710	25/06/1993	18:00:00
1994	13.985	16/06/1994	18:00:00
1995	7.970	20/07/1995	12:00:00
1996	10.400	23/07/1996	16:00:00
1997	12.400	31/07/1997	21:00:00
1998	10.760	08/07/1998	11:00:00
1999	12.760	16/07/1999	02:00:00
2000	10.550	14/07/2000	03:00:00
2001	11.570	20/07/2001	15:00:00
2002	12.360	26/06/2002	22:00:00
2003	13.520	28/07/2003	04:00:00
2004	13.980	04/08/2004	02:00:00
2005	13.450	29/06/2005	16:00:00
2006	12.900	05/07/2006	14:00:00
2007	10.200	02/07/2007	13:00:00
2008	11.420	12/08/2008	13:00:00
2009	9.300	21/07/2009	13:00:00
2010	7.980	09/09/2010	04:00:00
2011	11.800	29/08/2011	06:00:00
2012	8.100	10/08/2012	01:00:00

4.2.3 Summary of Data

Stage –Discharge data for the period 2012-13

Station Name: Ambica at Gadat (01 02 20 001) Division : Tapi Division Surat Local River: Ambica Sub -Division : LTSD, CWC, Surat

Day	Jun		Jul		Aug			Sep			Oct			Nov	
	W.L	Q	W.L	Q	W.L	Q		W.L	Q		W.L	Q		W.L	Q
1	4.930	0.000	3.580	0.000	5.765	203.5		4.890	222.6		3.820	13.34		5.000	0.000
2	4.920	0.000	3.570	0.000	4.950	120.8		4.460	99.18	*	3.800	14.13	*	5.000	0.000
3	4.920	0.000	3.570	0.000	4.120	71.74		4.300	70.27		3.830	16.18	*	5.000	0.000
4	4.920	0.000	3.560	0.000	4.105	54.24		4.500	105.8	*	3.830	16.18	*	5.000	0.000
5	4.920	0.000	3.560	0.000	4.010	35.45	*	4.930	185.8	*	3.850	18.61	*	5.000	0.000
6	4.900	0.000	3.550	0.000	4.010	48.68		5.300	265.9	#	3.850	18.61	*	5.000	0.000
7	4.880	0.000	3.580	0.000	4.045	51.70		5.180	238.9	*	3.850	18.61	*	5.000	0.000
8	4.820	0.000	3.580	0.000	4.015	44.57		4.600	123.1	*	3.850	18.61	*	5.000	0.000
9	4.820	0.000	3.580	0.000	3.950	28.71	*	4.390	87.90	*	3.850	19.72		5.000	0.000
10	4.810	0.000	3.580	0.000	6.300	525.7	*	4.585	102.5		3.850	18.84		5.000	0.000
11	4.820	0.000	3.690	0.000	4.950	93.90		4.820	164.0	#	3.850	18.87		5.000	0.000
12	4.830	0.000	3.690	0.000	5.750	375.5	*	5.130	210.6		3.840	17.57		5.000	0.000
13	4.840	0.000	3.670	0.000	6.930	548.7		4.630	104.2		3.810	15.33		5.000	0.000
14	4.850	0.000	3.670	0.000	5.650	350.0	#	4.500	105.8	*	3.780	12.46	*	5.000	0.000
15	4.860	0.000	3.660	0.000	4.900	179.8	*	4.475	142.7		3.770	12.71		5.000	0.000
16	4.870	0.000	3.660	0.000	4.650	132.0	#	4.410	91.08	*	3.760	10.87	*	5.000	0.000
17	4.570	0.000	3.660	0.000	4.420	85.74		4.260	68.22	*	3.760	0.000		5.000	0.000
18	3.700	0.000	3.660	0.000	4.295	74.29		4.160	55.39		3.760	0.000		5.000	0.000
19	3.400	0.000	3.740	0.000	4.240	65.34	*	4.100	49.73		3.760	0.000		5.000	0.000
20	3.700	0.000	3.860	0.000	4.220	62.50	*	4.060	41.42	*	4.300	0.000		5.000	0.000

21	3.700	0.000	3.890	0.000	4.140	41.24	4.090	45.80	4.620	0.000	5.000	0.000
22	3.680	0.000	3.840	0.000	4.100	35.39	4.050	39.33	4.800	0.000	5.000	0.000
23	3.600	0.000	3.810	0.000	4.070	29.76	4.020	36.62 *	5.000	0.000	5.000	0.000
24	3.600	0.000	3.790	0.000	4.070	29.29	3.990	33.34	5.000	0.000	5.000	0.000
25	3.600	0.000	3.790	0.000	4.040	29.33	3.970	29.47	5.000	0.000	5.000	0.000
26	3.600	0.000	3.980	0.000	4.010	35.45 *	3.960	26.71	5.000	0.000	5.000	0.000
27	3.600	0.000	3.890	0.000	4.160	57.42	3.925	22.74	5.000	0.000	5.000	0.000
28	3.590	0.000	3.820	0.000	4.890	186.5	3.870	18.85	5.000	0.000	5.000	0.000
29	3.580	0.000	3.810	0.000	5.365	272.8	3.840	17.33	5.000	0.000	5.000	0.000
30	3.590	0.000	3.800	0.000	4.425	155.0	3.840	17.68 *	5.000	0.000	5.000	0.000
31			4.000	0.000	5.000	246.0			5.000	0.000		
Ten-Daily Mean												
I Ten-Daily	4.884	0.000	3.571	0.000	4.527	118.5	4.714	150.2	3.838	17.28	5.000	0.000
II Ten-Daily	4.444	0.000	3.696	0.000	5.000	196.8	4.455	103.3	3.839	8.781	5.000	0.000
III Ten-Daily	3.614	0.000	3.856	0.000	4.388	101.6	3.955	28.79	4.947	0.000	5.000	0.000
Monthly												
Min.	3.400	0.000	3.550	0.000	3.950	28.71	3.840	17.33	3.760	0.000	5.000	0.000
Max.	4.930	0.000	4.000	0.000	6.930	548.7	5.300	265.9	5.000	19.72	5.000	0.000
Mean	4.314	0.000	3.713	0.000	4.630	137.8	4.374	94.10	4.232	8.407	5.000	0.000

Annual Runoff in MCM = 635 **Annual Runoff in mm = 421**

Peak Observed Discharge = 548.7 cumecs on 13/08/2012 **Corres. Water Level :6.93 m**

Lowest Observed Discharge = 0.000 cumecs on 01/06/2012 **Corres. Water Level :4.93 m**

Q: Observed/Computed discharge in cumecs WL: Corresponding Mean Water Level (m.s.l) in m * : Computed Discharge #:Discarded Discharge (values changed as per rating curve)

Note: River remained in pooling/ no flow condition w.e.f. 01/06/12 to 31/07/12 and from 17/10/2012 to 31/05/2013**.**Back water effect form Dewadha Dam exists at site during this period.

Stage –Discharge data for the period 2012-13

Station Name: Ambica at Gadat (01 02 20 001) Division : Tapi Division Surat Local River: Ambica Sub -Division : LTSD, CWC, Surat

Day	Dec		Jan		Feb		Mar		Apr		May	
	W.L	Q	WL	Q	WL	Q	WL	Q	WL	Q	WL	Q
1	5.000	0.000	5.000	0.000	4.890	0.000	4.960	0.000	4.950	0.000	4.930	0.000
2	5.000	0.000	5.000	0.000	4.870	0.000	4.960	0.000	4.950	0.000	4.930	0.000
3	5.000	0.000	4.970	0.000	4.870	0.000	4.960	0.000	4.940	0.000	4.930	0.000
4	5.000	0.000	4.970	0.000	4.870	0.000	4.960	0.000	4.940	0.000	4.930	0.000
5	5.000	0.000	4.970	0.000	4.870	0.000	4.960	0.000	4.940	0.000	4.930	0.000
6	5.000	0.000	4.970	0.000	4.880	0.000	4.960	0.000	4.940	0.000	4.930	0.000
7	5.000	0.000	4.970	0.000	4.880	0.000	4.970	0.000	4.940	0.000	4.930	0.000
8	5.000	0.000	4.930	0.000	4.880	0.000	4.970	0.000	4.940	0.000	4.930	0.000
9	5.000	0.000	4.930	0.000	4.880	0.000	4.970	0.000	4.940	0.000	4.930	0.000
10	5.000	0.000	4.920	0.000	4.880	0.000	4.970	0.000	4.940	0.000	4.930	0.000
11	5.000	0.000	4.920	0.000	4.880	0.000	4.970	0.000	4.940	0.000	4.930	0.000
12	5.000	0.000	4.920	0.000	4.880	0.000	4.970	0.000	4.940	0.000	4.930	0.000
13	5.000	0.000	4.920	0.000	4.890	0.000	4.970	0.000	4.940	0.000	4.930	0.000
14	5.000	0.000	4.900	0.000	4.890	0.000	4.960	0.000	4.940	0.000	4.930	0.000
15	5.000	0.000	4.900	0.000	4.890	0.000	4.960	0.000	4.940	0.000	4.930	0.000
16	5.000	0.000	4.890	0.000	4.890	0.000	4.960	0.000	4.940	0.000	4.910	0.000
17	5.000	0.000	4.880	0.000	4.890	0.000	4.960	0.000	4.940	0.000	4.910	0.000
18	5.000	0.000	4.880	0.000	4.900	0.000	4.960	0.000	4.940	0.000	4.910	0.000
19	5.000	0.000	4.880	0.000	4.980	0.000	4.960	0.000	4.950	0.000	4.910	0.000
20	5.000	0.000	4.870	0.000	4.980	0.000	4.960	0.000	4.950	0.000	4.910	0.000

21	5.000	0.000	4.870	0.000	4.980	0.000	4.960	0.000	4.950	0.000	4.900	0.000
22	5.000	0.000	4.870	0.000	4.980	0.000	4.960	0.000	4.950	0.000	4.920	0.000
23	5.000	0.000	4.870	0.000	4.980	0.000	4.960	0.000	4.950	0.000	4.920	0.000
24	5.000	0.000	4.860	0.000	4.980	0.000	4.960	0.000	4.950	0.000	4.920	0.000
25	5.000	0.000	4.860	0.000	4.980	0.000	4.960	0.000	4.950	0.000	4.920	0.000
26	5.000	0.000	4.850	0.000	4.970	0.000	4.960	0.000	4.950	0.000	4.920	0.000
27	5.000	0.000	4.850	0.000	4.970	0.000	4.950	0.000	4.950	0.000	4.920	0.000
28	5.000	0.000	4.850	0.000	4.960	0.000	4.950	0.000	4.950	0.000	4.920	0.000
29	5.000	0.000	4.860	0.000			4.950	0.000	4.950	0.000	4.920	0.000
30	5.000	0.000	4.870	0.000			4.950	0.000	4.950	0.000	4.920	0.000
31	5.000	0.000	4.890	0.000			4.950	0.000			4.930	0.000
Ten-Daily Mean												
I Ten-Daily	5.000	0.000	4.963	0.000	4.877	0.000	4.964	0.000	4.942	0.000	4.930	0.000
II Ten-Daily	5.000	0.000	4.896	0.000	4.907	0.000	4.963	0.000	4.942	0.000	4.920	0.000
III Ten-Daily	5.000	0.000	4.864	0.000	4.975	0.000	4.955	0.000	4.950	0.000	4.919	0.000
Monthly												
Min.	5.000	0.000	4.850	0.000	4.870	0.000	4.950	0.000	4.940	0.000	4.900	0.000
Max.	5.000	0.000	5.000	0.000	4.980	0.000	4.970	0.000	4.950	0.000	4.930	0.000
Mean	5.000	0.000	4.906	0.000	4.916	0.000	4.961	0.000	4.945	0.000	4.923	0.000

Peak Computed Discharge = 525.7 cumecs on 10/08/2012 Corres. Water Level :6.3 m

Lowest Computed Discharge = 10.87 cumecs on 16/10/2012 Corres. Water Level :3.76 m

Q: Observed/Computed discharge in cumec WL: Corresponding Mean Water Level (m.s.l) in m * : Computed Discharge

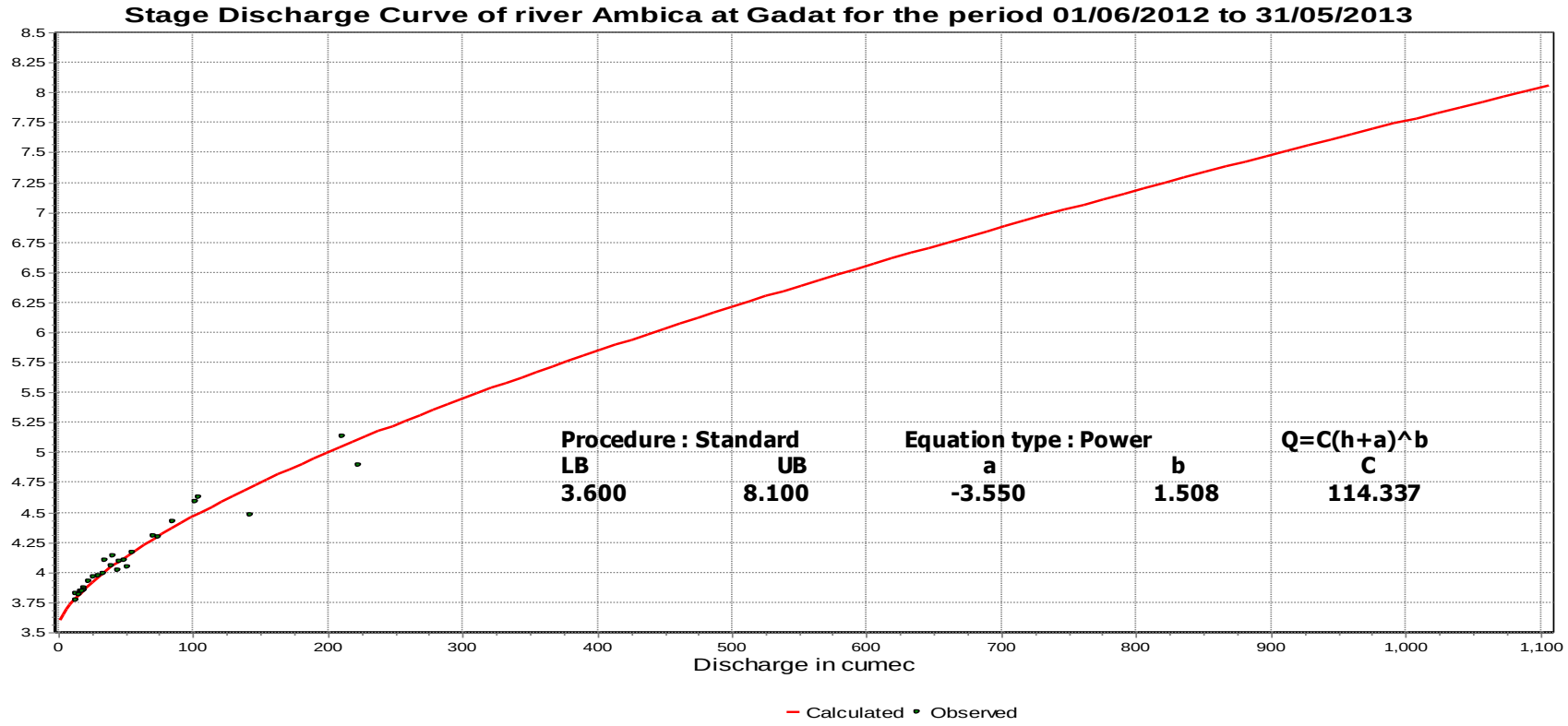
#:Discarded Discharge (values changed as per rating curve)

Note: River remained in pooling/ no flow condition w.e.f. 01/06/12 to 31/07/12 and from 17/10/2012 to 31/05/2013.Back water effect form Dewadha Dam exists at site during this period.

4.2.4 Stage Discharge Curve

Station Name: Ambica at Gadat (01 02 20 001) Division : Tapi Division Surat Local River: Ambica Sub -Division : LTSD, CWC, Surat

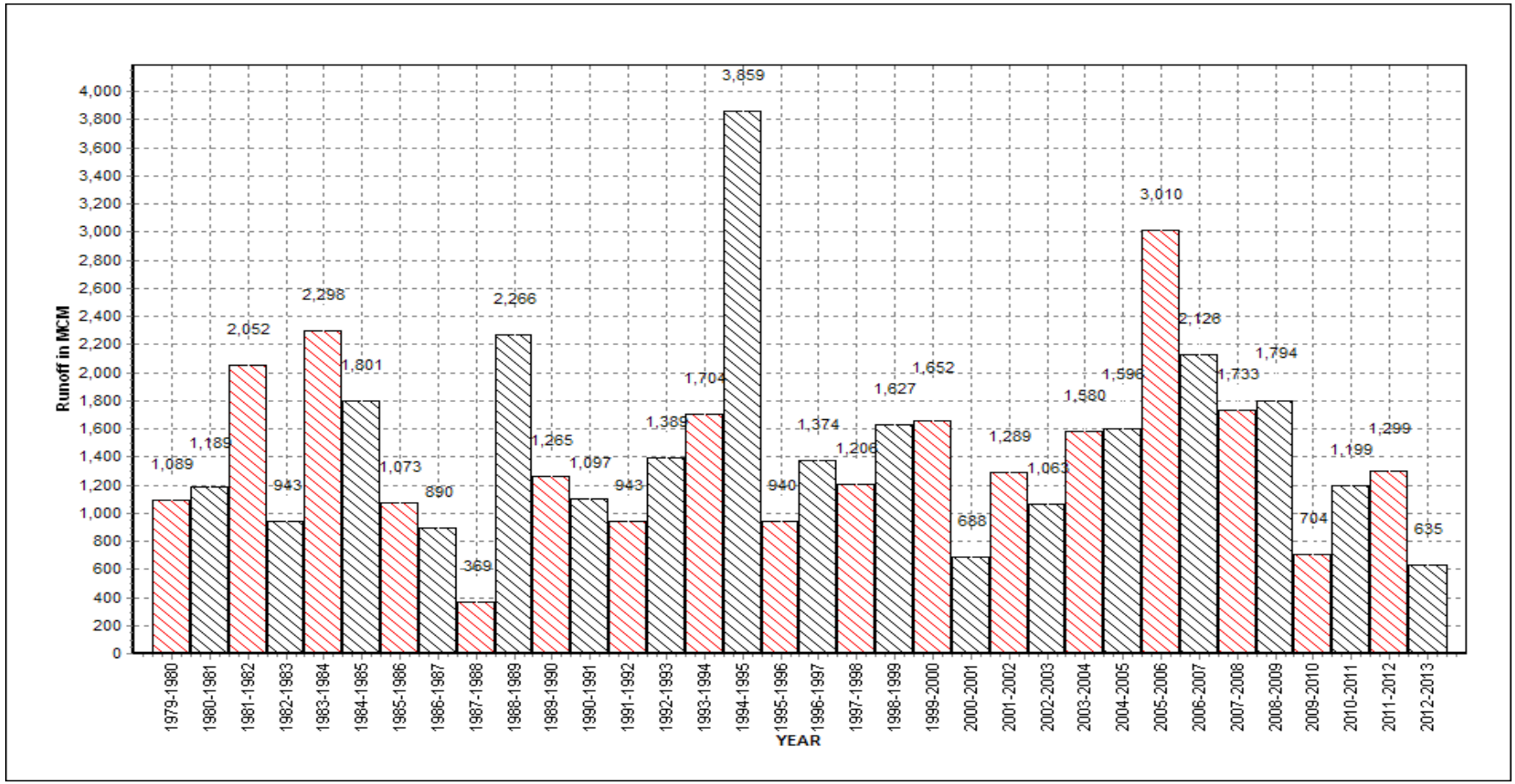
Stage Discharge Curves of site Ambica at Gadat for the Year2012-13



4.2.5 Annual runoff

Annual Runoff Values Runoff Based on period 1979 to 2013

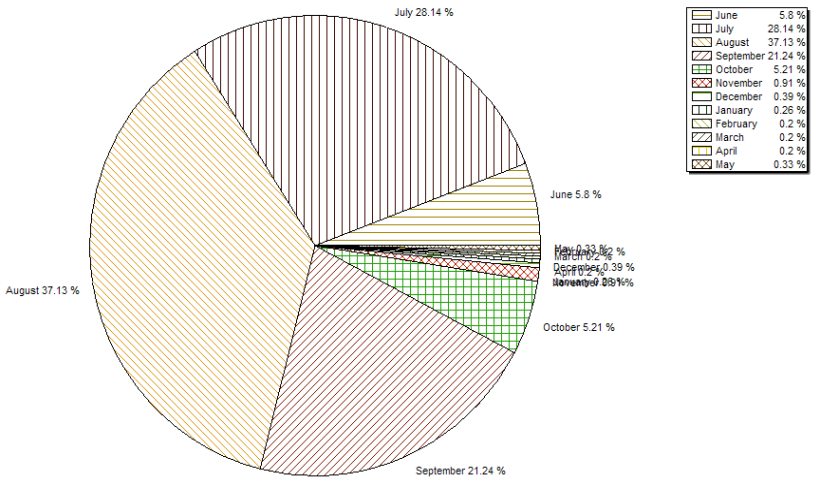
Station Name: Ambica at Gadat (01 02 20 001) Division : Tapi Division, Surat Local River: Ambica Sub -Division : LTSD, CWC, Surat



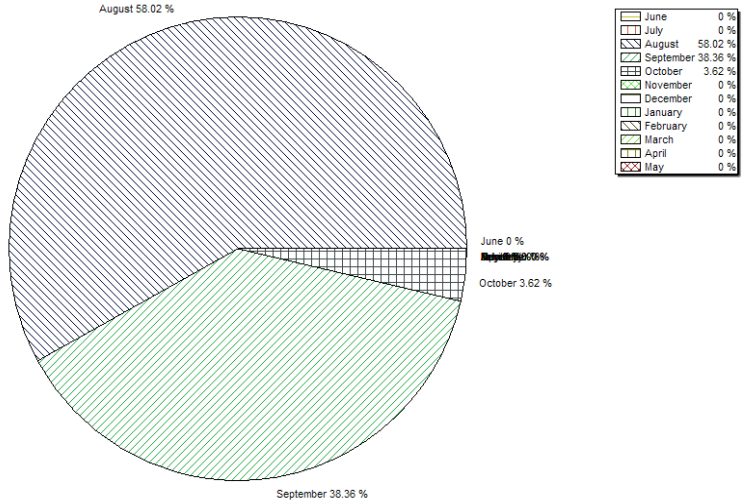
4.2.6 Monthly average Runoff

Station Name: Ambica at Gadat (01 02 20 001) Division : Tapi Division, Surat Local River: Ambica Sub -Division : LTSD, CWC, Surat

Monthly Average Runoff Based on period: 1979 -2012



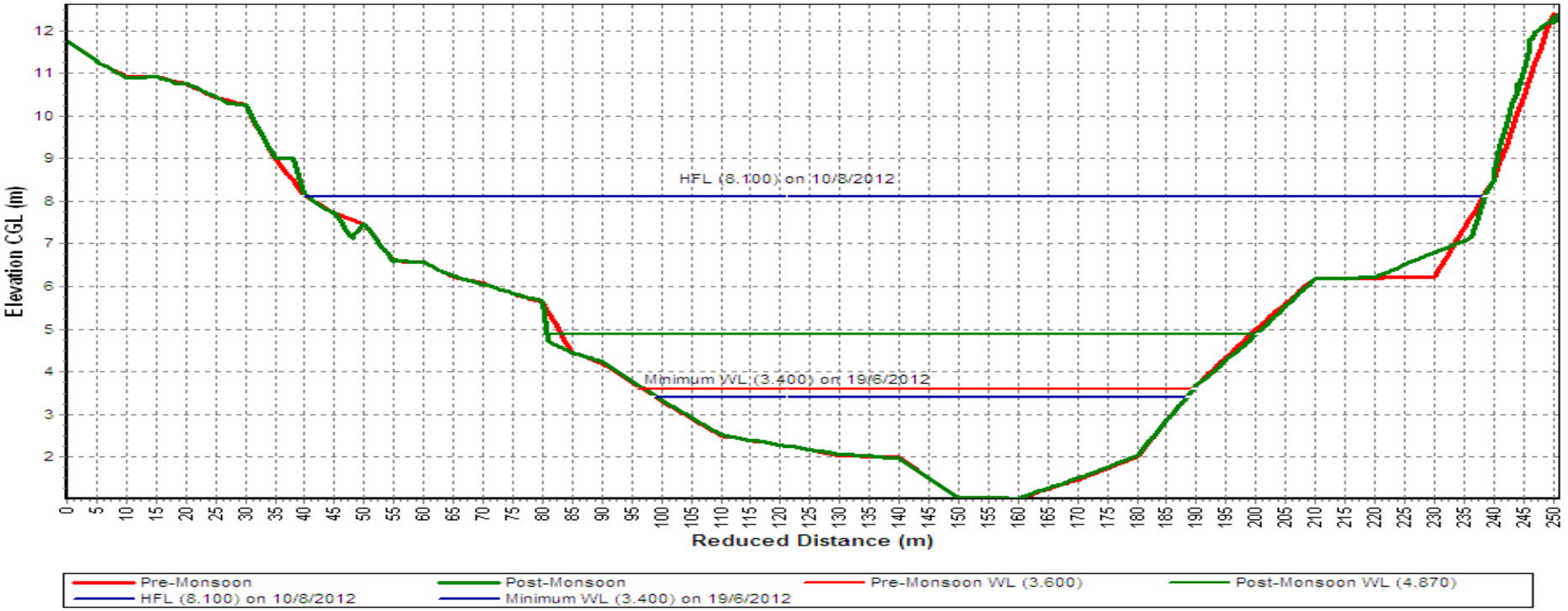
Monthly Average Runoff Based on period: 2012-13



