जल वार्षिकी

WATER YEAR BOOK

2018 – 19

पश्चिम प्रवाही नदियाँ

तापी, पूर्णा, अम्बिका, वैतरणा, धाधर, दमनगंगा और किम

Central Water Commission

Mahi & Tapi Basin Organization

Hydrological Observation Circle

Gandhinagar

केन्द्रीय जल आयोग

माही व तापी बेसिन संगठन

जलविज्ञानीय प्रेक्षण परिमंडल

गाँधीनगर

March 2020

आमुख

राष्ट्रीय जल नीति में मानकीकृत राष्ट्रीय सूचना प्रणाली डेटा बेस और डेटा बैंकों के एक नेटवर्क के साथ गुणवत्ता के आकड़े, उपलब्ध कराने और प्रसंस्करण क्षमताओं में सुधार के लिए मौजूदा केंद्रीय और राज्य स्तरीय एजेंसियों को एकीकरण की आवश्यकता पर बल दिया गया है। जल के बहुउपयोगी स्वरूप एवं उसकी बढ़ती मांग को पूरा करने हेतु संसाधनो के अनुकूलतम नियोजन के संदर्भ में सम्बंधित आंकड़ो का संकलन अति महत्वपूर्ण है।

केंद्रीय जल आयोग, जल संसाधन के विकास में संलग्न, भारत सरकार, जल शक्ति मंत्रालय के अंतर्गत देश की एक शीर्षस्थ तकनिकी संस्था है, जो जल विज्ञानिय आंकड़ो के एकीकरण से लेकर परियोजनायो का मूल्यांकन, अभिकल्पन, प्रबोधन तथा परिचालन करती है।

जल विज्ञानिय प्रेक्षण परिमंडल गांधीनगर, माही तापी बेसिन संगठन के अंतर्गत केंद्रीय जल आयोग की एक क्षेत्रीय इकाई है, जिसके अंतर्गत गुजरात, मध्य प्रदेश, महाराष्ट्र, राजस्थान, दादर नगर हवेली एवं दमन दीव (केंद्र शासित प्रदेश) के भाग से होकर पश्चिम की ओर बहने वाली 17 वेसिनों के अधिसूचित महत्वपूर्ण स्थलों पर जल के सतही प्रवाह के आंकड़ो, एकत्रित किये जाते है।

तापी मंडल सूरत द्वारा तापी नदी पर, वर्तमान में 9 स्थलों पर और पश्चिम स्वतंत्र प्रवाही नदियों के 7 स्थलों पर सतही प्रवाह का प्रेक्षण किया जा रहा है। इनके आकड़े, इस वार्षिकी 2018-19 में संकलित किया गया है।

जल वर्ष 2005-06 से जल वार्षिकी का प्रकाशन, केंद्रीय जल आयोग, नई दिल्ली द्वारा निर्धारित स्वरूप में किया जा रहा है। इस वार्षिकी में सतही प्रवाह के आकड़ो के साथ-साथ वेसिन से सम्बंधित सुचनाए जेसे कि जलवायु, भूगर्भविज्ञान, कृषि, भूमि आदि भी दिये गए है।

इस वार्षिकी में दी गयी सूचना एवं संकलित आकड़ो, उन सभी के लिये उपयोगी होगे जो जल संसाधनों से सम्बंधित किसी भी क्षेत्र में रूचि रखते है, ऐसी आशा है। इसे और उपयोगी बनाने हेतु सुझाव आमंत्रित है।

वार्षिकी में प्रकाशित आकड़ो के संकलन, विश्लेषण तथा प्रकाशन हेतु माही तापी बेसिन संगठन के अधीनस्थ जल विज्ञानिय प्रेक्षण परिमंडल एवं तापी मंडल सूरत के अधिकारियो एवं कर्मचारीयो ने जिस समर्पण एवं लगन से कार्य सम्पादित किया है, वह प्रशंसनीय है।

24.3.2020

गांधीनगर (गुजरात)
मार्च 2020

(डी. एस. चासकर)
अधीक्षण अभियंता

Preface

The National Water Policy stresses the need for a standardized National Information System with a network of database and data bank, integrating the existing Central and State agencies for providing quality data and improving the processing capabilities. Collection and compilation of data assumes greater importance in the context of optimal resource planning to meet the ever increasing demand for water in its multi-faceted use.

Central Water Commission is an apex organization of the country concerned with planned development and monitoring in water resource sector. CWC has for long been maintaining a Hydrological Observation & Flood forecasting network, which covers almost all the interstate rivers of India.

Hydrological Observation (HO) Circle, Gandhinagar, a field unit in Mahi-Tapi Basin Organization of the Central Water Commission, is entrusted with the hydrological observations in 17 river basins of Gujarat, Madhya Pradesh, Maharashtra, Rajasthan, Dadra and Nagar Haveli and Daman & Diu(UT).

The Tapi Division, headquartered at Surat, under HO Circle, is at present, carrying out hydrological observation at 9 sites in Tapi Basin and 7 sites on independent West flowing rivers viz. Purna, Ambica, Vaitarna, Dhadar, Damanganga and Kim and its tributaries, which have been compiled in this Water Year Book.

The publication of Water Year Book in SWDES format has been started since the water year 2005-06 as per guideline issued by Central Water Commission, New Delhi. This Year Book not only provides the hydrological data but also provides general information about geology, climate, agriculture, soil, cities/towns, major and medium projects in the basin etc.

It is hoped that the information and data compiled herein will be useful to all those concerned with any field related with water resources of the country. Comments and suggestions, if any, for further improvement of the Water Year Book are most welcome. The efforts put in by all the concerned officers and staff of MTBO, Central Water Commission is gratefully acknowledged.

24-3-2020

Gandhinagar
March, 2020

(D.S. Chaskar)
Superintending Engineer

C o n t e n t s

List of Plates and Figures

List of Tables

Abbreviations and symbols

Av	:	Average
Ann	:	Annual
A.G.R.	:	Automatic Gauge Recorder
C	:	Centigrade
Cum	:	Cubic meter
Cumec	:	Cubic meter per second
c/s	:	Cross section
C.W.C.	:	Central Water Commission
D	:	Days
Dis	:	Discharge
F	:	Float Observation
F.F.	:	Flood Forecasting
G	:	Gauge
GD	:	Gauge and Discharge
GDS	:	Gauge, Discharge and Sediment
GDWQ	:	Gauge, Discharge and Water Quality
GDSWQ	:	Gauge, Discharge, Sediment and Water Quality
GTS	:	Great Trigonometrical Survey
Hrs.	:	Hours
IWYB	:	Integrated Water Year Book
WYB	:	Water Year Book
km	:	Kilo meter
M	:	Million
m	:	Meter
mm	:	milli meter
m^3/s	:	Cubic meter per second
Mm3 / MCM	:	Million Cubic meter
Max.	:	Maximum
Min.	:	Minimum
m.s.l.	:	Mean sea level
MD	:	Mahi Division, CWC, Gandhinagar
neg.	:	Negligible
NNW	:	National Net Work
R.Days	:	Remaining days
R.L.	:	Reduced Level
R.D.	:	Reduced Distance
R.C.C.	:	Reinforced Cement Concrete
sq km	:	Square Kilometer
TD	:	Tapi Division, CWC, Surat
WQ	:	Water Quality
W.L.	:	Water Level
W.Year	:	Water Year
WRID	:	Water Resources Investigation Division, Ahmadabad
WRI C	:	Water Resources Investigation Circle, Ahmadabad
80 Key	:	80 Key Hydrological Station Scheme
163 Key	:	163 Key Hydrological Station Scheme
^{0}, ‘ . “	:	Degree (30^0) Minutes(56’) Seconds (35”)
*	:	Estimated Discharge
#	:	Discarded and estimated discharge

1. Introduction

1.1 General

This water year book presents data of sixteen hydrological observation stations, along with general information about basins for the water year 2018-19 in Tapi, Purna, Vaitarna, Ambica, Dhadhar, Kim, Wagh and Damanganga rivers. The data of 16 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.

The gauge & discharge data of sixteen (16) stations, viz. Tapi at Dedtalai, Tapi at Burhanpur, Purna at Gopalkheda, Purna at Yerli, Tapi at Gidhade, Tapi at Sarangkheda and Purna at Mahuwa, Ambica at Gadat, Vaitarna at Durvesh, Dhadhar at Pingalwada, Damanganga at Nanipalsan, Wagh at Ozerkhedaand Kim at Motinaroli, Gomai at Prakasha, Panjhara at Morane, Tapi at Ghala are included in this book. From administrative consideration, all the river basins are divided into five Sub Division viz. Upper Tapi Sub-Division, Bhusawal, Middle Tapi Sub-Division, Dhule, Lower Tapi Sub-Division, Surat, Damanganga Sub-Division, Silvassa and Lower Narmda Sub-Division, Bharuch respectively under the Tapi Division, Surat.

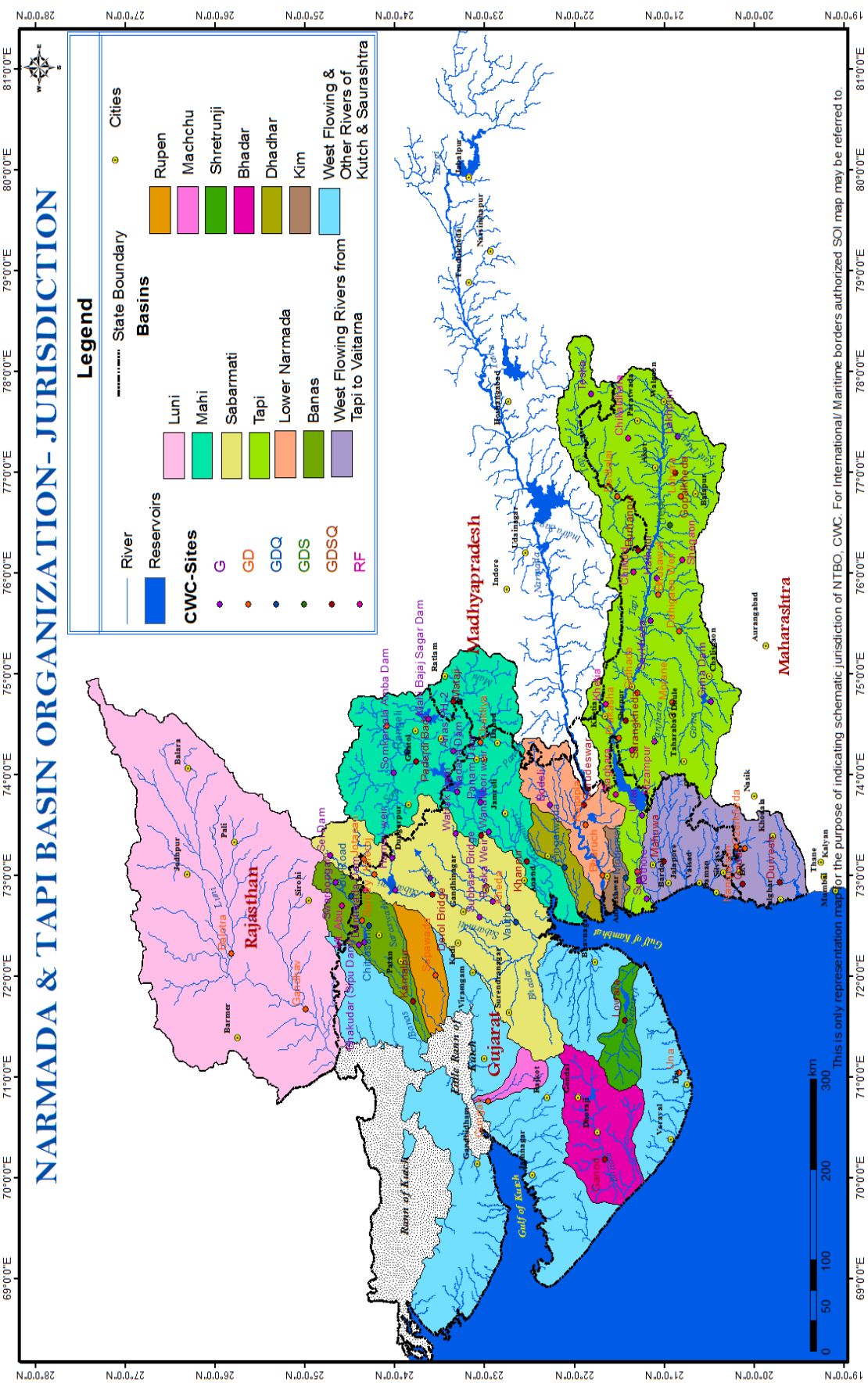
Central Water commission is conducting hydrological observations on major west flowing river basins under various schemes viz national network (NNW), 80-key stations, 163- key stations and flood forecasting (FF). The scheme wise distributions of sites are shown in the **table-1**.

Table-1: Scheme wise distributions of sites

Sl. No.	Name of Site	Station Code	Scheme	Type
1.	Tapi at Teska	TESKA	FF	G
2.	Tapi at Dedtalai	01 02 17 001	NNW (HO)	GD
3.	Tapi at Nawtha	N/A	DWRIS (HO)	GD
4.	Tapi at Burhanpur	01 02 17 002	NNW (HO)	GDSQ
5.	Tapi at Hathnur	01 02 17 006	FF	G
6.	Sipna at Chikaldara	CHIKHALADARA	FF	R/F
7.	Purna at Lakhpuri	01 02 17 003	NNW (HO)	G
8.	Purna at Gopalkheda	01 02 17 004	NNW (HO)	GDSQ
9.	Kate purna at Kurankheda	N/A	DWRIS (HO)	GD
10.	Mun at Lohara	2 036 1182	DWRIS (HO)	GD
11.	Bahula/Hivra at Duskheda	N/A	DWRIS (HO)	G
12.	Purna at Yerli	01 02 17 005	NNW (HO)	GDS
13.	Mohuganga at Shelgaon	N/A	FF	RF

14.	Nalganga/Purna at Talaswada	N/A	DWRIS (HO)	G
15.	Tapi at Bhusawal	01 02 17 007	FF	GD
16.	Vanoli at Pimpri	N/A	DWRIS (HO)	GD
17.	Girna at Girna Dam	01 02 17 008	FF	G
18.	Manyad at Saygaon	N/A	DWRIS (HO)	GD
19.	Van/purna at Vankhed	N/A	DWRIS (HO)	GD
20.	Morna at Akola	N/A	DWRIS (HO)	G
21.	Girna at Dahigaon Weir	01 02 17 009	FF	G
22.	Anjani at Narne	N/A	DWRIS (HO)	G
23.	Tapi at Savkheda	01 02 17 011	NNW (HO)	G
24.	Purna at Dhupeshwar	N/A	DWRIS (HO)	GD
25.	Panjra at Morane (Dhulia)	01 02 17 013	NNW (HO)	GD
26.	Arunawati at Sirpur	N/A	DWRIS (HO)	GD
27.	Tapi at Gidhade	01 02 17 014	FF	GD
28.	Buray at Sindhkheda	N/A	DWRIS (HO)	GD
29.	Arunawati at Balasana (Malpur)	N/A	DWRIS (HO)	G
30.	Titur at Bamrul	N/A	DWRIS (HO)	GD
31.	Tapi at Sarangkheda	01 02 17 015	NNW (HO)	GDSQ
32.	Gomai at Prakasha	N/A	DWRIS (HO)	GD
33.	Shevali at Velda	N/A	DWRIS (HO)	G
34.	Nesu at Chandapur(Uchhal)	N/A	DWRIS (HO)	G
35.	Sagbara	N/A	FF	RF
36.	Tapi at Ukai	01 02 17 016	FF	G
37.	Tapi at Kakrapar	01 02 17 017	N/A	G
38.	Ver at Gavachi (Ver)	N/A	DWRIS (HO)	GD
39.	Tapi at Ghala	01 02 17 018	NNW (HO)	GD
40.	Tapi at Kathore	N/A	DWRIS (HO)	G
41.	Tapi at Surat (Seasonal)	01 02 17 019	FF	G
42.	Nandurbar	N/A	FF	RF
43.	Nizampur (Dusane)	N/A	FF	RF
44.	Khetia (Pansamal)	N/A	FF	RF
45.	Chiklod	N/A	FF	RF
46.	Purna at Mahuwa	01 02 19 001	NNW (HO)	GDS WQ
47.	Vaitarna At Durvesh	01 02 25 001	NNW (HO)	GDS WQ
48.	Ambica at Gadat	01 02 20 001	80 Key stations (HO)	GDSWQ
49.	Dhadhar At Pingalwada	01 02 14 001	163 Key stations	GDWQ
50.	Kim at Motinaroli	01 02 16 001	163 Key stations	GDWQ
51.	Wagh at Ozerkheda	01 02 24 002	FF	GD
52.	Damanganga at Nanipalsan	01 02 24 001	FF	GD

Plate no.1


NARMADA & TAPI BASIN ORGANIZATION- JURISDICTION
Legend
River
Reservoirs
CWC-Sites
G
GD
GDQ
GDS
GDSQ
RF
State Boundary
Basins
Luni
Mahi
Sabarmati
Tapi
Lower Narmada
Banas
West Flowing Rivers from Tapi to Vaitarna
West Flowing & Other Rivers of Kutch & Saurashtra
Cities
Rupen
Machchu
Shretrunji
Bhadar
Dhadhar
Kim
Rajasthan
Madhyapradesh
Gujarat
Maharashtra
Gulf of Kambat
Rann of Kutch
Gulf of Kutch
0 50 100 200 300 km
This is only representation map for the purpose of indicating schematic jurisdiction of NTBO, CWC. For International/ Maritime borders authorized SOI map may be referred to.

2. Basin Description

There are 7 West flowing river basins as given below under the jurisdiction of Tapi Division, Central Water Commission, Surat,

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

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

2.1 Tapi Basin

2.1.1 Geographical setting of Tapi Basin

The Tapi Basin is situated in the northern part of the Deccan Plateau and extends over an area of 65145 sqkm which is nearly 2% of the total geographical area of the country. Nearly 80% of the basin lies in the State of Maharashtra. The basin lies between east longitudes of 72^0 38' to 78^0 17' and north latitudes of 20^0 05' to 22^0 03'. It is bound in the north by the Satpura range in the east by the Mahadeo hills, in the south by the Ajanta range and Satmala hills and in the west by the Arabian Sea. The river is bound on the three sides by the hill ranges. The Tapi River along with its tributaries flows over the plains of Vidharbha, Khandesh and Gujarat, its cover a large area in the state of Maharashtra and a small area in Madhya Pradesh and Gujarat. The basin has an elongated shape with a maximum length of 587 km from east to west and the maximum width of 210 km from north to south. Perimeter of the basin is about 1840 km. There are two well defined physical regions in the basin, viz. hilly region and plains; the hilly regions comprising Satpura, Satmala, Mahadeo, Ajanta and Gawilgarh hills are well forested. The plain covers the Khandesh areas which are broad and fertile suitable for cultivation primarily. The basin consists of black soils. The coastal plains of Gujarat are composed of alluvial clays with a layer of black soil above. The culturable area of the basin is about 4.29 Mha which is 2.2% of the total culturable area of the country. The forest cover is about 25% of the area in the basin. Physiographical, the area is a basaltic landscape with major physiographic units of

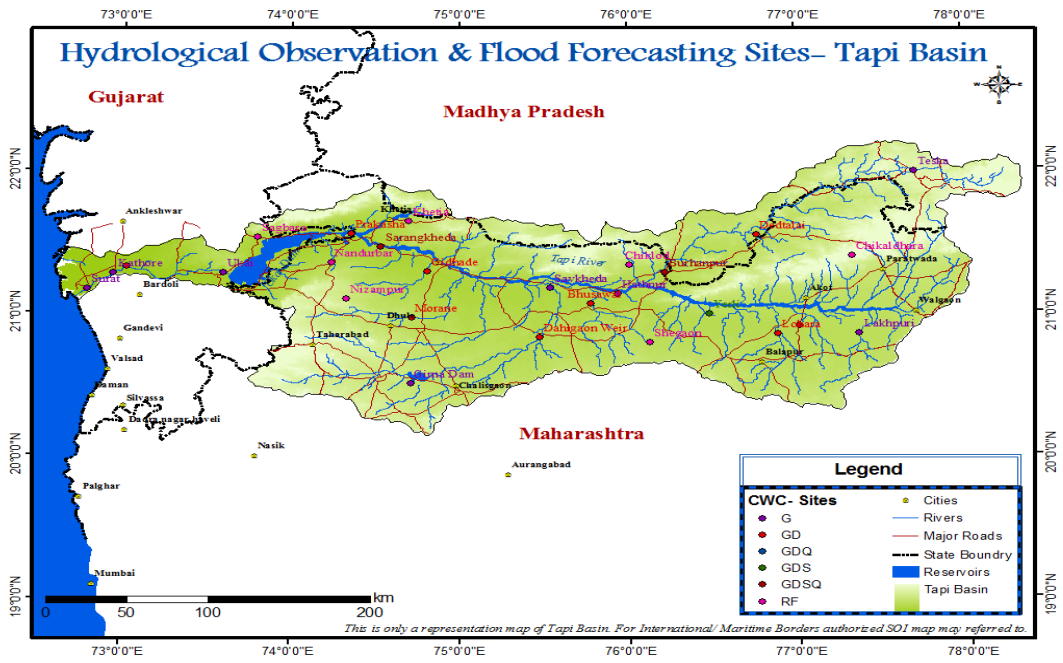
plateau lands, escarpments, hills, piedmont plains, colluvio-alluvial plains and valley plains.

The entire Tapi basin can be divided in three sub basins: Upper Tapi Basin up to Hathnur (confluence of Purna with the main Tapi (29,430 sq km), Middle Tapi Basin from Hathnur up to the Sarangkheda gauging site (28,970 sqkm), and the Lower Tapi Basin from Sarangkheda up to Sea (6,745 sq km). The annual rainfall for the upper, middle and lower Tapi basins for an average year is 931.90 mm, 713.05 mm and 1407.9 mm respectively.

2.1.2 The River System

The Tapi River (Hindi ताप्ती , Marathi तापी, Gujarati: તાપ્તી) ancient original name Tapi River (Sanskrit: तापी), is a river in central India. It is one of the major rivers of peninsular India with a length of around 724 km. The Tapi River originates in the Betul district from a place called Multai. It is one of only three rivers in peninsular India that run from east to west, the others being the Narmada River and the Mahi River. The Tapi is the second largest westward draining inter-state river basin. It covers a large area in the State of Maharashtra besides areas in the states of Madhya Pradesh and Gujarat.

Plate no.2.1.1



The Tapi River drains an area of 65145 sq km out of which nearly 80 percent lies in Maharashtra. The State wise distribution of the drainage area is shown in **Table 2**.1

Table-2.1: **State wise distribution of drainage area(Tapi River Basin)**

Sl. No	Name of State	Drainage area (sqkm)	Percentage of total
1	Madhya Pradesh	9,804	15.0
2	Maharashtra	51,504	79.1
3	Gujarat	3,837	5.9
	Total	65,145	100.0

For the first 282 Km., the river flows in Madhya Pradesh, out of which 54 Km form the common boundary with Maharashtra State. It flows for 228 Km in Maharashtra before entering Gujarat. Traversing a length of 214 Km in Gujarat, the Tapi joins Arabian sea in Gulf of Cambay after flowing past the Surat city. The river receives tidal influence for a length of about 20 Km upstream from mouth i.e. up to Singanapore weir.

The Tapi receives several tributaries on both banks. There are 14 major tributaries having a length more than 50 Km. On the right bank 4 tributaries namely, the Vaki, the Gomai, the Arunavati and the Aner join the Tapi. On the left bank, 10 important tributaries namely the Nesu, the Arunavati, the Buray, the Panjhra, the Bori, the Girna, the Vaghur, the Purna, the Mona and the Sipna drain into the main channel. The drainage system on the left bank of the Tapi is therefore, more extensive as compared to the right bank area.

The Purna and the Girna, the two important left bank tributaries together account for nearly 45 percent of the total catchment area of the Tapi. The Purna is one of the principal tributaries of the Tapi, starts in Betul district in Gawilgar hills of the Satpura range and mostly drains through three districts of Vidharbha namely Amravati, Akola and Buldhana. The Girna another Major tributary rises in the Western Ghats and drains Nasik and Jalgaon districts of Maharashtra.

2.1.3 Major Tributaries of the Tapi River System

2.1.3.1 Purna River: Purna, is one of the tributaries of Tapi, joins from the left. The Purna is the principal affluent of the Tapi. It is the main artery of a network of rivers and streams draining Akola, Amravati and Buldana districts of Maharashtra and Betul district of Madhya Pradesh. It is the only river in the upper Tapi Basin, which has a perennial flow. Rising in the Gawilgarh hills at an elevation of 900 m., North latitude 21^0 38’ 00” and East longitude 77^0 36’ 00”, the Purna flows first in a South westerly direction for about 60 km through hills and forests before it enters the Purna plains.

Flowing in a generally westerly direction for a length of 274 Km, the Purna joins the Tapi north west of Edalabad. The Man is the main left bank tributaries of Purna, and Chandrabhaga and Wan are the principal right bank tributaries. Thus Purna drains a total area of 18, 929 Sqkm.

2.1.3.2 Girna River: The Girna River is a river in Maharashtra state of southern India. It originates at Kem peak in the Western Ghats range of Nashik District with a latitude of 21° 7' 60" N and a longitude of 75° 19' 0" E, and flows east across Nashik and Jalgaon districts, swinging north in Jalgaon District to join the Tapti River. The dams on the river are Chanakapur and Girana Dam. The name Girna derives from the name of Goddess Giraja (Parvati). A 100 sq km area around Girna River has an approximate population of 979337 (0.009793 persons per square meter) and an average elevation of 246 meters above the sea. The basin of the Girna lies on the Deccan Plateau, and its valley has fertile soils which are intensively farmed.

2.1.3.3 Gomai: Gomai River is tributary of Tapti River. It originates in Satpura Mountain Range and merge in Tapi River around 2 km east of Prakasha. Gomai river itself has many small tributary rivers like Susri river (passing by Sultanpur), Tipria river (passing by Mandane), Umri river, Sukhi river

2.1.3.4 Panzara: The Panzara-Kan or Panjhra is a river in Khandesh region of Maharashtra state of India. It is a tributary of the Tapi River. Panjhra River originates just few kilometers from a small town Pimpalner, Tal-Sakri in Dhule District. One small reservoir named Latipada dam is constructed just after its origin.

2.1.3.5 Pedhi: The only important left bank tributary of the Purna is the Pedhi. It rises in the low hills near Rithpur and receives a number of small affluent both from the east and the west, the chief on the west being the Naghira river.

2.1.3.6 Arna: The first of the principal right bank affluent of the Purna is the Arna which emerges from the Satpuda hills in Betul district and flows in a south and south-easterly direction passing by Sirasgaon to join the Purna just below Deurwada.

2.1.4 Tapi Basin as per the Watershed Atlas of India

As per the watershed atlas of India, Published by Department of Agriculture and cooperation, Ministry of agriculture, Krishi Bhavan New Delhi (1990),

The sub-catchments from 5C1A to 5C5B pertain to Tapi Basin as shown in **plate-3**.

2.1.4.1 Sub-catchment -5C1A (5C1A1 to 5C1A4) : This catchment is situated in the Surat district of Gujarat drained by lower Tapi River near to its confluence with and

some small tributary like Ver and Anjana. The catchment area of this sub catchment is 2140 sq.km.

2.1.4.2 Sub-catchment 5C1B (5C1B1 to 5C1B4): This Catchment is situated in the plain region of Surat and Bharuch District of Gujarat drained by Kim, Sena, Kini and Ghanta River. The total catchment area of this Catchment is 2580 sq.km

2.1.4.3 Sub-catchment -5C2A (5C2A1 to 5C2A7): This catchment is situated in the hilly and plane region of Gujarat, Maharashtra State and Madhya Pradesh (MP) drained by small tributaries such as Godada nadi, Dadan khadi, Dudhi, khadi, Kanji nadi, Dehli nadi, Vatkaada nadi, Valhari nadi,Vaki, Gomai, Umri, Lendi-Kordi, covered under Bharuch and Surat districts in Gujarat, Dhulia in Maharashtra and Khargone in MP with the catchment area of 3890 sq.km.

2.1.4.4 Sub-catchment 5C2B (5C2B1 to 5C2B7): This catchment is situated in the hilly and plain region of Maharashtra State and Madhya Pradesh drained by small tributaries such as Arunavati, Aner, Dhudkheda, Guli Bhaurak, Mor and Suki on the Right Bank of Tapi River. The total catchment area of this catchment is 4890 sq.km.

2.1.4.5 Sub-catchment - 5C3A (5C3A1 to 5C3A5): This is situated in the plain region of Gujarat and Maharashtra State, drained by Main tributaries such as Rangavali, Nesu, Kordi, Shivnad, Bhad and Amravti in Sub-catchment on the Left Bank of Tapi River. The total catchment area of this Catchment is 3200 sq.km.

2.1.4.6 Sub-catchment- 5C3B (5C3B1 to 5C3B8): This is situated in the plain region of Maharashtra State, drained by Buray, Sur, Pan, Panjhara, Kanehr, Mokti, Hinasan, Jamkheri Kan, Bori Chikli, Sugran and Kanoli covered under Dhulia, Jalgaon and Nasik district and falls in the Sub-catchment on the Left Bank of Tapi River. The total catchment area of this catchment is 6480 sq.km.

2.1.4.7 Sub-catchment- 5C3C (5C3C1 to 5C3C9): This is situated in the plain region of Maharashtra State, drained by Anjani, Girna, Bahula, Tittut, Nanyad, Panjhari, Sukhi, Masam, Kanjari, Aram and Punand in sub-catchment on the Left Bank of Tapi River covered most of the part of Jalgaon Nasik, Aurangabad and Dhulia. The total catchment area of this catchment is 10100 sqkm

2.1.4.8 Sub-catchment-5C3D (5C3D1 to 5C3D4): This is situated in the plain region of Maharashtra State, drained by Main tributaries such as Vaghursur, Kag, Khadki, Koka and Bhogavati in the sub-catchment on the Left Bank of Tapi River. The total catchment area of this catchment is 2800 sq.km

2.1.4.9 Sub-catchment -5C4A (5C4A1 to 5C3A6): This sub catchment is situated in the plain region of Maharashtra State, drained by the Tributaries of Purna River such as Nalganga, Biswa, Ghan nadi, Mas, Nirgana and Mun. Catchment area of this sub-catchment is 5950 sq.km.

2.1.4.10 Sub-catchment -5C4B (5C3B1 to 5C3B6): This sub-catchment is situated in the plain region of Maharashtra State, drained by the Tributaries of Purna River such as Ban, Shahnur and Bodli km. Catchment area of this sub- catchment is 4020 sq.km

2.1.4.11 Sub-catchment -5C4C (5C4C1 to 5C4C6): This is situated in the plain region of Maharashtra State, drained by the Tributaries of Purna River such as Murna, Purna, Katapurna, Uma and Pedhi Catchment area of this sub-catchment is 5950 sq.km.

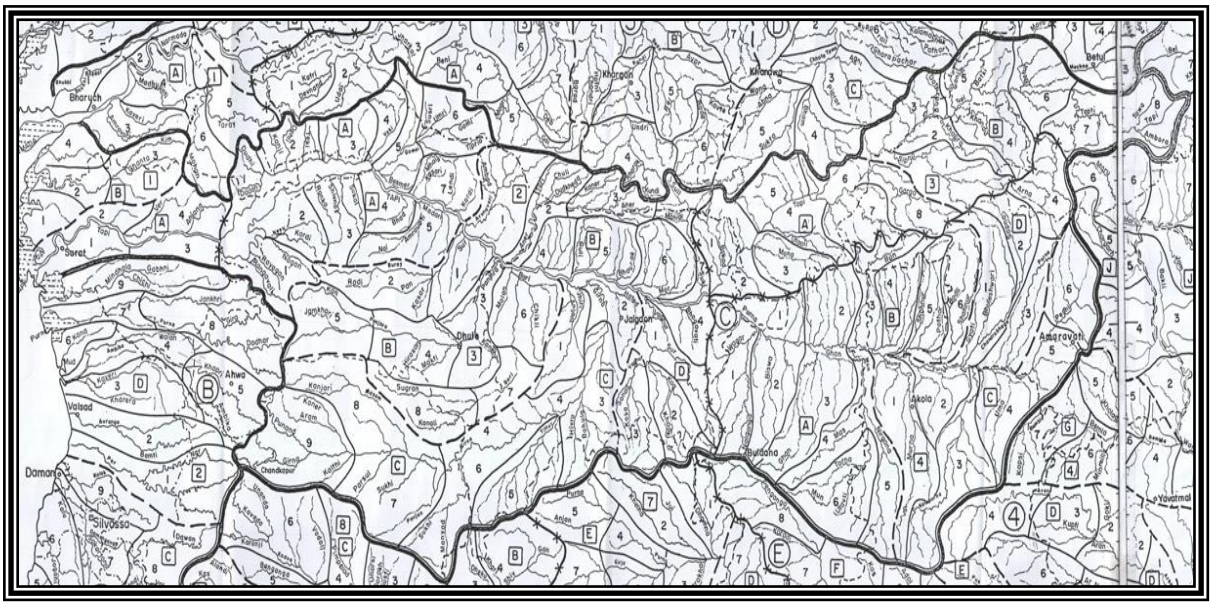
2.1.4.12 Sub-catchment -5C4D (5C4D1 to 5C3D4): This Sub Catchment area is situated in the plain region of Maharashtra State, drained by the Tributaries of Purna River such as Chanrabhaga, Sapna, and Arna. The total catchment area is 3370 sq.km

2.1.4.13 Sub-catchment -5C5A (5C5A1 to 5C5A8): This Catchment is situated in the plain and hills region of Maharashtra and Madhya Pradesh State, drained by the Bokad river, Mona river, Utaoli, Tapi and Garg. The total catchment area is 4650 sq.km.

2.1.4.14 Sub-catchment - 5C5B (5C5B1 to 5C1B8): This Catchment is situated in the plain and hills region of Maharashtra and Madhya Pradesh State, drained by Sipna, Kharpra, Dahsana, Khandu, Baki, Betul and Ambora in Sub-catchment. The total catchment area of this sub-catchment is 5980 sq.km.

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

Plate no-2.1.2

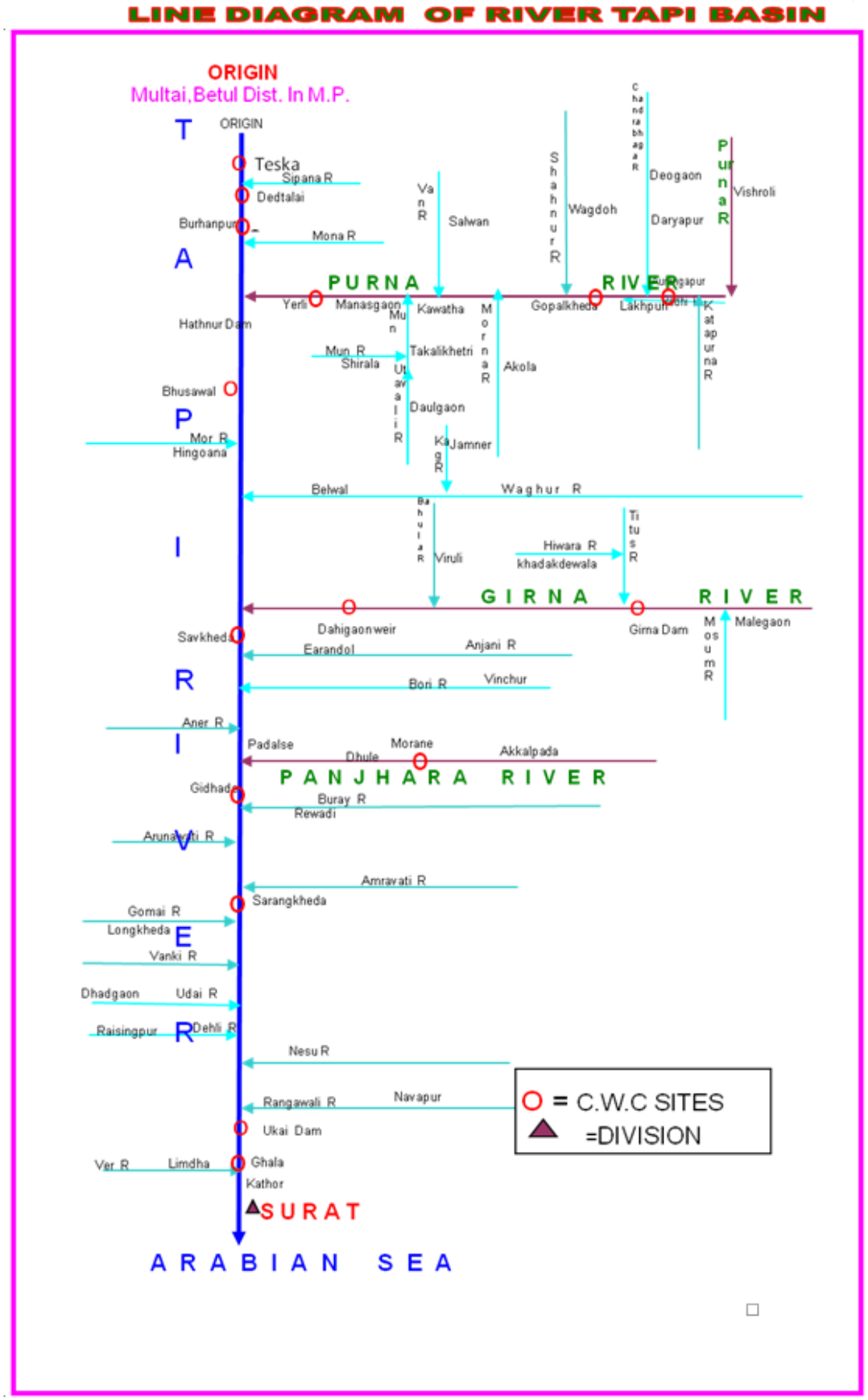


Table–2.2: **General information of main River / Tributaries of Tapi River Basin**

Sl. No.	Name of River / tributary	Bank	Elevation of source above m.s.l. [m]	Length [km]	Catchment area [km^2]	% of total area
1.	2.	3.	4.	5.	6.	7.
1	Tapi		752	724	22522	34.57
2	Gomai	Right	600	58	1148	1.76
3	Arunavati	Right	450	53	935	1.44
4	Buray	Left	600	64	1419	2.18
5	Panjhra	Left	600	138	3257	5.00
6	Bori	Left	600	130	2580	3.96
7	Aner	Right	600	94	1702	2.61
8	Girna	Left	900	260	10061	15.44
9	Waghur	Left	751	96	2592	3.98
10	Purna	Left	900	274	18929	29.06
				TOTAL	65145	100

Plate-no.2.1.3

LINE DIAGRAM OF RIVER TAPI BASIN



2.1.5 The Climate

The climate of the Tapi Basin is characterized by a hot summer and general dryness throughout the year except during the south-west monsoon season in the upper and middle part of basin but the lower part of the Tapi River Basin shows variation in temperature, rainfall, humidity and other climatic parameters.

The year may be divided into four periods. The winter from December to February, the summer from March to May, the south-west monsoon season from June to September and the post-monsoon period from the October to November

2.1.5.1 Temperature

Temperature of Tapi basin is like any other part of central India, the temperature is maximum in the month of May and minimum in the month of December to January. In general, upper and middle part of Tapi basin record lower temperature as compared to the lower Tapi basin where the influence of the sea is prominent, and temperature fluctuation is lower than the upper and middle basin. The temperature profile in the basin is given in the **table-2.3.**

Table-2.3: **Temperature profile of Tapi basin Mean Monthly Maximum Temperature (^{o}C)**

Month	**Mean Monthly Maximum Temperature (^{o}C)**										
Location / Name of Site	Dedtalai	Burhanpur	Lakhpuri	Gopalkheda	Yerli	Hathnur	Bhusawal	Savkheda	Morane	Gidhade	Sarangkheda
Jun-18	35.0	35.0	36.8	40.0	37.2	37.3	39.6	28.3	40.6	39.2	44.9
Jul-18	28.0	27.6	28.7	32.4	30.6	31.3	33.5	26.2	*	32.7	30.5
Aug-18	27.0	27.7	29.4	31.0	28.9	30.1	32.9	20.1	31.1	32.2	30.5
Sep-18	29.2	30.0	30.8	31.2	30.9	32.0	35.3	32.2	32.3	34.4	34.7
Oct-18	31.2	32.5	32.1	33.5	32.9	35.1	37.8	33.7	36.4	38.9	38.2
Nov-18	28.4	30.0	31.0	31.7	31.7	32.4	35.1	32.8	34.1	.5.2	35.4
Dec-18	25.0	25.3	25.7	27.9	27.5	27.6	30.4	27.7	34.8	30.8	29.5
Jan-19	24.7	25.3	25.5	29.0	27.6	27.2	29.6	27.6	31.9	28.9	29.4
Feb-19	28.8	30.0	30.4	31.6	30.6	31.4	33.5	30.6	34.9	33.4	34.2
Mar-19	33.0	34.5	34.8	34.8	36.4	26.6	38.0	34.5	38.5	37.0	37.4
Apr-19	38.0	39.8	40.7	39.8	42.4	42.1	43.4	39.8	43.5	41.5	43.3
May-19	40.4	40.8	40.4	42.2	43.2	42.5	43.9	41.6	43.8	43.1	42.5
Annual Mean	30.7	31.5	32.2	33.8	33.3	33.0	36.1	31.3	33.5	32.7	35.9

Note:- * Instrument not working

Table-2.4: **Temperature profile of Tapi basin (Mean Monthly Minimum Temperature (^{o}C))**

Month	Mean Monthly Minimum Temperature (^{o}C)										
Location / Name of Site	Dedtalai	Burhanpur	Lakhpuri	Gopalkheda	Yerli	Hathnur	Bhusawal	Savkheda	Morane	Gidhade	Sarangkheda
Jun-18	26.5	26.2	14.6	26.9	25.2	28.3	27.1	26.3	31.4	30.4	26.2
Jul-18	23.5	23.8	24.6	22.5	23.2	25.6	25.0	24.7		20.7	24.1
Aug-18	23.0	24.3	24.7	23.1	22.7	25.6	24.6	24.2	24.4	19.7	25.3
Sep-18	22.4	22.7	23.5	22.7	21.7	25.5	23.6	23.8	21.1	20.0	23.7
Oct-18	21.0	21.8	20.3	23.4	18.8	23.1	21.4	21.0	20.1	17.6	22.3
Nov-18	17.6	17.6	16.3	19.6	12.8	18.6	18.6	15.8	15.0	13.4	19.5
Dec-18	13.5	12.9	14.3	11.0	8.4	11.9	14.1	11.2	13.4	9.6	12.8
Jan-19	11.2	11.2	12.8	8.6	7.5	10.5	13.0	9.7	10.4	8.1	11.0
Feb-19	15.5	15.7	16.4	14.7	12.2	16.7	16.8	13.4	14.4	11.3	13.6
Mar-19	19.9	19.0	20.5	18.5	16.3	23.7	20.6	17.8	18.5	14.5	18.4
Apr-19	25.5	24.4	27.7	22.2	22.1	30.0	27.1	22.7	24.8	20.1	26.0
May-19	29.7	26.5	32.6	20.6	24.9	28.7	28.7	27.4	26.9	22.9	27.1
Annual Mean	20.8	20.5	20.7	19.5	18.0	22.4	21.7	19.8	18.4	17.4	20.8

2.1.5.2 Rainfall

The south west monsoon sets in the Tapi basin in the middle of June and withdraws by mid October. About 90 percent of total rainfall is received during the monsoon months, of which 50% is received during July and August. The Tapi River basin shows different climatic characteristics due to the variation of topography from upper to lower part of basin.

The average rainfall in the Tapi basin is 848.9 mm. Basin wise variations of rainfall are shown in **table-2.5** and average rainfall recorded at various sites is given under **table- 2.6.**

Table-2.5: Average Monsoon rainfall since 1987

Sr. No.	Name of Sub Basin	Bank	Length in Km	Catchment Area (sqkm)	% with reference to total area.	Average of Monsoon rainfall (mm) since 1987
1.	Upper Tapi up to Hathnur	Main	290	10471	16.1	999.7
2.	Purna	Left	274	18929	29.1	702.3
3.	Middle Tapi, Hathnur to Ukai excluding Girna.	Main	305	22734	34.9	733.0
4.	Girna	Left	260	10061	15.4	656.3
5.	Lower Tapi-from Ukai to confluence to sea near Surat	Main	129	2920	4.5	1197.9

Table -2.6: **Rainfall at sites in Tapi Basin**

Average Annual Rainfall for the period, since inception							
Sl No	Name of Site	District	Seasonal Average Rainfall (mm)				Total Annual Average Rainfall
			Winter monsoon (Jan-Feb)	Pre monsoon (Mar-May)	South-west monsoon (June-Sept)	post monsoon (Oct-Dec)	
1	Teska	Betul (MP)	10.9	14.5	1058.7	19.0	1103.2
2	Lakhpuri	Akola (MS)	15.9	28.3	662.2	75.3	781.7
3	Chikhaldara	Amarawati	20.7	30.9	1473.4	109.5	1634.4
4	Gopalkheda	Akola (MS)	16.5	23.1	639.0	54.0	732.6
5	Dedtalai	Burhanpur (MP)	12.2	17.8	824.7	53.2	907.9
6	Burhanpur	Burhanpur (MP)	14.1	23.9	777.4	63.1	878.5
7	Yerli	Buldana (MS)	12.9	19.8	600.0	74.8	707.5
8	Hathnur-	Jalgaon (MS)	11.7	12.9	606.9	63.5	695.1
9	Bhusawal	Jalgaon (MS)	8.4	18.4	635.7	58.7	721.2
10	Girna	Nasik (MS)	16.2	66.6	2070.0	54.0	617.0
11	Dahigaon	Jalgaon(MS)	7.6	22.6	674.3	60.9	765.4
12	Savkheda	Jalgaon (MS)	4.6	17.6	597.1	49.6	668.9
13	Morane	Dhule(MS)	6.4	13.7	484.2	59.7	565.0
14	Gidhade	Dhule(MS)	3.7	9.1	530.4	40.9	584.1
15	Sarangkheda	Nandurbar (MS)	2.6	14.0	563.2	43.8	623.6

2.1.5.3 Wind

Wind speed profile of the basin, based on data collected, is given in **table-7.** The average monthly wind speed in the Tapi basin varies between about 15 km/h and 1.2 km/h. In the pre and post monsoon period, the wind speed is generally higher. The predominant wind direction is NW followed by SW and W. **Table-2.7** shows wind data of Tapi basin.

Table-2.7: **Wind speed profile of Tapi Basin**

Month	**Average wind Speed km/h**									
Location / Name of Site	Dedtalai	Burhanpur	Lakhpuri	Gopalkheda	Yerli	Hathnur	Bhusawal	Savkheda	Morane	Gidhade
Jun-18	*	2.9	0.1	6.3	*	*	2.8	7.3	9.6	5.6
Jul-18	*	2.0	0.0	3.7	*	*	1.4	4.4	0.5	2.8
Aug-18	*	2.2	0.0	4.7	*	*	1.5	5.7	0.7	4.2
Sep-18	*	0.6	*	3.4	*	*	1.3	4.8	0.9	2.2
Oct-18	*	0.5	*	2.3	*	*	1.8	1.0	0.4	0.6
Nov-18	*	0.6	*	4.2	*	*	1.2	1.2	0.4	0.9
Dec-18	*	0.6	*	5.2	*	*	3.1	1.5	0.4	1.0
Jan-19	*	0.8	*	5.8	*	*	2.0	1.7	0.4	0.5
Feb-19	*	0.5	*	7.0	*	*	1.3	3.2	0.6	1.2
Mar-19	*	0.5	*	7.3	*	*	1.0	3.9	0.7	1.2
Apr-19	*	0.7	*	7.2	*	*	1./	0.3	0.8	1.7
May-19	*	1.2	*	6.9	*	*	3.0	1.0	1.3	4.9
Annual	*	1.1	*	5.3	*	*	1.9	3.0	1.4	2.2

Note:- * Instrument not working

2.1.5.4 Humidity

The morning relative humidity in the basin varies between 92.4% to 34.6% and the evening relative humidity is between 85.8% to 25.4% depending upon the season. Humidity is maximum during the monsoon months and is around 80% to 90%. In winter months of December and January, relative humidity comes down to around 30%. Variation in relative humidity between upper, middle and lower section of basin is not very pronounced except in the vicinity of coastal areas. The relative humidity at various stations of CWC in the Tapi basin is given in **Table-2.8**.

Table-2.8: **Relative Humidity Data for Tapi basin**

Month	% Morning Humidity						
Location / Name of Site	Dedtalai	Burhanpur	Lakhpuri	Gopalkheda	Yerli	Hathnur	Bhusawal
Jun-18	75.1	85.6	79.8	71.5	62.9	68.1	68.8
Jul-18	88.6	89.3	89.8	71.4	75.7	80.4	84.0
Aug-18	88.7	92.5	88.9	84.7	76.0	83.0	86.7
Sep-18	88.0	87.6	88.9	81.4	77.5	80.5	82.5
Oct-18	76.1	75.7	87.1	73.0	72.5	60.0	66.5
Nov-18	76.1	71.2	80.5	73.0	60.2	59.4	64.5
Dec-18	77.4	74.4	76.2	68.1	*	54.8	65.4
Jan-19	77.2	71.6	74.7	61.9	*	55.3	68.9
Feb-19	70.5	62.7	64.1	61.9	*	48.6	57.1
Mar-19	61.7	50.0	56.5	50.5	*	40.2	49.6
Apr-19	56.7	48.2	53.6	56.1	*	30.8	41.1
May-19	54.0	49.7	53.5	55.7	*	44.6	54.2
Annual Mean	74.2	71.6	74.5	67.4	70.8	58.8	65.8

Note:- * Instrument not working

Month	% Evening Humidity						
Location / Name of Site	Dedtalai	Burhanpur	Lakhpuri	Gopalkheda	Yerli	Hathnur	Bhusawal
Jun-18	56.2	67.4	71.0	55.3	46.0	54.3	50.5
Jul-18	84.4	83.5	82.2	72.6	68.8	78.7	82.7
Aug-18	86.0	84.4	79.4	78.6	78.3	74.5	76.3
Sep-18	74.3	64.0	68.2	73.0	71.6	64.6	63.9
Oct-18	59.3	43.0	48.7	54.4	58.3	47.5	38.1
Nov-18	56.8	46.3	49.8	61.8	45.8	56.0	43.2
Dec-18	59.0	51.3	67.0	51.1	*	50.0	44.6
Jan-19	52.7	43.7	74.4	45.8	*	43.5	42.0
Feb-19	47.9	38.4	43.6	48.3	*	44.1	31.9
Mar-19	44.0	31.0	42.6	45.9	*	32.5	23.9
Apr-19	43.0	31.6	40.3	46.2	*	24.1	22.4
May-19	37.6	32.0	36.1	43.1	*	23.3	25.0
Annual Mean	51.4	58.6	56.3	61.5	49.4	45.4	45.4

Note:- * Instrument not working

2.1.6 Geology

Trap Rocks

Deccan traps cover maximum part of this basin, These trap rocks are the result of outpouring of enormous lava flows which spread over vast areas of Western, Central and Southern India at the end of mesozoic era. They came through long narrow fissures and cracks in the earth crust and spread out as nearly horizontal sheets. They are called 'plateau basalt', because they form a flat-topped plateau. Due to the step-like or terraced appearance on the slope of hills they are also known as 'trap'. These volcanic rocks assume a considerable thickness ranging from a few hundred feet in the south to a couple of thousand feet in the north. The individual thickness of flow varies from a few feet up to a 100 feet or more. A bore-hole at Bhusawal 1211 feet deep, revealed 29 flows, the average being 40 feet In the high hills consisting of several flows, the individual flows can easily be demarcated by their distinct flow lines along which a thin growth of grass is noticed. The lavas are generally horizontal in disposition but at places they dip at very small angles. The traps that are commonly found in the plateau or cliff faces are compact and harder, often characterized by vertical prismatic or columnar jointing. They are dark grey or dark greenish grey to brownish grey in color. The amygdaloidal variety, which is greenish to purplish in color and comparatively softer, generally forms the slopes and valley floors. They contain innumerable cavities which are usually filled with secondary minerals such as quartz, chalcedony, agate, jasper, rock crystal, Zeolites and calcite: The ash or Scoriaceous beds and red bole beds are sometimes noticed. The main minerals constituent in the trap rocks are abundant in Labradorite and Enstatite-augite with varying proportion of interstitial glass which on alteration gives rise to secondary minerals like Palagonite, Chlorophaete Iddingsite, etc. Sometimes Porphyritic basalt is seen showing Phenocrysts of Felspars and glassy matters. Magnetite occurs as minute discreet grains amidst other minerals as well as in the glassy groundmass. In a few cases, olivine is also present.

The other formations found in the basin are Alluvium , lower Gondwana, Cuddapah system Bijwara series and granites gneiss. Most of the area of Tapi basin falling in the Maharashtra state is full of cuts and valleys, land on the right side of the basin lying on southern slopes of Satpura hills consist of black soils the soil cover is deep and rock is found at greater depths. Lands on the left of the basin on northern slopes of Sahyadri consist mainly of dykes and red Murrum soil and are rocky in most parts.

The stratigraphic sequence of Tapi basin is tabulated **table-9**.

Table-2.9: **Stratigraphic sequence**

Formation	Age
Soil, river alluvia, calcareous Kankar and sands, etc.	Recent.
Conglomerates	Sub-recent.
Trap dykes	Cretaceous Eocene
Deccan basalt flows with inter-trappean Beds, ash beds.	
Erosional Unconformity :	
Upper Gondwana sandstones	Lower cretaceous.

Source : Cultural.maharashtra.gov.in/english/gazetteer

Tectonics and Sedimentation in Tapi Basin

The Late Cenozoic period in the Central Indian Tectonic Zone (CITZ) was marked by several episodes of crustal adjustments which are reflected in terms of various tectonic landforms, repeated adjustments in the drainage systems and sedimentation pattern in the Tapi basin which is a half graben structure. The northern margin of the basin is bound by ENE-WSW trending Tapi Fault Zone (TFZ) while the southern margin gradually merges with the Ajanta-Buldhana plateau.

The Tapi in the initial eastern part runs along a narrow intermontane valley carved into the lower middle level plateau of the south Satpuras. The course of the river is dominantly straight to sinuous with resistant channel boundaries and coarse bed material. Here, majority of the fluvial deposition has been in the form of overbank deposits with restricted flood plain development. The river here flows through a fault controlled valley cut into Deccan Traps and the river terraces on either bank are unpaired. The episode of faulting appears to have been preceded by a high rainfall phase and development of ash associated red paleosol horizon. Post uplift sedimentation in this part of the basin has been in form of buff coloured slack water deposits, dominantly finer grained during uppermost part of Late Pleistocene. Possible inset of transient arid phase (~LGM) had led to preservation of lithified grit beds. The last phase of sedimentation in this part of the basin is in form of grey silt bearing inset terraces of Holocene period derived from older sediments. This phase appears to have witnessed a major episode of faulting as evident by presence of massive, meter scale bank collapse structures in the sediments. At present the river has set into a denudational phase, engaging into deep incision of its older sediment package and intense undercutting of the

exposed sections. Intense vertical erosive activity influenced by slow tectonic uplift is manifest in form of fresh scarp sections, presence of giant pot holes and talus scree and block falls from the sections along the river course. The imprints of ongoing tectonic activity in this part have been in the form of tilting, crushing and brecciation of Deccan Traps and alignment of hot and cold springs along the river course.

The Tapi River after traversing this intermontane valley descends onto the foothills which has a different set up of tectonic landforms and sedimentation history. Here the river course is having dominantly wide and open meander bends with occasional presence of point bars and channel bars. This part represents the deeper part of the basin and sedimentation here has been under the influence of two regional scale faults: Tapi North Fault (TNF) traversing the lower plateau parts of the Satpura ranges and its margin and Tapi River Fault (TRF) which as the name suggests, runs along the course of the Tapi river and has governed the sedimentation pattern in the basin. Several first order transverse tributaries emerge from the Satpura foothills and join the Tapi River course in this stretch. Chronological data supports that the sedimentation in this part of the basin was initiated at least during middle Pleistocene. Episodic uplift of the reactivated segments of old crustal scale discontinuities has provided loci for sedimentation in the basin. The flood plain (red palaeosol) sediments of this part also show signatures of high rainfall phase caused by intensification of monsoon and episodic uplift of the northern footwall block of TNF. Climatic amelioration caused development of multiple bedded calcrete horizons and flash flood deposit. Rejuvenation of the main river and its tributaries has also introduced channel deposits along the river courses at a later phase possibly during upper part of Late Pleistocene. The youngest Holocene deposit occur as inset terraces along the river course. The sedimentary pile in this part is appreciably thick and the base rock/Quaternary contact is not seen along the river course except for the parts which have witnessed contemporary uplift along TRF.

Both TNF and TRF have been active during the deposition of sediments in this part of the basin. The imprints of TNF activity have been in the form of zones of high geothermal gradient, accelerated denudation even along the juvenile first order streams and deformation of sediments. TRF on the other hand, has preserved the evidences of active tectonic activity in the form of paleoliquefaction features,

deformation of sediments, development of coalesced colonies of potholes resulting from intense scouring of the Deccan Trap base rock along the uplifted segments of the TRF and development of alluvial fans. The episodic faulting in the basin created the depocentre for initiation of sedimentation and seismicity in the basin.

(Source: Snigdha Ghatak, Mriganka Ghatak , Tectono-climatic controls on fluvial sedimentation of upper and middle reaches of Tapi River basin, Central India, 2011, Second National Working Group Meeting, Geological Survey Of India)

Purna Basin

Part of the basin is covered by rocks of the Deccan volcanics of Creteceo-Eocene age, and a few alluvium patches of the Purna and Penganga basin, respectively. The trap rocks are usually fine to coarse-grained, dark grey to greenish-black basalts of vesicular and massive types. The hard compact massive flows are generally noticed on the hill tops, *e.g.*, Melghat section whereas comparatively soft and amygdular varieties usually occupy the flanks of the hill or valley floors. Spheroidal exfoliation is a characteristic feature of weathering in the traps. Besides vertical and inclined jointing, columnar jointing is also well seen in more massive types. The vesicular and non-vesicular flows are at places separated by thin beds of ash or scoriae, but typical inter-trappean sedimentary rocks have not been recognised in the area. The amygdular varieties of flows carry secondary minerals like zeolites (mostly heulandite), calcite and chalcedony. No dykes have been found associated with the trap flows in the district where a lava pile of approximately 800 metres is preserved.

Alluvium

The Purna valley alluvium occupies an extensive stretch of low lying ground between Paturda and the confluence of Purna river with that of Tapi in Jalgaon district. In the river valleys and where superficial rain-wash has accumulated, a mixture of black cotton soil associated with sub-recent conglomeratic formation or light brown laterite material is noticeable at places, but otherwise, there is little variation in the nature and extent of soil or any variety of geological interest. The alluvium of the plains is usually of considerable depth. Much on the alluvium produces effervescence of sodium salts. Majority of the wells sunk in the area have brackish water.

Source : Cultural.maharashtra.gov.in/english/gazetteer

2.1.7 Soil

The soil in the Tapi basin up to Ukai Dam can be broadly classified in to three groups.

1. Coarse shallow soils
2. Medium black soils

3. Deep black soils.

The area covered by these three group of soils in the basin is given in **table-10.**

Table-2.10: **Types of Soil in Tapi basin**

sl. no.	Type of soil	Districts covered
1	Coarse shallow soils	Betul, Khandwa, Khargon, Amrawati, Akola, Buldhana, Jalgaon, Dhule, Aurangabad and Nasik
2	Medium black soils	Khandwa, Amrawati, Akola, Buldhana, Jalgaon, Dhule, and Nasik
3	Deep black soils.	Amrawati, Akola, Buldhana, Jalgaon, Dhule, Nasik, Surat and Bharuch

Coarse shallow soils

These soils have developed primarily from the basaltic Deccan trap and have been considerably affected by natural processes of weathering and erosion. Their depth is generally between 25cm to 50 cm and seldom more, their texture from surface to sub surface varies from silty loam to clay. Their organic matter content is usually poor and they are moderately drained.

Medium black soils

These soils have developed from Deccan traps and cover the largest area of the basin. Their depth is generally between 50cm to 1m. these soils contain higher lime reserve and are alkaline in reaction. These soils are fair in their contents of phosphates and potash but low in organic matter and nitrogen.

Deep black soils

These soils are found along the Purna river and in the middle and lower reaches of Tapi River. These soils have originated primarily from decomposition of trap rocks of hilly ranges. The depth of this soil varies from 1m to 6m. The soil have very high clay content Montmorillonite predominating and not easily workable during monsoon. The soil reaction varies from neutral to alkaline.

Source: Hydrology and Water Resources of India, Water Science and Technology Library Volume 57, 2007, pp 561-595 Tapi, Sabarmati and Mahi Basins, Sharad K. Jain, Pushpendra K. Agarwal, Vijay P. Singh (http://link.springer.com/chapter/10.1007%2F1-4020-5180-8_12)

2.1.8 Forest

The Tapi basin exhibits two distinct geographical regions, viz., the plain regions in the east and south-east and the hilly regions of the Satpura ranges in north and north-west.

The plain region is extensively cultivated and forests appear only in dotted, scattered patches. The hilly region is an extensive block of compact forests and contains an abundance of rich teak trees. The percentage of the forest area to total area in the Tapi basin is approximately 25% of the total area, and is unevenly distributed.

Tree Forests

These include the forests of producing big-size teak and timber of other type.

Minor Forests

These include the forests in the plain regions, which are capable of producing small-size timber poles of teak, etc. These forests also supply fire-wood, thorns and grass and serve as good pastures for grazing the cattle.

Babul Bans.

These are artificially created forests of Babul (*Acacia arabica*) in the cultivated plain tracts and lie dotted over the area.

Ramnas and Pasture Forests

These include open forests with sparse tree growth and lie mostly in the plain regions, where an intense demand exists for grass and grazing.

Utilization

The forests are managed under regular working plans, the object being the supply of large-size timber for commercial use. The minor forests like Babul Bans and the Ramnas and pasture lands are being maintained to supply the local demand for small-size timber, fuel, grass and grazing.

Forest Produce

The major forest produce is timber. The minor forest produce constitutes various items, such as bamboo, fuel, Rosha grass, fodder grass, minerals, horns and hides, Tendu leaves and gum.

Forest Trees

The most useful trees and plants found in these forests, are given below: -

Teak (*Tectona grandis*), *Tiwas* (*Ougenia dalbergioides*), *Shisham* (*Dalbergia latifolia*)., *Bija* (*Pterocarpus marsupium*)., *Haldu* (*Adina cordifolia*), *Saj* (*Terminalia tomenlosa*), *Dhawda* (*Anogeissus latifolia*), *Dhaman* (*Grewia tiliaefolia*), *Semal* (*Bombax malabaricum*; *Silk cotton tree*), *Siivan* (*Gmelina arborea*), *Kusum* (*Schleichera trijuga*), *Kalam* (*Stephegyne parvifolia*),

Kahu (*Terminalia arjuna), Landia* (*Lagerstroemia parviflora*), *Harra* (*Terminalia chebula), Bhormal* (*Hymenodictyon excelsum*), *Salai* (*Boswellia serrata*), *Moyen* (*Odina nodier*), *Kekda* (*Garuga pinnata*), *Maharukh* (*Ailanthus excelsa*), *Moha* (*Madhuca latifolia*),*Tendu* (*Diospyros melanoxylon), Achar* (*Buchanania lanzan), Aonla* (*Emblica officinalis*) *Beheda* (*Terminalia belerica*), *Bhilawa* (*Semecarpus anacardium*) *Amba* (*Mangifera indica*) *Bor* (*Zizyphus jujuba*) *Palas* (*Butea frondosa*) *Babul* (*Acacia arabica*) *Khair* (*Acacia calechu*), *Anjan* (*Hardwickia binata), Jamun* (*Eugenia jambolana), Bhosa* (*Bauhiniarecemosa*), *Rohan* (*Soymida febrifuga*), *Amalatas* (*Cassia fistula*), *Bel* (*Aeglemarmelos*), *Kumbhi* (*Careya arborea*), *Gular* (*Ficus species*), *Dahi-palas* (*Cordias*), *Mokha* (*Schrebera swietenioides*), *Bhirra* (*Chlo-roxylon swietenia*), *Hiwar* (*Acacialeucophloea), Kulu* (*Sterculia urens*), *Gongal* (*Cochlospermum gossypium*) *Dudhi* (*Wrightia tinctoria*), *Arang* (*Kydia calycina*) *Pangra* (*Exythrina Indica*), *Bamboos* (*Dendrocalamus strictus*).

Source: cultural.maharashtra.gov.in/english/gazetteer

2.1.9 Major/ Medium/Multipurpose/Irrigation projects

At present there are 38 Major and Medium Irrigation schemes completed and 2 projects are in under construction in the form of reservoirs or weirs in the Tapi catchment. List of the name of the completed, under construction and ongoing Projects are given in **Table. 11,12 and 13** respectively.

Table -2.11: **Major/ Medium/Multipurpose/Irrigation Projects (completed)**

Sl.No	Name of project	River	Status	Capacity (MCM)	
				Gross	Live
1.	Girna Project	Girna	Medium	608.450	523.55
2.	Dahigaon	Girna			
3.	Manyad Project	Manyad	Medium	53.95	40.27
4.	Bori Project	Bori	Medium	40.31	25.15
5.	Hathnur	Tapi	Medium	388.000	255.00
6.	Suki	Suki	Medium	50.16	39.85
7.	Abhora	Boked Nalla	Medium	7.440	6.020
8.	Boker Bari	Boker Bari Nala	Medium	7.090	6.54
9.	Agnawati	Agnawati	Medium	3.740	2.76
10.	Titur	Titur	Pick up bandhara.		
11.	Tondapur	Khadki Nalla	Medium	6.304	4.636
12.	Aner Project	Aner	Medium	103.230	56.38
13.	Karwand Proj.	Arunawati	Medium	33.840	31.15

14.	Panjhra Project	Panjhra	Medium	43.410	35.63
15.	Malangaon	Kan	Medium	13.020	11.35
16.	Kanholi	Khanholi	Medium	11.79	8.450
17.	Burai	Burai	Medium	21.330	14.21
18.	Arunawati	Arunawati	Mediu	27.780	14.97
19.	Rangawali	Rangawali	Medium	15.020	12.89
20.	Nagasakya	Panzar	Medium	15.620	11.240
21.	Haran Bari	Mousam	Medium	34.780	--
22.	Ukai	Tapi	Major	8510	7092
23.	Kakrapar	Tapi	Major	51.51	36.57
24.	Lakhigav	Dhakani	Medium	38.80	37.41
25.	Ver	Ver	Medium	4.90	4.61
26.	Sulwada Barrage	Tapi	Medium	65.06	64.642
27.	Sarangkheda Barrage	Tapi	Medium	92.20	91.82
28.	Prakasha Barrage	Tapi	Medium	63.64	62.11
29.	Kate Purna	Kate Purna	Major	97.670	86.350
30.	Nal ganga	Nal ganga	Major	76.200	69.320
31.	Uma	Uma	Medium	14.000	11.680
32.	Nirguna	Nirguna	Medium	32.290	28.850
33.	Morna	Morna	Medium	44.740	41.460
34.	Gyan ganga	Gyan ganga	Medium	36.260	33.930
35.	Mos	Mos	Medium	17.504	15.140
36.	Paltag	Vishvganga	Medium	9.090	7.510
37.	Man	Man	Medium	39.760	36.830
38.	Thoran	Tributary of Purna	Medium	8.480	7.900

NOTE: The information has been collected from concerned State Government.

Table -2.12: **Major/ Medium/Multipurpose/Irrigation Projects (Under construction)-Tapi basin**

Under Construction projects					
Sl No	Name of Project	River	Classification	Gross Capacity (MCM)	Live storage (MCM)
1	Shelgaon Barrage	Tapi	Medium	116.37	110.35
2	Padelsa Dam	Tapi	Medium	420.56	407.59

Note: The information has been collected from concerned State Government.

Table -13: **Ongoing Major /Medium Projects- Purna basin**

Sl. No	Name of Project	River	Classification	Gross Capacity (MCM)	Live storage (MCM)
1	Ghungshi Project	Purna	Medium	17.444	17.269
2	Purna Barrage II (Ner Dhamna)	Purna	Medium	8.1743	8.1126
3	Jigaon Project	Purna	Medium	736.579	296.726

NOTE: The information has been collected from concerned State Government.

2.1.9.1 Important Projects in Tapi Basin

The salient features of the important projects, namely Hathnur Dam of Upper Tapi Project, Kakrapar weir and Ukai Dam of Ukai Project, Girna Dam and Dahigaon Weir of Girna Project, are as follows:

Hathnur Dam (Maharashtra)

This is the first stage of Upper Tapi Project. It consists of 717 m long Ogee shaped gated overflow weir in the centre with 1863 m long earthen embankment on either side constructed across the river Tapi near Hathnur village in Jalgaon district of Maharashtra State. It is having a live storage capacity of 255 MCM to irrigate 3, 78, 384 hectares of land in Raver, Yawal and Chopda talukas of Jalgaon district by a right bank canal of 95 km length.

Kakrapar Weir (Gujarat)

The project comprises of an Ogee shaped masonry pick up weir constructed across the Tapi River near Kakrapar in Surat district of Gujarat. The weir was constructed at a cost of Rs.20.61 crores. The weir is 621 m long and 14m high. Two canals take off from either bank to irrigate an area of 2.28 lakh ha. This project was commissioned in the year 1954 as stage -- I of the Ukai project.

Ukai Dam (Gujarat)

This is stage - II of the multipurpose Ukai Project. It consists of 4928 m long and 68.6 m high composite earth - cum - masonry dam across the Tapi River near Ukai village in Surat district of Gujarat State. It includes a spillway with power dam

constructed on the left bank. Two canals take off from either bank to irrigate an area of 1.58 lakh ha. The power house has an installed capacity of 4 units of 75 MW each.

Girna Dam (Maharashtra)

It is constructed across river Girna, a tributary of river Tapi near Panzan village in Nandgaon taluka of Nasik district. This is a multipurpose scheme, main purpose being irrigation and subsidiary power generation (power generation yet to be started). This is a composite dam having total length of 963.17 m, masonry dam with gated spillway for a length of 426.72 m and earthen dam of length of 536.45 m respectively.

Dahigam Weir (Maharashtra)

It is constructed across river Girna near Dahigaon village in Pachora Taluka of Jalgaon district of Maharashtra. It consists of a Ogee shaped Weir having a length of 422.76m and a maximum height of 8.82m. It irrigates an area of 57797 ha land through left bank canal of 45.06 Km. length.

2.2 Purna Basin

2.2.1 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-2.2.1.**

Plate-2.2.1

2.2.2 River System

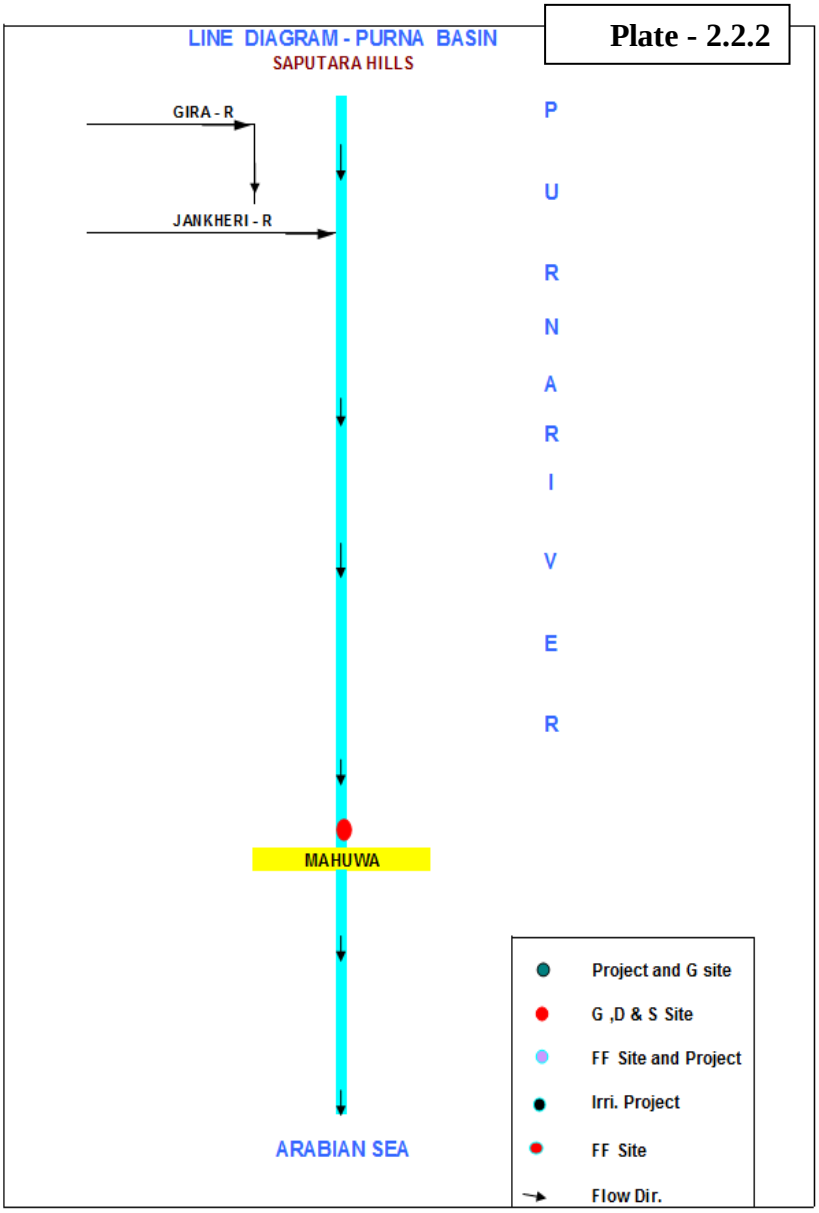
The river Purna rises in the Saputara hills of the Western Ghats near the village Chinchi in Maharashtra. The length of the river from its source to outflow in the Arabian Sea is about 180 km.

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-2.2.1** and line diagram of Purna river system is shown in **Plate - 2.2.2**

Table -2.2.1: 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 - 2.2.2



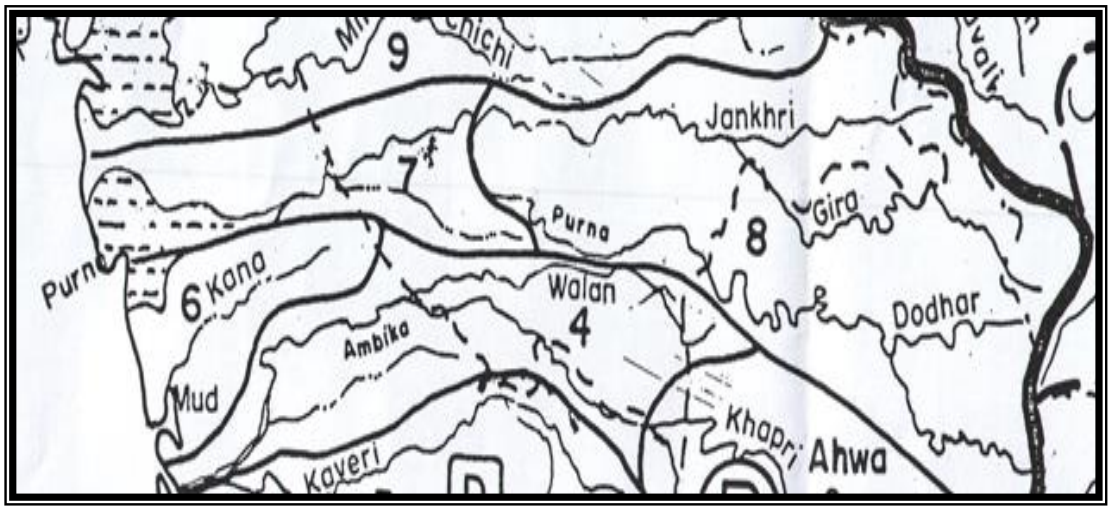
2.2.3 Purna Basin as per Watershed Atlas of India

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.

2.2.3.1 Sub catchment -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)

2.2.4 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 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:

2.2.4.1 Temperature

The Temperature is maximum in the month of May and Minimum in the month of December to January. The maximum, minimum temperatures observed 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 -2.2.2**

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

Mnth	Mean Monthly Maximum Temperature (^{o}C)	Mean Monthly Minimum Temperature (^{o}C)
Jun-18	33.9	27.2
Jul-18	28.1	25.1
Aug-18	28.1	25.8
Sep-18	30.1	25.6
Oct-18	33.2	24.0
Nov-18	30.8	19.9
Dec-18	26.9	15.2
Jan-19	30.6	13.6
Feb-19	33.5	17.3
Mar-19	37.9	18.2
Apr-19	41.4	23.9
May-19	40.1	25.9
Annual mean	32.9	21.8

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 1534.9 mm. The rainfall at site Mahuwa in Purna Basin shown in **Table - 2.2.3.**

Table -2.2.3 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 2018-19	No of rainy days in 2018-19
1	Mahuwa	33	1534.9	73	1569.6	63

Table-2.2.4: Seasonal Rainfall during Water Year 2018 at Mahuwa in Purna basin

Sl No	Name of Site	Seasonal Rainfall (mm) in 2018				Total Annual Rainfall
		Winter monsoon	Pre monsoon	South-West monsoon	Post monsoon	
		(Jan-Feb)	(Mar-May)	(June-Sept)	(Oct-Dec)	
1	Mahuwa	0.0	0.0	1569.6	0.0	1569.6

2.2.4.3 Wind

The wind speed and direction profile at site Mahuwa, based on collected data is given in **table -2.2.5**. The average monthly wind speed varies from 2.9 km/h to 0.0 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 2.2.5: Wind Speed at site Mahuwa in Purna basin during Water Year 2018-19

Month	Mean monthly wind Speed (km/h)
Jun-18	0.46
Jul-18	0.058
Aug-18	0.058
Sep-18	0.001
Oct-18	*
Nov-18	*
Dec-18	*
Jan-19	*
Feb-19	*
Mar-19	*
Apr-19	*
May-19	*
Annual mean	0.14

Note:- * Instrument not working

2.2.4.4 Humidity

The relative Humidity in Purna basin at site Mahuwa varies between 97.7% and 64.1% 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 -2.2.6**

Table 2.2.6: Mean monthly Relative Humidity at site Mahuwa in Purna Basin during Water Year 2018-19

Month	Relative Humidity (%)
Jun-18	88.57
Jul-18	89.74
Aug-18	88.09
Sep-18	90.07
Oct-18	87.81
Nov-18	77.57
Dec-18	75.06
Jan-19	74.10
Feb-19	75.80
Mar-19	72.50
Apr-19	77.80
May-19	82.50
Annual mean	81.67

2.2.5 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.

2.2.6 Soil

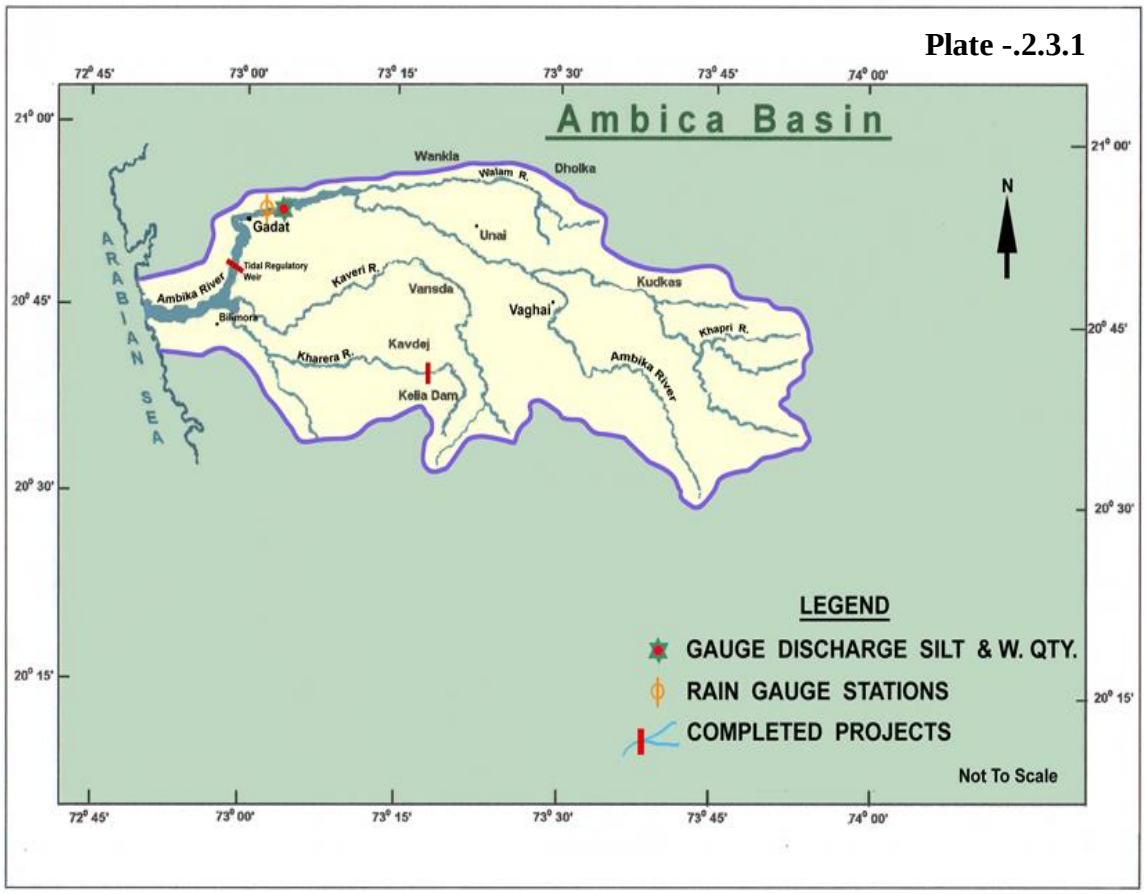
Soils of Purna basin can be classified into three groups viz lateritic soils, deep black soils and coastal alluvial soils.

2.3 Ambica Basin

2.3.1 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 -2.3.1.**

Plate -.2.3.1



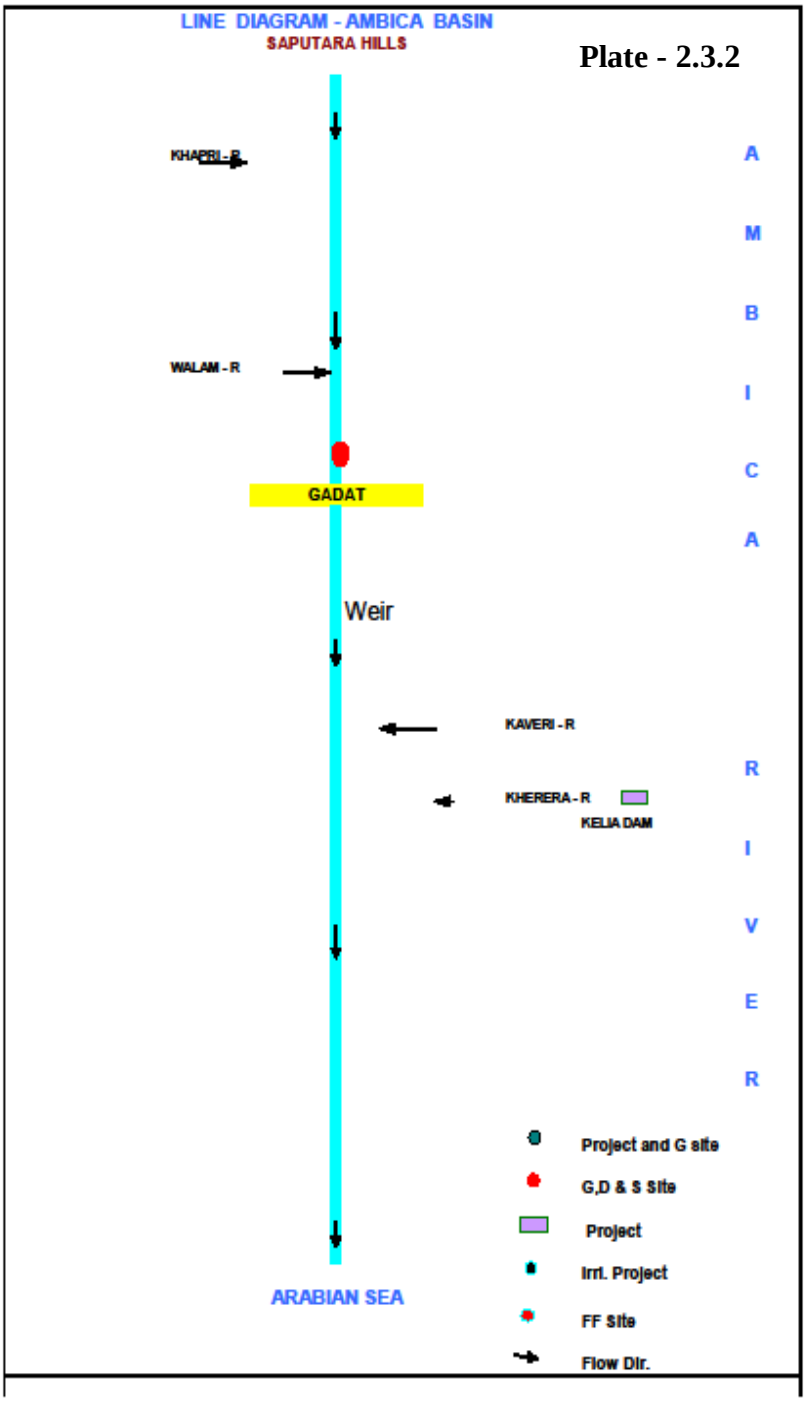
2.3.2 River System

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-2.3.1** and line diagram of Ambica river system is shown in **Plate - 2.3.2.**

Table -2.3.1: 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



2.3.3 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.-2.3.1.**

2.3.3.1 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)

2.3.4 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 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.

2.3.4.1 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 27.4^0C to 40^0C and 28.6^0C to 8^0 C respectively. The temperature profile in the basin is given in the **table 2.3.2**

Table-2.3.2: Mean monthly Temperature (^{0}C) during water year at site Gadat

Month	Mean Monthly Maximum Temperature (^{o}C)	Mean Monthly Minimum Temperature (^{o}C)
Jun-18	*	25.9
Jul-18	26.9	28.9
Aug-18	27.1	29.8
Sep-18	30.3	27.1
Oct-18	31.2	26.5
Nov-18	29.5	23.8
Dec-18	25.0	14.8
Jan-19	27.6	13.5
Feb-19	29.7	14.6
Mar-19	35.9	19.5
Apr-19	39.4	23.3
May-19	36.6	25.7
Annual mean	30.8	22.5

***** Note:- * Instrument not working

2.3.4.2 Rainfall

The basin receives most of the rainfall from the South West monsoon from June to September. Average annual rainfall in the basin is 1780.6 mm. The rainfall at site in Ambica Basin shown in **Table -2.3.3 & 2.3.4.**

Table -2.3.3: 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 2018-19	No of rainy days in 2018-19
1	Gadat	36	1780.6	73	2155.9	57

Table-2.3.4: Seasonal Rainfall during Water Year 2018 at site Gadat in Ambica Basin

Sl No	Name of Site	Seasonal Rainfall (mm) in 2018				Total Annual Rainfall
		Winter monsoon	Pre monsoon	South-West monsoon	Post monsoon	
		(Jan-Feb)	(Mar-May)	(June-Sept)	(Oct-Dec)	
1	Gadat	0	0	2156.7	0.0	2156.7

2.3.4.3 Wind

The wind speed and direction profile at site Gadat based on collected data is given in T**able -2.3.5**.The average monthly wind speed varies from 0.3 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 NE.

Table 2.3.5: Wind Speed at site Gadat in Ambica basin during Water Year 2018-19

Month	Mean monthly wind Speed (km/h)
Jun-18	2.56
Jul-18	1.24
Aug-18	0.19
Sep-18	0.15
Oct-18	0.06
Nov-18	0.05
Dec-18	0.12
Jan-19	0.12
Feb-19	0.09
Mar-19	0.13
Apr-19	0.18
May-19	0.22
Annual mean	0.23

2.3.4.4 Humidity

The relative Humidity in Ambica basin varies between 93.3 % to 74.0 % depending upon the season the humidity is naturally maximum in the monsoon period and is around 93.3 to 89.9 %. 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- 2.3.6**

Table -2.3.6: Mean monthly Relative Humidity at site Gadat in Ambica Basin during Water Year 2018-19

Month	Relative Humidity (%)
Jun-18	90.9
Jul-18	91.0
Aug-18	90.9
Sep-18	90.9
Oct-18	90.7
Nov-18	87.6
Dec-18	90.9
Jan-19	91.0
Feb-19	91.0
Mar-19	90.9
Apr-19	90.4
May-19	90.6
Annual mean	90.5

2.3.5 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

2.3.6 Soil

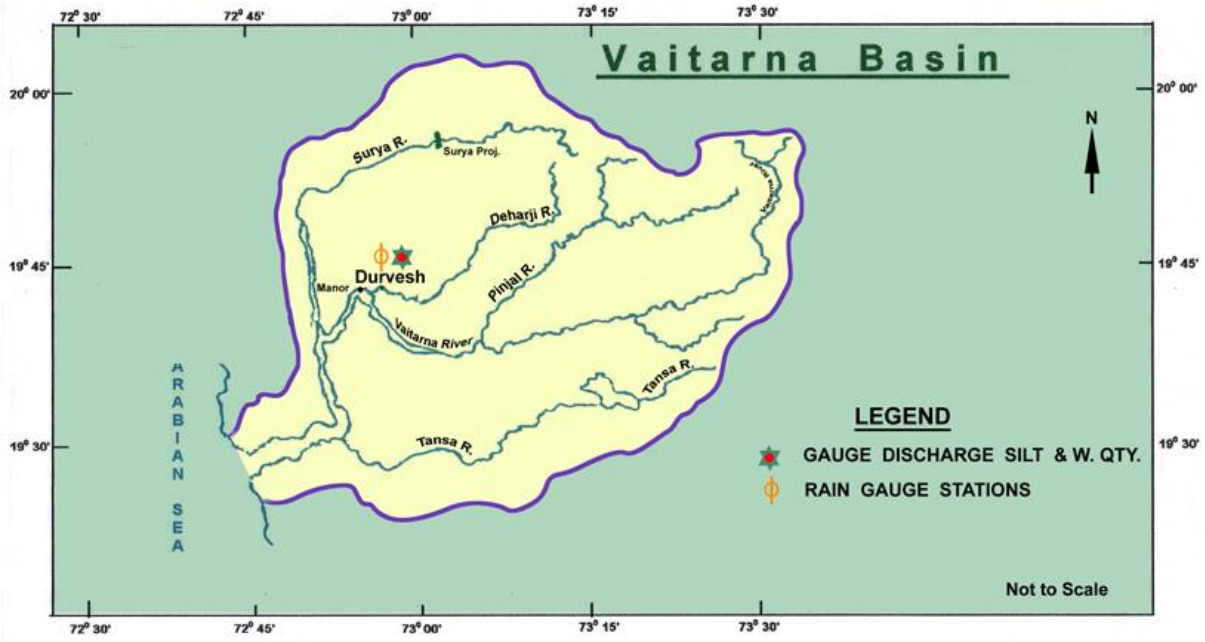
Soil of Ambica basin can be broadly classified into three group viz. Laterite soil, deep black soil and alluvial soil.

2.4 Vaitarna Basin

2.4.1 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 -2.4.1**. 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 -2.4.1

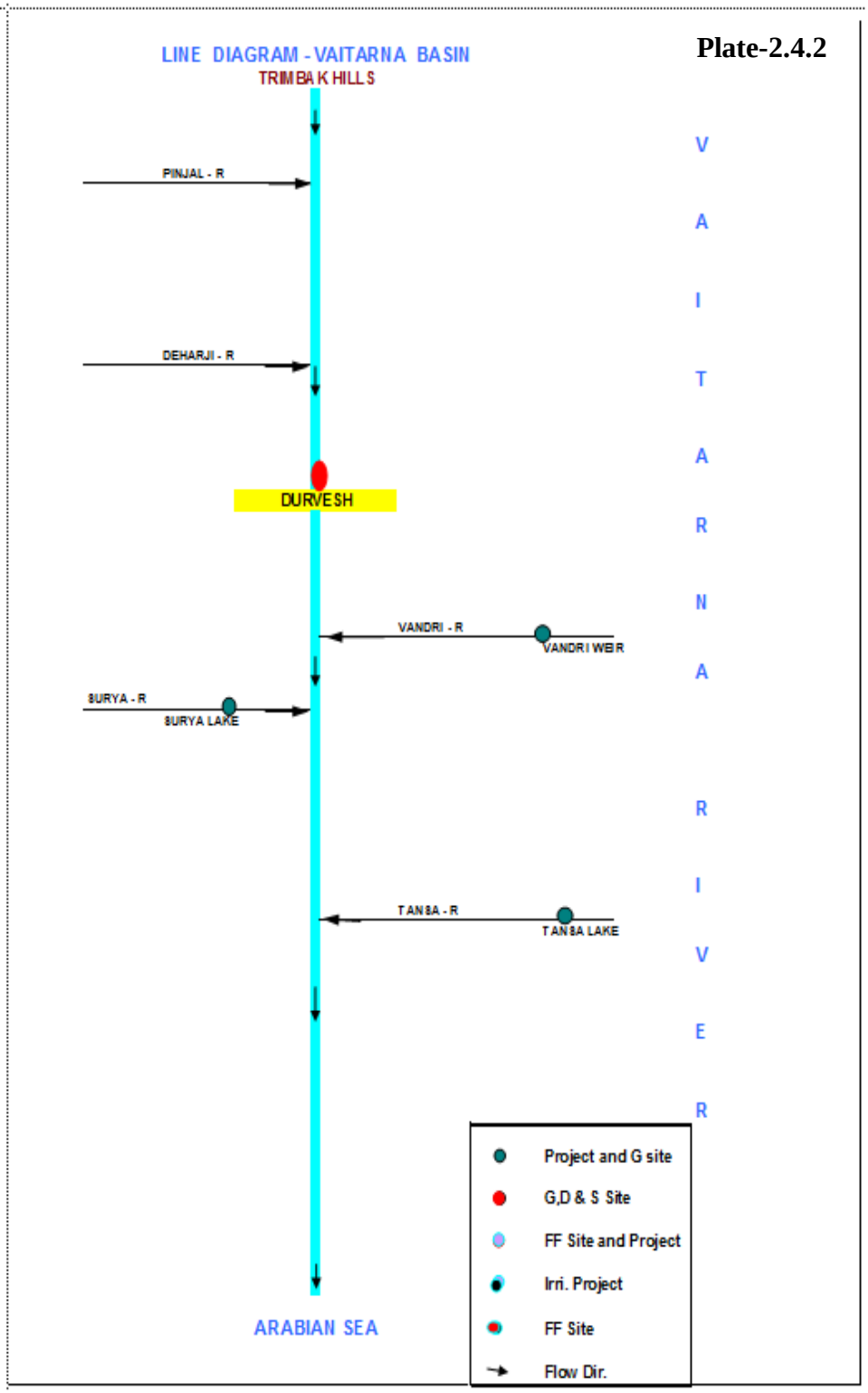


2.4.2 River System

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 -2.4.2**.



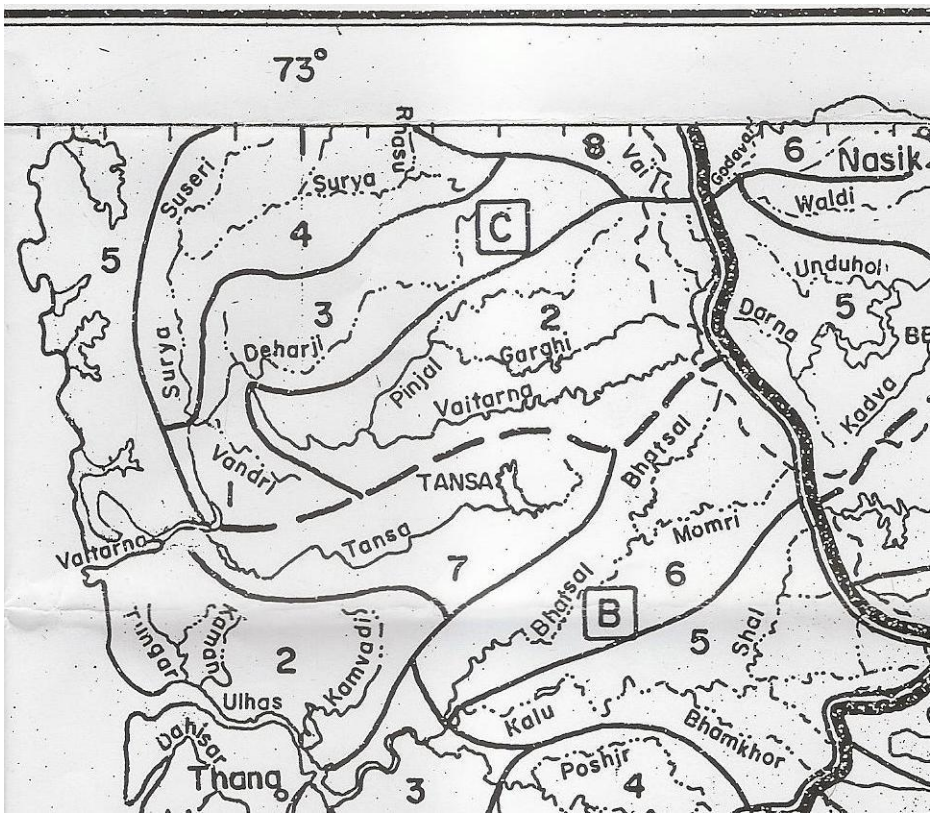
2.4.3 Vaitarna Basin as per Watershed Atlas of India

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 2.4.1**.

2.4.3.1 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)

2.4.4 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.

2.4.4.1 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 Durvesh

Month	Mean Monthly Maximum Temperature (^{o}C)	Mean Monthly Minimum Temperature (^{o}C)
Jun-18	35.7	27.6
Jul-18	29.8	25.5
Aug-18	29.0	25.6
Sep-18	31.5	24.6
Oct-18	37.2	23.7
Nov-18	38.0	20.1
Dec-18	34.3	15.6
Jan-19	33.7	13.0
Feb-19	34.5	16.0
Mar-19	38.2	18.4
Apr-19	41.8	24.3
May-19	39.6	26.5
Annual mean	35.3	21.7

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. Average annual rainfall in the basin is 2595.2 mm. The rainfall at site in Vaitarna Basin shown in **Table-2.4.2** and **Table-2.4.3**.

Table-2.4.2 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 2018-19	No of rainy days in 2018-19
1	Durvesh	37	2595.2	95	2281.6	87

Table-2.4.3: Seasonal Rainfall during Water Year 2018 at site Durvesh in Vaitarna basin

Sl No	Name of Site	Seasonal Rainfall (mm) in 2018				Total Annual Rainfall
		Winter monsoon	Pre monsoon	South-West monsoon	Post Monsoon	
		(Jan-Feb)	(Mar-May)	(June-Sept)	(Oct-Dec)	
1	Durvesh	0.0	0.0	2281.6	0.0	2281.6

2.4.4.3 Wind

The wind speed and direction profile at site Durvesh based on collected data is given in **Table-2.4.4**. 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-2.4.4: Wind Speed at site Durvesh in Vaitarna basin during Water Year 2018-19

Month	Mean monthly wind Speed (km/h)
Jun-18	4.7
Jul-18	5.6
Aug-18	4.6
Sep-18	2.3
Oct-18	2.0
Nov-18	1.9
Dec-18	2.2
Jan-19	2.0
Feb-19	1.9
Mar-19	2.2
Apr-19	2.7
May-19	3.2
Annual mean	2.9

2.4.4.4 Humidity

The relative Humidity in Vaitarna basin varies between 92.0 % and 70.0 % depending upon the season. Humidity is maximum in the monsoon period about 92.0 % to 87.9

%. In the winter months of November and December, it decreases. Relative humidity at Durvesh station of CWC is given in **Table-2.4.5**.

Table-2.4.5: Mean monthly Relative Humidity at site Durvesh in Vaitarna Basin during Water Year 2018-19

Month	Relative Humidity (%)
Jun-18	88.6
Jul-18	92.0
Aug-18	92.0
Sep-18	92.0
Oct-18	91.5
Nov-18	86.3
Dec-18	81.5
Jan-19	86.9
Feb-19	83.6
Mar-19	77.0
Apr-19	80.0
May-19	87.1
Annual mean	86.5

2.4.5 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.

2.4.6 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.

2.4.7 Major / Medium/ multipurpose/ irrigation projects

The major and medium projects completed / ongoing on Vaitarna river basin are as shown in **Table-2.4.6**

Table-2.4.6: 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

NOTE: The information has been collected from concerned State Government.

2.4.7.1 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.

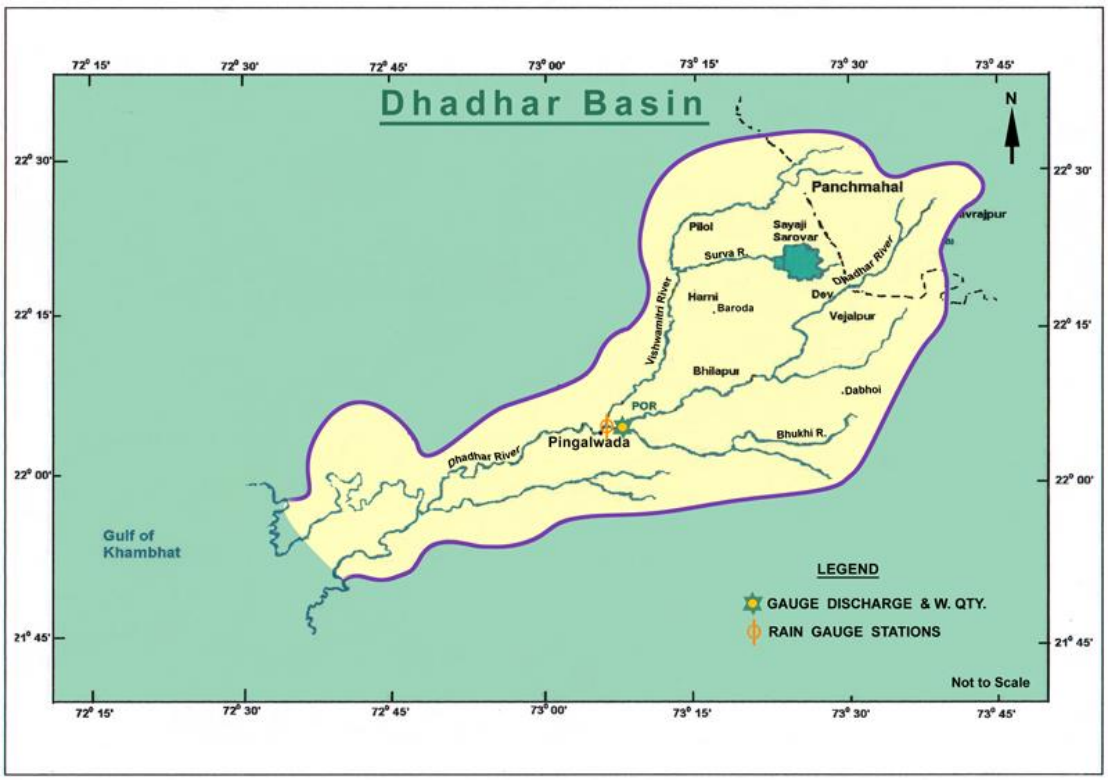
2.5 Dhadhar Basin

2.5.1 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 -2.5.1**.

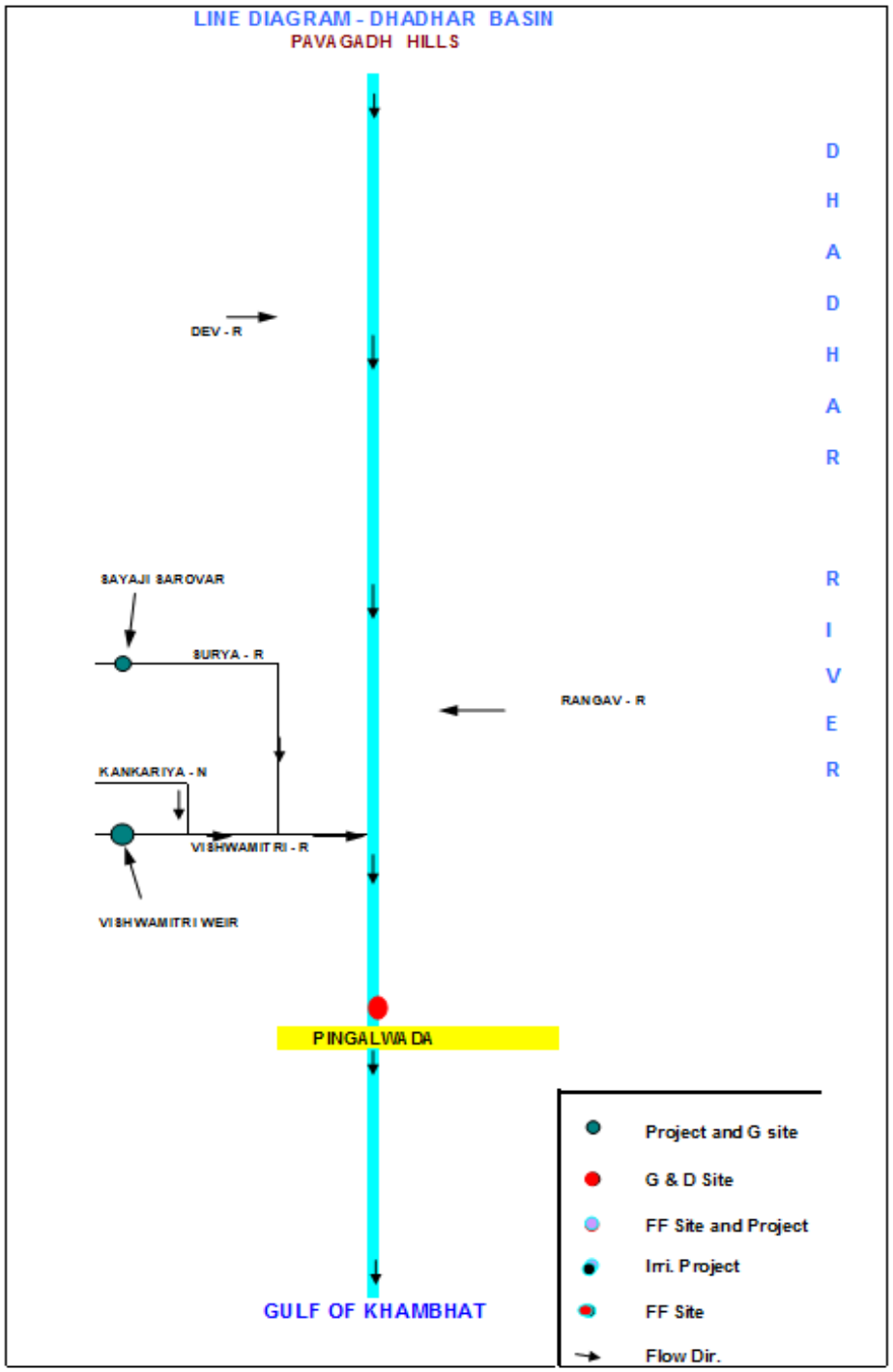
Plate- 2.5.1



2.5.2 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 -2.5.2**.

Plate -2.5.2.



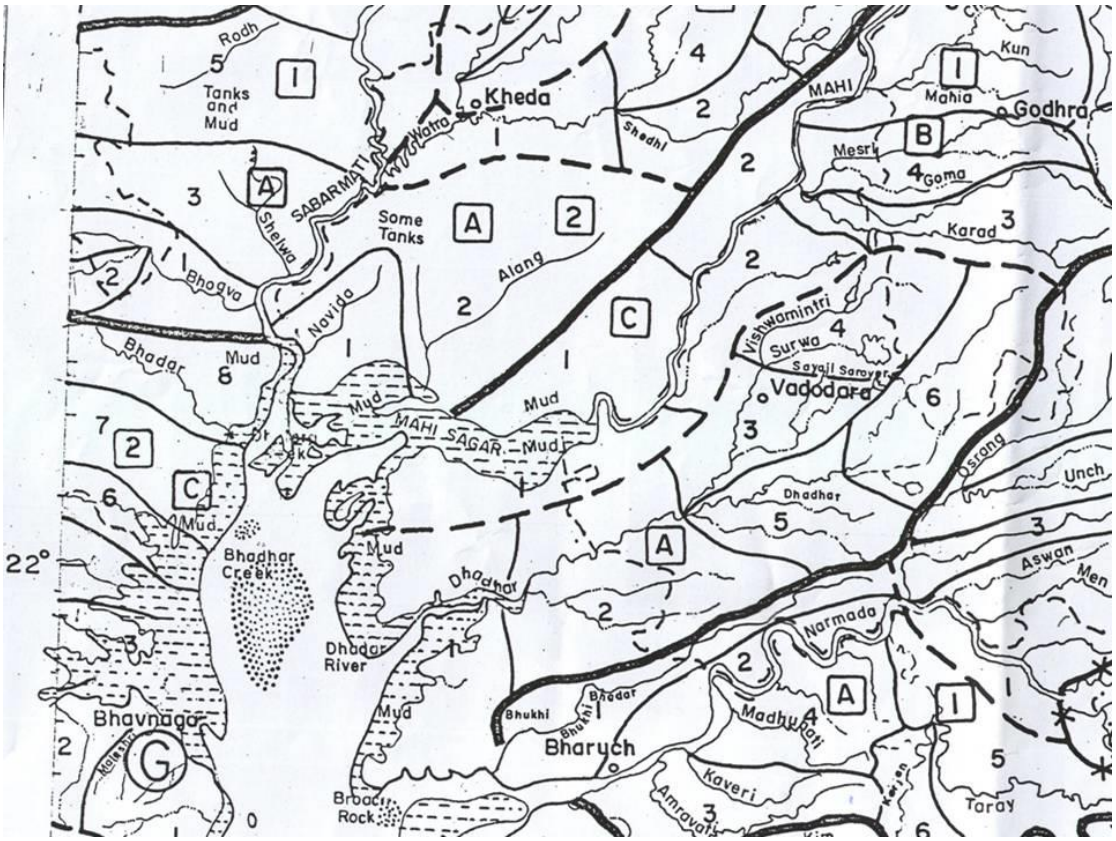
2.5.3 Dhadhar Basin as per Water Shed Atlas of India

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 2.5.1**.

2.5.3.1 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)

2.5.4 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.

2.5.4.1 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 -2.5.1**

Table-2.5.1: 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-18	37.7	20.4
Jul-18	29.8	14.8
Aug-18	30.2	15.7
Sep-18	29.1	15.7
Oct-18	31.3	16.4
Nov-18	32.4	18.1
Dec-18	28.2	13.6
Jan-19	27.6	12.5
Feb-19	28.5	14.3
Mar-19	31.9	16.6
Apr-19	39.2	22.1
May-19	39.5	22.3
Annual mean	32.1	16.9

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 average annual rainfall in the Dhadar basin is 891.0 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.

Average annual rainfall in the basin is 850.8 mm. The rainfall at site Pingalwada in Dhadhar Basin is shown in **Table -2.5.2** and **Table-2.5.3.**

Table-2.5.2 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 2018-19	No of rainy days in 2018-19
1	Pingalwada	28	850.8	44	647.6	45

Table-2.5.3 Seasonal Rainfall during Water Year 2018 at site Pingalwada

Sl No	Name of Site	Seasonal Rainfall (mm) in 2018				Total Annual Rainfall
		Winter monsoon	Pre monsoon	South-West monsoon	Post monsoon	
		(Jan-Feb)	(Mar-May)	(June-Sept)	(Oct-Dec)	
1	Pingalwada	0.0	0.0	646.6	0.0	646.6

2.5.4.3 Wind

The wind speed data of the Dhadhar basin is given in table -2.5.4. 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-2.5.4: Wind Speed at site Pingalwada in Dhadhar basin during Water Year 2018-19

Month	Mean monthly wind Speed (km/h)
Jun-18	1.7
Jul-18	0.6
Aug-18	0.5
Sep-18	0.1
Oct-18	0.0
Nov-18	0.0
Dec-18	0.3
Jan-19	0.3
Feb-19	0.2
Mar-19	0.2
Apr-19	0.1
May-19	0.4
Annual mean	0.4

2.5.4.4 Humidity

The relative Humidity in Dhadhar basin varies between 90.1 % to 66.8 % depending upon the season. Humidity is maximum in the monsoon period and is around 90.1 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 -2.5.5.

Table-2.5.5: Mean monthly Relative Humidity at site Pingalwada in Dhadhar Basin during Water Year 2018-19

Month	Relative Humidity (%)
Jun-18	80.3
Jul-18	88.0
Aug-18	87.4
Sep-18	86.7
Oct-18	84.1
Nov-18	83.8
Dec-18	80.4
Jan-19	83.5
Feb-19	85.1
Mar-19	81.0
Apr-19	78.0
May-19	80.3
Annual mean	83.2

2.5.5 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.

2.5.6 Major/Medium/Multipurpose/Irrigation projects

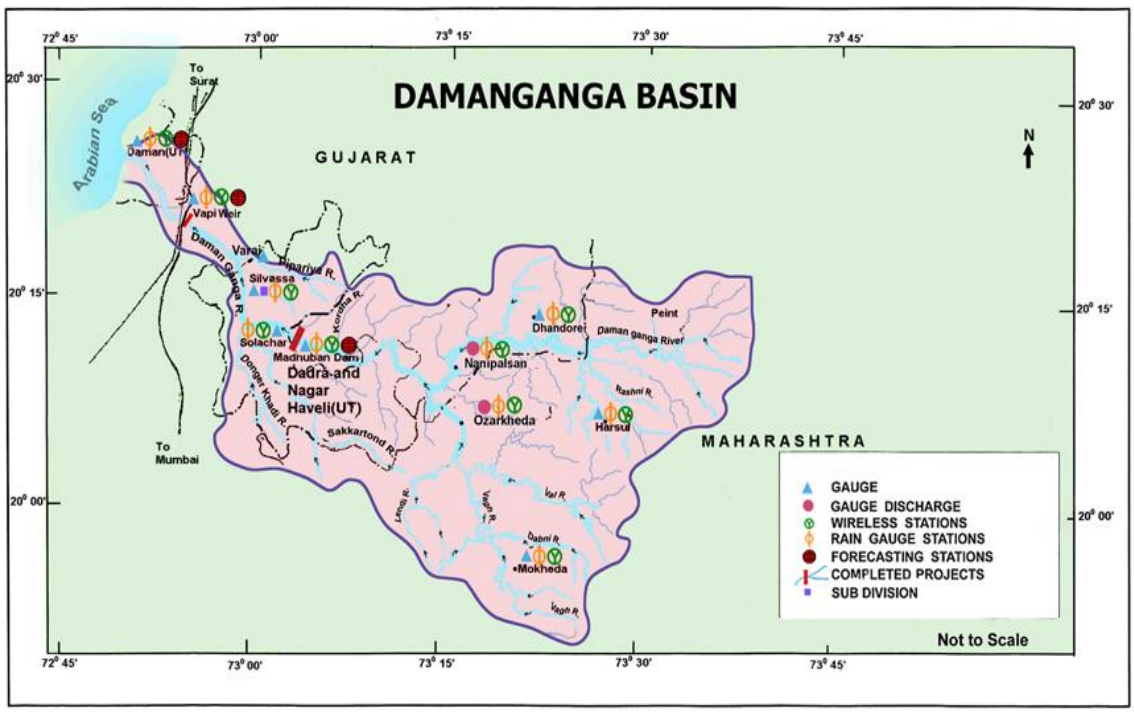
Ajwa tank, Pratap pura, Uma Bhariara, Dhanora, Ghansarva, Haripura, Vadodara, Deo Dam are the medium existing/ongoing projects in the basin.

2.6 Damanganga Basin

2.6.1 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-2.6.1**. 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-2.6.1



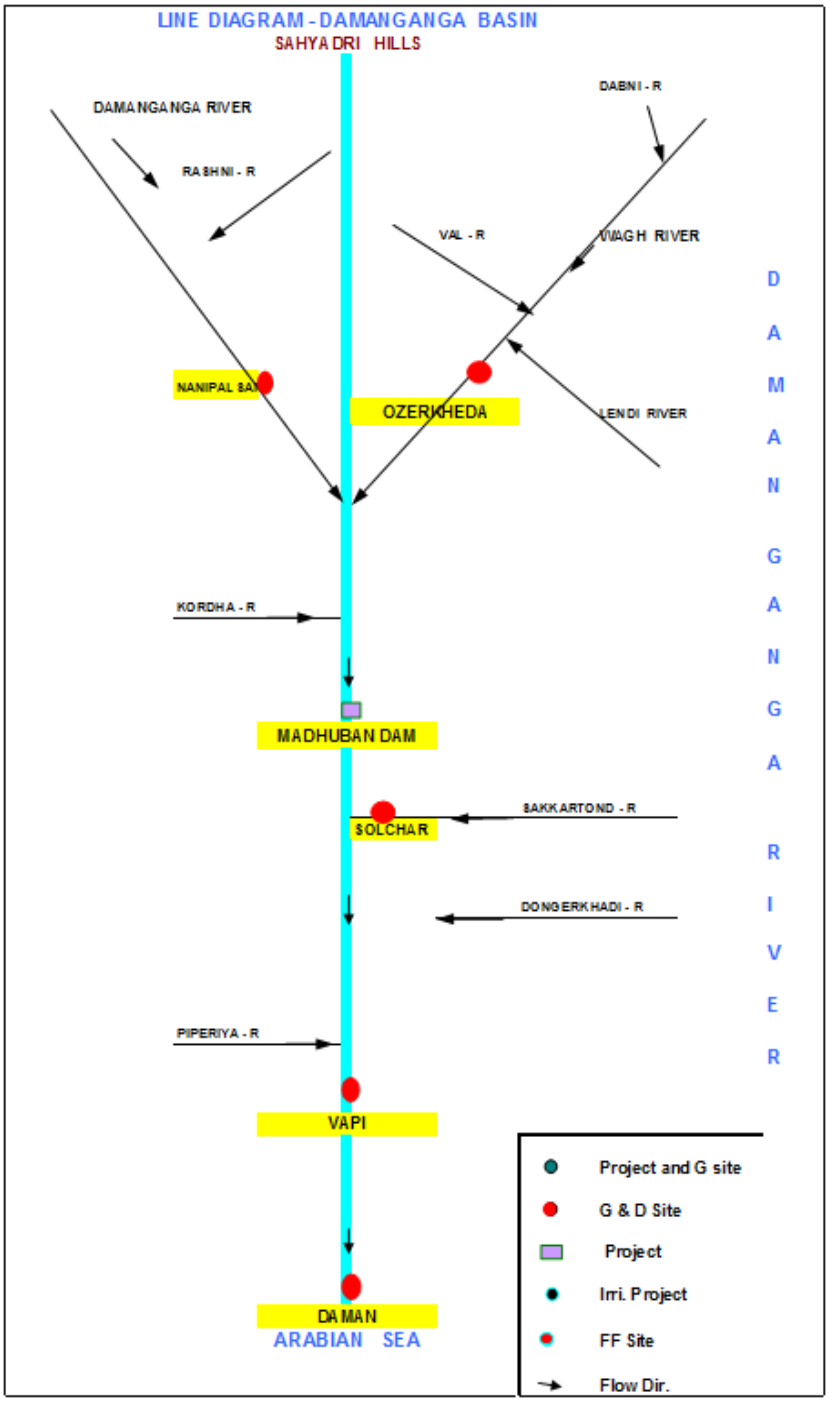
2.6.2 River System

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-2.6.1** and line diagram of Damanganga river system is shown in **Plate-2.6.2**.

Table -2.6.1: 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-2.6.2



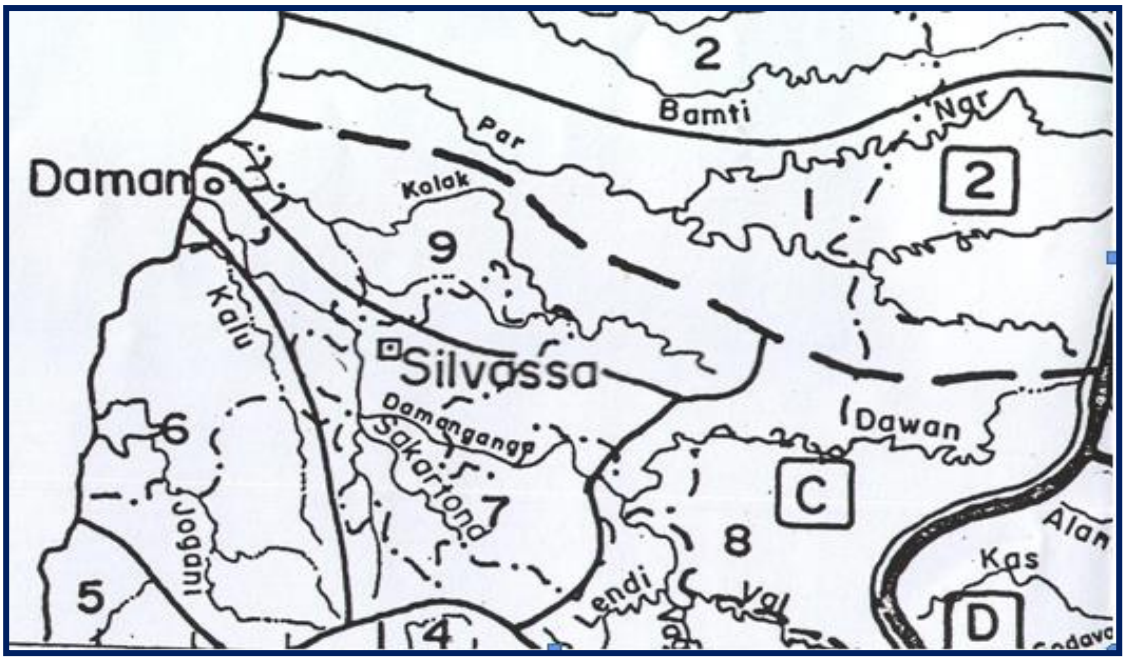
2.6.3 Damanganga Basin as per Watershed Atlas of India

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-2.6.1**.

2.6.3.1 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)

2.6.4 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

2.6.4.1 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-2.6.2

Table-2.6.2; 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 (^{o}C)	Mean Monthly Minimum Temperature (^{o}C)	Mean Monthly Maximum Temperature (^{o}C)	Mean Monthly Minimum Temperature (^{o}C)
Jun-18	35.0	27.1	32.2	24.3
Jul-18	27.8	23.9	25.1	21.9
Aug-18	28.2	24.7	25.7	22.6
Sep-18	30.4	24.9	29.0	21.5
Oct-18	35.7	22.2	35.0	19.5
Nov-18	35.1	17.2	34.9	18.4
Dec-18	31.4	12.9	29.8	11.4
Jan-19	31.4	11.6	30.4	10.9
Feb-19	32.4	12.0	33.1	12.8
Mar-19	35.7	15.7	34.5	16.5
Apr-19	40.8	21.5	38.5	21.6
May-19	38.9	24.5	36.8	24.2
Annual mean	33.6	19.9	32.1	18.8

2.6.4.2 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. Average annual rainfall in the basin is 2144.5 mm. The rainfall at site in Damanganga Basin as shown in Table -**2.6.3**. & table **2.6.4**

Table -2.6.3: 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 2018-19	No of rainy days in 2018-19
1	Ozerkheda	33	2093.5	90	1899.4	74
2	Nanipalsan	33	2195.5	92	2595.8	76

Table-2.6.4: Seasonal Rainfall during Water Year 2018 at site Nanipalsan & Ozerkheda in Damanganga Basin

Sl No	Name of Site	Seasonal Rainfall (mm) in 2018				Total Annual Rainfall
		Winter monsoon (Jan-Feb)	Pre monsoon (Mar-May)	South-West monsoon (June-Sept)	Post monsoon (Oct-Dec)	
1	Nanipalsan	0.0	0.0	2579.2	16.6	2595.8
2	Ozerkheda	0.0	0.0	1852.0	47.4	1899.4

2.6.4.3 Wind

The wind speed data of the Damanganga basin at two sites viz Ozerkheda and Nanipalsan are given in **Table -2.6.5**. The average wind speed in the Damanganga basin varies about 0.7 km/h to 4.3 km/h. in the pre and post monsoon period.

Table -2.6.5: Wind Speed at site Ozerkheda & Nanipalsan in Damanganga basin basin during Water Year 2018-19

Month	Mean monthly wind Speed (km/h)	
	Nanipalsan	Ozerkheda
Jun-18	3.8	3.2
Jul-18	2.2	0.9
Aug-18	2.2	0.8
Sep-18	1.5	0.4
Oct-18	1.1	0.1
Nov-18	1.0	0.2
Dec-18	1.3	0.6
Jan-19	1.6	1.0
Feb-19	2.1	1.4
Mar-19	2.5	2.1
Apr-19	3.1	2.4
May-19	3.5	2.9
Annual mean	2.2	1.3

2.6.4.4 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 91.9 to 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-2.6.6**.

Table-2.6.6: Mean monthly Relative Humidity at site Ozerkheda & Nanipalsan in Damanganga Basin during Water Year 2018-19

Month	Relative Humidity (%)	
Name of Site	Nanipalsan	Ozerkheda
Jun-18	86.4	81.5
Jul-18	82.3	90.3
Aug-18	91.6	91.4
Sep-18	91.1	88.2
Oct-18	90.3	88.5
Nov-18	88.7	80.0
Dec-18	85.3	77.2
Jan-19	84.6	71.8
Feb-19	86.1	71.3
Mar-19	84.4	72.0
Apr-19	80.6	70.2
May-19	82.0	76.5
Annual mean	86.1	79.9

2.6.5 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.

2.6.6 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.

2.6.7 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.

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

Sl. No	Name of the	River	Status	Capacity in Mcm		Utilisation
				Gross	Live	
7.	Vaitarn Hydro Electric Project.	Vaitarna	Major	301.60	295.80	Multipurpose
8.	Surya Project.	Surya	Major	285.31	276.35	Multipurpose
9.	Modak Sagar (Lower	Vaitarna	Medium	N.A.	N.A.	Irrigation
10	Wandra Project	Wandria	Medium	37.11	35.938	-do-
11	Deharji River Project	Deharji	Medium	93.120	89.840	-do-
12	Tansa Dam	Tansa	Medium	N.A.	N.A.	Multipurpose

NOTE: The information has been collected from concerned state government.

2.6.7.1 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.

2.7 Kim Basin

2.7.1 Geographical setting of Kim Basin

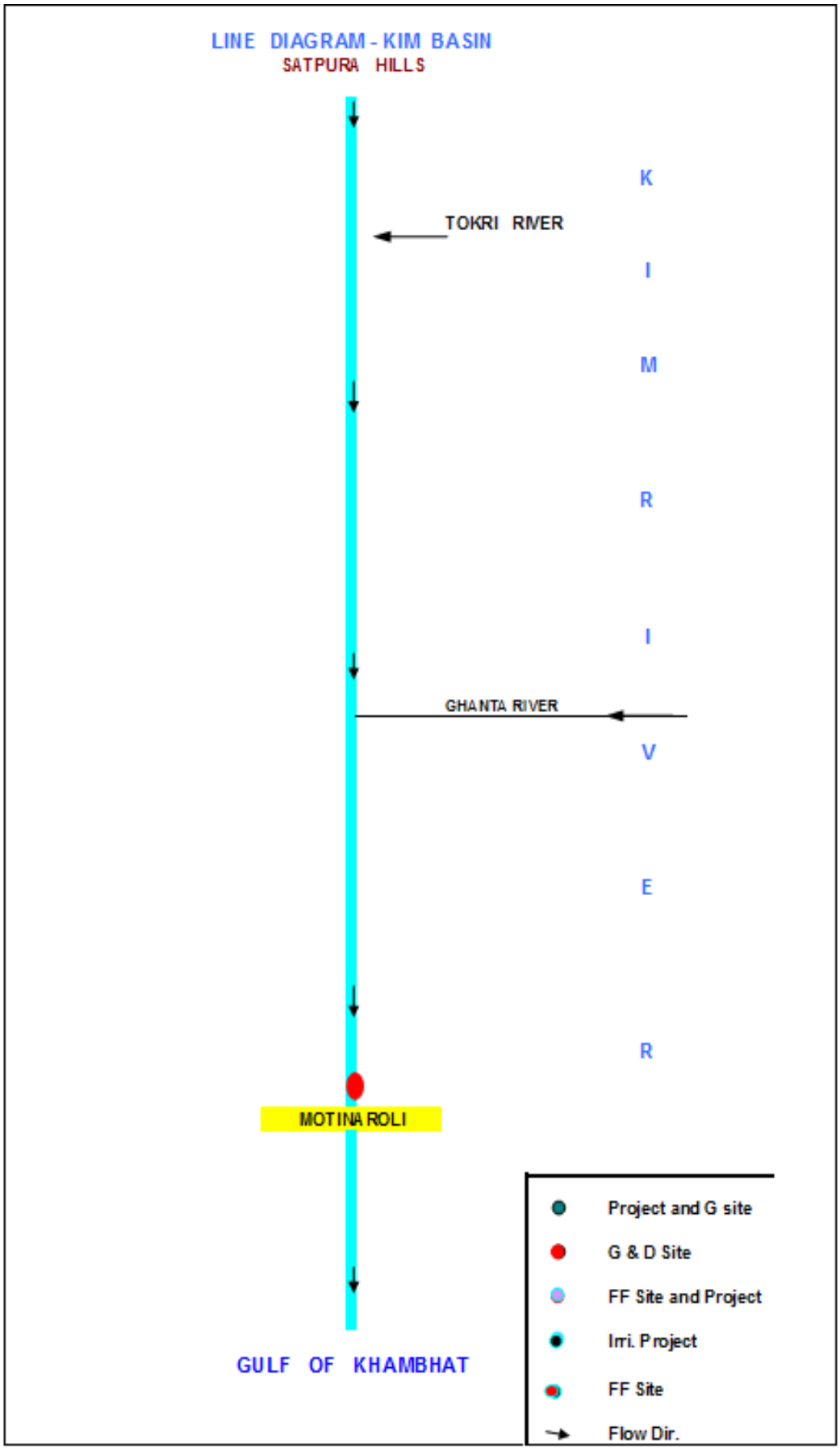
Kim River is one of the west flowing rivers in Gujarat state. It originates from Saputara Hill ranges in Bharuch district and falls in Gulf of Khambhat near village Kantiajal of Hansot taluka of Bharuch district after flowing south west direction for a length of 107 km. The river Kim, for the first 80 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 -2.7.1**.

Plate -2.7.1

2.7.2 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 between 21° 19’ to 21° 38’ North latitude and 72° 40’ to 73° 27’ East longitude. A line diagram of Kim basin is shown in **Plate -2.7.2**.

Plate -2.7.2


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.

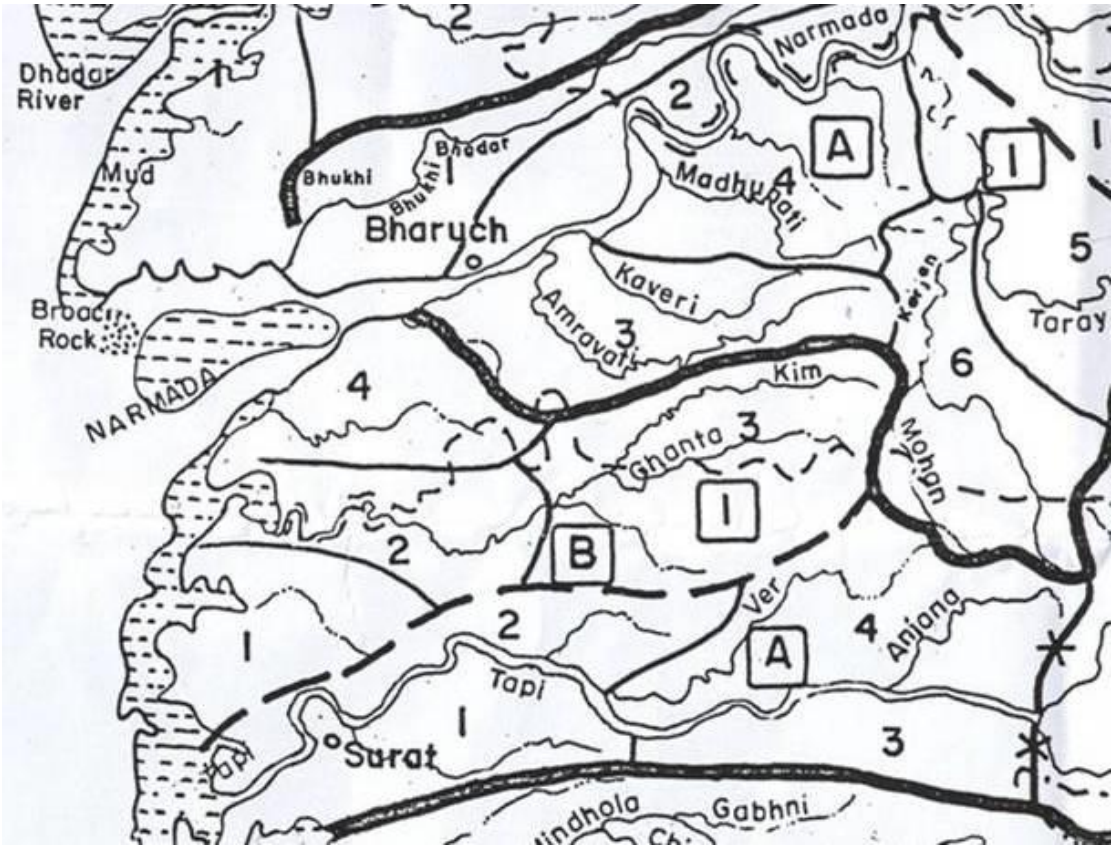
2.7.3 Kim Basin as per Water Shed Atlas of India

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.-2.7.1**.

2.7.3.1 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)

2.7.4 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

2.7.4.1 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-2.7.1**.

Table-2.7.1: Mean monthly Temperature (^{0}C) during water year at site Kim at Motinaroli during Water Year 2018-19

Month	Mean Monthly Maximum Temperature	Mean Monthly Minimum Temperature
Jun-18	35.9	26.0
Jul-18	30.8	24.1
Aug-18	35.9	26.4
Sep-18	34.5	22.6
Oct-18	38.8	22.5
Nov-18	37.7	30.4
Dec-18	33.5	15.5
Jan-19	32.0	12.6
Feb-19	31.9	14.5
Mar-19	35.6	18.7
Apr-19	43.5	26.7
May-19	41.1	31.2
Annual mean	35.9	22.6

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. Average annual rainfall in the basin is 1176.8 mm. The rainfall at site in Kim Basin shown in **Table-2.7.2** & **Table-2.7.3**.

Table-2.7.2: 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 2018-19	No of rainy days in 2018-19
1	Motinaroli	27	1176.8	54	980.7	45

Table-2.7.3: Seasonal Rainfall during Water Year 2018 at site Motinaroli

Sl No	Name of Site	Seasonal Rainfall (mm) in 2018				Total Annual Rainfall
		Winter monsoon (Jan-Feb)	Pre monsoon (Mar-May)	South-West monsoon (June-Sept)	Post monsoon (Oct-Dec)	
1	Motinaroli	0.0	0.0	980.7	0.0	980.7

2.7.4.3 Wind

The wind speed data of the Kim basin is given in Table-2.7.4. The average wind speed in the Kim basin varies about 0.3 km/h to 7.9 km/h. The pre dominant wind direction is NE

Table-2.7.4:Wind Speed at site Motinaroli in Kim basin during Water Year 2018-19

Month	Mean monthly wind Speed (km/h)
Jun-18	4.8
Jul-18	3.9
Aug-18	4.7
Sep-18	2.2
Oct-18	0.7
Nov-18	0.5
Dec-18	0.8
Jan-19	1.1
Feb-19	1.2
Mar-19	1.5
Apr-19	2.3
May-19	3.6
Annual Mean	2.3

2.7.4.4 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 78.7 % to 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-2.7.5.

Table-2.7.5: Mean monthly Relative Humidity at site Motinaroli in Kim Basin during Water Year 2018-19

Month	Relative Humidity (%)
Jun-18	79.7
Jul-18	90.9
Aug-18	79.0
Sep-18	90.4
Oct-18	84.5
Nov-18	70.7
Dec-18	69.5
Jan-19	85.9
Feb-19	87.4
Mar-19	83.1
Apr-19	86.9
May-19	86.6
Annual Mean	82.9

2.7.5 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.

2.7.6 Major / Medium/multipurpose/irrigation projects

The major and medium projects completed / ongoing on Kim river basin are as shown in Table-2.7.6.

Table-2.7.6: 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	Tokri	Medium	8.15	7.84	Domestic
2	Pigut Irrigation S	Tokri	Medium	7.52	7.27	-do-

NOTE: The information has been collected from concerned State Government.

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).

4.0 Hydrological data

4.1 Tapi Basin

4.1.1 Tapi at Dedtalai

4.1.1.1 History Sheet

			Water Year	**:**	**2018-2019**
Site	**:**	**Tapi at Dedtalai**	**Code**	**:**	**01 02 17 001**
State	:	Madhya Pradesh	District		Khandwa
Basin	:	Tapi-Basin	Independent River	:	Tapi
Tributary	:	Tapi	Sub Tributary	:	
Sub-Sub Tributary	:		Local River	:	Tapi/Tapi
Division	:	Surat	Sub-Division	:	Upper Tapi Sub Division Bhusawal
Drainage Area	:	3860 Sq. Km.	Bank	:	
Latitude	:	21°30'47"	Longitude	:	76°45'26"
Zero of Gauge (m)	:	270 (m.s.l)	06-01-1977		
		Opening Date	Closing Date		
Gauge	:	06-01-1977			
Discharge	:	12-12-1977	31-05-2005		
Discharge	:	06-02-2014 *			
Sediment	:	24-01-1984	31-05-2005		
Water Quality	:	01-08-1979	31-05-2005		

Note : * Site has been upgraded for discharge observations

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

Year	Maximum			Minimum		
	Q (cumec)	**WL (m)**	**Date**	**Q (cumec)**	**WL (m)**	**Date**
2014-2015	600.0	111.610	27/11/1977	0.000	109.400	08/07/1977
2015-2016	2088	277.750	06/08/2015	0.000	271.800	01/06/2015
2016-2017	4506	282.325	12/07/2016	0.000	271.690	01/06/2016
2017-2018	2105	276.850	20/07/2017	0.000	272.150	01/06/2017
2018-2019	2539	278.730	21/08/2018	0.000	271.650	01/06/2018

4.1.1.2 Annual Maximum flood peak

Station Name: Tapi at Dedtalai (01 02 17 015) Division: Tapi division Surat

Local River: Tapi Sub Division: Upper Tapi Bhusawal

Year	**MWL (m)**	**Date**	**Hour**
2014	289.00	05/08/2014	03:00:00
2015	289.700	05/08/2015	03:00:00
2016	282.700	12/07/2016	09:00:00
2017	278.250	20/07/2017	12:00:00
2018	278.760	21/08/2019	08:00:00

4.1.1.3 Summary of Data

Stage Discharge data for the period 2018 to 2019

Station Name: Tapi at Dedtalai (01 02 17 01) Division: Tapi Division Surat Local River:Tapi Sub Division: : Upper Tapi Sub Division Bhusawal

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	271.650	0.000	272.540	0.000 *	274.970	91.18	275.140	159.9	274.940	91.13	272.940	0.000
2	271.630	0.000	272.280	0.000 *	274.915	70.43	275.100	155.3 *	274.940	82.82 *	273.080	0.000
3	271.610	0.000	271.950	0.000 *	274.870	61.54	275.070	141.1 *	274.920	57.70	273.080	0.000
4	271.590	0.000	271.880	0.000 *	274.850	61.74	275.070	142.2	274.895	59.42	273.180	0.000
5	271.580	0.000	271.900	0.000 *	274.830	0.000	275.045	132.9	274.870	0.000	273.130	0.000
6	271.570	0.000	271.880	0.000 *	274.820	0.000	275.030	108.9	274.860	0.000	273.030	0.000
7	271.560	0.000	272.070	0.000 *	274.800	0.000	275.015	96.22	274.850	0.000	272.970	0.000
8	271.550	0.000	273.880	0.000 *	274.760	0.000	275.025	111.1	274.830	0.000	272.850	0.000
9	271.540	0.000	274.880	0.000 *	274.740	0.000	275.020	118.0 *	274.820	0.000	272.690	0.000
10	271.540	0.000	274.790	0.000 *	274.880	0.000	274.995	87.44	274.810	0.000	272.630	0.000
11	271.540	0.000	276.160	763.2 *	274.830	0.000	274.960	85.48	274.790	0.000	272.530	0.000
12	275.000	0.000	276.250	821.5 *	274.920	0.000	274.930	60.49	274.770	0.000	272.440	0.000
13	274.910	0.000	275.360	287.4 *	274.890	94.30	274.910	0.000	274.750	0.000	272.350	0.000
14	274.810	0.000	275.120	164.9 *	274.880	68.63	274.900	0.000	274.710	0.000	272.400	0.000
15	274.780	0.000	275.100	155.3 *	274.860	50.30 *	274.890	0.000	274.670	0.000	272.500	0.000
16	274.730	0.000	275.090	150.5 *	274.880	69.64	274.860	0.000	274.600	0.000	272.590	0.000
17	274.720	0.000	274.960	91.39 *	275.945	660.6	274.840	0.000	274.470	0.000	272.650	0.000
18	274.720	0.000	274.920	74.42 *	275.465	384.7	274.820	0.000	274.420	0.000	272.750	0.000
19	274.150	0.000	274.920	74.42 *	275.480	353.0 *	274.810	0.000	274.180	0.000	272.840	0.000
20	273.650	0.000	274.970	95.74 *	275.520	475.1	274.800	0.000	273.780	0.000	272.900	0.000

21	273.210	0.000	274.940	82.82 *	278.730	2539	274.790	0.000	273.710	0.000	272.950	0.000
22	272.680	0.000	274.930	78.60 *	276.870	1443 *	278.105	2302	273.440	0.000	273.050	0.000
23	272.660	0.000	275.050	131.7 *	276.140	812.6	275.800	538.8 *	273.150	0.000	273.100	0.000
24	273.250	0.000	275.320	266.2 *	275.810	570.3	275.370	288.3	273.400	0.000	273.120	0.000
25	273.960	0.000	275.280	245.2 *	275.585	423.3	275.240	230.5	273.820	0.000	273.100	0.000
26	273.600	0.000	275.330	271.5 *	275.710	485.1 *	275.150	176.7	274.200	0.000	273.100	0.000
27	273.250	0.000	275.290	220.9	275.400	331.6	275.110	155.4	274.430	0.000	273.100	0.000
28	272.720	0.000	275.190	181.9	275.310	252.9	275.065	132.7	274.670	0.000	273.100	0.000
29	272.420	0.000	275.110	160.0 *	275.240	208.6	275.030	111.6	274.780	0.000	273.090	0.000
30	272.630	0.000	275.040	122.5	275.200	205.5	274.990	104.5 *	274.740	0.000	273.080	0.000
31			275.000	106.7	275.170	196.9			274.730	0.000		
Ten-Daily Mean												
I Ten-Daily	271.582	0.000	272.805	0.000	274.844	28.49	275.051	125.3	274.874	29.11	272.958	0.000
II Ten-Daily	274.301	0.000	275.285	267.9	275.167	215.6	274.872	14.60	274.514	0.000	272.595	0.000
III Ten-Daily	273.038	0.000	275.135	169.8	275.924	679.0	275.465	404.0	274.097	0.000	273.079	0.000
Monthly												
Min.	271.540	0.000	271.880	0.000	274.740	0.000	274.790	0.000	273.150	0.000	272.350	0.000
Max.	275.000	0.000	276.250	821.5	278.730	2539	278.105	2302	274.940	91.13	273.180	0.000
Mean	272.974	0.000	274.432	146.7	275.331	319.7	275.129	181.3	274.482	9.389	272.877	0.000

Annual Runoff in MCM = 1744 **Annual Runoff in mm = 452**

Peak Observed Discharge = 2539.00 cumecs on 21-08-2018 **Corres. Water Level :278.730 m**

Lowest Observed Discharge = 0.000 cumecs on 01-06-2018 **Corres. Water Level :271.650 m**

Note: pooling condition from 01-06-2018 to 30-06-18, from 06-08-18 TO 12-08-18, from 13-09-18 to 21-09-18, and from 05-10-18 to 31-05-19.
Shortage of staff from 01-07-2018 to 26-07-2018.