4.2.7 Superimposed Cross section

Station Name: Ambica at Gadat (01 02 20 001) Division: Tapi Division, Surat Local River: Ambica Sub Division: LTSD, CWC, Surat

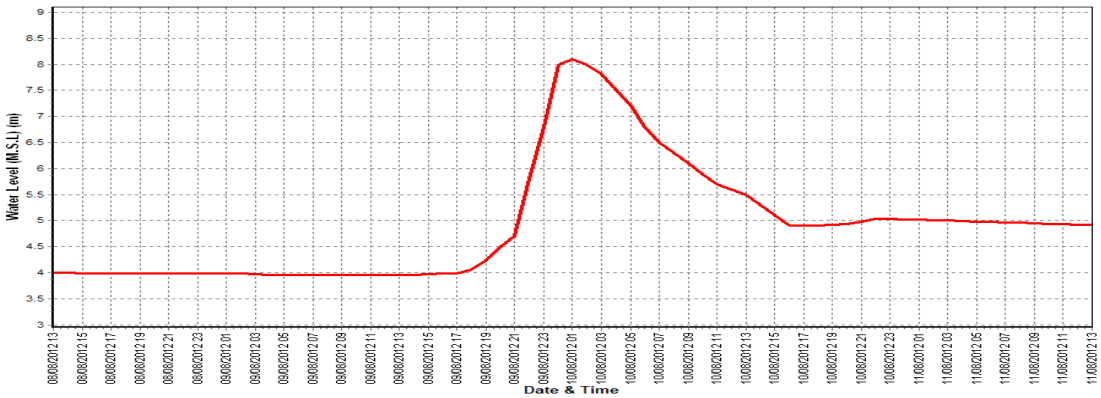
Historical Flood Level observed so far 13.985 m on date 16/08/1994 at 18:00 hrs



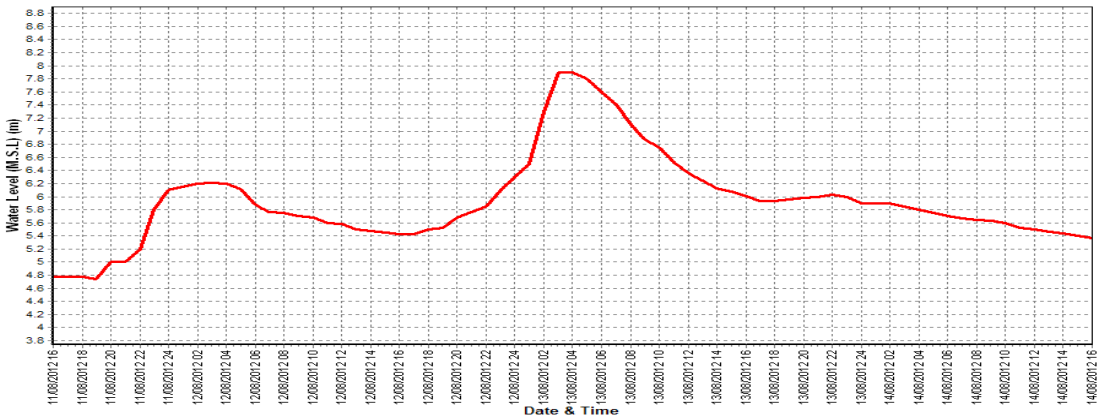
4.2.8 Water Level vs. Time- Graph of Highest Flood Peaks during 2012-13

Station Name: Ambica at Gadat (01 02 20 001) Division : Tapi Division Surat
Local River: Ambica Sub -Division : LTSD, CWC, Surat

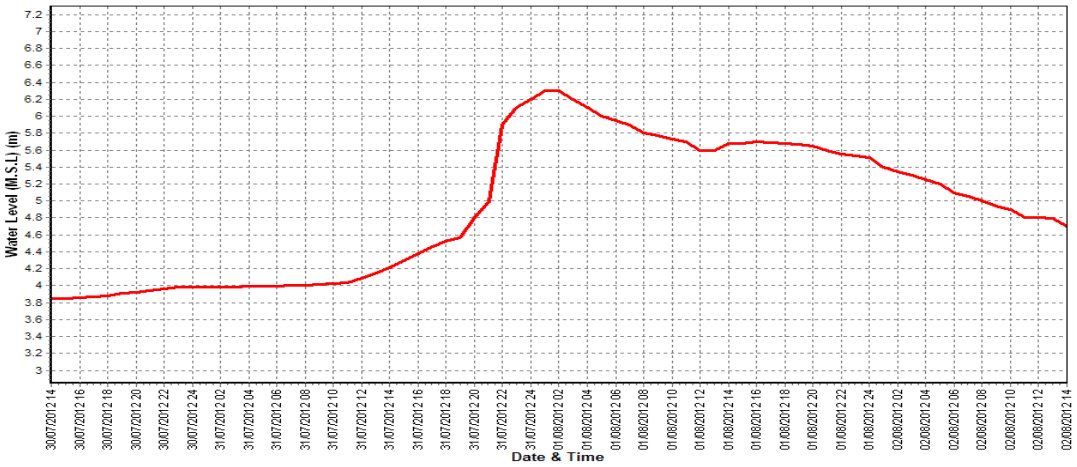
Water level vs. Time graph of 1st flood peak during the year 2012-13



Water level vs. Time graph of 2nd flood peak during the year 2012-13



Water level vs. Time graph of 3rd flood peak during the year 2012-13



4.3 Vaitarna at Durvesh

4.3.1 History sheet

HISTORY SHEET

Water Year : 2012-13

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,CWC,Silvassa
Drainage Area	:	2019 Sq. Km.	Bank	:	
Latitude	:	19°42'45"	Longitude	:	72°55'50"
Zero of Gauge (m) : 0 (m.s.l)			26/10/1970		
		Opening Date	Closing Date		
Gauge	:	26/10/1970			
Discharge	:	26/01/1971			
Sediment	:	26/01/1971			
Water Quality	:	01/06/1977			

Annual Maximum / Minimum discharge with corresponding Water Level (m.s.l)

	Maximum			Minimum		
Year	Q (cumecs)	WL (m)	Date	Q (cumecs)	WL (m)	Date
1971-1972	4386	11.330	30/09/1971	0.000	1.975	21/06/1971
1972-1973	1543	6.463	02/07/1972	0.000	0.680	03/06/1972
1973-1974	3826	10.950	23/09/1973	0.000	0.890	09/05/1974
1974-1975	1655	6.743	04/07/1974	0.000	0.880	09/05/1975
1975-1976	3303	8.437	11/08/1975	0.000	0.855	29/04/1976
1976-1977	7744	14.250	31/07/1976	0.000	0.975	09/05/1977
1977-1978	4374	11.522	03/09/1977	0.020	0.825	14/06/1977
1978-1979	1796	7.277	21/06/1978	0.000	0.800	03/05/1979
1979-1980	5000	9.060	11/08/1979	0.000	1.045	19/06/1979
1980-1981	2460	9.025	04/08/1980	0.000	1.010	13/02/1981
1981-1982	1748	8.675	10/07/1981	0.000	1.400	17/12/1981
1982-1983	1140	8.900	22/08/1982	2.000	1.620	08/11/1982
1983-1984	2249	9.635	13/08/1983	0.000	0.920	14/06/1983
1984-1985	3180	12.900	19/07/1984	0.100	1.250	15/06/1984
1985-1986	1032	7.155	03/08/1985	0.000	1.440	05/07/1985
1986-1987	1293	7.850	19/07/1986	0.000	1.240	30/10/1986
1987-1988	1287	7.065	07/07/1987	0.000	1.954	02/07/1987
1988-1989	3396	11.000	16/07/1988	0.000	0.000	02/02/1989
1989-1990	1672	9.075	25/07/1989	0.000	1.610	30/06/1989
1990-1991	1761	7.690	18/08/1990	0.000	0.000	03/01/1991
1991-1992	1361	8.800	28/07/1991	0.000	0.000	26/01/1992
1992-1993	1405	8.675	12/08/1992	0.000	0.000	27/01/1993
1993-1994	1497	6.045	16/07/1993	0.000	0.000	15/02/1994
1994-1995	2340	12.550	13/07/1994	0.000	0.000	05/02/1995
1995-1996	1039	7.250	21/07/1995	0.000	0.000	02/02/1996
1996-1997	1611	7.380	23/07/1996	0.900	1.120	10/12/1996
1997-1998	4100	12.330	31/07/1997	0.000	1.200	14/06/1997
1998-1999	8000	15.220	17/09/1998	0.000	1.200	26/04/1999
1999-2000	4536	12.180	16/07/1999	0.000	1.190	14/05/2000
2000-2001	1749	8.440	13/07/2000	0.000	1.140	30/12/2000
2001-2002	1469	7.200	04/07/2001	0.000	1.140	31/12/2001
2002-2003	4400	10.830	27/06/2002	0.000	1.100	24/12/2002
2003-2004	6038	12.350	28/07/2003	0.000	1.090	28/12/2003
2004-2005	5080	12.050	03/08/2004	0.000	1.080	20/04/2005
2005-2006	4997	10.450	28/07/2005	0.000	1.030	13/04/2006
2006-2007	4086	10.680	07/08/2006	0.659	1.060	26/12/2006
2007-2008	2034	7.530	03/07/2007	0.853	1.070	24/12/2007
2008-2009	2941	9.830	20/09/2008	0.470	1.060	22/12/2008
2009-2010	1633	7.750	23/07/2009	0.000	1.000	01/06/2009
2010-2011	1422	7.060	02/08/2010	13.48	0.700	10/06/2010
2011-2012	3408	9.930	29/08/2011	0.000	0.950	03/06/2011
2012-2013	1394	6.460	04/09/2012	0.000	0.840	01/06/2012

4.3.2 Annual Maximum Flood Peak

Year	Highest Flood Level (m)	Date	Hour
1974	7.690	04/07/1974	15:00:00
1975	9.860	30/07/1975	03:00:00
1976	14.700	31/07/1976	15:00:00
1977	12.075	03/09/1977	06:00:00
1978	7.720	21/06/1978	10:00:00
1979	9.510	11/08/1979	06:00:00
1980	10.830	04/08/1980	00:00:00
1981	10.500	10/07/1981	20:00:00
1982	9.200	22/08/1982	09:00:00
1983	12.000	15/08/1983	19:00:00
1984	14.460	18/07/1984	18:00:00
1985	8.050	03/08/1985	18:00:00
1986	8.300	15/07/1986	20:00:00
1987	10.800	20/08/1987	15:00:00
1988	13.800	16/07/1988	16:00:00
1989	11.540	25/07/1989	01:00:00
1990	10.250	03/07/1990	20:00:00
1991	10.500	28/07/1991	00:00:00
1992	10.500	03/09/1992	21:00:00
1993	11.900	17/07/1993	00:00:00
1994	12.800	13/07/1994	08:00:00
1995	8.100	21/07/1995	18:00:00
1996	8.220	23/07/1996	18:00:00
1997	12.920	31/07/1997	13:00:00
1998	16.130	17/09/1998	13:00:00
1999	12.500	16/07/1999	09:00:00
2000	8.670	13/07/2000	14:00:00
2001	8.300	09/07/2001	18:00:00
2002	14.500	26/06/2002	18:00:00
2003	12.400	28/07/2003	09:00:00
2004	15.120	02/08/2004	22:00:00
2005	11.340	02/08/2005	14:00:00
2006	11.300	08/08/2006	16:00:00
2007	9.680	05/08/2007	19:00:00
2008	14.220	11/08/2008	20:00:00
2009	9.600	22/07/2009	15:00:00
2010	8.160	31/08/2010	19:00:00
2011	12.720	28/08/2011	19:00:00
2012	7.480	04/09/2012	18:00:00

4.3.1 Summary of Data **Stage –Discharge data for the period 2012-13**

Station Name: Vaitarna at Durvesh (01 02 25 001) Division : Tapi Division Surat Sub -Division : DGSD, CWC, Silvasa

Local River: Vaitarna

Day	Jun		Jul		Aug		Sep		Oct		Nov	
	W.L	Q	W.L	Q	W.L	Q	W.L	Q	W.L	Q	W.L	Q
1	0.840	0.000	1.030	0.000	5.270	907.0 #	3.340	330.2	1.920	43.00	1.520	6.788
2	0.870	0.000	1.070	0.000	3.940	394.7	3.070	244.4 *	1.920	47.20 *	1.500	6.156
3	0.920	0.000	1.130	0.000	3.230	263.0	3.620	402.6	2.140	78.78	1.500	6.082
4	0.970	0.000	1.190	0.000	3.090	245.3	6.460	1394 #	2.320	131.0	1.490	8.960 *
5	1.010	0.000	1.180	0.000	2.980	224.8 *	6.040	1213 #	2.280	122.9	1.490	5.814
6	1.050	0.000	1.240	0.000	2.910	225.0	3.970	535.7	2.200	104.7	1.480	5.449
7	1.030	0.000	1.290	0.618 *	3.150	241.0	4.450	665.0	2.290	97.14 *	1.470	4.973
8	0.980	0.000	1.270	0.264 *	2.940	218.7	3.620	378.5	2.560	157.1	1.450	4.314
9	0.900	0.000	1.270	0.264 *	3.100	247.0	3.320	302.3 *	2.240	109.7	1.430	3.854
10	0.870	0.000	1.300	0.800 *	3.300	297.5 *	3.830	483.3	2.110	73.32	1.400	3.355
11	0.850	0.000	2.170	123.7	3.800	433.1	5.200	881.0 #	2.050	68.56	1.390	3.830 *
12	0.850	0.000	3.850	450.6	3.790	424.1 *	4.500	637.7 #	2.000	63.61	1.390	2.871
13	0.840	0.000	3.300	316.0	3.770	419.7	3.420	316.9	1.950	48.29	1.380	3.420 *
14	0.840	0.000	3.120	250.3	3.440	307.7	3.250	267.5	1.890	43.80 *	1.380	2.584
15	0.840	0.000	2.850	197.6 *	3.120	255.6 *	2.990	251.1	1.850	39.96	1.360	2.255
16	0.860	0.000	2.560	154.3	2.810	212.3	2.720	171.8 *	1.810	37.64	1.350	2.030
17	0.920	0.000	2.510	148.5	2.720	194.5	2.620	170.3	1.800	35.04	1.340	1.653
18	0.940	0.000	3.180	258.9	2.580	157.5	2.390	139.8	1.780	31.31	1.340	1.960 *
19	0.980	0.000	5.450	975.3 #	2.860	199.6 *	2.360	131.3	1.760	31.20	1.330	1.547
20	1.040	0.000	5.180	873.6 #	3.500	347.0 *	2.300	118.6	1.740	28.48	1.320	1.395

21	1.080	0.000	3.740	419.6	3.280	286.4	2.300	127.2	1.740	28.33 *	1.310	1.274
22	1.120	0.000	2.830	193.5 *	2.940	227.8	2.220	108.2	1.700	25.88	1.300	1.074
23	1.040	0.000	2.630	161.0	3.180	266.1	2.180	80.83 *	1.670	14.28	1.280	1.002
24	1.040	0.000	2.620	159.0	2.790	207.7	2.120	76.14	1.650	13.00 *	1.260	0.764
25	1.020	0.000	3.250	303.0	2.570	168.4	2.060	70.58	1.630	11.26	1.230	0.000 *
26	0.970	0.000	3.000	227.7	2.450	122.9 *	2.000	65.25	1.610	10.11	1.200	0.483
27	1.120	0.000	2.790	199.9	3.510	322.3	1.980	62.52	1.590	15.66 *	1.180	0.404
28	1.190	0.000	2.570	156.7	4.640	683.9 #	1.960	60.09	1.580	14.93 *	1.170	0.340 *
29	1.140	0.000	2.460	124.6 *	4.660	690.6 #	1.940	53.67	1.580	9.104	1.160	0.284
30	1.040	0.000	4.100	513.1 #	3.700	354.9	1.940	49.53 *	1.560	8.403	1.160	0.278
31			4.630	680.5 #	4.630	680.5 #			1.540	7.690		
Ten-Daily Mean												
I Ten-Daily	0.944	0.000	1.197	0.195	3.391	326.4	4.172	594.9	2.198	96.47	1.473	5.574
II Ten-Daily	0.896	0.000	3.417	374.9	3.239	295.1	3.175	308.6	1.863	42.79	1.358	2.354
III Ten-Daily	1.076	0.000	3.147	285.3	3.486	364.7	2.070	75.40	1.623	14.42	1.225	0.590
Monthly												
Min.	0.840	0.000	1.030	0.000	2.450	122.9	1.940	49.53	1.540	7.690	1.160	0.000
Max.	1.190	0.000	5.450	975.3	5.270	907.0	6.460	1394	2.560	157.1	1.520	8.960
Mean	0.972	0.000	2.605	222.2	3.376	329.9	3.139	326.3	1.886	50.04	1.352	2.840

Annual Runoff in MCM = 2466 **Annual Runoff in mm = 1221**

Peak Observed Discharge = 1394 cumecs on 04/09/2012 **Corres. Water Level :6.46 m**

Lowest Observed Discharge = 0.000 cumecs on 01/06/2012 **Corres. Water Level :0.84 m**

Q: Observed/Computed discharge in cumec WL: Corresponding Mean Water Level (m.s.l) in m * : Computed Discharge

#:Discarded Discharge (values changed as per rating curve)

Note: River remained in pooling/ no flow condition w.e.f. 01/06/12 to 06/07/12 & from 01/12/12 to 31/05/13 .

Stage –Discharge data for the period 2012-13

Station Name: Vaitarna at Durvesh (01 02 25 001) Division : Tapi Division, Surat Sub -Division : DGSD, CWC, Silvassa Local River: Vaitarna

Day	Dec		Jan		Feb		Mar		Apr		May	
	W.L	Q	WL	Q	WL	Q	WL	Q	WL	Q	WL	Q
1	1.150	0.216	1.240	0.000	0.980	0.000	1.130	0.000	1.140	0.000	1.010	0.000
2	1.140	0.000	1.040	0.000	0.980	0.000	1.070	0.000	1.000	0.000	0.920	0.000
3	1.130	0.000	1.000	0.000	0.980	0.000	1.020	0.000	0.900	0.000	0.840	0.000
4	1.120	0.000	1.000	0.000	0.970	0.000	1.000	0.000	0.840	0.000	0.810	0.000
5	1.110	0.000	1.000	0.000	0.970	0.000	0.980	0.000	0.820	0.000	0.810	0.000
6	1.110	0.000	0.990	0.000	0.970	0.000	0.980	0.000	0.820	0.000	0.820	0.000
7	1.100	0.000	0.990	0.000	0.970	0.000	0.970	0.000	0.810	0.000	0.840	0.000
8	1.090	0.000	1.020	0.000	1.030	0.000	0.950	0.000	0.840	0.000	0.890	0.000
9	1.090	0.000	1.120	0.000	1.150	0.000	0.920	0.000	1.000	0.000	0.950	0.000
10	1.100	0.000	1.250	0.000	1.250	0.000	0.890	0.000	1.200	0.000	1.020	0.000
11	1.110	0.000	1.220	0.000	1.320	0.000	0.920	0.000	1.200	0.000	1.100	0.000
12	1.150	0.000	1.200	0.000	1.290	0.000	1.050	0.000	1.120	0.000	1.180	0.000
13	1.170	0.000	1.180	0.000	1.200	0.000	1.190	0.000	1.050	0.000	1.170	0.000
14	1.190	0.000	1.160	0.000	1.110	0.000	1.200	0.000	1.000	0.000	1.100	0.000
15	1.210	0.000	1.140	0.000	1.020	0.000	1.040	0.000	0.970	0.000	1.020	0.000
16	1.190	0.000	1.000	0.000	0.980	0.000	0.960	0.000	0.930	0.000	0.960	0.000
17	1.170	0.000	1.000	0.000	0.970	0.000	0.890	0.000	0.890	0.000	0.890	0.000
18	1.100	0.000	1.000	0.000	0.970	0.000	0.860	0.000	0.830	0.000	0.830	0.000
19	1.100	0.000	0.990	0.000	0.960	0.000	0.840	0.000	0.810	0.000	0.800	0.000
20	1.100	0.000	0.990	0.000	0.960	0.000	0.850	0.000	0.810	0.000	0.810	0.000

21	1.090	0.000	0.990	0.000	0.950	0.000	0.830	0.000	0.800	0.000	0.840	0.000
22	1.090	0.000	0.980	0.000	0.950	0.000	0.820	0.000	0.800	0.000	0.890	0.000
23	1.080	0.000	0.980	0.000	0.970	0.000	0.820	0.000	0.830	0.000	0.980	0.000
24	1.080	0.000	1.020	0.000	1.050	0.000	0.840	0.000	0.920	0.000	1.100	0.000
25	1.110	0.000	1.130	0.000	1.130	0.000	0.910	0.000	1.000	0.000	1.180	0.000
26	1.200	0.000	1.210	0.000	1.220	0.000	0.970	0.000	1.100	0.000	1.170	0.000
27	1.240	0.000	1.190	0.000	1.300	0.000	1.060	0.000	1.160	0.000	1.090	0.000
28	1.330	0.000	1.150	0.000	1.200	0.000	1.150	0.000	1.190	0.000	0.980	0.000
29	1.340	0.000	1.090	0.000			1.240	0.000	1.130	0.000	0.850	0.000
30	1.300	0.000	1.030	0.000			1.310	0.000	1.080	0.000	0.790	0.000
31	1.260	0.000	0.990	0.000			1.300	0.000			0.780	0.000
Ten-Daily Mean												
I Ten-Daily	1.114	0.022	1.065	0.000	1.025	0.000	0.991	0.000	0.937	0.000	0.891	0.000
II Ten-Daily	1.149	0.000	1.088	0.000	1.078	0.000	0.980	0.000	0.961	0.000	0.986	0.000
III Ten-Daily	1.193	0.000	1.069	0.000	1.096	0.000	1.023	0.000	1.001	0.000	0.968	0.000
Monthly												
Min.	1.080	0.000	0.980	0.000	0.950	0.000	0.820	0.000	0.800	0.000	0.780	0.000
Max.	1.340	0.216	1.250	0.000	1.320	0.000	1.310	0.000	1.200	0.000	1.180	0.000
Mean	1.153	0.007	1.074	0.000	1.064	0.000	0.999	0.000	0.966	0.000	0.949	0.000

Peak Computed Discharge = 424.1 cumecs on 12/08/2012 Corres. Water Level :3.79 m

Lowest Computed Discharge = 0.000 cumecs on 25/11/2012 Corres. Water Level :1.23 m

Q: Observed/Computed discharge in cumec WL: Corresponding Mean Water Level (m.s.l) in m * : Computed Discharge

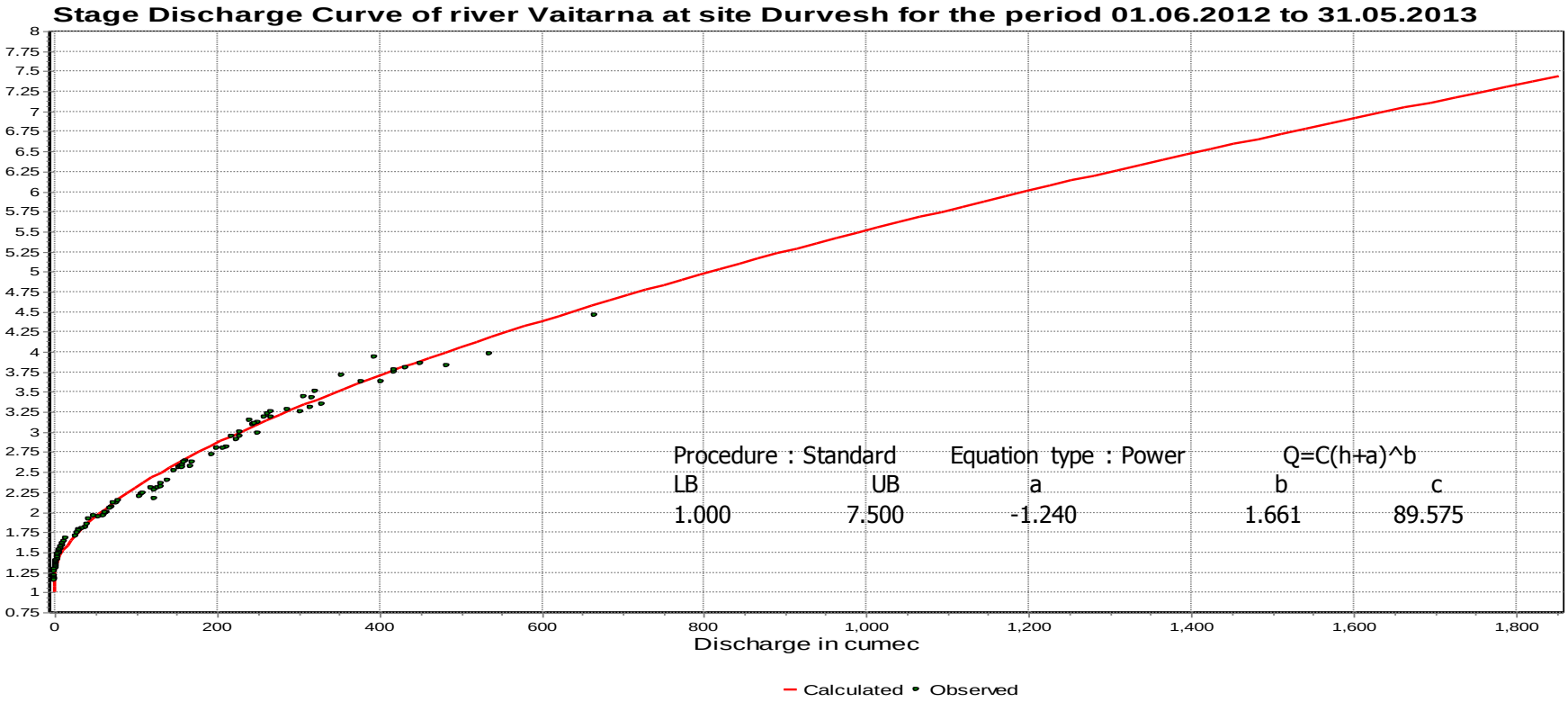
#:Discarded Discharge (values changed as per rating curve)

Note: River remained in pooling/ no flow condition w.e.f. 01/06/12 to 06/07/12 & from 01/12/12 to 31/05/13 .