Q: observed/ computed discharge in Cumec, WL: Corresponding Mean Water Level (msl) in m, *: Computed Discharge

#Discarded and estimated

Stage Discharge data for the period 2018 to 2019

Station Name: Tapi at Dedtalai (01 02 17 01) Division: Tapi Division Surat Local River:Tapi Sub Division: Upper Tapi Sub Division Bhusawal

Day	Dec		Jan		Feb		Mar		Apr		May	
	W.L	Q	WL	Q	WL	Q	WL	Q	WL	Q	WL	Q
1	273.330	0.000	271.890	0.000	271.990	0.000	271.820	0.000	271.610	0.000	271.490	0.000
2	273.260	0.000	271.930	0.000	272.000	0.000	271.800	0.000	271.600	0.000	271.480	0.000
3	273.130	0.000	271.960	0.000	272.020	0.000	271.800	0.000	271.600	0.000	271.470	0.000
4	273.080	0.000	271.970	0.000	272.040	0.000	271.790	0.000	271.600	0.000	271.470	0.000
5	273.020	0.000	272.000	0.000	272.070	0.000	271.790	0.000	271.600	0.000	271.470	0.000
6	272.960	0.000	272.020	0.000	272.080	0.000	271.790	0.000	271.600	0.000	271.460	0.000
7	272.870	0.000	272.040	0.000	272.090	0.000	271.780	0.000	271.600	0.000	271.460	0.000
8	272.800	0.000	272.060	0.000	272.100	0.000	271.780	0.000	271.600	0.000	271.450	0.000
9	272.710	0.000	272.070	0.000	272.110	0.000	271.750	0.000	271.600	0.000	271.450	0.000
10	272.640	0.000	272.080	0.000	272.120	0.000	271.730	0.000	271.590	0.000	271.440	0.000
11	272.580	0.000	272.100	0.000	272.130	0.000	271.720	0.000	271.590	0.000	271.440	0.000
12	272.540	0.000	272.100	0.000	272.140	0.000	271.710	0.000	271.580	0.000	271.430	0.000
13	272.480	0.000	272.110	0.000	272.150	0.000	271.700	0.000	271.570	0.000	271.430	0.000
14	272.430	0.000	272.120	0.000	272.150	0.000	271.690	0.000	271.570	0.000	271.420	0.000
15	272.380	0.000	272.140	0.000	272.160	0.000	271.690	0.000	271.560	0.000	271.420	0.000
16	272.300	0.000	272.150	0.000	272.160	0.000	271.680	0.000	271.560	0.000	271.410	0.000
17	272.230	0.000	272.170	0.000	272.130	0.000	271.670	0.000	271.550	0.000	271.410	0.000
18	272.220	0.000	272.180	0.000	272.070	0.000	271.660	0.000	271.550	0.000	271.400	0.000
19	272.200	0.000	272.190	0.000	272.040	0.000	271.640	0.000	271.540	0.000	271.380	0.000
20	272.160	0.000	272.150	0.000	272.030	0.000	271.630	0.000	271.540	0.000	271.360	0.000

21	272.080	0.000	272.120	0.000	272.020	0.000	271.630	0.000	271.530	0.000	271.340	0.000
22	271.980	0.000	271.970	0.000	271.990	0.000	271.630	0.000	271.530	0.000	271.320	0.000
23	271.920	0.000	271.940	0.000	271.970	0.000	271.620	0.000	271.520	0.000	271.300	0.000
24	271.870	0.000	271.930	0.000	271.950	0.000	271.620	0.000	271.520	0.000	271.260	0.000
25	271.860	0.000	271.910	0.000	271.920	0.000	271.620	0.000	271.510	0.000	271.220	0.000
26	271.850	0.000	271.900	0.000	271.860	0.000	271.620	0.000	271.510	0.000	271.180	0.000
27	271.850	0.000	271.910	0.000	271.840	0.000	271.610	0.000	271.500	0.000	271.130	0.000
28	271.850	0.000	271.930	0.000	271.830	0.000	271.610	0.000	271.500	0.000	271.080	0.000
29	271.860	0.000	271.950	0.000			271.610	0.000	271.500	0.000	271.030	0.000
30	271.870	0.000	271.970	0.000			271.610	0.000	271.490	0.000	270.970	0.000
31	271.890	0.000	271.980	0.000			271.610	0.000			270.910	0.000
Ten-Daily Mean												
I Ten-Daily	272.980	0.000	272.002	0.000	272.062	0.000	271.783	0.000	271.600	0.000	271.464	0.000
II Ten-Daily	272.352	0.000	272.141	0.000	272.116	0.000	271.679	0.000	271.561	0.000	271.410	0.000
III Ten-Daily	271.898	0.000	271.955	0.000	271.922	0.000	271.617	0.000	271.511	0.000	271.158	0.000
Monthly												
Min.	271.850	0.000	271.890	0.000	271.830	0.000	271.610	0.000	271.490	0.000	270.910	0.000
Max.	273.330	0.000	272.190	0.000	272.160	0.000	271.820	0.000	271.610	0.000	271.490	0.000
Mean	272.394	0.000	272.030	0.000	272.041	0.000	271.691	0.000	271.557	0.000	271.338	0.000

Peak Computed Discharge = 1443.0 cumecs on 22-08-2018 Corres. Water Level :276.870 m

Lowest Computed Discharge = 0.00 cumecs on 01-07-2018 Corres. Water Level :272.540 m

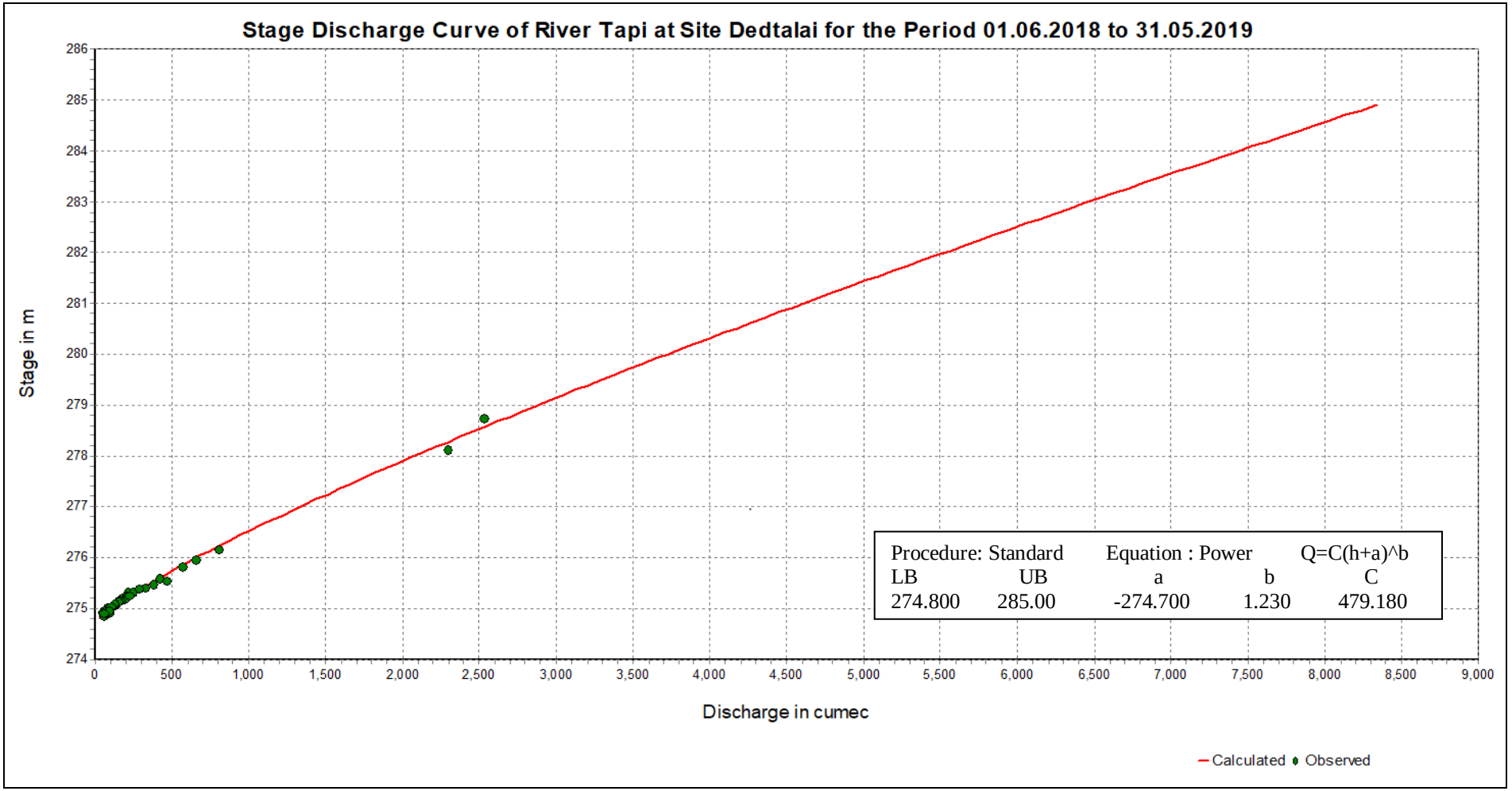
Note: pooling condition from 01-06-2018 to 30-06-18, from 06-08-18 TO 12-08-18, from 13-09-18 to 21-09-18, and from 05-10-18 to 31-05-19.
Shortage of staff from 01-07-2018 to 26-07-2018.

Q: observed/ computed discharge in Cumec, WL: Corresponding Mean Water Level (msl) in m, *: Computed Discharge

#Discarded and estimated

4.1.1.4 Stage Discharge Curve

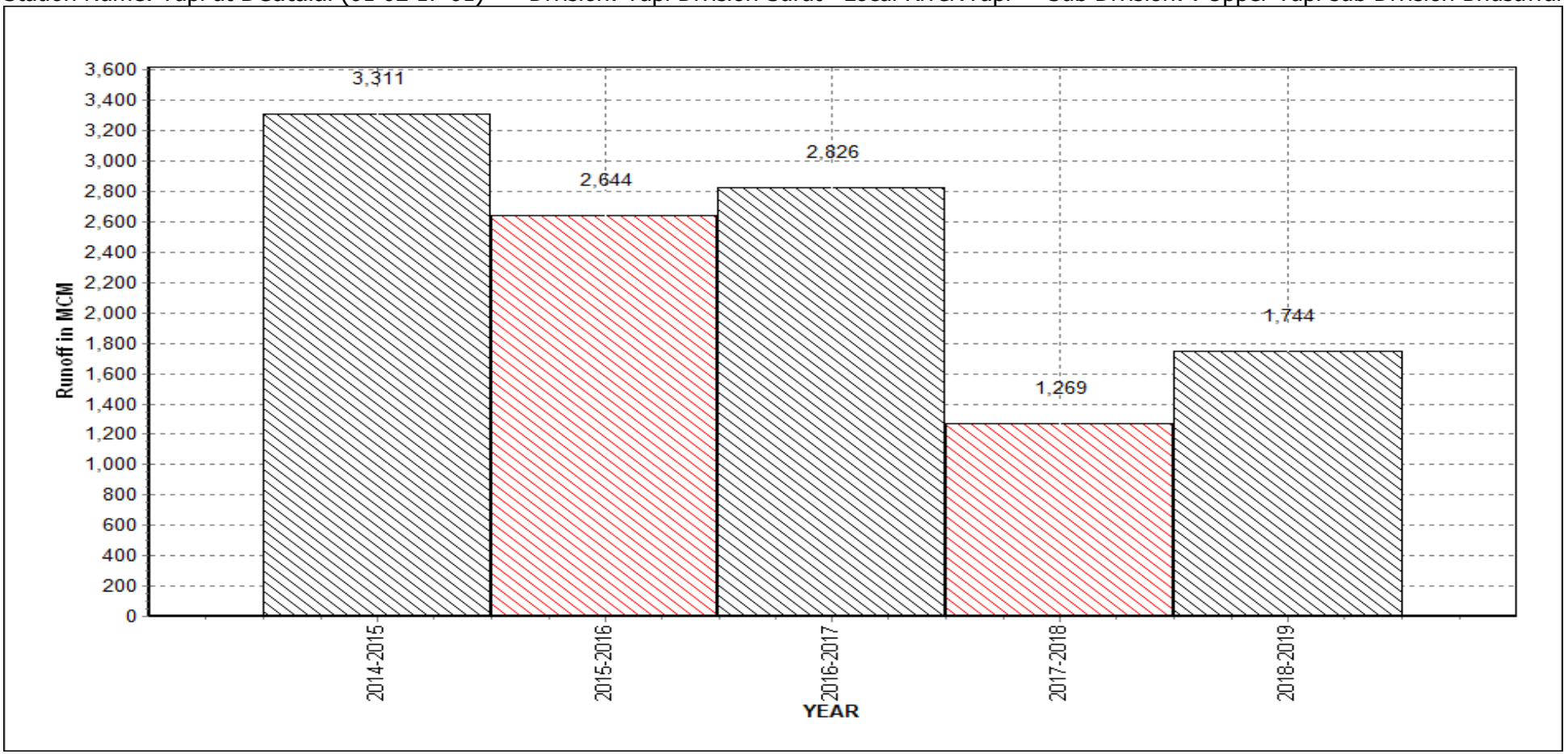
Station Name: Tapi at Dedtalai (01 02 17 01) Division: Tapi Division Surat Local River:Tapi Sub Division: Upper Tapi Sub Division Bhusawal



4.1.1.5 Annual runoff

Annual Runoff for the period 1977-2019

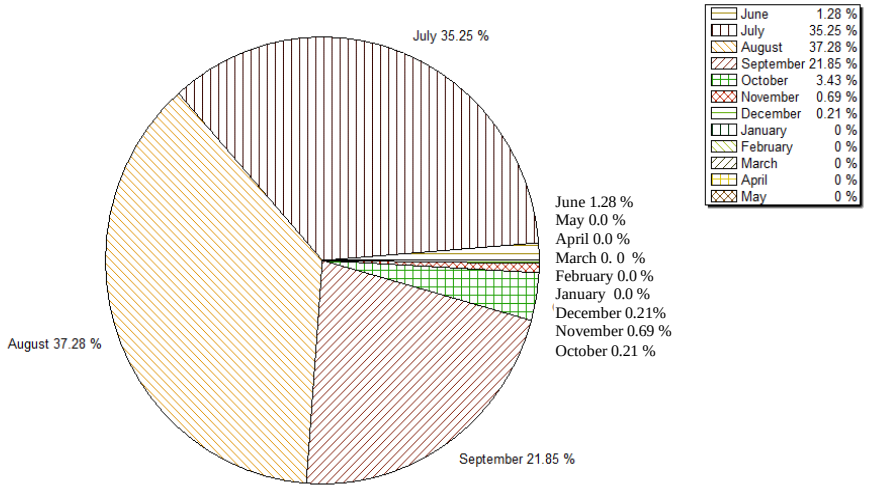
Station Name: Tapi at Dedtalai (01 02 17 01) Division: Tapi Division Surat Local River:Tapi Sub Division: : Upper Tapi sub Division Bhusawal



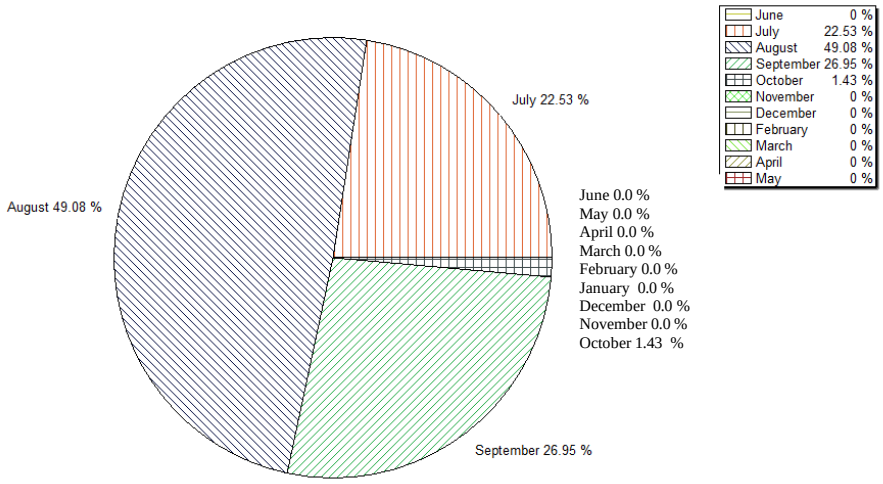
4.1.1.6 Monthly Average Runoff

Station Name: Tapi at Dedtalai (01 02 17 01) Division: Tapi Division Surat Local River:Tapi Sub Division: : Upper Tapi Sub Division Bhusawal

Monthly Average Runoff Based on period 2015-2018

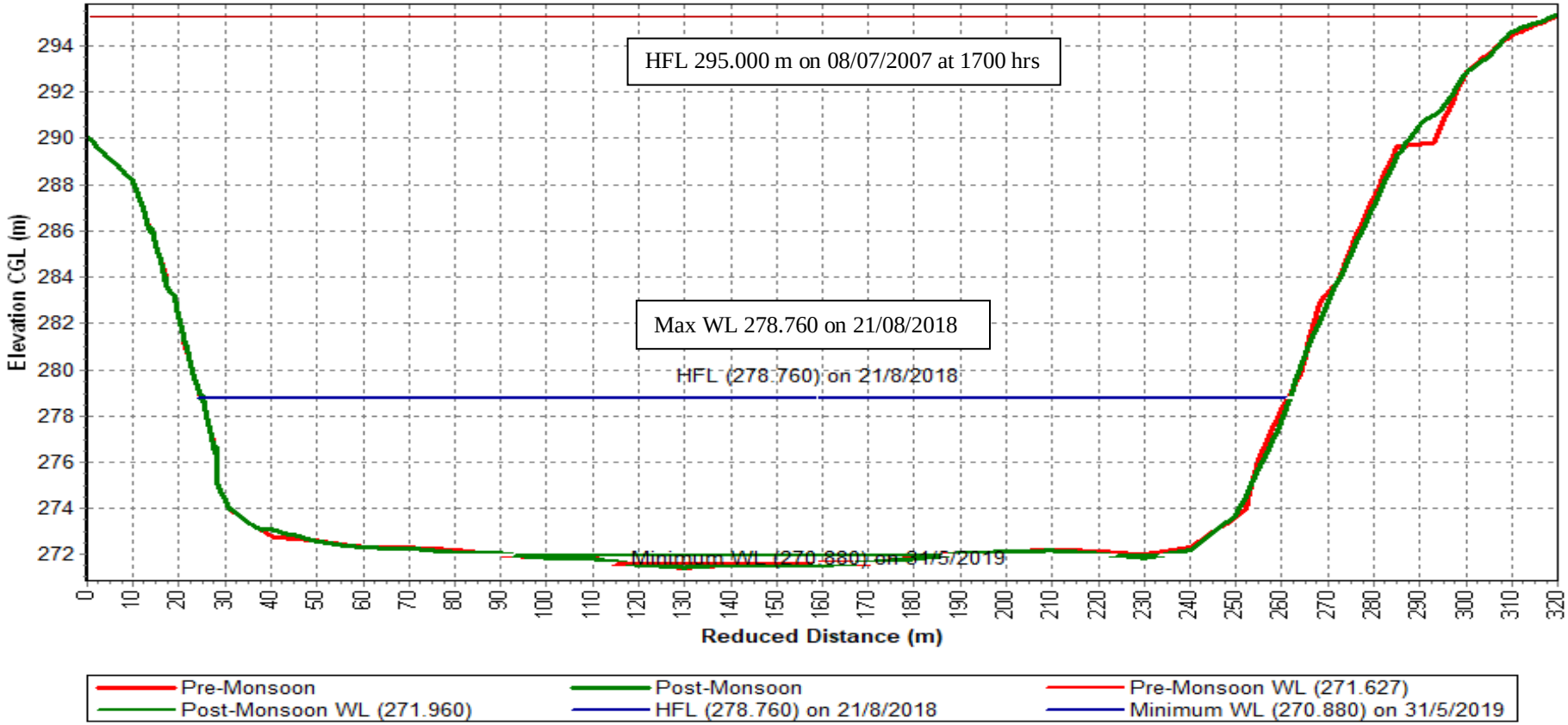


Monthly Runoff Based on period 2018-2019



4.1.1.7 Superimposed cross section

Station Name: Tapi at Dedtalai (01 02 17 01) Division: Tapi Division Surat Local River:Tapi Sub Division: : Upper Tapi Sub Division Bhusawal

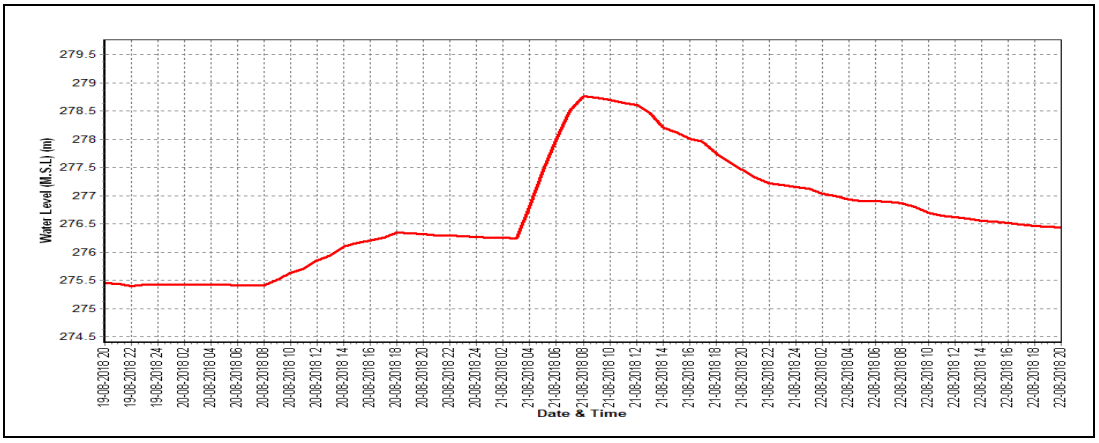


4.1.1.8 WL vs Time Graph of I,II,III peak

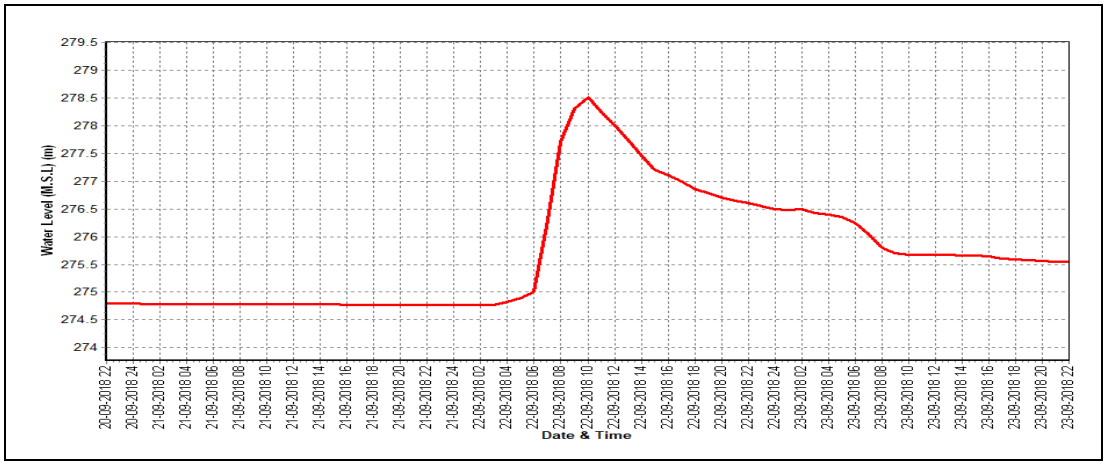
Station Name: Tapi at Dedtalai (01 02 17 01) Division: Tapi Division Surat

Local River: Sub Division: Upper Tapi Sub division Bhusawal

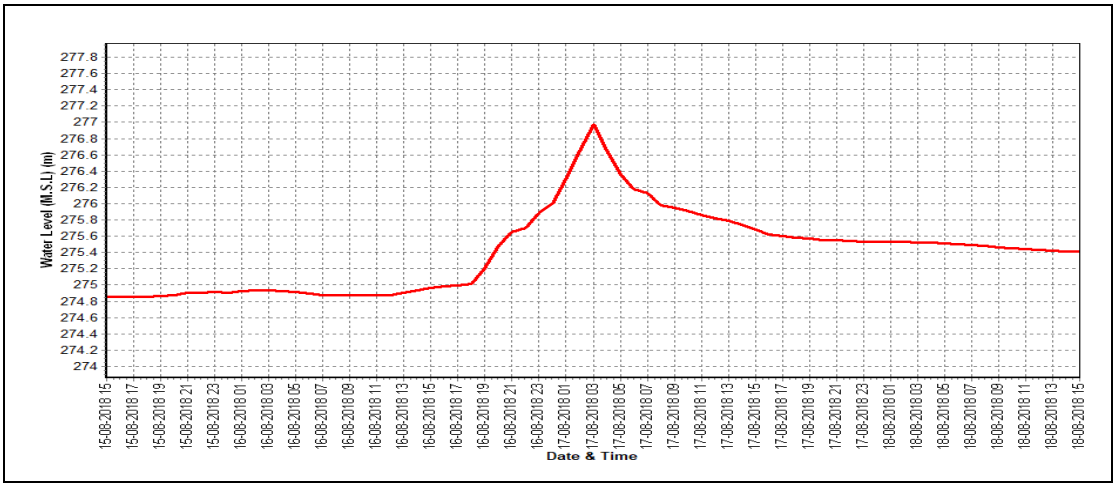
Water Level v/s Time graph of Highest (I) Flood Peak during the water year 2018-19



Water Level v/s Time graph of Highest (II) Flood Peak during the water year 2018-19



Water Level v/s Time graph of Highest (III) Flood Peak during the water year 2018-19



4.1.2 Tapi at Burhanpur

4.1.2.1 History sheet

Site	**:**	**Tapi at Burhanpur**	**Code**	**:**	**01 02 17 002**
State	:	Madhya Pradesh	District		Khandwa
Basin	:	Tapi	Independent River	:	Tapi
Tributary	:		Sub Tributary	:	
Sub-Sub Tributary	:		Local River	:	
Division	:	Tapi Division Surat	Sub-Division	:	Upper Tapi Sub Division Bhusawal
Drainage Area	:	8487 sq km	Bank	:	Right
Latitude	:	21°17'12"	Longitude	:	76°30'18"
Zero of Gauge (m)	:	213 (msl)	16/06/1972		
		Opening Date	Closing Date		
Gauge	:	16/06/1972			
Discharge	:	14/09/1972			
Sediment	:	23/12/1972			
Water Quality	:	01/06/1977			

Annual Maximum / Minimum observed discharge with corresponding Water Level (m)

Year	Maximum			Minimum		
	Q (cumec)	WL (m)	Date	Q (cumec)	WL (m)	Date
1973-1974	6330	226.112	27/08/1973	1.100	215.120	04/06/1973
1974-1975	2015	220.908	13/08/1974	0.900	214.990	19/05/1975
1975-1976	6117	224.890	12/08/1975	0.800	215.085	22/05/1976
1976-1977	3745	224.435	03/09/1976	0.000	215.085	28/02/1977
1977-1978	3893	223.000	14/09/1977	0.720	214.960	28/05/1978
1978-1979	26683	239.500	29/08/1978	1.000	214.990	01/06/1978
1979-1980	12100	233.950	10/08/1979	0.400	214.970	16/05/1980
1980-1981	5379	224.780	06/08/1980	0.800	214.980	31/05/1981
1981-1982	13259	230.100	10/08/1981	0.800	214.970	16/06/1981
1982-1983	1120	219.190	12/09/1982	0.300	215.030	09/05/1983
1983-1984	3687	222.200	01/09/1983	0.300	215.030	12/06/1983
1984-1985	11305	230.975	19/08/1984	0.100	215.010	10/06/1984
1985-1986	1875	220.500	14/08/1985	0.100	214.890	31/05/1986
1986-1987	4837	223.800	15/08/1986	0.000	214.860	11/05/1987
1987-1988	1160	219.000	18/06/1987	0.200	214.920	31/01/1988
1988-1989	4707	222.825	22/07/1988	0.000	214.780	02/05/1989
1989-1990	3435	221.400	19/08/1989	0.050	214.920	08/03/1990
1990-1991	8959	226.100	23/08/1990	0.000	214.870	15/05/1991
1991-1992	8246	232.450	31/07/1991	0.000	214.700	23/04/1992
1992-1993	4694	224.600	17/08/1992	0.000	214.550	05/05/1993
1993-1994	8268	223.800	16/06/1993	0.000	214.500	12/06/1993
1994-1995	17027	233.600	06/09/1994	0.000	214.800	05/06/1994
1995-1996	6630	226.500	03/09/1995	0.000	214.730	31/05/1996
1996-1997	2742	220.800	28/07/1996	0.136	215.030	16/05/1997
1997-1998	12339	229.350	26/07/1997	0.000	214.700	29/05/1998
1998-1999	25261	238.000	15/09/1998	0.000	214.700	13/06/1998
1999-2000	8649	227.800	10/08/1999	0.111	214.750	30/05/2000
2000-2001	1403	219.000	20/07/2000	0.000	215.620	17/05/2001
2001-2002	6664	225.050	15/08/2001	0.000	215.280	31/05/2002
2002-2003	5300	225.500	06/09/2002	0.000	215.170	25/05/2003
2003-2004	5130	224.600	28/07/2003	0.000	214.950	14/06/2003
2004-2005	5197	225.130	23/08/2004	0.000	215.320	09/05/2005
2005-2006	4098	224.060	15/09/2005	0.000	214.500	13/06/2005
2006-2007	3825	224.075	08/08/2006	0.000	215.900	01/06/2006
2007-2008	32686	236.800	08/07/2007	0.000	214.920	01/06/2007
2008-2009	3797	223.050	05/08/2008	0.000	215.220	01/05/2009
2009-2010	2810	222.500	23/07/2009	0.000	215.320	01/06/2009
2010-2011	2803	223.950	09/09/2010	0.000	216.000	24/01/2011
2011-2012	5965	225.475	27/08/2011	0.000	215.790	12/06/2011
2012-2013	8613	228.250	06/09/2012	0.000	215.290	27/05/2013
2013-2014	8189	228.700	01/08/2013	0.000	215.280	01/06/2013
2014-2015	1834	221.025	09/09/2014	0.000	BACK WATER EFFECT	
2015-2016	1930	221.100	07/08/2015	0.000	214.940	01/06/2015
2016-2017	2245	221.900	04/08/2016	0.000	215.170	01/06/2016
2017-2018	904.30	219.750	21/07/2017	0.000	BACK WATER EFFECT	
2018-2019	1430	220.350	21/08/2018	0.000	BACK WATER EFFECT	

4.1.2.2 Annual Maximum flood peak

Year	MWL (m)	Date	Hour
1973	227.075	15/07/1973	03:00:00
1974	221.750	13/08/1974	02:00:00
1975	225.850	11/09/1975	20:00:00
1976	224.850	03/09/1976	08:00:00
1977	223.325	14/09/1977	15:00:00
1978	239.500	29/08/1978	18:00:00
1979	233.172	10/08/1979	09:00:00
1980	227.350	06/08/1980	14:00:00
1981	229.800	10/08/1981	00:00:00
1982	218.100	12/09/1982	00:00:00
1983	222.250	02/09/1983	17:00:00
1984	230.600	19/08/1984	02:00:00
1985	219.500	14/08/1985	00:00:00
1986	225.200	15/08/1986	00:00:00
1987	219.600	21/08/1987	06:00:00
1988	223.950	03/10/1988	07:00:00
1989	222.990	23/08/1989	21:00:00
1990	232.150	23/08/1990	17:00:00
1991	233.350	31/07/1991	05:00:00
1992	225.850	16/08/1992	21:00:00
1993	230.200	16/07/1993	22:00:00
1994	236.700	06/09/1994	17:00:00
1995	226.600	03/09/1995	10:00:00
1996	223.600	26/07/1996	19:00:00
1997	229.500	26/07/1997	10:00:00
1998	238.800	15/09/1988	12:00:00
1999	229.800	10/08/1999	03:00:00
2000	223.200	19/07/2000	15:00:00
2001	229.900	15/08/2001	23:00:00
2002	227.800	06/09/2002	01:00:00
2003	228.450	28/07/2003	02:00:00
2004	226.500	23/08/2004	05:00:00
2005	224.400	02/08/2005	13:00:00
2006	225.700	06/08/2006	22:00:00
2007	239.950	08/07/2007	17:00:00
2008	227.000	05/08/2008	21:00:00
2009	225.700	23/07/2009	01:00:00
2010	225.300	30/07/2010	19:00:00
2011	226.100	27/08/2011	09:00:00
2012	238.000	05/09/2012	23:00:00
2013	234.000	01/08/2013	14:00:00
2014	236.700	23/07/2014	18:00:00
2015	235.500	05/08/2015	06:00:00
2016	227.700	12/07/2016	16:00:00
2017	221.550	20/07/2017	19:00:00
2018	223.300	21/08/2018	16:00:00

4.1.2.3 Summary of Data

Stage Discharge data for the period 2018 to 2019

Station Name: Tapi at Burhanpur (01 02 17 002) Division: Tapi Division Surat Local River: Tapi Sub Division: Upper Tapi Sub Division Bhusawal

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		0.000	216.010	0.000	217.150	126.5	217.515	246.6	217.195	132.7	216.070	4.869
2		0.000	216.010	0.000	217.110	108.5	217.470	229.7 *	217.150	117.3 *	216.060	4.629
3		0.000	215.990	0.000	217.090	91.80	217.420	211.1 *	217.115	115.3	216.040	4.389
4		0.000	215.980	0.000	217.040	83.31	217.400	207.6	217.080	101.9	216.030	4.870 *
5		0.000	215.950	0.000	217.000	69.07 *	217.350	177.0	217.080	98.10	216.020	5.806
6		0.000	215.880	0.000	216.960	62.77	217.300	161.0	217.065	78.82	216.010	5.311
7	RIVER	0.000	215.980	0.000	216.945	59.22	217.255	160.6	217.060	57.92 *	216.050	5.050 *
8	DRY	0.000	215.830	0.000	216.900	49.60	217.230	158.9	217.025	65.15	216.160	6.102
9		0.000	216.150	0.000	216.870	46.77	217.260	154.6 *	216.995	59.13	216.170	6.202
10		0.000	216.300	0.000	216.960	59.57	217.215	148.7	216.970	57.55	216.180	6.867
11		0.000	218.400	0.000	217.000	68.23	217.170	132.7	216.960	54.07	216.190	6.310 *
12		0.000	219.700	0.000	216.980	62.94 *	217.160	125.9	216.935	44.87	216.190	7.016
13		0.000	218.380	0.000	217.025	78.02	217.110	104.1 *	216.910	36.62	216.190	7.105
14		0.000	217.700	0.000	217.050	87.10	217.100	90.33	216.890	36.45 *	216.190	7.040
15		0.000	217.920	0.000	217.030	78.63	217.090	91.87	216.880	31.19	216.180	6.485
16		0.000	217.580	0.000	217.010	70.15	217.060	87.92 *	216.870	30.25	216.180	6.247
17	213.480	0.000	217.350	0.000	220.200	1389	217.045	79.19	216.865	26.50	216.180	6.182
18	215.900	0.000	217.250	0.000	218.190	475.7	217.010	62.00	216.860	25.73	216.170	6.130 *
19	215.840	0.000	217.180	0.000	218.100	472.4 *	216.990	61.17	216.860	28.13 *	216.170	5.688
20	215.800	0.000	217.270	0.000	217.955	457.5	216.980	55.73	216.850	25.42 *	216.160	5.193

21	215.910	0.000	217.210	0.000		220.350	1430		216.960	56.88	*	216.850	25.42	*	216.150	5.950	*
22	216.250	0.000	217.200	0.000		220.900	1732	*	217.250	163.6		216.850	23.99		216.140	5.860	#
23	215.970	0.000	217.230	0.000		219.415	1026		219.350	1007	*	216.840	20.41		216.130	5.770	*
24	215.890	0.000	217.440	0.000		218.730	709.6		218.100	472.4	*	216.830	19.90		216.120	5.680	#
25	216.040	0.000	218.040	0.000		218.335	494.2		217.730	347.9		216.820	18.92		216.110	5.590	*
26	216.100	0.000	217.880	0.000		218.160	496.7	*	217.535	285.9		216.790	11.25		216.100	5.500	#
27	216.080	0.000	217.730	302.0		218.030	500.2		217.445	240.0		216.520	9.400	#	216.090	5.410	#
28	216.180	0.000	217.600	245.5		217.845	388.1		217.380	190.3		216.380	8.070	*	216.060	5.140	#
29	216.190	0.000	217.520	247.6	*	217.710	342.6		217.295	163.2		216.270	6.434		216.060	5.140	#
30	216.090	0.000	217.290	169.3		217.645	301.8		217.260	154.6	*	216.210	5.498		215.940	4.080	#
31			217.180	137.1		217.555	271.1					216.120	5.012				
Ten-Daily Mean																	
I Ten-Daily			216.008	0.000		217.002	75.71		217.342	185.6		217.074	88.38		216.079	5.410	
II Ten-Daily	215.255	0.000	217.873	0.000		217.654	324.0		217.072	89.09		216.888	33.92		216.180	6.340	
III Ten-Daily	216.070	0.000	217.484	100.1		218.607	699.3		217.631	308.2		216.589	14.03		216.090	5.412	
Monthly																	
Min.	213.480	0.000	215.830	0.000		216.870	46.77		216.960	55.73		216.120	5.012		215.940	4.080	
Max.	216.250	0.000	219.700	302.0		220.900	1732		219.350	1007		217.195	132.7		216.190	7.105	
Mean	215.837	0.000	217.133	35.53		217.782	377.1		217.348	194.3		216.842	44.43		216.116	5.72	

Annual Runoff in MCM = 1744 **Annual Runoff in mm = 205**

Peak Observed Discharge = 1430.00 cumecs on 21-08-2018 **Corres. Water Level :220.350 m**

Lowest Observed Discharge = 0.000 cumecs on 17-06-2018 **Corres. Water Level :213.480 m**

Note: River Dry from 01/06/18 to 16/06/18, River in pooling condition i.e. negligible flow during 17/06/18 to 26/07/18 and from 11-12-18 to 31-05-19. Discarded points 27/10/18, 22/11/18, 24/11/18, from 26/11/18 to 01/12/18, 03/12/18, 04/12/18

Q: observed/ computed discharge in cumec, WL: Corresponding Mean Water Level (msl) in m, *: Computed Discharge

#Discarded and estimated

Stage Discharge data for the period 2018 to 2019

Station Name: Tapi at Burhanpur (01 02 17 002) Division: Tapi Division Surat Local River: Tapi Sub Division: Upper Tapi Sub Division Bhusawal

Day	Dec		Jan		Feb		Mar		Apr		May	
	W.L	Q	WL	Q	WL	Q	WL	Q	WL	Q	WL	Q
1	215.900	3.730 #	215.450	0.000	215.910	0.000	215.830	0.000	215.010	0.000	214.390	0.000
2	215.870	3.470 *	215.450	0.000	215.910	0.000	215.810	0.000	214.980	0.000	214.360	0.000
3	215.840	3.210 #	215.450	0.000	215.900	0.000	215.780	0.000	214.950	0.000	214.350	0.000
4	215.750	2.450 #	215.450	0.000	215.900	0.000	215.760	0.000	214.930	0.000	214.320	0.000
5	215.600	1.290	215.450	0.000	215.900	0.000	215.740	0.000	214.900	0.000	214.300	0.000
6	215.530	0.772	215.450	0.000	215.900	0.000	215.710	0.000	214.880	0.000	214.280	0.000
7	215.530	0.719	215.450	0.000	215.900	0.000	215.680	0.000	214.860	0.000	214.270	0.000
8	215.530	0.582	215.450	0.000	215.900	0.000	215.650	0.000	214.840	0.000	214.260	0.000
9	215.500	0.510 *	215.450	0.000	215.900	0.000	215.630	0.000	214.820	0.000	214.250	0.000
10	215.480	0.368	215.450	0.000	215.900	0.000	215.550	0.000	214.800	0.000	214.240	0.000
11	215.470	0.000	215.450	0.000	215.900	0.000	215.520	0.000	214.770	0.000	214.230	0.000
12	215.470	0.000	215.450	0.000	215.900	0.000	215.470	0.000	214.750	0.000	214.210	0.000
13	215.470	0.000	215.520	0.000	215.890	0.000	215.430	0.000	214.700	0.000	214.200	0.000
14	215.470	0.000	215.590	0.000	215.890	0.000	215.380	0.000	214.660	0.000	214.180	0.000
15	215.470	0.000	215.610	0.000	215.890	0.000	215.370	0.000	214.610	0.000	214.160	0.000
16	215.470	0.000	215.610	0.000	215.890	0.000	215.350	0.000	214.580	0.000	214.140	0.000
17	215.470	0.000	215.610	0.000	215.880	0.000	215.340	0.000	214.570	0.000	214.120	0.000
18	215.470	0.000	215.610	0.000	215.870	0.000	215.330	0.000	214.570	0.000	214.090	0.000
19	215.460	0.000	215.790	0.000	215.870	0.000	215.310	0.000	214.570	0.000	214.020	0.000
20	215.460	0.000	215.920	0.000	215.870	0.000	215.290	0.000	214.560	0.000	213.950	0.000

21	215.460	0.000	215.930	0.000	215.870	0.000	215.270	0.000	214.550	0.000	213.860	0.000
22	215.460	0.000	215.930	0.000	215.860	0.000	215.250	0.000	214.540	0.000	213.790	0.000
23	215.460	0.000	215.930	0.000	215.860	0.000	215.230	0.000	214.540	0.000	213.720	0.000
24	215.460	0.000	215.930	0.000	215.860	0.000	215.200	0.000	214.520	0.000	213.680	0.000
25	215.460	0.000	215.930	0.000	215.860	0.000	215.160	0.000	214.510	0.000	213.640	0.000
26	215.460	0.000	215.930	0.000	215.850	0.000	215.130	0.000	214.500	0.000	213.620	0.000
27	215.450	0.000	215.930	0.000	215.850	0.000	215.100	0.000	214.480	0.000	213.610	0.000
28	215.450	0.000	215.930	0.000	215.840	0.000	215.080	0.000	214.460	0.000	213.600	0.000
29	215.450	0.000	215.920	0.000			215.060	0.000	214.430	0.000	213.580	0.000
30	215.450	0.000	215.910	0.000			215.050	0.000	214.420	0.000	213.570	0.000
31	215.450	0.000	215.910	0.000			215.030	0.000			213.560	0.000
Ten-Daily Mean												
I Ten-Daily	215.653	1.710	215.450	0.000	215.902	0.000	215.714	0.000	214.897	0.000	214.302	0.000
II Ten-Daily	215.468	0.000	215.616	0.000	215.885	0.000	215.379	0.000	214.634	0.000	214.130	0.000
III Ten-Daily	215.455	0.000	215.925	0.000	215.856	0.000	215.142	0.000	214.495	0.000	213.657	0.000
Monthly												
Min.	215.450	0.000	215.450	0.000	215.840	0.000	215.030	0.000	214.420	0.000	213.560	0.000
Max.	215.900	3.730	215.930	0.000	215.910	0.000	215.830	0.000	215.010	0.000	214.390	0.000
Mean	215.523	0.552	215.672	0.000	215.883	0.000	215.403	0.000	214.675	0.000	214.018	0.000

Peak Computed Discharge = 1732.00 cumecs on 22-08-2018 Corres. Water Level :220.900 m

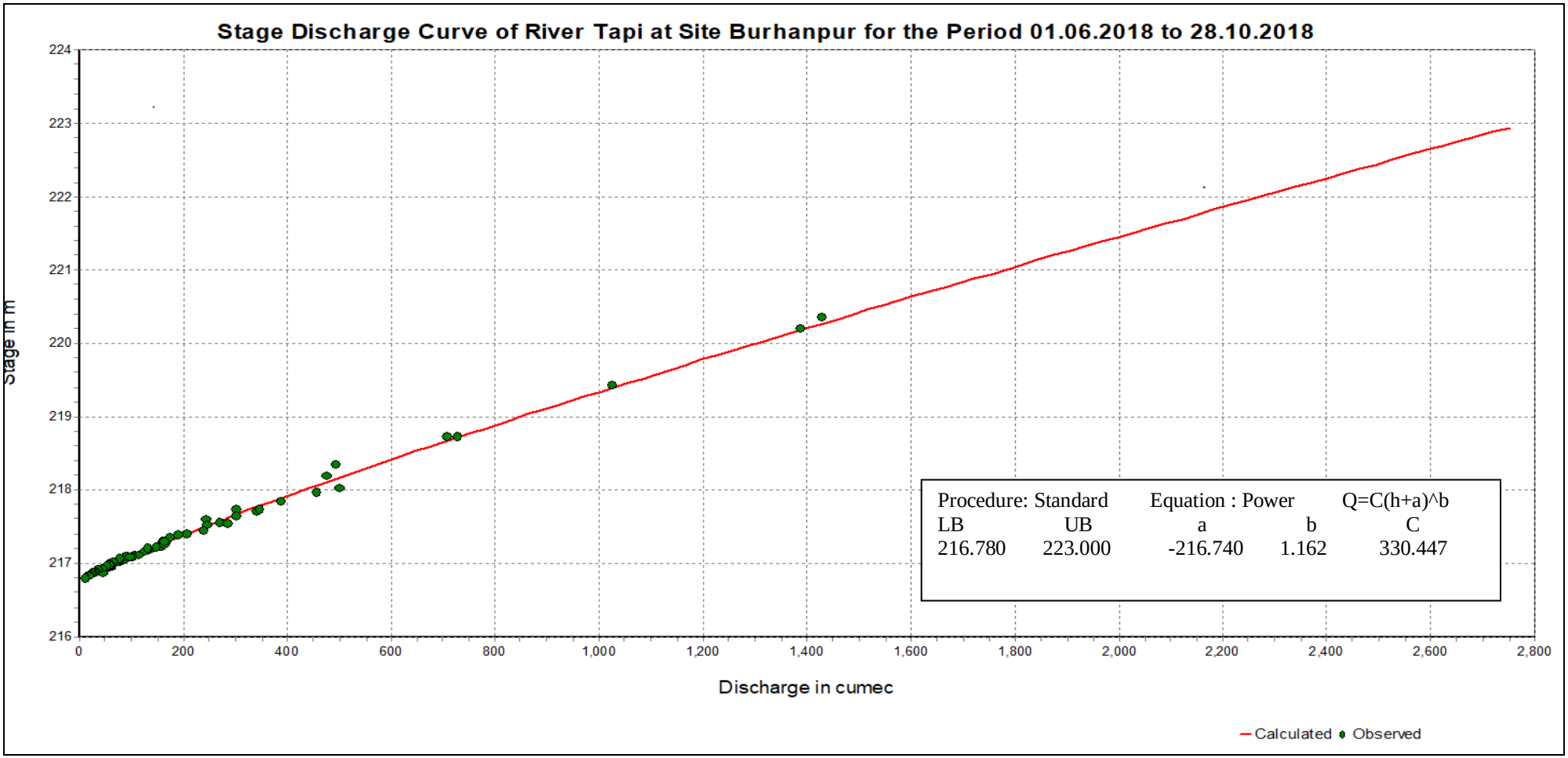
Lowest Computed Discharge = 0.510 cumecs on 09-12-2018 Corres. Water Level :215.500 m

Note: River Dry from 01/06/18 to 16/06/18, River in pooling condition i.e. negligible flow during 17/06/18 to 26/07/18 and from 11-12-18 to 31-05-19. Discarded points 27/10/18, 22/11/18, 24/11/18, from 26/11/18 to 01/12/18, 03/12/18, 04/12/18

Q: observed/ computed discharge in Cumec, WL: Corresponding Mean Water Level (msl) in m, *: Computed Discharge
#Discarded and estimated

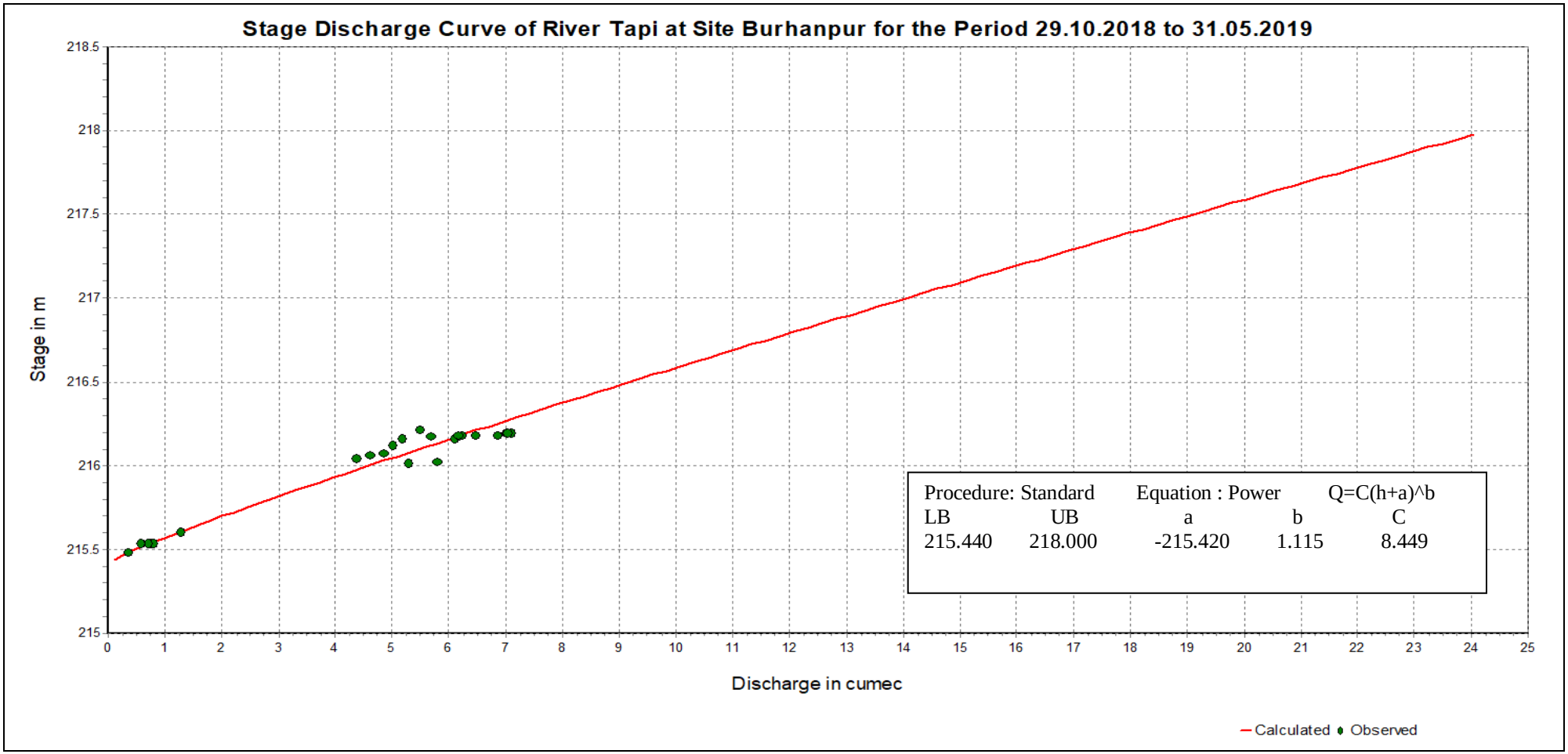
4.1.2.4 Stage Discharge Curve

Station Name: Tapi at Burhanpur (01 02 17 002) Division: Tapi Division Surat Local River: Tapi Sub Division: Upper Tapi Sub Division Bhusawal



4.1.2.4 Stage Discharge Curve

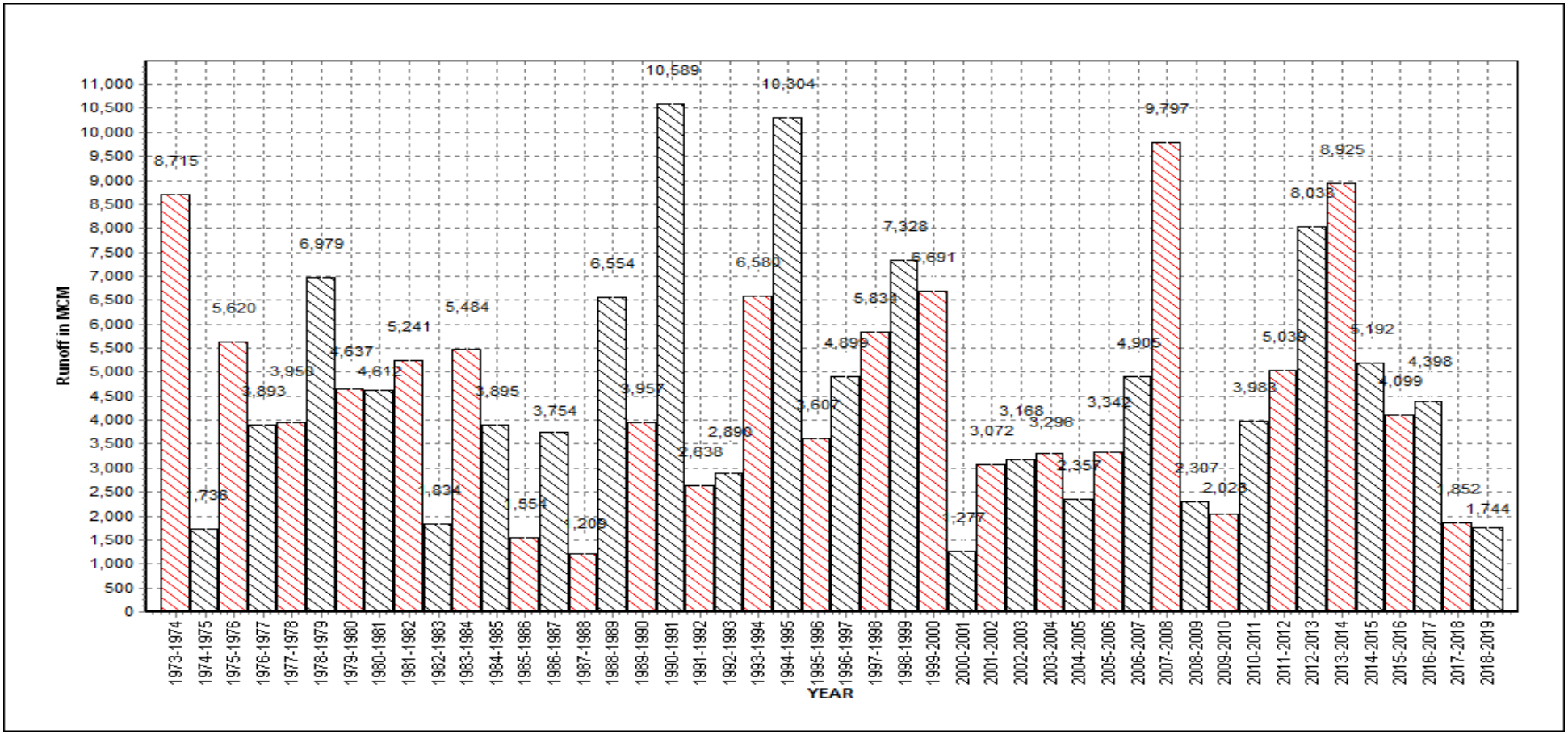
Station Name: Tapi at Burhanpur (01 02 17 002) Division: Tapi Division Surat Local River: Tapi Sub Division: Upper Tapi Sub Division Bhusawal



4.1.2.5 Annual Runoff

Annual Runoff for the period 1973-2019

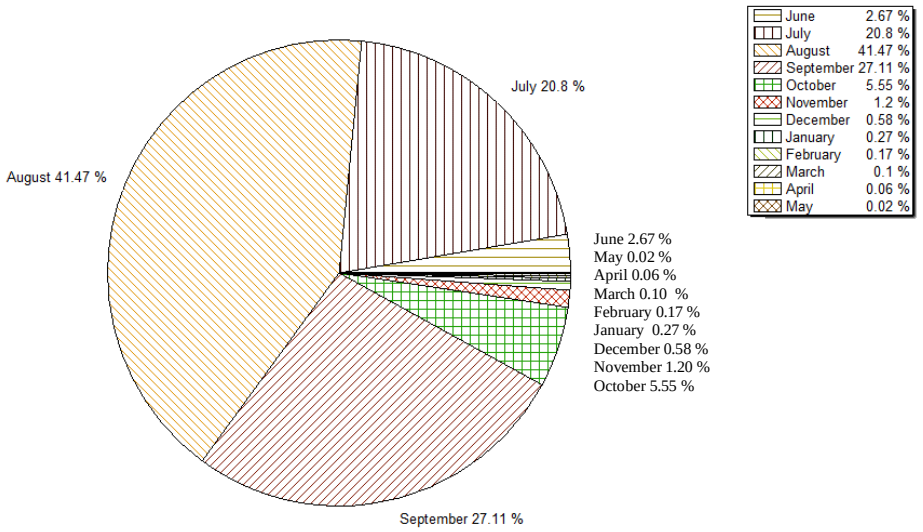
Station Name: Tapi at Burhanpur (01 02 17 002) Division: Tapi Division Surat Local River: Tapi Sub Division: Upper Tapi Sub Division Bhusawal



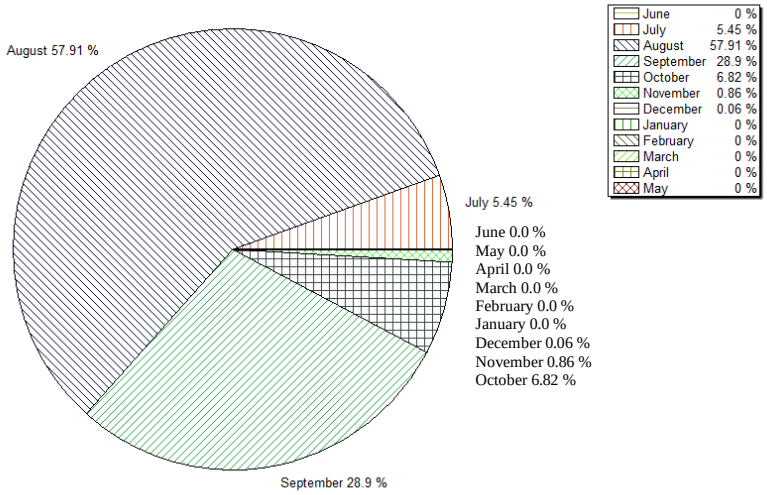
4.1.2.6 Monthly average Runoff

Station Name: Tapi at Burhanpur (01 02 17 002) Division: Tapi Division Surat Local River: Tapi Sub Division: Upper Tapi Sub Division Bhusawal

Monthly Average Runoff Based on period 1971-2018

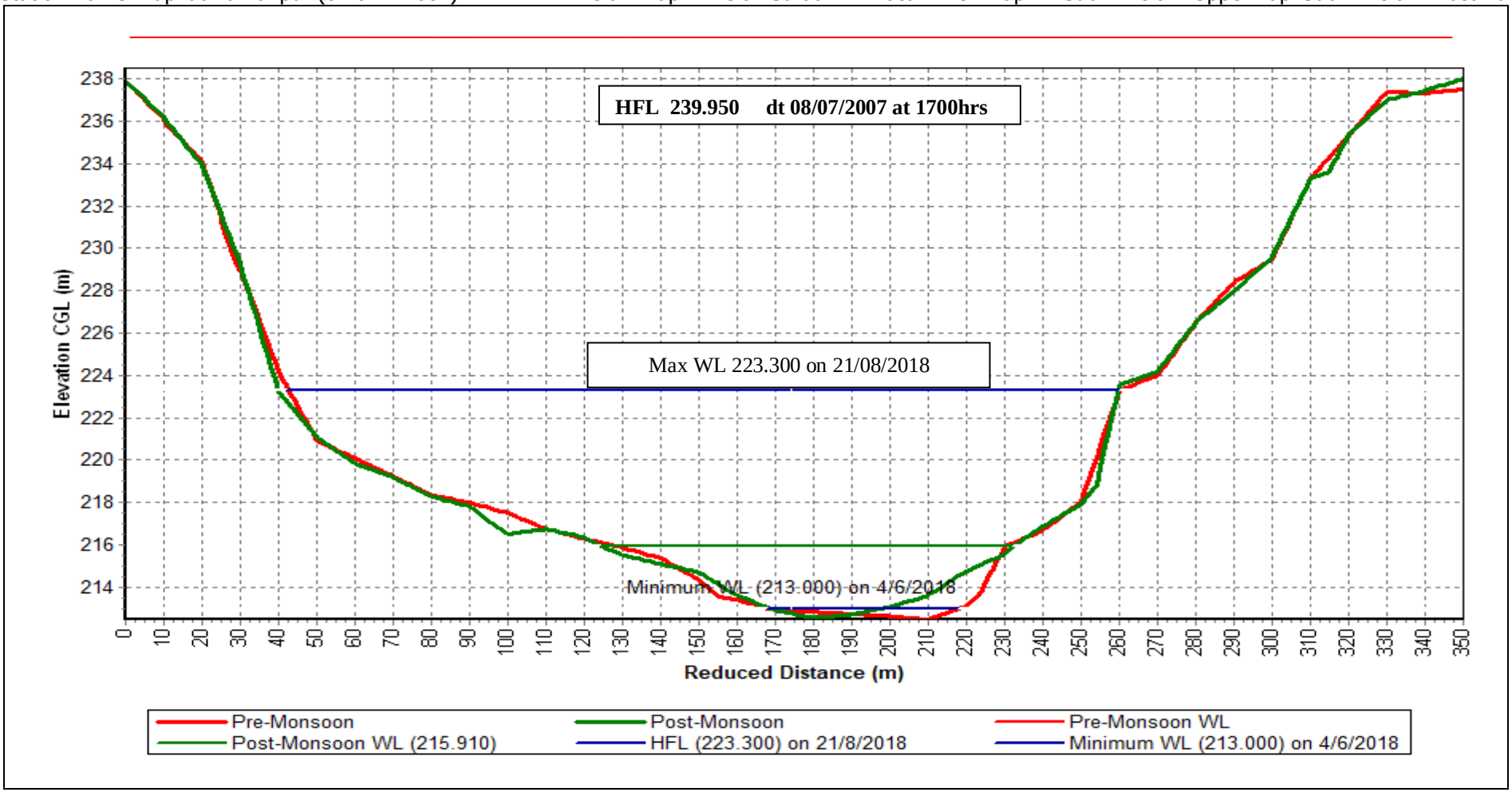


Monthly Runoff Based on period 2018-2019



4.1.2.7 Superimposed cross section

Station Name: Tapi at Burhanpur (01 02 17 002) Division: Tapi Division Surat Local River: Tapi Sub Division: Upper Tapi Sub Division Bhusawal

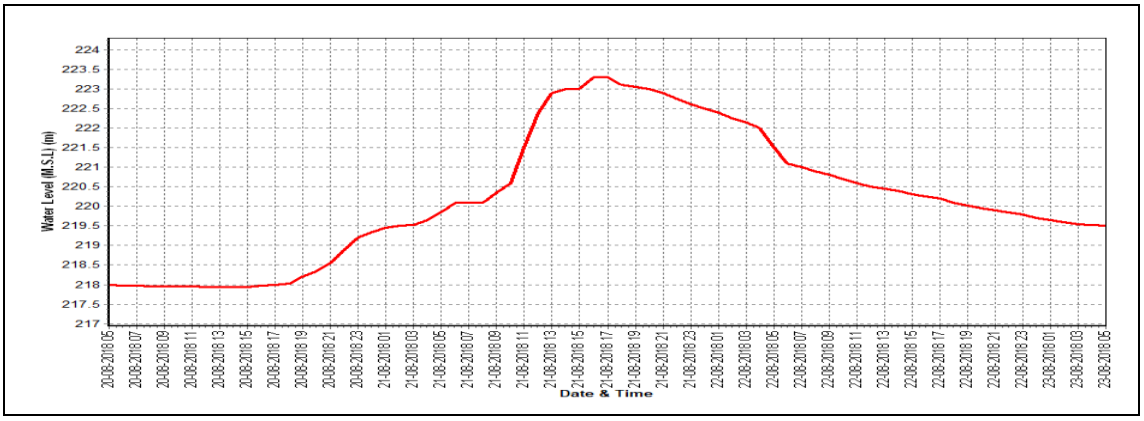


4.1.2.8 WL vs Time Graph of I, II, III peak

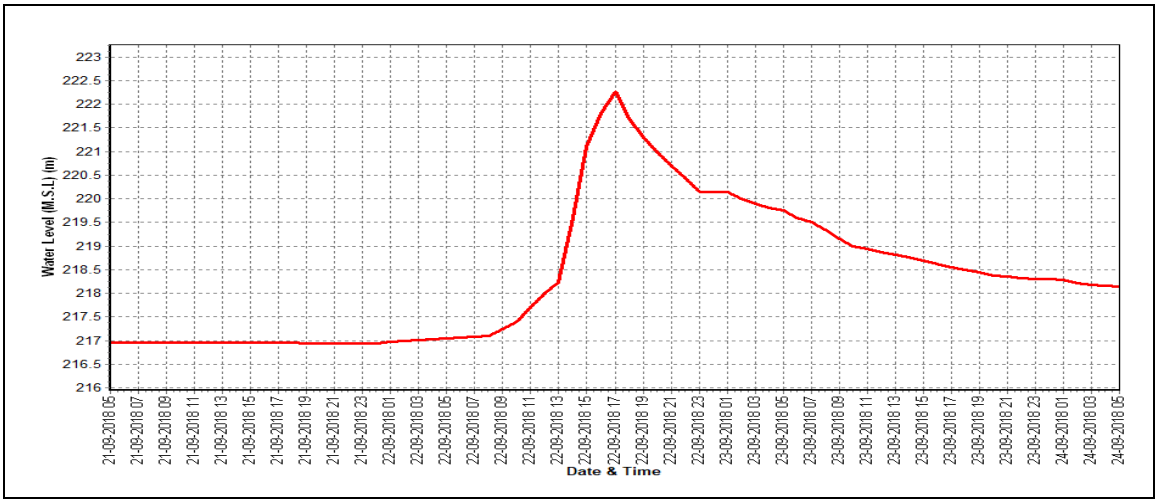
Station Name: Tapi at Burhanpur (01 02 17 002)
Local River: Tapi

Division: Tapi Division Surat
Sub Division: Upper Tapi Sub Division Bhusawal

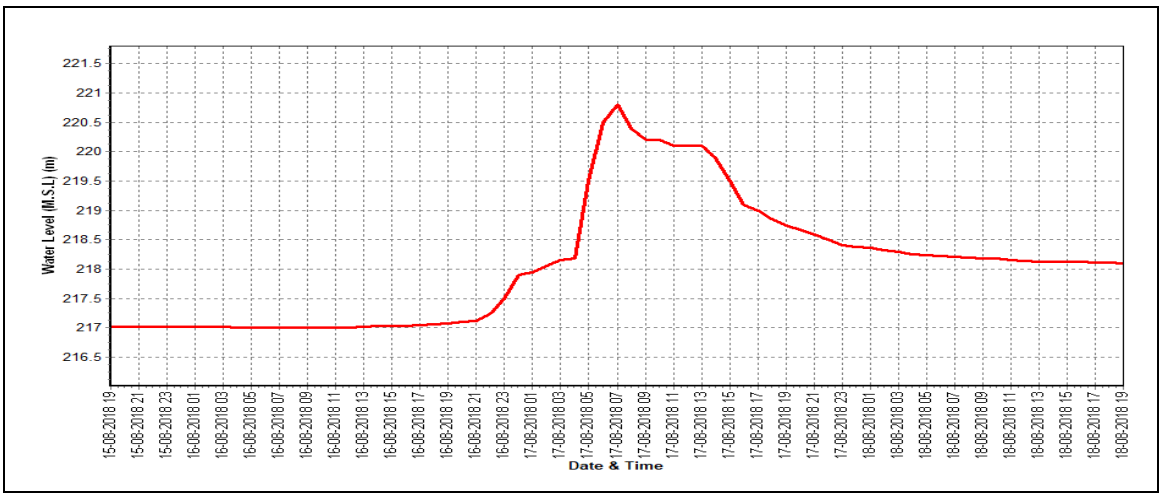
Water level vs Time Graph of Highest (I) flood peak during the water year 2018-19



Water level vs Time Graph of Highest (II) flood peak during the water year 2018-19



Water level vs Time Graph of Highest (III) flood peak during the water year 2018-19



4.1.3 Purna at Gopalkheda

4.1.3.1 History sheet

Site	**:**	**Purna at Gopalkheda**	**Code**	**:**	**01 02 17 004**
State	:	Maharashtra	District		Akola
Basin	:	Tapi	Independent River	:	Tapi
Tributary	:	Purna	Sub Tributary	:	
Sub-Sub Tributary	:		Local River	:	
Division	:	Tapi Division Surat	Sub-Division	:	Upper Tapi Sub Division Bhusawal
Drainage Area	:	9500 sq km	Bank	:	Left
Latitude	:	20°52’35”	Longitude	:	76°59’14”
Zero of Gauge (m)	:	236 (msl)	17/02/1977		
		Opening Date	Closing Date		
Gauge	:	17/02/1977			
Discharge	:	17/02/1977			
Sediment	:	30/07/1979			
Water Quality	:	01/08/1979			

Annual Maximum / Minimum observed discharge with corresponding Water Level (m)

	Maximum			Minimum		
Year	Q (cumec)	WL (m)	Date	Q (cumec)	WL (m)	Date
1977-1978	133.9	81.532	26/11/1977	0.300	80.420	11/06/1977
1978-1979	2105	250.327	30/08/1978	0.196	237.120	12/05/1979
1979-1980	1872	252.100	10/08/1979	0.000	237.100	18/05/1980
1980-1981	529.3	243.920	17/08/1980	0.200	237.150	01/06/1980
1981-1982	2881	249.680	10/08/1981	0.200	237.020	02/06/1981
1982-1983	358.9	242.240	21/07/1982	0.000	236.860	15/04/1983
1983-1984	1630	248.970	12/08/1983	0.400	236.905	14/06/1983
1984-1985	712.0	245.310	19/08/1984	0.300	237.045	15/02/1985
1985-1986	437.0	242.100	27/06/1985	0.100	237.050	06/01/1986
1986-1987	2192	247.595	15/08/1986	0.200	236.920	14/06/1986
1987-1988	444.1	241.170	21/08/1987	0.000	236.960	21/07/1987
1988-1989	2700	251.450	03/10/1988	0.993	237.170	11/04/1989
1989-1990	565.3	243.800	24/08/1989	0.000	237.170	05/04/1990
1990-1991	1419	248.050	17/08/1990	0.240	236.660	05/03/1991
1991-1992	1341	246.525	31/07/1991	0.000	237.040	26/01/1992
1992-1993	1329	248.650	22/08/1992	0.213	236.470	17/03/1993
1993-1994	189.5	239.090	17/07/1993	0.000	237.300	26/05/1994
1994-1995	2976	250.690	07/09/1994	0.000	237.340	11/05/1995
1995-1996	970.8	245.188	25/07/1995	0.000	237.300	21/04/1996
1996-1997	736.8	243.000	08/09/1996	0.000	236.890	03/05/1997
1997-1998	1313	246.100	01/12/1997	0.000	236.200	24/05/1998
1998-1999	2521	249.955	16/09/1998	0.049	236.410	12/04/1999
1999-2000	1840	249.275	10/08/1999	0.047	236.450	10/04/2000
2000-2001	1020	247.325	20/07/2000	0.000	236.300	10/05/2001
2001-2002	767.7	244.085	15/06/2001	0.087	236.310	24/12/2001
2002-2003	1910	246.700	03/09/2002	0.000	236.300	20/07/2002
2003-2004	200.4	239.500	29/07/2003	0.010	237.600	04/12/2003
2004-2005	292.8	239.700	06/08/2004	0.000	236.220	21/06/2004
2005-2006	1953	247.925	02/08/2005	0.000	236.270	24/06/2005
2006-2007	4124	251.600	07/08/2006	0.430	236.260	18/07/2006
2007-2008	3608	251.100	09/07/2007	0.020	236.110	09/05/2008
2008-2009	256.5	239.740	22/09/2008	0.109	236.150	07/07/2008
2009-2010	286.4	239.675	08/07/2009	0.000	237.160	19/08/2009
2010-2011	1293	245.345	01/08/2010	0.000	237.250	13/05/2011
2011-2012	768.2	243.380	29/08/2011	0.000	237.620	22/01/2011
2012-2013	2515	250.000	07/09/2012	0.000	R-Dry	04/06/2012
2013-2014	2983	249.195	02/08/2013	0.000	237.300	01/06/2013
2014-2015	2743	250.950	24/07/2014	0.000	R-Dry	26/12/2014
2015-2016	1149	244.425	07/08/2015	0.000	R-Dry	28/10/2015
2016-2017	264.8	240.840	04/08/2016	0.000	R-Dry	01/06/2016
2017-2018	130.4	238.550	30/08/2017	0.000	R-Dry	01/06/2017
2018-2019	205.0	240.020	21/08/2018	0.000	236.410	10/08/2018

4.1.3.2 Annual Maximum flood peak

Year	MWL (m)	Date	Hour
1977	241.200	25/11/1977	08:00:00
1978	250.405	30/08/1978	08:00:00
1979	252.100	10/08/1979	08:00:00
1980	247.010	17/08/1980	17:00:00
1981	249.770	10/08/1981	09:00:00
1982	242.940	22/07/1982	16:00:00
1983	249.130	12/08/1983	11:00:00
1984	245.980	19/08/1984	16:00:00
1985	246.000	26/06/1985	18:00:00
1986	247.730	15/08/1986	11:00:00
1987	241.990	21/08/1987	08:00:00
1988	252.000	03/10/1988	14:00:00
1989	244.700	24/08/1989	01:00:00
1990	251.000	25/07/1990	06:00:00
1991	248.350	31/07/1991	15:00:00
1992	248.650	22/08/1992	07:00:00
1993	239.780	16/07/1993	17:00:00
1994	250.750	07/09/1994	10:00:00
1995	245.350	25/07/1995	11:00:00
1996	243.240	08/09/1996	06:00:00
1997	246.250	30/11/1997	18:00:00
1998	250.150	16/09/1998	16:00:00
1999	249.590	10/08/1999	15:00:00
2000	247.400	20/07/2000	09:00:00
2001	244.300	15/06/2001	06:00:00
2002	249.550	03/09/2002	23:00:00
2003	241.900	28/07/2003	18:00:00
2004	242.050	05/08/2004	23:00:00
2005	250.800	01/08/2005	21:00:00
2006	251.600	07/08/2006	06:00:00
2007	251.270	09/07/2007	04:00:00
2008	241.150	21/09/2008	20:00:00
2009	241.880	08/07/2009	15:00:00
2010	246.580	31/07/2010	18:00:00
2011	244.550	06/09/2011	02:00:00
2012	250.160	07/09/2012	05:00:00
2013	249.340	02/08/2013	13:00:00
2014	250.360	24/07/2014	09:00:00
2015	252.450	06/08/2015	07:00:00
2016	248.500	13/07/2016	03:00:00
2017	241.300	27/08/2017	19:00:00
2018	243.700	17/08/2018	16:00:00

4.1.3.3 Summary of Data

Stage Discharge data for the period 2018 to 2019

Station Name: Purna at Gopalkheda (01 02 17 004) Division : Tapi Division Surat Local River: Purna Sub Division: Upper Tapi Sub Division Bhusawal

Day	Jun		Jul		Aug		Sep		Oct		Nov
1	RIVER DRY	0.000	237.520	48.57 *	236.600	8.685	236.770	16.45	236.460	4.675	0.000
2		0.000	236.600	8.710 *	236.580	7.980 #	236.770	15.25 *	236.460	3.840 *	0.000
3		0.000	236.700	12.49 *	236.560	7.430	236.770	15.25 *	236.450	3.874	0.000
4		0.000	236.770	15.25 *	236.550	7.400	236.750	13.83	236.440	3.426	0.000
5		0.000	236.440	3.200 *	236.550	6.900 *	236.700	12.09	236.410	0.000	0.000
6		0.000	236.550	6.900 *	236.500	3.481	236.660	9.777	236.390	0.000	0.000
7		0.000	238.150	79.95 *	236.440	3.320	236.630	9.337	236.380	0.000	0.000
8		0.000	236.880	19.75 *	236.420	2.840	236.620	9.068	236.380	0.000	0.000
9		0.000	238.030	73.79 *	236.420	2.790	236.610	9.080 *	236.370	0.000	0.000
10		0.000	236.900	20.58 *	236.410	0.000	236.600	8.493	236.360	0.000	0.000
11	236.720	13.27 *	238.300	87.74 *	236.390	0.000	236.590	7.625	236.350	0.000	0.000
12	238.140	79.43 *	242.220	318.6 *	236.390	0.000	236.540	6.378	236.350	0.000	0.000
13	236.670	11.33 *	240.950	239.3 *	236.390	0.000	236.530	6.200 *	236.340	0.000	0.000
15	236.340	0.390 *	237.880	66.21 *	236.390	0.000	236.520	6.152	236.310	0.000	0.000
16	236.290	0.000 *	237.950	69.73 *	236.390	0.000	236.450	5.677	236.280	0.000	0.000
17	236.260	0.000 *	238.600	103.7 *	236.390	0.000	236.450	3.520 *	236.260	0.000	0.000
18	236.250	0.000 *	237.400	42.89 *	240.030	161.6	236.450	2.001	236.240	0.000	0.000
19	236.240	0.000 *	236.830	17.68 *	239.500	147.9	236.420	1.941	236.230	0.000	0.000
20	236.210	0.000 *	236.760	14.85 *	240.450	209.1 *	236.390	0.000	236.230	0.000	0.000

21	236.500	5.170 *	236.680	11.72 *	240.020	205.2	236.360	0.000	236.220	0.000	RIVER DRY	0.000
22	236.950	22.69 *	236.660	10.95 *	242.850	359.1 *	236.370	0.000	236.210	0.000		0.000
23	237.300	38.24 *	236.650	10.57 *	238.590	116.9	236.820	0.000	236.180	0.000		0.000
24	237.660	55.33 *	236.650	10.57 *	237.520	43.82	236.840	18.19	236.170	0.000		0.000
25	237.350	40.55 *	236.640	10.20 *	237.260	31.90	236.730	15.34	236.160	0.000		0.000
26	237.000	24.83 *	236.640	7.980 *	237.060	27.44 *	236.670	10.98	236.130	0.000		0.000
27	237.200	33.67 *	236.750	12.69	236.950	20.60	236.590	7.910	236.120	0.000		0.000
28	237.550	50.01 *	236.690	11.80	236.870	19.03	236.550	7.393	236.110	0.000		0.000
29	236.700	12.49 *	236.660	10.95 *	236.830	20.35	236.510	6.734	236.100	0.000		0.000
30	236.640	10.20 *	236.640	10.82	236.790	18.29	236.490	4.830 *	236.100	0.000		0.000
31			236.610	8.765	236.780	18.05			236.100	0.000		0.000
Ten-Daily Mean												
I Ten-Daily		0.000	237.054	28.92	236.503	5.083	236.688	11.86	236.410	1.582		0.000
II Ten-Daily	236.532	10.44	238.359	97.31	237.646	60.48	236.471	3.949	236.281	0.000		0.000
III Ten-Daily	237.085	29.32	236.661	10.64	237.956	80.07	236.593	7.137	236.145	0.000		0.000
Monthly												
Min.	236.200	0.000	236.440	3.200	236.390	0.000	236.360	0.000	236.100	0.000		0.000
Max.	238.140	79.43	242.220	318.6	242.850	359.1	236.840	18.19	236.460	4.675		0.000
Mean	236.809	19.88	237.335	44.49	237.387	49.56	236.584	7.650	236.275	0.510		0.000

Annual Runoff in MCM = 307 **Annual Runoff in mm = 32**

Peak Observed Discharge = 205.200 cumecs on 21-08-2018 **Corres. Water Level :240.020 m**

Lowest Observed Discharge = 0.000 cumecs on 10-08-2018 **Corres. Water Level :236.410 m**

Note: River Dry from 01/06/18 to 10/06/18, 01/11/18 to 14/12/18, 27/12/18 to 03/01/19 and from 15/01/2019 to 31/05/2019; no flow from 10/08/2018 to 16/08/18, 19/09/18 to 23/09/18, 05/10/18 to 31/10/18, 15/12/18 to 26/12/18 and 04/01/19 to 14/01/19 Shortage of Staff from 11/06/2018 to 26/07/2018. Discarded points 02/08/2018.