4.3.4 Stage Discharge Curve

Station Name: Vaitarna at Durvesh (01 02 25 001) Division : Tapi Division Surat Local River: Vaitarna Sub -Division : DGSD, CWC, Silvassa

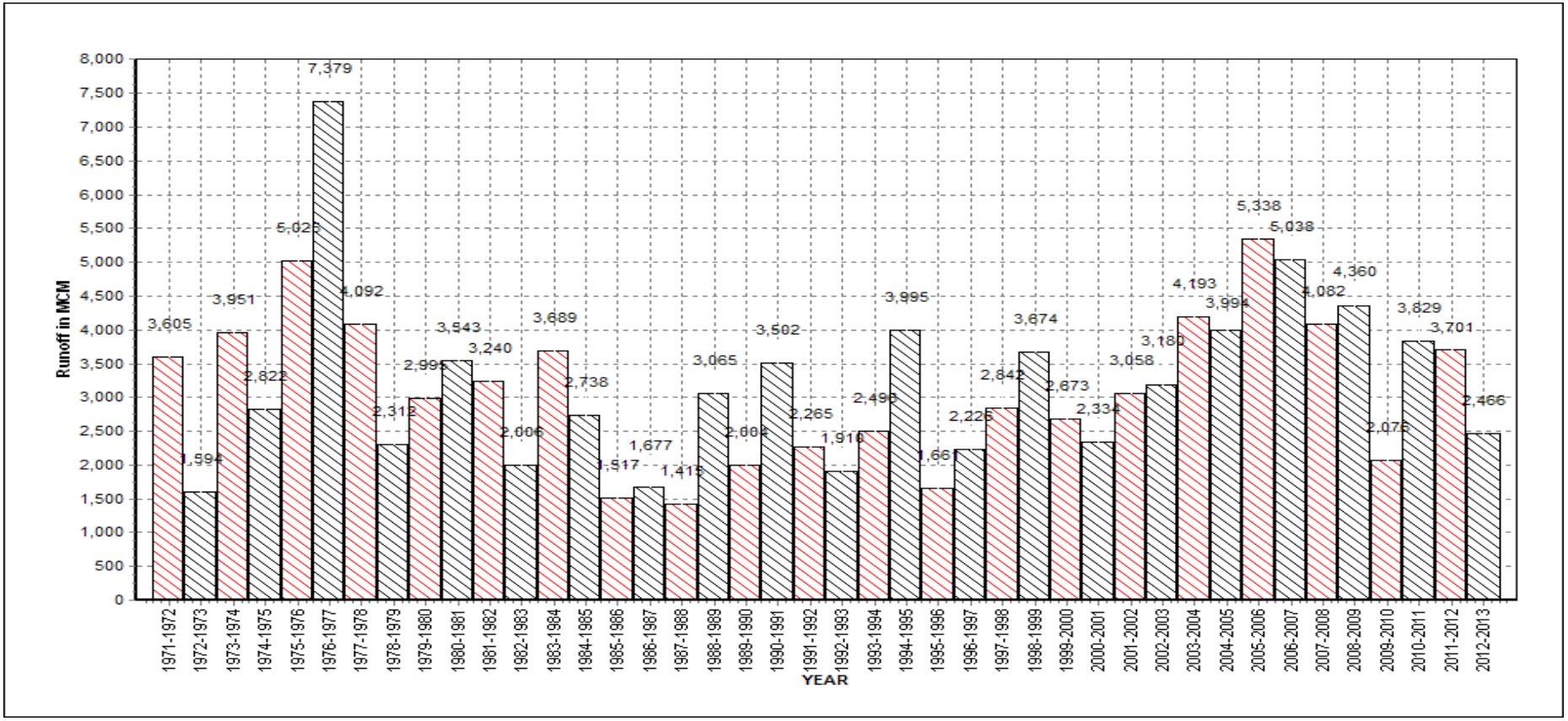
Stage Discharge Curves of site Vaitarna at Durvesh for the Year2012-13



Annual Runoff

Annual Runoff Values- Runoff Based on period 1971 to 2013

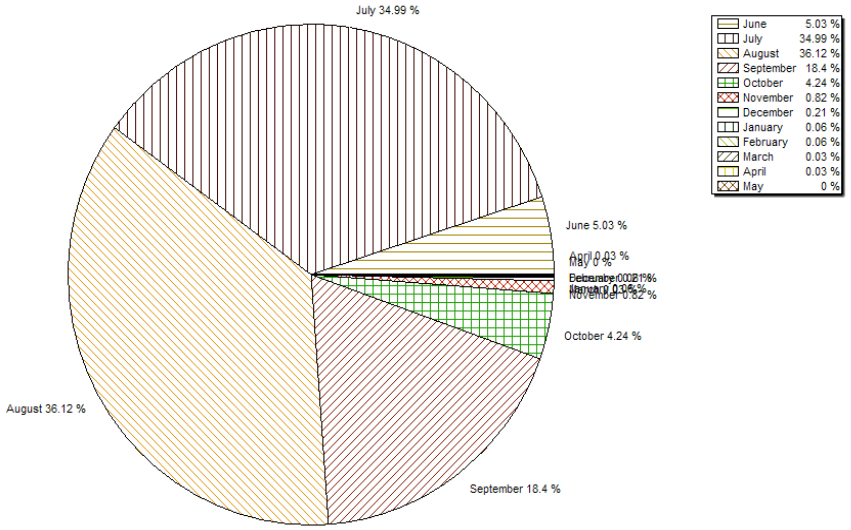
Station Name: Vaitarna at Durvesh (01 02 25 001) Division : Tapi Division Surat Local River: Vaitrana Sub -Division : DGSD, CWC, Silvassa



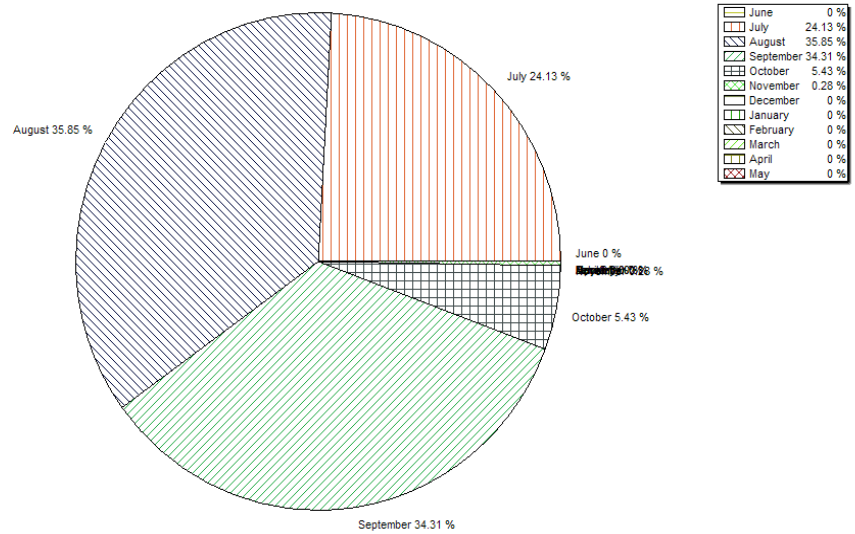
4.3.6 Monthly Average Runoff

Station Name: Vaitarna at Durvesh (01 02 25 001) Division : Tapi Division Surat Local River: Vaitarna Sub -Division : DGSD, CWC, Silvassa

Monthly Average Runoff Based on period: 1971 -2012



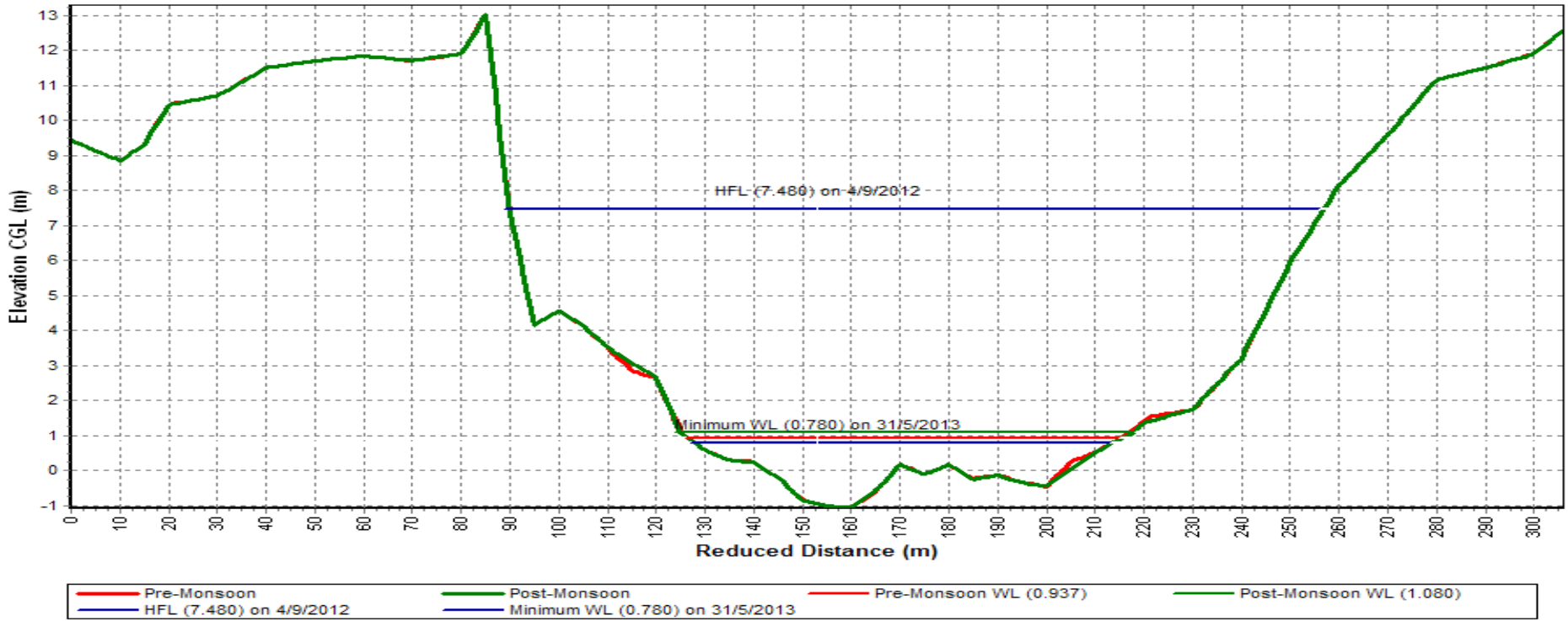
Monthly Average Runoff Based on period: 2012 -2013



4.3.7 Superimposed Cross section

Station Name: Vaitarna at Durvesh (01 02 25 001) Division : Tapi Division Surat Local River: Vaitarna Sub -Division : DGSD, CWC, Silvassa

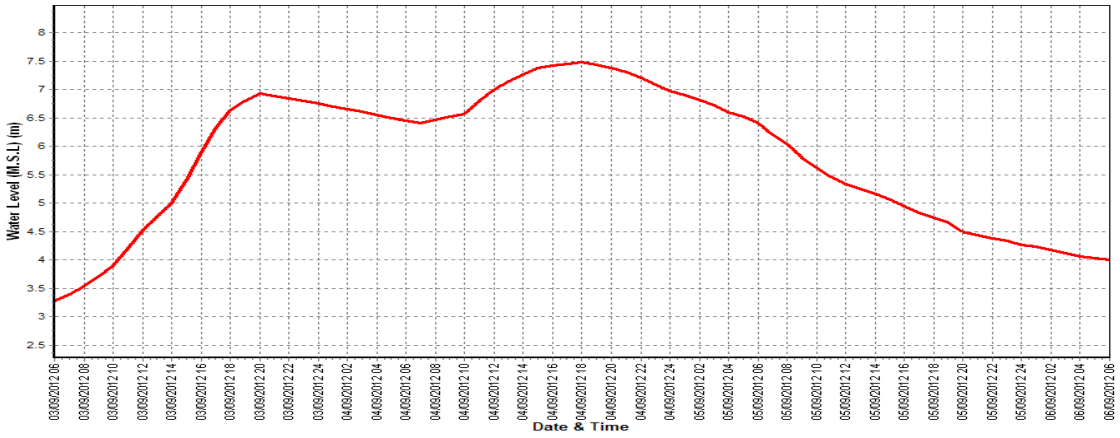
Historical Flood Level observed so far 16.130 m on date 17/09/1998 at 13:00 hrs



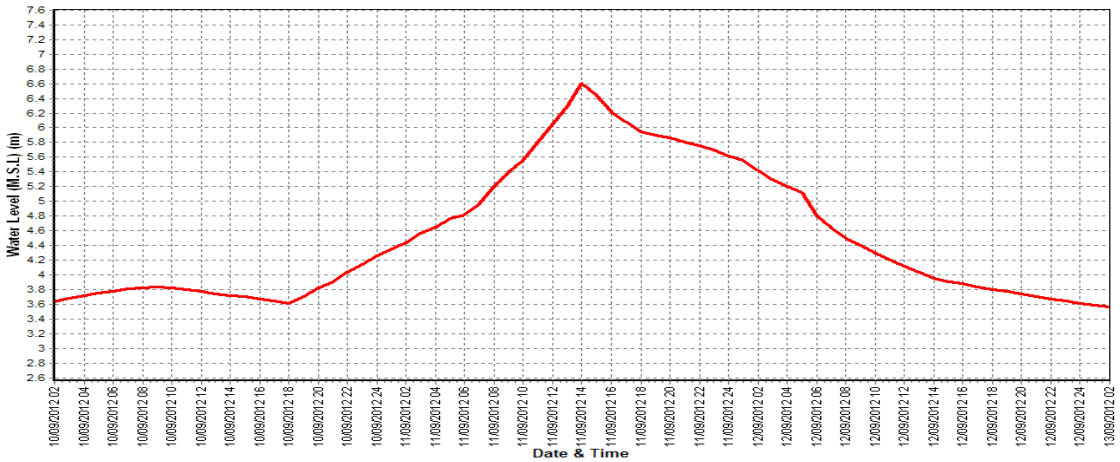
4.3.8 Water Level vs. Time- Graph of Highest Flood Peaks during 2012-13

Station Name: Vaitarna at Durvesh (01 02 25 001) Division : Tapi Division Surat
Local River: Vaitarna Sub -Division : DGSD, CWC, Silvassa

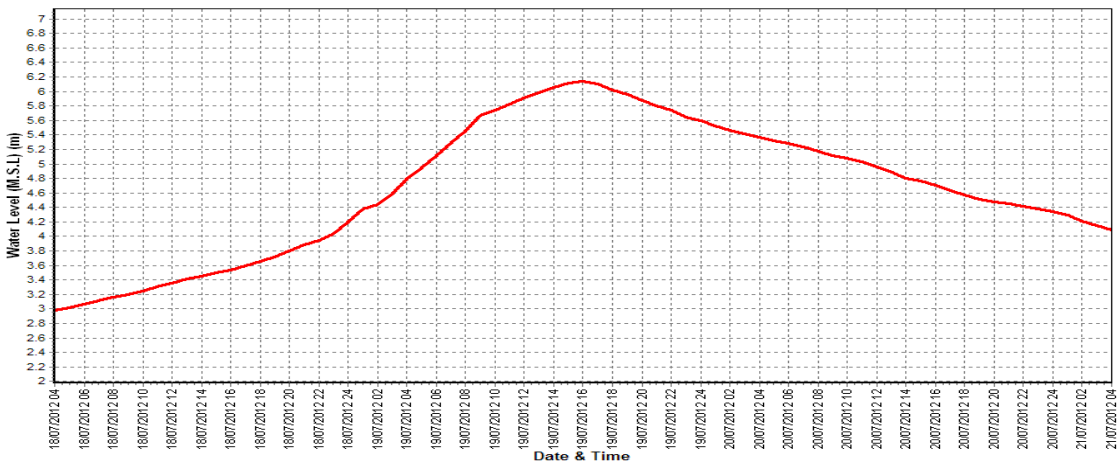
Water level vs. Time graph of I flood peak during the year 2012-13



Water level vs. Time graph of II flood peak during the year 2012-13



Water level vs. Time graph of III flood peak during the year 2012-13



4.4 Dhadhar Basin

4.4.1 History Sheet

HISTORY SHEET

			Water Year	**:**	**2012-13**
Site	**:**	**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
Zero of Gauge (m)	:	2 (m.s.l)	07/04/1989		
		Opening Date	Closing Date		
Gauge	:	07/04/1989			
Discharge	:	30/06/1989			
Sediment	:				
Water Quality	:	15/03/1990			

Annual Maximum / Minimum discharge with corresponding Water Level (m.s.l)

	Maximum			Minimum		
Year	**Q (cumecs)**	**WL (m)**	**Date**	**Q (cumecs)**	**WL (m)**	**Date**
1989-1990	334.9	10.768	21/08/1989	0.185	4.840	08/05/1990
1990-1991	985.4	18.200	25/08/1990	0.002	5.050	01/04/1991
1991-1992	424.3	13.025	25/07/1991	0.053	5.320	29/05/1992
1992-1993	197.7	10.368	04/09/1992	0.152	5.110	22/01/1993
1993-1994	674.5	15.300	18/07/1993	0.350	5.000	19/03/1994
1994-1995	1056	19.050	09/09/1994	0.280	5.040	12/06/1994
1995-1996	442.0	12.700	23/07/1995	0.650	5.000	30/05/1996
1996-1997	641.7	15.390	30/07/1996	0.500	5.000	25/11/1996
1997-1998	1014	17.400	26/08/1997	0.500	5.120	11/01/1998
1998-1999	602.0	16.835	18/09/1998	0.356	5.120	12/05/1999
1999-2000	23.02	6.500	14/10/1999	0.500	5.040	19/12/1999
2000-2001	503.1	15.425	15/07/2000	0.231	4.980	20/04/2001
2001-2002	418.2	13.500	12/08/2001	0.302	4.990	09/06/2001
2002-2003	427.1	13.700	05/09/2002	0.690	5.050	20/04/2003
2003-2004	839.9	15.710	26/08/2003	0.712	5.060	20/03/2004
2004-2005	681.5	15.260	16/08/2004	0.765	5.070	12/06/2004
2005-2006	807.5	18.450	02/07/2005	0.995	5.180	26/02/2006
2006-2007	759.0	18.245	31/07/2006	0.000	5.000	06/04/2007
2007-2008	586.9	15.250	03/07/2007	2.134	5.050	31/05/2008
2008-2009	682.7	15.750	13/08/2008	1.250	5.110	08/05/2009
2009-2010	21.98	6.745	31/08/2009	0.000	5.090	13/06/2009
2010-2011	655	15.850	09/08/2010	0.000	5.210	01/06/2010
2011-2012	250.1	13.200	14/08/2011	0.000	5.370	27/11/2011
2012-13	148.2	12.090	12/09/2012	0.000	5.230	01/06/2012

4.4.2 Annual Maximum Flood Peak

Year	Highest Flood Level (m)	Date	Hour
1989	7.860	01/09/1989	08:00:00
1990	18.870	25/08/1990	16:00:00
1991	13.250	25/07/1991	14:00:00
1992	10.500	04/09/1992	23:00:00
1993	15.300	18/07/1993	08:00:00
1994	19.700	08/09/1994	18:00:00
1995	13.300	22/07/1995	23:00:00
1996	15.750	29/07/1996	23:00:00
1997	17.400	26/08/1997	00:00:00
1998	16.950	18/09/1998	02:00:00
1999	7.000	21/07/1999	17:00:00
2000	15.430	15/07/2000	09:00:00
2001	13.500	11/08/2001	21:00:00
2002	13.850	05/09/2002	17:00:00
2003	15.840	26/08/2003	17:00:00
2004	15.260	15/08/2004	22:00:00
2005	18.450	02/07/2005	17:00:00
2006	18.500	31/07/2006	16:00:00
2007	15.350	02/07/2007	21:00:00
2008	17.700	14/08/2008	07:00:00
2009	7.000	29/08/2009	19:00:00
2010	16.300	09/08/2010	19:00:00
2011	13.200	14/08/2011	07:00:00
2012	12.800	12/09/2012	08:00:00

4.4.3 Summary of Data

Stage discharge data for the period of 2012-13

Station Name: Dhadar at Pingalwada(01 02 14 001) Division : Tapi Division, Surat Local River: Pingalwada Sub -Division : LNSD, CWC, Bharuch

Day	Jun		Jul		Aug		Sep		Oct		Nov	
	W.L	Q	W.L	Q	W.L	Q	W.L	Q	W.L	Q	W.L	Q
1	5.230	0.000	5.300	0.000	5.430	4.007	6.200	14.12	6.200	14.10	5.700	6.425
2	5.210	0.000	5.300	0.000	5.430	4.259	6.500	18.09 *	5.900	9.250 *	5.690	6.246
3	5.200	0.000	5.290	0.000	5.450	4.428	6.300	15.32	5.850	10.42	5.690	6.204
4	5.200	0.000	5.350	2.504 *	5.410	3.961	6.400	16.22	5.850	10.08	5.680	6.350 *
5	5.200	0.000	6.000	10.64 *	5.400	3.040 *	7.500	29.82	5.800	9.944	5.680	6.179
6	5.190	0.000	6.000	10.64 *	5.390	3.014	8.450	51.14	5.800	9.952	5.680	4.853
7	5.190	0.000	5.800	7.910 *	5.380	2.645	8.860	62.90	5.800	7.910 *	5.650	4.755
8	5.200	0.000	5.700	6.610 *	5.380	2.642	9.000	66.49	5.850	10.34	5.650	4.752
9	5.200	0.000	5.600	5.360 *	5.400	3.342	9.110	65.85 *	5.850	10.32	5.640	4.622
10	5.190	0.000	6.000	11.25	5.550	4.750 *	8.500	52.73	5.800	9.883	5.640	4.618
11	5.200	0.000	6.200	12.66	6.000	11.21	11.200	110.9 #	5.800	9.839	5.630	5.730 *
12	5.190	0.000	6.100	11.83	6.100	12.06 *	12.800	148.2 #	5.800	9.609	5.620	4.156
13	5.190	0.000	6.000	11.18	6.650	20.08	12.100	131.6 #	5.800	9.530	5.630	5.730 *
14	5.210	0.000	5.800	8.748	11.100	108.6 #	10.800	101.9 #	5.850	8.580 *	5.640	4.601
15	5.200	0.000	5.700	6.610 *	11.750	123.5 #	8.300	49.81 #	5.800	9.409	5.620	5.600 *
16	5.200	0.000	5.600	6.160	10.900	104.2 #	7.200	29.65 *	5.750	8.667	5.620	5.600 *
17	5.320	0.000	5.600	6.273	8.450	50.59	6.800	22.90 #	5.750	8.520	5.620	4.128
18	5.340	0.000	5.895	9.321	7.305	27.06	6.780	22.58 #	5.750	8.471	5.610	5.480 *
19	5.330	0.000	6.200	12.71	6.780	22.58 *	6.560	19.12	5.720	8.021	5.610	3.744
20	5.320	0.000	6.000	11.24	6.500	18.09 *	6.500	18.88	5.720	7.484	5.620	3.963

21	5.320	0.000	5.800	8.719	6.350	15.80	6.400	18.16	5.720	6.860 *	5.620	3.963
22	5.310	0.000	5.750	7.250 *	6.300	15.18	6.300	16.00	5.700	6.721	5.640	4.648
23	5.300	0.000	5.700	6.494	6.280	15.08	6.420	16.84 *	5.680	6.371	5.630	4.509
24	5.300	0.000	5.700	6.500	6.200	14.06	6.350	16.51	5.680	6.350 *	5.630	4.099
25	5.300	0.000	5.600	5.931	6.200	13.97	6.320	16.18	5.680	6.347	5.630	5.730 *
26	5.310	0.000	5.500	5.302	6.180	13.23 *	6.300	15.86	5.700	6.619	5.620	3.956
27	5.300	0.000	5.450	5.002	6.220	14.27	6.220	15.15	5.690	6.480 *	5.620	3.964
28	5.300	0.000	5.430	4.235	6.220	14.22	6.210	14.44	5.680	6.350 *	5.620	5.600 *
29	5.300	0.000	5.430	3.370 *	6.170	13.31	6.200	14.16	5.680	6.283	5.610	3.648
30	5.290	0.000	5.430	4.194	6.240	14.47	6.190	13.38 *	5.700	6.545	5.610	3.777
31			5.440	4.451	6.200	14.08			5.700	6.500		
Ten-Daily Mean												
I Ten-Daily	5.201	0.000	5.634	5.492	5.422	3.609	7.682	39.27	5.870	10.22	5.670	5.500
II Ten-Daily	5.250	0.000	5.909	9.672	8.154	49.80	8.904	65.55	5.774	8.813	5.622	4.873
III Ten-Daily	5.303	0.000	5.566	5.586	6.233	14.33	6.291	15.67	5.692	6.493	5.623	4.389
Monthly												
Min.	5.190	0.000	5.290	0.000	5.380	2.642	6.190	13.38	5.680	6.283	5.610	3.648
Max.	5.340	0.000	6.200	12.71	11.750	123.5	12.800	148.2	6.200	14.10	5.700	6.425
Mean	5.251	0.000	5.699	6.874	6.591	22.31	7.626	40.16	5.776	8.444	5.638	4.921

Annual Runoff in MCM = 293 Annual Runoff in mm = 122

Peak Observed Discharge = 148.2 cumecs on 12/09/2012 Corres. Water Level :12.8 m

Lowest Observed Discharge = 0.000 cumecs on 01/06/2012 Corres. Water Level :5.23 m

Q: Observed/Computed discharge in cumec WL: Corresponding Mean Water Level (m.s.l) in m * : Computed Discharge

#:Discarded Discharge (values changed as per rating curve)

Note: River remained in pooling/ no flow condition w.e.f. 01/06/12 to 03/07/12 .