Q: observed/ computed discharge in Cumec, WL: Corresponding Mean Water Level (msl) in m, *: Computed Discharge
#Discarded and estimate

Stage Discharge data for the period 2018 to 2019

Station Name: Purna at Gopalkheda (01 02 17 004) Division : Tapi Division Surat Local River: Purna Sub Division: Upper Tapi Sub Division Bhusawal

Day	Dec		Jan		Feb		Mar		Apr		May	
	W.L	Q	WL	Q	WL	Q	WL	Q	WL	Q	WL	Q
1		0.000		0.000		0.000		0.000		0.000		0.000
2		0.000	RIVER DRY	0.000		0.000		0.000		0.000		0.000
3		0.000		0.000		0.000		0.000		0.000		0.000
4		0.000	236.030	0.000		0.000		0.000		0.000		0.000
5		0.000	236.050	0.000		0.000		0.000		0.000		0.000
6		0.000	236.050	0.000		0.000		0.000		0.000		0.000
7	RIVER DRY	0.000	236.050	0.000		0.000		0.000		0.000		0.000
8		0.000	236.100	0.000 *		0.000		0.000		0.000		0.000
9		0.000	236.100	0.000		0.000		0.000		0.000		0.000
10		0.000	236.050	0.000	RIVER DRY	0.000	RIVER DRY	0.000	RIVER DRY	0.000	RIVER DRY	0.000
11		0.000	236.050	0.000		0.000		0.000		0.000		0.000
12		0.000	236.050	0.000		0.000		0.000		0.000		0.000
13		0.000	236.050	0.000		0.000		0.000		0.000		0.000
14		0.000	236.300	0.000		0.000		0.000		0.000		0.000
15	236.110	0.000		0.000		0.000		0.000		0.000		0.000
16	236.150	0.000		0.000		0.000		0.000		0.000		0.000
17	236.150	0.000	RIVER DRY	0.000		0.000		0.000		0.000		0.000
18	236.170	0.000		0.000		0.000		0.000		0.000		0.000
19	236.170	0.000		0.000		0.000		0.000		0.000		0.000
20	236.120	0.000		0.000		0.000		0.000		0.000		0.000

21	236.100	0.000	RIVER DRY	0.000	RIVER DRY	0.000	RIVER DRY	0.000	RIVER DRY	0.000	RIVER DRY	0.000
22	236.100	0.000		0.000		0.000		0.000		0.000		0.000
23	236.100	0.000		0.000		0.000		0.000		0.000		0.000
24	236.100	0.000		0.000		0.000		0.000		0.000		0.000
25	236.050	0.000		0.000		0.000		0.000		0.000		0.000
26	236.300	0.000		0.000		0.000		0.000		0.000		0.000
27		0.000		0.000		0.000		0.000		0.000		0.000
28		0.000		0.000		0.000		0.000		0.000		0.000
29		0.000		0.000				0.000		0.000		0.000
30		0.000		0.000				0.000		0.000		0.000
31		0.000		0.000				0.000				0.000
Ten-Daily Mean												
I Ten-Daily		0.000	236.061	0.000		0.000		0.000		0.000		0.000
II Ten-Daily	236.145	0.000	236.113	0.000		0.000		0.000		0.000		0.000
III Ten-Daily	236.125	0.000		0.000		0.000		0.000		0.000		0.000
Monthly												
Min.	236.050	0.000	236.030	0.000		0.000		0.000		0.000		0.000
Max.	236.300	0.000	236.300	0.000		0.000		0.000		0.000		0.000
Mean	236.135	0.000	236.080	0.000		0.000		0.000		0.000		0.000

Peak Computed Discharge = 359.1 cumecs on 22-08-2018 Corres. Water Level :242.850 m
Lowest Computed Discharge = 0.000 cumecs on 15-06-2018 Corres. Water Level :236.290 m

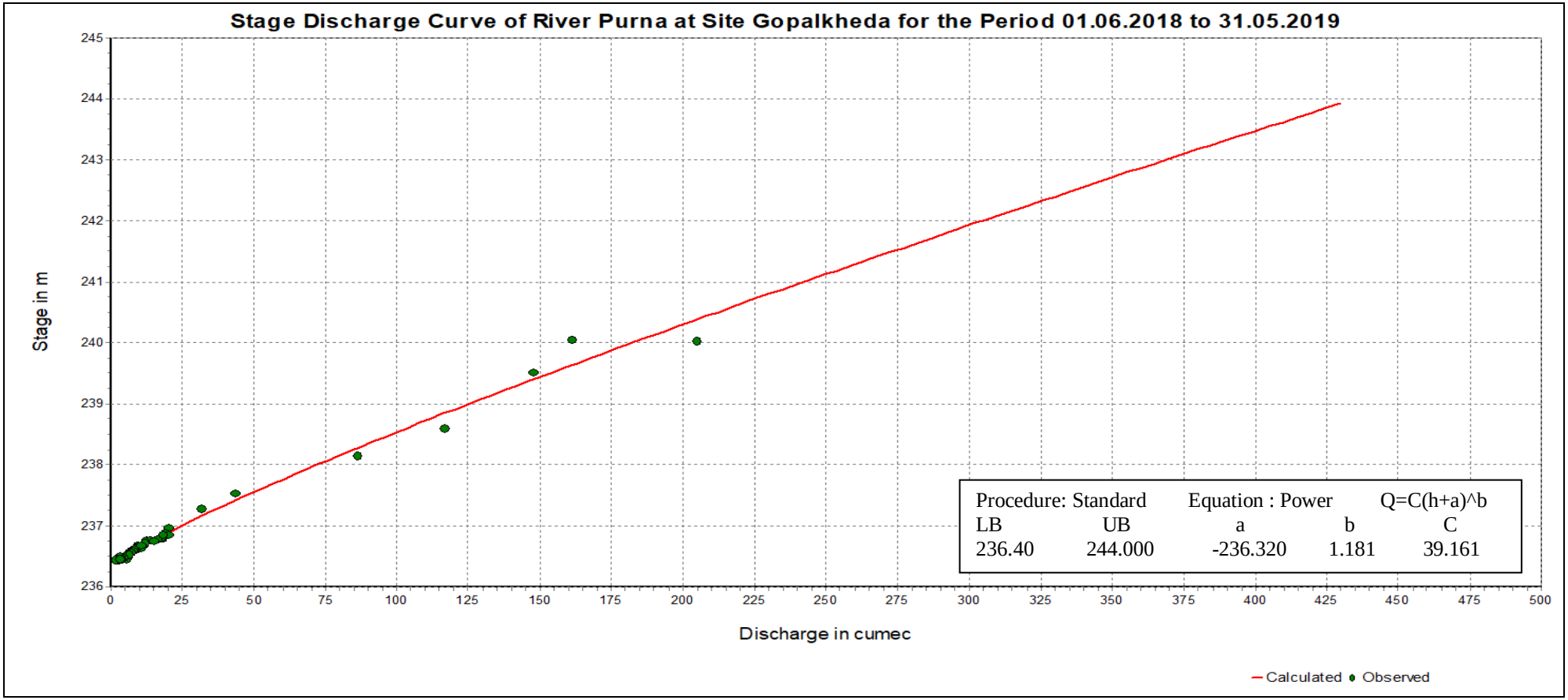
Note: River Dry from 01/06/18 to 10/06/18, 01/11/18 to 14/12/18, 27/12/18 to 03/01/19 and from 15/01/2019 to 31/05/2019; no flow from 10/08/2018 to 16/08/18, 19/09/18 to 23/09/18, 05/10/18 to 31/10/18, 15/12/18 to 26/12/18 and 04/01/19 to 14/01/19 Shortage of Staff from 11/06/2018 to 26/07/2018. Discarded points 02/08/2018.

Q: observed/ computed discharge in Cumec, WL: Corresponding Mean Water Level (msl) in m, *: Computed Discharge

#Discarded and estimated

4.1.3.4 Stage Discharge Curve

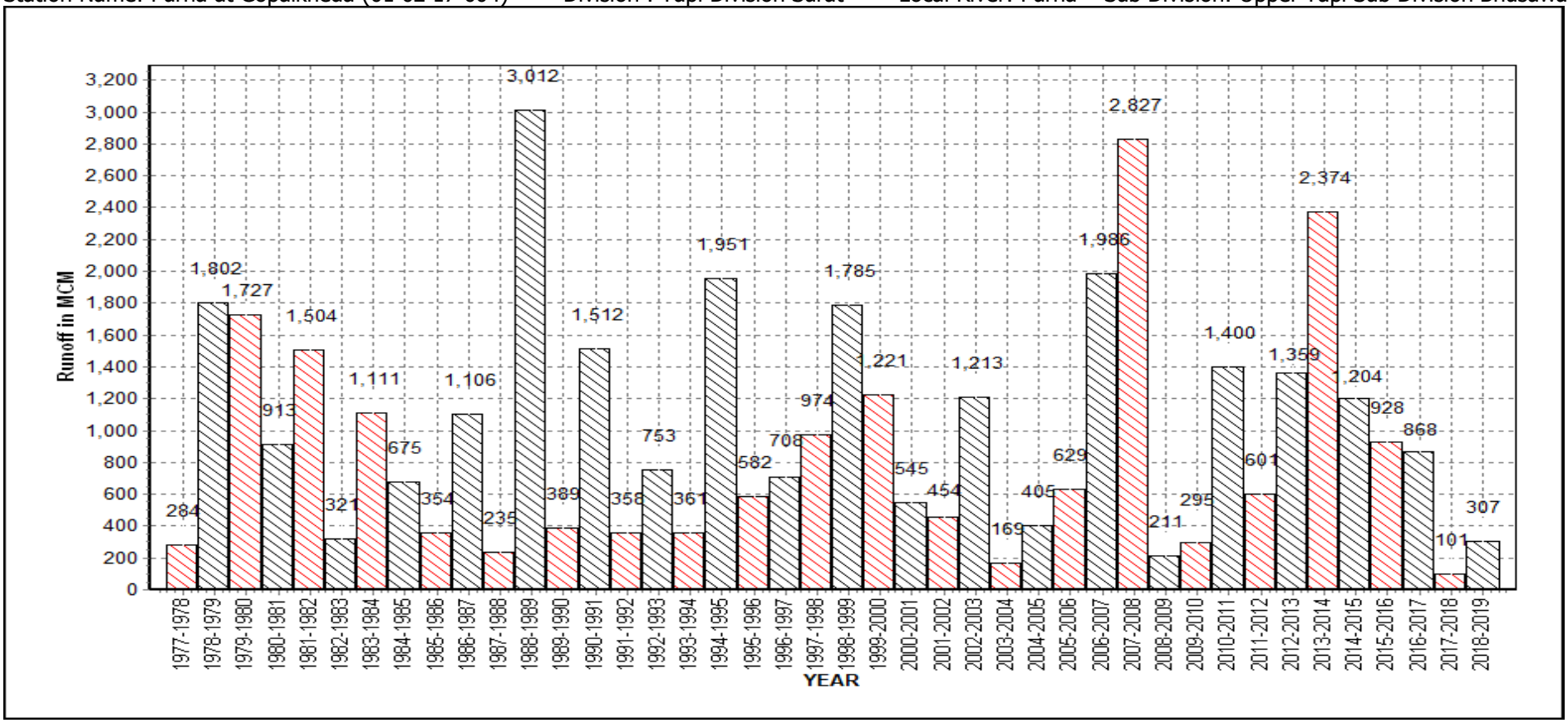
Station Name: Purna at Gopalkheda (01 02 17 004) Division : Tapi Division Surat Local River: Purna Sub Division: Upper Tapi Sub Division Bhusawal



4.1.3.5 Annual runoff

Annual Runoff for the period 1977-2019

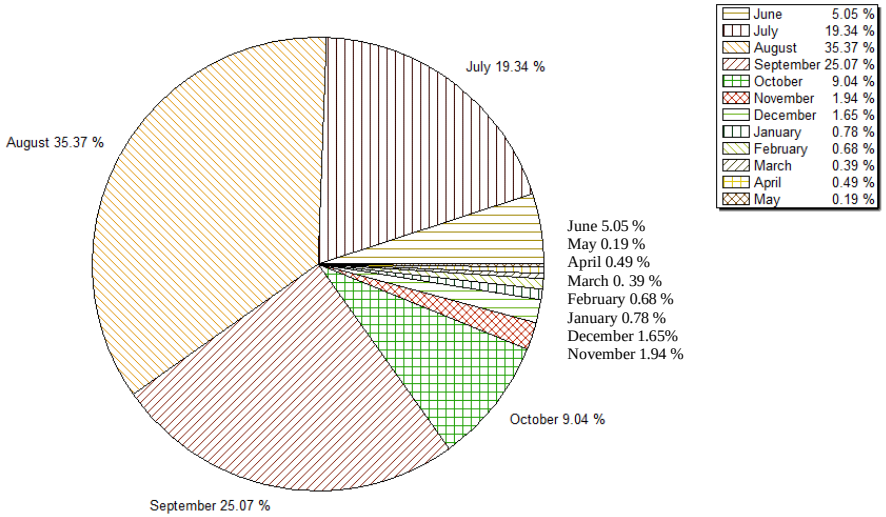
Station Name: Purna at Gopalkheda (01 02 17 004) Division : Tapi Division Surat Local River: Purna Sub Division: Upper Tapi Sub Division Bhusawal



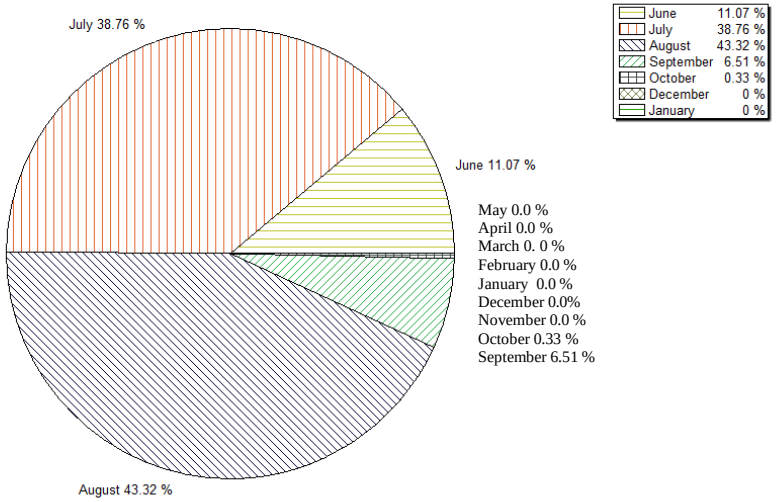
4.1.3.6 Monthly average Runoff

Station Name: Purna at Gopalkheda (01 02 17 004) Division : Tapi Division Surat Local River: Purna Sub Division: Upper Tapi Sub Division Bhusawal

Monthly Average Runoff Based on period 1977-2018

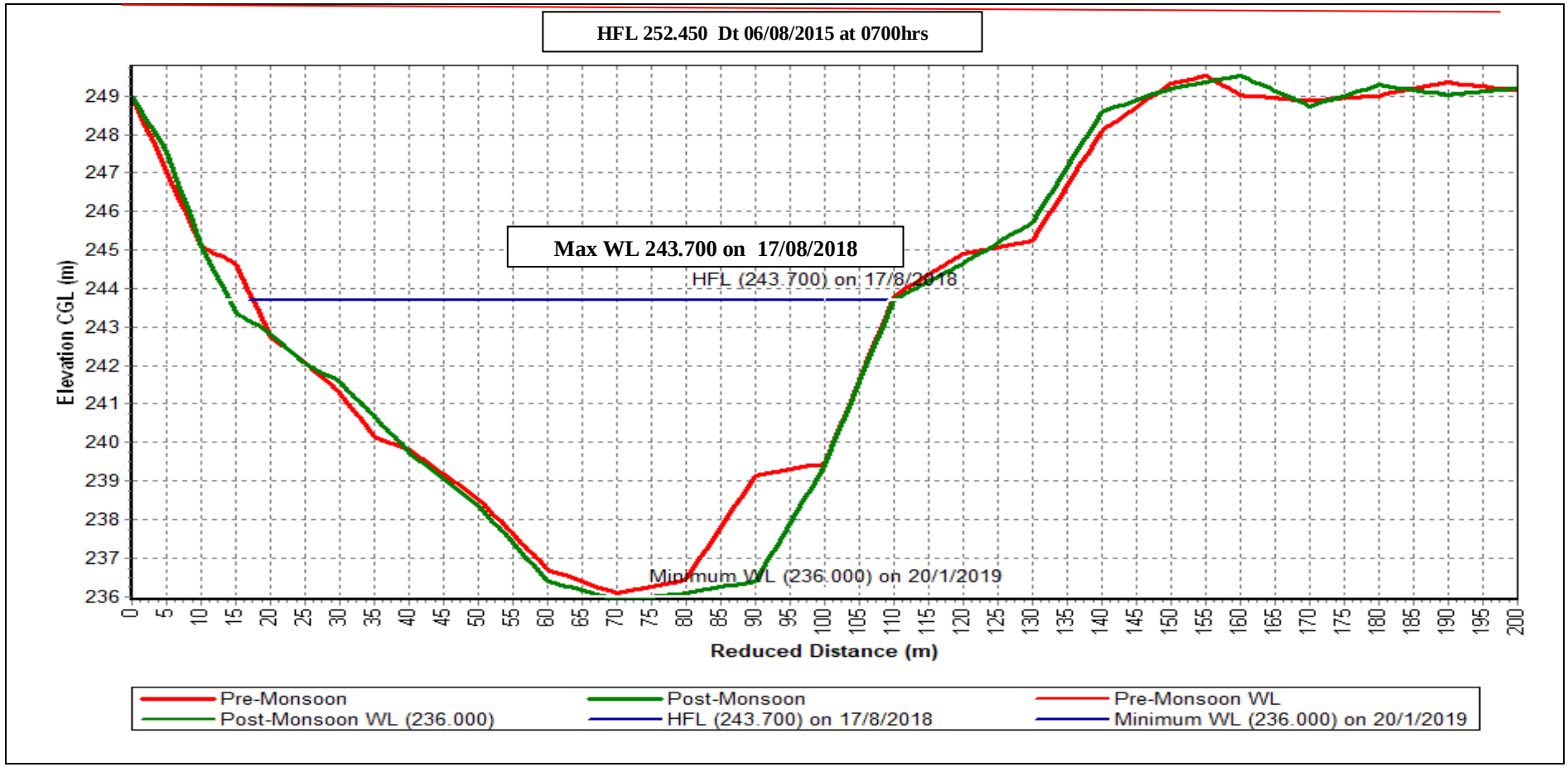


Monthly Runoff Based on period 2018-2019



4.1.3.7 Superimposed cross section

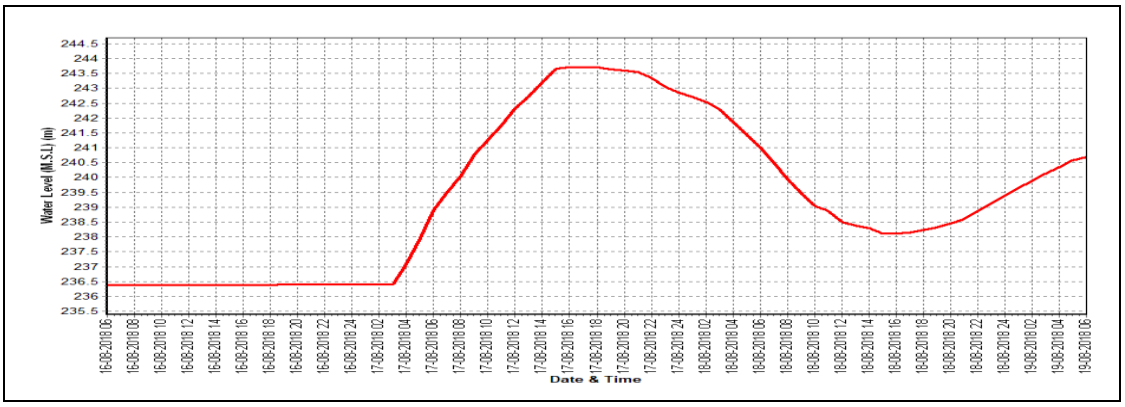
Station Name: Purna at Gopalkheda (01 02 17 004) Division : Tapi Division Surat Local River: Purna Sub Division: Upper Tapi Sub Division Bhusawal



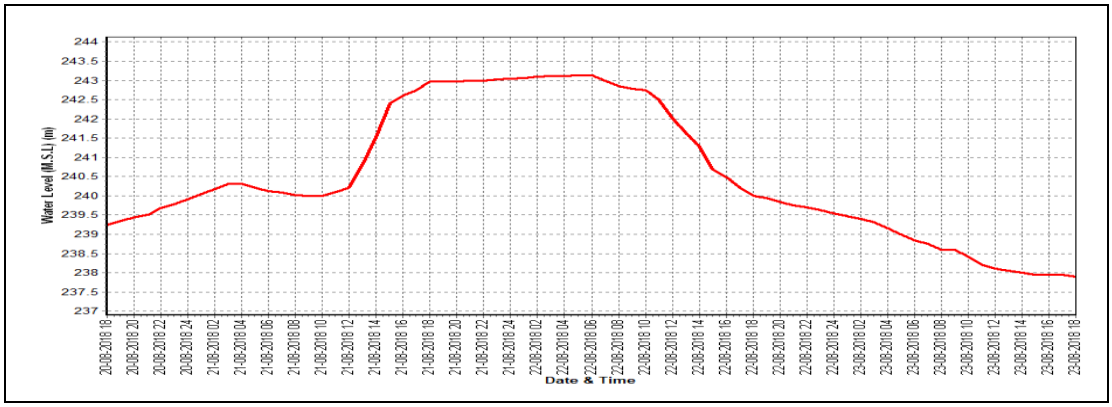
4.1.3.8 WL vs Time graph of highest I, II, III peak

Station Name: Purna at Gopalkheda (01 02 17 004) Division : Tapi Division Surat
Local River: Purna Sub Division: Upper Tapi Sub Division Bhusawal

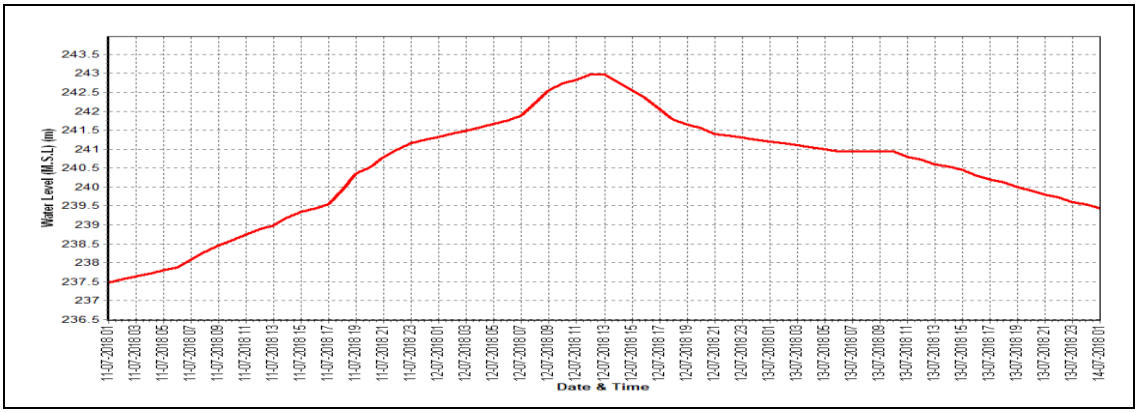
Water level vs Time Graph of Highest (I) flood peak during the water year 2018-19



Water level vs Time Graph of Highest (II) flood peak during the water year 2018-19



Water level vs Time Graph of Highest (III) flood peak during the water year 2018-19



4.1.4 Purna at Yerli

4.1.4.1 HISTORY SHEET

Site	**:**	**Purna at Yerli**	**Code**	**:**	**01 02 17 005**
State	:	Maharashtra	District		Buldhana
Basin	:	Tapi	Independent River	:	Tapi
Tributary	:	Purna	Sub Tributary	:	-
Sub-Sub Tributary	:		Local River	:	
Division	:	Tapi Division Surat	Sub-Division	:	Upper Tapi Sub Division Bhusawal
Drainage Area	:	16517 sq km	Bank	:	Left
Latitude	:	20°56'11"	Longitude	:	76°28'27"
Zero of Gauge (m)	:	213 (msl)	11/11/1971		
		Opening Date	Closing Date		
Gauge	:	11/11/1971			
Discharge	:	01/03/1972			
Sediment	:	09/04/1973			
Water Quality	:	01/06/1977	31/05/2005		

Annual Maximum / Minimum discharge with corresponding Water Level (above msl)

Year	Maximum			Minimum		
	Q (cumec)	**WL (m)**	**Date**	**Q cumec)**	**WL (m)**	**Date**
1973-1974	3060	226.210	28/08/1973	0.000	228.370	27/08/1973
1974-1975	2005	220.882	13/08/1974	0.200	214.400	28/05/1975
1975-1976	2493	222.883	05/09/1975	0.200	214.580	13/05/1976
1976-1977	2580	222.800	04/09/1976	0.200	214.630	02/06/1976
1977-1978	1885	220.965	14/06/1977	0.500	214.553	12/06/1977
1978-1979	4154	225.200	31/08/1978	1.200	214.805	29/05/1979
1979-1980	10380	230.510	11/08/1979	0.916	214.785	14/06/1979
1980-1981	1842	221.532	18/08/1980	1.200	214.815	31/05/1981
1981-1982	3350	224.780	11/08/1981	0.800	214.755	02/06/1981
1982-1983	651.6	219.485	21/07/1982	0.100	214.650	20/04/1983
1983-1984	6055	229.850	12/08/1983	1.243	214.695	31/05/1984
1984-1985	1611	220.595	10/10/1984	0.000	214.475	26/05/1985
1985-1986	3146	223.650	27/06/1985	0.000	214.570	30/05/1986
1986-1987	3073	224.240	07/08/1986	0.100	214.610	01/06/1986
1987-1988	1122	219.825	21/08/1987	0.000	214.620	21/04/1988
1988-1989	6700	228.500	04/10/1988	0.000	214.360	07/06/1988
1989-1990	1298	220.780	24/08/1989	0.000	214.730	17/05/1990
1990-1991	4501	227.150	25/07/1990	0.000	214.880	11/05/1991
1991-1992	1480	221.540	01/08/1991	0.000	214.730	03/03/1992
1992-1993	1974	222.445	22/08/1992	0.000	214.435	17/06/1992
1993-1994	2269	223.820	16/07/1993	0.000	214.650	07/05/1994
1994-1995	3785	225.550	08/09/1994	0.000	214.600	10/06/1994
1995-1996	1538	221.510	03/09/1995	0.000	214.600	16/04/1996
1996-1997	747.2	219.650	24/10/1996	0.000	214.655	23/04/1997
1997-1998	1294	221.350	01/12/1997	0.000	214.600	16/05/1998
1998-1999	3059	224.710	17/09/1998	0.000	214.550	22/05/1999
1999-2000	3020	224.150	11/08/1999	0.000	214.700	30/04/2000
2000-2001	680.0	220.200	20/07/2000	0.000	214.620	27/11/2000
2001-2002	1659	222.260	15/06/2001	0.000	214.600	18/05/2002
2002-2003	2750	225.870	04/09/2002	0.000	214.580	03/02/2003
2003-2004	443.4	218.095	29/09/2003	0.000	214.580	04/06/2003
2004-2005	407.8	217.425	06/08/2004	0.000	214.620	07/03/2005
2005-2006	3046	224.550	02/08/2005	0.000	214.690	07/06/2005
2006-2007	8703	233.540	07/08/2006	0.000	214.600	03/03/2007
2007-2008	3132	225.615	02/07/2007	0.000	214.620	18/05/2008
2008-2009	542.8	218.645	22/09/2008	0.000	214.410	23/04/2009
2009-2010	369.0	217.395	04/09/2009	0.000	River Dry	04/11/2009
2010-2011	1757	223.005	01/08/2010	0.257	214.760	31/12/2010
2011-2012	989.3	219.000	06/09/2012	0.000	214.970	01/06/2011
2012-2013	2348	223.750	08/09/2012	0.000	River Dry	01/06/2012
2013-2014	2814	225.430	03/08/2013	0.000	214.300	17/12/2013
2014-2015	2434	224.050	25/07/2014	0.000	214.070	01/06/2014
2015-2016	673.0	217.900	08/08/2015	0.000	River Dry	01/06/2015
2016-2017	1525	221.385	28/07/2016	0.000	River Dry	01/06/2016
2017-2018	416. 7	217.380	30/08/2017	0.000	River Dry	01/06/2017
2018-2019	1107	219.000	18/08/2018	0.000	River Dry	01/06/2018

4.1.4.2 Annual Maximum flood peak

Year	MWL (m)	Date	Hour
1972	224.895	19/08/1972	14:00:00
1973	220.990	13/08/1973	06:00:00
1974	220.990	13/08/1974	06:00:00
1975	222.990	05/09/1975	07:00:00
1976	223.040	04/09/1976	01:00:00
1977	221.250	28/06/1977	20:00:00
1978	225.330	31/08/1978	04:00:00
1979	230.670	11/08/1979	03:00:00
1980	222.200	17/08/1980	15:00:00
1981	224.950	11/08/1981	01:00:00
1982	220.600	20/07/1982	22:00:00
1983	229.870	12/08/1983	09:00:00
1984	220.710	10/10/1984	10:00:00
1985	223.750	27/06/1985	14:00:00
1986	225.200	07/08/1986	00:00:00
1987	219.860	21/08/1987	09:00:00
1988	228.850	04/10/1988	12:00:00
1989	223.340	21/07/1989	21:00:00
1990	228.100	25/07/1990	19:00:00
1991	221.540	01/08/1991	07:00:00
1992	222.655	22/08/1992	19:00:00
1993	223.920	16/07/1993	06:00:00
1994	225.600	08/09/1994	12:00:00
1995	221.520	03/09/1995	09:00:00
1996	219.820	08/09/1996	21:00:00
1997	221.350	01/12/1997	08:00:00
1998	224.730	17/09/1998	11:00:00
1999	224.390	11/08/1999	13:00:00
2000	221.130	20/07/2000	21:00:00
2001	222.530	15/06/2001	10:00:00
2002	226.060	26/08/2002	04:00:00
2003	218.320	09/08/2003	03:00:00
2004	218.120	06/08/2004	14:00:00
2005	225.600	02/08/2005	20:00:00
2006	233.700	07/08/2006	12:00:00
2007	226.930	09/07/2007	23:00:00
2008	218.670	22/09/2008	09:00:00
2009	217.700	04/09/2009	02:00:00
2010	224.000	31/07/2010	22:00:00
2011	220.600	13/07/2011	15:00:00
2012	224.070	07/09/2012	22:00:00
2013	225.440	03/08/2013	12:00:00
2014	224.240	25/07/2014	03:00:00
2015	226.680	06/08/2015	15:00:00
2016	222.950	12/07/2016	08:00:00
2017	217.820	30/08/2017	06:00:00
2018	219.380	18/08/2018	06:00:00

4.1.4.3 Summary of Data

Stage Discharge data for the period 2018 to 2019

Station Name: Purna at Yerli (01 02 17 005) Division: Tapi Division, Surat Local River: Sub Division: Upper Tapi Sub Division Bhusawal

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		0.000	214.600	11.70 *	214.410	3.702	214.700	11.11	214.320	5.385	214.190	0.000
2		0.000	214.630	6.406	214.390	3.335	214.650	13.52 *	214.290	3.700 *	214.180	0.000
3	RIVER	0.000	214.580	6.474	214.375	3.244	214.590	11.32 *	214.290	5.323	214.180	0.000
4	DRY	0.000	214.560	5.912	214.280	3.136	214.590	11.40	214.280	5.288	214.180	0.000
5		0.000	214.560	5.861	214.260	3.190 *	214.540	10.64	214.270	5.225	214.170	0.000
6		0.000	214.460	2.616	214.230	2.979	214.505	10.36	214.260	2.176	214.170	0.000
7		0.000	215.185	80.28	214.170	2.883	214.500	9.986	214.250	3.040 *	214.160	0.000
8		0.000	214.970	29.15 *	214.140	2.739	214.480	8.882	214.240	1.350	214.150	0.000
9		0.000	215.520	90.56	214.110	2.548	214.460	7.410 *	214.240	1.031	214.150	0.000
10		0.000	215.950	147.7	214.090	1.957	214.430	8.437	214.220	1.010	214.140	0.000
11		0.000	214.845	16.66	214.080	1.784	214.420	8.309	214.190	1.010	214.120	0.000
12		0.000	217.100	369.8 *	214.060	0.890 *	214.400	8.232	214.150	0.000	214.100	0.000
13	214.825	15.97	217.650	541.5 *	214.000	0.510 #	214.380	5.470 *	214.150	0.000	214.090	0.000
14	214.640	6.551	215.985	148.8	213.970	0.360 #	214.350	4.830 *	214.150	0.000	214.000	0.000
15	214.520	4.980	215.030	32.91 *	213.960	0.320 *	214.320	7.454	214.150	0.000	213.950	0.000
16	214.460	7.410 *	216.275	189.9	213.950	0.280 #	214.290	7.145	214.150	0.000	213.900	0.000
17	214.380	5.470 *	215.100	37.63 #	214.450	7.995	214.250	3.040 *	214.150	0.000	213.890	0.000
18	214.190	2.190 *	214.795	17.99	219.000	1107	214.230	3.925	214.150	0.000	213.880	0.000
19	214.000	0.510 *	214.650	7.090	216.050	143.8 *	214.190	3.895	214.150	0.000	213.870	0.000
20	213.970	0.360 *	214.580	7.908	215.915	147.6	214.145	3.677	214.150	0.000	213.860	0.000

21	213.890	0.110 *	214.550	7.694	216.510	356.5	214.120	1.400 #	214.150	0.000	213.850	0.000
22	214.830	16.33	214.520	9.110 *	218.850	1061 *	214.100	1.220 *	214.150	0.000	213.820	0.000
23	214.750	14.66	214.510	7.279	216.765	385.5	214.410	2.540	214.180	0.000	213.810	0.000
24	215.030	32.91 *	214.535	7.370	215.530	123.9	214.500	8.520 *	214.200	0.000	213.780	0.000
25	214.845	17.08	214.490	6.671	215.000	31.00 #	214.520	14.22	214.200	0.000	213.650	0.000
26	214.620	6.415	214.540	7.656	215.000	31.00 *	214.500	13.95	214.200	0.000	213.560	0.000
27	214.550	5.869	214.520	7.515	214.900	25.12 #	214.470	13.50	214.200	0.000	213.520	0.000
28	216.015	150.3	214.490	6.669	214.900	25.12 #	214.460	9.797	214.200	0.000	213.480	0.000
29	214.840	11.16	214.470	7.680 *	214.800	19.96 #	214.420	9.487	214.200	0.000	213.450	0.000
30	214.630	6.493	214.450	6.366	214.850	22.45 #	214.390	5.367 *	214.190	0.000	213.400	0.000
31			214.430	6.134	214.750	17.65 #			214.190	0.000		
I Ten-Daily		0.000	214.901	38.67	214.246	2.971	214.544	10.31	214.266	3.353	214.167	0.000
II Ten-Daily	214.373	5.430	215.601	137.0	214.943	141.0	214.298	5.598	214.154	0.101	213.966	0.000
III Ten-Daily	214.800	26.13	214.500	7.286	215.623	190.8	214.389	8.000	214.187	0.000	213.632	0.000
Monthly												
Min.	213.890	0.110	214.430	2.616	213.950	0.280	214.100	1.220	214.150	0.000	213.400	0.000
Max.	216.015	150.3	217.650	541.5	219.000	1107	214.700	14.22	214.320	5.385	214.190	0.000
Mean	214.610	16.93	214.985	59.26	214.960	114.2	214.410	7.968	214.202	1.114	213.922	0.000

Annual Runoff in MCM = 514 **Annual Runoff in mm = 31**

Peak Observed Discharge = 1107.00 cumecs on 18-08-2018 Corres. Water Level :219.000 m

Lowest Observed Discharge = 0.000 cumecs on 12-10-2018 Corres. Water Level :214.150 m

Note: Negligible Flow from 12/10/2018 to 11/12/2019; River Dry from 01/06/2018 to 12/06/18 and 12/12/19 to 31/05/19, Shortage of staff from 16/06/18 to 21/06/18, Discarded data 17/07/18, 13/08/18, 14/08/18, 16/08/18 and from 25/08/18 to 31/08/18

Q: observed/ computed discharge in Cumec, WL: Corresponding Mean Water Level (msl) in m, *: Computed Discharge
#Discarded and estimated

Stage Discharge data for the period 2018 to 2019

Station Name: Purna at Yerli (01 02 17 005) Division: Tapi Division, Surat Local River: Sub Division: Upper Tapi Sub Division Bhusawal

Day	Dec		Jan		Feb		Mar		Apr		May	
	W.L	Q	WL	Q	WL	Q	WL	Q	WL	Q	WL	Q
1	213.390	0.000	RIVER DRY	0.000	RIVER DRY	0.000	RIVER DRY	0.000	RIVER DRY	0.000	RIVER DRY	0.000
2	213.350	0.000		0.000		0.000		0.000		0.000		0.000
3	213.350	0.000		0.000		0.000		0.000		0.000		0.000
4	213.250	0.000		0.000		0.000		0.000		0.000		0.000
5	213.200	0.000		0.000		0.000		0.000		0.000		0.000
6	213.150	0.000		0.000		0.000		0.000		0.000		0.000
7	213.100	0.000		0.000		0.000		0.000		0.000		0.000
8	213.050	0.000		0.000		0.000		0.000		0.000		0.000
9	213.020	0.000		0.000		0.000		0.000		0.000		0.000
10	213.010	0.000		0.000		0.000		0.000		0.000		0.000
11	213.000	0.000		0.000		0.000		0.000		0.000		0.000
12	RIVER DRY	0.000		0.000		0.000		0.000		0.000		0.000
13		0.000		0.000		0.000		0.000		0.000		0.000
14		0.000		0.000		0.000		0.000		0.000		0.000
15		0.000		0.000		0.000		0.000		0.000		0.000
16		0.000		0.000		0.000		0.000		0.000		0.000
17		0.000		0.000		0.000		0.000		0.000		0.000
18		0.000		0.000		0.000		0.000		0.000		0.000
19		0.000		0.000		0.000		0.000		0.000		0.000
20		0.000		0.000		0.000		0.000		0.000		0.000

21	RIVER DRY	0.000	RIVER DRY	0.000	RIVER DRY	0.000	RIVER DRY	0.000	RIVER DRY	0.000	RIVER DRY	0.000
22		0.000		0.000		0.000		0.000		0.000		0.000
23		0.000		0.000		0.000		0.000		0.000		0.000
24		0.000		0.000		0.000		0.000		0.000		0.000
25		0.000		0.000		0.000		0.000		0.000		0.000
26		0.000		0.000		0.000		0.000		0.000		0.000
27		0.000		0.000		0.000		0.000		0.000		0.000
28		0.000		0.000		0.000		0.000		0.000		0.000
29		0.000		0.000				0.000		0.000		0.000
30		0.000		0.000				0.000		0.000		0.000
31		0.000		0.000								0.000
Ten-Daily Mean												
I Ten-Daily	213.187	0.000		0.000		0.000		0.000		0.000		0.000
II Ten-Daily	213.000	0.000		0.000		0.000		0.000		0.000		0.000
III Ten-Daily		0.000		0.000		0.000		0.000		0.000		0.000
Monthly				0.000		0.000		0.000		0.000		0.000
Min.	213.000	0.000		0.000		0.000		0.000		0.000		0.000
Max.	213.390	0.000		0.000		0.000		0.000		0.000		0.000
Mean	213.170	0.000		0.000		0.000		0.000		0.000		0.000

Peak Computed Discharge = 1061.0 cumecs on 22/08/2018 Corres. Water Level :218.850 m

Lowest Computed Discharge =0.110 cumecs on 21/06/2018 Corres. Water Level :213.890 m

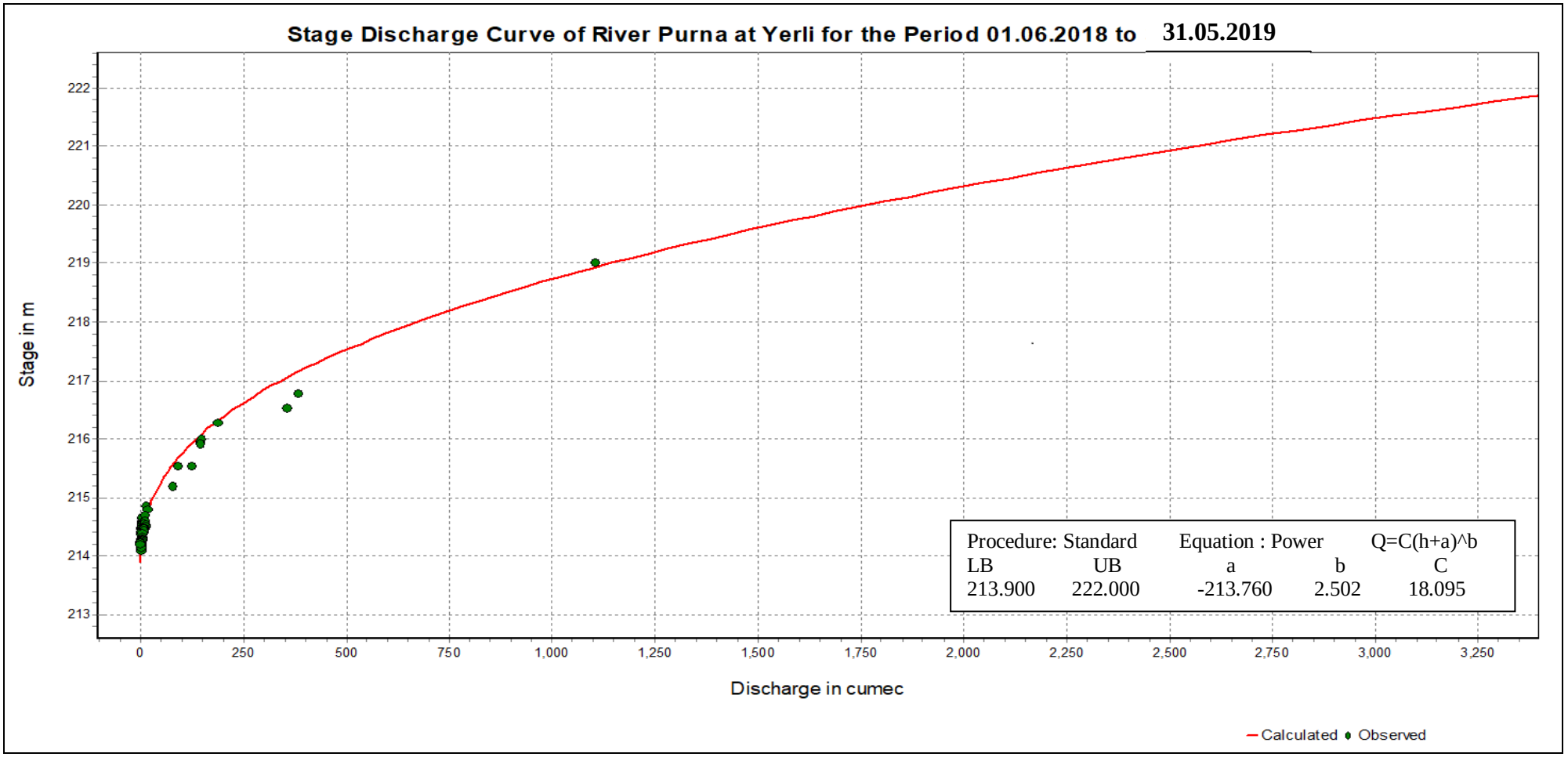
Note: Negligible Flow from 12/10/2018 to 11/12/2019; River Dry from 01/06/2018 to 12/06/18 and 12/12/19 to 31/05/19, Shortage of staff from 16/06/18 to 21/06/18, Discarded data 17/07/18, 13/08/18, 14/08/18, 16/08/18 and from 25/08/18 to 31/08/18

Q: observed/ computed discharge in Cumec, WL: Corresponding Mean Water Level (msl) in m, *: Computed Discharge

#Discarded and estimated

4.1.4.4 Stage Discharge Curve

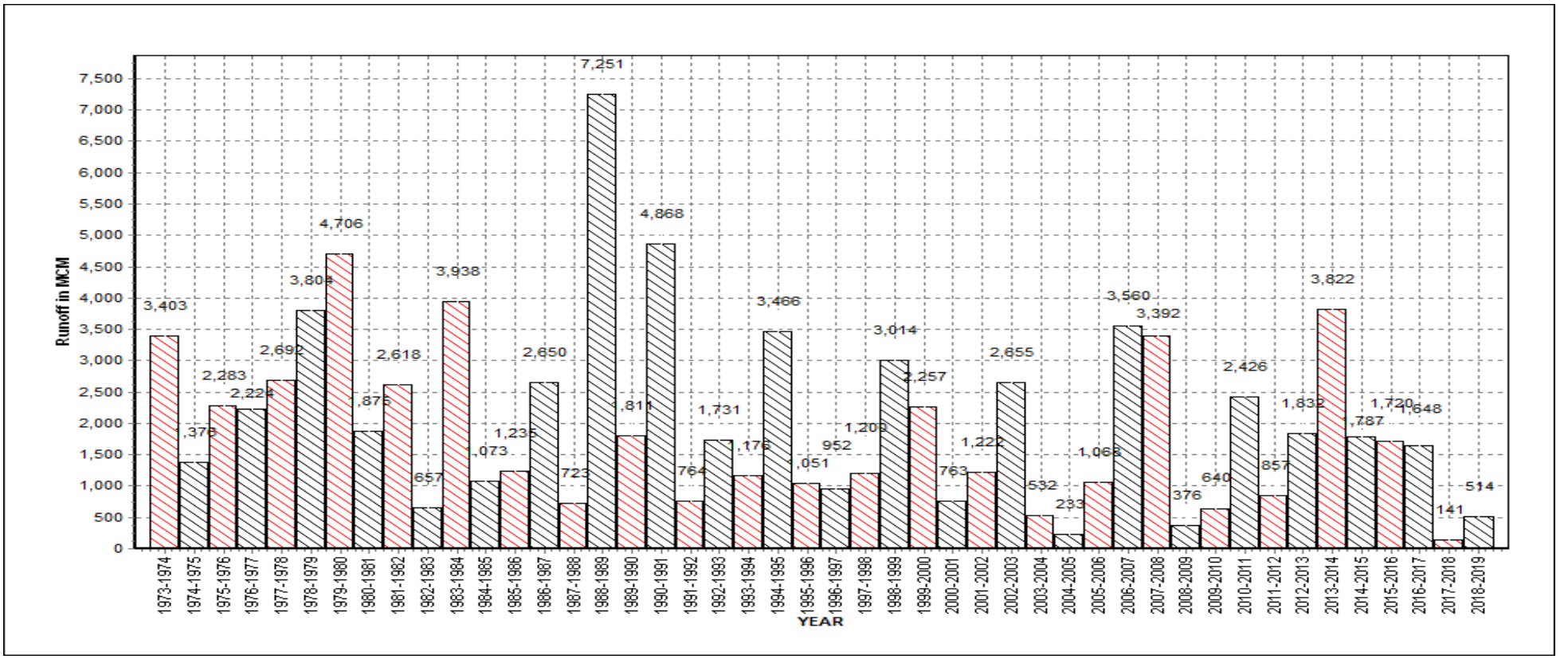
Station Name: Purna at Yerli (01 02 17 005) Division: Tapi Division, Surat Local River:Purna Sub Division: Upper Tapi Sub Division Bhusawal



4.1.4.5 Annual runoff

Annual Runoff for the period 1973-2019

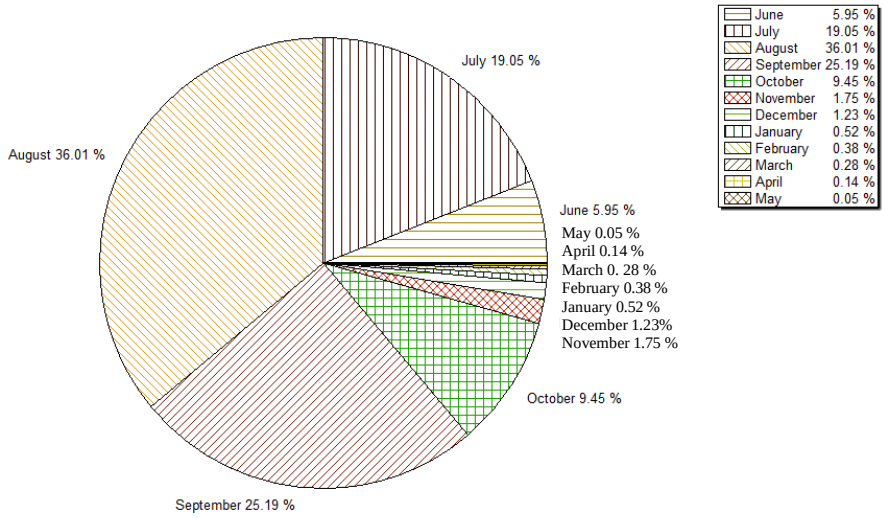
Station Name: Purna at Yerli (01 02 17 005) Division: Tapi Division, Surat Local River:Purna Sub Division: Upper Tapi Sub Division Bhusawal



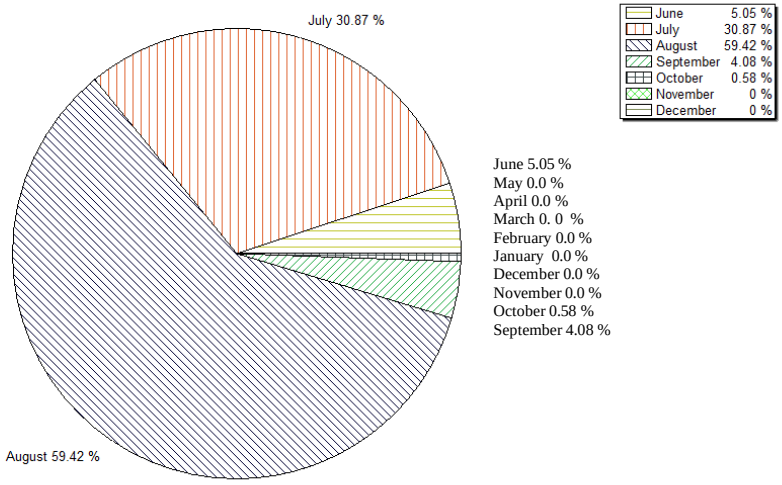
4.1.4.6 Monthly average Runoff

Station Name: Purna at Yerli (01 02 17 005) Division: Tapi Division, Surat Local River:Purna Sub Division: Upper Tapi Sub Division Bhusawal

Monthly Average Runoff Based on period 1973-2018



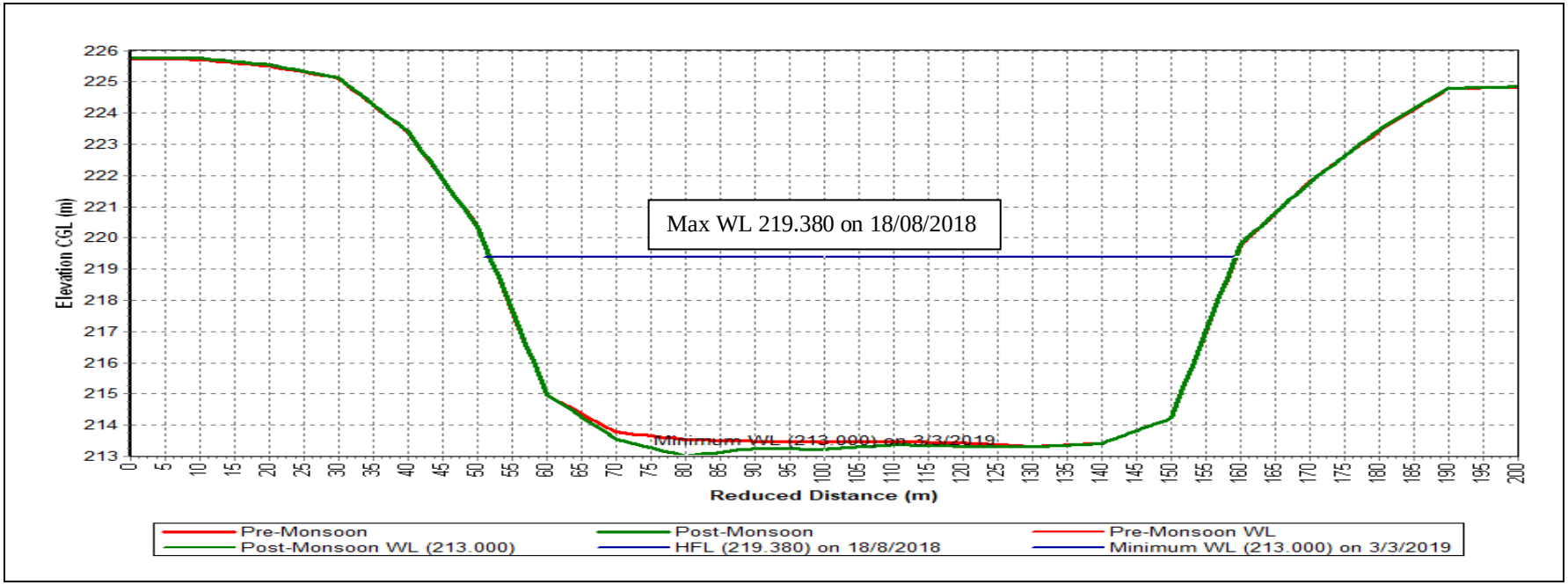
Monthly Runoff Based on period 2018-2019



4.1.4.7 Superimposed cross section

Station Name: Purna at Yerli (01 02 17 005) Division: Tapi Division, Surat Local River: Purna Sub Division: Upper Tapi Sub Division Bhusawal

HFL 233.700 Dt 07/08/2006 at 12:00 hrs

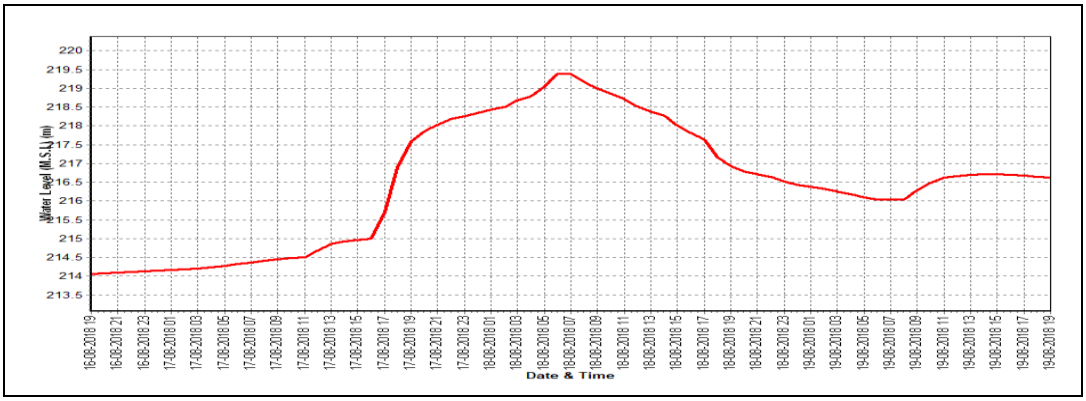


4.1.4.8 WL vs Time graph of highest I, II, III peak

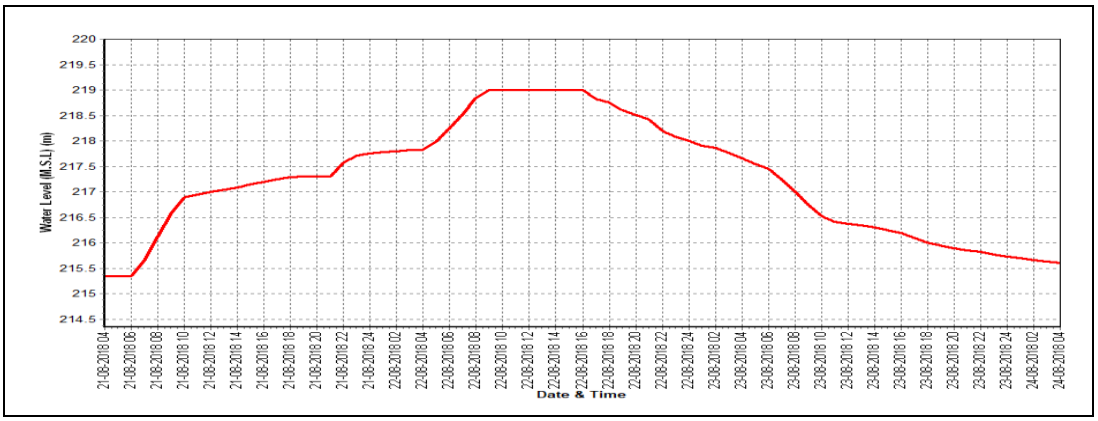
Station Name: Purna at Yerli (01 02 17 005)
Local River: Purna

Division: Tapi Division, Surat
Sub Division: Upper Tapi Sub Division Bhusawal

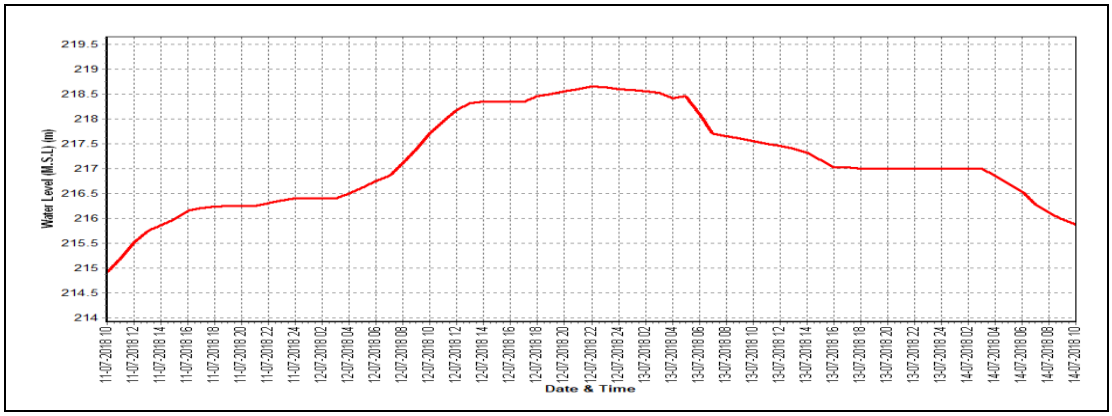
Water level vs Time Graph of Highest (I) flood peak during the water year 2018-19



Water level vs Time Graph of Highest (II) flood peak during the water year 2018-19



Water level vs Time Graph of Highest (III) flood peak during the water year 2018-19



4.1.5 Panjhara at Morane

4.1.5.1 History Sheet

Site	:	Panjhara at Morane	Code	:	01 02 17 013
State	:	Maharashtra	District		Dhule
Basin	:	Tapi	Independent River	:	Tapi
Tributary	:	Panjhra	Sub Tributary	:	
Sub-Sub Tributary	:		Local River	:	Tapi
Division	:	Tapi Division Surat	Sub-Division	:	Middle Tapi Sub Division Dhule
Drainage Area	:	1933 sq km	Bank	:	Right
Latitude	:	20°54'33"	Longitude	:	74°42'04"
Zero of Gauge (m)	:	264.0 (msl)	27/03/1978		
		Opening Date	Closing Date		
Gauge	:	27/03/1978			
Discharge		28/03/1978	31/05/2005		
Discharge*	:	2016			
Sediment	:	29/08/1986	31/05/2005		
Water Quality	:	01/07/1986	31/05/2005		

Note : * Site has been upgraded for discharge observations

Annual Maximum / Minimum discharge with corresponding Water Level (msl)

	Maximum			Minimum		
Year	**Q (cumec)**	**WL (m)**	**Date**	**Q (cumec)**	**WL (m)**	**Date**
2016-2017	239.185	265.460	01/10/2016	0.912	**264.190**	**03/06/2016**
2017-2018	185.800	265.580	13/10/2017	0.000	**264.040**	**20/06/2017**
2018-2019	65.890	265.300	18/02/2019	0.000	**263.350**	**01/06/2018**

4.1.5.2 Annual Maximum flood peak

Station Name: Panjhara at Morane (01 02 17 013) Division: Tapi division Surat
Local River:Panjhara Sub Division: Middle Tapi Sub Division Dhule

Year	MWL (m)	Date	Hour
1978	267.870	30/08/1978	11:00:00
1979	266.870	10/03/1979	13:00:00
1980	266.900	21/06/1980	04:00:00
1981	267.550	23/09/1981	09:00:00
1982	267.110	20/06/1982	05:00:00
1983	267.45	25/09/1983	07:00:00
1984	266.780	09/10/1984	08:00:00
1985	266.410	01/08/1985	20:00:00
1986	266.280	18/06/1986	14:00:00
1987	267.850	29/06/1987	06:00:00
1988	268.500	22/09/1988	23:00:00
1989	267.850	24/07/1989	05:00:00
1990	266.590	24/08/1990	10:00:00
1991	266.570	13/07/1991	17:00:00
1992	266.810	20/06/1992	21:00:00
1993	266.650	28/09/1993	11:00:00
1994	267.750	06/09/1994	18:00:00
1995	266.100	12/08/1995	10:00:00
1996	266.600	08/08/1996	19:00:00
1997	267.800	25/08/1997	15:00:00
1998	267.330	15/09/1998	12:00:00
1999	266.000	13/10/1999	06:00:00
2000	265.200	02/07/2000	18:00:00
2001	265.300	11/10/2001	10:00:00
2002	266.650	03/09/2002	17:00:00
2003	266.295	27/09/2003	24:00:00
2004	266.600	12/08/2004	03:00:00
2005	267.550	03/07/2005	16:00:00
2006	267.250	07/08/2006	13:00:00
2007	266.850	04/07/2007	15:00:00
2008	266.450	19/09/2008	19:00:00
2009	264.950	05/10/2009	20:00:00
2010	264.600	29/08/2010	18:00:00
2011	264.870	02/09/2011	16:00:00
2012	264.500	30/06/2012	06:00:00
2013	265.480	24/09/2013	18:00:00
2014	266.950	09/09/2014	06:00:00
2015	263.980	29/09/2015	23:00:00
2016	265.460	04/10/2016	07:00:00
2017	266.300	07/06/2017	20:00:00
2018	265.080	23/08/2018	18:00:00

4.1.5.3 Summary of Data

Stage Discharge data for the period 2018 to 2019

Station Name: Panjhara at Morane (01 02 17 013) Division: Tapi Division Surat Local River: Panjhara Sub Division: Middle Tapi Sub Division Dhule