Stage discharge data for the period of 2012-13

Station Name: Dhadar at Pingalwada (01 02 14 001) Division: Tapi Division, Surat Local River: Pingalwada Sub-Division:LNSD, CWC, Bharuch

Day	Dec		Jan		Feb		Mar		Apr		May	
	W.L	Q	WL	Q	WL	Q	WL	Q	WL	Q	WL	Q
1	5.600	3.658	5.610	6.261	5.610	5.874	5.580	5.294	5.560	4.649	5.530	3.998
2	5.600	5.360 *	5.650	6.910	5.610	5.762	5.590	5.335	5.550	4.357	5.530	3.981
3	5.600	5.360 *	5.650	6.838	5.620	5.600 *	5.590	5.240 *	5.550	4.496	5.520	3.738
4	5.600	5.360 *	5.640	6.929	5.620	6.205	5.590	5.335	5.540	4.351	5.520	3.764
5	5.610	5.480 *	5.640	6.986	5.610	5.992	5.580	5.271	5.570	4.954	5.510	4.280 *
6	5.610	3.770	5.610	5.480 *	5.610	5.997	5.570	5.091	5.560	4.793	5.520	3.732
7	5.600	3.659	5.630	6.854	5.600	5.808	5.570	5.101	5.560	4.870 *	5.510	3.340
8	5.600	3.668	5.620	6.567	5.600	5.763	5.580	5.263	5.550	4.721	5.500	3.238
9	5.610	5.480 *	5.620	6.480	5.600	5.720	5.580	5.266	5.550	4.665	5.500	3.292
10	5.610	3.772	5.640	6.931	5.620	5.600 *	5.570	4.990 *	5.560	4.860	5.510	3.404
11	5.600	3.679	5.630	6.768	5.620	6.202	5.580	5.266	5.550	4.734	5.500	3.292
12	5.610	3.770	5.620	6.465	5.630	6.458	5.580	5.298	5.530	4.678	5.400	3.040 *
13	5.630	4.351	5.630	5.730 *	5.620	6.186	5.580	5.282	5.540	4.343	5.300	1.998
14	5.610	3.768	5.630	6.777	5.620	6.075	5.570	5.166	5.540	4.640 *	5.250	1.699
15	5.620	3.880	5.620	6.429	5.600	5.688	5.570	5.140	5.540	4.314	5.220	1.590
16	5.610	5.480 *	5.620	6.398	5.610	5.767	5.560	4.939	5.530	4.401	5.200	1.525
17	5.600	3.668	5.610	6.184	5.610	5.480 *	5.560	4.870 *	5.560	4.482	5.200	1.050 *
18	5.640	7.118	5.620	6.271	5.600	5.573	5.570	5.188	5.560	4.478	5.200	1.050 *
19	5.620	6.723	5.610	5.957	5.600	5.566	5.560	4.912	5.560	4.463	5.200	1.050 *
20	5.620	6.575	5.610	5.480 *	5.600	5.533	5.570	4.958	5.550	4.304	5.210	1.140 *

21	5.610	6.346	5.630	6.389	5.580	5.300	5.570	4.913	5.560	4.870 *	5.210	1.140 *
22	5.610	6.261	5.620	6.215	5.590	5.351	5.560	4.638	5.560	4.478	5.200	1.050 *
23	5.620	5.600 *	5.630	6.361	5.590	5.342	5.560	4.640	5.560	4.468	5.200	1.050 *
24	5.620	6.554	5.620	6.204	5.600	5.360 *	5.560	4.870 *	5.550	4.750 *	5.210	1.140 *
25	5.610	5.480 *	5.620	5.600 *	5.600	5.588	5.550	4.451	5.540	4.323	5.200	1.050 *
26	5.610	6.282	5.610	5.480 *	5.590	5.319	5.550	4.446	5.540	4.305	5.220	1.230 *
27	5.620	6.546	5.610	5.480 *	5.590	5.308	5.550	4.750 *	5.530	4.022	5.220	1.230 *
28	5.600	5.985	5.600	5.742	5.580	5.311	5.560	4.637	5.530	4.520 *	5.200	1.050 *
29	5.600	5.959	5.610	5.872			5.550	4.750 *	5.540	4.103	5.210	1.140 *
30	5.620	5.600 *	5.610	5.840			5.550	4.450	5.530	4.006	5.200	1.050 *
31	5.620	6.583	5.600	5.711			5.540	4.640 *			5.200	1.050 *
Ten-Daily Mean												
I Ten-Daily	5.604	4.557	5.631	6.624	5.610	5.832	5.580	5.219	5.555	4.672	5.515	3.677
II Ten-Daily	5.616	4.901	5.620	6.246	5.611	5.853	5.570	5.102	5.546	4.484	5.268	1.743
III Ten-Daily	5.613	6.109	5.615	5.900	5.590	5.360	5.555	4.653	5.544	4.385	5.206	1.107
Monthly												
Min.	5.600	3.658	5.600	5.480	5.580	5.300	5.540	4.446	5.530	4.006	5.200	1.050
Max.	5.640	7.118	5.650	6.986	5.630	6.458	5.590	5.335	5.570	4.954	5.530	4.280
Mean	5.611	5.218	5.622	6.245	5.605	5.705	5.568	4.98	5.548	4.513	5.326	2.141

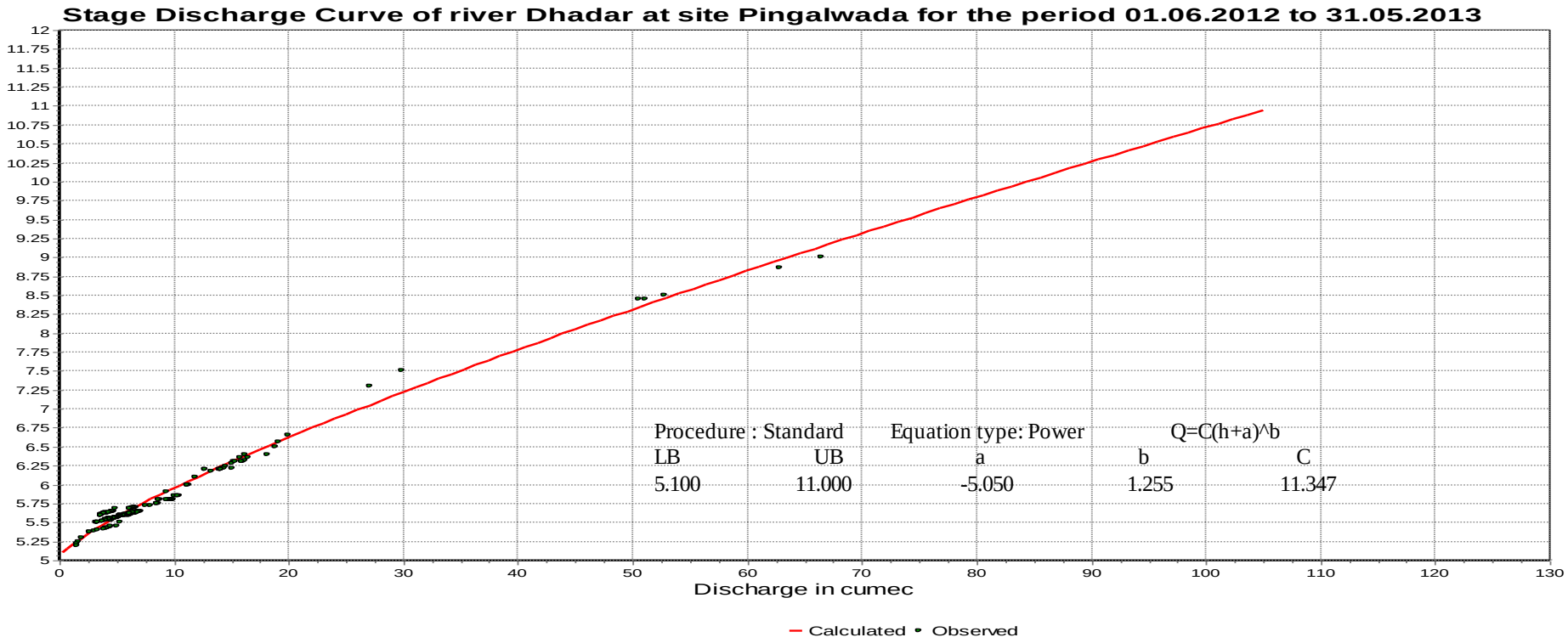
Peak Computed Discharge = 65.85 cumecs on 09/09/2012 Corres. Water Level :9.11 m
Lowest Computed Discharge = 1.050 cumecs on 17/05/2013 Corres. Water Level :5.2 m

Q: Observed/Computed discharge in cumec WL: Corresponding Mean Water Level (m.s.l) in m * : Computed Discharge
#:Discarded Discharge (values changed as per rating curve)
Note: River remained in pooling/ no flow condition w.e.f. 01/06/12 to 03/07/12 .

4.4.4 Stage Discharge curve

Station Name: Dhadar at Pingalwada(01 02 14 001) Division : Tapi Division, Surat Local River: Pingalwada Sub -Division : LNSD, CWC, Bharuch

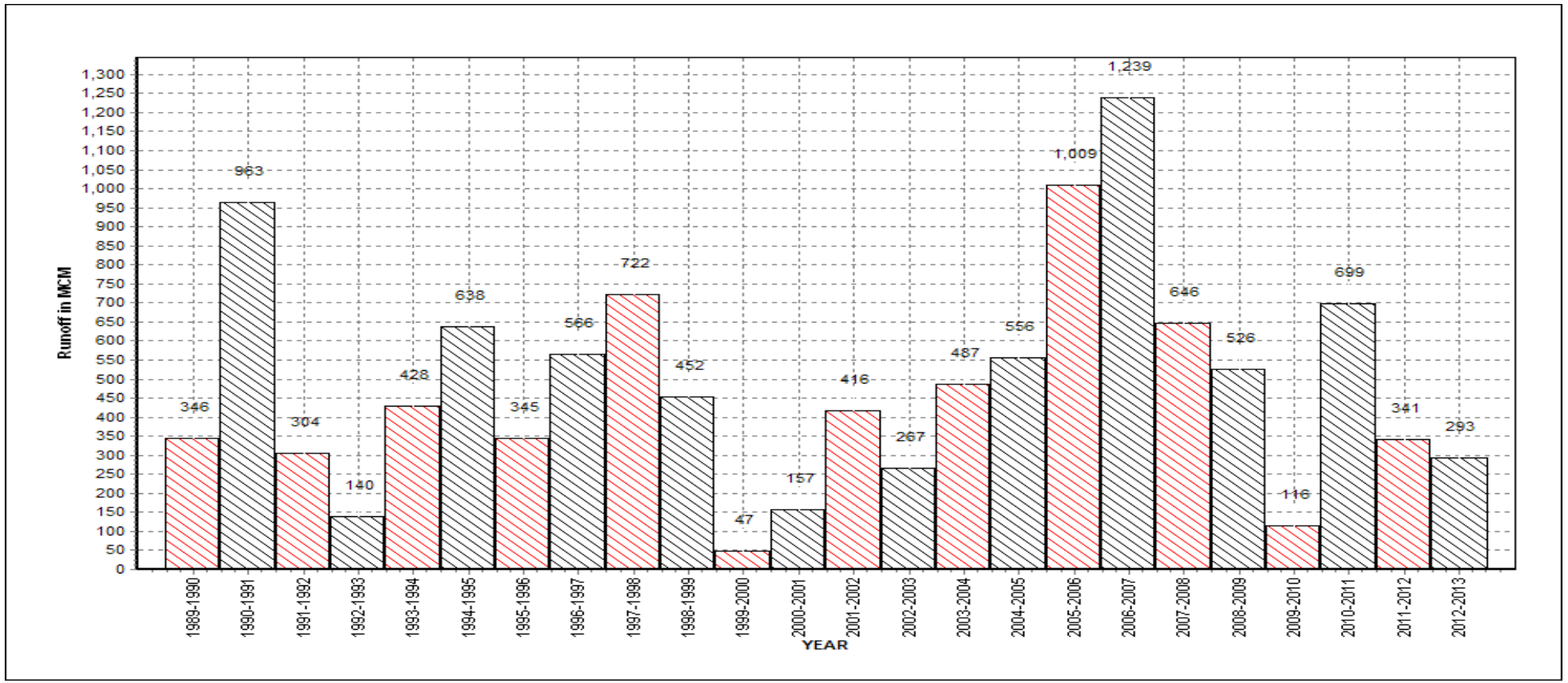
Stage Discharge Curves of site Dhadhar at Pingalwada for the Year 2012-13



4.4.5 Annual Runoff

Annual Runoff Values Runoff Based on period: 1989-2013

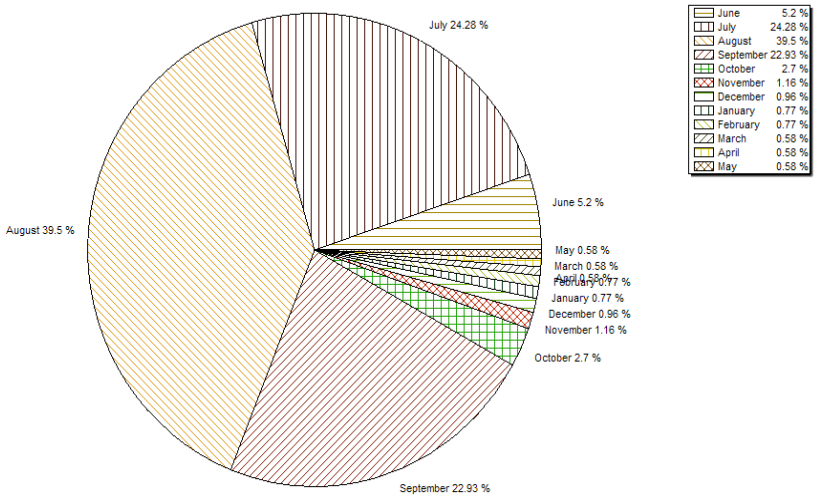
Station Name: Dhadhar at Pingalwada (01 02 14 001) Division : Tapi Division, Surat Local River: Pingalwada Sub -Division : LNSD, CWC, Bharuch



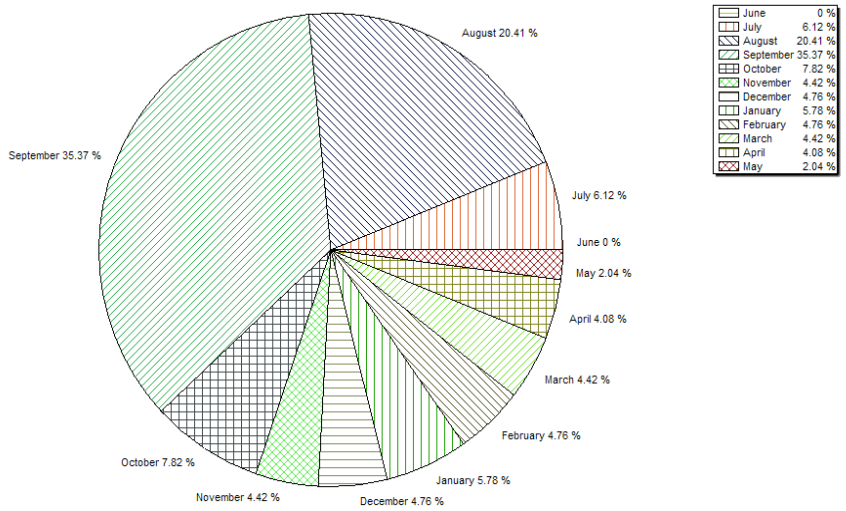
4.4.6 Monthly Average Runoff

Station Name: Dhadar at Pingalwada(01 02 14 001) Division : Tapi Division, Surat Local River: Pingalwada Sub -Division : LNSD, CWC, Bharuch

Monthly Average Runoff Based on period: 1989-2012

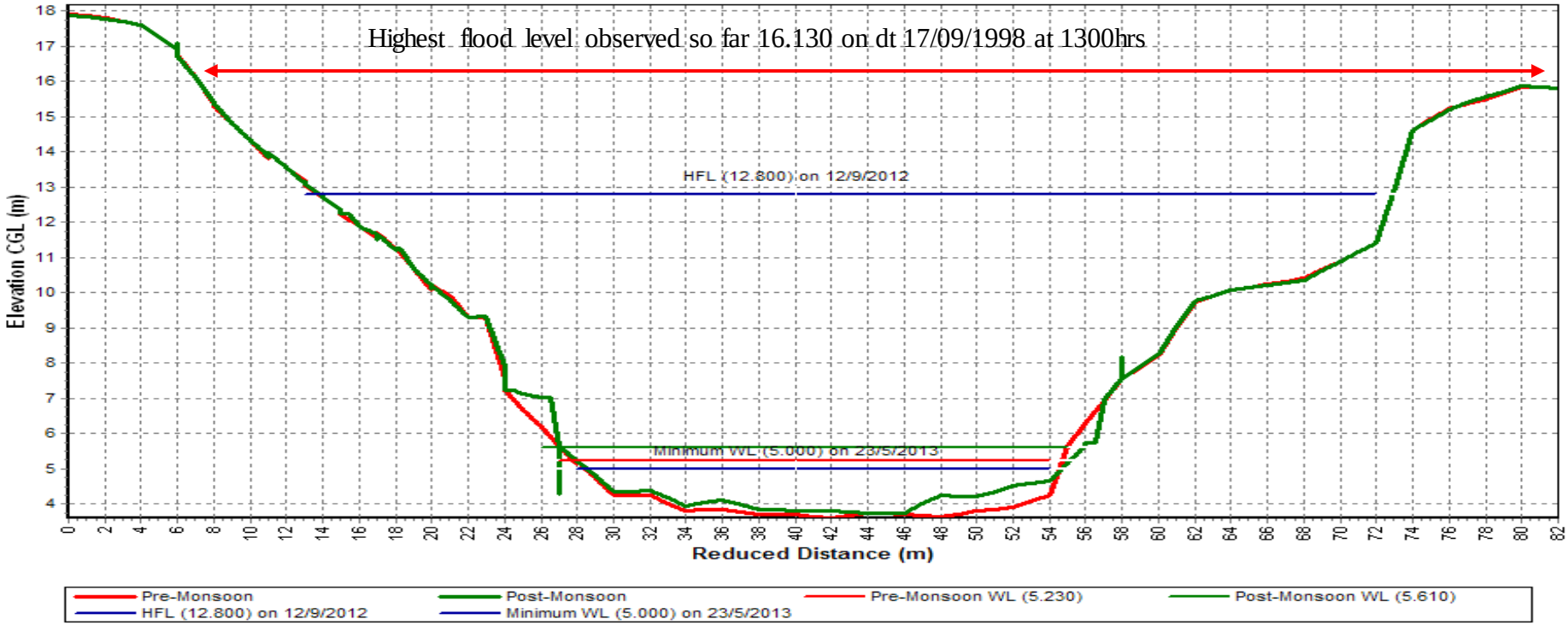


Monthly Average Runoff Based on period: 2012-13



4.4.7 Superimposed Cross section

Station Name: Dhadar at Pingalwada (01 02 14 001) Division : Tapi Division, Surat Local River: Pingalwada Sub -Division : LNSD, CWC, Bharuch

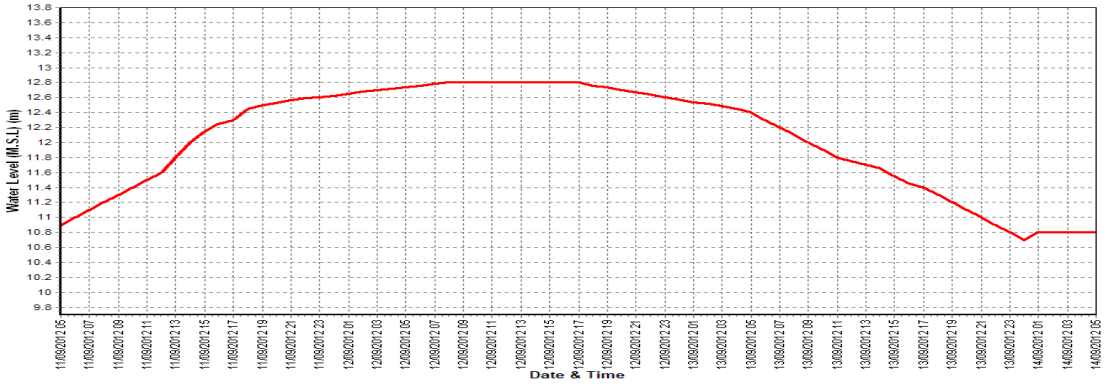


4.4.8 Water Level vs. Time- Graph of Highest Flood Peaks during 2012-13

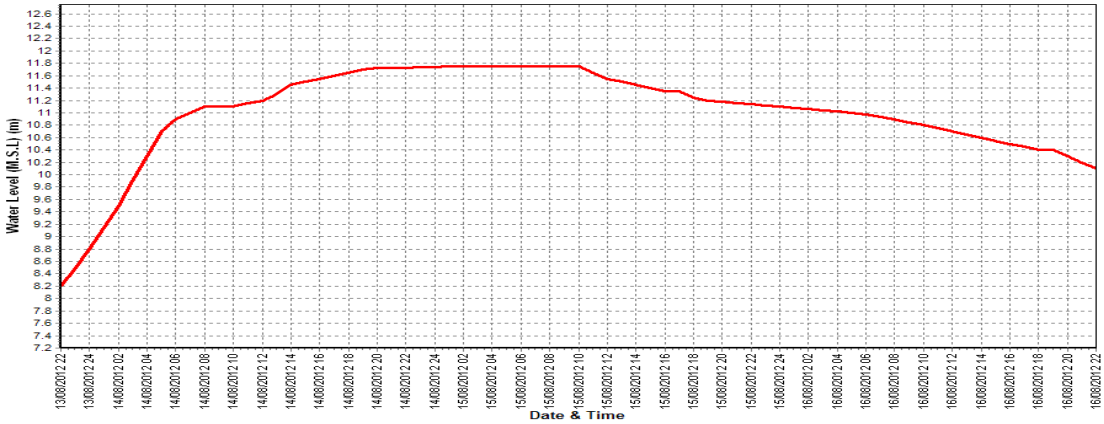
Station Name: Dhadar at Pingalwada
Local River: Pingalwada

Division : Tapi Division, Surat
Sub -Division : LNSD, CWC, Bharuch

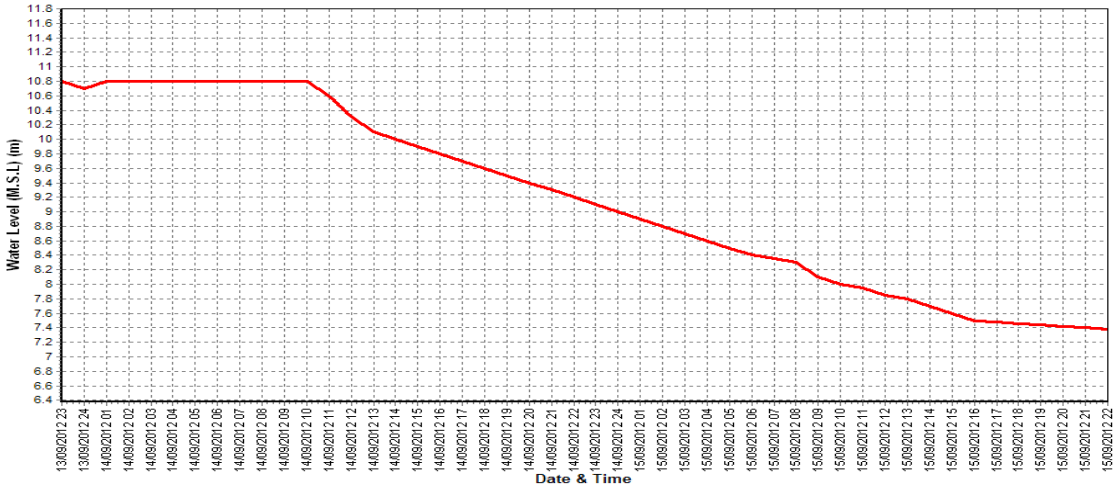
Water level vs. Time graph of I flood peak during the year 2012-13



Water level vs. Time graph of II flood peak during the year 2012-13



Water level vs. Time graph of III flood peak during the year 2012-13



4.5 Wagh Basin

4.5.1.1 History Sheet

HISTORY SHEET

			Water Year	**:**	**2012-13**
Site	**:**	**Wagh at Ozerkheda**	**Code**	**:**	**01 02 24 002**
State	:	Maharashtra	District		Nashik
Basin	:	WFR South of Tapi	Independent River	:	Daman Ganga
Tributary	:	Wagh	Sub Tributary	:	
Sub-Sub Tributary	:		Local River	:	
Division	:	Tapi Division, Surat	Sub-Division	:	DGSD,CWC,Silvassa
Drainage Area	:	640 Sq. Km.	Bank	:	
Latitude	:	20°06'01"	Longitude	:	73°16'16"
Zero of Gauge (m)	:	80.1 (m.s.l)	15/06/1983		
		Opening Date	Closing Date		
Gauge	:	28/06/1983			
Discharge	:	01/06/1984 Seasonal			
		01/06/1991 (Regular)			

Annual Maximum / Minimum discharge with corresponding Water Level (m.s.l)

	Maximum			Minimum		
Year	**Q (cumecs)**	**WL (m)**	**Date**	**Q (cumecs)**	**WL (m)**	**Date**
1991-1992	878.8	86.950	27/07/1991	0.000	81.400	17/05/1992
1992-1993	770.9	86.285	12/08/1992	0.000	81.080	22/05/1993
1993-1994	1117	87.100	13/07/1993	0.000	80.980	18/05/1994
1994-1995	1306	88.300	13/07/1994	0.000	81.340	10/02/1995
1995-1996	650.0	85.450	03/09/1995	0.000	80.610	04/03/1996
1996-1997	264.0	84.430	24/07/1996	0.000	80.410	04/02/1997
1997-1998	635.5	86.330	31/07/1997	0.000	80.860	18/03/1998
1998-1999	477.9	85.700	17/09/1998	0.000	80.650	05/05/1999
1999-2000	1144	87.175	16/07/1999	0.000	81.070	14/04/2000
2000-2001	774.8	85.750	13/07/2000	0.000	81.460	22/05/2001
2001-2002	284.0	84.620	16/08/2001	0.000	81.190	05/05/2002
2002-2003	1414	88.050	29/06/2002	0.000	81.110	07/05/2003
2003-2004	1145	87.200	28/07/2003	0.000	81.330	15/02/2004
2004-2005	2700	90.390	03/08/2004	0.000	81.670	20/04/2005
2005-2006	1660	88.550	29/06/2005	0.000	81.140	20/02/2006
2006-2007	1080	86.740	08/08/2006	0.042	81.210	13/01/2007
2007-2008	934.6	86.690	09/08/2007	0.100	81.130	09/01/2008
2008-2009	1421	87.855	12/08/2008	0.072	81.140	15/12/2008
2009-2010	1687	88.595	23/07/2009	0.000	81.090	01/06/2009
2010-2011	578.7	85.320	23/07/2010	0.000	81.080	01/06/2010
2011-2012	1289	87.2	29/08/2011	0.000	81.260	02/12/2011
2012-2013	1365	85.95	11/09/2012	0.000	81.140	01/06/2012

4.5.1.2 Annual Maximum Flood Peak

Year	Highest Flood Level (m)	Date	Hour
1991	87.400	17/07/1991	11:00:00
1992	86.600	12/08/1992	13:00:00
1993	89.700	13/07/1993	16:00:00
1994	88.400	13/07/1994	07:00:00
1995	86.230	02/09/1995	16:00:00
1996	85.720	27/08/1996	19:00:00
1997	89.650	31/07/1997	18:00:00
1998	85.900	17/09/1998	09:00:00
1999	87.350	16/07/1999	07:00:00
2000	85.980	13/07/2000	18:00:00
2001	84.660	16/08/2001	12:00:00
2002	89.200	29/06/2002	13:00:00
2003	87.320	27/07/2003	12:00:00
2004	96.100	04/08/2004	01:00:00
2005	90.000	29/06/2005	05:00:00
2006	87.100	10/08/2006	16:00:00
2007	87.680	08/08/2007	16:00:00
2008	91.000	11/08/2008	17:00:00
2009	88.700	23/07/2009	09:00:00
2010	85.320	23/07/2010	08:00:00
2011	89.500	28/08/2011	16:00:00
2012	86.700	11/09/2012	12:00:00

4.5.1.3 Summary of Data

Stage Discharge Data for The period 2012-13

Station Name: Wagh at Ozerkheda (01 02 24 002) Division: Tapi Division, Surat Local River: Wagh Sub -Division: DGSD, CWC, Silvasssa

Day	Jun		Jul		Aug		Sep		Oct		Nov	
	W.L	Q	W.L	Q	W.L	Q	W.L	Q	W.L	Q	W.L	Q
1	81.140	0.000	81.130	0.000	84.200	298.4	82.800	99.81	82.590	96.06	82.440	76.14
2	81.140	0.000	81.130	0.000	83.100	116.4	82.750	108.9 *	82.580	86.40 *	82.440	75.87
3	81.130	0.000	81.150	0.000	82.850	119.4	82.730	81.18	82.400	63.65 #	82.440	75.54
4	81.130	0.000	81.150	0.000	82.750	108.2	82.700	77.05	82.400	67.55	82.400	63.65 *
5	81.130	0.000	81.180	0.000	82.750	108.9 *	83.750	255.9 #	82.625	100.1	81.930	11.99 #
6	81.130	0.000	81.180	0.000	82.750	109.8	84.300	294.1	82.650	103.3	81.930	11.99 #
7	81.130	0.000	81.200	0.000	82.730	104.2	84.350	302.9	82.670	98.20 *	81.930	11.99 #
8	81.130	0.000	81.200	0.000	82.850	119.8	83.150	129.0	82.800	109.9	81.930	11.99 #
9	81.130	0.000	81.220	0.000	82.850	116.6	82.900	129.5 *	82.700	104.8	81.950	4.047
10	81.130	0.000	82.500	83.77	83.800	263.8 *	83.175	132.0	82.600	86.39	81.930	3.964
11	81.130	0.000	82.495	82.14	83.100	134.0	85.950	1365	82.550	97.47	81.930	11.99 *
12	81.130	0.000	82.520	92.07	83.100	157.8 *	84.200	328.2 *	82.500	89.26	81.930	3.981
13	81.130	0.000	82.500	83.98	83.350	176.9	83.100	157.8 *	82.480	78.37	81.930	11.99 *
14	81.130	0.000	82.500	84.34	83.150	140.5	83.200	144.8	82.480	73.61 *	81.930	3.953
15	81.130	0.000	82.450	69.84 *	82.880	126.7 *	83.000	130.5	82.480	85.51	81.920	3.894
16	81.130	0.000	82.430	74.10	82.800	118.6	82.940	135.1 *	82.480	80.97	81.920	3.888
17	81.130	0.000	82.400	73.23	82.760	112.5	82.860	117.4	82.480	84.83	81.920	4.242
18	81.130	0.000	82.550	108.4	82.700	106.7	82.810	112.4	82.480	89.25	81.910	10.18 *
19	81.130	0.000	84.700	411.9 #	82.650	105.0 *	82.750	109.0	82.450	80.94	81.910	3.743
20	81.130	0.000	84.200	298.7	82.650	95.55 *	82.700	105.4	82.450	80.62	81.910	3.687

21	81.130	0.000	83.100	144.0	82.750	110.2	82.700	104.4	82.450	69.84 *	81.910	3.669
22	81.130	0.000	82.980	140.7 *	82.700	105.6	82.680	94.33	82.450	80.10	81.900	3.567
23	81.130	0.000	82.700	111.2	82.650	99.82	82.680	99.53 *	82.450	79.90	81.850	3.232
24	81.130	0.000	82.600	96.49	82.650	97.44	82.670	104.3	82.450	69.84 *	81.800	2.746
25	81.130	0.000	82.700	104.5	82.640	95.34	82.660	103.7	82.450	79.90	81.800	1.520 *
26	81.130	0.000	82.800	117.8	82.630	95.92 *	82.650	98.10	82.450	78.54	81.750	2.454
27	81.130	0.000	82.700	104.2	82.620	92.48	82.640	100.6	82.450	69.84 *	81.740	2.414
28	81.130	0.000	82.650	87.04	84.200	328.2 #	82.630	98.15	82.450	69.84 *	81.720	2.300 *
29	81.130	0.000	82.630	92.92 *	83.000	107.2	82.620	96.84	82.450	77.71	81.700	2.107
30	81.130	0.000	82.950	139.4	82.950	99.60	82.600	88.99 *	82.450	94.40	81.670	1.904
31			84.300	344.7 #	82.930	96.95			82.450	77.11		
Ten-Daily Mean												
I Ten-Daily	81.132	0.000	81.304	8.377	83.063	146.6	83.260	161.0	82.601	91.63	82.132	34.72
II Ten-Daily	81.130	0.000	82.875	137.9	82.914	127.4	83.351	270.6	82.483	84.08	81.921	6.155
III Ten-Daily	81.130	0.000	82.919	134.8	82.884	120.8	82.653	98.90	82.450	77.00	81.784	2.591
Monthly												
Min.	81.130	0.000	81.130	0.000	82.620	92.48	82.600	77.05	82.400	63.65	81.670	1.520
Max.	81.140	0.000	84.700	411.9	84.200	328.2	85.950	1365	82.800	109.9	82.440	76.14
Mean	81.131	0	82.384	95.02	82.951	131.2	83.088	176.8	82.510	84	81.946	14.49

Annual Runoff in MCM = 1328 Annual Runoff in mm = 2076

Peak Observed Discharge = 1365 cumecs on 11/09/2012 Corres. Water Level :85.95 m

Lowest Observed Discharge = 0.000 cumecs on 01/06/2012 Corres. Water Level :81.14 m

Q: Observed/Computed discharge in cumec WL: Corresponding Mean Water Level (m.s.l) in m * : Computed Discharge

#:Discarded Discharge (values changed as per rating curve)

Note: River remained in pooling/ no flow condition w.e.f. 01/06/12 to 09/07/12 & 21/12/2012 to 31/05/2013.

Stage Discharge Data for the period 2012-13

Station Name: Wagh at Ozerkheda (01 02 24 002) Division : Tapi Division, Surat Local River: Wagh Sub -Division : DGSD, CWC, Silvasa

Day	Dec		Jan		Feb		Mar		Apr		May	
	W.L	Q	WL	Q	WL	Q	WL	Q	WL	Q	WL	Q
1	81.650	1.780	81.470	0.000	81.410	0.000	81.380	0.000	81.360	0.000	81.320	0.000
2	81.650	0.000 *	81.470	0.000	81.410	0.000	81.380	0.000	81.360	0.000	81.320	0.000
3	81.650	1.780	81.470	0.000	81.410	0.000	81.380	0.000	81.360	0.000	81.320	0.000
4	81.650	1.762	81.470	0.000	81.410	0.000	81.380	0.000	81.350	0.000	81.320	0.000
5	81.630	1.515	81.460	0.000	81.410	0.000	81.380	0.000	81.350	0.000	81.320	0.000
6	81.630	1.564	81.460	0.000	81.400	0.000	81.380	0.000	81.350	0.000	81.320	0.000
7	81.600	1.357	81.460	0.000	81.400	0.000	81.380	0.000	81.350	0.000	81.320	0.000
8	81.600	1.338	81.460	0.000	81.400	0.000	81.360	0.000	81.350	0.000	81.320	0.000
9	81.600	0.000 *	81.460	0.000	81.400	0.000	81.360	0.000	81.350	0.000	81.320	0.000
10	81.550	1.091	81.460	0.000	81.400	0.000	81.360	0.000	81.340	0.000	81.320	0.000
11	81.550	1.073	81.450	0.000	81.400	0.000	81.360	0.000	81.340	0.000	81.320	0.000
12	81.530	0.933	81.450	0.000	81.400	0.000	81.360	0.000	81.340	0.000	81.320	0.000
13	81.530	0.919	81.450	0.000	81.400	0.000	81.360	0.000	81.340	0.000	81.320	0.000
14	81.510	0.796	81.450	0.000	81.400	0.000	81.360	0.000	81.340	0.000	81.320	0.000
15	81.500	0.555	81.450	0.000	81.390	0.000	81.360	0.000	81.340	0.000	81.320	0.000
16	81.500	0.500 *	81.450	0.000	81.390	0.000	81.360	0.000	81.340	0.000	81.320	0.000
17	81.490	0.100 *	81.430	0.000	81.390	0.000	81.360	0.000	81.340	0.000	81.320	0.000
18	81.490	0.100 *	81.430	0.000	81.390	0.000	81.360	0.000	81.340	0.000	81.320	0.000
19	81.490	0.100 *	81.430	0.000	81.390	0.000	81.360	0.000	81.340	0.000	81.300	0.000
20	81.490	0.100 *	81.430	0.000	81.390	0.000	81.350	0.000	81.340	0.000	81.300	0.000

21	81.480	0.000	81.420	0.000	81.380	0.000	81.350	0.000	81.340	0.000	81.300	0.000
22	81.480	0.000	81.420	0.000	81.380	0.000	81.360	0.000	81.340	0.000	81.300	0.000
23	81.480	0.000	81.420	0.000	81.380	0.000	81.360	0.000	81.340	0.000	81.300	0.000
24	81.480	0.000	81.420	0.000	81.380	0.000	81.360	0.000	81.320	0.000	81.300	0.000
25	81.480	0.000	81.420	0.000	81.380	0.000	81.360	0.000	81.320	0.000	81.300	0.000
26	81.480	0.000	81.420	0.000	81.380	0.000	81.360	0.000	81.320	0.000	81.300	0.000
27	81.470	0.000	81.420	0.000	81.380	0.000	81.360	0.000	81.320	0.000	81.300	0.000
28	81.470	0.000	81.420	0.000	81.380	0.000	81.360	0.000	81.320	0.000	81.300	0.000
29	81.470	0.000	81.420	0.000			81.360	0.000	81.320	0.000	81.300	0.000
30	81.470	0.000	81.410	0.000			81.360	0.000	81.320	0.000	81.300	0.000
31	81.470	0.000	81.410	0.000			81.360	0.000			81.300	0.000
Ten-Daily Mean												
I Ten-Daily	81.621	1.219	81.464	0.000	81.405	0.000	81.374	0.000	81.352	0.000	81.320	0.000
II Ten-Daily	81.508	0.518	81.442	0.000	81.394	0.000	81.359	0.000	81.340	0.000	81.316	0.000
III Ten-Daily	81.475	0.000	81.418	0.000	81.380	0.000	81.359	0.000	81.326	0.000	81.300	0.000
Monthly												
Min.	81.470	0.000	81.410	0.000	81.380	0.000	81.350	0.000	81.320	0.000	81.300	0.000
Max.	81.650	1.780	81.470	0.000	81.410	0.000	81.380	0.000	81.360	0.000	81.320	0.000
Mean	81.533	0.560	81.441	0.000	81.394	0.000	81.364	0.000	81.339	0.000	81.312	0.000

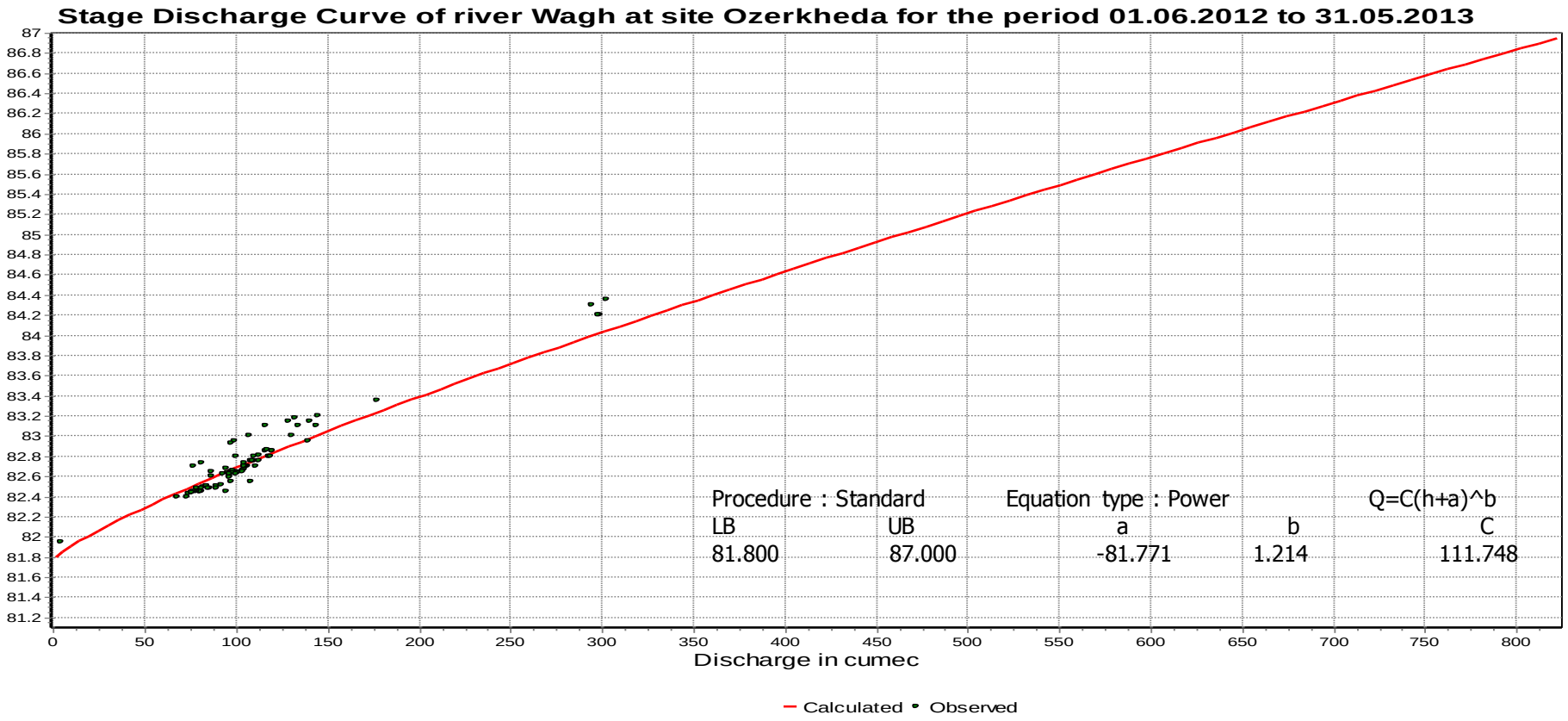
Peak Computed Discharge = 328.2 cumecs on 12/09/2012 Corres. Water Level :84.2 m
Lowest Computed Discharge = 0.000 cumecs on 02/12/2012 Corres. Water Level :81.65 m

Q: Observed/Computed discharge in cumec WL: Corresponding Mean Water Level (m.s.l) in m * : Computed Discharge
#:Discarded Discharge (values changed as per rating curve)

Note: River remained in pooling/ no flow condition w.e.f. 01/06/12 to 09/07/12 & 21/12/2012 to 31/05/2013.

4.5.1.4 Stage Discharge Curve

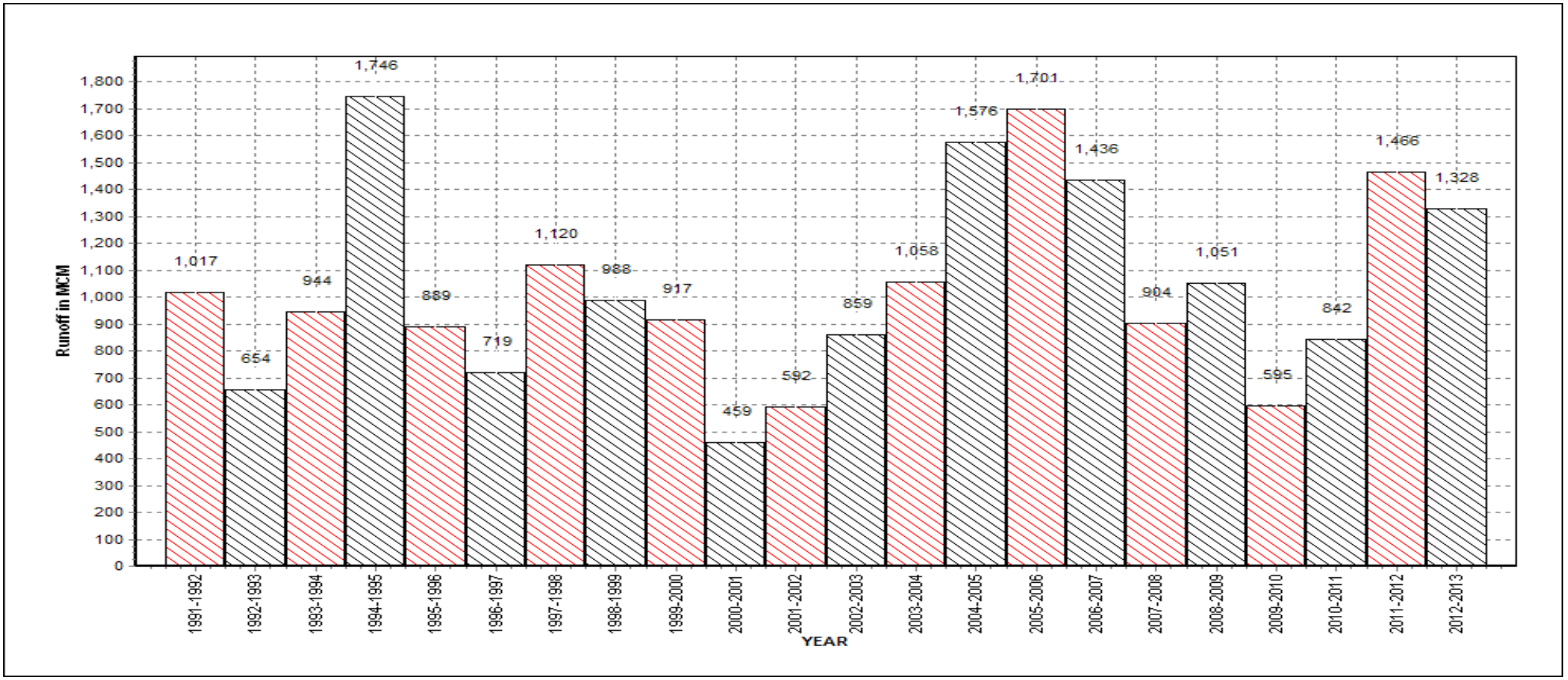
Station Name: Wagh at Ozerkheda (01 02 24 002) Division: Tapi Division, Surat Local River: Wagh Sub -Division: DGSD, CWC, Silvasssa



4.5.1.5 Annual Runoff

Annual Runoff Values Runoff Based on period 1991-2013

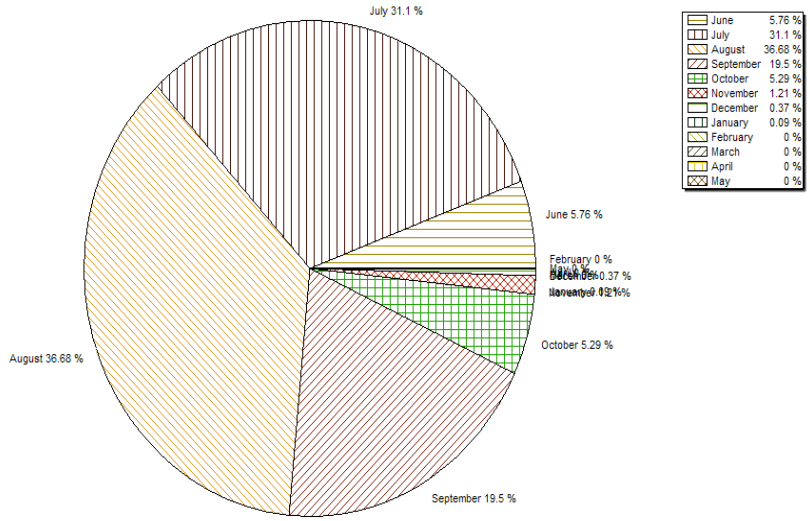
Station Name: Wagh at Ozerkheda (01 02 24 002) Division: Tapi Division, Surat Local River: Wagh Sub -Division: DGSD, CWC, Silvasssa



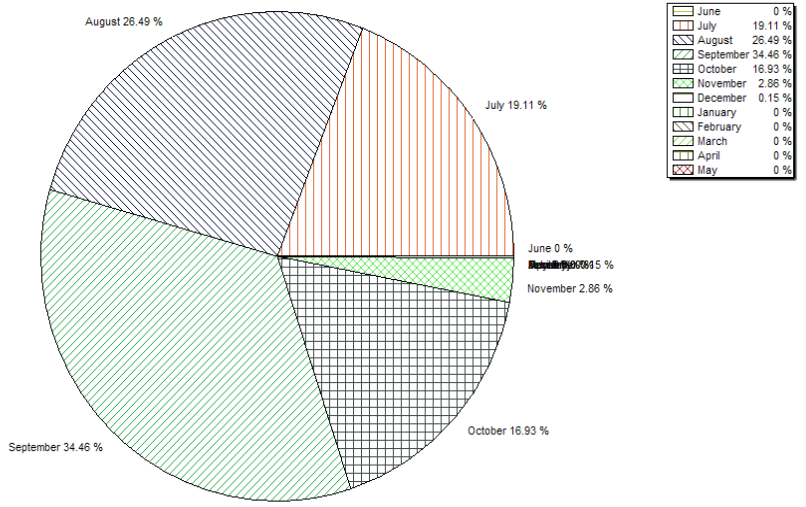
4.5.1.6 Monthly Average Runoff

Station Name: Wagh at Ozerkheda (01 02 24 002) Division: Tapi Division, Surat Local River: Wagh Sub -Division: DGSD, CWC, Silvasa