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	263.350	0.000		0.000		0.000	264.150	6.687	*		0.000		0.000
2		0.000		0.000		0.000	263.900	1.650	*		0.000		0.000
3		0.000		0.000		0.000	263.820	1.360	*		0.000		0.000
4		0.000	RIVER DRY	0.000		0.000	263.750	7.090	*		0.000		0.000
5		0.000		0.000		0.000	264.150	8.729	*		0.000		0.000
6		0.000		0.000		0.000	264.000	7.626	*		0.000		0.000
7		0.000		0.000		0.000	264.150	5.573	*		0.000		0.000
8	RIVER DRY	0.000		0.000	RIVER DRY	0.000	264.140	7.610	*		0.000		0.000
9		0.000	263.750	0.000		0.000	263.900	1.101	*		0.000		0.000
10		0.000		0.000		0.000	263.750	0.749	*	RIVER DRY	0.000	RIVER DRY	0.000
11		0.000		0.000		0.000	263.740	3.298	*		0.000		0.000
12		0.000		0.000		0.000	263.900	0.000			0.000		0.000
13		0.000		0.000		0.000	263.800	0.000			0.000		0.000
14		0.000		0.000		0.000	263.600	0.000			0.000		0.000
15		0.000	RIVER DRY	0.000		0.000	263.600	0.000			0.000		0.000
16		0.000		0.000		0.000		0.000			0.000		0.000
17		0.000		0.000	264.220	5.340		0.000			0.000		0.000
18		0.000		0.000	263.500	0.080	* RIVER DRY	0.000			0.000		0.000
19		0.000		0.000	264.200	8.268		0.000			0.000		0.000
20		0.000		0.000	263.720	1.570		0.000			0.000		0.000

21	RIVER DRY	0.000	RIVER DRY	0.000	263.800	2.699	RIVER DRY	0.000	RIVER DRY	0.000	RIVER DRY	0.000
22		0.000		0.000	263.650	1.152		0.000		0.000		0.000
23		0.000		0.000	263.780	1.239		0.000		0.000		0.000
24		0.000		0.000	264.830	32.83		0.000		0.000		0.000
25		0.000		0.000	264.140	8.478		0.000		0.000		0.000
26		0.000		0.000	263.800	1.860 *		0.000		0.000		0.000
27	263.350	0.000		0.000	263.630	0.254		0.000		0.000		0.000
28	RIVER DRY	0.000		0.000	264.400	27.53		0.000		0.000		0.000
29		0.000		0.000	264.150	6.328		0.000		0.000		0.000
30		0.000		0.000	264.400	22.03		0.000		0.000		0.000
31				0.000	264.300	7.798				0.000		
Ten-Daily Mean												
I Ten-Daily	263.350	0.000	263.750	0.000		0.000	263.971	4.818		0.000		0.000
II Ten-Daily		0.000		0.000	263.910	1.526	263.728	0.330		0.000		0.000
III Ten-Daily	263.350	0.000		0.000	264.080	10.20		0.000		0.000		0.000
Monthly												
Min.	263.350	0.000	263.750	0.000	263.500	0.000	263.600	0.000		0.000		0.000
Max.	263.350	0.000	263.750	0.000	264.830	32.83	264.150	8.729		0.000		0.000
Mean	263.350	0.000	263.750	0.000	264.035	4.112	263.890	1.716		0.000		0.000

Annual Runoff in MCM = 106 **Annual Runoff in mm = 55**

Peak Observed Discharge = 32.832 cumecs on 24-08-2018 Corres. Water Level :264.830 m

Lowest Observed Discharge = 0.000 cumecs on 01-06-2018 Corres. Water Level :263.350 m

Note: River Dry from 01/06/17 to 07/06/17, 01/01/18 to 31/01/18 ,01/01/18 to 31/01/18and from 01/04/18 to 10/05/18, River remain in pooling condition from. 20/06/2017 to 26/06/17,05/07/17 to 13/07/17, 29/07/17 to 15/08/17, 17/08/17 to 22/08/17, 05/09/17 to 11/09/17, 27/09/17 to 28/09/17, 30/10/17 to 31/12/17, 01/02/18 to 16/02/18, 26/02/18 to 31/03/18 and 11/05/2018 to 31/05/2018, Discarded 17/07/2018,13/08/2018, 14/08/2018, 16/08/2018 & 25/08/2018 to 31/08/2018

Q: observed/ computed discharge in Cumec, WL: Corresponding Mean Water Level (msl) in m, *: Computed Discharge

#Discarded and estimated

Stage Discharge data for the period 2018 to 2019

Station Name: Panjhara at Morane (01 02 17 013) Division: Tapi Division Surat Local River: Panjhara Sub Division: Middle Tapi Sub Division Dhule

Day	Dec		Jan		Feb		Mar		Apr		May		
	W.L	Q	WL	Q	WL	Q	WL	Q	WL	Q	WL	Q	
1		0.000		0.000		0.000		0.000		0.000		0.000	
2		0.000		0.000		0.000		0.000		0.000		0.000	
3		0.000		0.000		0.000		0.000		0.000		0.000	
4		0.000		0.000		0.000		0.000		0.000		0.000	
5		0.000		0.000		0.000		0.000		0.000	RIVER DRY	0.000	
6		0.000		0.000		0.000		0.000		0.000		0.000	
7		0.000		0.000		0.000		0.000		0.000		0.000	
8		0.000		0.000	RIVER DRY	0.000	RIVER DRY	0.000	RIVER DRY	0.000		0.000	
9		0.000	RIVER DRY	0.000		0.000		0.000		0.000		0.000	
10	RIVER DRY	0.000		0.000		0.000		0.000		0.000		0.000	
11		0.000		0.000		0.000		0.000		0.000		0.000	
12		0.000		0.000		0.000		0.000		0.000		0.000	
13		0.000		0.000		0.000		0.000		0.000	265.100	50.94	#
14		0.000		0.000		0.000		0.000		0.000	265.100	50.94	#
15		0.000		0.000		0.000		0.000		0.000	265.100	50.94	#
16		0.000		0.000		0.000		0.000		0.000	265.100	50.94	#
17		0.000		0.000		0.000		0.000		0.000	265.100	50.94	#
18		0.000		0.000	265.300	65.69	#	0.000		0.000	265.100	50.94	#
19		0.000		0.000	265.300	65.69	#	0.000		0.000	265.150	54.53	*
20		0.000		0.000	265.300	65.69	#	0.000		0.000	265.100	50.94	#

21	RIVER DRY	0.000	RIVER DRY	0.000	265.300	65.69 #	RIVER DRY	0.000	RIVER DRY	0.000	264.300	50.94 #
22		0.000		0.000	265.300	65.69 #		0.000		0.000	RIVER DRY	0.000
23		0.000		0.000	265.300	65.69 #		0.000		0.000		0.000
24		0.000		0.000	265.200	50.05 *		0.000		0.000		0.000
25		0.000		0.000	265.300	65.69 #		0.000		0.000		0.000
26		0.000		0.000	265.300	65.69 #		0.000		0.000		0.000
27		0.000		0.000	264.100	6.700 #		0.000		0.000		0.000
28		0.000		0.000	RIVER DRY	0.000		0.000		0.000		0.000
29		0.000		0.000				0.000		0.000		0.000
30		0.000		0.000				0.000		0.000		0.000
31		0.000		0.000				0.000				0.000
Ten-Daily Mean												
I Ten-Daily		0.000		0.000		0.000		0.000		0.000		0.000
II Ten-Daily		0.000		0.000	265.300	19.71		0.000		0.000	265.106	41.11
III Ten-Daily		0.000		0.000	265.114	48.15		0.000		0.000	264.300	4.631
Monthly												
Min.		0.000		0.000	264.100	0.000		0.000		0.000	264.300	0.000
Max.		0.000		0.000	265.300	65.69		0.000		0.000	265.150	54.53
Mean		0.000		0.000	265.170	20.80		0.000		0.000	265.017	14.90

Peak Computed Discharge = 54.53 cumecs on 19/05/2019 Corres. Water Level :265.150 m

Lowest Computed Discharge = 0.000 cumecs on 01/06/2018 Corres. Water Level :263.350 m

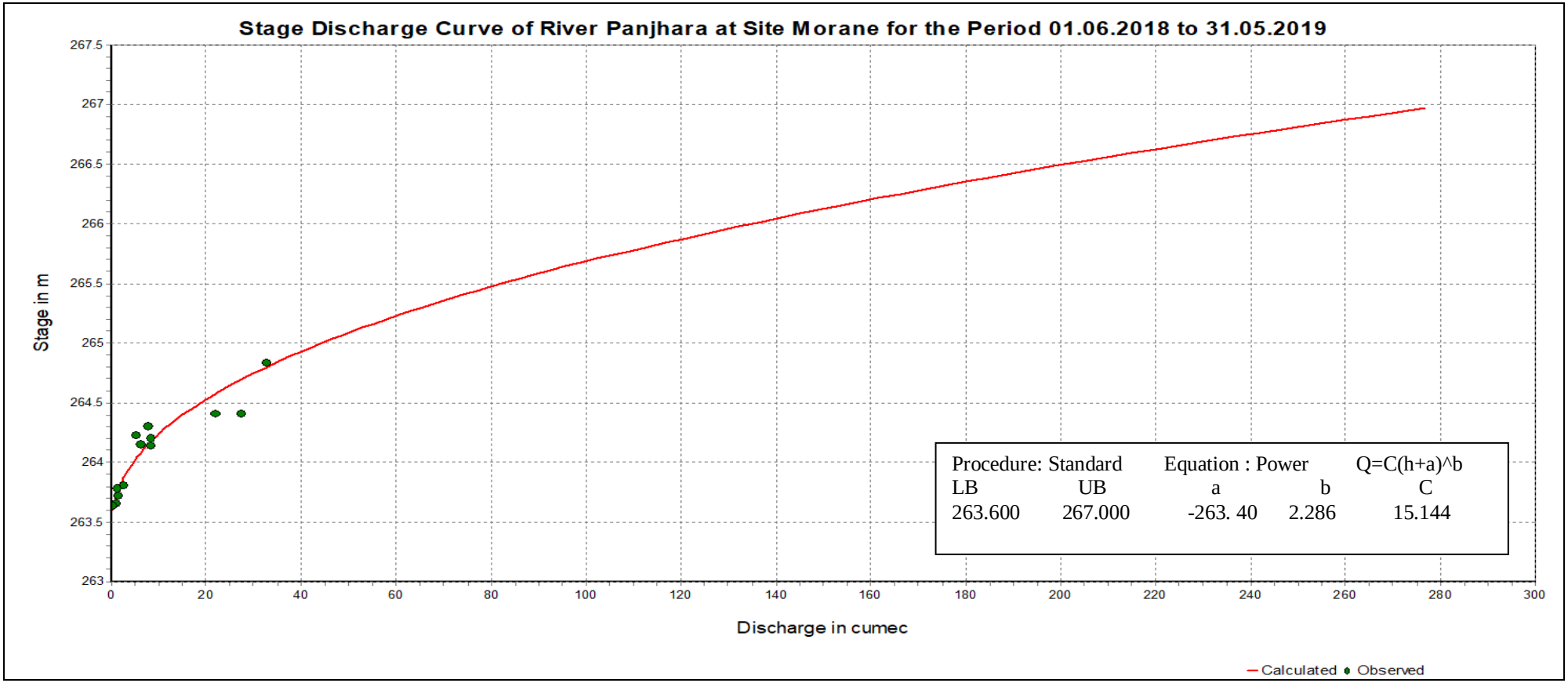
Note: River Dry from 01/06/17 to 07/06/17, 01/01/18 to 31/01/18 ,01/01/18 to 31/01/18and from 01/04/18 to 10/05/18, River remain in pooling condition from. 20/06/2017 to 26/06/17,05/07/17 to 13/07/17, 29/07/17 to 15/08/17, 17/08/17 to 22/08/17, 05/09/17 to 11/09/17, 27/09/17 to 28/09/17, 30/10/17 to 31/12/17, 01/02/18 to 16/02/18, 26/02/18 to 31/03/18 and 11/05/2018 to 31/05/2018, Discarded 17/07/2018,13/08/2018, 14/08/2018, 16/08/2018 & 25/08/2018 to 31/08/2018

Q: observed/ computed discharge in Cumec, WL: Corresponding Mean Water Level (msl) in m, *: Computed Discharge

#Discarded and estimated

4.1.5.4 Stage Discharge Curve

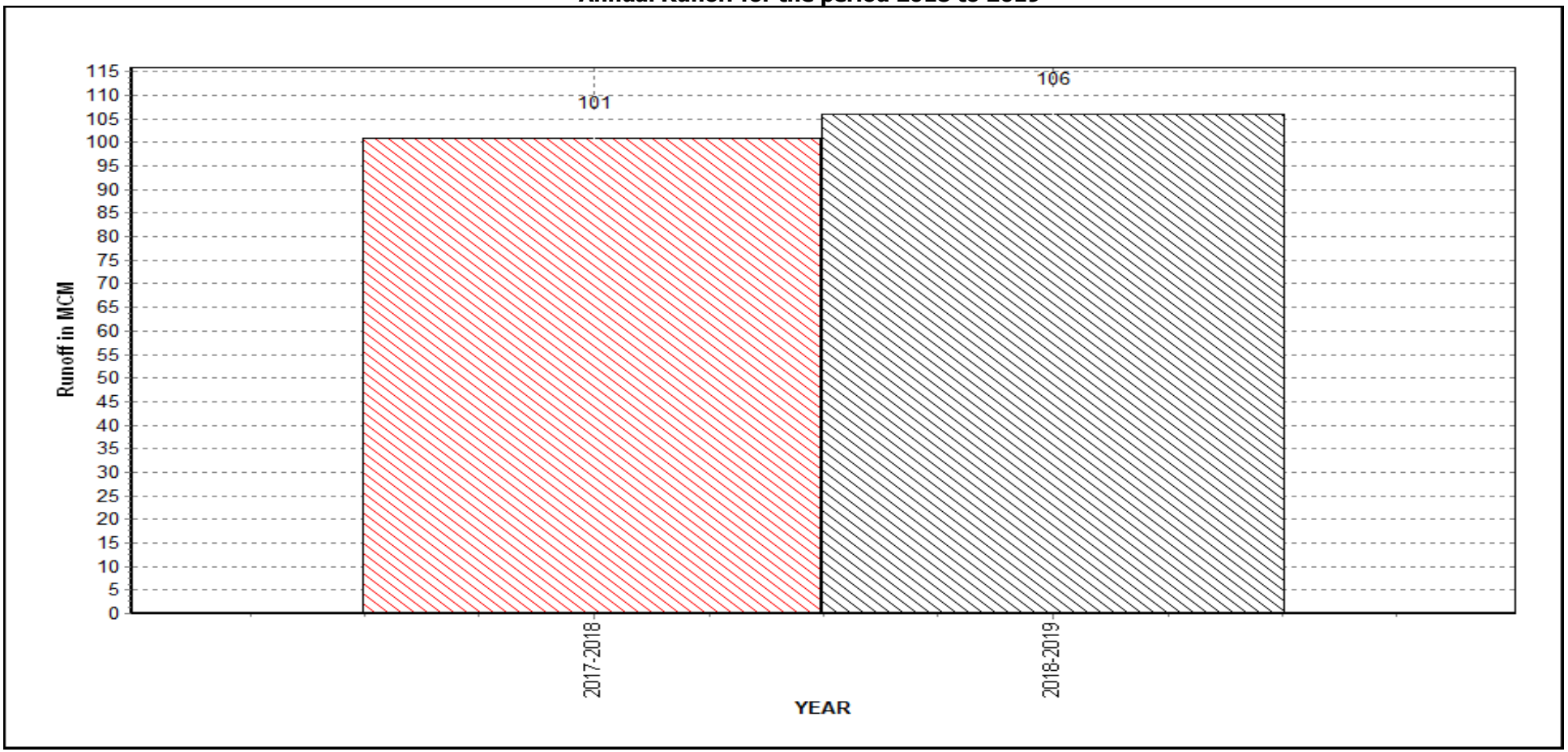
Station Name: Panjhara at Morane (01 02 17 013) Division: Tapi Division Surat Local River: Panjhara Sub Division: Middle Tapi Sub Division Dhule



4.1.5.5 Annual Runoff

Station Name: Panjhara at Morane (01 02 17 013) Division: Tapi Division Surat Local River: Panjhara Sub Division: Middle Tapi Sub Division Dhule

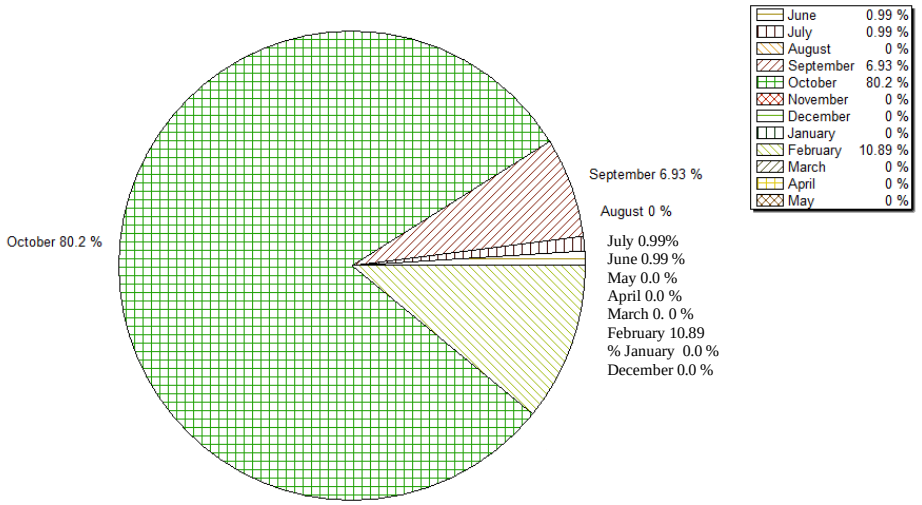
Annual Runoff for the period 2018 to 2019



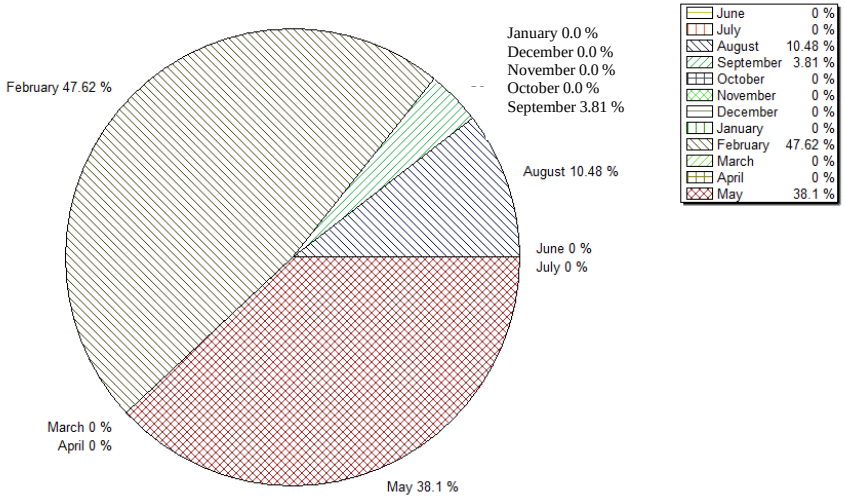
4.1.5.6 Monthly average Runoff

Station Name: Panjhara at Morane (01 02 17 013) Division: Tapi Division Surat Local River: Panjhara Sub Division: Middle Tapi Sub Division Dhule

Monthly Average Runoff Based on period 1973-2018

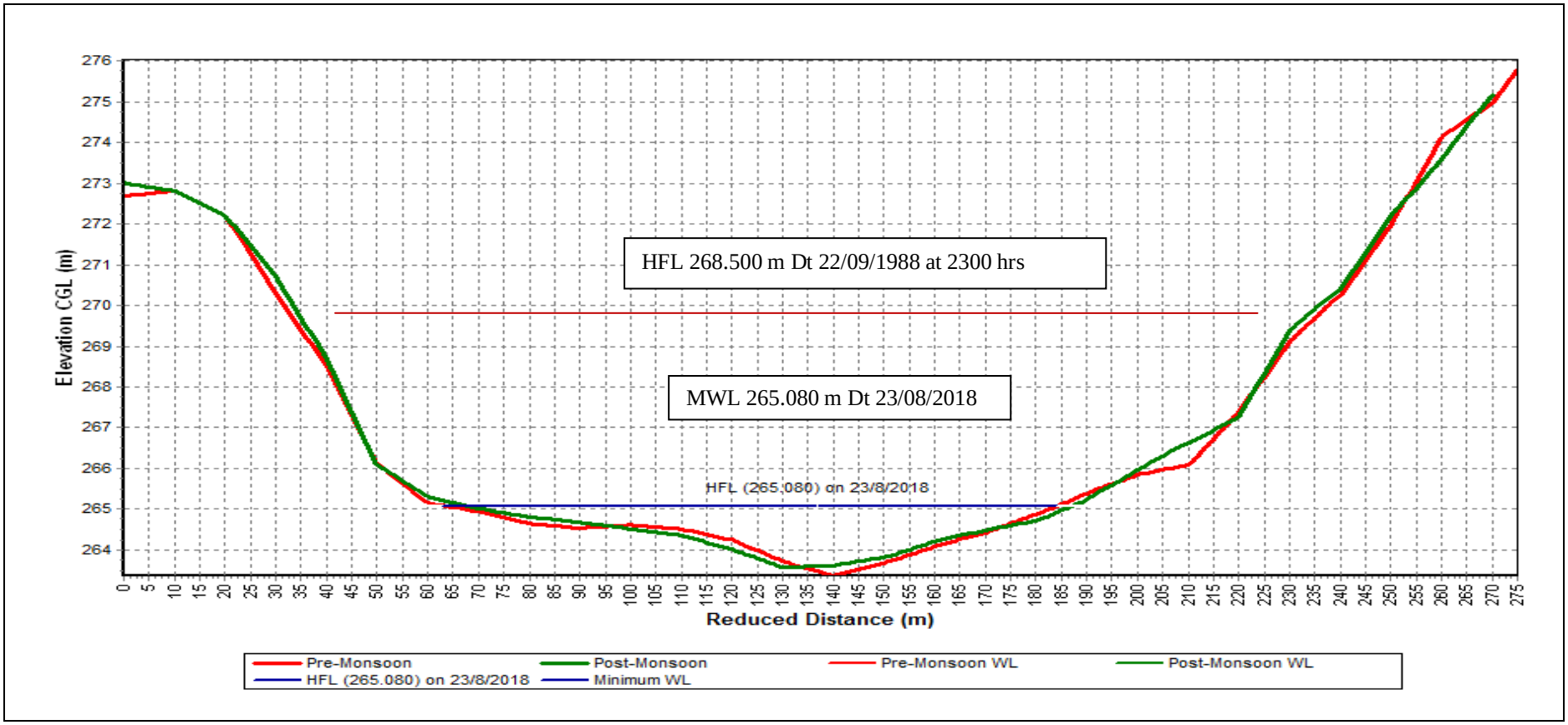


Monthly Runoff Based on period 2018-2019



4.1.5.7Superimposed cross section

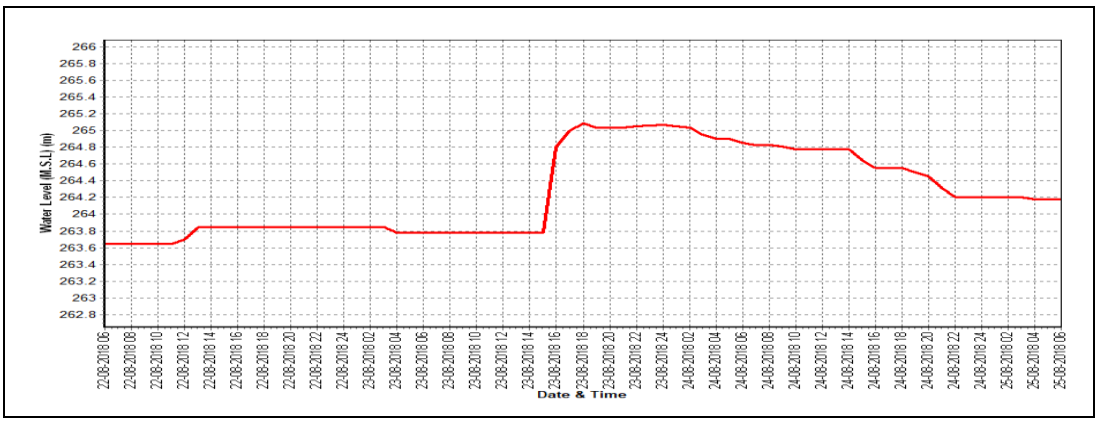
Station Name: Panjhara at Morane (01 02 17 013) Division: Tapi Division Surat Local River: Panjhara Sub Division: Middle Tapi Sub Division Dhule



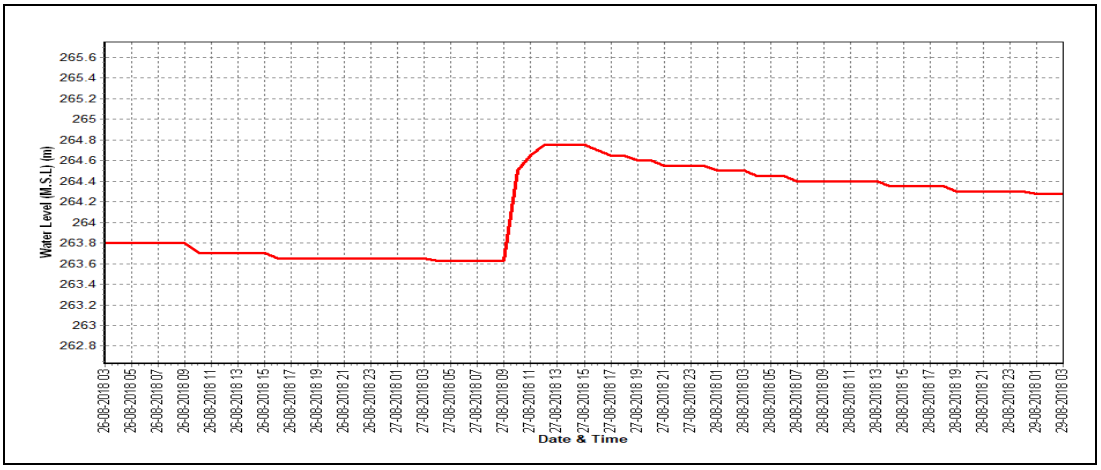
4.1.5.8WL vs Time Graph of I,II,III peak

Station Name: Panjhara at Morane (01 02 17 013) Division: Tapi Division Surat
Local River:Panjhara Sub Division: Middle Tapi Sub Division Dhule

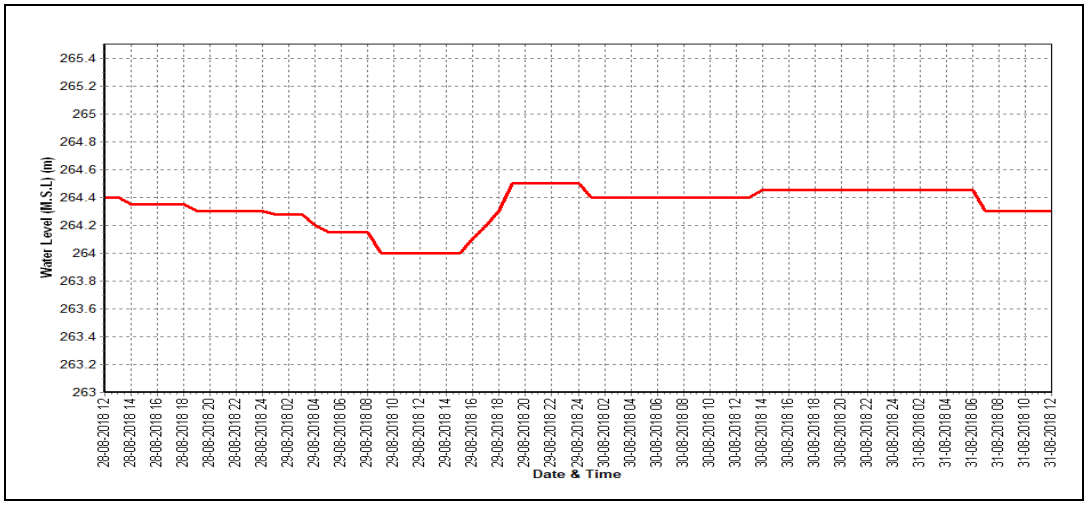
Water level vs Time Graph of Highest (I) flood peak during the water year 2018-19



Water level vs Time Graph of Highest (II) flood peak during the water year 2018-19



Water level vs Time Graph of Highest (III) flood peak during the water year 2018-19



4.1.6 Tapi at Gidhade

4.1.6.1 History Sheet

Site	:	Gidhade	Code	:	01 02 17 014
State	:	Maharashtra	District		Dhule
Basin	:	Tapi	Independent River	:	Tapi
Tributary	:	-	Sub Tributary	:	
Sub-Sub Tributary	:		Local River	:	Tapi
Division	:	Tapi Division Surat	Sub-Division	:	Middle Tapi Sub Division Dhule
Drainage Area	:	54750 sq km	Bank	:	Right
Latitude	:	21°17'45"	Longitude	:	74°48'45"
Zero of Gauge (m)	:	119 (msl)	15/06/1969		
		Opening Date	Closing Date		
Gauge	:	15/06/1969			
Discharge	:	19/06/1990			
Sediment	:				
Water Quality	:	01/09/1990	31/05/2005		

Annual Maximum / Minimum discharge with corresponding Water Level (msl)

	Maximum			Minimum		
Year	**Q (cumec)**	**WL (m)**	**Date**	**Q (cumec)**	**WL (m)**	**Date**
1991-1992	7680	131.300	01/08/1991	0.000	122.100	01/04/1992
1992-1993	4224	129.175	18/08/1992	0.000	River Dry	15/03/1993
1993-1994	8018	132.250	17/07/1993	0.000	River Dry	26/03/1994
1994-1995	15068	136.775	07/09/1994	0.000	River Dry	12/06/1994
1995-1996	4981	130.705	04/09/1995	0.000	River Dry	06/02/1996
1996-1997	2681	127.880	28/07/1996	0.000	River Dry	08/8/1997
1997-1998	4516	130.825	27/07/1997	0.000	River Dry	24/03/1998
1998-1999	17578	137.805	16/09/1998	0.000	River Dry	15/04/1999
1999-2000	6267	131.050	11/08/1999	0.000	River Dry	02/04/2000
2000-2001	2541	126.925	20/07/2000	0.000	River Dry	30/04/2001
2001-2002	5063	130.250	16/08/2001	0.000	River Dry	29/01/2002
2002-2003	7361	132.900	03/09/2002	0.000	River Dry	27/12/2002
2003-2004	4180	129.150	25/08/2003	0.000	River Dry	26/03/2004
2004-2005	3218	129.225	06/08/2004	0.000	River Dry	14/12/2004
2005-2006	3697	128.700	03/08/2005	0.000	River Dry	02/12/2005
2006-2007	20898	141.650	08/08/2006	0.000	River Dry	03/01/2007
2007-2008	10684	135.690	09/07/2007	0.000	121.560	25/06/2007
2008-2009	3670	128.900	06/08/2008	33.270	122.340	26/08/2008
2009-2010	5735	131.190	04/09/2009	0.000	123.350	13/08/2009
2010-2011	4134	129.200	10/09/2010	32.16	122.335	22/07/2010
2011-2012	3639	128.475	30/08/2011	0.000	Pooling effect	NA
2012-2013	8117	133.350	07/09/2012	0.000	129.100	01/06/2012
2013-2014	8875	134.425	02/08/2013	0.573	122.700	16/09/2013
2014-2015	9463	136.000	24/07/2014	0.000	129.900	01/06/2014
2015-2016	4333	129.100	08/08/2015	0.000	Pooling effect	NA
2016-2017	7720	130.450	13/07/2016	0.000	Pooling effect	NA
2017-2018	3132	126.200	30/08/2017	0.000	Pooling effect	NA
2018-2019	4282	130.300	22/08/2018	0.000	Pooling effect	NA

4.1.6.2 Annual Maximum flood peak

Station Name: Tapi at Gidhade (01 02 17 014) Division: Tapi division Surat
Local River:Tapi Sub Division: Middle Tapi Sub Division Dhule

Year	MWL (m)	Date	Hour
1970	134.650	20/08/1970	11:00:00
1971	128.200	24/07/1971	22:00:00
1972	135.650	19/08/1972	10:00:00
1973	134.300	28/08/1973	02:00:00
1974	128.750	13/08/1974	21:00:00
1975	130.950	05/09/1975	23:00:00
1976	130.300	04/09/1976	23:00:00
1977	129.275	03/09/1977	21:00:00
1978	138.075	30/08/1978	17:00:00
1979	137.650	11/08/1979	07:00:00
1980	130.860	07/08/1980	09:00:00
1981	134.000	11/08/1981	04:00:00
1982	127.140	20/06/1982	19:00:00
1983	131.020	13/08/1983	13:00:00
1984	133.000	19/08/1984	22:00:00
1985	126.650	03/08/1985	16:00:00
1986	130.450	16/08/1986	09:00:00
1987	126.300	22/08/1987	06:00:00
1988	131.740	04/10/1988	05:00:00
1989	131.640	20/08/1989	03:00:00
1990	135.240	17/08/1990	14:00:00
1991	133.500	01/08/1991	01:00:00
1992	129.580	03/09/1992	19:00:00
1993	132.550	17/07/1993	16:00:00
1994	138.820	07/09/1994	23:00:00
1995	131.150	03/09/1995	23:00:00
1996	128.450	28/07/1996	03:00:00
1997	131.850	27/07/1997	04:00:00
1998	137.890	16/09/1998	12:00:00
1999	132.060	11/08/1999	02:00:00
2000	128.620	13/07/2000	18:00:00
2001	131.510	16/08/2001	16:00:00
2002	133.550	26/08/2002	00:00:00
2003	131.900	24/08/2003	21:00:00
2004	129.450	24/08/2004	03:00:00
2005	129.250	02/08/2005	19:00:00
2006	142.950	07/08/2006	15:00:00
2007	136.240	09/07/2007	16:00:00
2008	131.590	16/10/2008	00:00:00
2009	132.760	03/10/2009	09:00:00
2010	130.000	10/09/2010	10:00:00
2011	132.680	08/10/2011	18:00:00
2012	135.600	06/09/2012	22:00:00
2013	135.400	02/08/2013	15:00:00
2014	136.000	24/07/2014	08:00:00
2015	135.500	06/08/2015	06:00:00
2016	132.520	27/10/2016	08:00:00
2017	132.300	25/09/2017	08:00:00
2018	132.280	12/10/2018	13:00:00

4.1.6.3 Summary of Data

Stage Discharge data for the period 2018 to 2019

Station Name: Tapi at Gidhade (01 02 17 014) Division: Tapi Division Surat Local River: Tapi Sub Division: Middle Tapi Sub Division Dhule

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	127.700	0.000	128.400	0.000	125.980	0.000	130.100	0.000	132.000	0.000	132.080	0.000
2	127.650	0.000	128.000	0.000	125.700	0.000	130.750	0.000	131.650	0.000	132.050	0.000
3	127.800	0.000	127.900	0.000	125.000	0.000	130.450	0.000	131.880	0.000	131.980	0.000
4	127.650	0.000	128.070	0.000	125.000	0.000	130.350	0.000	132.100	0.000	131.950	0.000
5	127.600	0.000	128.140	0.000	125.000	0.000	130.450	0.000	132.050	0.000	131.930	0.000
6	127.680	0.000	128.100	0.000	125.000	0.000	130.300	0.000	131.950	0.000	131.900	0.000
7	127.680	0.000	127.760	0.000	125.000	0.000	130.300	0.000	131.950	0.000	131.870	0.000
8	127.820	0.000	127.900	0.000	125.900	0.000	130.300	0.000	132.000	0.000	131.870	0.000
9	127.300	0.000	127.920	0.000	126.300	0.000	130.300	0.000	131.900	0.000	131.850	0.000
10	127.300	0.000	126.700	0.000	126.480	0.000	130.300	0.000	131.920	0.000	131.850	0.000
11	127.280	0.000	126.850	1578	126.620	0.000	130.300	0.000	132.050	0.000	131.830	0.000
12	127.260	0.000	123.500	281.4	126.710	0.000	130.350	0.000	132.170	0.000	131.780	0.000
13	127.250	0.000	125.300	866.5 #	126.750	0.000	130.830	0.000	132.250	0.000	131.760	0.000
14	127.240	0.000	123.650	319.9	126.820	0.000	130.900	0.000	132.200	0.000	131.750	0.000
15	127.230	0.000	123.300	305.5 *	126.850	0.000	131.100	0.000	132.150	0.000	131.730	0.000
16	127.200	0.000	122.450	178.6	126.890	0.000	131.480	0.000	132.200	0.000	131.680	0.000
17	127.150	0.000	123.100	204.1	125.950	0.000	131.780	0.000	132.200	0.000	131.660	0.000
18	127.100	0.000	122.600	206.1	125.000	1167	132.020	0.000	132.200	0.000	131.650	0.000
19	127.080	0.000	122.150	164.2	124.600	628.4 *	132.160	0.000	132.200	0.000	131.600	0.000
20	126.980	0.000	124.300	540.7 *	123.925	406.4	132.000	0.000	132.180	0.000	131.580	0.000

21	126.920	0.000	126.250	1271	*	127.200	1777	#	131.900	0.000	132.180	0.000	131.560	0.000
22	126.900	0.000	127.300	1837	*	130.300	4282		131.900	0.000	132.180	0.000	131.530	0.000
23	126.930	0.000	127.100	1719	*	126.300	1545		130.400	0.000	132.180	0.000	131.500	0.000
24	126.930	0.000	126.230	1261	*	124.750	675.4	#	127.600	0.000	132.180	0.000	131.480	0.000
25	127.020	0.000	125.600	983.7	*	126.800	1551	#	128.700	0.000	132.180	0.000	131.450	0.000
26	127.060	0.000	126.100	1200	*	127.050	1690	*	129.400	0.000	132.170	0.000	131.430	0.000
27	127.050	0.000	127.650	2055	#	128.400	2577	*	131.400	0.000	132.170	0.000	131.400	0.000
28	127.050	0.000	127.100	1719	#	129.200	3218	#	132.000	0.000	132.160	0.000	131.380	0.000
29	127.070	0.000	125.900	0.000		125.500	738.4		132.000	0.000	132.160	0.000	131.380	0.000
30	127.700	0.000	125.300	0.000		128.100	0.000		131.900	0.000	132.130	0.000	131.350	0.000
31			125.700	0.000		129.100	0.000				132.100	0.000		
Ten-Daily Mean														
I Ten-Daily	127.618	0.000	127.889	0.000		125.536	0.000		130.360	0.000	131.940	0.000	131.933	0.000
II Ten-Daily	127.177	0.000	123.720	464.5		126.012	220.2		131.292	0.000	132.180	0.000	131.702	0.000
III Ten-Daily	127.063	0.000	126.385	1095		127.518	1641		130.720	0.000	132.163	0.000	131.446	0.000
Monthly														
Min.	126.900	0.000	122.150	0.000		123.925	0.000		127.600	0.000	131.650	0.000	131.350	0.000
Max.	127.820	0.000	128.400	2055		130.300	4282		132.160	0.000	132.250	0.000	132.080	0.000
Mean	127.286	0.000	126.010	538.4		126.393	653.4		130.791	0.000	132.096	0.000	131.694	0.000

Annual Runoff in MCM = 3192 **Annual Runoff in mm = 58**

Peak Observed Discharge = 4282.00 cumecs on 22-08-2018 Corres. Water Level :126.300 m

Lowest Observed Discharge = 0.000 cumecs on 01-06-2018 Corres. Water Level :127.700 m

Note: River remained in pooling condition from. 01/06/2018 to 10/07/2018, 28/07/2018 to 17/08/2018, 29/08/2018 to 31/05/2019 No release or negligible release during this period from existing barrage in D/S of site. Observations discarded on 13/07/2018, 27/07/2018, 28/07/2018, 21/082018, 24/08/2018, 25/08/2018 & 28/08/2018

Q: observed/ computed discharge in Cumec, WL: Corresponding Mean Water Level (msl) in m, *: Computed Discharge

#Discarded and estimated

Stage Discharge data for the period 2018 to 2019

Station Name: Tapi at Gidhade (01 02 17 014) Division: Tapi Division Surat Local River: Tapi Sub Division: Middle Tapi Sub Division Dhule

Day	Dec		Jan		Feb		Mar		Apr		May	
	W.L	Q	WL	Q	WL	Q	WL	Q	WL	Q	WL	Q
1	131.310	0.000	130.540	0.000	129.820	0.000	129.180	0.000	128.360	0.000	127.600	0.000
2	131.280	0.000	130.570	0.000	129.800	0.000	129.150	0.000	128.320	0.000	127.570	0.000
3	131.260	0.000	130.500	0.000	129.760	0.000	129.100	0.000	128.300	0.000	127.540	0.000
4	131.250	0.000	130.470	0.000	129.760	0.000	129.050	0.000	128.260	0.000	127.520	0.000
5	131.230	0.000	130.420	0.000	129.740	0.000	129.050	0.000	128.240	0.000	127.500	0.000
6	131.200	0.000	130.380	0.000	129.700	0.000	129.000	0.000	128.220	0.000	127.460	0.000
7	131.180	0.000	130.380	0.000	129.680	0.000	128.950	0.000	128.200	0.000	127.420	0.000
8	131.150	0.000	130.360	0.000	129.680	0.000	128.900	0.000	128.160	0.000	127.400	0.000
9	131.100	0.000	130.360	0.000	129.630	0.000	128.860	0.000	128.140	0.000	127.360	0.000
10	131.080	0.000	130.340	0.000	129.600	0.000	128.860	0.000	128.100	0.000	127.320	0.000
11	131.050	0.000	130.330	0.000	129.600	0.000	128.850	0.000	128.060	0.000	127.300	0.000
12	131.020	0.000	130.310	0.000	129.550	0.000	128.830	0.000	128.060	0.000	127.280	0.000
13	131.000	0.000	130.300	0.000	129.520	0.000	128.800	0.000	128.020	0.000	127.260	0.000
14	130.980	0.000	130.300	0.000	129.500	0.000	128.780	0.000	128.020	0.000	127.240	0.000
15	130.950	0.000	130.280	0.000	129.480	0.000	128.760	0.000	128.000	0.000	127.200	0.000
16	130.900	0.000	130.260	0.000	129.480	0.000	128.750	0.000	127.960	0.000	127.200	0.000
17	130.870	0.000	130.280	0.000	129.450	0.000	128.730	0.000	127.940	0.000	127.180	0.000
18	130.850	0.000	130.160	0.000	129.420	0.000	128.700	0.000	127.920	0.000	127.160	0.000
19	130.830	0.000	130.130	0.000	129.400	0.000	128.680	0.000	127.900	0.000	127.120	0.000
20	130.800	0.000	130.100	0.000	129.380	0.000	128.660	0.000	127.880	0.000	127.100	0.000

21	130.780	0.000	130.070	0.000	129.350	0.000	128.640	0.000	127.850	0.000	127.060	0.000
22	130.750	0.000	130.050	0.000	129.300	0.000	128.600	0.000	127.830	0.000	127.000	0.000
23	130.720	0.000	130.050	0.000	129.260	0.000	128.580	0.000	127.800	0.000	126.980	0.000
24	130.700	0.000	130.030	0.000	129.240	0.000	128.560	0.000	127.780	0.000	126.930	0.000
25	130.680	0.000	130.030	0.000	129.200	0.000	128.550	0.000	127.760	0.000	126.900	0.000
26	130.650	0.000	130.000	0.000	129.150	0.000	128.500	0.000	127.740	0.000	126.870	0.000
27	130.630	0.000	129.970	0.000	129.150	0.000	128.480	0.000	127.720	0.000	126.820	0.000
28	130.600	0.000	129.930	0.000	129.200	0.000	128.460	0.000	127.700	0.000	126.820	0.000
29	130.580	0.000	129.900	0.000			128.440	0.000	127.680	0.000	126.800	0.000
30	130.560	0.000	129.870	0.000			128.420	0.000	127.660	0.000	126.760	0.000
31	130.540	0.000	129.850	0.000			128.400	0.000			126.720	0.000
Ten-Daily Mean												
I Ten-Daily	131.204	0.000	130.432	0.000	129.717	0.000	129.010	0.000	128.230	0.000	127.469	0.000
II Ten-Daily	130.925	0.000	130.245	0.000	129.478	0.000	128.754	0.000	127.976	0.000	127.204	0.000
III Ten-Daily	130.654	0.000	129.977	0.000	129.231	0.000	128.512	0.000	127.752	0.000	126.878	0.000
Monthly												
Min.	130.540	0.000	129.850	0.000	129.150	0.000	128.400	0.000	127.660	0.000	126.720	0.000
Max.	131.310	0.000	130.570	0.000	129.820	0.000	129.180	0.000	128.360	0.000	127.600	0.000
Mean	130.919	0.000	130.210	0.000	129.493	0.000	128.751	0.000	127.986	0.000	127.174	0.000

Peak Computed Discharge = 2577.00 cumecs on 27/08/2018 Corres. Water Level :128.400 m

Lowest Computed Discharge = 305.50 cumecs on 15/07/2018 Corres. Water Level :123.300 m

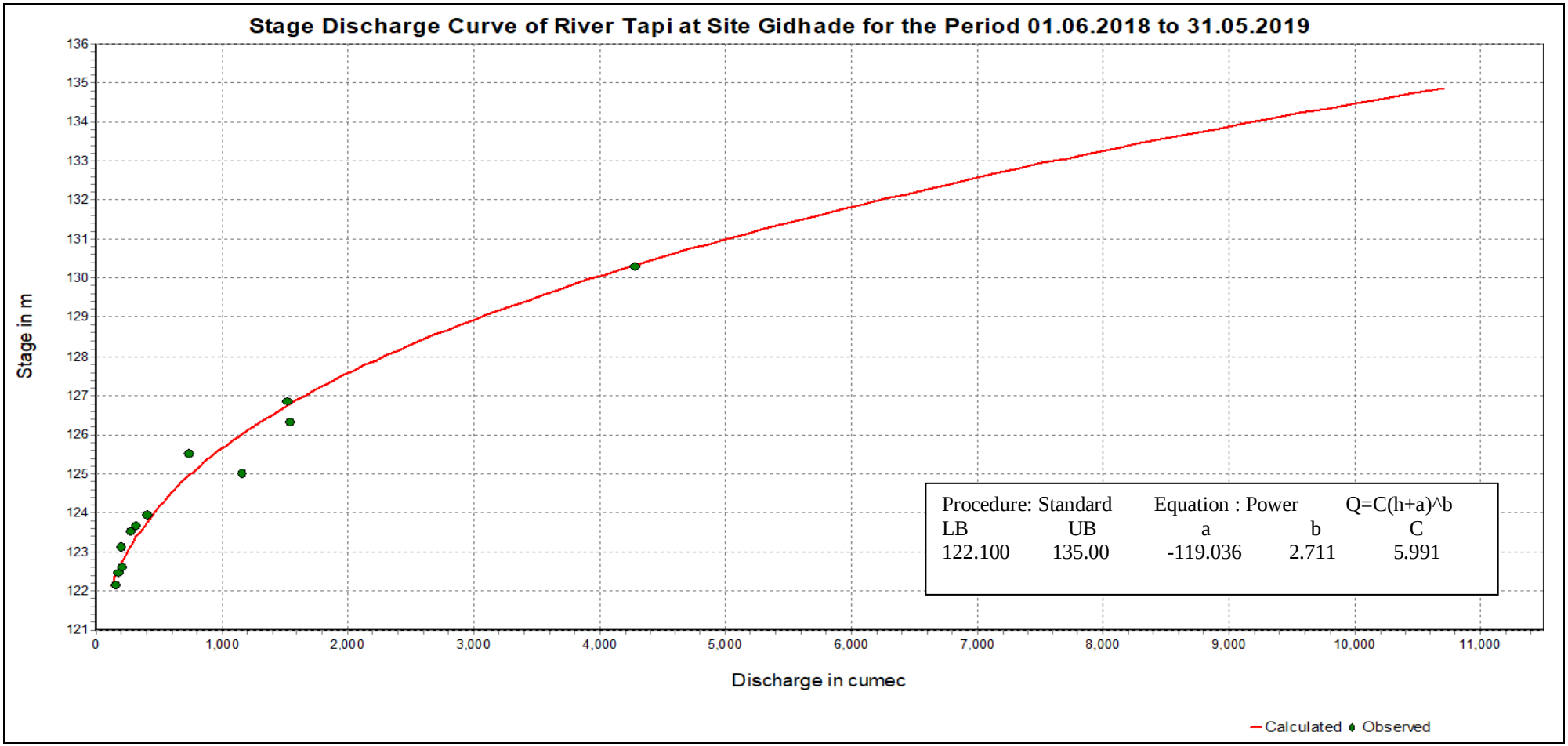
Note: River remained in pooling condition from. 01/06/2018 to 10/07/2018, 28/07/2018 to 17/08/2018, 29/08/2018 to 31/05/2019 No release or negligible release during this period from existing barrage in D/S of site. Observations discarded on 13/07/2018, 27/07/2018, 28/07/2018, 21/082018, 24/08/2018, 25/08/2018 & 28/08/2018

Q: observed/ computed discharge in Cumec, WL: Corresponding Mean Water Level (msl) in m, *: Computed Discharge

#Discarded and estimated

4.1.6.4 Stage Discharge Curve

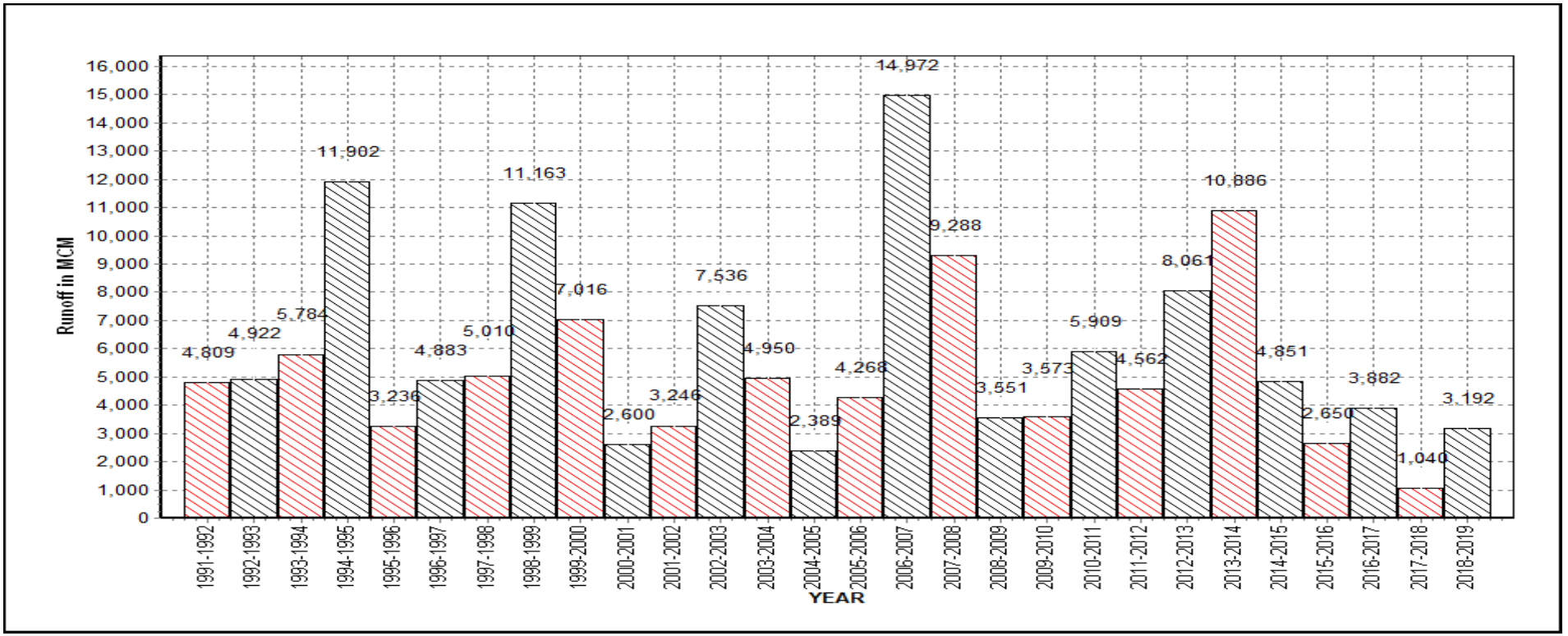
Station Name: Tapi at Gidhade (01 02 17 014) Division: Tapi Division Surat Local River:Tapi Sub Division: Middle Tapi Sub Division Dhule



4.1.6.5 Annual Runoff

Annual Runoff for the period 1991 to 2019

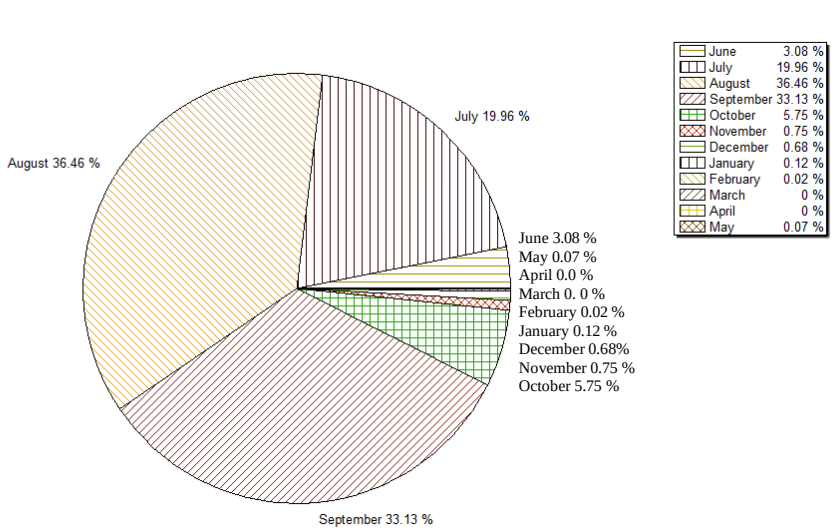
Station Name: Tapi at Gidhade (01 02 17 014) Division: Tapi Division Surat Local River:Tapi Sub Division: Middle Tapi Sub Division Dhule



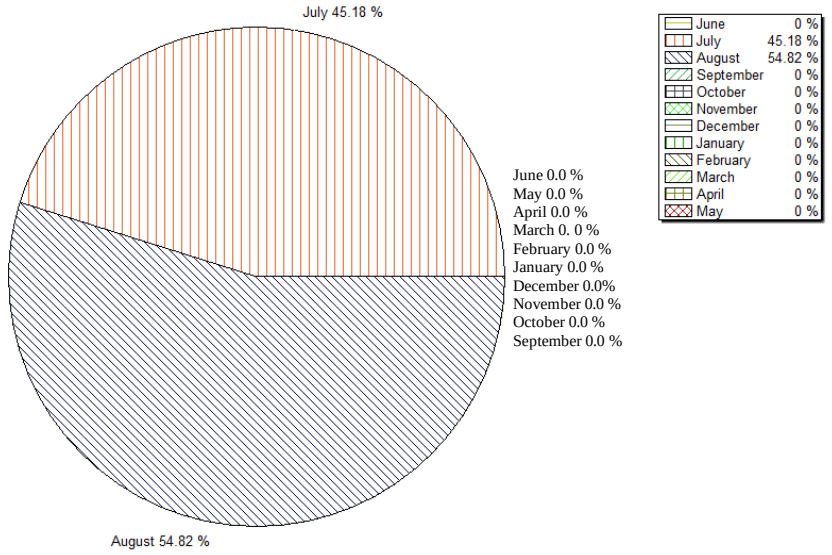
4.1.6.6 Monthly average Runoff

Station Name: Tapi at Gidhade (01 02 17 014) Division: Tapi Division Surat Local River:Tapi Sub Division: Middle Tapi Sub Division Dhule

Monthly Average Runoff Based on period 1991-2018

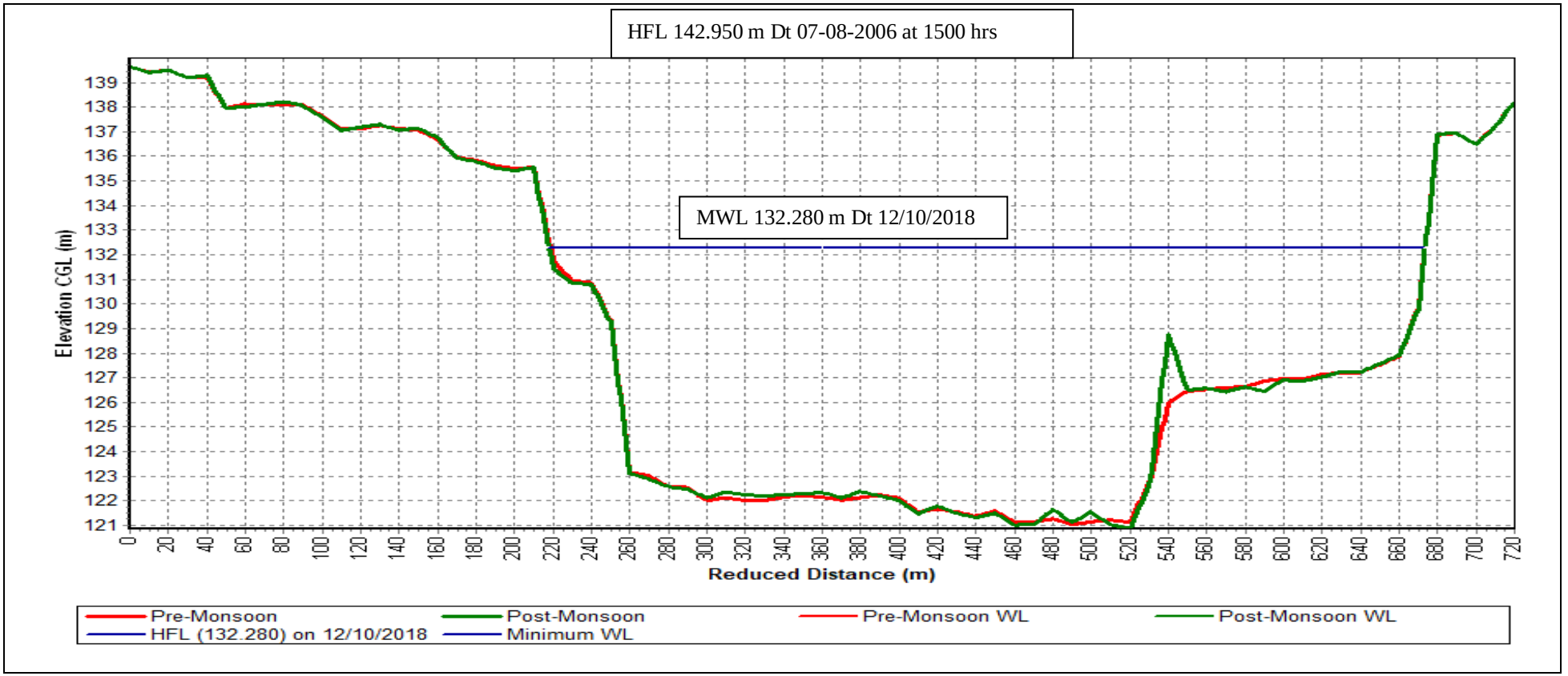


Monthly Runoff Based on period 2018-2019



4.1.6.7Superimposed cross section

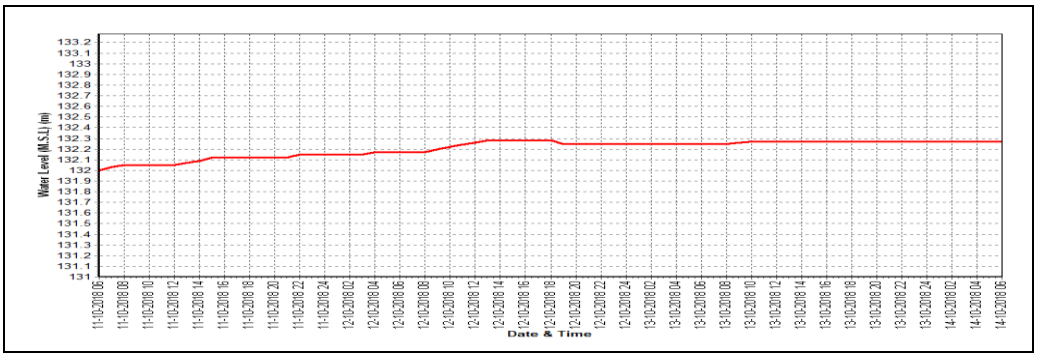
Station Name: Tapi at Gidhade (01 02 17 014) Division: Tapi Division, Surat Local River:Tapi Sub Division: Middle Tapi Sub Division Dhule



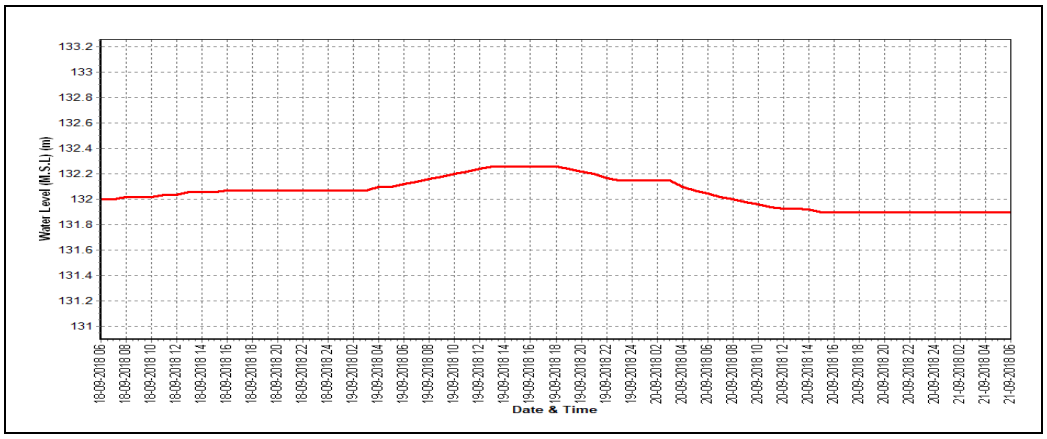
4.1.6.8 WL vs Time Graph of I,II,III peak

Station Name: Tapi at Gidhade (01 02 17 014) Division: Tapi Division Surat
Local River:Tapi Sub Division: Middle Tapi Sub Division Dhule

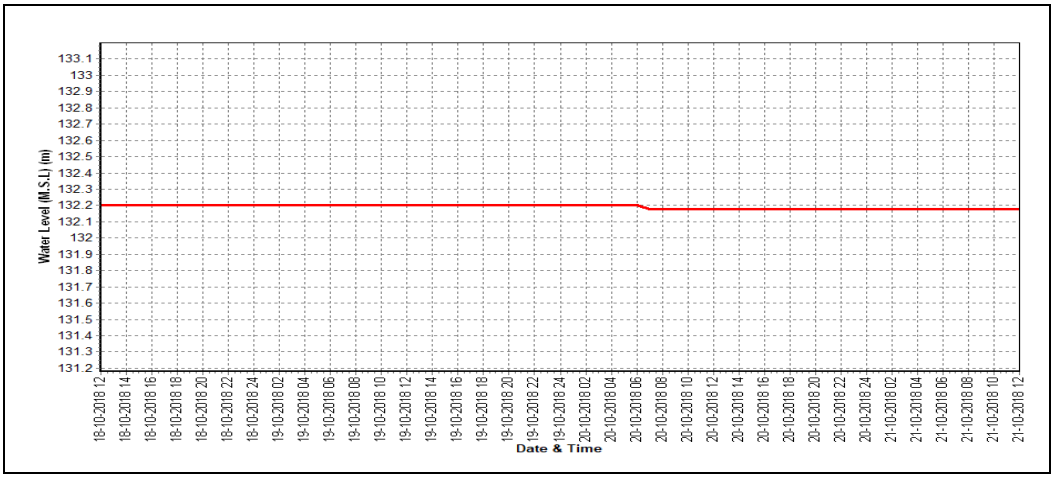
Water level vs Time Graph of Highest (I) flood peak during the water year 2018-19



Water level vs Time Graph of Highest (II) flood peak during the water year 2018-19



Water level vs Time Graph of Highest (III) flood peak during the water year 2018-19



4.1.7 Tapi at Sarangkheda

4.1.7.1 History Sheet

Site	**:**	**SARANGKHEDA**	**Code**	**:**	**01 02 17 015**
State	:	Maharashtra	District		Nandurbar
Basin	:	Tapi	Independent River	:	Tapi
Tributary	:	-	Sub Tributary	:	
Sub-Sub Tributary	:		Local River	:	Tapi
Division	:	Tapi Division Surat	Sub-Division	:	Middle Tapi Sub Division Dhule
Drainage Area	:	58400 sq km	Bank	:	Right
Latitude	:	21°25'55"	Longitude	:	74°31'37"
Zero of Gauge (m)	:	108 (msl)	21/09/1971		
		Opening Date	Closing Date		
Gauge	:	29/07/1976			
Discharge	:	19/10/1977			
Sediment	:	13/07/1984			
Water Quality	:	01/01/1980			

Annual Maximum / Minimum discharge with corresponding Water Level (above msl)

Year	Maximum			Minimum		
	Q (cumec)	**WL (m)**	**Date**	**Q (cumec)**	**WL (m)**	**Date**
1977-1978	600.0	111.610	27/11/1977	0.000	109.400	08/07/1977
1978-1979	13819	121.500	30/08/1978	6.400	109.450	01/06/1978
1979-1980	15000	122.725	11/08/1979	5.000	109.795	03/06/1979
1980-1981	5403	117.010	07/08/1980	5.500	109.730	19/05/1981
1981-1982	11375	119.985	11/08/1981	5.400	109.760	16/06/1981
1982-1983	1714	113.498	21/06/1982	2.500	109.570	22/05/1983
1983-1984	9493	117.135	13/08/1983	2.700	109.570	04/06/1983
1984-1985	13750	118.600	20/08/1984	0.700	109.530	07/10/1984
1985-1986	1820	113.570	04/08/1985	1.400	109.615	24/02/1986
1986-1987	7026	117.395	16/08/1986	0.300	109.480	31/05/1987
1987-1988	1604	113.270	22/08/1987	0.000	109.280	03/05/1988
1988-1989	10521	118.145	04/10/1988	0.000	109.280	11/06/1988
1989-1990	9300	118.055	20/08/1989	0.000	River Dry	24/03/1990
1990-1991	11838	120.060	17/08/1990	0.000	River Dry	23/03/1991
1991-1992	7986	118.485	01/08/1991	0.000	River Dry	29/10/1991
1992-1993	5244	116.000	18/08/1992	0.000	River Dry	10/02/1993
1993-1994	8462	118.060	17/07/1993	0.000	River Dry	05/03/1994
1994-1995	15626	122.575	07/09/1994	0.000	River Dry	01/04/1995
1995-1996	6156	117.530	04/09/1995	0.000	River Dry	26/01/1996
1996-1997	3510	114.810	28/07/1996	0.000	River Dry	29/06/1996
1997-1998	7174	117.970	27/07/1997	0.000	River Dry	24/02/1998
1998-1999	21292	123.030	16/09/1998	0.000	River Dry	22/04/1999
1999-2000	6300	118.100	11/08/1999	0.000	River Dry	05/03/2000
2000-2001	3435	114.900	14/07/2000	0.000	River Dry	01/01/2001
2001-2002	4076	115.800	17/08/2001	0.000	River Dry	23/02/2002
2002-2003	9000	119.000	26/08/2002	0.000	River Dry	13/02/2003
2003-2004	7564	117.400	25/08/2003	0.000	River Dry	30/04/2004
2004-2005	5909	115.970	24/08/2004	0.000	River Dry	24/02/2005
2005-2006	4458	116.050	03/08/2005	0.000	River Dry	30/11/2005
2006-2007	23044	126.000	08/08/2006	0.160	109.330	30/01/2007
2007-2008	11827	121.000	09/07/2007	0.000	109.680	03/01/2008
2008-2009	3406	114.900	06/08/2008	0.000	River Dry	05/09/2008
2009-2010	3942	114.850	24/07/2009	0.000	River Dry	01/06/2009
2010-2011	4876	116.450	10/09/2010	7.400	109.900	22/07/2010
2011-2012	4404	116.100	20/06/2011	123.9	110.650	20/06/2011
2012-2013	10481	120.350	07/09/2012	0.000	110.200	04/07/2012
2013-2014	9027	119.750	02/08/2013	0.000	109.300	01/06/2013
2014-2015	10946	120.250	24/07/2014	0.000	109.700	01/06/2014
2015-2016	7553	118.500	06/08/2015	0.000	110.180	01/06/2015
2016-2017	5701	117.000	13/07/2016	0.000	River Dry	01/06/2016
2017-2018	1227	112.300	15/09/2017	0.000	River Dry	01/06/2017
2018-2019	1838	113.100	23/08/2018	0.000	110.000	01/06/2018

4.1.7.2 Annual Maximum flood peak

Station Name: Tapi at Sarangkheda (01 02 17 015)Division: Tapi division Surat
Local River: Tapi Sub Division: Middle Tapi Sub division Dhule

Year	MWL (m)	Date	Hour
1977	111.910	27/11/1977	18:00:00
1978	123.340	30/08/1978	22:00:00
1979	122.800	11/08/1979	10:00:00
1980	117.420	07/08/1980	16:00:00
1981	120.000	11/08/1981	09:00:00
1982	114.370	21/06/1982	01:00:00
1983	117.370	13/08/1983	17:00:00
1984	119.120	20/08/1984	03:00:00
1985	114.115	28/06/1985	21:00:00
1986	117.830	16/08/1986	13:00:00
1987	113.510	22/08/1987	11:00:00
1988	118.160	04/10/1988	09:00:00
1989	118.340	20/08/1989	06:00:00
1990	120.700	17/08/1990	17:00:00
1991	119.440	01/08/1991	05:00:00
1992	116.200	03/09/1992	22:00:00
1993	118.730	17/07/1993	18:00:00
1994	123.640	08/09/1994	03:00:00
1995	117.800	03/09/1995	23:00:00
1996	115.070	28/07/1996	17:00:00
1997	118.050	27/07/1997	07:00:00
1998	123.640	16/09/1998	18:00:00
1999	118.280	11/08/1999	00:00:00
2000	115.550	13/07/2000	23:00:00
2001	117.700	16/08/2001	22:00:00
2002	119.900	26/08/2002	04:00:00
2003	118.300	25/08/2003	00:00:00
2004	116.350	06/08/2004	15:00:00
2005	116.300	03/08/2005	03:00:00
2006	127.080	08/08/2006	02:00:00
2007	121.800	09/07/2007	19:00:00
2008	115.650	06/08/2008	14:00:00
2009	117.000	06/09/2009	03:00:00
2010	116.800	10/09/2010	05:00:00
2011	116.400	28/08/2011	08:00:00
2012	121.600	07/09/2012	06:00:00
2013	121.400	02/08/2013	24:00:00
2014	121.750	24/07/2014	17:00:00
2015	119.000	06/08/2015	03:00:00
2016	117.350	13/07/2016	15:00:00
2017	112.700	31/08/2017	08:00:00
2018	115.000	22/08/2018	12:00:00

4.1.7.3 Summary of Data

Stage Discharge data for the period 2018 to 2019

Station Name: Tapi at Sarangkheda (01 02 17 015) Division: Tapi Division Surat Local River:Tap Sub Division: Middle Tapi sub division, Dhule

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	110.000	0.000	109.600	0.000	109.650	135.2 *	110.150	0.000	112.350	0.000	111.700	0.000
2	109.960	0.000	109.600	0.000	109.500	0.000	110.150	0.000	112.400	0.000	111.700	0.000
3	109.900	0.000	109.600	0.000	109.200	0.000	111.500	0.000	112.400	0.000	111.650	0.000
4	109.880	0.000	109.600	0.000	109.000	0.000	111.850	956.9 #	112.400	0.000	111.600	0.000
5	109.880	0.000	109.600	0.000	109.000	0.000	111.800	0.000	112.400	0.000	111.600	0.000
6	109.860	0.000	109.600	0.000	109.000	0.000	111.600	0.000	112.550	0.000	111.600	0.000
7	109.860	0.000	109.600	0.000	109.000	0.000	111.600	0.000	112.500	0.000	111.550	0.000
8	109.850	0.000	109.600	0.000	109.000	0.000	111.600	0.000	112.500	0.000	111.550	0.000
9	109.850	0.000	109.600	0.000	109.000	0.000	111.550	0.000	112.400	0.000	111.550	0.000
10	109.850	0.000	109.600	0.000	109.000	0.000	111.550	0.000	112.350	0.000	111.500	0.000
11	109.850	0.000	109.700	0.000	109.000	0.000	111.550	0.000	112.300	0.000	111.450	0.000
12	109.850	0.000	110.250	275.9	109.000	0.000	111.550	0.000	112.300	0.000	111.400	0.000
13	109.850	0.000	111.650	843.0 *	109.000	0.000	111.550	0.000	112.200	0.000	111.400	0.000
14	109.850	0.000	111.650	766.0	109.000	0.000	111.450	0.000	112.200	0.000	111.350	0.000
15	109.800	0.000	111.200	613.5 *	109.000	0.000	111.400	0.000	112.200	0.000	111.350	0.000
16	109.800	0.000	110.350	217.8	109.000	0.000	111.400	0.000	112.150	0.000	111.300	0.000
17	109.750	0.000	110.350	248.4	109.000	0.000	111.350	0.000	112.150	0.000	111.300	0.000
18	109.700	0.000	110.500	298.6	111.400	709.6 #	111.350	0.000	112.100	0.000	111.300	0.000
19	109.650	0.000	109.900	117.0	111.700	869.6 *	111.300	0.000	112.100	0.000	111.300	0.000
20	109.600	0.000	109.450	95.05 *	110.500	376.0	111.300	0.000	112.050	0.000	111.250	0.000

21	109.600	0.000	109.250	67.64 *	110.550	337.8	111.250	0.000	112.000	0.000	111.250	0.000
22	109.550	0.000	109.250	109.1	114.000	2804 *	111.250	0.000	112.000	0.000	111.250	0.000
23	109.550	0.000	109.700	107.6	113.100	1838	112.000	0.000	111.950	0.000	111.250	0.000
24	109.500	0.000	109.900	112.7	112.100	1114 #	112.500	1395 #	111.900	0.000	111.200	0.000
25	109.500	0.000	109.750	108.9	111.800	1225	112.200	0.000	111.850	0.000	111.150	0.000
26	109.500	0.000	109.700	247.8	111.000	525.7 *	112.250	0.000	111.800	0.000	111.100	0.000
27	109.500	0.000	110.050	320.5	111.100	490.6	112.300	0.000	111.800	0.000	111.100	0.000
28	109.500	0.000	110.350	294.0 *	111.250	645.5	112.300	0.000	111.800	0.000	111.100	0.000
29	109.500	0.000	110.250	265.2 *	111.500	1147	112.300	0.000	111.750	0.000	111.050	0.000
30	109.500	0.000	109.900	187.6	110.100	0.000	112.300	0.000	111.750	0.000	111.050	0.000
31			109.700	133.8	110.050	0.000			111.700	0.000		
Ten-Daily Mean												
I Ten-Daily	109.889	0.000	109.600	0.000	109.135	13.52	111.335	95.69	112.425	0.000	111.600	0.000
II Ten-Daily	109.770	0.000	110.500	347.5	109.660	195.5	111.420	0.000	112.175	0.000	111.340	0.000
III Ten-Daily	109.520	0.000	109.800	177.7	111.505	920.7	112.065	139.5	111.845	0.000	111.150	0.000
Monthly												
Min.	109.500	0.000	109.250	0.000	109.000	0.000	110.150	0.000	111.700	0.000	111.050	0.000
Max.	110.000	0.000	111.650	843.0	114.000	2804	112.500	1395	112.550	0.000	111.700	0.000
Mean	109.726	0.000	109.961	175.2	110.145	394.1	111.607	78.39	112.139	0.000	111.363	0.000

Annual Runoff in MCM = 1728 **Annual Runoff in mm = 30**

Peak Observed Discharge = 1838.00 cumecs on 23-08-2018 Corres. Water Level :113.100 m
Lowest Observed Discharge = 0.000 cumecs on 01-06-2018 Corres. Water Level :110.000 m

Note: All Gates of Sarangkheda Barrage closed /river in pooling condition from 01/06/18 to 11/07/18, 02/08/18 to 17/08/18, 30/08/18 to 31/08/18, and 05/09/18 to 31/05/19. Discharge discarded 18/08/18, 24/08/18 and 04/09/18.