Monthly Average Runoff Based on period 1991-2012



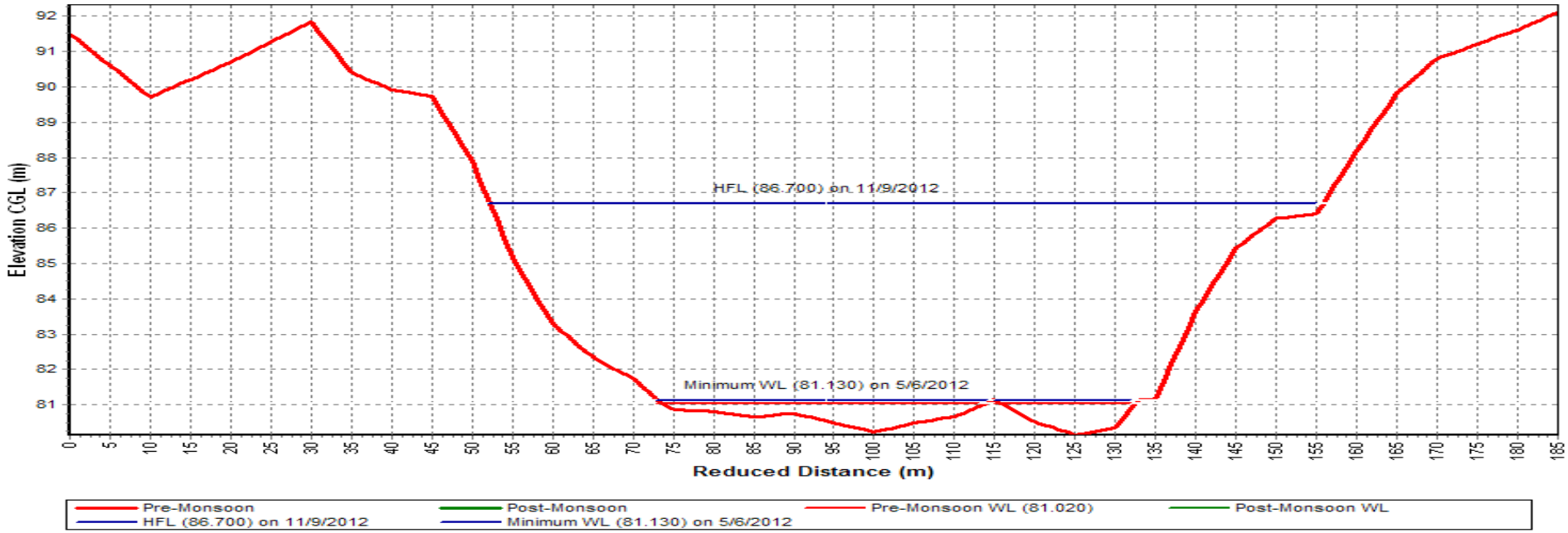
Monthly Average Runoff Based on period 2012-13



4.5.1.7 Superimposed cross section

Station Name: Wagh at Ozerkheda (01 02 24 002) Division: Tapi Division, Surat Local River: Wagh Sub -Division: DGSD, CWC, Silvasa

Highest flood level observed so far 96.100 on dt 04/08/2004 at 0100hrs

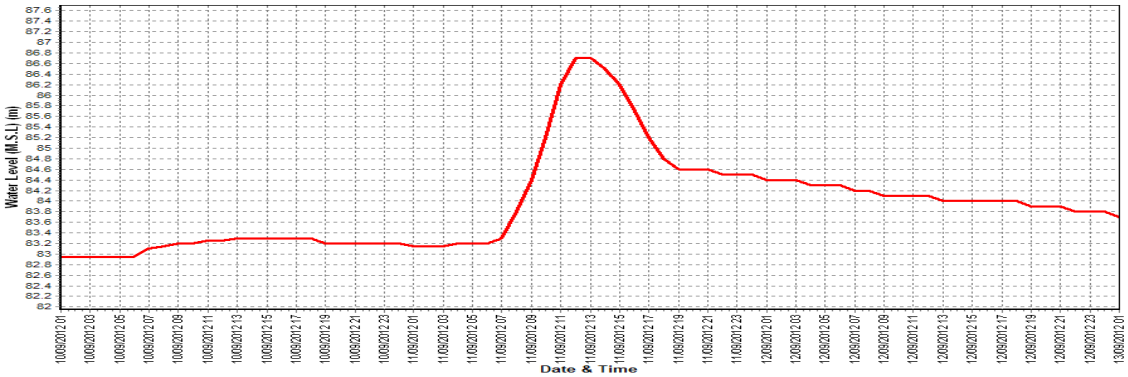


4.5.1.8 Water Level vs. Time- Graph of Highest Flood Peaks during 2012-13

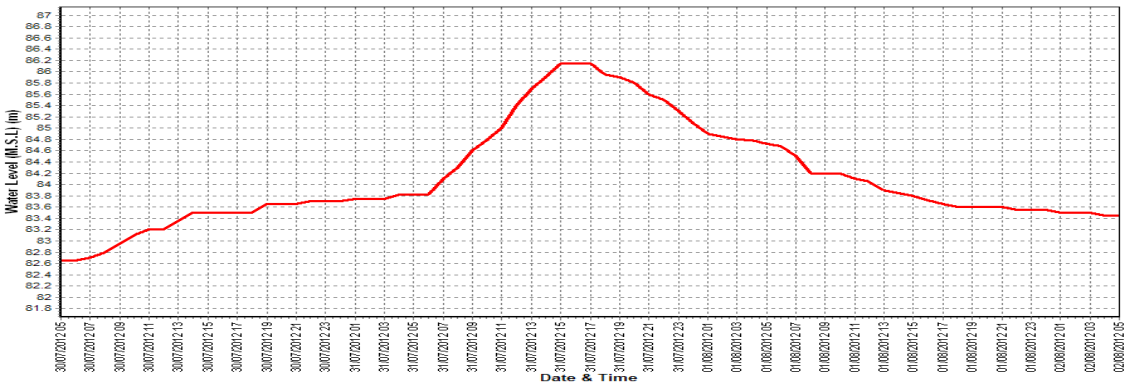
Station Name: Wagh at Ozerkheda
Local River: Wagh

Division : Tapi Division, Surat
Sub -Division : DGSD, CWC, Silvasssa

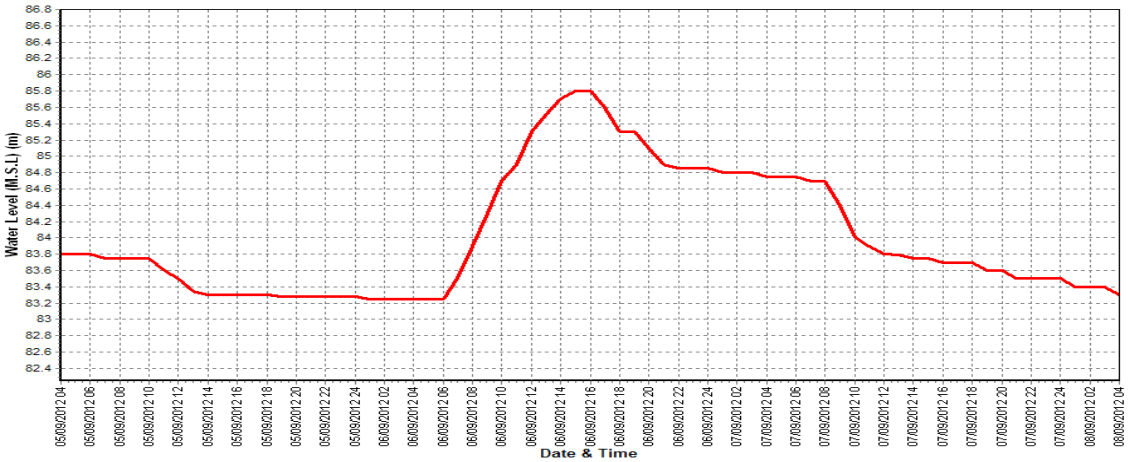
Water level vs. Time graph of I flood peak during the year 2012-13



Water level vs. Time graph of II flood peak during the year 2012-13



Water level vs. Time graph of III flood peak during the year 2012-13



4.5 Damanganga Basin

4.5.2.1 History sheet

History Sheet

				Water Year	**:**	**2012-13**
Site	**:**	**Damanganga at Nanipalsan**		**Code**	**:**	**01 02 24 001**
State	:	Gujarat		District		Valsad
Basin	:	WFR South of Tapi		Independent River	:	Daman Ganga
Tributary	:			Sub Tributary	:	
Sub-Sub Tributary	:			Local River	:	
Division	:	Tapi Division, Surat		Sub-Division	:	DGSD,CWC,Silvasa
Drainage Area	:	764 Sq. Km.		Bank	:	
Latitude	:	20°12'00" N		Longitude	:	73°17'00" E
Zero of Gauge (m)	:	95 (m.s.l)		6/15/1982		
		Opening Date		Closing Date		
Gauge	**:**	**15/06/1982**				
Discharge	**:**	**13/10/1983**	**Seasonal**			
		01/06/1991	**regular**			

Annual Maximum / Minimum discharge with corresponding Water Level (m.s.l)

Year	Maximum			Minimum		
	Q (cumecs)	**WL (m)**	**Date**	**Q (cumecs)**	**WL (m)**	**Date**
1991-1992	1018	101.200	28/07/1991	0.000	96.120	26/01/1992
1992-1993	703.1	99.875	12/08/1992	0.000	96.340	22/02/1993
1993-1994	1393	101.485	13/07/1993	0.000	96.100	18/04/1994
1994-1995	1184	102.040	13/07/1994	0.000	96.020	27/04/1995
1995-1996	440.1	99.700	03/09/1995	0.000	96.070	09/03/1996
1996-1997	219.6	99.650	09/08/1996	0.000	96.320	13/03/1997
1997-1998	340.0	100.480	25/08/1997	0.000	96.260	12/03/1998
1998-1999	902.5	102.490	17/09/1998	0.000	96.230	27/06/1998
1999-2000	360.0	100.600	15/07/1999	0.000	96.250	13/06/1999
2000-2001	997.5	102.375	14/07/2000	0.000	96.250	03/03/2001
2001-2002	252.5	99.250	18/06/2001	0.000	96.580	19/02/2002
2002-2003	300.8	99.850	25/08/2002	0.521	96.670	30/11/2002
2003-2004	362.0	100.110	28/07/2003	0.716	96.710	10/12/2003
2004-2005	3173	103.925	03/08/2004	0.290	96.540	31/12/2004
2005-2006	1439	102.050	29/06/2005	0.000	96.420	28/02/2006
2006-2007	2728	103.590	09/08/2006	0.000	96.370	19/02/2007
2007-2008	895.1	100.900	09/08/2007	0.393	96.600	06/01/2008
2008-2009	1304	102.100	11/08/2008	0.000	96.400	25/04/2009
2009-2010	972.5	101.380	05/09/2009	0.000	96.460	19/02/2010
2010-2011	309.9	99.300	02/08/2010	0.000	96.320	01/06/2010
2011-2012	692.8	100.4	29/08/2011	0.000	96.580	24/12/2011
2012-2013	617.7	99.800	11/09/2012	0.000	96.300	01/06/2012

4.5.2.2 Annual Maximum Flood Peak

Year	Highest Flood Level (m)	Date	Hour
1982	100.000	16/08/1982	07:00:00
1983	102.300	15/08/1983	10:00:00
1984	99.700	18/07/1984	13:00:00
1985	99.900	31/07/1985	15:00:00
1986	99.500	19/07/1986	06:00:00
1987	104.000	07/07/1987	13:00:00
1988	100.170	26/07/1988	14:00:00
1989	100.250	24/07/1989	06:00:00
1990	101.000	20/08/1990	03:00:00
1991	101.660	28/07/1991	00:00:00
1992	101.670	12/08/1992	16:00:00
1993	107.890	13/07/1993	13:00:00
1994	103.700	13/07/1994	06:00:00
1995	99.840	21/07/1995	21:00:00
1996	99.980	08/08/1996	19:00:00
1997	104.000	31/07/1997	14:00:00
1998	103.020	17/09/1998	13:00:00
1999	103.200	15/07/1999	13:00:00
2000	103.010	14/07/2000	01:00:00
2001	99.280	18/06/2001	03:00:00
2002	101.850	02/09/2002	18:00:00
2003	100.990	27/07/2003	17:00:00
2004	110.030	03/08/2004	18:00:00
2005	102.200	03/07/2005	15:00:00
2006	104.580	09/08/2006	12:00:00
2007	102.860	08/08/2007	23:00:00
2008	102.100	11/08/2008	08:00:00
2009	101.600	22/07/2009	18:00:00
2010	100.550	24/07/2010	23:00:00
2011	100.580	28/08/2011	01:00:00
2012	101.650	31/07/2012	13:00:00

4.5.2.3 Summary of Data

Stage Discharge Data for the period 2012-13

Station Name: Damanganga at Nanipalsan (01 02 24 001) Division : Tapi Division, Surat Local River: Damanganga Sub-Division:DGSD,CWC, Silvasssa

Day	Jun		Jul		Aug		Sep		Oct		Nov	
	W.L	Q	W.L	Q	W.L	Q	W.L	Q	W.L	Q	W.L	Q
1	96.300	0.000	96.300	0.000	98.600	210.4	98.100	135.1	97.240	25.79	96.950	6.096
2	96.290	0.000	96.300	0.000	97.950	121.8	97.850	90.73 *	97.240	25.30 *	96.920	5.832
3	96.290	0.000	96.350	0.000	97.800	109.0	97.770	104.3	97.490	36.82	96.900	5.667
4	96.290	0.000	96.370	0.000	97.770	106.0	97.765	95.66	97.630	62.09 #	96.880	6.297 *
5	96.290	0.000	96.390	0.000	97.700	70.57 *	98.000	123.4	97.680	68.08 #	96.850	5.462
6	96.280	0.000	96.410	0.000	97.720	92.53	98.000	122.7	97.710	71.83 #	96.830	5.360
7	96.280	0.000	96.420	0.000	97.780	100.3	98.250	154.8	98.350	178.1 *	96.830	3.928
8	96.280	0.000	96.430	0.000	97.700	90.22	98.050	132.7	97.750	102.5	96.830	3.743
9	96.280	0.000	96.440	0.000	97.765	97.94	97.950	105.7 *	97.530	77.85	96.820	3.575
10	96.280	0.000	96.460	0.000	98.500	210.5 *	98.250	152.7	97.470	36.21	96.820	3.530
11	96.280	0.000	97.280	28.28 #	98.250	156.6	99.800	617.7 #	97.430	32.12	96.820	4.428 *
12	96.280	0.000	97.200	25.43	98.450	199.3 *	98.300	160.7	97.360	34.76 #	96.820	3.496
13	96.280	0.000	97.130	22.67	98.100	137.0	98.100	137.1	97.340	33.00 #	96.810	4.151 *
14	96.280	0.000	97.140	23.17	97.900	112.6	98.000	122.9	97.330	32.25 *	96.810	3.328
15	96.280	0.000	97.200	22.51 *	97.850	90.73 *	97.850	106.8	97.300	18.98	96.810	3.336
16	96.280	0.000	97.170	23.45	97.750	95.56	97.800	83.71 *	97.250	17.63	96.810	3.250
17	96.280	0.000	97.150	22.67	97.700	90.08	97.740	94.23	97.200	15.82	96.800	3.210
18	96.280	0.000	97.180	24.44	97.620	73.79	97.650	85.31	97.180	15.60	96.800	3.880 *
19	96.280	0.000	98.160	123.7	97.660	65.65 *	97.600	78.74	97.150	12.45	96.790	3.072
20	96.280	0.000	97.900	100.7	97.640	63.27 *	97.560	71.58	97.140	11.69	96.780	2.924

21	96.280	0.000	97.550	77.62	97.690	88.70	97.540	69.05	97.120	17.44 *	96.750	1.897
22	96.280	0.000	97.360	34.77 *	97.610	72.61	97.500	40.43	97.120	9.876	96.740	1.850
23	96.280	0.000	97.220	18.57	97.600	71.15	97.510	48.90 *	97.100	10.40	96.740	1.831
24	96.280	0.000	97.870	110.6	97.570	68.61	97.450	37.08	97.080	15.16 *	96.720	1.746
25	96.280	0.000	97.560	69.05	97.510	40.07	97.410	34.37	97.070	9.630	96.700	1.724 *
26	96.280	0.000	97.500	39.39	97.500	47.88 *	97.370	26.81	96.990	7.162	96.700	1.683
27	96.280	0.000	97.460	35.79	97.560	66.80	97.300	27.93	96.980	10.21 *	96.680	1.399
28	96.280	0.000	97.450	34.31	98.330	161.2	97.260	26.94	96.980	10.21 *	96.680	1.402 *
29	96.280	0.000	97.700	70.57 *	98.000	125.2	97.250	24.16	96.980	6.989	96.680	1.364
30	96.280	0.000	97.850	102.0	97.820	106.5	97.250	26.03 *	96.960	6.584	96.670	1.309
31			98.300	166.7	98.500	183.7			96.950	6.222		
Ten-Daily Mean												
I Ten-Daily	96.286	0.000	96.387	0.000	97.928	120.9	97.998	121.8	97.609	68.46	96.863	4.949
II Ten-Daily	96.280	0.000	97.351	41.70	97.892	108.5	98.040	155.9	97.268	22.43	96.805	3.508
III Ten-Daily	96.280	0.000	97.620	69.03	97.790	93.86	97.384	36.17	97.030	9.990	96.706	1.620
Monthly												
Min.	96.280	0.000	96.300	0.000	97.500	40.07	97.250	24.16	96.950	6.222	96.670	1.309
Max.	96.300	0.000	98.300	166.7	98.600	210.5	99.800	617.7	98.350	178.1	96.950	6.297
Mean	96.282	0.000	97.135	37.95	97.868	107.3	97.808	104.6	97.294	32.86	96.791	3.359

Annual Runoff in MCM = 758 Annual Runoff in mm = 993

Peak Observed Discharge = 617.7 cumecs on 11/09/2012 Corres. Water Level :99.8 m

Lowest Observed Discharge = 0.000 cumecs on 01/06/2012 Corres. Water Level :96.3 m

Q: Observed/Computed discharge in cumec WL: Corresponding Mean Water Level (m.s.l) in m * : Computed Discharge

#:Discarded Discharge (values changed as per rating curve)

Note: River remained in pooling/ no flow condition w.e.f. 01/06/12 to 10/07/12 & 01/01/2013 to 31/05/2013.

Stage Discharge Data for The period 2012-13

Station Name: Damanganga at Nanipalsan (01 02 24 001) Division : Tapi Division, Surat Local River: Damanganga Sub -Division: DGSD, CWC, Silvasssa

Day	Dec		Jan		Feb		Mar		Apr		May	
	W.L	Q	WL	Q	WL	Q	WL	Q	WL	Q	WL	Q
1	96.670	1.277	96.530	0.000	96.500	0.000	96.480	0.000	96.460	0.000	96.430	0.000
2	96.660	1.116 *	96.530	0.000	96.500	0.000	96.480	0.000	96.460	0.000	96.430	0.000
3	96.660	1.232	96.530	0.000	96.500	0.000	96.480	0.000	96.460	0.000	96.430	0.000
4	96.650	1.012	96.530	0.000	96.500	0.000	96.480	0.000	96.460	0.000	96.430	0.000
5	96.650	0.964	96.520	0.000	96.500	0.000	96.480	0.000	96.460	0.000	96.430	0.000
6	96.640	0.906	96.520	0.000	96.500	0.000	96.470	0.000	96.460	0.000	96.430	0.000
7	96.640	0.868	96.520	0.000	96.500	0.000	96.470	0.000	96.450	0.000	96.430	0.000
8	96.630	0.807	96.520	0.000	96.500	0.000	96.470	0.000	96.450	0.000	96.430	0.000
9	96.630	0.752 *	96.520	0.000	96.490	0.000	96.470	0.000	96.450	0.000	96.430	0.000
10	96.620	0.781	96.520	0.000	96.490	0.000	96.470	0.000	96.450	0.000	96.420	0.000
11	96.600	0.687	96.520	0.000	96.490	0.000	96.470	0.000	96.450	0.000	96.420	0.000
12	96.600	0.741	96.520	0.000	96.490	0.000	96.470	0.000	96.450	0.000	96.420	0.000
13	96.600	0.659	96.520	0.000	96.490	0.000	96.470	0.000	96.450	0.000	96.420	0.000
14	96.600	0.653	96.520	0.000	96.490	0.000	96.470	0.000	96.450	0.000	96.420	0.000
15	96.590	0.621	96.520	0.000	96.490	0.000	96.470	0.000	96.450	0.000	96.420	0.000
16	96.590	0.384 *	96.520	0.000	96.490	0.000	96.470	0.000	96.450	0.000	96.420	0.000
17	96.580	0.499	96.520	0.000	96.490	0.000	96.470	0.000	96.450	0.000	96.420	0.000
18	96.580	0.477	96.520	0.000	96.480	0.000	96.470	0.000	96.450	0.000	96.420	0.000
19	96.580	0.438	96.520	0.000	96.480	0.000	96.470	0.000	96.450	0.000	96.420	0.000
20	96.570	0.249 *	96.520	0.000	96.480	0.000	96.470	0.000	96.450	0.000	96.420	0.000

21	96.570	0.249 *	96.520	0.000	96.480	0.000	96.460	0.000	96.450	0.000	96.420	0.000
22	96.570	0.249 *	96.510	0.000	96.480	0.000	96.460	0.000	96.450	0.000	96.410	0.000
23	96.560	0.193 *	96.510	0.000	96.480	0.000	96.460	0.000	96.450	0.000	96.410	0.000
24	96.560	0.190 *	96.510	0.000	96.480	0.000	96.460	0.000	96.430	0.000	96.410	0.000
25	96.560	0.190 *	96.510	0.000	96.480	0.000	96.460	0.000	96.430	0.000	96.410	0.000
26	96.550	0.140 *	96.510	0.000	96.480	0.000	96.460	0.000	96.430	0.000	96.410	0.000
27	96.550	0.140 *	96.510	0.000	96.480	0.000	96.460	0.000	96.430	0.000	96.410	0.000
28	96.540	0.100 *	96.510	0.000	96.480	0.000	96.460	0.000	96.430	0.000	96.400	0.000
29	96.540	0.100 *	96.510	0.000			96.460	0.000	96.430	0.000	96.400	0.000
30	96.540	0.100 *	96.510	0.000			96.460	0.000	96.430	0.000	96.400	0.000
31	96.540	0.100 *	96.510	0.000			96.460	0.000			96.400	0.000
Ten-Daily Mean												
I Ten-Daily	96.645	0.972	96.524	0.000	96.498	0.000	96.475	0.000	96.456	0.000	96.429	0.000
II Ten-Daily	96.589	0.541	96.520	0.000	96.487	0.000	96.470	0.000	96.450	0.000	96.420	0.000
III Ten-Daily	96.553	0.159	96.511	0.000	96.480	0.000	96.460	0.000	96.436	0.000	96.407	0.000
Monthly												
Min.	96.540	0.100	96.510	0.000	96.480	0.000	96.460	0.000	96.430	0.000	96.400	0.000
Max.	96.670	1.277	96.530	0.000	96.500	0.000	96.480	0.000	96.460	0.000	96.430	0.000
Mean	96.594	0.544	96.518	0	96.489	0	96.468	0	96.447	0	96.418	0

Peak Computed Discharge = 210.5 cumecs on 10/08/2012 Corres. Water Level :98.5 m

Lowest Computed Discharge = 0.100 cumecs on 28/12/2012 Corres. Water Level :96.54 m

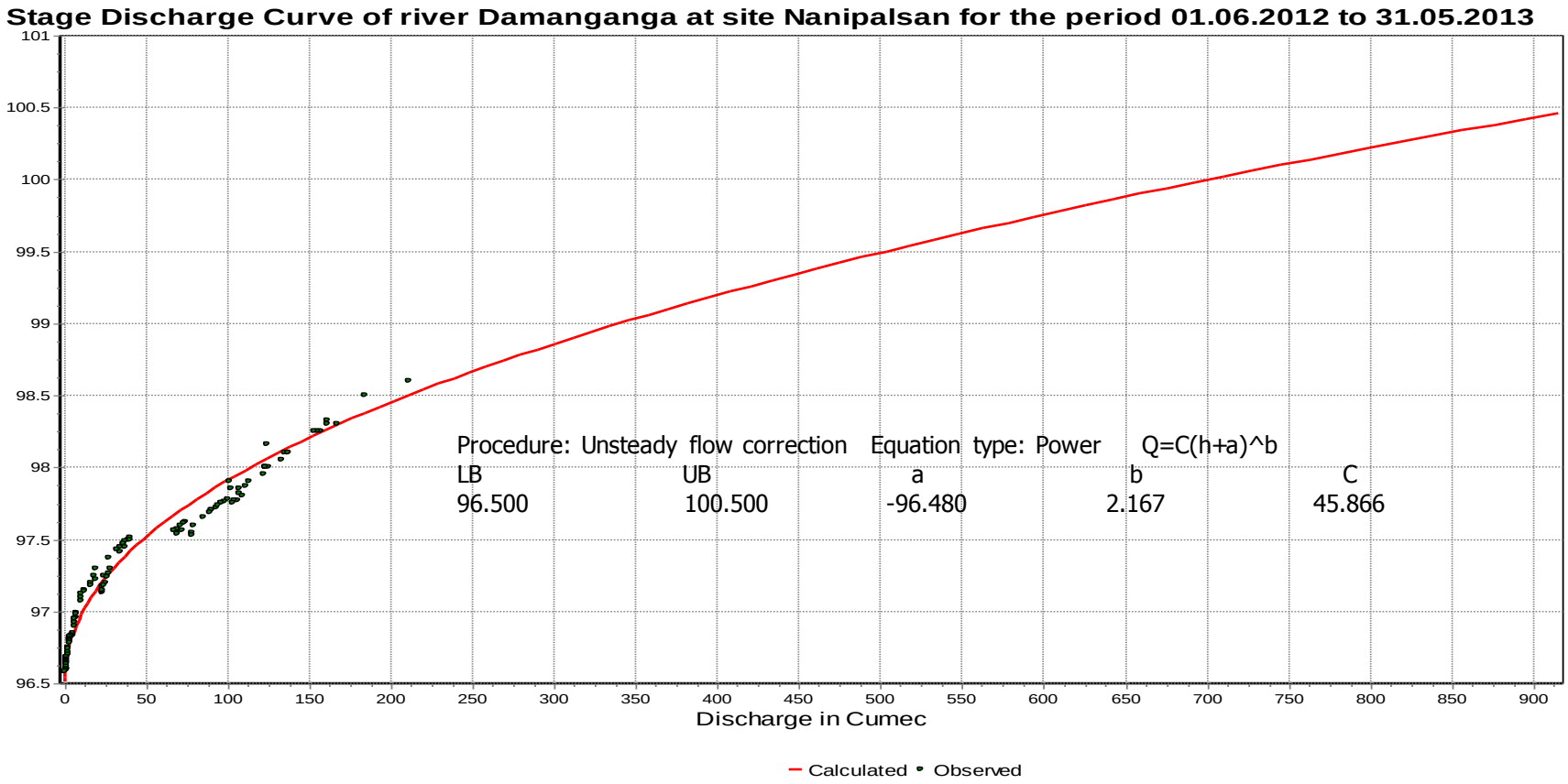
Q: Observed/Computed discharge in cumec WL: Corresponding Mean Water Level (m.s.l) in m * : Computed Discharge

#:Discarded Discharge (values changed as per rating curve)

Note: River remained in pooling/ no flow condition w.e.f. 01/06/12 to 10/07/12 & 01/01/2013 to 31/05/2013.

4.5.2.4 Stage Discharge Curve

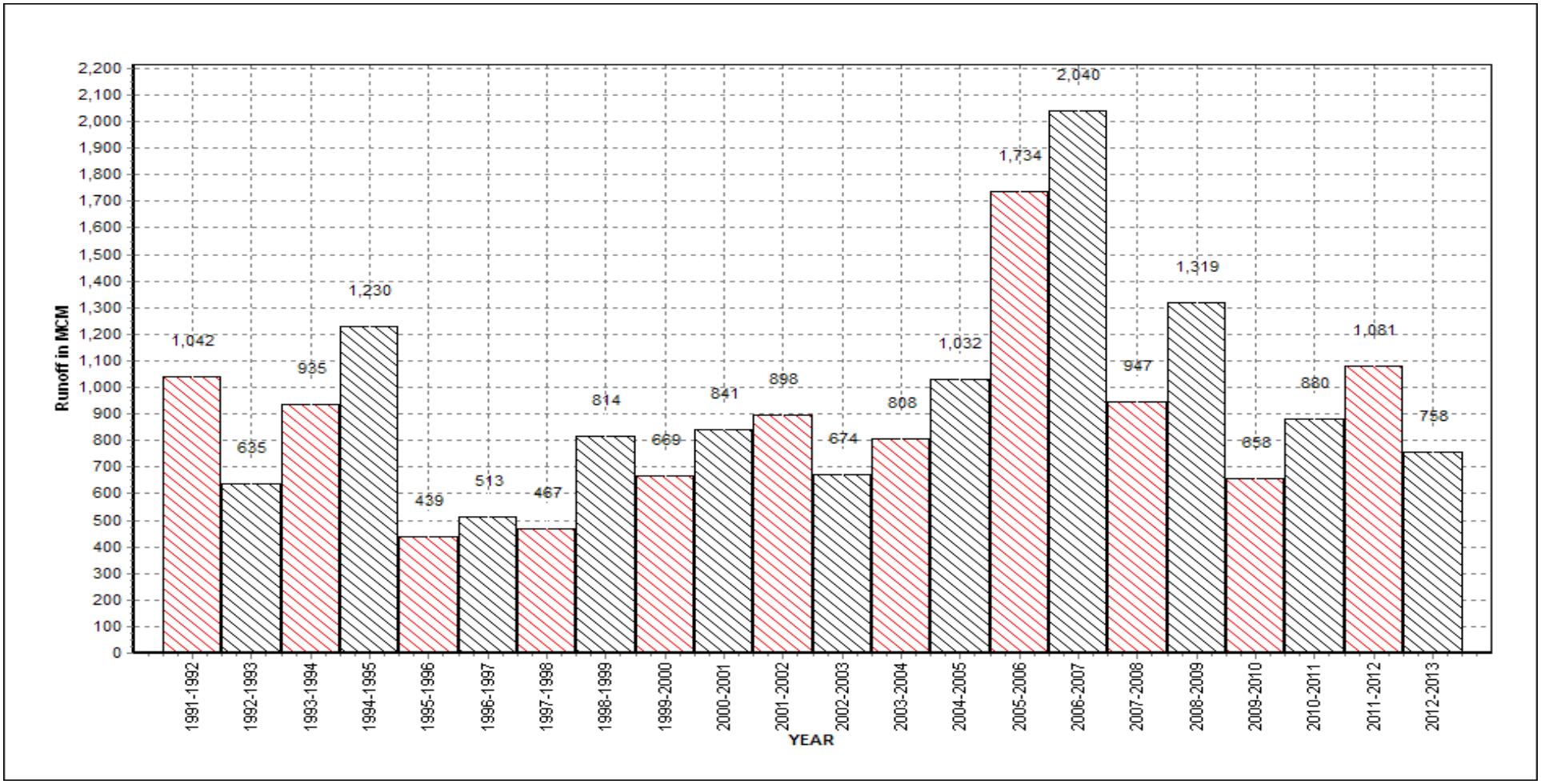
Station Name: Damanganga at Nanipalsan (01 02 24 001) Division : Tapi Division, Surat Local River: Damanganga Sub -Division: DGSD, CWC, Silvassa



4.5.2.5 Annual runoff

Annual Runoff values for the year 1991-2013

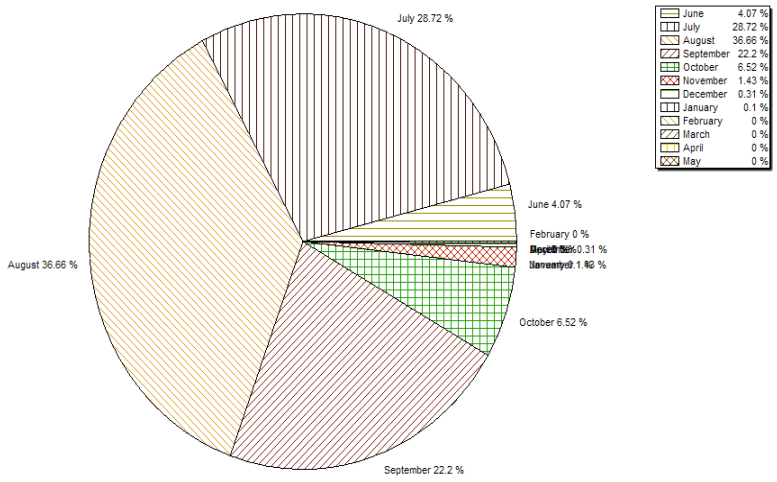
Station Name: Damanganga at Nanipalsan (01 02 24 001) Division : Tapi Division, Surat Local River: Damanganaga Sub -Division : DGSD, CWC, Silvassa



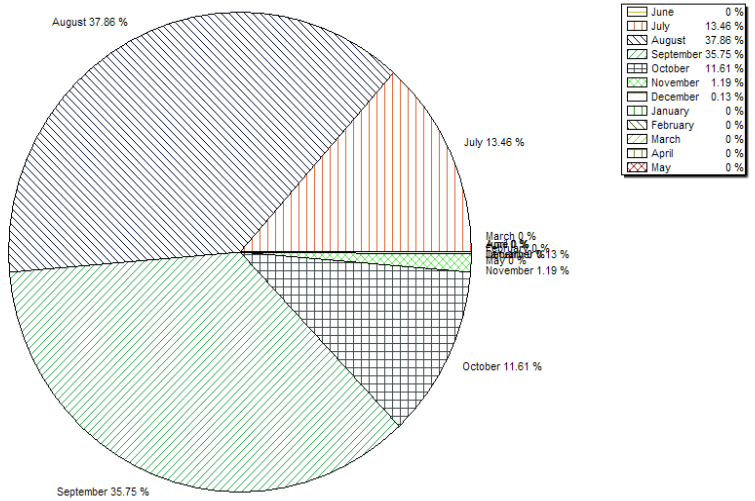
5.2.6 Monthly Average Runoff

Station Name: Damanganga at Nanipalsan (01 02 24 001) Division : Tapi Division, Surat Local River: Damanganga Sub -Division : DGSD, CWC, Silvasa

Monthly Average Runoff Based on period 1991-2012



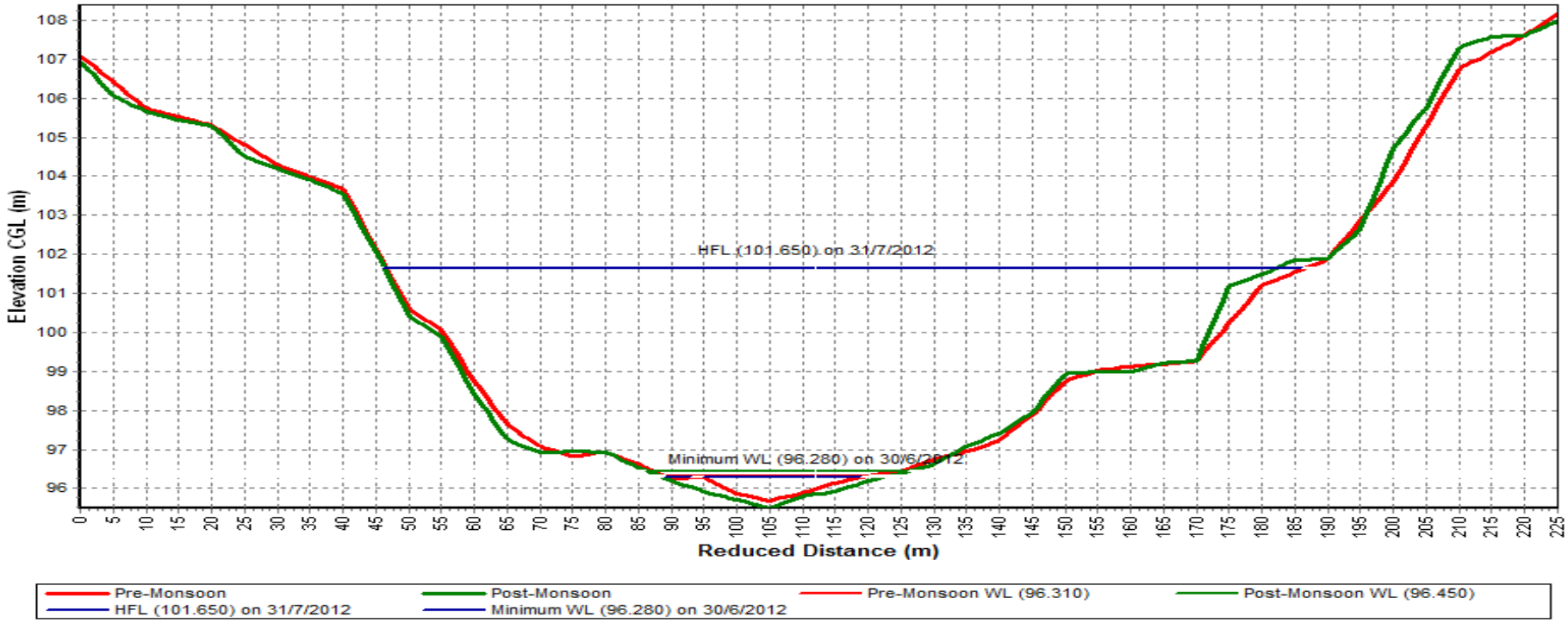
Monthly Average Runoff Based on period 2012-13



4.5.2.7 Superimposed cross section

Station Name: Damanganga at Nanipalsan (01 02 24 001) Division : Tapi Division, Surat Local River: Damanganga Sub-Division:DGSD, CWC, Silvasa

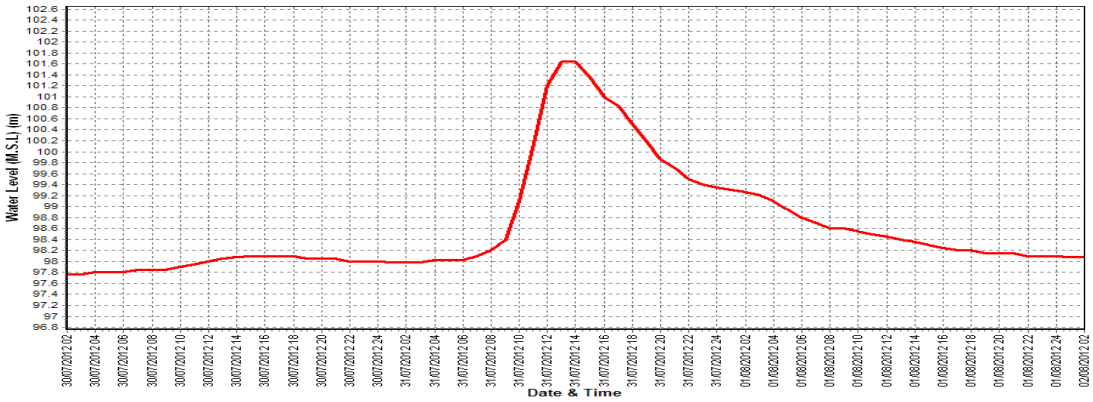
Highest flood level observed so far 110.030 on dt 03/08/2004 at 18 : 00hrs



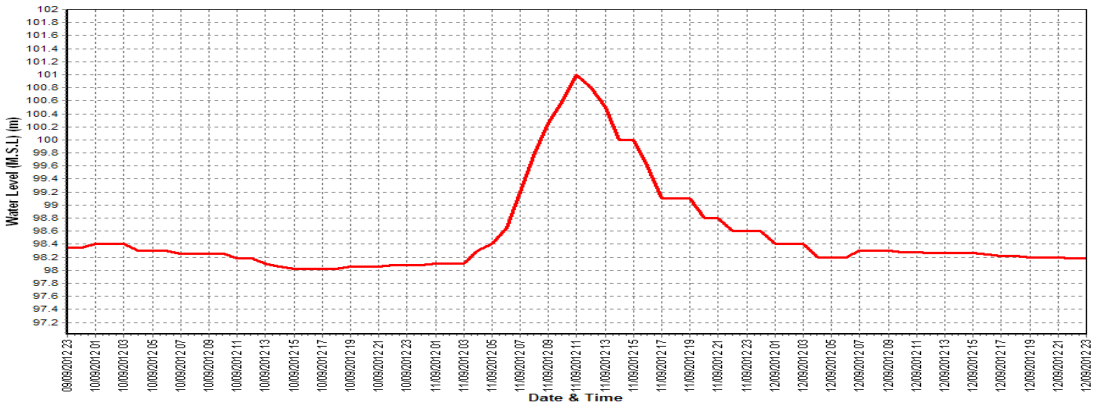
4.5.2.8 Water Level vs. Time- Graph of Highest Flood Peaks during 2012-13

Station Name: Damanganga at Nanipalsan (01 02 24 001) Division: Tapi Division, Surat
Local River: Damanganga Sub -Division: DGSD, CWC, Silvasa

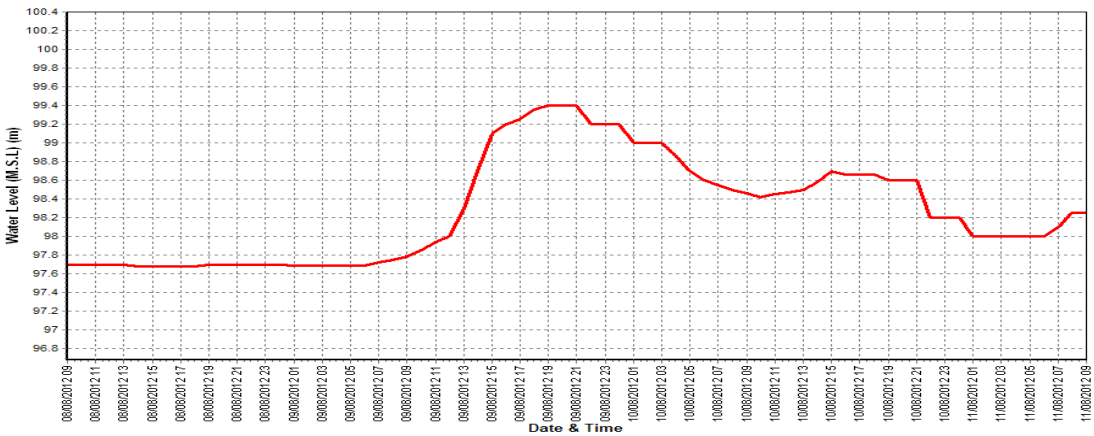
Water level vs. Time graph of I flood peak during the year 2012-13



Water level vs. Time graph of II flood peak during the year 2012-13



Water level vs. Time graph of III flood peak during the year 2012-13



4.6 Kim basin

4.6.1 History sheet

HISTORY SHEET

			Water Year	**:**	**2012-13**
Site	**:**	**Motinaroli**	**Code**	**:**	**01 02 16 001**
State	:	Gujarat	District		Surat
Basin	:	Narmada	Independent River	:	Kim
Tributary	:	-	Sub Tributary	:	-
Sub-Sub Tributary	:	-	Local River	:	Kim
Division	:	Tapi Dvision, Surat	Sub-Division	:	LNSD Bharuch
Drainage Area	:	804 Sq. Km.	Bank	:	Right
Latitude	:	21°24'16"	Longitude	:	72°57'48"
Zero of Gauge **m**	:	5 (m.s.l)	17/10/1990		

		Opening Date	Closing Date
Gauge	:	17/10/1990	
Discharge	:	17/10/1990	
Sediment	:		
Water Quality	:	1/7/1991	

Annual maximum/minimum discharge with corresponding Water level (above m.s.l)

Year	Maximum			Minimum		
	Q (cumecs)	**WL (m)**	**Date**	**Q (cumecs)**	**WL (m)**	**Date**
1991-1992	58.73	36.980	01/08/1991	0.000	6.245	06/05/1992
1992-1993	736.4	17.510	22/06/1992	0.191	7.515	30/03/1993
1993-1994	426.3	13.890	16/07/1993	0.170	7.520	17/05/1994
1994-1995	700.5	13.750	22/07/1994	0.000	7.350	04/04/1995
1995-1996	668.6	15.700	21/07/1995	0.240	7.280	05/04/1996
1996-1997	676.0	16.800	24/07/1996	0.112	7.470	23/04/1997
1997-1998	372.0	16.355	24/08/1997	0.080	7.300	10/03/1998
1998-1999	404.0	15.900	16/09/1998	0.099	7.230	26/03/1999
1999-2000	282.5	13.500	20/07/1999	0.170	7.360	26/03/2000
2000-2001	296.2	13.625	14/07/2000	0.041	7.200	28/05/2001
2001-2002	377.1	14.650	16/08/2001	0.000	7.220	07/05/2002
2002-2003	526.8	14.930	04/09/2002	0.000	7.100	13/04/2003
2003-2004	649.0	14.640	25/07/2003	0.000	7.190	29/05/2004
2004-2005	1288	17.200	04/08/2004	0.000	7.340	14/02/2005
2005-2006	720.2	16.380	30/06/2005	0.000	7.310	22/06/2005
2006-2007	923.2	17.650	29/07/2006	0.956	7.710	27/02/2007
2007-2008	851.7	16.815	02/07/2007	0.280	7.530	08/03/2008
2008-2009	735.6	15.985	12/08/2008	0.500	7.440	25/03/2009
2009-2010	206.8	13.660	07/09/2009	0.000	7.550	25/01/2010
2010-2011	384.2	14.625	10/09/2010	0.770	7.620	04/01/2011
2011-2012	497.8	14.425	26/08/2011	0.000	7.630	19/12/2012
2012-2013	47.640	13.480	04/09/2012	0.000	7.720	07/01/2013

4.6.2 Annual Maximum Flood peak

Year	Highest Flood Level (m)	Date	Hour
1990	7.320	20/11/1990	08:00:00
1991	37.000	01/08/1991	08:00:00
1992	44.500	22/06/1992	11:00:00
1993	15.480	18/07/1993	22:00:00
1994	18.150	16/06/1994	23:00:00
1995	15.850	21/07/1995	15:00:00
1996	16.800	24/07/1996	03:00:00
1997	16.550	24/08/1997	11:00:00
1998	16.600	16/09/1998	13:00:00
1999	16.480	20/07/1999	19:00:00
2000	14.000	14/07/2000	06:00:00
2001	14.800	16/08/2001	08:00:00
2002	15.080	04/09/2002	13:00:00
2003	16.630	25/07/2003	20:00:00
2004	17.400	04/08/2004	12:00:00
2005	17.500	29/06/2005	18:00:00
2006	18.225	29/07/2006	21:00:00
2007	18.090	02/07/2007	20:00:00
2008	16.400	12/08/2008	15:00:00
2009	18.000	19/02/2009	08:00:00
2010	16.130	10/09/2010	05:00:00
2011	14.630	26/08/2011	11:00:00
2012	13.500	04/09/2012	10:00:00

4.6.3 Summary of data

Stage Discharge Data for the period 2012-13

Station Name: Kim at Motinaroli (01 02 16 001) Division : Tapi Division, Surat Local River:Kim Sub -Division : LNSD, CWC, Bharuch

Day	Jun		Jul		Aug		Sep		Oct		Nov	
	W.L	Q	W.L	Q	W.L	Q	W.L	Q	W.L	Q	W.L	Q
1	7.850	0.726 *	7.960	1.416 *	8.460	7.253	9.820	15.20 #	8.310	3.771 #	8.120	3.149
2	7.770	0.300 *	7.970	1.539	8.380	7.118	9.450	12.17 *	8.270	3.490 *	8.110	3.156
3	7.770	0.300 *	8.080	2.585	8.200	4.839	8.950	4.714	8.250	4.280	8.140	3.363
4	7.730	0.040 #	8.190	3.821	8.120	2.253	13.480	47.64	8.490	6.136	8.140	2.604 *
5	7.810	0.487 *	8.200	4.339	8.080	2.202 *	9.660	13.78 #	8.430	7.017	8.140	3.792
6	7.840	0.666 #	8.270	4.409	8.060	2.069 #	9.245	7.896	8.400	6.848	8.150	4.739
7	7.880	0.910 #	8.280	4.386	8.050	2.003 #	9.275	9.393	8.340	3.980 *	8.130	3.211
8	8.090	1.157	8.200	3.012 *	8.030	1.870 #	9.105	8.333	8.340	5.135	8.110	3.166
9	8.160	2.275	8.200	4.529	8.020	1.805 #	8.960	8.466 *	8.310	3.771 #	8.110	3.165
10	8.190	2.940 *	8.075	0.881	8.040	1.937 *	8.800	5.946	8.290	5.048	8.110	3.174
11	8.150	1.938	8.160	1.427	8.130	2.954	9.485	10.12	8.220	4.070	8.100	2.335 *
12	8.130	1.868	8.080	0.260	8.290	3.632 *	9.900	15.65 #	8.220	3.586	8.090	3.072
13	8.060	2.069 #	8.060	2.069 #	8.360	5.914	9.410	11.86 #	8.230	3.640	8.070	2.135 *
14	8.170	2.807 #	8.170	2.807	8.320	4.991	9.300	8.287	8.220	3.149 *	8.070	2.638
15	8.230	3.508	8.190	2.943 *	8.250	3.355 *	9.405	10.08	8.200	3.416	8.040	2.513
16	8.210	3.675	8.220	2.017	8.200	4.437	9.360	11.47 *	8.170	3.483	8.000	2.340
17	8.190	2.943 *	8.220	2.039	8.190	4.339	9.080	7.568	8.170	3.450	7.970	1.954
18	8.180	3.787	8.210	4.475	8.210	4.467	8.920	8.169 #	8.170	3.444	7.970	1.480 *
19	8.170	3.641	10.570	22.35	8.270	3.490 *	8.580	5.683 #	8.190	5.233	7.980	1.998
20	8.865	6.433	9.050	6.990	8.290	3.632 *	8.785	7.860	8.160	3.567	8.010	2.347