Q: observed/ computed discharge in Cumec, WL: Corresponding Mean Water Level (msl) in m, *: Computed Discharge
#Discarded and estimated
Stage Discharge data for the period 2018 to 2019

Station Name: Tapi at Sarangkheda (01 02 17 015) Division: Tapi Division Surat Local River:Tapi Sub Division: Middle Tapi Sub Division, Dhule

Day	Dec		Jan		Feb		Mar		Apr		May	
	W.L	Q	WL	Q	WL	Q	WL	Q	WL	Q	WL	Q
1	111.000	0.000	110.400	0.000	109.800	0.000	109.250	0.000	109.050	0.000	109.000	0.000
2	111.000	0.000	110.350	0.000	109.800	0.000	109.200	0.000	109.000	0.000	109.000	0.000
3	111.000	0.000	110.350	0.000	109.750	0.000	109.200	0.000	109.000	0.000	109.000	0.000
4	110.950	0.000	110.300	0.000	109.750	0.000	109.200	0.000	109.000	0.000	109.000	0.000
5	110.950	0.000	110.300	0.000	109.700	0.000	109.200	0.000	109.000	0.000	109.000	0.000
6	110.950	0.000	110.250	0.000	109.700	0.000	109.200	0.000	109.000	0.000	109.000	0.000
7	110.900	0.000	110.250	0.000	109.650	0.000	109.150	0.000	109.000	0.000	109.000	0.000
8	110.900	0.000	110.250	0.000	109.600	0.000	109.150	0.000	109.000	0.000	109.000	0.000
9	110.850	0.000	110.200	0.000	109.600	0.000	109.150	0.000	109.000	0.000	109.000	0.000
10	110.850	0.000	110.200	0.000	109.600	0.000	109.100	0.000	109.000	0.000	109.000	0.000
11	110.800	0.000	110.150	0.000	109.600	0.000	109.100	0.000	109.000	0.000	109.000	0.000
12	110.800	0.000	110.100	0.000	109.550	0.000	109.100	0.000	109.000	0.000	109.000	0.000
13	110.750	0.000	110.100	0.000	109.550	0.000	109.100	0.000	109.000	0.000	109.000	0.000
14	110.750	0.000	110.100	0.000	109.500	0.000	109.000	0.000	109.000	0.000	109.000	0.000
15	110.700	0.000	110.050	0.000	109.500	0.000	109.050	0.000	109.000	0.000	109.000	0.000
16	110.700	0.000	110.050	0.000	109.500	0.000	109.050	0.000	109.000	0.000	109.000	0.000
17	110.700	0.000	110.050	0.000	109.450	0.000	109.050	0.000	109.000	0.000	109.000	0.000
18	110.650	0.000	110.050	0.000	109.450	0.000	109.050	0.000	109.000	0.000	109.000	0.000
19	110.650	0.000	110.000	0.000	109.450	0.000	109.050	0.000	109.000	0.000	109.000	0.000
20	110.600	0.000	110.000	0.000	109.400	0.000	109.050	0.000	109.000	0.000	109.000	0.000

21	110.600	0.000	110.000	0.000	109.400	0.000	109.050	0.000	109.000	0.000	109.000	0.000
22	110.550	0.000	109.950	0.000	109.400	0.000	109.050	0.000	109.000	0.000	109.000	0.000
23	110.550	0.000	109.950	0.000	109.400	0.000	109.050	0.000	109.000	0.000	109.000	0.000
24	110.500	0.000	109.950	0.000	109.350	0.000	109.050	0.000	109.000	0.000	109.000	0.000
25	110.500	0.000	109.900	0.000	109.300	0.000	109.050	0.000	109.000	0.000	109.000	0.000
26	110.500	0.000	109.900	0.000	109.300	0.000	109.050	0.000	109.000	0.000	109.000	0.000
27	110.450	0.000	109.900	0.000	109.300	0.000	109.050	0.000	109.000	0.000	109.000	0.000
28	110.450	0.000	109.900	0.000	109.250	0.000	109.050	0.000	109.000	0.000	109.000	0.000
29	110.450	0.000	109.850	0.000			109.050	0.000	109.000	0.000	108.900	0.000
30	110.400	0.000	109.850	0.000			109.050	0.000	109.000	0.000	108.700	0.000
31	110.400	0.000	109.800	0.000			109.050	0.000			108.500	0.000
Ten-Daily Mean												
I Ten-Daily	110.935	0.000	110.285	0.000	109.695	0.000	109.180	0.000	109.005	0.000	109.000	0.000
II Ten-Daily	110.710	0.000	110.065	0.000	109.495	0.000	109.060	0.000	109.000	0.000	109.000	0.000
III Ten-Daily	110.486	0.000	109.905	0.000	109.338	0.000	109.050	0.000	109.000	0.000	108.918	0.000
Monthly												
Min.	110.400	0.000	109.800	0.000	109.250	0.000	109.000	0.000	109.000	0.000	108.500	0.000
Max.	111.000	0.000	110.400	0.000	109.800	0.000	109.250	0.000	109.050	0.000	109.000	0.000
Mean	110.703	0.000	110.079	0.000	109.521	0.000	109.095	0.000	109.002	0.000	108.971	0.000

Peak Computed Discharge = 2804.0 cumecs on 22/0/2018 Corres. Water Level :114.000 m

Lowest Computed Discharge = 67.74 cumecs on 21/07/2018 Corres. Water Level :109.250 m

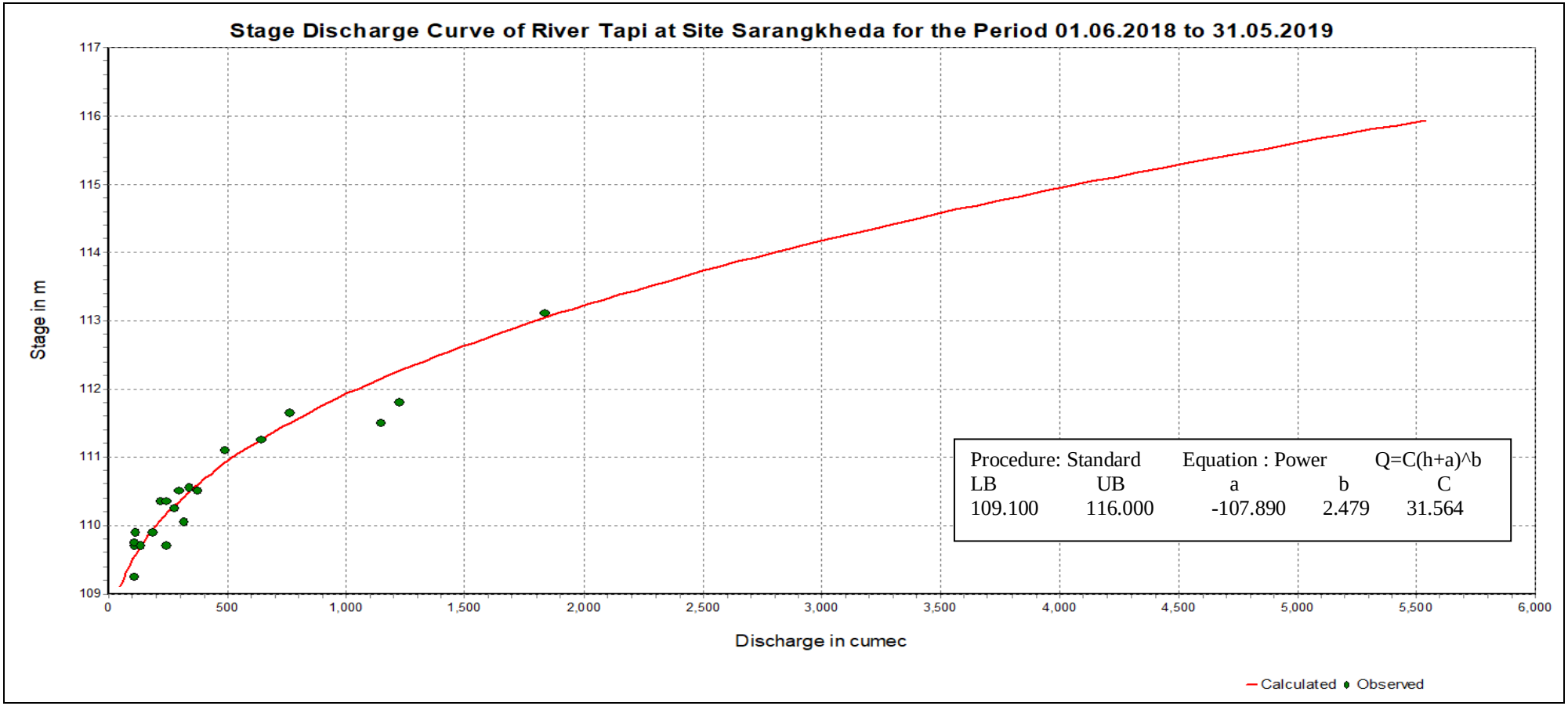
Note: All Gates of Sarangkheda Barrage closed /river in pooling condition from 01/06/18 to 11/07/18, 02/08/18 to 17/08/18, 30/08/18 to 31/08/18, and 05/09/18 to 31/05/19. Discharge discarded 18/08/18, 24/08/18 and 04/09/18.

Q: observed/ computed discharge in Cumec, WL: Corresponding Mean Water Level (msl) in m, *: Computed Discharge

#Discarded and estimated

4.1.7.4 Stage Discharge Curve

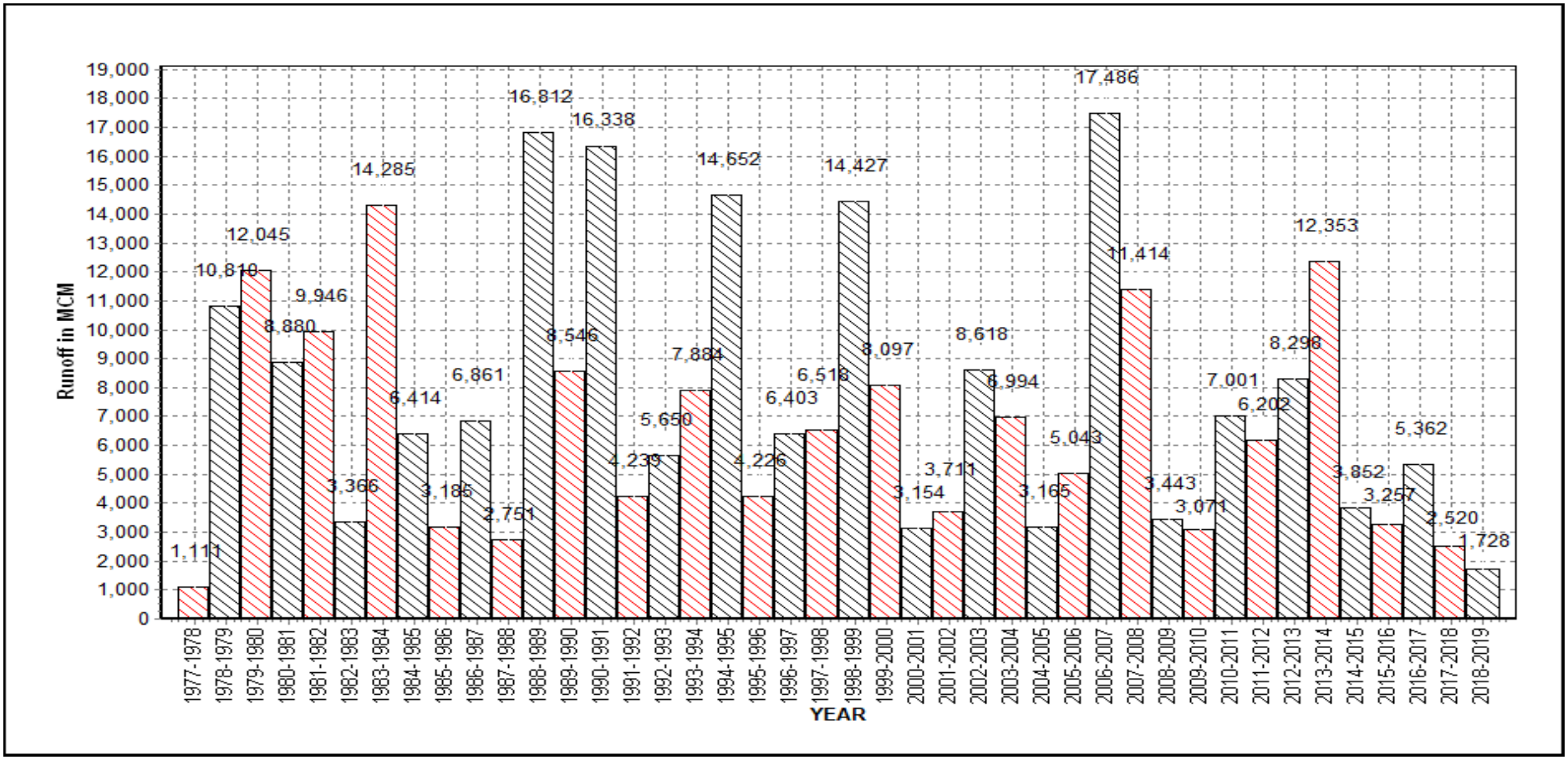
Station Name: Tapi at Sarangkheda (01 02 17 015) Division: Tapi Division Surat Local River: Tapi Sub Division: Middle Tapi Sub divisionDhule



4.1.7.5 Annual runoff

Annual Runoff for the period 1977-2019

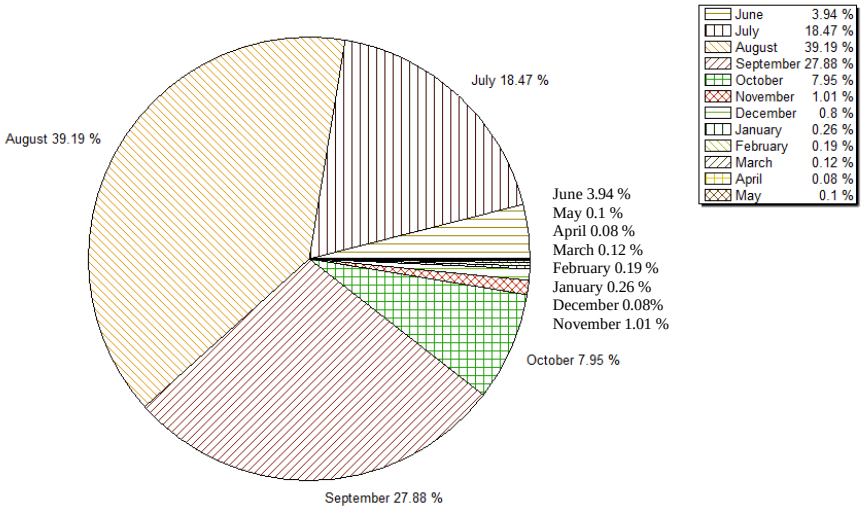
Station Name: Tapi at Sarangkheda (01 02 17 015) Division: Tapi Division Surat Local River:Tapi Sub Division: Middle Tapi Sub division, Dhule



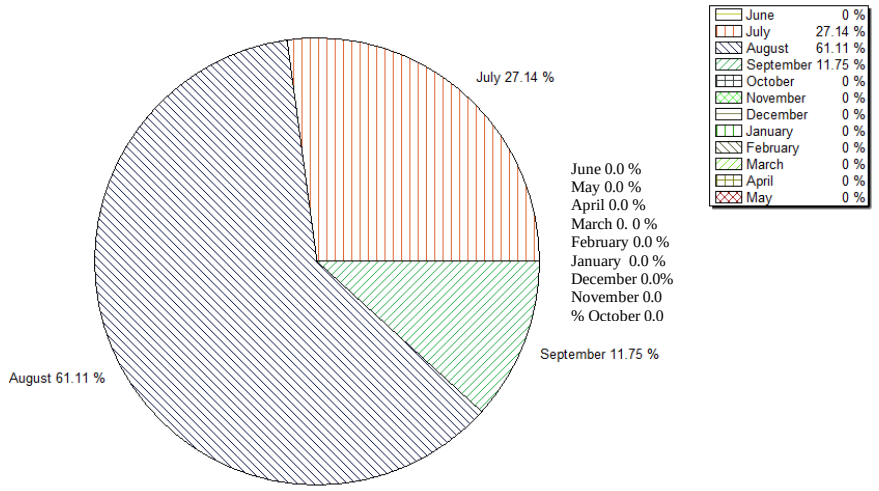
4.1.7.6 Monthly Average Runoff

Station Name: Tapi at Sarangkheda (01 02 17 015) Division: Tapi Division Surat Local River:Tapi Sub Division: Middle Tapi Sub division, Dhule

Monthly Average Runoff Based on period 1971-2018

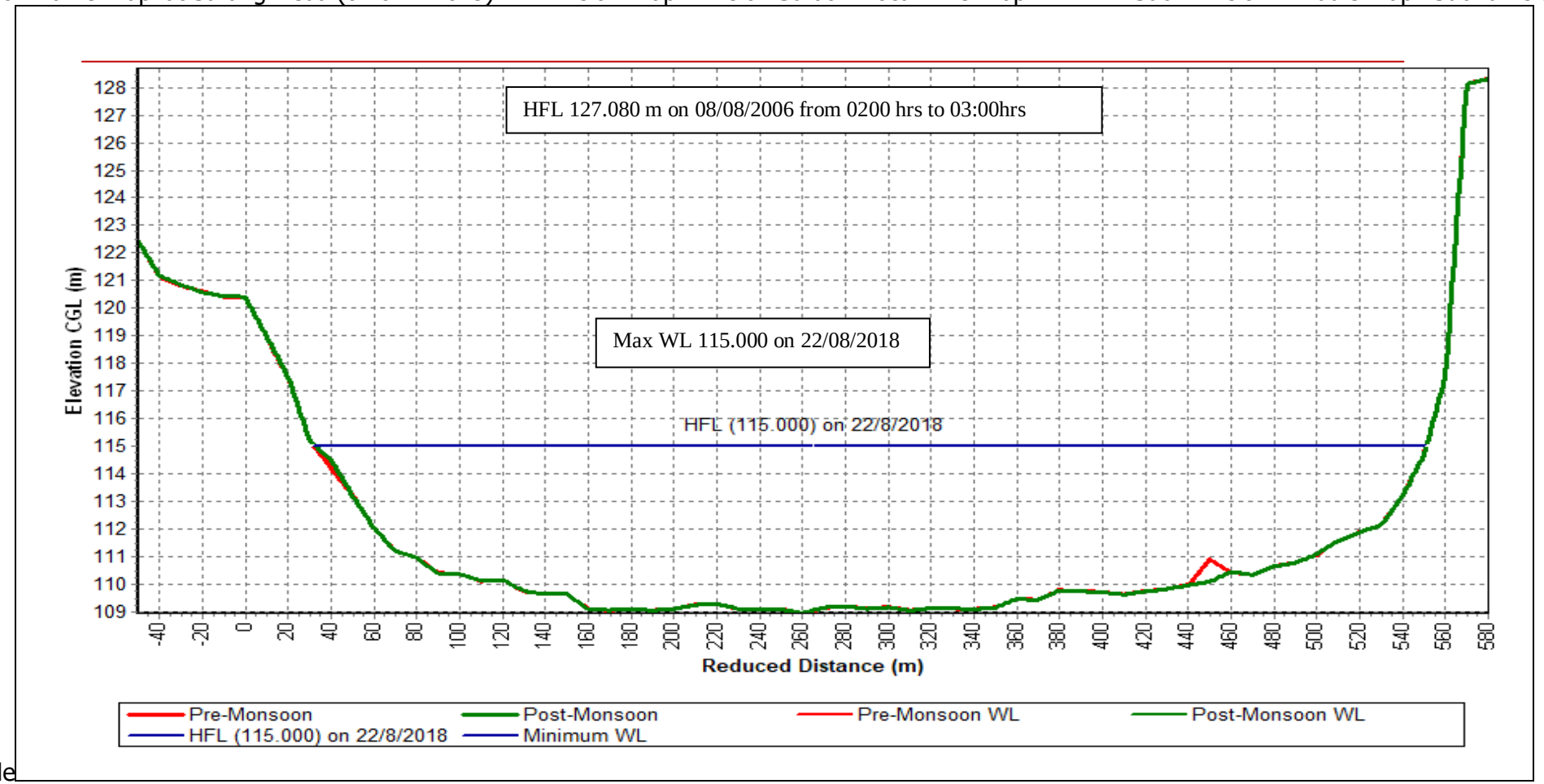


Monthly Runoff Based on period 2018-2019



4.1.7.7 Superimposed cross section

Station Name: Tapi at Sarangkheda (01 02 17 015) Division: Tapi Division Surat Local River:Tapi Sub Division: Middle Tapi Sub division, Dhule

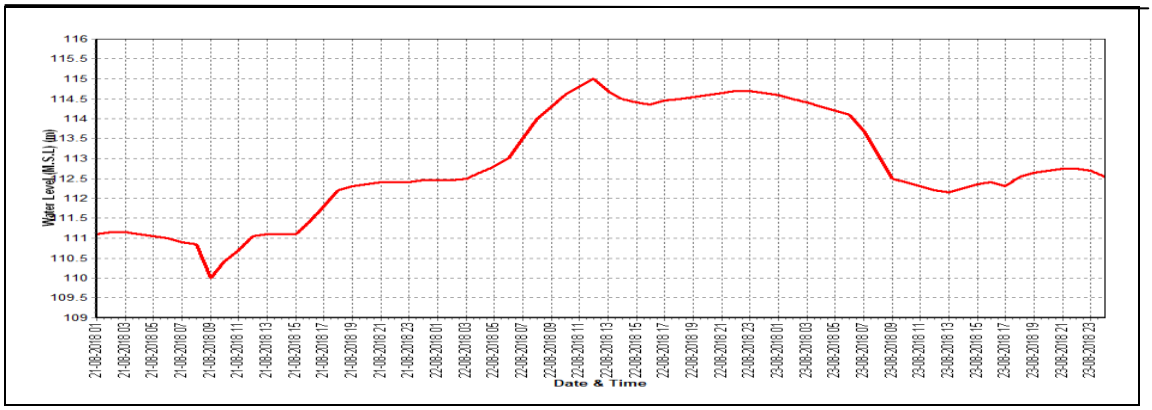


4.1.7.8 WL vs Time Graph of I,II,III peak

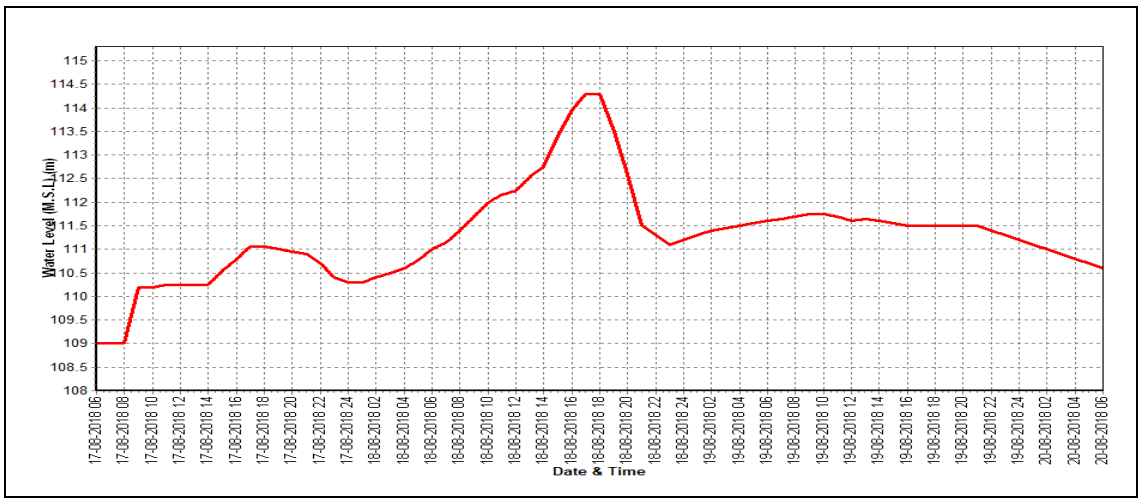
Station Name: Tapi at Sarangkheda (01 02 17 015) Division: Tapi Division Surat

Local River: Tapi Sub Division: Middle Tapi Sub division, Dhule

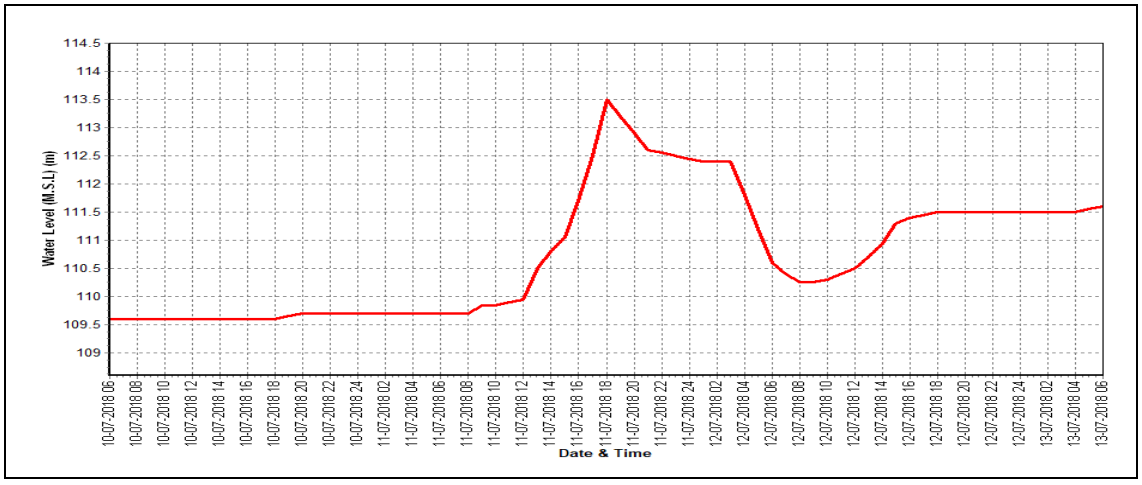
Water Level v/s Time graph of Highest (I) Flood Peak during the water year 2018-19



Water Level v/s Time graph of Highest (II) Flood Peak during the water year 2018-19



Water Level v/s Time graph of Highest (III) Flood Peak during the water year 2018-19



4.1.8 Gomai at Prakasha (Dambarkheda)

4.1.8.1 History Sheet

			Water Year	**:**	**2017-2018**
Site	**:**	**Gomai at Prakasha**	**Code**	**:**	**01 02 41 170**
State	:	Maharashtra	District		Nandurbar
Basin	:	Tapi	Independent River	:	Tapi
Tributary	:	Gomai	Sub Tributary	:	
Sub-Sub Tributary	:		Local River	:	
Division	:	Surat	Sub-Division	:	Middle Tapi Sub Division Dhule
Drainage Area	:	6819 Sq. Km.	Bank	:	Right
Latitude	:	21°31'00"	Longitude	:	74°23'48"
Zero of Gauge (m)	:	109 (m.s.l)	01-10-2014		
		Opening Date	Closing Date		
Gauge	:	01-10-2014			
Discharge	:	01-10-2014			
Sediment	:	-----			
Water Quality	:	------			

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

Year	Maximum			Minimum		
	Q (cumec)	**WL (m)**	**Date**	**Q (cumec)**	**WL (m)**	**Date**
2016-2017	12.110	110.150	06/08/2016	River Dry		
2017-2018	23.040	110.400	31/08/2017	River Dry		
2018-2019	11.570	109.950	23/08/2018	River Dry		

4.1.8.2 Annual Maximum flood peak

Station Name: Gomai at Prakasha (01 02 41 170) Division: Tapi division Surat

Local River: Gomai Sub Division: Middle Tapi Sub Division, Dhule

Year	**MWL (m)**	**Date**	**Hour**
2016	110.900	08/10/2016	24:00:00
2017	111.950	12/10/2017	08:00:00
2018	111.100	06/10/2018	18:00:00

4.1.8.3 Summary of Data

Stage Discharge data for the period 2018 to 2019

Station Name: Gomai at Prakasha (01 02 41 170) Division: Tapi Division Surat Local River:Gomai Sub Division: : Middle Tapi Sub Division, Dhule

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	River Dry	0.000	River Dry	0.000	River Dry	0.000	109.900	9.800	110.800	0.000	109.800	0.000
2		0.000		0.000		0.000	109.900	9.220 *	110.800	0.000	109.700	0.000
3		0.000		0.000		0.000	109.850	8.340 *	110.800	0.000	109.700	0.000
4		0.000		0.000		0.000	109.850	7.802	111.000	0.000	109.700	0.000
5		0.000		0.000		0.000	110.900	0.000	111.000	0.000	109.700	0.000
6		0.000		0.000		0.000	110.900	0.000	111.000	0.000	109.700	0.000
7		0.000		0.000		0.000	109.850	0.000	111.100	0.000	109.700	0.000
8		0.000		0.000		0.000	109.750	0.000	111.100	0.000	109.600	0.000
9		0.000		0.000		0.000	109.700	0.000	111.100	0.000	109.600	0.000
10		0.000		0.000		0.000	109.700	0.000	111.100	0.000	109.600	0.000
11		0.000		0.000		0.000	109.600	0.000	111.000	0.000	109.500	0.000
12		0.000		0.000		0.000	109.550	0.000	111.000	0.000	109.500	0.000
13		0.000		0.000		0.000	109.500	0.000	110.800	0.000	109.500	0.000
14		0.000		0.000		0.000	109.500	0.000	110.700	0.000	109.500	0.000
15		0.000		0.000		0.000	109.500	0.000	110.600	0.000	109.400	0.000
16		0.000		0.000		0.000	109.450	0.000	110.600	0.000	109.400	0.000
17		0.000		0.000		0.000	109.400	0.000	110.500	0.000	109.300	0.000
18		0.000		0.000	109.900	7.827	109.400	0.000	110.500	0.000	109.300	0.000
19		0.000		0.000	109.800	7.540 *	109.450	0.000	110.400	0.000	109.300	0.000
20		0.000		0.000	109.600	4.920 *	109.500	0.000	110.300	0.000	109.200	0.000

21	River Dry	0.000	River Dry	0.000	109.600	4.920 #	109.500	0.000	110.300	0.000	109.200	0.000
22		0.000		0.000	109.750	7.285	109.500	0.000	110.300	0.000	109.200	0.000
23		0.000		0.000	109.950	11.57	109.500	0.000	110.200	0.000	109.100	0.000
24		0.000		0.000	109.900	0.000	109.500	0.000	110.100	0.000	109.100	0.000
25		0.000		0.000	109.800	0.000	110.700	0.000	110.100	0.000	109.100	0.000
26		0.000	109.700	0.000	109.750	0.000	110.900	0.000	110.000	0.000	109.100	0.000
27		0.000	109.650	0.000	109.800	0.000	110.900	0.000	110.000	0.000	109.100	0.000
28		0.000	109.550	0.000	109.850	0.000	110.850	0.000	109.900	0.000	109.100	0.000
29		0.000	109.500	0.000	109.850	0.000	110.850	0.000	109.900	0.000	109.050	0.000
30		0.000	109.400	0.000	110.000	0.000	110.800	0.000	109.800	0.000	109.050	0.000
31			109.100	0.000	109.900	0.000			109.800	0.000		
Ten-Daily Mean												
I Ten-Daily		0.000		0.000		0.000	110.030	3.516	110.980	0.000	109.680	0.000
II Ten-Daily		0.000		0.000	109.767	2.029	109.485	0.000	110.640	0.000	109.390	0.000
III Ten-Daily		0.000	109.483	0.000	109.832	2.162	110.300	0.000	110.036	0.000	109.110	0.000
Monthly												
Min.		0.000	109.100	0.000	109.600	0.000	109.400	0.000	109.800	0.000	109.050	0.000
Max.		0.000	109.700	0.000	110.000	11.57	110.900	9.800	111.100	0.000	109.800	0.000
Mean		0.000	109.483	0.000	109.818	1.42	109.938	1.17	110.535	0.000	109.393	0.000

Annual Runoff in MCM = 7 **Annual Runoff in mm = 1**

Peak Observed Discharge = 11.57 cumecs on 23-08-2018 **Corres. Water Level :109.950 m**

Lowest Observed Discharge = 0.000 cumecs on 26-07-2018 **Corres. Water Level :109.700 m**

Note: River Dry from 01-06-18 to 25-07-18, 01-08-18 to 17-08-18, and 05-12-19 to 31-05-19, River in pooling condition from 26-07-18 to 31-07-18, 24-08-18 to 31-08-18, and 05-09-18 to 04-12-19. Discarded observation 21-08-18.

Q: observed/ computed discharge in Cumec, WL: Corresponding Mean Water Level (msl) in m, *: Computed Discharge

#Discarded and estimated

Stage Discharge data for the period 2017 to 2018

Station Name: Gomai at Prakasha (01 02 41 170) Division: Tapi Division Surat Local River:Gomai Sub Division: : Middle Tapi Sub Division, Dhule

Day	Dec		Jan		Feb		Mar		Apr		May	
	W.L	Q	WL	Q	WL	Q	WL	Q	WL	Q	WL	Q
1	109.050	0.000	River Dry	0.000	River Dry	0.000	River Dry	0.000	River Dry	0.000	River Dry	0.000
2	109.050	0.000		0.000		0.000		0.000		0.000		0.000
3	109.050	0.000		0.000		0.000		0.000		0.000		0.000
4	109.050	0.000		0.000		0.000		0.000		0.000		0.000
5	River Dry	0.000		0.000		0.000		0.000		0.000		0.000
6		0.000		0.000		0.000		0.000		0.000		0.000
7		0.000		0.000		0.000		0.000		0.000		0.000
8		0.000		0.000		0.000		0.000		0.000		0.000
9		0.000		0.000		0.000		0.000		0.000		0.000
10		0.000		0.000		0.000		0.000		0.000		0.000
11		0.000		0.000		0.000		0.000		0.000		0.000
12		0.000		0.000		0.000		0.000		0.000		0.000
13		0.000		0.000		0.000		0.000		0.000		0.000
14		0.000		0.000		0.000		0.000		0.000		0.000
15		0.000		0.000		0.000		0.000		0.000		0.000
16		0.000		0.000		0.000		0.000		0.000		0.000
17		0.000		0.000		0.000		0.000		0.000		0.000
18		0.000		0.000		0.000		0.000		0.000		0.000
19		0.000		0.000		0.000		0.000		0.000		0.000
20		0.000		0.000		0.000		0.000		0.000		0.000

21	River Dry	0.000	River Dry	0.000	River Dry	0.000	River Dry	0.000	River Dry	0.000	River Dry	0.000
22		0.000		0.000		0.000		0.000		0.000		0.000
23		0.000		0.000		0.000		0.000		0.000		0.000
24		0.000		0.000		0.000		0.000		0.000		0.000
25		0.000		0.000		0.000		0.000		0.000		0.000
26		0.000		0.000		0.000		0.000		0.000		0.000
27		0.000		0.000		0.000		0.000		0.000		0.000
28		0.000		0.000		0.000		0.000		0.000		0.000
29		0.000		0.000				0.000		0.000		0.000
30		0.000		0.000				0.000		0.000		0.000
31		0.000		0.000				0.000				0.000
Ten-Daily Mean												
I Ten-Daily	109.050	0.000		0.000		0.000		0.000		0.000		0.000
II Ten-Daily		0.000		0.000		0.000		0.000		0.000		0.000
III Ten-Daily		0.000		0.000		0.000		0.000		0.000		0.000
Monthly												
Min.	109.050	0.000		0.000		0.000		0.000		0.000		0.000
Max.	109.050	0.000		0.000		0.000		0.000		0.000		0.000
Mean	109.050	0.000		0.000		0.000		0.000		0.000		0.000

Peak Computed Discharge = 43.49 cumecs on 26-07-2017 Corres. Water Level :110.950 m

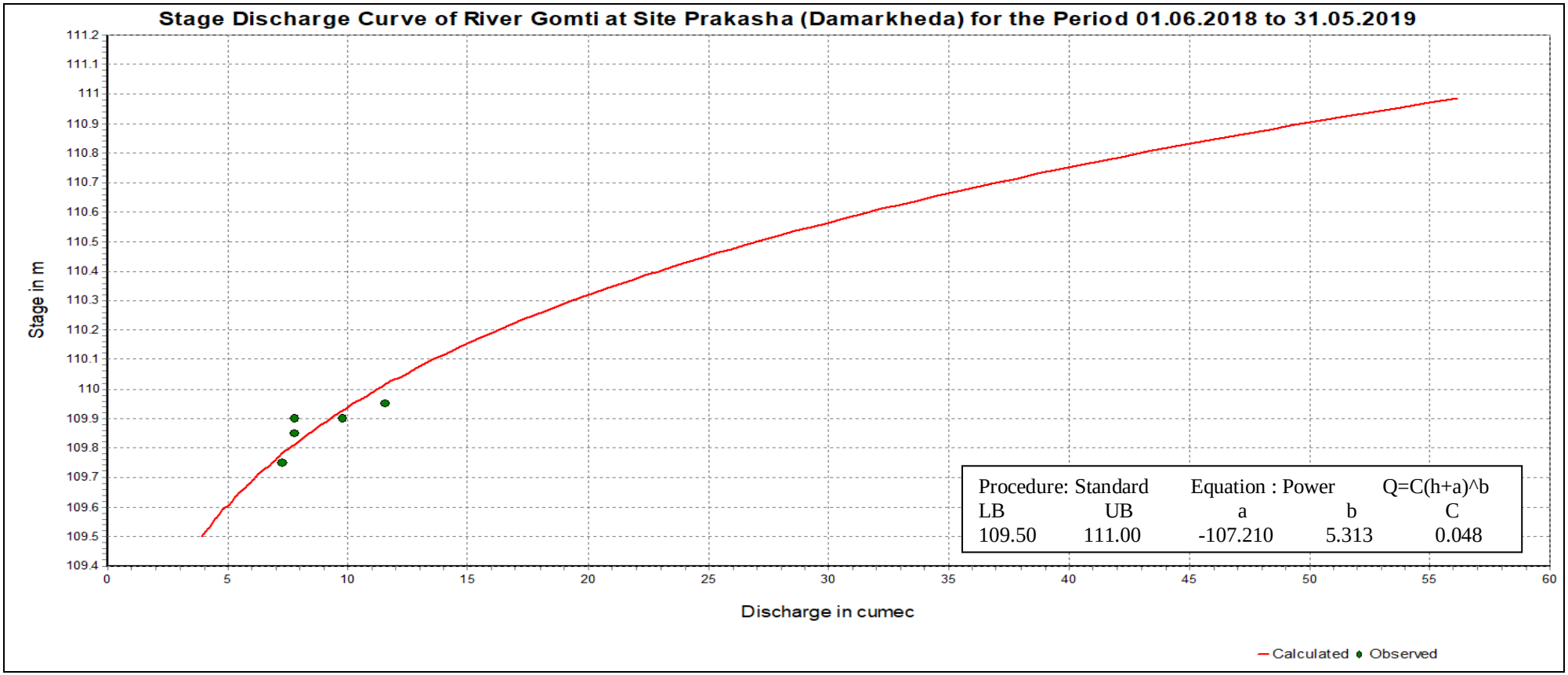
Lowest Computed Discharge = 1.590 cumecs on 04-07-2017 Corres. Water Level :109.450 m

Note: River Dry from 01-06-18 to 25-07-18, 01-08-18 to 17-08-18, and 05-12-19 to 31-05-19, River in pooling condition from 26-07-18 to 31-07-18, 24-08-18 to 31-08-18, and 05-09-18 to 04-12-19. Discarded observation 21-08-18.

Q: observed/ computed discharge in Cumec, WL: Corresponding Mean Water Level (msl) in m, *: Computed Discharge
#Discarded and estimated

4.1.8.4 Stage Discharge Curve

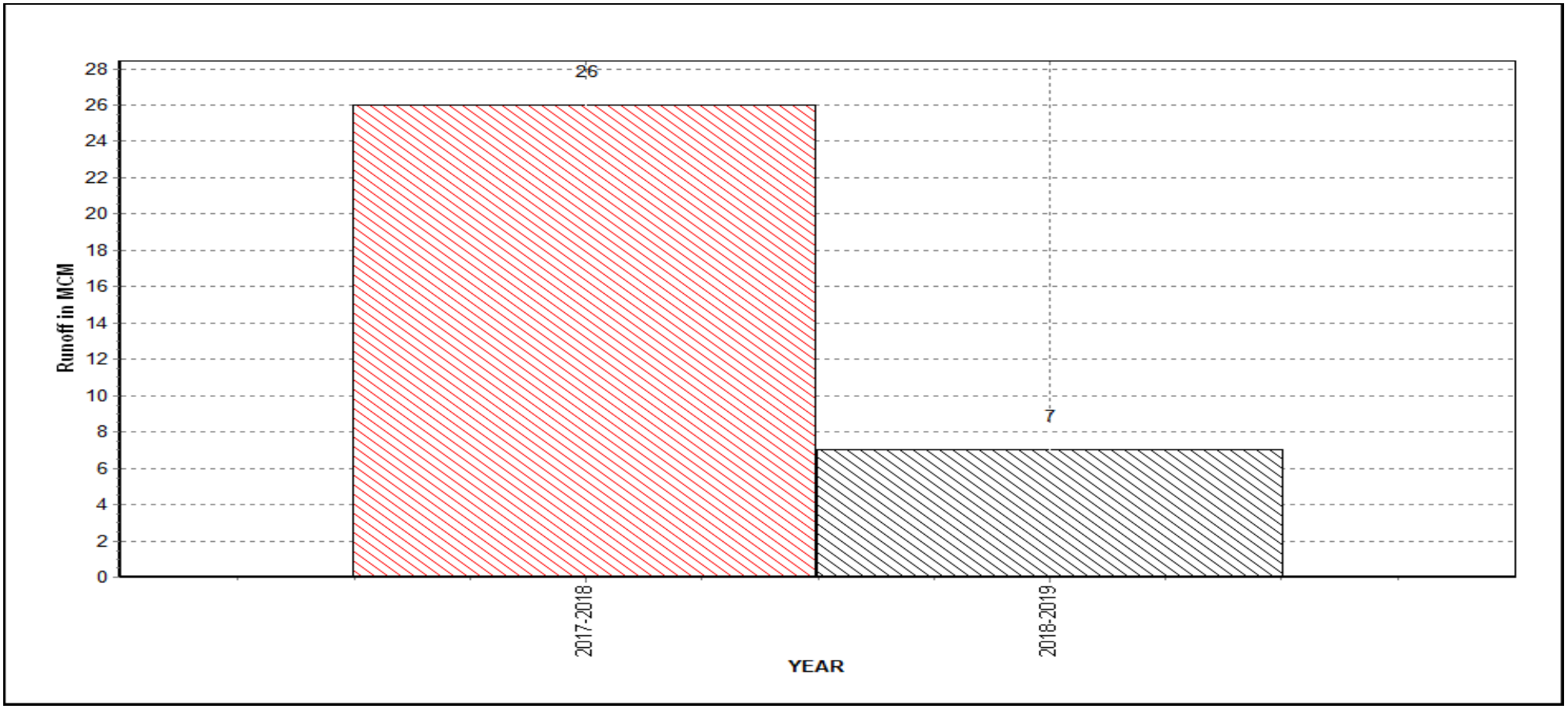
Station Name: Gomai at Prakasha (01 02 41 170) Division: Tapi Division Surat Local River:Gomai Sub Division: : Middle Tapi Sub Division, Dhule



4.1.8.5 Annual runoff

Annual Runoff for the period 2017-2019

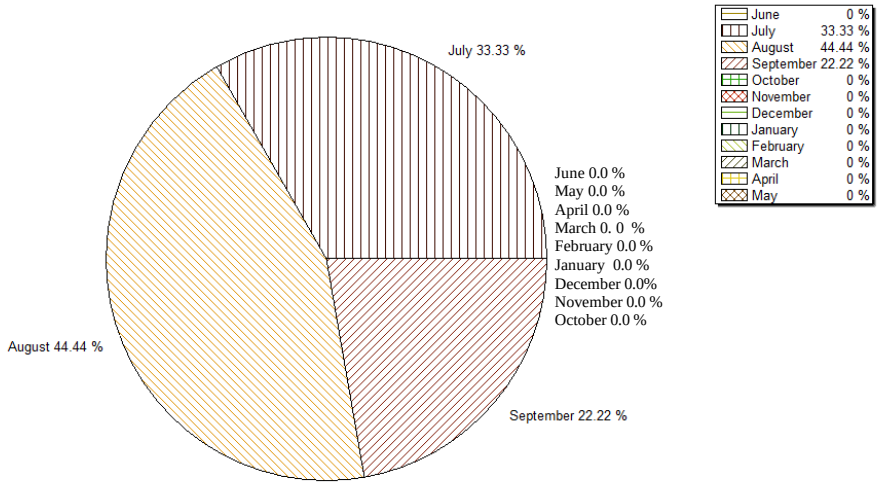
Station Name: Gomai at Prakasha (01 02 41 170) Division: Tapi Division Surat Local River:GomaiSub Division: : Middle Tapi Sub Division, Dhule



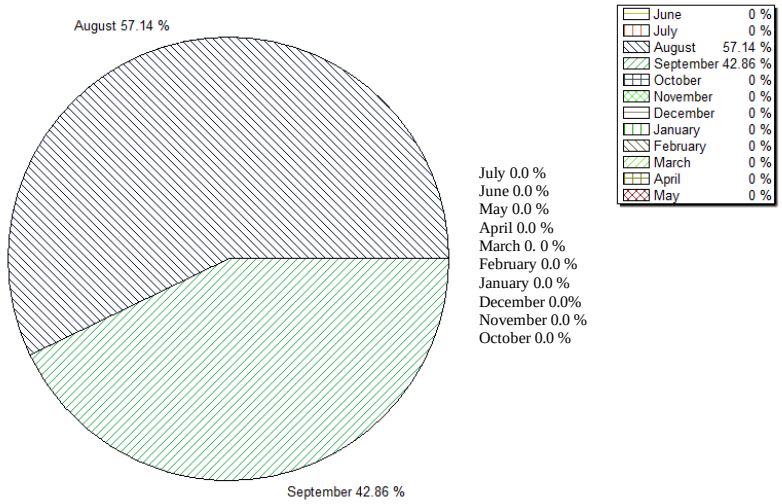
4.1.8.6 Monthly Average Runoff

Station Name: Gomai at Prakasha (01 02 41 170) Division: Tapi Division Surat Local River:GomaiSub Division: : Middle Tapi Sub Division, Dhule

Monthly Average Runoff Based on period 2017-2018

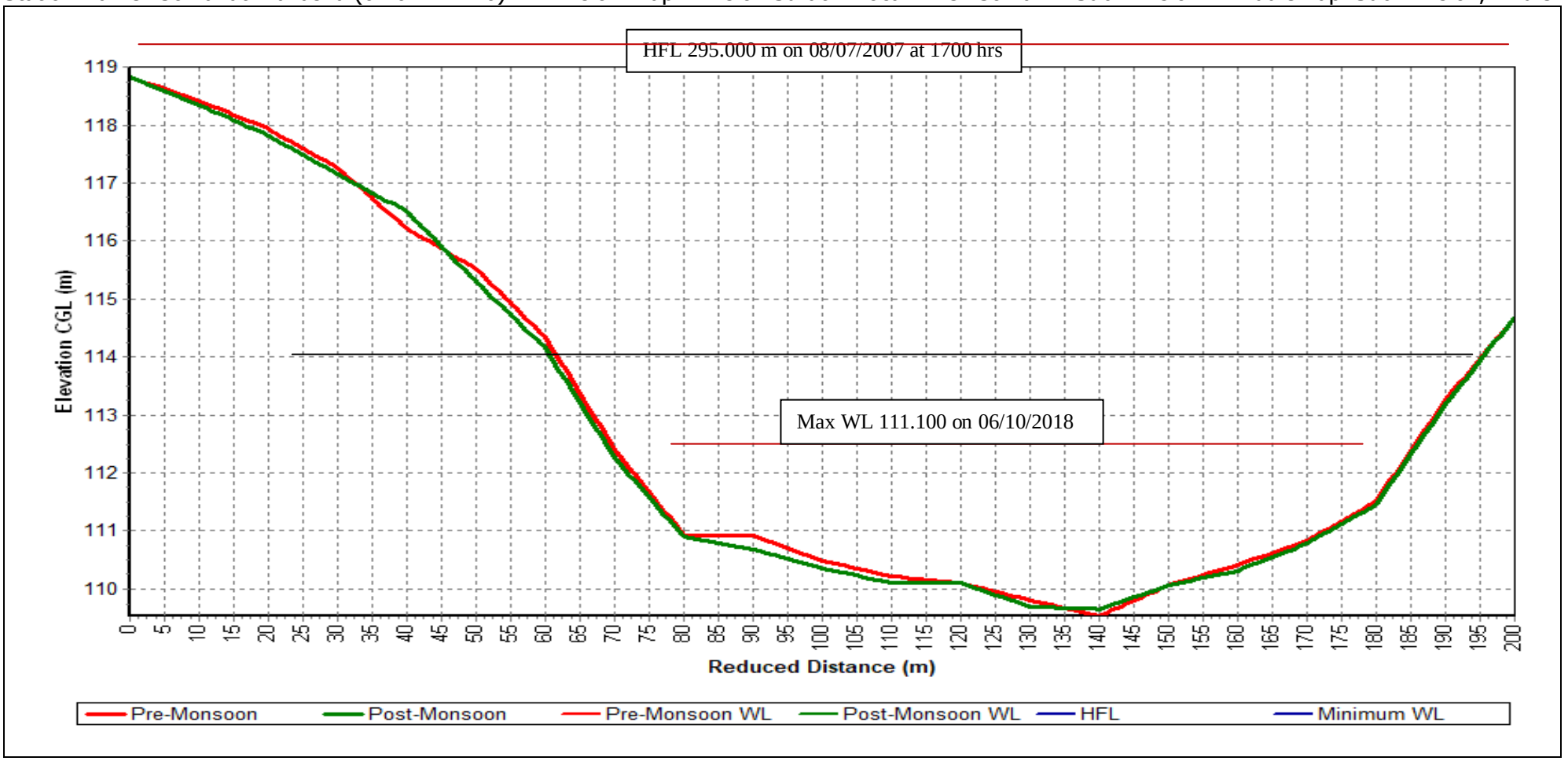


Monthly Runoff Based on period 2018-2019



4.1.8.7 Superimposed cross section

Station Name: Gomai at Prakasha (01 02 41 170) Division: Tapi Division Surat Local River:Gomai Sub Division: : Middle Tapi Sub Division, Dhule

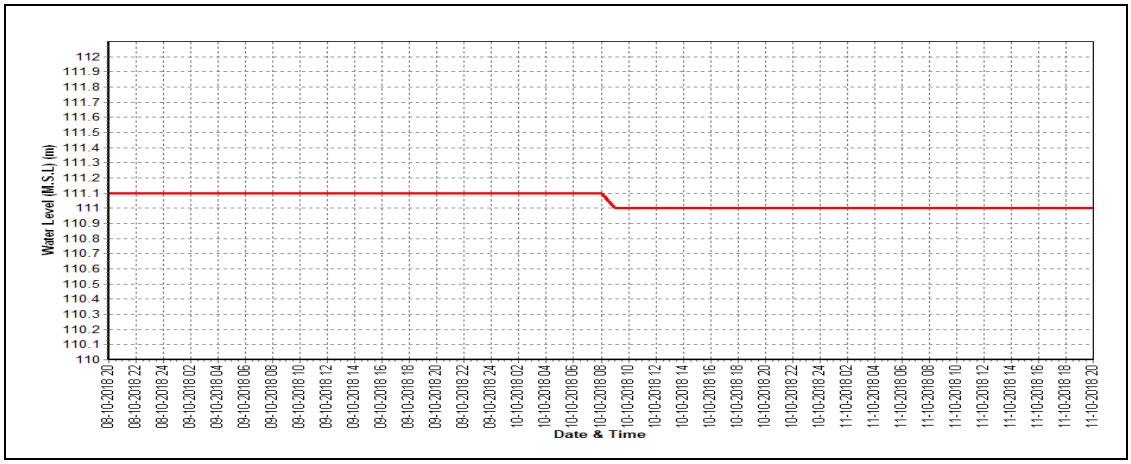


4.1.8.8 WL vs Time Graph of I,II,III peak

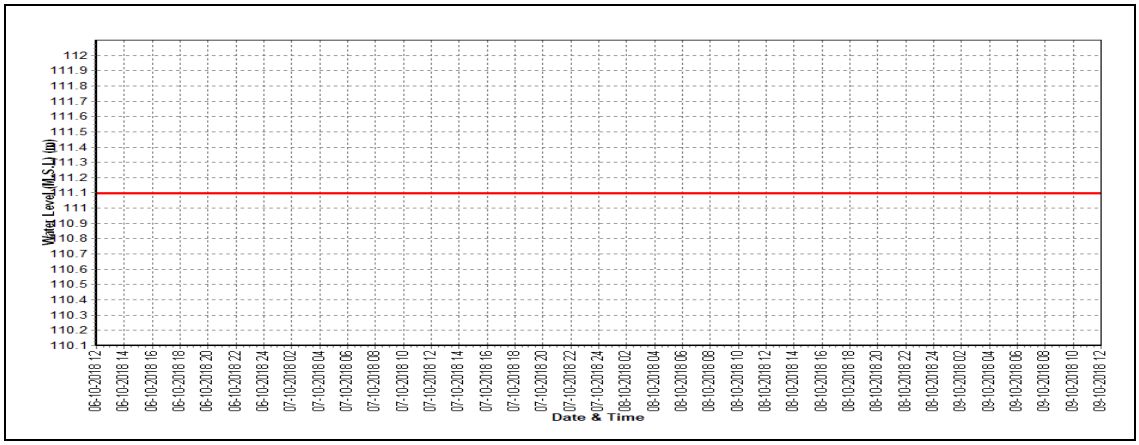
Station Name: Gomai at Prakasha (01 02 41 170) Division: Tapi Division Surat

Local River: Gomai Sub Division: Middle Tapi Sub Division, Dhule

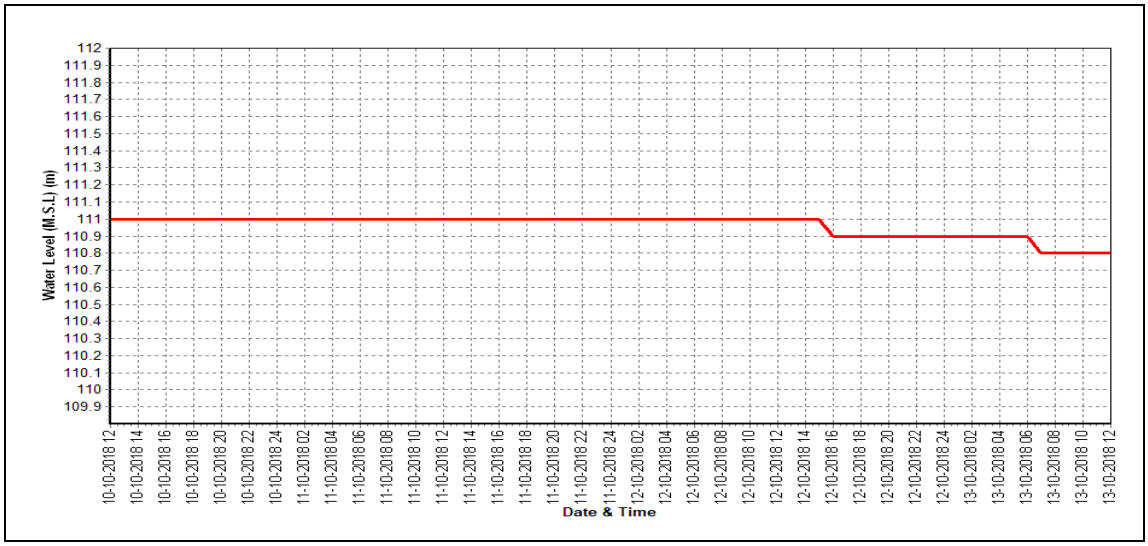
Water Level v/s Time graph of Highest (I) Flood Peak during the water year 2018-19



Water Level v/s Time graph of Highest (II) Flood Peak during the water year 2018-19



Water Level v/s Time graph of Highest (III) Flood Peak during the water year 2018-19



4.1.9 Tapi at Ghala

4.1.9.1 History Sheet

			Water Year	**:**	**2018-2019**
Site	**:**	**Tapi at Ghala**	**Code**	**:**	**01 02 17 018**
State	:	Gujarat	District		Surat
Basin	:	Tapi	Independent River	:	Tapi
Tributary	:	Tapi	Sub Tributary	:	
Sub-Sub Tributary	:		Local River	:	Tapi/Tapi
Division	:	Surat	Sub-Division	:	Lower Tapi sub division, Surat
Drainage Area	:	63325 Sq. Km.	Bank	:	Right
Latitude	:	21°17'50"	Longitude	:	73°01'31"
Zero of Gauge (m)	:	1.870 (m.s.l)	15-08-1977		
		Opening Date	Closing Date		
Gauge	:	15-08-1977			
Discharge	:	01-06-1978	31-05-2005		
Discharge	:	2014 *			
Sediment	:	-----			
Water Quality	:	01-08-1983	31-05-2005		

Note : * Site has been upgraded for discharge observations

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

Year	Maximum			Minimum		
	Q (cumec)	**WL (m)**	**Date**	**Q (cumec)**	**WL (m)**	**Date**
2017-18	213.30	3.945	24/08/2017	0.000	2.710	01/06/2017
2018-2019	153.10	5.880	21/07/2018	0.000	3.240	01/06/2018

4.1.9.2 Annual Maximum flood peak

Station Name: Tapi at Ghala (01 02 17 018) Division: Tapi division Surat

Local River: Tapi Sub Division: Lower Tapi Sub division, Surat

Year	**MWL (m)**	**Date**	**Hour**
2014	11.910	09/09/2014	24:00:00
2015	9.930	16/08/2015	21:00:00
2016	5.720	12/08/2016	19:00:00
2017	4.850	28/07/2018	15:00:00
2018	5.900	21/07/2018	10:00:00

4.1.9.3 Summary of Data

Stage Discharge data for the period 2018 to 2019

Station Name: Tapi at Ghala (01 02 17 018) Division: Tapi Division Surat Local River:Tapi Sub Division: : Lower Tapi Sub Division, 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	3.240	0.000	3.070	0.000	4.400	74.15	4.490	47.17	3.500	0.000	3.100	0.000
2	3.220	0.000	3.030	0.000	4.300	63.10	4.390	57.57 *	3.470	0.000	3.050	0.000
3	3.170	0.000	3.000	0.000	4.210	60.54	4.290	51.97 *	3.460	0.000	3.040	0.000
4	3.120	0.000	3.110	0.000	4.130	58.82	4.270	34.29	3.430	0.000	3.040	0.000
5	3.110	0.000	3.380	0.000	4.050	39.09 *	4.250	45.81	3.420	0.000	3.030	0.000
6	3.080	0.000	3.600	0.000	3.960	43.35	4.240	43.31	3.400	0.000	3.030	0.000
7	3.050	0.000	3.700	0.000	3.850	39.46	4.200	37.32	3.370	0.000	3.010	0.000
8	3.020	0.000	3.960	34.48 *	3.770	40.74	4.140	27.01	3.350	0.000	2.990	0.000
9	3.010	0.000	4.230	48.67 #	3.740	36.86	4.030	38.06 *	3.340	0.000	2.980	0.000
10	3.000	0.000	4.205	47.32 #	3.680	27.04	3.990	23.57	3.330	0.000	2.970	0.000
11	2.960	0.000	4.265	0.000	3.640	21.47	3.930	21.78	3.310	0.000	2.960	0.000
12	2.940	0.000	4.480	0.000	3.620	18.38 *	3.770	25.21	3.300	0.000	2.930	0.000
13	2.920	0.000	5.190	0.000	3.590	11.47	3.720	20.00 *	3.300	0.000	2.920	0.000
14	2.910	0.000	4.990	0.000	3.580	0.000	3.690	17.66	3.280	0.000	2.910	0.000
15	2.900	0.000	4.770	79.92 *	3.560	0.000	3.670	16.72	3.250	0.000	2.900	0.000
16	3.250	0.000	5.040	89.39	3.540	0.000	3.660	0.000	3.200	0.000	2.940	0.000
17	3.370	0.000	4.970	85.94	3.560	0.000	3.550	0.000	3.130	0.000	2.990	0.000
18	3.340	0.000	4.820	82.02	4.440	0.000	3.530	0.000	3.090	0.000	2.990	0.000
19	3.320	0.000	4.760	85.62	4.660	73.28 *	3.510	0.000	3.070	0.000	2.990	0.000
20	3.280	0.000	4.680	77.15	4.540	68.02	3.490	0.000	3.040	0.000	2.980	0.000

21	3.220	0.000	5.880	153.1 #	4.600	69.60	3.480	0.000	3.020	0.000	2.970	0.000
22	3.190	0.000	5.620	135.1 *	5.470	124.9 *	3.470	0.000	3.070	0.000	2.950	0.000
23	3.170	0.000	5.210	108.7	5.120	101.8 *	3.470	0.000	3.130	0.000	2.920	0.000
24	3.130	0.000	4.830	91.27	4.780	74.09	3.590	0.000	3.120	0.000	2.900	0.000
25	3.130	0.000	4.775	89.62	4.670	66.76	3.550	0.000	3.110	0.000	2.870	0.000
26	3.160	0.000	4.770	96.19	4.650	72.68 *	3.530	0.000	3.200	0.000	2.860	0.000
27	3.140	0.000	4.690	95.71	4.640	62.96	3.520	0.000	3.170	0.000	2.850	0.000
28	3.130	0.000	4.640	85.40	4.640	64.50	3.510	0.000	3.170	0.000	2.920	0.000
29	3.120	0.000	4.610	70.31 *	4.630	69.80	3.500	0.000	3.120	0.000	2.940	0.000
30	3.100	0.000	4.580	80.80	4.620	58.84	3.500	0.000	3.130	0.000	2.940	0.000
31			4.490	86.77	4.590	59.44			3.120	0.000		
Ten-Daily Mean												
I Ten-Daily	3.102	0.000	3.529	13.05	4.009	48.31	4.229	40.61	3.407	0.000	3.024	0.000
II Ten-Daily	3.119	0.000	4.797	50.00	3.873	19.26	3.652	10.14	3.197	0.000	2.951	0.000
III Ten-Daily	3.149	0.000	4.918	99.36	4.765	75.04	3.512	0.000	3.124	0.000	2.912	0.000
Monthly												
Min.	2.900	0.000	3.000	0.000	3.540	0.000	3.470	0.000	3.020	0.000	2.850	0.000
Max.	3.370	0.000	5.880	153.1	5.470	124.9	4.490	57.57	3.500	0.000	3.100	0.000
Mean	3.123	0.000	4.430	55.60	4.233	48.42	3.798	16.92	3.239	0.000	2.962	0.000

Annual Runoff in MCM = 322 **Annual Runoff in mm = 5**

Peak Observed Discharge = 153.10 cumecs on 21/07/2018 **Corres. Water Level :5.880 m**

Lowest Observed Discharge = 0.000 cumecs on 01/06/2018 **Corres. Water Level :3.240 m**

Note: pooling condition from 01/06/2018 to 07/07/2018, 11/07/18 to 14/07/18, 14/08/18 to 18/08/18 and 16/09/18 to 31/05/19 Discarded points 09/07/18, 10/07/18 & 21/07/18; Shortage of staff on 23/08/18.

Q: observed/ computed discharge in Cumec, WL: Corresponding Mean Water Level (msl) in m, *: Computed Discharge

#Discarded and estimated

Stage Discharge data for the period 2018 to 2019

Station Name: Tapi at Ghala (01 02 17 018) Division: Tapi Division Surat Local River:Tapi Sub Division: : Lower Tapi Sub Division, Surat

Day	Dec		Jan		Feb		Mar		Apr		May	
	W.L	Q	WL	Q	WL	Q	WL	Q	WL	Q	WL	Q
1	2.930	0.000	2.730	0.000	3.200	0.000	3.400	0.000	3.160	0.000	3.110	0.000
2	2.930	0.000	2.700	0.000	3.210	0.000	3.300	0.000	3.120	0.000	3.050	0.000
3	2.920	0.000	2.600	0.000	3.200	0.000	3.240	0.000	3.040	0.000	3.310	0.000
4	2.910	0.000	2.630	0.000	3.180	0.000	3.190	0.000	3.000	0.000	3.450	0.000
5	2.910	0.000	2.640	0.000	3.170	0.000	3.140	0.000	3.080	0.000	3.510	0.000
6	2.900	0.000	2.690	0.000	3.160	0.000	3.110	0.000	3.180	0.000	3.460	0.000
7	2.900	0.000	2.770	0.000	3.150	0.000	3.090	0.000	3.260	0.000	3.370	0.000
8	2.890	0.000	2.880	0.000	3.140	0.000	3.050	0.000	3.390	0.000	3.330	0.000
9	2.870	0.000	2.810	0.000	3.130	0.000	3.010	0.000	3.480	0.000	3.300	0.000
10	2.870	0.000	2.950	0.000	3.130	0.000	2.980	0.000	3.540	0.000	3.240	0.000
11	2.860	0.000	3.140	0.000	3.130	0.000	2.980	0.000	3.400	0.000	3.260	0.000
12	2.850	0.000	3.130	0.000	3.120	0.000	3.040	0.000	3.300	0.000	3.330	0.000
13	2.850	0.000	3.110	0.000	3.140	0.000	3.190	0.000	3.240	0.000	3.580	0.000
14	2.840	0.000	3.080	0.000	3.210	0.000	3.190	0.000	3.200	0.000	3.710	0.000
15	2.830	0.000	3.080	0.000	3.300	0.000	3.220	0.000	3.190	0.000	3.660	0.000
16	2.820	0.000	3.070	0.000	3.400	0.000	3.300	0.000	3.210	0.000	3.610	0.000
17	2.820	0.000	3.070	0.000	3.450	0.000	3.300	0.000	3.240	0.000	3.560	0.000
18	2.810	0.000	3.070	0.000	3.520	0.000	3.270	0.000	3.200	0.000	3.520	0.000
19	2.810	0.000	3.060	0.000	3.590	0.000	3.230	0.000	3.150	0.000	3.470	0.000
20	2.860	0.000	3.110	0.000	3.740	0.000	3.150	0.000	3.080	0.000	3.330	0.000

21	2.790	0.000	3.120	0.000	3.900	0.000	3.110	0.000	3.210	0.000	3.010	0.000
22	2.780	0.000	3.130	0.000	3.680	0.000	3.100	0.000	3.170	0.000	3.040	0.000
23	2.780	0.000	3.140	0.000	3.640	0.000	3.160	0.000	3.080	0.000	3.150	0.000
24	2.760	0.000	3.140	0.000	3.610	0.000	3.280	0.000	3.940	0.000	3.230	0.000
25	2.740	0.000	3.160	0.000	3.570	0.000	3.360	0.000	2.880	0.000	3.300	0.000
26	2.810	0.000	3.160	0.000	3.500	0.000	3.400	0.000	3.170	0.000	3.360	0.000
27	2.830	0.000	3.180	0.000	3.460	0.000	3.370	0.000	3.280	0.000	3.370	0.000
28	2.830	0.000	3.190	0.000			3.330	0.000	3.250	0.000	3.380	0.000
29	2.810	0.000	3.190	0.000			3.290	0.000	3.170	0.000	3.300	0.000
30	2.750	0.000	3.200	0.000			3.240	0.000			3.220	0.000
31	2.860	0.000	3.110	0.000	3.740	0.000	3.150	0.000	3.080	0.000	3.330	0.000
Ten-Daily Mean												
I Ten-Daily	2.903	0.000	2.740	0.000	3.167	0.000	3.151	0.000	3.225	0.000	3.313	0.000
II Ten-Daily	2.829	0.000	3.089	0.000	3.351	0.000	3.190	0.000	3.220	0.000	3.511	0.000
III Ten-Daily	2.795	0.000	3.156	0.000	3.638	0.000	3.254	0.000	3.223	0.000	3.245	0.000
Monthly												
Min.	2.740	0.000	2.600	0.000	3.120	0.000	2.980	0.000	2.880	0.000	3.010	0.000
Max.	2.930	0.000	3.200	0.000	3.900	0.000	3.400	0.000	3.940	0.000	3.710	0.000
Mean	2.841	0.000	3.000	0.000	3.367	0.000	3.200	0.000	3.223	0.000	3.353	0.000

Peak Computed Discharge = 135.1 cumecs on 22/07/2018 Corres. Water Level :5.620 m

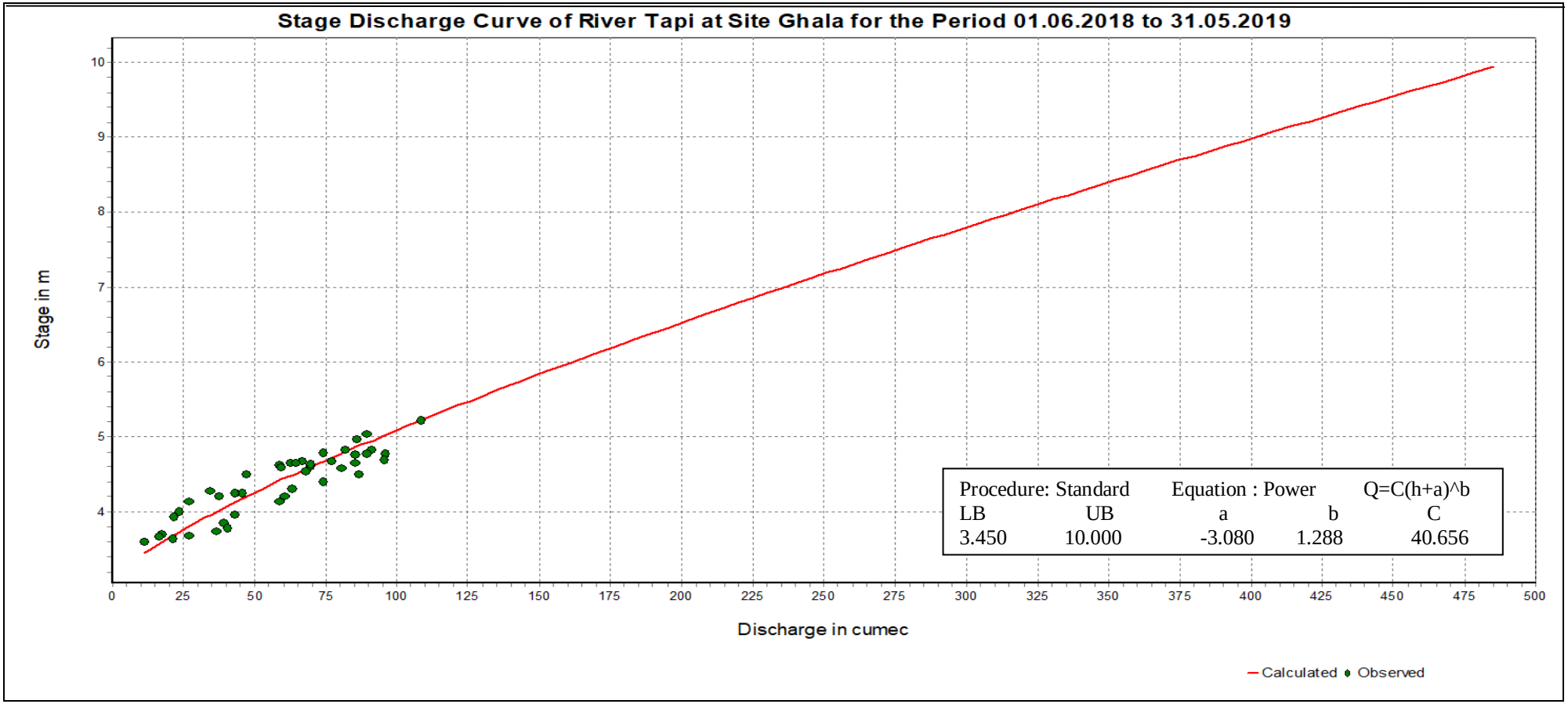
Lowest Computed Discharge = 18.38 cumecs on 12/08/2018 Corres. Water Level :3.620 m

Note: pooling condition from 01/06/2018 to 07/07/2018, 11/07/18 to 14/07/18, 14/08/18 to 18/08/18 and 16/09/18 to 31/05/19 Discarded points 09/07/18, 10/07/18 & 21/07/18; Shortage of staff on 23/08/18.

Q: observed/ computed discharge in Cumec, WL: Corresponding Mean Water Level (msl) in m, *: Computed Discharge
#Discarded and estimated

4.1.9.4 Stage Discharge Curve

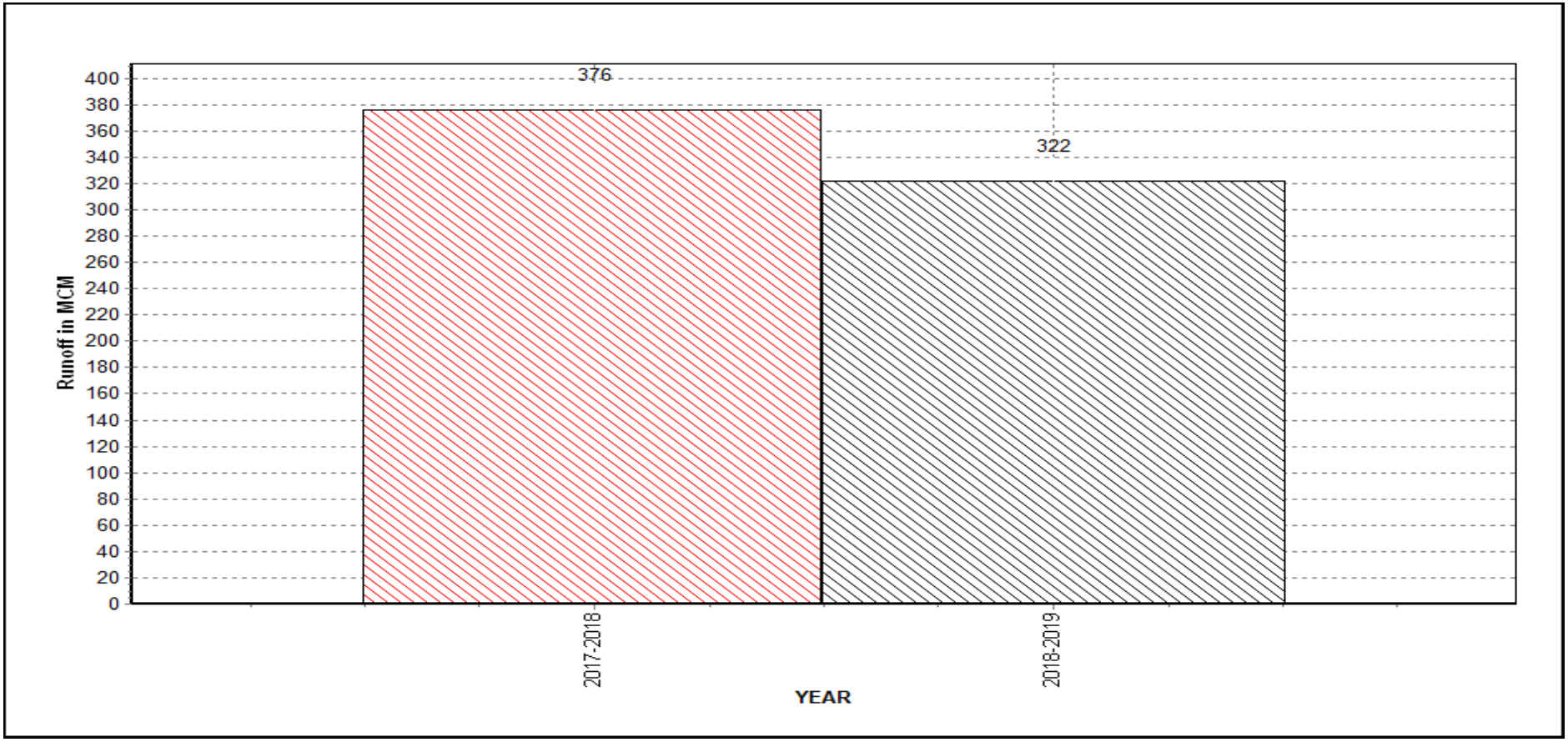
Station Name: Tapi at Ghala (01 02 17 018) Division: Tapi Division Surat Local River: Tapi Sub Division: : Lower Tapi Sub Division, Surat



4.1.9.5 Annual runoff

Annual Runoff for the period 2018-2019

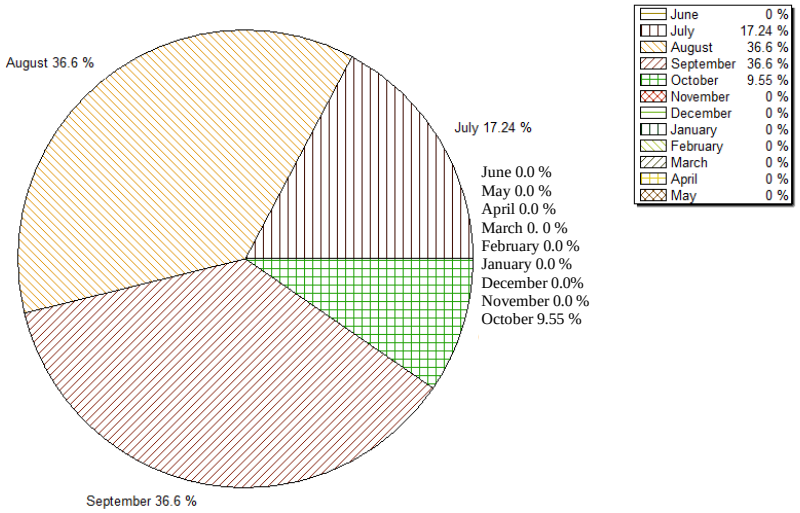
Station Name: Tapi at Ghala (01 02 17 018) Division: Tapi Division Surat Local River: Tapi Sub Division: : Lower Tapi Sub Division, Surat



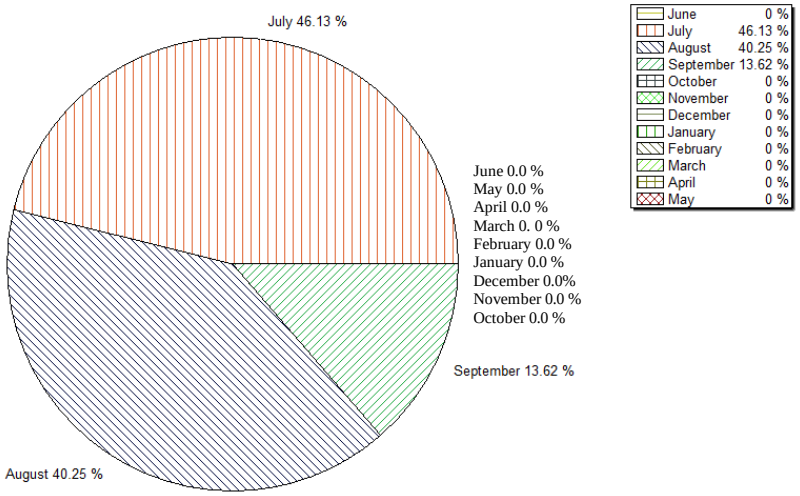
4.1.9.6 Monthly Average Runoff

Station Name: Tapi at Ghala (01 02 17 018) Division: Tapi Division Surat Local River: Tapi Sub Division: : Lower Tapi Sub Division, Surat

Monthly Average Runoff Based on period 2017-2018

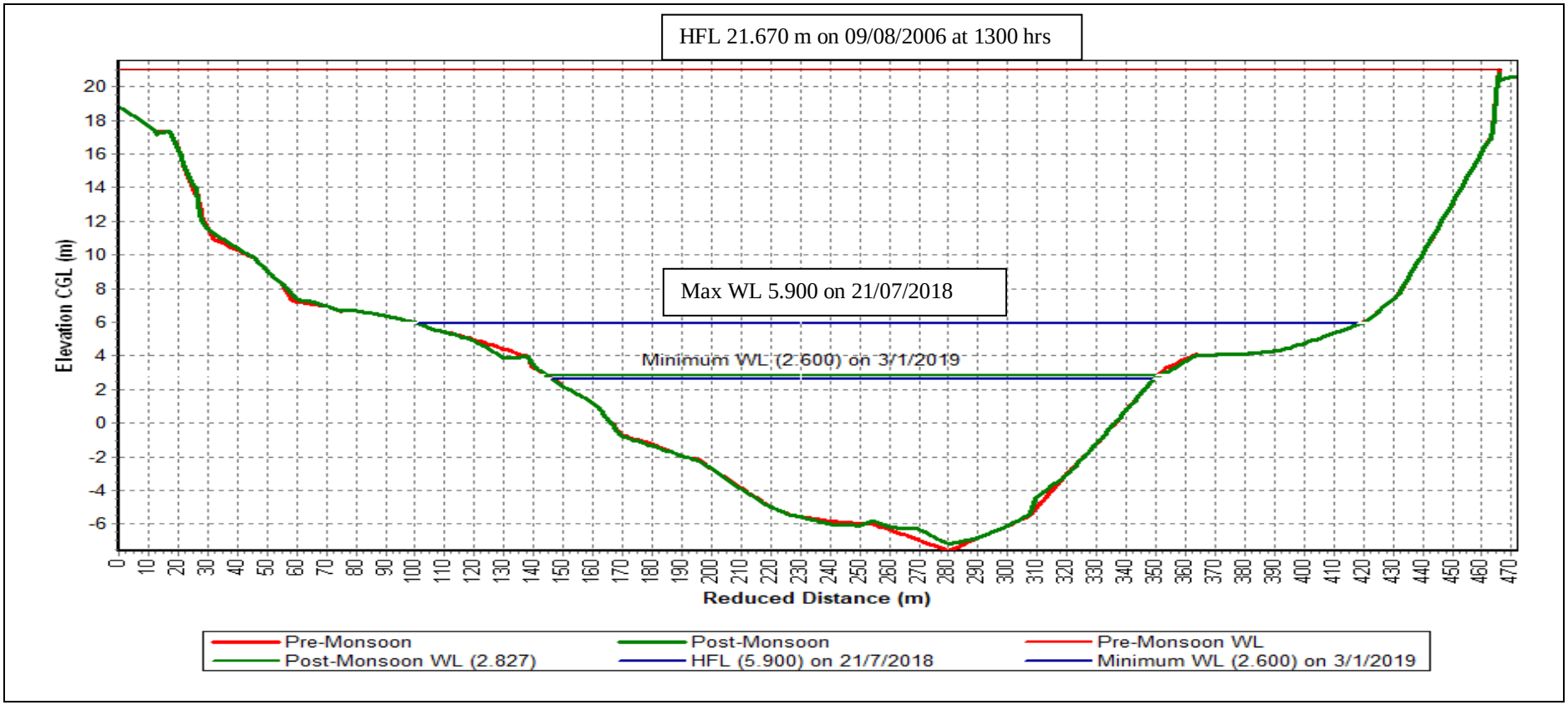


Monthly Runoff Based on period 2018-2019



4.1.9.7 Superimposed cross section

Station Name: Tapi at Ghala (01 02 17 018) Division: Tapi Division Surat Local River: Tapi Sub Division: : Lower Tapi Sub Division, Surat

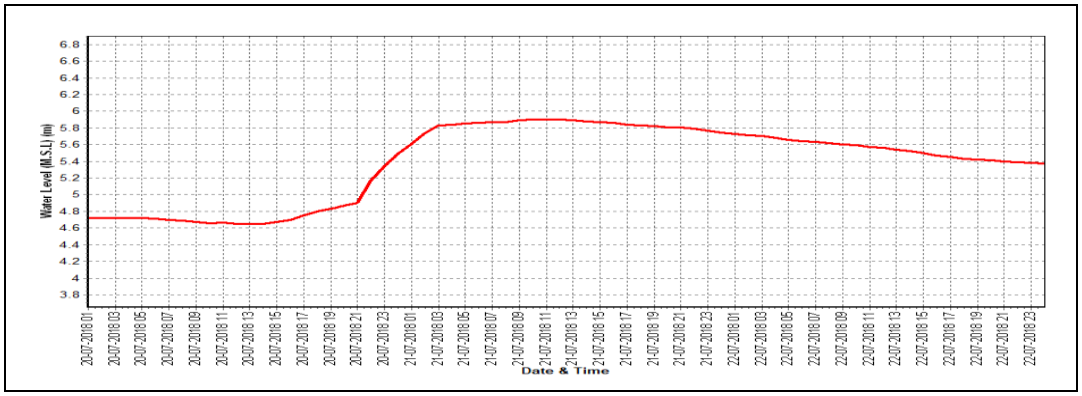


4.1.9.8 WL vs Time Graph of I,II,III peak

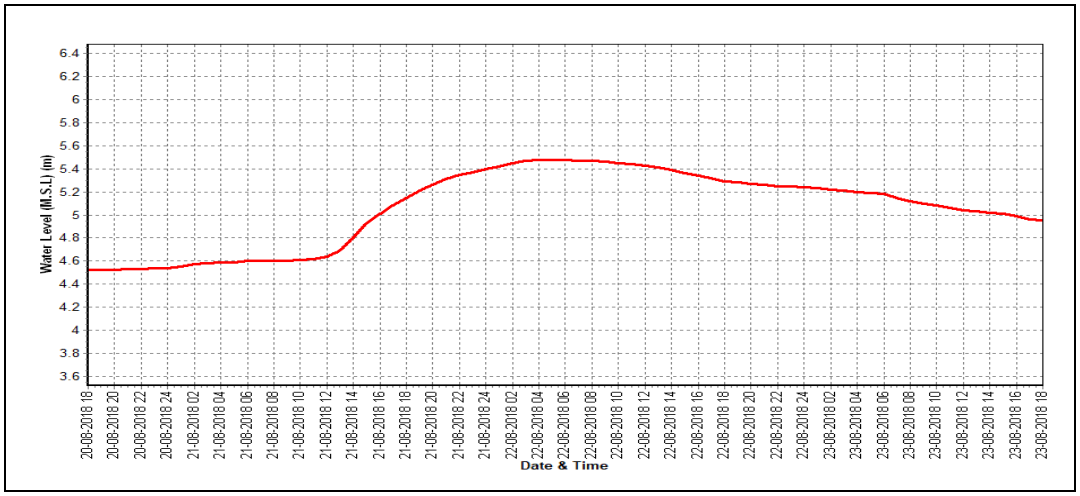
Station Name: Tapi at Ghala (01 02 17 018) Division: Tapi Division Surat

Local River: Tapi Sub Division: Lower Tapi Sub division, Surat

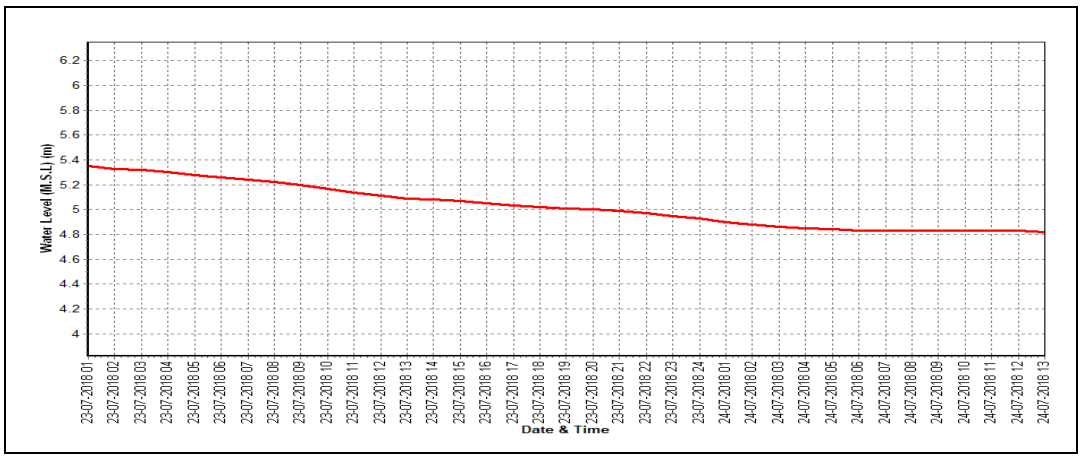
Water Level v/s Time graph of Highest (I) Flood Peak during the water year 2018-19



Water Level v/s Time graph of Highest (II) Flood Peak during the water year 2018-19



Water Level v/s Time graph of Highest (III) Flood Peak during the water year 2018-19



4.0 Purna Basin

4.2.1 Purna at Mahuwa

4.2.1.1 History sheet

HISTORY SHEET

			Water Year	**:**	**2018-19**
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	:	Lower Tapi Sub Division, 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
2013-2014	1508	15.500	24/09/2013	0.000	9.000	As per SD Curve
2014-2015	843.3	13.630	30/07/2014	0.000	9.010	01/06/2014
2015-2016	548.0	12.400	19/09/2015	0.000	8.690	01/06/2015
2016-2017	1048	14.020	09/08/2016	0.000	8.870	01/06/2016
2017-2018	1060	14.300	28/07/2017	0.000	8.840	01/06/2017
2018-2019	845.3	13.400	17/08/2018	0.000	8.460	01/06/2018

4.2.1.2 Annual Maximum flood Peaks

Year	Annual Maximum flood Peaks (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
2013	19.700	23/09/2013	20:00:00
2014	14.200	30/07/2014	14:00:00
2015	15.800	18/09/2015	24:00:00
2016	14.500	06/08/2016	17:00:00
2017	16.840	27/07/2017	23:00:00
2018	17.600	17/08/2018	12:00:00

4.2.1.3 Summary of Data

Stage –Discharge data for the period 2018-19

Station Name: Purna at Mahuwa (010219001) Division : Tapi Division Surat Local River: Purna Sub -Division : Lower Tapi Sub Division, 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	8.460	0.000	9.060	0.000	9.740	29.02	9.960	51.77	9.080	3.280	8.690	0.000
2	8.450	0.000	8.980	0.000	9.680	25.21	9.960	48.60 *	9.070	2.370 *	8.690	0.000
3	8.440	0.000	8.950	0.000	9.680	25.27	10.100	61.54 *	9.050	4.510	8.680	0.000
4	8.430	0.000	9.100	0.000	9.660	23.59	10.220	76.77	9.020	3.790	8.690	0.000
5	8.430	0.000	9.180	0.000	9.650	25.52 *	10.120	70.56	9.060	4.670	8.700	0.000
6	8.450	0.000	9.190	0.000	9.680	25.19	10.020	55.31	9.030	3.870	8.730	0.000
7	8.480	0.000	9.180	0.000	9.600	17.89	9.920	49.71	9.010	1.410 *	8.740	0.000
8	8.510	0.000	10.700	135.1 *	9.560	15.21	9.840	43.81	8.990	0.000	8.740	0.000
9	8.540	0.000	9.640	24.90 *	9.520	12.65	9.780	34.27 *	8.960	0.000	8.700	0.000
10	8.540	0.000	9.350	10.35 *	9.600	17.91	9.720	28.51	8.940	0.000	8.680	0.000
11	8.530	0.000	12.800	631.7 *	9.620	19.11	9.660	23.50	8.920	0.000	8.670	0.000
12	8.530	0.000	12.260	467.8 *	9.620	23.69 *	9.580	17.76	8.920	0.000	8.660	0.000
13	8.540	0.000	11.220	262.8	9.660	23.61	9.540	19.15 *	8.910	0.000	8.630	0.000
14	8.550	0.000	10.740	163.2	9.780	29.44	9.500	12.06	8.910	0.000	8.610	0.000
15	8.550	0.000	10.420	97.09 *	9.700	26.00 *	9.440	9.900	8.890	0.000	8.590	0.000
16	8.530	0.000	11.300	273.8	9.620	19.30	9.410	12.83 *	8.890	0.000	8.560	0.000
17	8.510	0.000	10.980	208.6	13.400	845.3	9.380	6.950	8.890	0.000	8.500	0.000
18	8.500	0.000	11.960	408.5	11.240	265.2	9.340	6.370	8.890	0.000	8.480	0.000
19	8.480	0.000	10.980	208.3	10.800	150.3 *	9.300	5.800	8.880	0.000	8.470	0.000
20	8.460	0.000	11.440	282.9	10.500	118.6	9.280	5.490	8.900	0.000	8.460	0.000

21	8.440	0.000	11.300	273.7		13.280	763.5		9.520	18.09	*	8.900	0.000	8.490	0.000
22	8.420	0.000	11.440	267.1	*	11.680	319.8	*	9.340	6.200		8.900	0.000	8.540	0.000
23	8.410	0.000	10.980	208.6		11.100	240.1		9.420	13.27	*	8.800	0.000	8.550	0.000
24	8.390	0.000	10.780	168.5		10.840	171.8		9.360	6.510		8.800	0.000	8.520	0.000
25	8.390	0.000	10.660	139.9		10.660	139.4		9.300	5.780		8.790	0.000	8.510	0.000
26	8.380	0.000	10.620	135.1		10.600	120.8	*	9.260	5.230		8.790	0.000	8.470	0.000
27	8.460	0.000	10.380	99.62		10.540	128.8		9.220	4.900		8.780	0.000	8.460	0.000
28	9.130	0.000	10.220	82.06		10.500	120.4		9.180	4.640		8.750	0.000	8.460	0.000
29	9.110	0.000	10.080	59.59	*	10.220	76.71		9.140	3.960		8.770	0.000	8.450	0.000
30	9.080	0.000	9.940	51.05		10.100	69.03		9.110	3.160	*	8.740	0.000	8.450	0.000
31			9.840	43.85		10.020	55.19					8.720	0.000		
Ten-Daily Mean															
I Ten-Daily	8.473	0.000	9.333	17.04		9.637	21.75		9.964	52.09		9.021	2.390	8.704	0.000
II Ten-Daily	8.518	0.000	11.410	300.5		10.394	152.0		9.443	11.98		8.900	0.000	8.563	0.000
III Ten-Daily	8.621	0.000	10.567	139.0		10.867	200.5		9.285	7.174		8.795	0.000	8.490	0.000
Monthly															
Min.	8.380	0.000	8.950	0.000		9.520	12.65		9.110	3.160		8.720	0.000	8.450	0.000
Max.	9.130	0.000	12.800	631.7		13.400	845.3		10.220	76.77		9.080	4.670	8.740	0.000
Mean	8.537	0.000	10.441	151.7		10.318	127.2		9.564	23.75		8.902	0.771	8.586	0.000

Annual Runoff in MCM = 811 **Annual Runoff in mm = 406**

Peak Observed Discharge = 845.3 cumecs on 17/08/2018 Corres. Water Level :13.400 m

Lowest Observed Discharge = 0.000 cumecs on 01/06/2018 Corres. Water Level : 8.460 m

Note: River remained in pooling/ no flow condition w.e.f. 01/06/18 to 07/07/18 and from 08/10/18 to 31/05/19 Shortage of staff from 08/07/18 to 12/07/18.

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

Stage –Discharge data for the period 2018-19

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

Day	Dec		Jan		Feb		Mar		Apr		May	
	W.L	Q	WL	Q	WL	Q	WL	Q	WL	Q	WL	Q
1	8.440	0.000	8.550	0.000	8.400	0.000	8.450	0.000	8.340	0.000	8.520	0.000
2	8.440	0.000	8.560	0.000	8.400	0.000	8.490	0.000	8.340	0.000	8.510	0.000
3	8.440	0.000	8.560	0.000	8.400	0.000	8.510	0.000	8.330	0.000	8.520	0.000
4	8.470	0.000	8.540	0.000	8.400	0.000	8.530	0.000	8.330	0.000	8.520	0.000
5	8.490	0.000	8.520	0.000	8.400	0.000	8.550	0.000	8.330	0.000	8.530	0.000
6	8.520	0.000	8.510	0.000	8.400	0.000	8.550	0.000	8.330	0.000	8.550	0.000
7	8.550	0.000	8.490	0.000	8.400	0.000	8.550	0.000	8.330	0.000	8.550	0.000
8	8.560	0.000	8.470	0.000	8.400	0.000	8.530	0.000	8.320	0.000	8.590	0.000
9	8.570	0.000	8.480	0.000	8.390	0.000	8.530	0.000	8.320	0.000	8.590	0.000
10	8.580	0.000	8.470	0.000	8.390	0.000	8.540	0.000	8.320	0.000	8.570	0.000
11	8.600	0.000	8.460	0.000	8.390	0.000	8.570	0.000	8.320	0.000	8.540	0.000
12	8.620	0.000	8.450	0.000	8.390	0.000	8.560	0.000	8.320	0.000	8.520	0.000
13	8.610	0.000	8.450	0.000	8.390	0.000	8.560	0.000	8.310	0.000	8.500	0.000
14	8.610	0.000	8.440	0.000	8.390	0.000	8.560	0.000	8.310	0.000	8.470	0.000
15	8.600	0.000	8.440	0.000	8.390	0.000	8.560	0.000	8.310	0.000	8.450	0.000
16	8.600	0.000	8.440	0.000	8.380	0.000	8.550	0.000	8.310	0.000	8.430	0.000
17	8.610	0.000	8.440	0.000	8.380	0.000	8.540	0.000	8.310	0.000	8.410	0.000
18	8.620	0.000	8.440	0.000	8.380	0.000	8.520	0.000	8.300	0.000	8.400	0.000
19	8.620	0.000	8.440	0.000	8.370	0.000	8.490	0.000	8.300	0.000	8.400	0.000
20	8.630	0.000	8.440	0.000	8.370	0.000	8.450	0.000	8.300	0.000	8.400	0.000

21	8.650	0.000	8.430	0.000	8.370	0.000	8.430	0.000	8.300	0.000	8.390	0.000
22	8.660	0.000	8.430	0.000	8.370	0.000	8.410	0.000	8.300	0.000	8.390	0.000
23	8.650	0.000	8.420	0.000	8.360	0.000	8.400	0.000	8.290	0.000	8.380	0.000
24	8.640	0.000	8.420	0.000	8.360	0.000	8.390	0.000	8.290	0.000	8.370	0.000
25	8.610	0.000	8.420	0.000	8.360	0.000	8.380	0.000	8.320	0.000	8.370	0.000
26	8.600	0.000	8.410	0.000	8.370	0.000	8.380	0.000	8.360	0.000	8.360	0.000
27	8.580	0.000	8.410	0.000	8.370	0.000	8.370	0.000	8.420	0.000	8.360	0.000
28	8.550	0.000	8.410	0.000	8.410	0.000	8.360	0.000	8.480	0.000	8.360	0.000
29	8.550	0.000	8.410	0.000			8.360	0.000	8.540	0.000	8.350	0.000
30	8.540	0.000	8.410	0.000			8.350	0.000	8.530	0.000	8.350	0.000
31	8.540	0.000	8.400	0.000			8.350	0.000			8.340	0.000
Ten-Daily Mean												
I Ten-Daily	8.506	0.000	8.515	0.000	8.398	0.000	8.523	0.000	8.329	0.000	8.545	0.000
II Ten-Daily	8.612	0.000	8.444	0.000	8.383	0.000	8.536	0.000	8.309	0.000	8.452	0.000
III Ten-Daily	8.597	0.000	8.415	0.000	8.371	0.000	8.380	0.000	8.383	0.000	8.365	0.000
Monthly												
Min.	8.440	0.000	8.400	0.000	8.360	0.000	8.350	0.000	8.290	0.000	8.340	0.000
Max.	8.660	0.000	8.560	0.000	8.410	0.000	8.570	0.000	8.540	0.000	8.590	0.000
Mean	8.573	0.000	8.457	0.000	8.385	0.000	8.476	0.000	8.340	0.000	8.451	0.000

Peak Computed Discharge = 631.7 cumecs on 11/07/2018 **Corres. Water Level :12.800 m**

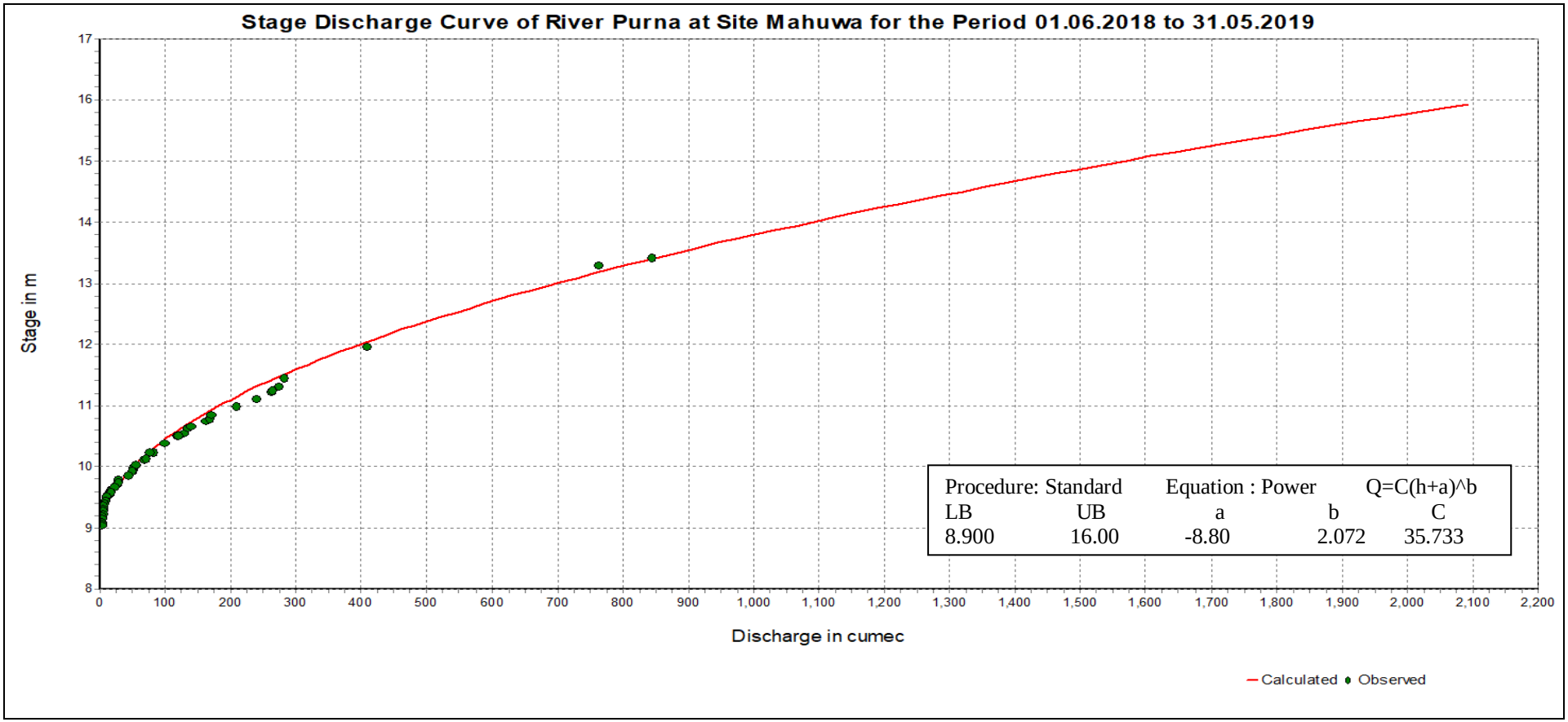
Lowest Computed Discharge = 1.410 cumecs on 07/10/2018 **Corres. Water Level : 9.010 m**

Note: River remained in pooling/ no flow condition w.e.f. 01/06/18 to 07/07/18 and from 08/10/18 to 31/05/19 Shortage of staff from 08/07/18 to 12/07/18.

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

4.2.1.4 Stage Discharge Curve

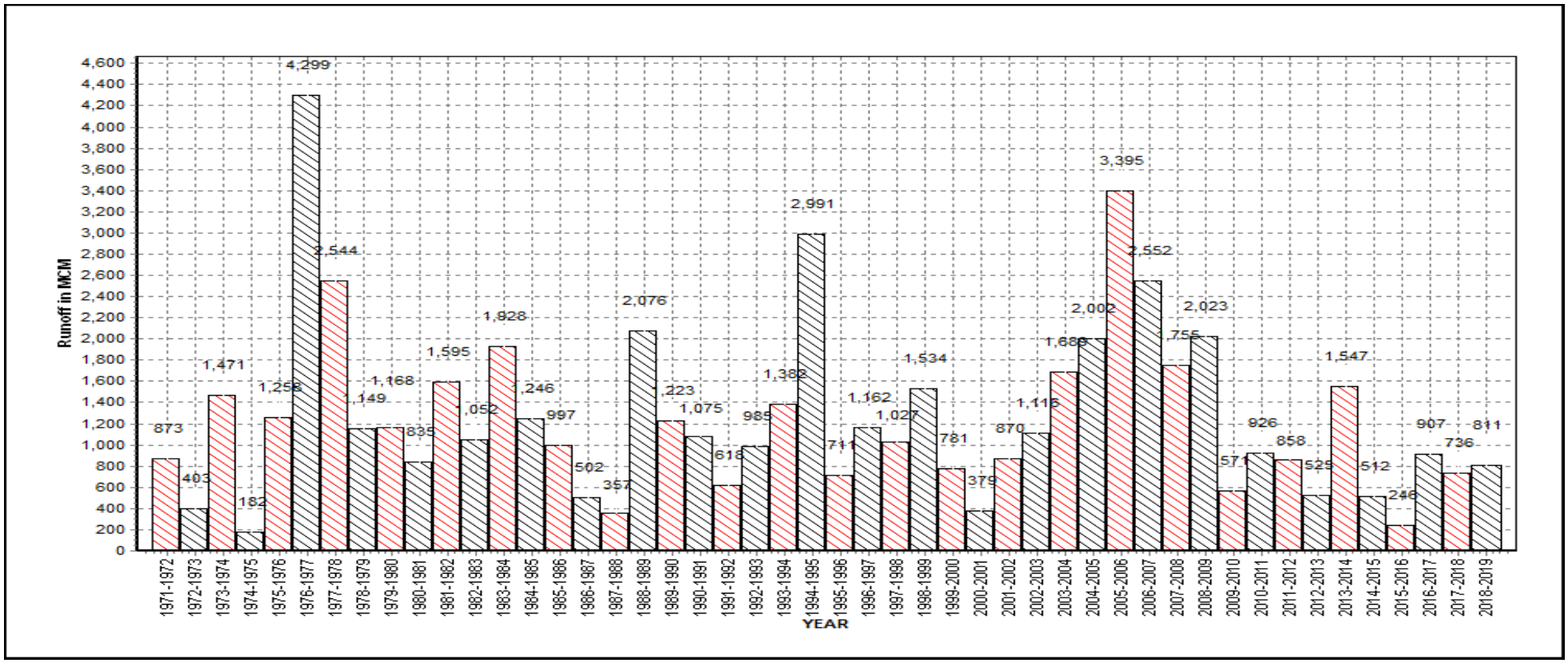
Station Name: Purna at Mahuwa (010219001) Division: Tapi Division Surat Local River: Purna Sub -Division: Lower Tapi Sub Division, Surat



4.2.1.5 Annual runoff

Annual Runoff Values Runoff Based on period 1971 to 2019

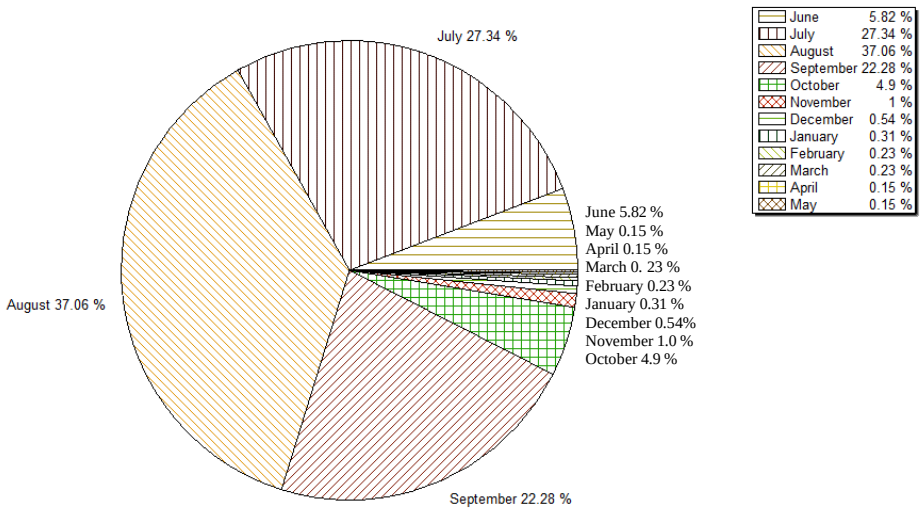
Station Name: Purna at Mahuwa (010219001) Division: Tapi Division Surat Local River: Purna Sub -Division: Lower Tapi Sub Division, Surat



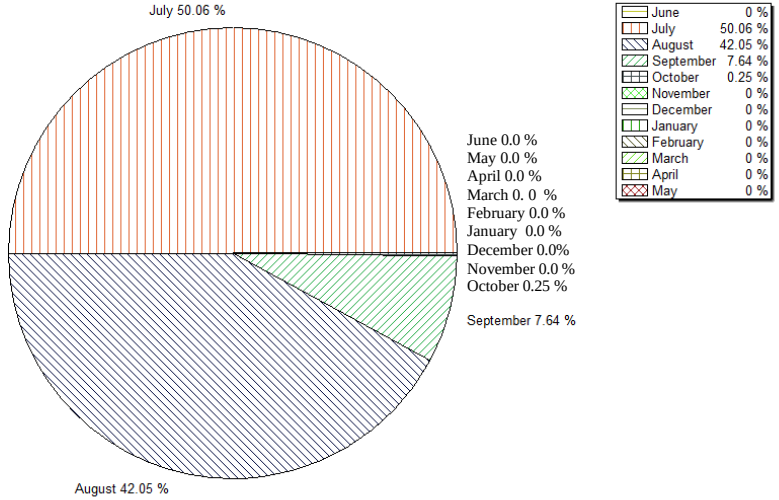
4.2.1.6 Monthly Average Runoff

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

Monthly Average Runoff Based on period: 1971 -2018

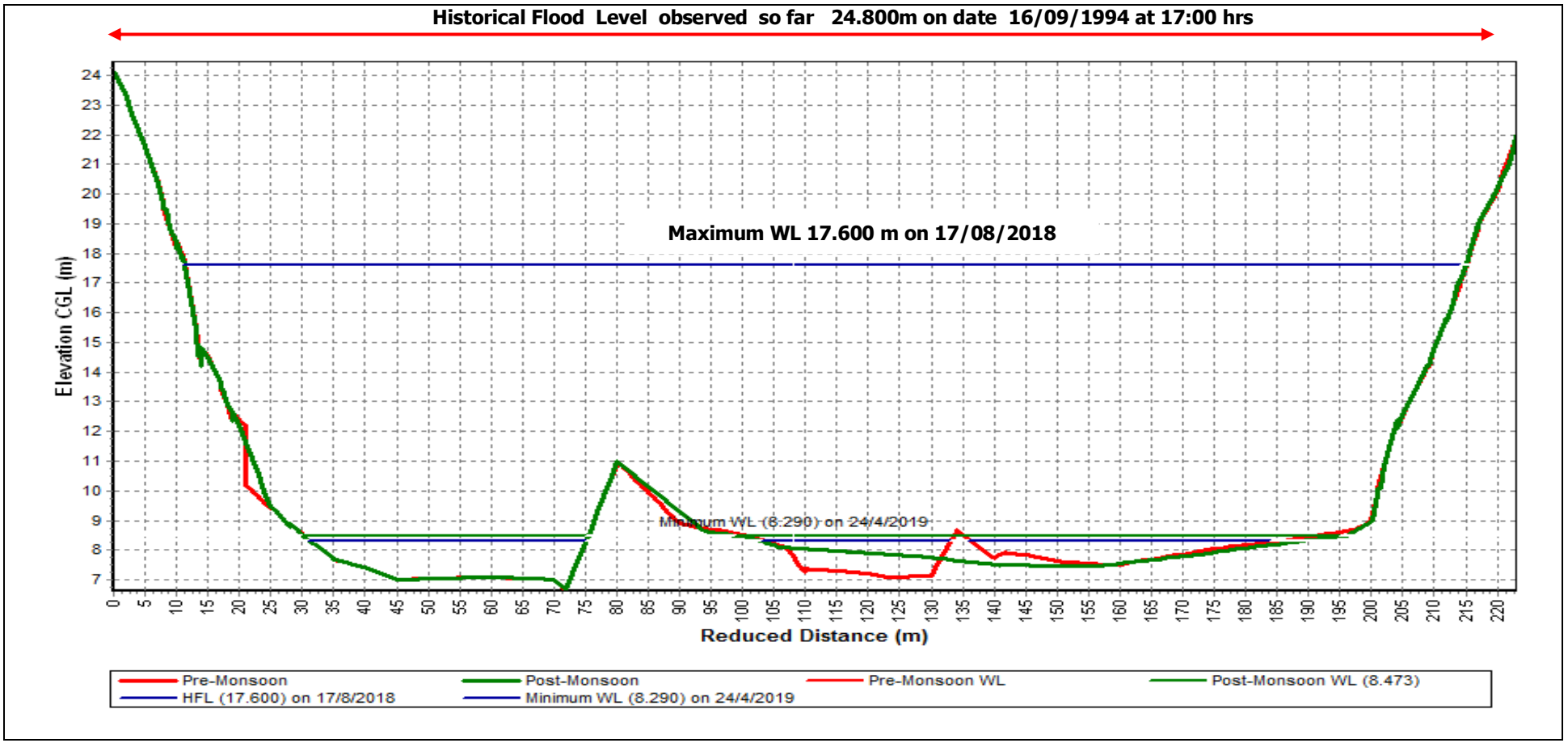


Monthly Average Runoff Based on period: 2018-19



4.2.1.7 Superimposed cross section

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

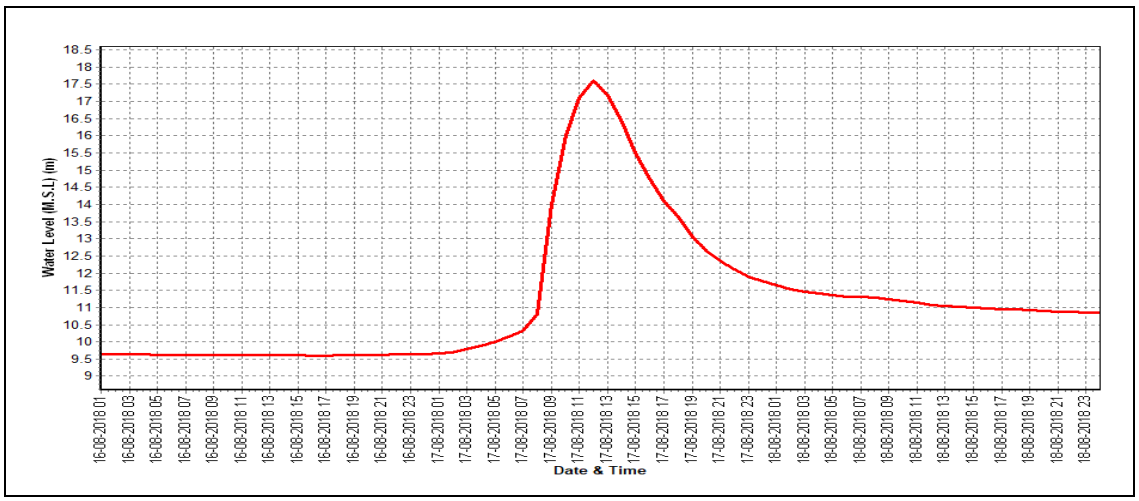


4.2.1.8 Water Level vs. Time- Graph of Highest Flood Peaks during 2018-19

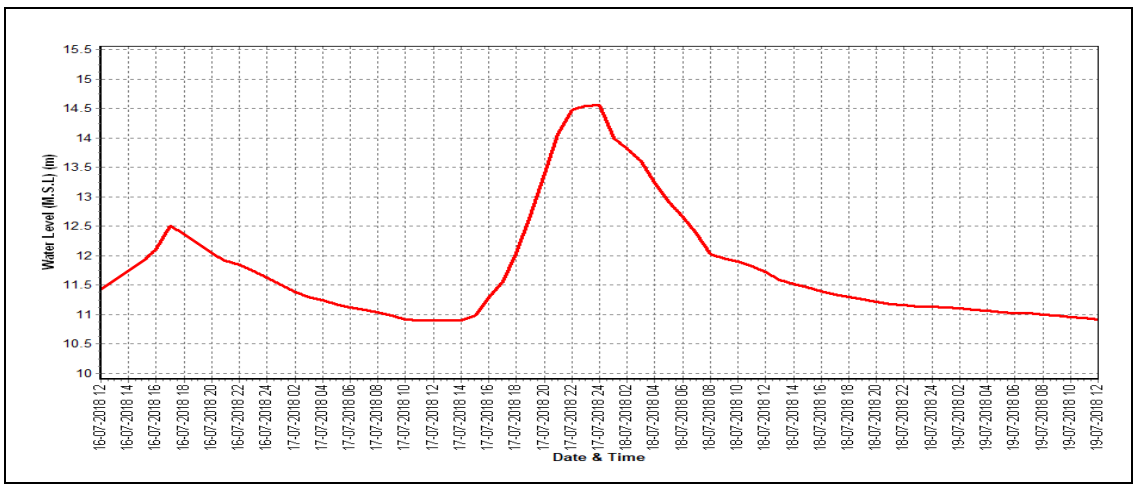
Station Name: Purna at Mahuwa (010219001) Division : Tapi Division Surat

Local River : Purna Sub -Division Lower Tapi Sub Division, Surat

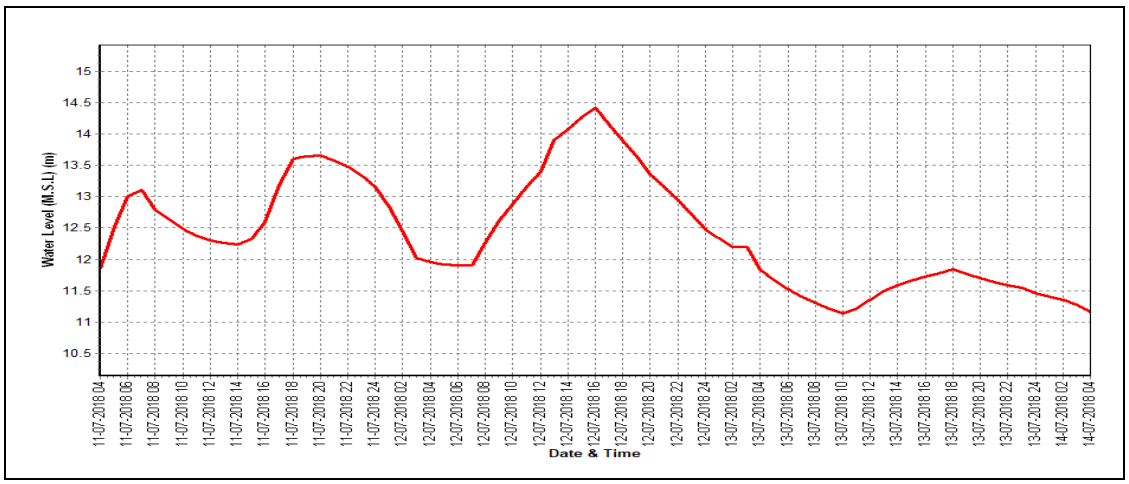
Water Level Vs. Time –Graph of I peak during the year 2018-19



Water Leel Vs. Time –Graph of II peak during the year 2018-19



Water Level Vs. Time –Graph of III peak during the year 2018-19



4.3 Ambica Basin

4.3.1 Ambica at Gadat

4.3.1.1 History sheet

HISTORY SHEET

			Water Year	**:**	**2018-19**
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	:	Lower Tapi 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
2013-2014	1399	8.715	14/08/2013	0.000	3.750	As per SD curve
2014-2015	2086	10.120	30/07/2014	0.000	4.970	01/06/2014
2015-2016	1227	8.250	19/09/2015	0.000	4.830	01/06/2015
2016-2017	1362	7.600	09/08/2016	0.000	4.940	01/06/2016
2017-2018	1354	8.550	28/07/2017	0.000	4.660	01/06/2017
2018-2019	1474	7.640	18/07/2018	0.000	4.330	01/06/2018

4.3.1.2 Annual Maximum Flood Peak

Year	Annual Maximum	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
2013	12.460	23/09/2013	20:00:00
2014	10.400	30/07/2014	11:00:00
2015	8.600	19/09/2015	06:00:00
2016	9.980	02/08/2016	13:00:00
2017	10.360	28/07/2017	24:00:00
2018	10.700	17/07/2018	22:00:00

4.3.1.3 Summary of Data

Stage –Discharge data for the period 2018-19

Station Name: Ambica at Gadat (01 02 20 001) Division : Tapi Division Surat Local River: Ambica Sub -Division : Lower Tapi Sub Division, 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	4.330	0.000	4.790	0.000	4.170	94.73	4.285	127.5	3.780	0.000	5.011	0.000
2	4.320	0.000	4.850	0.000	4.110	81.36	4.270	113.8 *	4.120	0.000	5.011	0.000
3	4.310	0.000	4.900	0.000	4.100	77.90	4.610	199.5 *	4.520	0.000	5.001	0.000
4	4.300	0.000	5.150	0.000	4.060	71.80	4.850	252.7	4.840	0.000	4.990	0.000
5	4.290	0.000	4.980	0.000	5.200	375.2 *	4.850	256.8	5.030	0.000	4.990	0.000
6	4.280	0.000	4.480	165.2 #	4.280	109.2	4.540	177.0	5.060	0.000	4.990	0.000
7	4.270	0.000	4.125	62.02	4.165	93.81	4.405	149.3	5.050	0.000	4.980	0.000
8	4.250	0.000	6.110	697.5 *	4.100	80.04	4.305	124.9	5.050	0.000	4.970	0.000
9	4.240	0.000	4.460	148.2	4.070	72.72	4.240	106.9 *	5.030	0.000	4.970	0.000
10	4.230	0.000	4.105	54.37	4.080	72.32	4.170	116.5	5.010	0.000	4.970	0.000
11	4.230	0.000	5.120	349.6 #	4.100	72.31	4.115	109.8	5.010	0.000	4.970	0.000
12	4.220	0.000	7.300	1015	4.100	76.43 *	4.070	66.83	5.000	0.000	4.970	0.000
13	4.210	0.000	7.600	1388	4.100	95.00	4.030	62.30 *	4.950	0.000	4.960	0.000
14	4.200	0.000	5.760	518.9	4.170	103.1	3.980	52.76	4.930	0.000	4.960	0.000
15	4.190	0.000	5.910	622.0 *	4.140	84.85 *	3.950	46.43	4.910	0.000	4.960	0.000
16	4.180	0.000	7.275	1272	4.110	85.81	3.930	43.61 *	4.980	0.000	4.950	0.000
17	4.170	0.000	6.585	816.0	4.130	123.2	3.900	40.44	5.010	0.000	4.950	0.000
18	4.160	0.000	7.640	1474	5.440	442.4	3.855	38.61	5.050	0.000	4.950	0.000
19	4.150	0.000	5.925	524.6	5.140	356.0 *	3.820	33.31	5.000	0.000	4.950	0.000
20	4.140	0.000	6.750	869.1	5.000	282.9	3.810	27.69	5.000	0.000	4.980	0.000

21	4.130	0.000	6.230	787.9	6.815	938.2	3.850	30.08 *	5.000	0.000	4.980	0.000
22	4.120	0.000	6.500	851.1 *	5.920	625.7 *	3.835	16.71	5.000	0.000	4.970	0.000
23	4.100	0.000	5.575	380.4	5.535	471.6	3.840	28.49 *	5.000	0.000	4.970	0.000
24	4.090	0.000	5.290	369.5	5.170	351.6	3.950	49.09	5.000	0.000	4.970	0.000
25	4.140	0.000	5.110	339.2	4.990	292.2	3.860	24.90	5.000	0.000	4.940	0.000
26	4.260	0.000	4.955	304.9	4.770	244.0 *	3.830	31.50	4.990	0.000	4.910	0.000
27	4.300	0.000	4.700	264.8	4.700	272.0	3.810	26.61	4.990	0.000	4.900	0.000
28	4.310	0.000	4.500	223.6	4.790	280.7	3.800	7.590	4.990	0.000	4.900	0.000
29	4.310	0.000			4.500	179.8	3.770	7.114	4.980	0.000	4.900	0.000
30	4.500	0.000	4.300	118.4	4.380	163.3	3.760	0.000	4.990	0.000	4.900	0.000
31			4.240	107.9	4.335	141.1			4.990	0.000		
Ten-Daily Mean												
I Ten-Daily	4.282	0.000	4.795	112.7	4.234	112.9	4.453	162.5	4.749	0.000	4.988	0.000
II Ten-Daily	4.185	0.000	6.586	884.8	4.443	172.2	3.946	52.18	4.984	0.000	4.960	0.000
III Ten-Daily	4.226	0.000	5.140	374.8	5.082	360.0	3.830	22.21	4.994	0.000	4.934	0.000
Monthly												
Min.	4.090	0.000	4.105	0.000	4.060	71.80	3.760	0.000	3.780	0.000	4.900	0.000
Max.	4.500	0.000	7.640	1474	6.815	938.2	4.850	256.8	5.060	0.000	5.011	0.000
Mean	4.231	0.000	5.507	457.4	4.602	219.7	4.076	78.96	4.912	0.000	4.961	0.000

Annual Runoff in MCM = 1979 **Annual Runoff in mm = 1310**

Peak Observed Discharge = 1474 cumecs on 18/07/2018 **Corres. Water Level :7.640 m**

Lowest Observed Discharge = 0.000 cumecs on 01/06/2018 **Corres. Water Level :4.3360 m**

Note: River remained in pooling/ no flow condition w.e.f. 01/06/18 to 05/07/18 and from 29/09/2018 to 31/05/2019**.** Discarded 06/07/2018 & 11/07/2018

Back water effect from Dewadha Dam exists at site during this period.

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)

Stage –Discharge data for the period 2018-19

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

Day	Dec		Jan		Feb		Mar		Apr		May	
	W.L	Q	WL	Q	WL	Q	WL	Q	WL	Q	WL	Q
1	5.080	0.000	4.740	0.000	4.360	0.000	3.890	0.000	3.520	0.000	3.090	0.000
2	5.070	0.000	4.710	0.000	4.360	0.000	3.890	0.000	3.510	0.000	3.080	0.000
3	5.060	0.000	4.690	0.000	4.350	0.000	3.870	0.000	3.490	0.000	3.070	0.000
4	5.060	0.000	4.670	0.000	4.350	0.000	3.850	0.000	3.480	0.000	3.060	0.000
5	5.050	0.000	4.620	0.000	4.320	0.000	3.830	0.000	3.460	0.000	3.050	0.000
6	5.050	0.000	4.600	0.000	4.300	0.000	3.820	0.000	3.440	0.000	3.040	0.000
7	5.040	0.000	4.620	0.000	4.280	0.000	3.810	0.000	3.420	0.000	3.010	0.000
8	5.040	0.000	4.610	0.000	4.260	0.000	3.810	0.000	3.400	0.000	2.890	0.000
9	5.020	0.000	4.690	0.000	4.250	0.000	3.800	0.000	3.390	0.000	2.870	0.000
10	5.010	0.000	4.700	0.000	4.230	0.000	3.780	0.000	3.380	0.000	2.850	0.000
11	5.010	0.000	4.670	0.000	4.200	0.000	3.760	0.000	3.360	0.000	2.830	0.000
12	5.000	0.000	4.670	0.000	4.200	0.000	3.760	0.000	3.340	0.000	2.810	0.000
13	5.000	0.000	4.650	0.000	4.200	0.000	3.750	0.000	3.320	0.000	2.790	0.000
14	5.000	0.000	4.640	0.000	4.190	0.000	3.740	0.000	3.310	0.000	2.780	0.000
15	5.010	0.000	4.610	0.000	4.180	0.000	3.740	0.000	3.300	0.000	2.770	0.000
16	5.010	0.000	4.500	0.000	4.170	0.000	3.730	0.000	3.290	0.000	2.760	0.000
17	5.010	0.000	4.500	0.000	4.170	0.000	3.720	0.000	3.280	0.000	2.750	0.000
18	5.010	0.000	4.560	0.000	4.160	0.000	3.700	0.000	3.270	0.000	2.740	0.000
19	5.030	0.000	4.540	0.000	4.140	0.000	3.700	0.000	3.260	0.000	2.730	0.000
20	5.030	0.000	4.520	0.000	4.130	0.000	3.690	0.000	3.230	0.000	2.720	0.000

21	5.030	0.000	4.510	0.000	4.120	0.000	3.680	0.000	3.210	0.000	2.700	0.000
22	5.010	0.000	4.500	0.000	4.100	0.000	3.660	0.000	3.200	0.000	2.690	0.000
23	4.900	0.000	4.480	0.000	4.090	0.000	3.650	0.000	3.190	0.000	2.680	0.000
24	4.760	0.000	4.460	0.000	3.940	0.000	3.640	0.000	3.180	0.000	2.670	0.000
25	4.760	0.000	4.420	0.000	3.930	0.000	3.620	0.000	3.160	0.000	2.660	0.000
26	4.750	0.000	4.400	0.000	3.920	0.000	3.610	0.000	3.150	0.000	2.650	0.000
27	4.750	0.000	4.400	0.000	3.900	0.000	3.600	0.000	3.140	0.000	2.640	0.000
28	4.750	0.000	4.380	0.000	3.890	0.000	3.580	0.000	3.130	0.000	2.620	0.000
29	4.740	0.000	4.370	0.000			3.560	0.000	3.120	0.000	2.600	0.000
30	4.740	0.000	4.370	0.000			3.540	0.000	3.100	0.000	2.600	0.000
31	4.740	0.000	4.360	0.000			3.530	0.000				
Ten-Daily Mean												
I Ten-Daily	5.048	0.000	4.665	0.000	4.306	0.000	3.835	0.000	3.449	0.000	3.001	0.000
II Ten-Daily	5.011	0.000	4.586	0.000	4.174	0.000	3.729	0.000	3.296	0.000	2.768	0.000
III Ten-Daily	4.812	0.000	4.423	0.000	3.986	0.000	3.606	0.000	3.158	0.000	2.651	0.000
Monthly												
Min.	4.740	0.000	4.360	0.000	3.890	0.000	3.530	0.000	3.100	0.000	2.600	0.000
Max.	5.080	0.000	4.740	0.000	4.360	0.000	3.890	0.000	3.520	0.000	3.090	0.000
Mean	4.952	0	4.554	0	4.168	0	3.720	0	3.301	0	2.807	0

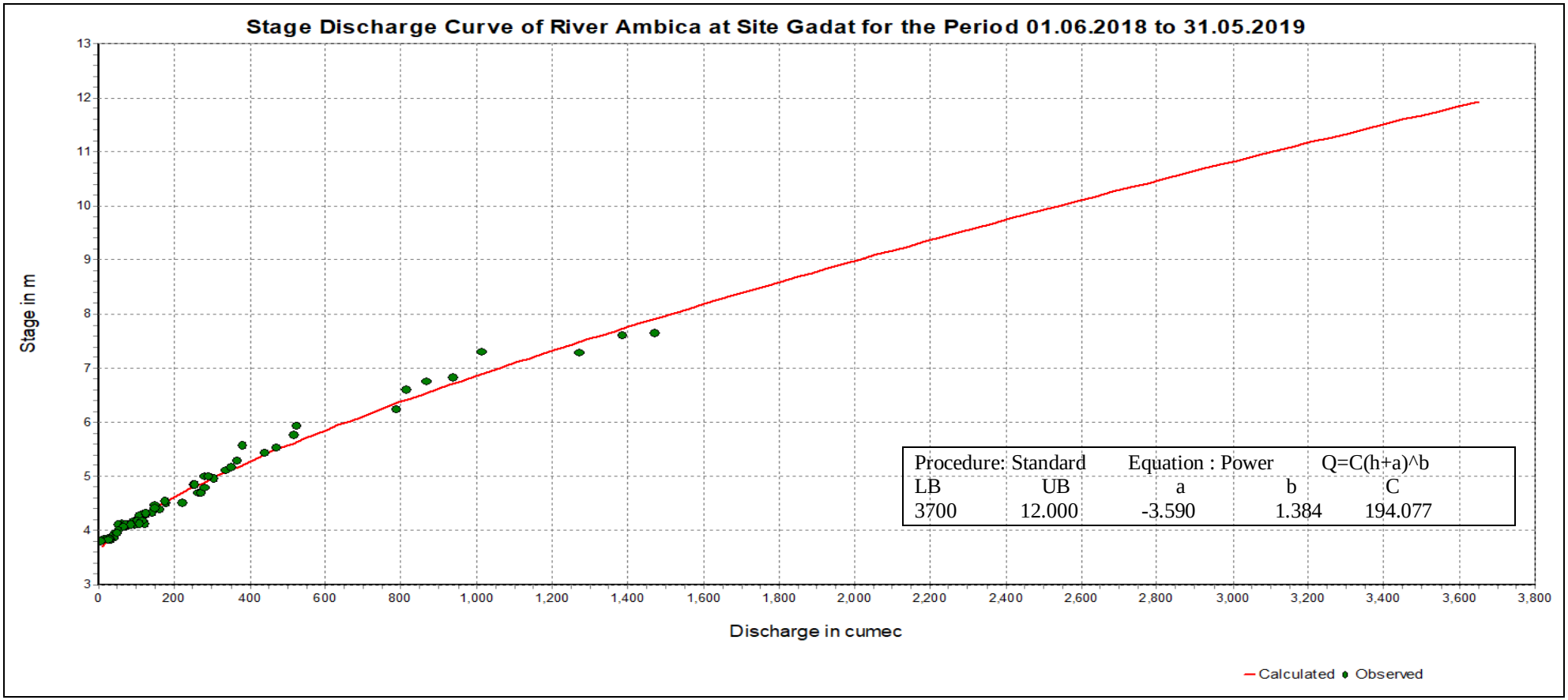
Peak Computed Discharge = 851.1 cumecs on 22/07/2018 Corres. Water Level :6.500 m
Lowest Computed Discharge = 28.49 cumecs on 23/09/2018 Corres. Water Level :3.840 m

Note: River remained in pooling/ no flow condition w.e.f. 01/06/18 to 05/07/18 and from 29/09/2018 to 31/05/2019**.** Discarded 06/07/2018 & 11/07/2018
Back water effect from Dewadha Dam exists at site during this period.