21	8.370	5.192	8.440	6.662	8.380	6.454	8.495	6.200	8.150	2.670 *	8.040	2.509
22	8.220	4.182	8.300	3.701 *	8.340	4.314	8.410	6.771	8.140	2.948	8.020	2.394
23	8.150	3.206	8.280	4.521	8.330	1.732	9.360	11.47 *	8.130	3.224	8.060	2.617
24	8.120	2.469 *	8.290	4.721	8.280	4.507	9.340	8.350	8.150	2.670 *	8.060	2.617
25	8.120	2.939	8.350	6.942	8.270	4.404	9.410	8.405	8.180	3.419	8.050	2.003 *
26	8.080	2.053	8.350	6.948	8.260	3.424 *	9.590	10.01	8.150	3.492	8.090	3.077
27	8.080	2.570	8.320	4.824	8.270	3.797	9.115	8.466	8.150	2.670 *	8.080	3.008
28	8.050	2.001	8.290	4.565	8.270	4.480	8.820	7.041	8.110	2.400 *	8.090	2.268 *
29	8.030	1.900	8.290	3.630 *	8.310	5.919	8.510	7.138	8.130	3.222	8.080	2.944
30	8.000	1.604	8.300	6.143	8.975	5.973	8.410	4.471 *	8.110	3.162	8.090	3.080
31			8.310	6.293	8.425	7.021			8.130	3.181		
Ten-Daily Mean												
I Ten-Daily	7.909	0.980	8.142	3.092	8.144	3.335	9.675	13.35	8.343	4.948	8.126	3.352
II Ten-Daily	8.235	3.267	8.493	4.737	8.251	4.121	9.222	9.675	8.195	3.704	8.030	2.281
III Ten-Daily	8.122	2.812	8.320	5.359	8.374	4.729	8.946	7.833	8.139	3.005	8.066	2.652
Monthly												
Min.	7.730	0.040	7.960	0.260	8.020	1.732	8.410	4.471	8.110	2.400	7.970	1.480
Max.	8.865	6.433	10.570	22.35	8.975	7.253	13.480	47.64	8.490	7.017	8.150	4.739
Mean	8.089	2.353	8.319	4.427	8.260	4.083	9.281	10.29	8.223	3.857	8.074	2.762

Annual Runoff in MCM = 87 Annual Runoff in mm = 108

Peak Observed Discharge = 47.64 cumecs on 04/09/2012 Corres. Water Level :13.48 m

Lowest Observed Discharge = 0.000 cumecs on 07/01/2013 Corres. Water Level :7.72 m

Q: Observed/Computed discharge in cumec WL: Corresponding Mean Water Level (m.s.l) in m * : Computed Discharge

#:Discarded Discharge (values changed as per rating curve)

Stage Discharge Data for The period 2012-13

Station Name: Kim at Motinaroli (01 02 16 001) Division : Tapi Division, Surat Local River: Kim Sub -Division : LNSD, CWC, Bharuch

Day	Dec		Jan		Feb		Mar		Apr		May	
	W.L	Q	WL	Q	WL	Q	WL	Q	WL	Q	WL	Q
1	8.090	3.084	7.760	0.201 *	7.920	1.161 *	8.060	1.316	7.600	0.000	7.660	0.000
2	8.090	2.268 *	7.790	0.370 *	7.920	1.161 *	7.980	1.297	7.580	0.000	7.650	0.000
3	8.090	3.084	7.780	0.313 *	8.020	1.805 *	7.800	0.450 *	7.550	0.000	7.600	0.000
4	8.100	3.112	7.790	0.370 *	8.120	1.322	7.720	0.000	7.520	0.000	7.530	0.000
5	8.100	3.127	7.790	0.370 *	8.170	1.541	7.700	0.000	7.490	0.000	7.510	0.000
6	8.100	3.087	7.800	0.428 *	8.240	1.256	7.680	0.000	7.470	0.000	7.480	0.000
7	8.090	3.075	7.720	0.000	8.240	1.260	7.660	0.000	7.450	0.000	7.560	0.000
8	8.090	3.075	7.720	0.000	8.330	3.515	7.650	0.000	7.420	0.000	7.670	0.000
9	8.080	2.202 *	7.710	0.000	8.340	3.566	7.650	0.000	7.400	0.000	7.650	0.000
10	8.100	3.123	7.760	0.201 *	8.330	3.910 *	7.640	0.000	7.390	0.000	7.650	0.000
11	8.100	3.116	7.760	0.201 *	8.380	3.718	7.640	0.000	7.380	0.000	7.650	0.000
12	8.090	3.084	7.750	0.147 *	8.380	3.723	7.640	0.000	7.410	0.000	7.700	0.000
13	8.070	2.639	7.740	0.095 *	8.390	3.773	7.640	0.000	7.360	0.000	7.740	0.000
14	8.100	3.107	7.730	0.044 *	8.350	3.584	7.640	0.000	7.200	0.000	7.740	0.000
15	8.140	3.789	7.710	0.000	8.410	3.814	7.640	0.000	7.080	0.000	7.750	0.000
16	8.150	2.670 *	7.710	0.000	8.420	3.827	7.640	0.000	7.070	0.000	7.760	0.000
17	8.140	3.818	7.700	0.000	8.370	4.190 *	7.650	0.000	7.030	0.000	7.700	0.000
18	8.140	3.840	7.700	0.000	8.490	4.142	7.640	0.000	7.010	0.000	7.650	0.000
19	8.140	3.830	7.710	0.000	8.390	3.763	7.640	0.000	7.000	0.000	7.660	0.000
20	8.120	3.153	7.720	0.000	8.380	3.709	7.780	0.310 *	7.010	0.000	7.670	0.000

21	8.070	2.926	7.720	0.000	8.330	3.523	7.820	0.540 *	7.020	0.000	7.740	0.000
22	7.960	1.919	7.710	0.000	8.180	1.526	7.840	0.666 *	7.150	0.000	7.740	0.000
23	7.850	0.726 *	7.710	0.000	8.200	1.596	7.850	0.726 *	7.500	0.000	7.740	0.000
24	7.810	0.487 *	7.710	0.000	8.180	2.870 *	7.820	0.546 *	7.520	0.000	7.790	0.000
25	7.780	0.313 *	7.720	0.000	8.130	1.399	7.810	0.487 *	7.490	0.000	7.830	0.000
26	7.840	0.666 *	7.720	0.000	8.210	1.624	7.830	0.600 *	7.520	0.000	7.830	0.000
27	7.850	0.726 *	7.820	0.546 *	8.150	1.468	7.830	0.600 *	7.540	0.000	7.900	0.000
28	7.820	0.546 *	7.870	0.849 *	8.150	1.461	7.710	0.000	7.580	0.000	7.900	0.000
29	7.810	0.487 *	7.870	0.849 *			7.640	0.000	7.600	0.000	7.910	0.000
30	7.780	0.313 *	7.890	0.973 *			7.610	0.000	7.620	0.000	7.910	0.000
31	7.780	0.313 *	7.900	1.035 *			7.620	0.000			7.910	0.000
Ten-Daily Mean												
I Ten-Daily	8.093	2.924	7.762	0.225	8.163	2.050	7.754	0.306	7.487	0.000	7.596	0.000
II Ten-Daily	8.119	3.305	7.723	0.049	8.396	3.824	7.655	0.031	7.155	0.000	7.702	0.000
III Ten-Daily	7.850	0.857	7.785	0.387	8.191	1.933	7.762	0.379	7.454	0.000	7.836	0.000
Monthly												
Min.	7.780	0.313	7.700	0.000	7.920	1.161	7.610	0.000	7.000	0.000	7.480	0.000
Max.	8.150	3.840	7.900	1.035	8.490	4.190	8.060	1.316	7.620	0.000	7.910	0.000
Mean	8.015	2.313	7.758	0.226	8.254	2.650	7.725	0.243	7.365	0.000	7.715	0.000

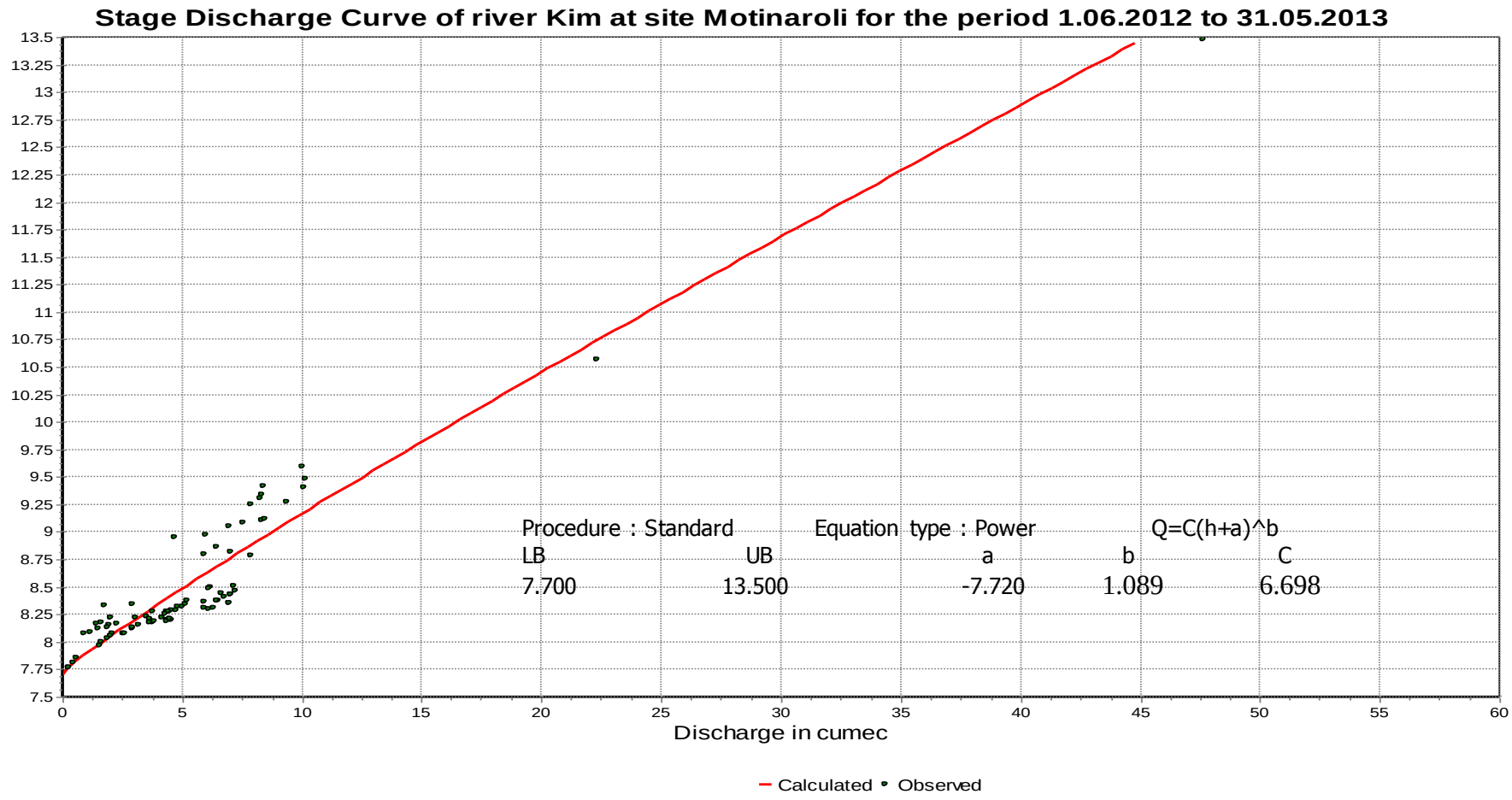
Peak Computed Discharge = 12.17 cumecs on 02/09/2012 Corres. Water Level :9.45 m
Lowest Computed Discharge = 0.044 cumecs on 14/01/2013 Corres. Water Level :7.73 m

Q: Observed/Computed discharge in cumec WL: Corresponding Mean Water Level (m.s.l) in m * : Computed Discharge
#:Discarded Discharge (values changed as per rating curve)

Note: River in pooling or no flow condition w.e.f. 28/03/2013 to 31/05/2013

4.6.4 Stage Discharge Curve

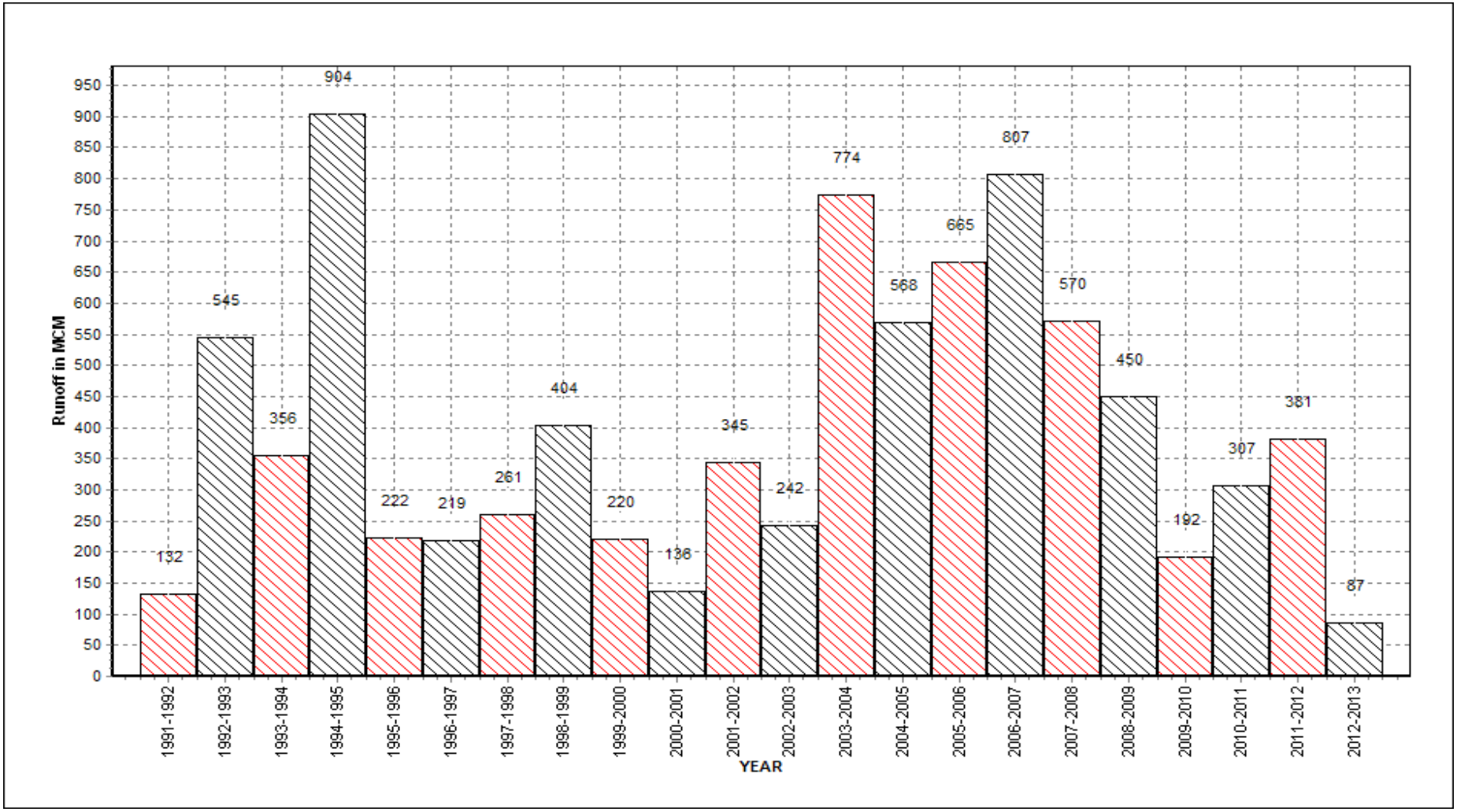
Station Name: Kim at Motinaroli (01 02 16 001) Division : Tapi Division, Surat Local River: Kim Sub -Division : LNSD, CWC, Bharuch



4.6.5 Annual runoff

Annual Runoff values for the period 1991-2013

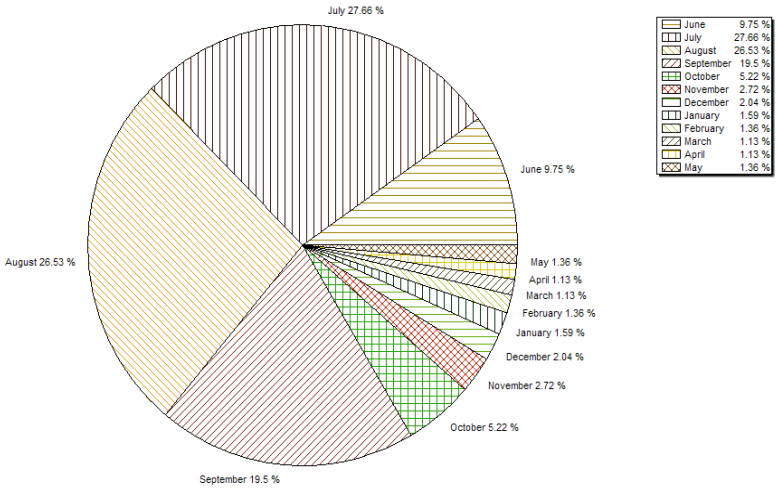
Station Name: Kim at Motinaroli (01 02 16 001) Division: Tapi Division, Surat Local River: Kim Sub -Division: LNSD, CWC, Bharuch



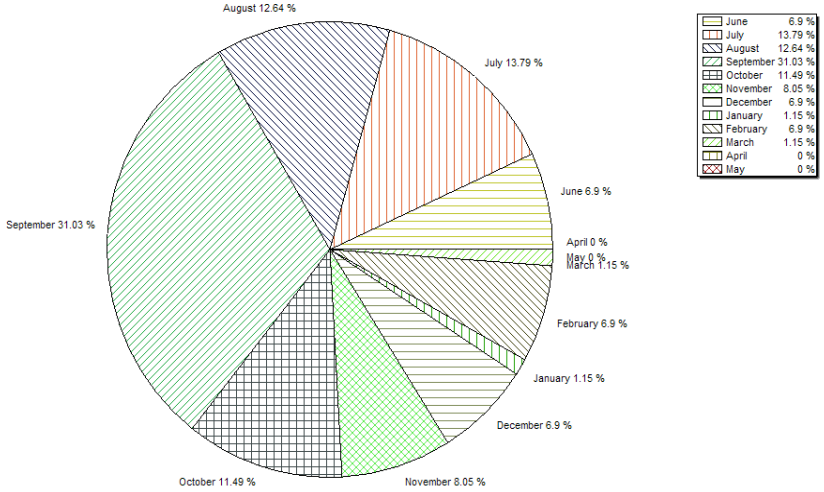
4.6.6 Monthly average Runoff

Station Name: Kim at Motinaroli (01 02 16 001) Division : Tapi Division, Surat Local River: Kim Sub -Division : LNSD, CWC, Bharuch

Monthly Average Runoff on period 1991-2012

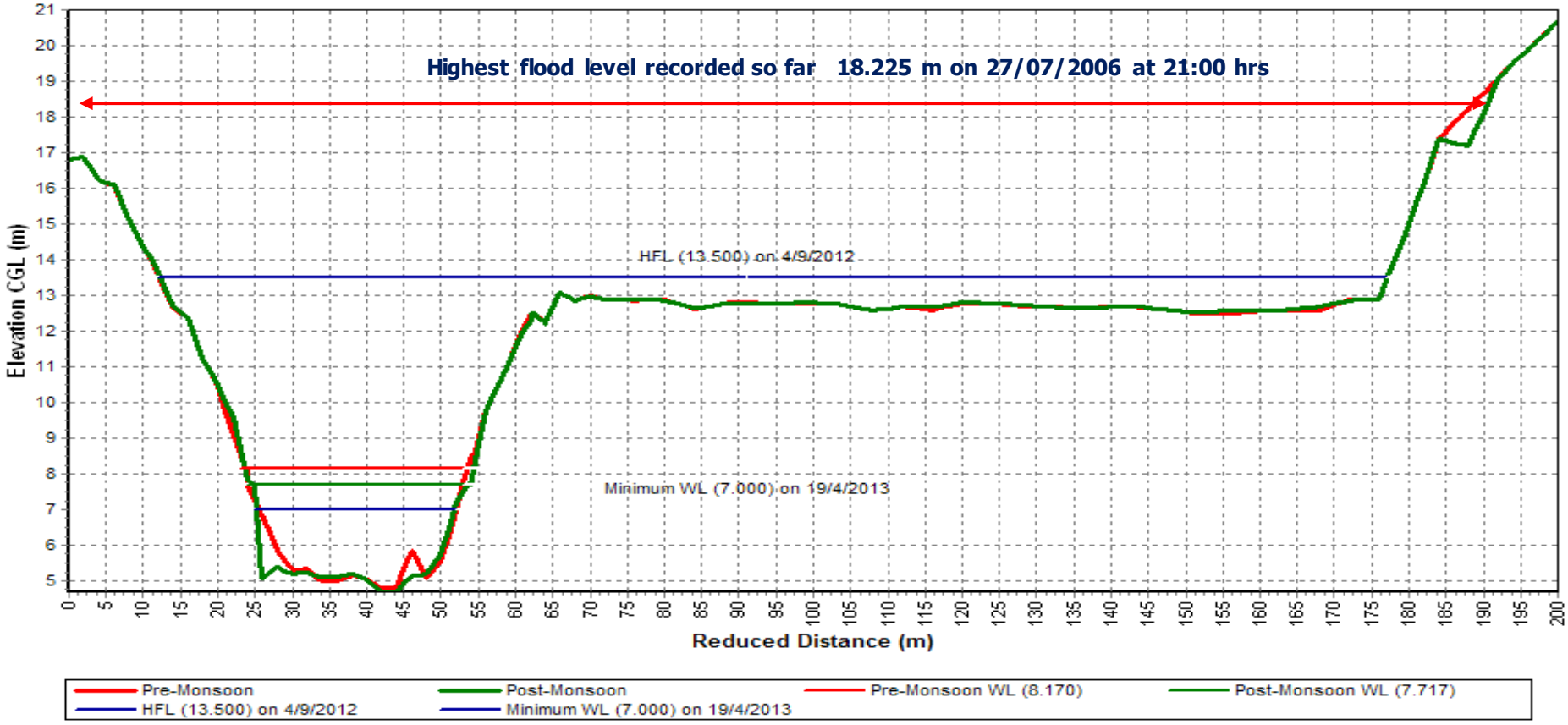


Monthly Average Runoff on period 2012-13



4.6.7 Superimposed cross section

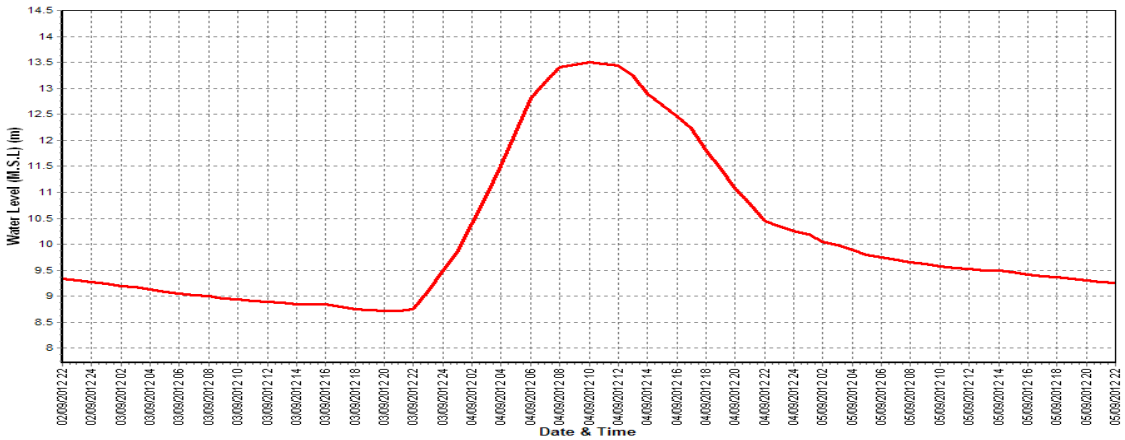
Station Name: Kim at Motinaroli (01 02 16 001) Division : Tapi Division, Surat Local River: Kim Sub -Division : LNSD, CWC, Bharuch



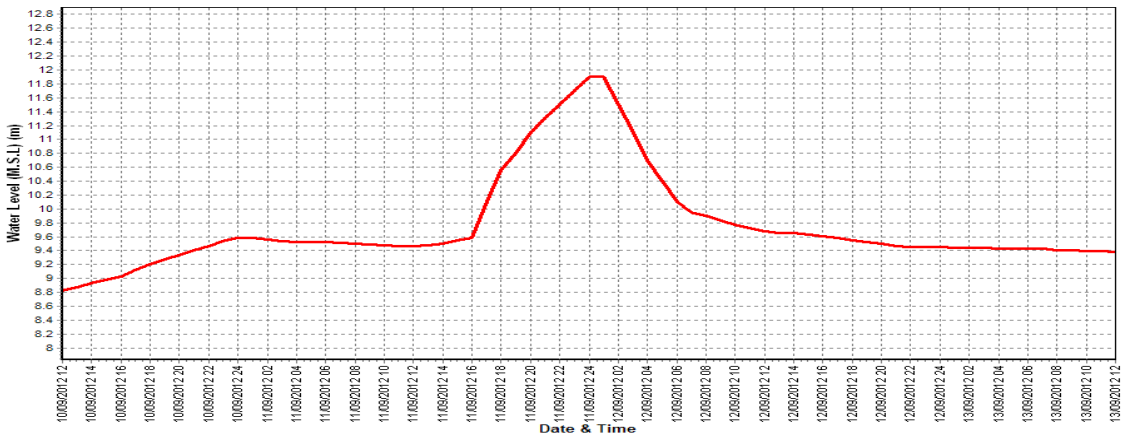
4.6.8 Water Level vs. Time Graph of highest flood peaks during 2012-13

Station Name: Kim at Motinaroli (01 02 16 001) Division : Tapi Division, Surat
Local River: Kim Sub -Division : LNSD, CWC, Bharuch

Water level vs. Time graph of 1st flood peak during the year 2012-13



Water level vs. Time graph of 2nd flood peak during the year 2012-13



Water level vs. Time graph of 3rd flood peak during the year 2012-13