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)

4.3.1.4 Stage Discharge Curve

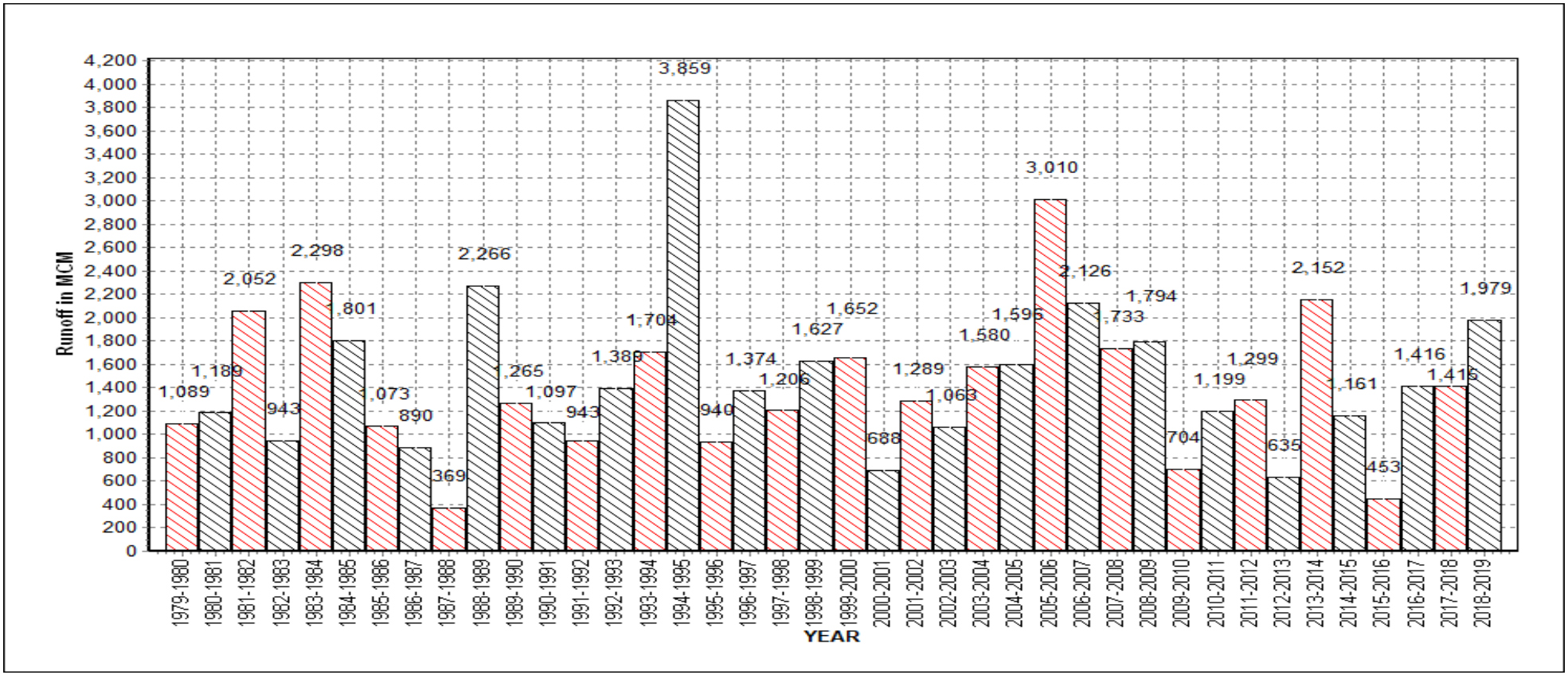
Station Name: Ambica at Gadat (01 02 20 001) Division : Tapi Division Surat Local River: Ambica Sub -Division : Lower Tapi Sub Division, Surat



4.3.1.5 Annual runoff

Annual Runoff Values Runoff Based on period 1979 to 2019

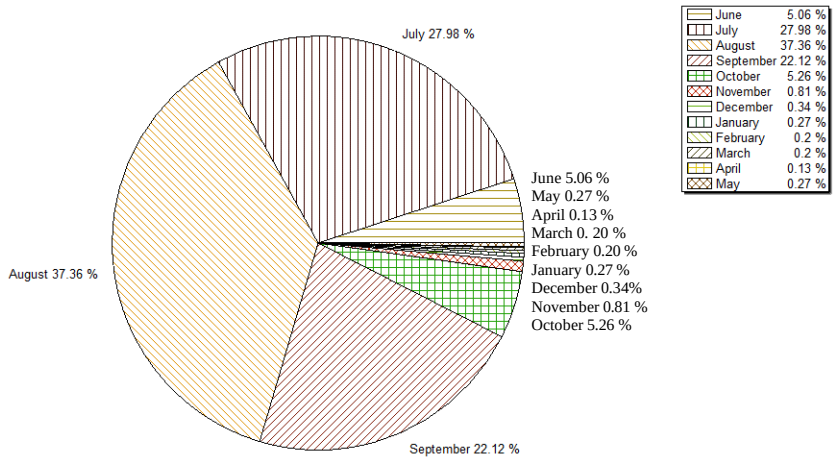
Station Name: Ambica at Gadat (01 02 20 001) Division : Tapi Division, Surat Local River: Ambica Sub -Division : Lower Tapi Sub Division, Surat



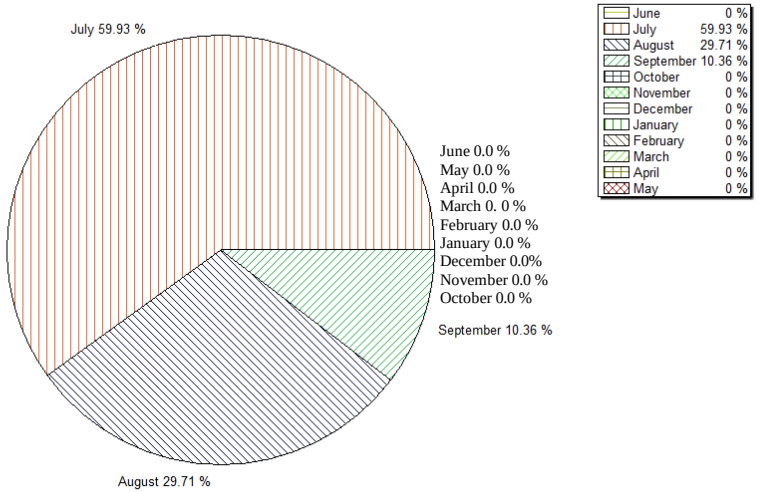
4.3.1.6 Monthly average Runoff

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

Monthly Average Runoff Based on period: 1979 -2018

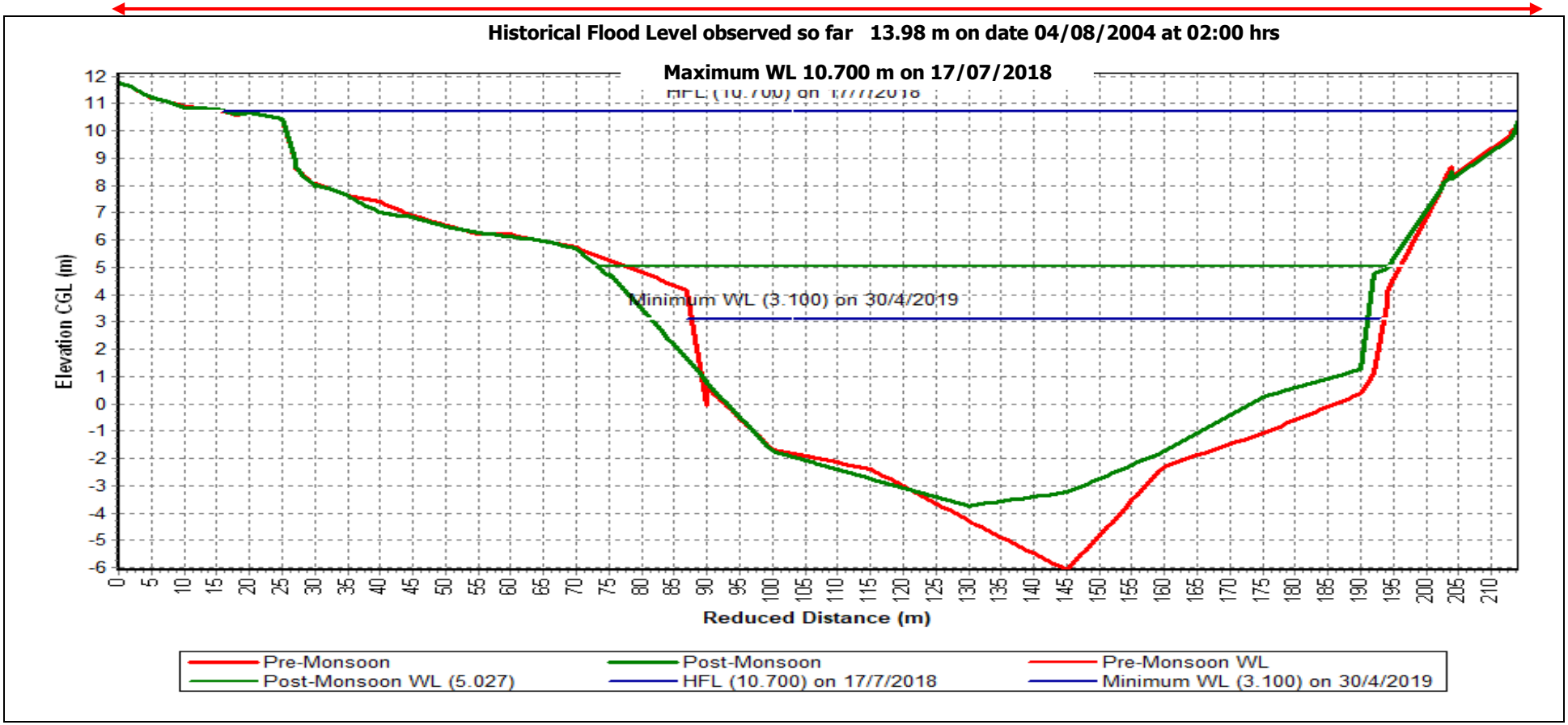


Monthly Average Runoff Based on period: 2018-19



4.3.1.7 Superimposed Cross section

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

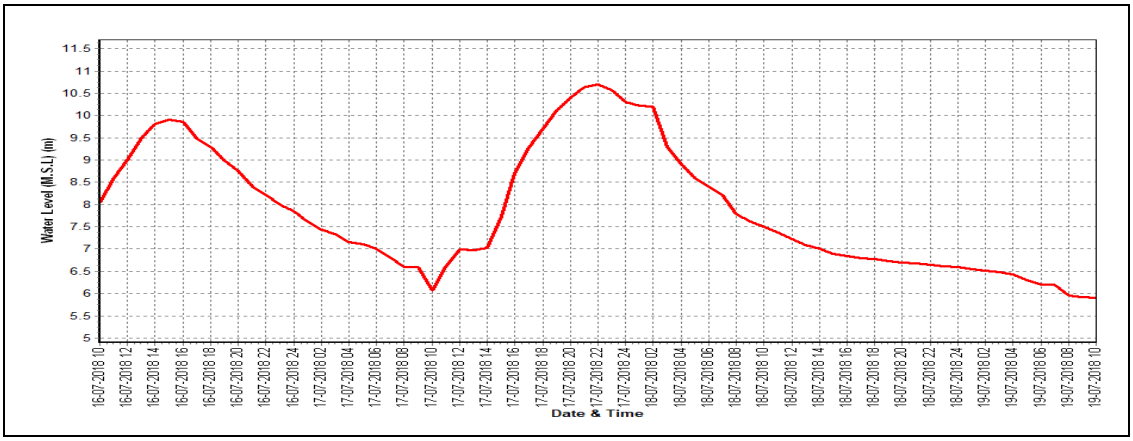


4.3.1.8 Water Level vs. Time- Graph of Highest Flood Peaks during 2018-19

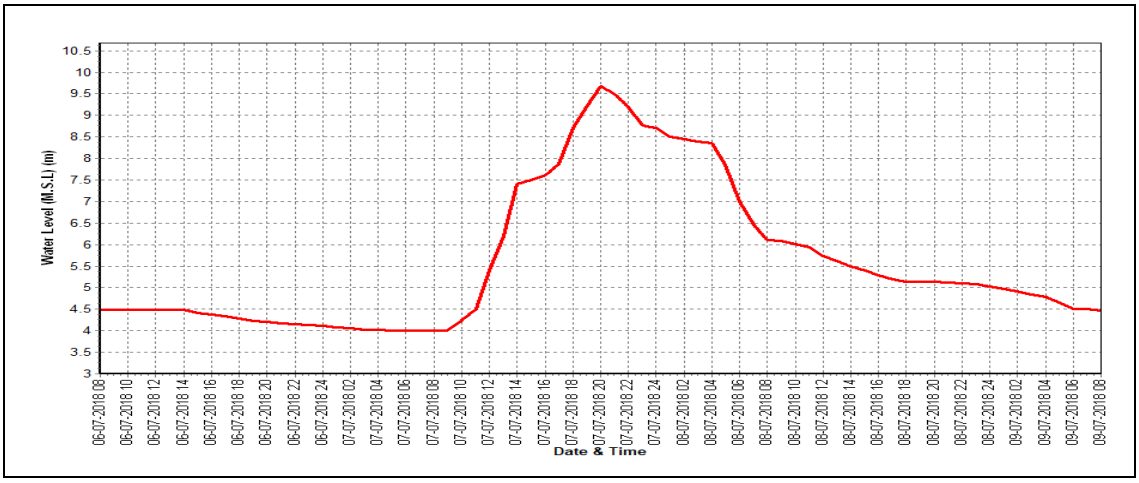
Station Name: Ambica at Gadat (01 02 20 001) Division : Tapi Division Surat

Local River: Ambica Sub -Division : Lower Tapi Sub Division, Surat

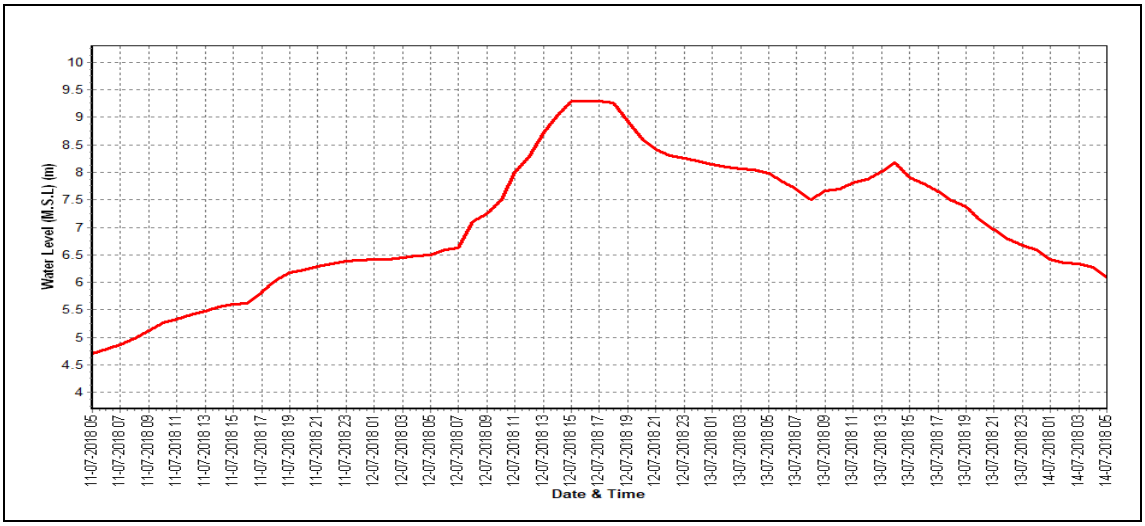
Water level vs. Time graph of 1st flood peak during the year 2018-19



Water level vs. Time graph of 2nd flood peak during the year 2018-19



Water level vs. Time graph of 3rd flood peak during the year 2018-19



4.3 Vaitarna Basin

4.4.1 Vaitarna at Durvesh

4.4.1.1 History sheet

HISTORY SHEET

Water Year : 2018-19

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
2013-2014	2070	7.200	12/07/2013	0.000	0.780	01/06/2013
2014-2015	1942	7.040	01/09/2014	0.000	1.200	01/07/2014
2015-2016	1475	7.170	22/07/2015	0.000	0.960	01/06/2015
2016-2017	3850	10.250	02/08/2016	0.000	0.870	01/06/2016
2017-2018	2514	9.965	20/09/2017	0.000	1.010	01/06/2017
2018-2019	3306	8.380	16/07/2018	0.000	1.340	01/12/2018

4.4.1.2 Annual Maximum Flood Peak

Year	Annual Maximum flood Peaks (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
2013	8.260	02/08/2013	04:00:00
2014	11.950	29/07/2014	14:00:00
2015	7.480	22/07/2015	14:00:00
2016	10.550	02/08/2016	18:00:00
2017	10.620	25/06/2017	10:00:00
2018	10.390	07/07/2018	18:00:00

4.4.1.3 Summary of Data **Stage –Discharge data for the period 2018-2019**

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	1.160	0.000	*	2.300	126.0	*	2.615	188.7		2.355	141.3		1.650	19.62		1.220	0.040	*
2	1.170	0.000	*	2.220	110.4	*	2.220	150.4		2.380	142.6	*	1.590	20.10	*	1.260	0.590	*
3	1.500	12.55	*	2.780	238.0	*	2.180	140.3		2.520	173.6	*	1.560	15.40		1.240	0.240	*
4	1.380	4.950	*	3.960	631.9	*	2.565	182.8		2.470	170.9		1.575	17.76		1.210	0.000	*
5	1.070	0.000	*	6.640	2067	*	2.820	248.7	*	2.610	222.5		1.600	21.93		1.220	0.040	*
6	1.090	0.000	*	3.700	531.5	*	2.510	175.2		2.435	160.6		1.600	22.00		1.340	3.100	*
7	1.000	0.000	*	6.550	2008	*	2.400	154.5		2.225	156.1		1.620	22.95	*	1.390	5.470	*
8	0.970	0.000	*	6.430	1930	*	2.300	141.2		2.130	123.5		1.620	25.11		1.420	7.160	*
9	0.980	0.000	*	3.970	635.9	*	2.320	141.7		2.120	92.04	*	1.600	22.70		1.440	8.380	*
10	1.070	0.000	*	4.370	804.9	*	2.685	226.2		2.070	122.6		1.595	15.72		1.460	9.690	*
11	1.170	0.000	*	5.000	1105	*	2.765	230.8		2.000	98.64		1.600	17.20		1.480	11.09	*
12	1.420	7.160	*	5.550	1399	*	3.300	391.7	*	1.975	76.89		1.600	15.61		1.490	11.81	*
13	1.380	4.950	*	4.770	954.0		3.675	539.3		1.940	62.69	*	1.595	13.79		1.450	9.030	*
14	1.380	4.950	*	4.855	1008		3.500	470.6		1.900	61.95		1.580	19.19	*	1.400	6.010	*
15	1.400	6.010	*	6.840	2297	*	3.140	341.0	*	1.880	61.96		1.480	12.30		1.310	1.960	*
16	1.430	7.760	*	8.380	3306		3.160	467.7		1.860	51.22	*	1.460	11.18		1.010	0.000	*
17	1.440	8.380	*	7.005	2335		3.565	490.5		1.845	56.20		1.440	10.35		0.900	0.000	*
18	1.370	4.460	*	5.295	1204		3.620	502.1	*	1.820	47.70		1.440	9.800		0.920	0.000	*
19	1.360	3.980	*	4.570	956.2		3.920	615.9	*	1.780	40.29		1.460	9.690	*	0.940	0.000	*
20	1.310	1.960	*	3.960	618.1		3.850	609.4		1.760	31.68		1.445	10.58		0.970	0.000	*

21	1.250	0.400	*	5.580	1444		3.500	431.1		1.860	51.22	*	1.420	7.160	*	0.990	0.000	*
22	1.210	0.000	*	5.340	1283	*	5.400	1316	*	1.840	52.40		1.450	10.14		0.990	0.000	*
23	1.230	0.120	*	4.965	1159		4.280	704.9		1.820	45.85	*	1.440	10.71		1.020	0.000	*
24	1.320	2.320	*	4.680	949.4		3.480	413.8		1.760	33.33		1.460	10.78		0.980	0.000	*
25	2.560	183.0	*	4.015	601.6		3.150	349.5		1.720	24.00		1.460	8.800		0.990	0.000	*
26	5.180	1198	*	3.235	385.6		3.720	538.9	*	1.705	24.92		1.460	8.470		0.970	0.000	*
27	2.710	219.8	*	3.060	300.8		3.330	314.3		1.680	24.63		1.460	6.560		1.050	0.000	*
28	2.400	146.9	*	3.065	341.5		3.485	433.7		1.660	20.55		1.520	14.10	*	1.320	2.320	*
29	2.600	192.5	*	3.070	319.7	*	3.075	258.8		1.680	23.25		1.540	15.72	#	1.380	4.950	*
30	2.550	180.6	*	3.065	186.0		2.760	249.2		1.680	29.11	*	1.550	16.56	#	1.400	6.010	*
31				2.635	181.7		2.530	159.8					1.340	3.873				
Ten-Daily Mean																		
I Ten-Daily	1.139	1.750		4.292	908.3		2.461	175.0		2.331	150.6		1.601	20.33		1.320	3.471	
II Ten-Daily	1.366	4.961		5.622	1518		3.449	465.9		1.876	58.92		1.510	12.97		1.187	3.990	
III Ten-Daily	2.301	212.3		3.883	650.3		3.519	470.0		1.741	32.93		1.464	10.26		1.109	1.328	
Monthly																		
Min.	0.970	0.000		2.220	110.4		2.180	140.3		1.660	20.55		1.340	3.873		0.900	0.000	
Max.	5.180	1198		8.380	3306		5.400	1316		2.610	222.5		1.650	25.11		1.490	11.81	
Mean	1.602	73.02		4.576	1013		3.155	373.5		1.983	80.81		1.523	14.38		1.205	2.93	

Annual Runoff in MCM = 4160 **Annual Runoff in mm = 2060**

Peak Observed Discharge = 3306 cumecs on 16/07/2018 Corres. Water Level :8.380 m

Lowest Observed Discharge = 0.000 cumecs on 01/12/2018 Corres. Water Level :1.340 m

Note: River remained in pooling/ no flow condition due to back water effect w.e.f. 01/12/18 to 31/05/18. Falty current meter from 01/06/18 to 12/07/18, Shortage of staff from 01/11/18 to 30/11/18, Discarded discharge 29/10/18 & 30/10/18.

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 2018-2019

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	1.340	0.000	0.910	0.000	0.920	0.000	0.850	0.000	0.880	0.000	0.840	0.000
2	1.050	0.000	0.960	0.000	0.980	0.000	0.930	0.000	0.920	0.000	0.930	0.000
3	0.960	0.000	1.170	0.000	1.260	0.000	0.990	0.000	1.120	0.000	1.130	0.000
4	1.200	0.000	1.300	0.000	1.350	0.000	1.030	0.000	1.190	0.000	1.310	0.000
5	1.310	0.000	1.350	0.000	1.410	0.000	1.300	0.000	1.340	0.000	1.330	0.000
6	1.360	0.000	1.370	0.000	1.440	0.000	1.380	0.000	1.400	0.000	1.350	0.000
7	1.400	0.000	1.360	0.000	1.460	0.000	1.400	0.000	1.420	0.000	1.340	0.000
8	1.440	0.000	1.350	0.000	1.460	0.000	1.440	0.000	1.440	0.000	1.320	0.000
9	1.460	0.000	1.350	0.000	1.420	0.000	1.470	0.000	1.430	0.000	1.200	0.000
10	1.480	0.000	1.390	0.000	1.380	0.000	1.490	0.000	1.310	0.000	1.150	0.000
11	1.470	0.000	1.440	0.000	1.340	0.000	1.460	0.000	1.200	0.000	1.130	0.000
12	1.440	0.000	1.350	0.000	1.310	0.000	1.340	0.000	1.100	0.000	0.990	0.000
13	1.200	0.000	1.100	0.000	0.940	0.000	1.100	0.000	1.040	0.000	0.960	0.000
14	0.860	0.000	0.960	0.000	0.870	0.000	0.970	0.000	0.990	0.000	0.940	0.000
15	0.780	0.000	0.780	0.000	0.860	0.000	0.900	0.000	0.970	0.000	1.060	0.000
16	0.750	0.000	0.840	0.000	0.860	0.000	0.870	0.000	1.180	0.000	1.330	0.000
17	0.740	0.000	0.840	0.000	1.070	0.000	0.950	0.000	1.270	0.000	1.300	0.000
18	0.730	0.000	0.940	0.000	1.350	0.000	1.060	0.000	1.340	0.000	1.350	0.000
19	0.750	0.000	0.990	0.000	1.410	0.000	1.330	0.000	1.380	0.000	1.390	0.000
20	1.000	0.000	1.280	0.000	1.470	0.000	1.410	0.000	1.400	0.000	1.420	0.000

21	1.340	0.000	1.410	0.000	1.420	0.000	1.800	0.000	1.430	0.000	1.280	0.000
22	1.380	0.000	1.470	0.000	1.530	0.000	1.400	0.000	1.450	0.000	1.240	0.000
23	1.410	0.000	1.520	0.000	1.550	0.000	1.250	0.000	1.370	0.000	1.220	0.000
24	1.430	0.000	1.570	0.000	1.560	0.000	1.010	0.000	1.230	0.000	1.140	0.000
25	1.470	0.000	1.620	0.000	1.540	0.000 *	1.300	0.000	1.150	0.000	1.080	0.000
26	1.550	0.000	1.560	0.000	1.180	0.000 *	1.370	0.000	1.040	0.000	0.990	0.000
27	1.600	0.000	1.470	0.000	0.980	0.000 *	1.170	0.000	0.940	0.000	0.900	0.000
28	1.460	0.000	1.020	0.000	0.900	0.000 *	1.010	0.000	0.860	0.000	0.870	0.000
29	1.310	0.000	0.940	0.000			0.920	0.000	0.810	0.000	0.840	0.000
30	0.970	0.000	0.870	0.000			0.880	0.000	0.800	0.000	0.800	0.000
31	0.940	0.000	0.860	0.000			0.860	0.000			0.830	0.000
Ten-Daily Mean												
I Ten-Daily	1.300	0.000	1.251	0.000	1.308	0.000	1.228	0.000	1.245	0.000	1.190	0.000
II Ten-Daily	0.972	0.000	1.052	0.000	1.148	0.000	1.139	0.000	1.187	0.000	1.187	0.000
III Ten-Daily	1.351	0.000	1.301	0.000	1.332	0.000	1.179	0.000	1.108	0.000	1.017	0.000
Monthly												
Min.	0.730	0.000	0.780	0.000	0.860	0.000	0.850	0.000	0.800	0.000	0.800	0.000
Max.	1.600	0.000	1.620	0.000	1.560	0.000	1.800	0.000	1.450	0.000	1.420	0.000
Mean	1.212	0.000	1.205	0.000	1.258	0.000	1.182	0.000	1.180	0.000	1.128	0.000

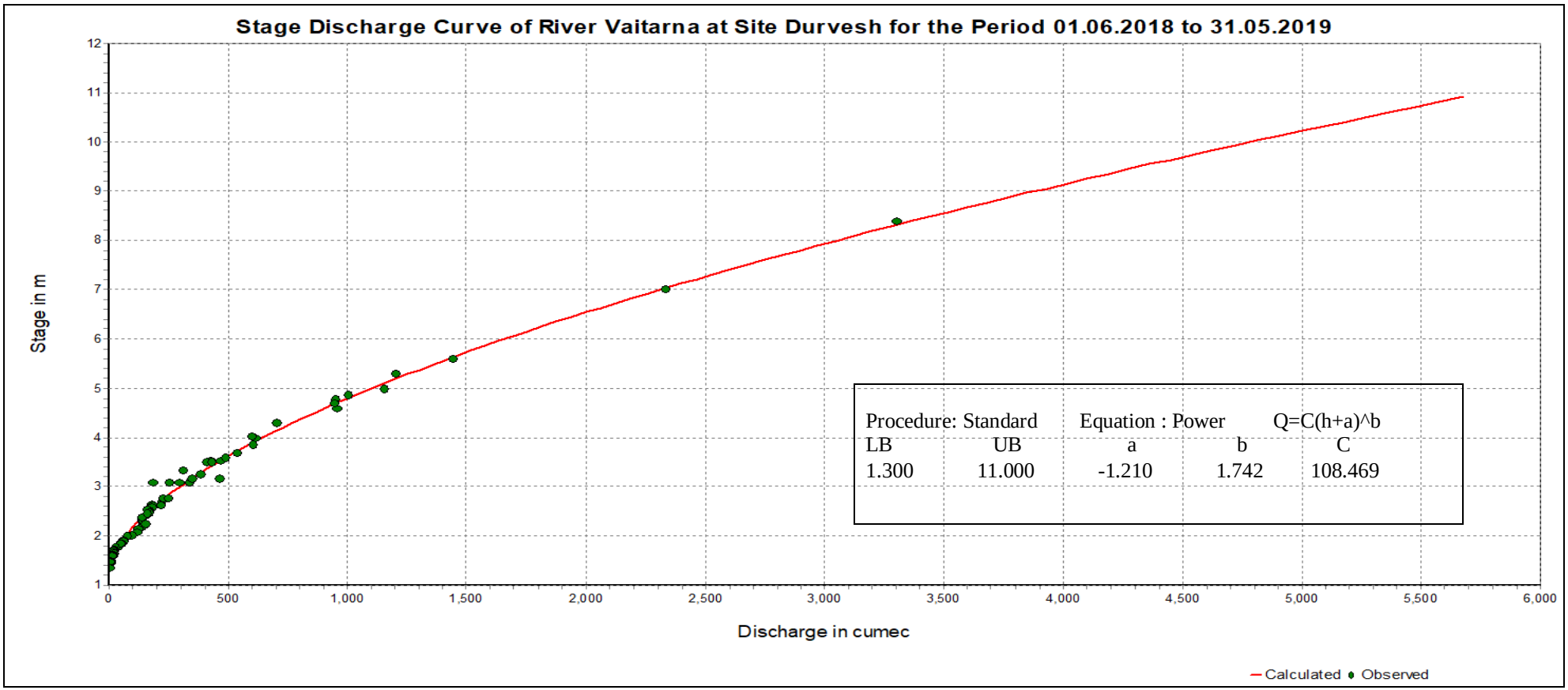
Peak Computed Discharge = 2297 cumecs on 15/07/2018 Corres. Water Level :6.840 m
Lowest Computed Discharge = 0.000 cumecs on 01/06/2018 Corres. Water Level : 1.160 m

Note: River remained in pooling/ no flow condition due to back water effect w.e.f. 01/12/18 to 31/05/18. Falty current meter from 01/06/18 to 12/07/18, Shortage of staff from 01/11/18 to 30/11/18, Discarded discharge 29/10/18 & 30/10/18.

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)

4.4.1.4 Stage Discharge Curve

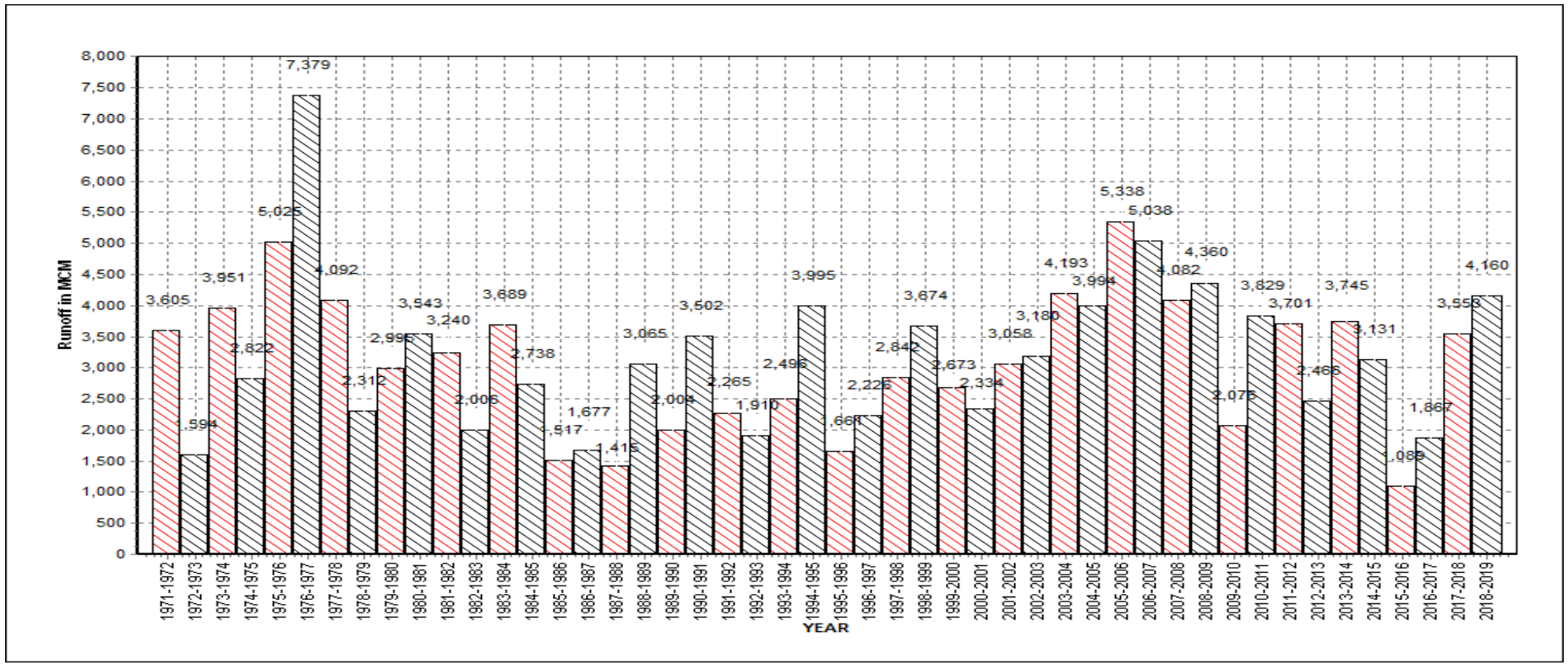
Station Name: Vaitarna at Durvesh (01 02 25 001) Division : Tapi Division Surat Local River: Vaitarna Sub -Division : DGSD, CWC, Silvassa



4.4.1.5 Annual Runoff

Annual Runoff Values- Runoff Based on period 1971 to 2019

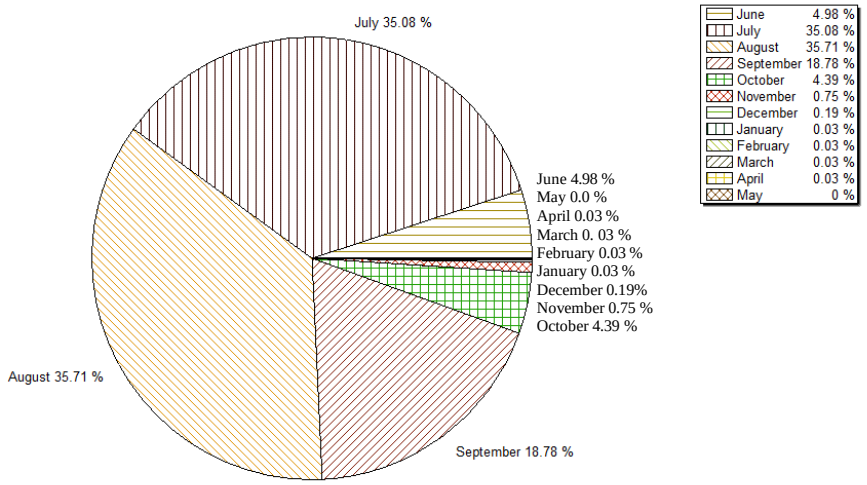
Station Name: Vaitarna at Durvesh (01 02 25 001) Division : Tapi Division Surat Local River: Vaitrana Sub -Division : DGSD, CWC, Silvassa



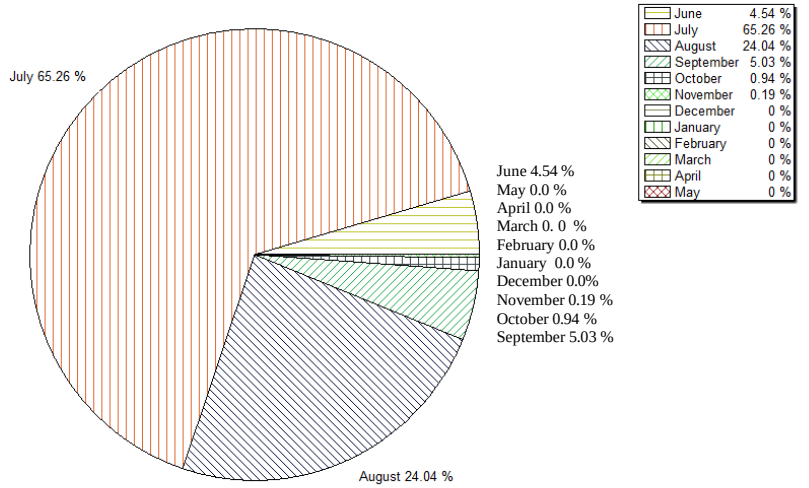
4.4.1.6 Monthly Average Runoff

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 -2018

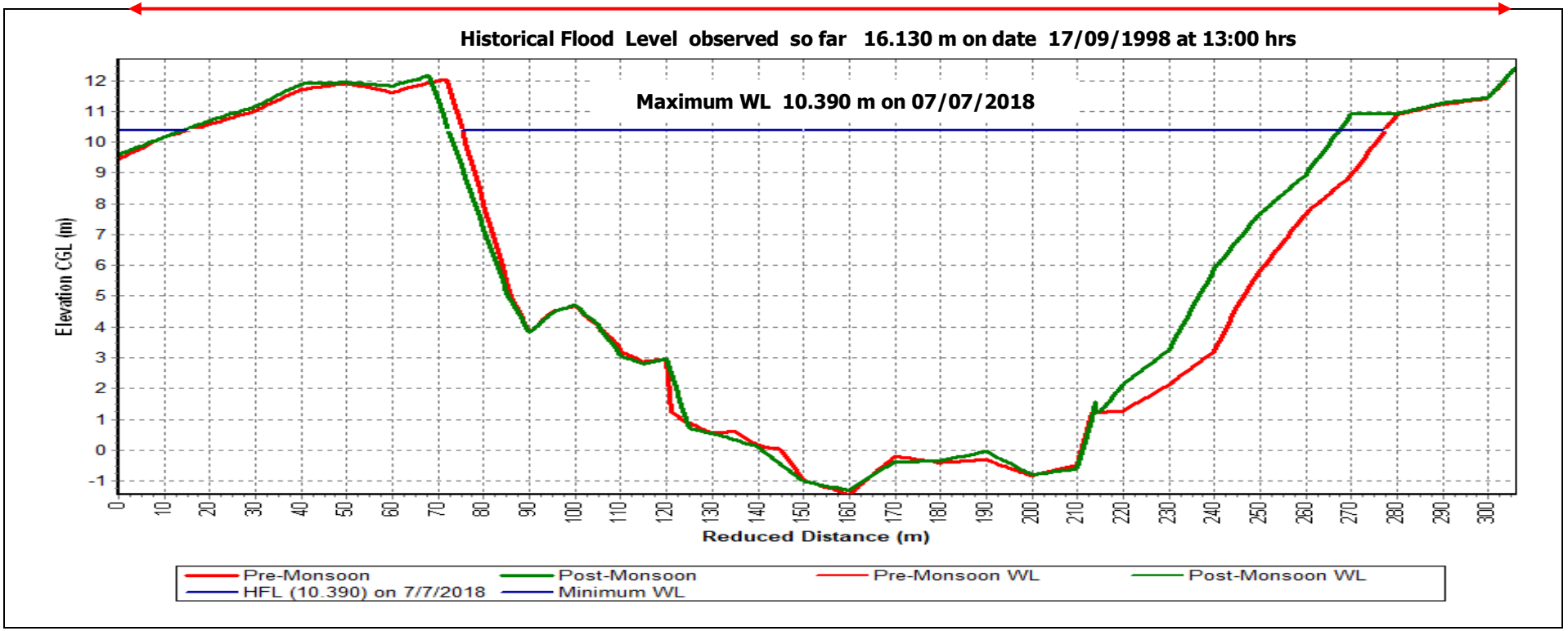


Monthly Average Runoff Based on period: 2018-19



4.4.1.7 Superimposed Cross section

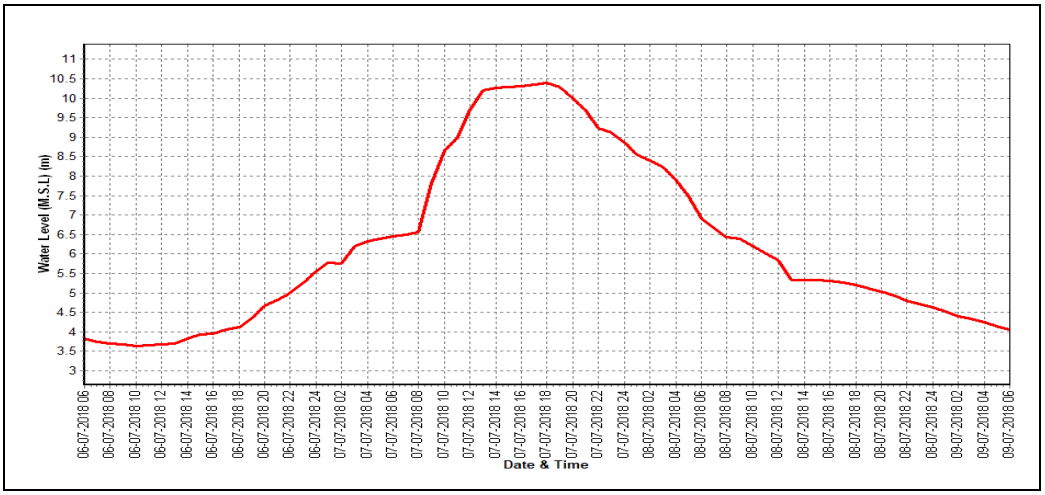
Station Name: Vaitarna at Durvesh (01 02 25 001) Division : Tapi Division Surat Local River: Vaitarna Sub -Division : DGSD, CWC, Silvassa



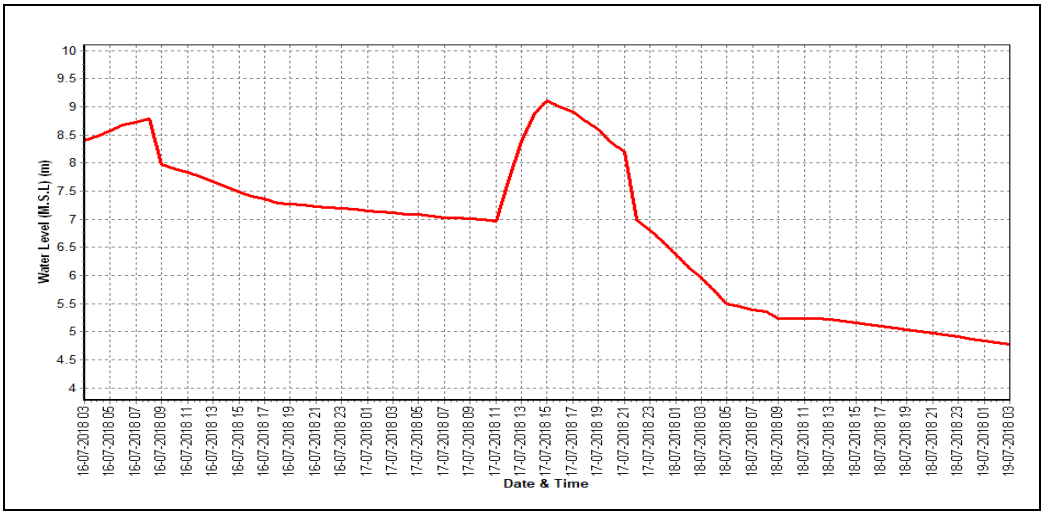
4.4.1.8 Water Level vs. Time- Graph of Highest Flood Peaks during 2018-19

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

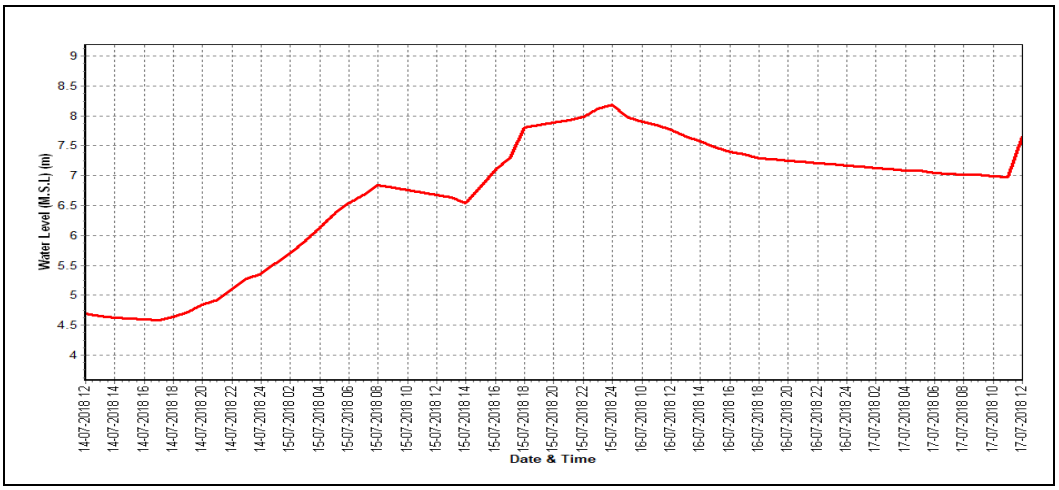
Water level vs. Time graph of I flood peak during the year 2018-19



Water level vs. Time graph of II flood peak during the year 2018-19



Water level vs. Time graph of III flood peak during the year 2018-19



4.5 Dhadhar Basin

4.5.1 Dhadhar at Pingalwada

4.5.1.1 History Sheet

HISTORY SHEET

			Water Year	**:**	**2018-19**
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	655.0	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
2012-2013	148.2	12.090	12/09/2012	0.000	5.230	01/06/2012
2013-2014	593.6	15.700	24/09/2013	0.000	5.200	01/06/2013
2014-2015	301.8	12.500	28/07/2014	2.110	5.040	21/06/2014
2015-2016	40.57	7.270	30/07/2015	1.542	5.300	03/05/2016
2016-2017	124.3	9.510	06/10/2016	0.000	5.580	01/06/2016
2017-2018	294.5	12.700	30/08/2017	0.000	6.580	01/06/2017
2018-2019	118.4	9.450	13/07/2018	5.322	6.070	29/05/2019

4.5.1.2 Annual Maximum Flood Peak

Year	Annual Maximum flood Peaks (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
2013	19.300	26/09/2013	05:00:00
2014	19.400	11/09/2014	18:00:00
2015	7.500	29/07/2015	12:00:00
2016	9.510	06/10/2016	05:00:00
2017	12.700	30/08/2017	08:00:00
2018	9.500	13/07/2018	10:00:00

4.5.1.3 Summary of Data

Stage discharge data for the period of 2018-19

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	6.030	7.005	6.330	11.65 *	6.280	12.77	6.670	22.17	6.230	11.27	6.090	7.917
2	6.020	6.910	6.240	9.909	6.290	12.95	6.520	15.51 *	6.200	9.240 *	6.080	7.819
3	6.020	6.220 *	6.220	9.594	6.260	11.88	6.450	14.04 *	6.180	9.915	6.100	8.097
4	6.030	6.945	6.240	9.887	6.250	11.74	6.400	15.37	6.170	9.767	6.110	7.680 *
5	6.010	6.708	6.420	14.90	6.270	10.51 *	6.420	15.59	6.150	9.341	6.100	8.114
6	6.030	6.945	6.380	14.27	6.240	11.58	6.380	15.02	6.140	9.075	6.090	7.929
7	6.040	7.096	6.500	18.27	6.230	11.20	6.340	13.98	6.130	8.020 *	6.080	7.180 *
8	6.020	6.926	6.340	11.85 *	6.220	10.82	6.350	14.19	6.160	9.541	6.090	7.910
9	6.010	6.693	6.260	10.20	6.210	10.59	6.300	11.08 *	6.170	9.773	6.100	8.122
10	6.030	6.380 *	6.220	9.594	6.200	10.10	6.290	13.15	6.150	9.343	6.090	7.914
11	6.030	6.957	6.390	14.43	6.190	9.720	6.270	11.84	6.170	9.793	6.100	7.510 *
12	6.020	6.920	7.650	43.42	6.210	9.420 *	6.250	11.20	6.150	9.346	6.080	7.837
13	6.040	7.104	9.450	118.4	6.200	10.10	6.220	9.600 *	6.180	9.919	6.090	7.903
14	6.060	7.457	9.300	103.1	6.220	10.82	6.200	10.27	6.180	8.880 *	6.070	7.538
15	6.080	7.649	9.000	91.79 *	6.210	9.420 *	6.170	9.885	6.160	9.443	6.060	7.334
16	6.060	6.860 *	8.190	55.61	6.190	9.722	6.200	9.240 *	6.140	9.070	6.050	7.206
17	6.060	6.860 *	9.310	104.8	6.505	16.65	6.170	9.861	6.160	9.393	6.050	7.144
18	6.050	7.328	7.990	50.50	8.010	48.69	6.210	10.44	6.140	9.076	6.060	6.860 *
19	6.070	7.462	7.240	35.60	7.830	50.56 *	6.160	9.630	6.120	7.850 *	6.050	7.088
20	6.050	7.326	7.450	39.27	7.810	44.79	6.180	9.891	6.140	9.079	6.060	7.321

21	6.070	7.464	7.670	44.04	7.660	40.70	6.160	8.530 *	6.120	7.850 *	6.070	7.020 *
22	6.060	7.432	7.800	49.61 *	7.610	39.15	6.180	9.906	6.120	8.377	6.060	7.305
23	6.080	7.620	7.790	47.62	8.375	68.74 *	6.230	9.780 *	6.130	8.479	6.050	6.690 *
24	6.100	7.510 *	7.450	39.28	7.930	46.45	6.280	12.86	6.100	8.155	6.070	7.516
25	6.160	8.627	7.530	40.88	7.560	38.01	6.320	13.35	6.110	8.241	6.080	7.180 *
26	7.100	33.73	7.850	49.37	7.400	38.17 *	6.280	12.88	6.090	7.970	6.080	7.889
27	6.800	27.76	7.740	45.08	7.120	29.34	6.320	13.36	6.120	8.391	6.090	7.900
28	6.640	22.69	7.180	34.05	7.000	27.46	6.280	12.87	6.100	7.510 *	6.090	7.852
29	6.500	18.32	6.700	19.48 *	6.850	25.67	6.270	12.44	6.090	7.941	6.090	7.840
30	6.400	14.77	6.430	15.48	6.650	21.80	6.250	10.14 *	6.080	7.845	6.080	7.803
31			6.320	13.78	6.510	16.52			6.100	8.118		
Ten-Daily Mean												
I Ten-Daily	6.024	6.783	6.315	12.01	6.245	11.41	6.412	15.01	6.168	9.529	6.093	7.868
II Ten-Daily	6.052	7.192	8.197	65.69	6.738	21.99	6.203	10.19	6.154	9.185	6.067	7.374
III Ten-Daily	6.391	15.59	7.315	36.24	7.333	35.64	6.257	11.61	6.105	8.080	6.076	7.500
Monthly												
Min.	6.010	6.220	6.220	9.594	6.190	9.420	6.160	8.530	6.080	7.510	6.050	6.690
Max.	7.100	33.73	9.450	118.4	8.375	68.74	6.670	22.17	6.230	11.27	6.110	8.122
Mean	6.156	9.856	7.277	37.93	6.790	23.42	6.291	12.27	6.141	8.904	6.079	7.581

Annual Runoff in MCM = 417 **Annual Runoff in mm = 174**

Peak Observed Discharge = 118.4 cumecs on 13/07/2018 **Corres. Water Level :9.450 m**

Lowest Observed Discharge = 5.322 cumecs on 29/05/2019 **Corres. Water Level :6.070 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 of 2018-19

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	6.090	7.836	6.570	14.56	6.560	14.45	6.280	11.07	6.140	6.940	6.100	6.034
2	6.080	7.180 *	6.520	14.08	6.580	14.51	6.260	10.88	6.130	6.831	6.110	6.198
3	6.110	8.226	6.540	14.36 *	6.560	16.36 *	6.250	10.14 *	6.140	6.944	6.100	6.017
4	6.120	8.423	6.520	13.97	6.500	12.98	6.250	10.73	6.120	6.523	6.120	6.396
5	6.110	8.195	6.580	14.57	6.500	13.08	6.260	10.88	6.120	6.506	6.130	8.020 *
6	6.220	11.25	6.560	16.36 *	6.520	14.02	6.240	10.51	6.130	6.815	6.110	6.183
7	6.200	10.97	6.540	14.32	6.500	13.05	6.260	10.86	6.140	8.190 *	6.100	6.003
8	6.220	11.22	6.570	14.46	6.540	14.31	6.280	11.06	6.140	6.943	6.110	6.181
9	6.260	10.33 *	6.800	18.68	6.520	15.51 *	6.240	10.49	6.120	6.500	6.100	6.008
10	6.240	11.50	6.540	14.39	6.500	15.08 *	6.250	10.14 *	6.130	6.829	6.120	6.376
11	6.200	10.86	6.500	13.06	6.520	14.05	6.220	9.743	6.120	6.454	6.120	6.369
12	6.240	11.45	6.520	13.98	6.480	13.65	6.200	9.331	6.140	6.948	6.110	7.680 *
13	6.230	11.33	6.520	15.51 *	6.480	13.69	6.220	9.731	6.130	6.825	6.100	6.005
14	6.240	11.48	6.500	15.08 *	6.500	13.07	6.180	7.871	6.140	8.190 *	6.110	6.171
15	6.200	10.81	6.340	11.77	6.460	12.28	6.160	7.583	6.120	6.435	6.090	5.717
16	6.220	9.600 *	6.360	11.94	6.360	11.90	6.180	7.734	6.130	6.823	6.080	5.409
17	6.230	11.27	6.320	11.51	6.380	12.63 *	6.160		6.130	8.020 *	6.100	6.028
18	6.200	10.82	6.340	11.74	6.360	11.80	6.100	6.482	6.110	6.230	6.090	7.350 *
19	6.180	9.901	6.350	11.91	6.340	11.70	6.120	6.616	6.120	7.850 *	6.100	7.510 *
20	6.160	9.336	6.340	11.85 *	6.320	11.20	6.110	6.578	6.120	6.437	6.090	5.916

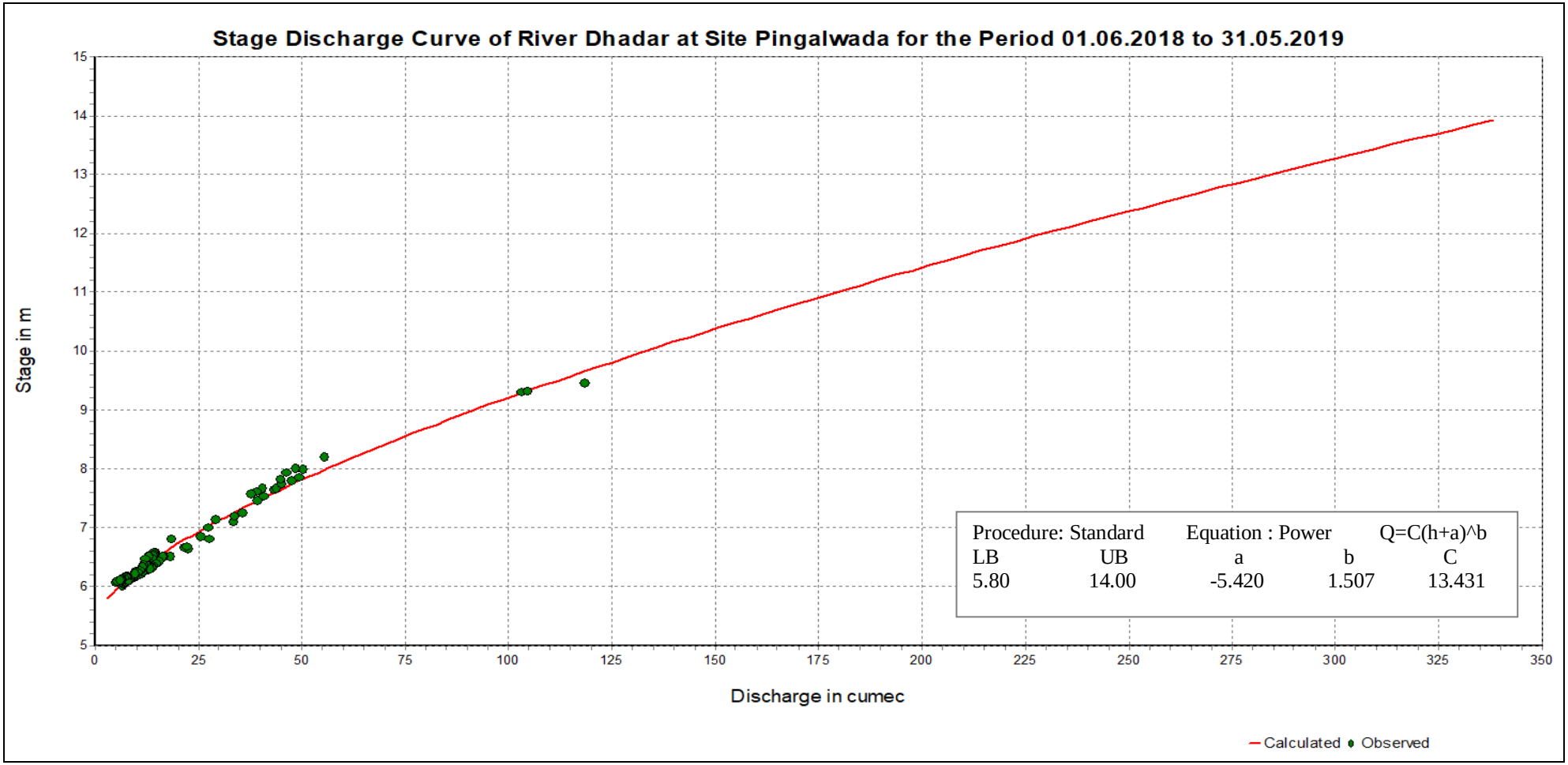
21	6.180	9.903	6.340	11.63	6.340	11.55	6.160	8.530 *	6.130	8.020 *	6.080	5.407
22	6.200	10.79	6.350	11.89	6.240	10.61	6.120	6.608	6.120	6.414	6.080	5.418
23	6.200	9.240 *	6.380	12.31	6.240	10.53	6.100	6.484	6.130	8.020 *	6.090	5.903
24	6.220	11.19	6.350	11.92	6.250	10.14 *	6.120	7.850 *	6.120	6.404	6.080	5.419
25	6.240	9.960 *	6.350	11.93	6.240	10.53	6.160	7.575	6.100	6.063	6.100	6.005
26	6.240	11.49	6.340	11.85 *	6.280	11.07	6.140	6.946	6.110	6.229	6.090	7.350 *
27	6.340	13.89	6.350	12.04 *	6.250	10.75	6.120	6.610	6.100	6.043	6.080	5.429
28	6.320	13.66	6.360	11.94	6.340	11.65	6.140	6.937	6.120	7.850 *	6.070	5.335
29	6.300	13.23	6.500	13.07			6.100	6.485	6.100	6.030	6.070	5.322
30	6.320	13.60 *	6.500	13.07			6.120	6.609	6.110	6.225	6.080	5.435
31	6.300	13.33	6.520	14.02			6.120	7.850 *			6.100	5.986
Ten-Daily Mean												
I Ten-Daily	6.165	9.513	6.574	14.98	6.528	14.33	6.257	10.67	6.131	6.902	6.110	6.342
II Ten-Daily	6.210	10.69	6.409	12.83	6.420	12.60	6.165	7.963	6.126	7.021	6.099	6.415
III Ten-Daily	6.260	11.84	6.395	12.33	6.273	10.85	6.127	7.135	6.114	6.730	6.084	5.728
Monthly												
Min.	6.080	7.180	6.320	11.51	6.240	10.14	6.100	6.482	6.100	6.030	6.070	5.322
Max.	6.340	13.89	6.800	18.68	6.580	16.36	6.280	11.07	6.140	8.190	6.130	8.020
Mean	6.213	10.72	6.457	13.35	6.416	12.72	6.181	8.563	6.124	6.884	6.097	6.148

Peak Computed Discharge = 91.79 cumecs on 15/07/2018 Corres. Water Level :9.000 m
Lowest Computed Discharge = 6.220 cumecs on 03/06/2018 Corres. Water Level :6.020 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)

4.5.1.4 Stage Discharge curve

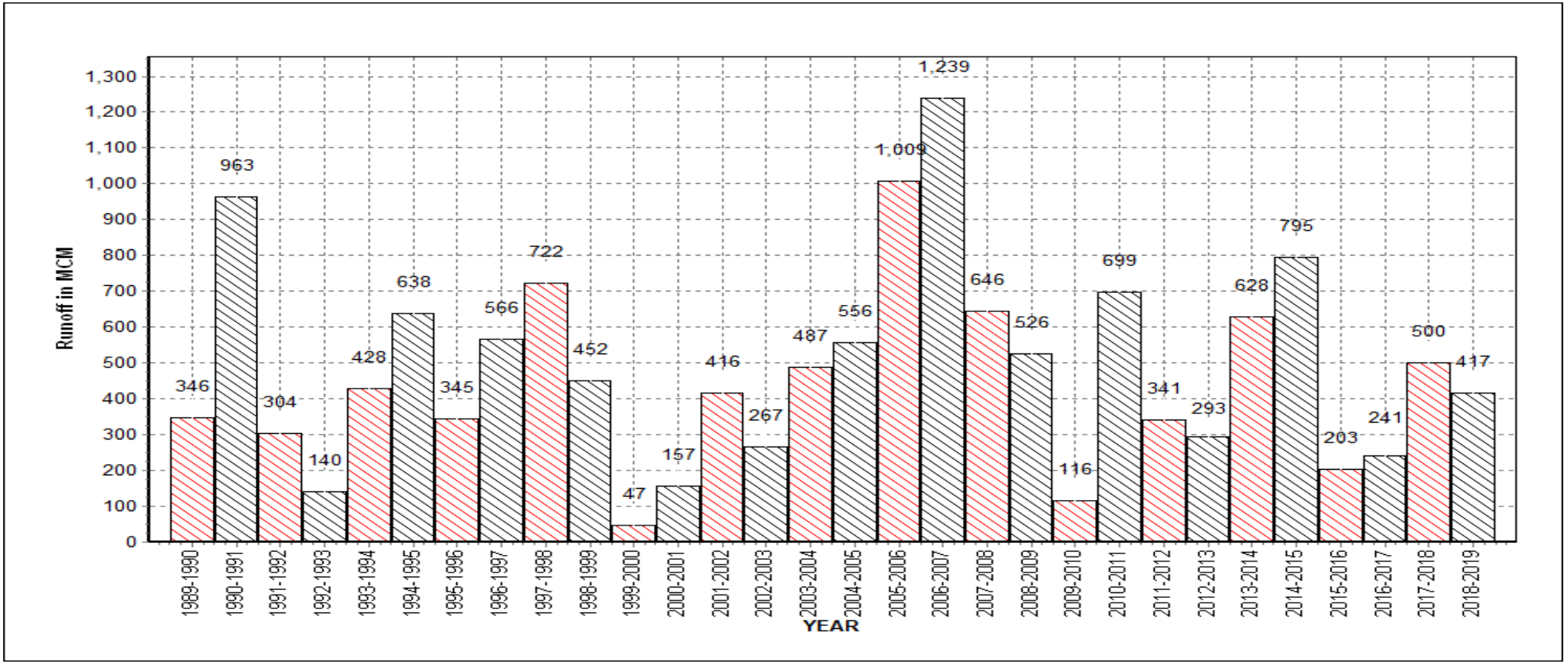
Station Name: Dhadar at Pingalwada(01 02 14 001) Division : Tapi Division, Surat Local River: Pingalwada Sub -Division : LNSD, CWC, Bharuch



4.5.1.5 Annual Runoff

Annual Runoff Values Runoff Based on period: 1989-2019

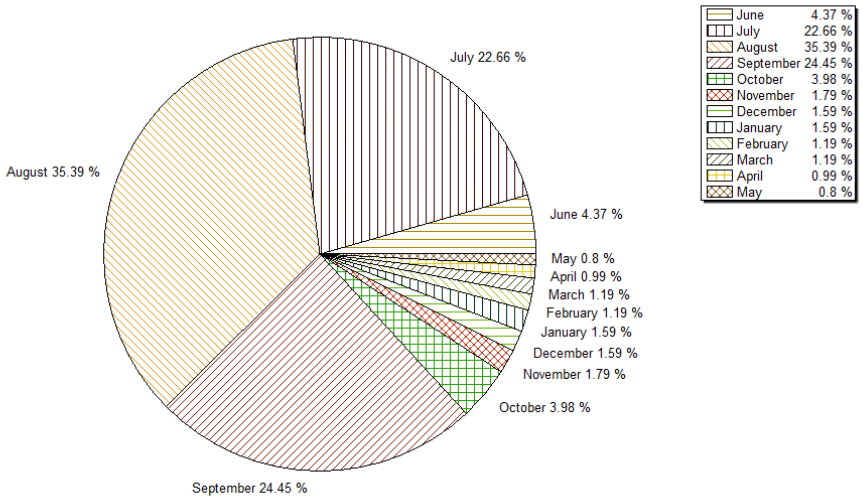
Station Name: Dhadhar at Pingalwada (01 02 14 001) Division : Tapi Division, Surat Local River: Pingalwada Sub -Division : LNSD, CWC, Bharuch



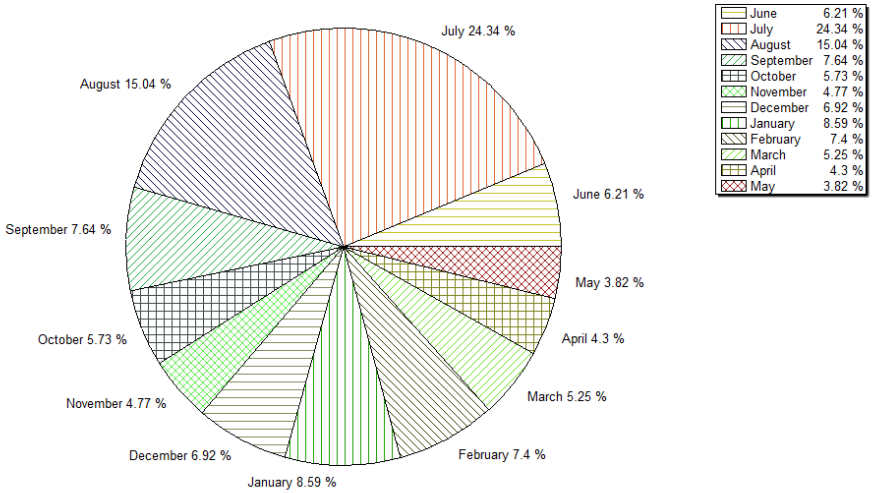
4.5.1.6 Monthly Average Runoff

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: 1989-2018

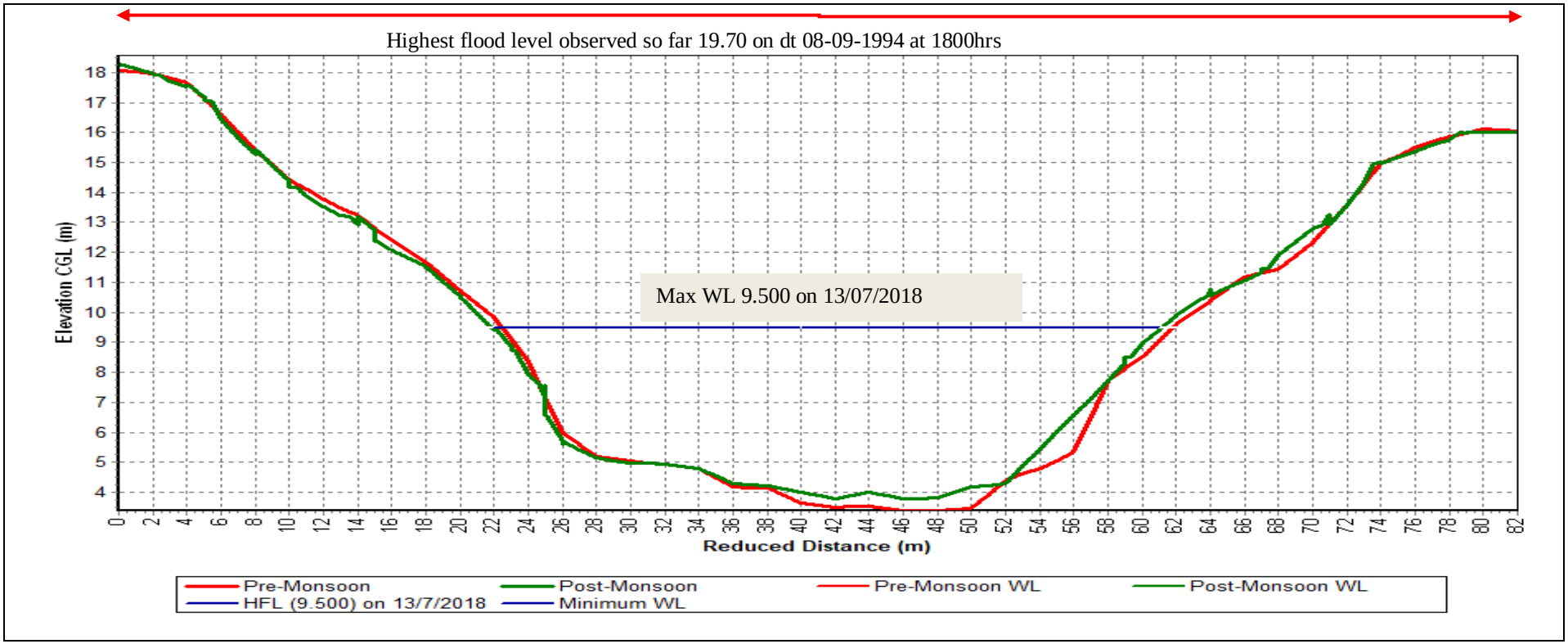


Monthly Average Runoff Based on period: 2018-2019



4.5.1.7 Superimposed Cross section

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

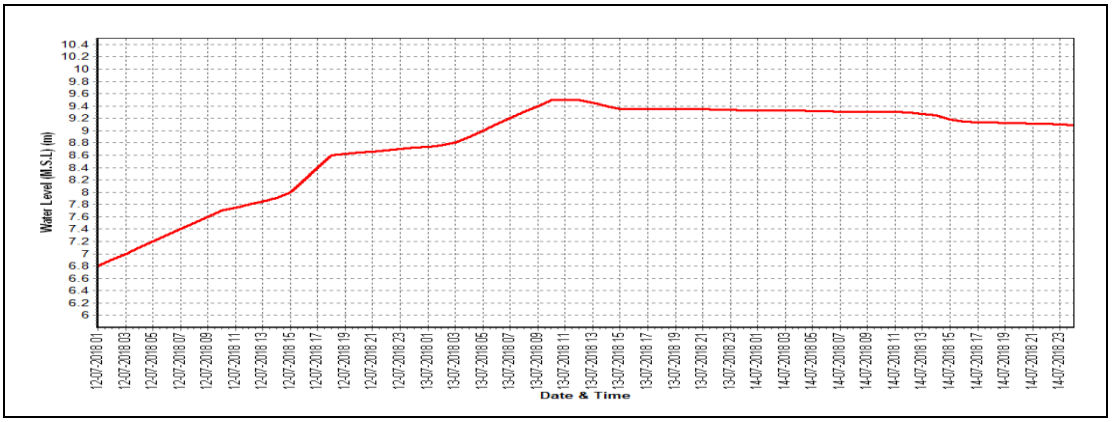


4.5.1.8 Water Level vs. Time- Graph of Highest Flood Peaks during 2018-19

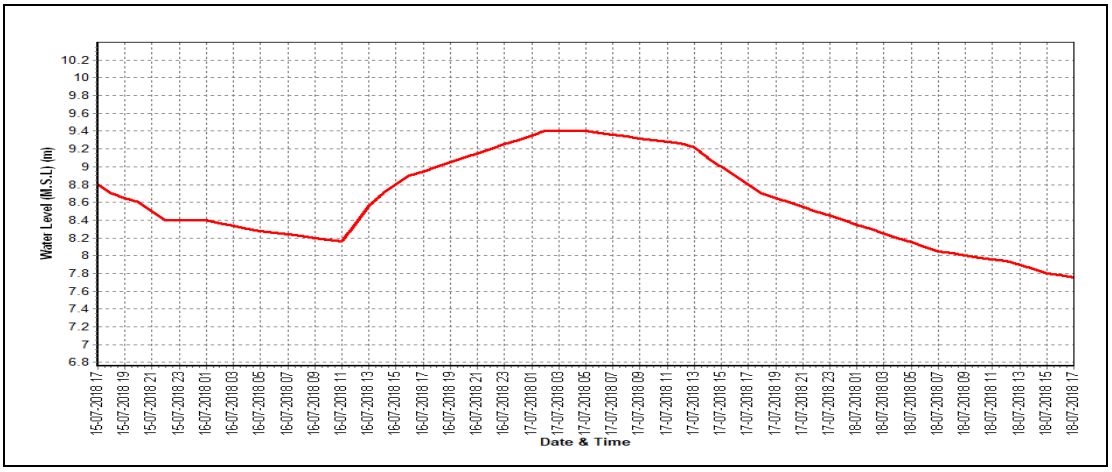
Station Name: Dhadar at Pingalwada
Local River: Pingalwada

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

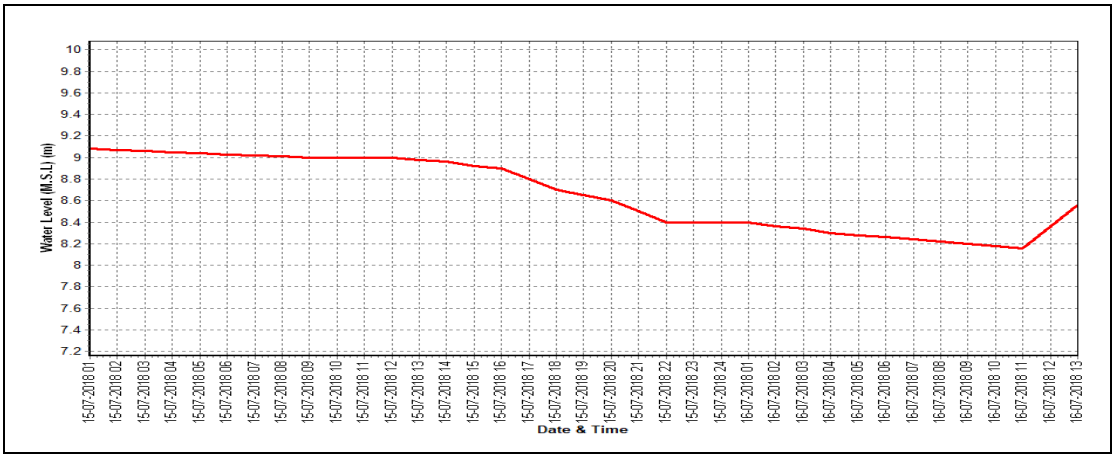
Water level vs. Time graph of I flood peak during the year 2018-19



Water level vs. Time graph of II flood peak during the year 2018-19



Water level vs. Time graph of III flood peak during the year 2018-19



4.6 Damanganga Basin

4.6.1 Wagh Basin

4.6.1.1 History Sheet

HISTORY SHEET

			Water Year	**:**	**2018-19**
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	87.200	29/08/2011	0.000	81.260	02/12/2011
2012-2013	1365	85.950	11/09/2012	0.000	81.140	01/06/2012
2013-2014	577.1	85.550	12/07/2013	0.000	81.300	01/06/2013
2014-2015	1267.0	87.100	31/07/2014	5.363	81.450	09/07/2014
2015-2016	251.7	84.000	28/07/2015	9.730	81.735	15/06/2015
2016-2017	1440	87.775	02/08/2016	0.000	81.210	01/06/2016
2017-2018	1140	87.070	15/07/2017	0.000	81.280	01/06/2017
2018-2019	1593	87.925	16/07/2018	0.000	81.410	01/11/2018

4.6.2.2 Annual Maximum Flood Peak

Year	Annual Maximum flood Peaks (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
2013	86.950	01/08/2013	11:00:00
2014	88.450	30/07/2014	20:00:00
2015	84.300	28/07/2015	18:00:00
2016	91.900	02/0/2016	19:00:00
2017	89.200	23/07/2017	21:00:00
2018	88.200	16/07/2018	12:00:00

4.6.1.3 Summary of Data

Stage Discharge Data for The period 2018-19

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	81.270	0.690 *	81.550	6.390 *	82.700	91.37	82.425	44.14	81.590	6.668	81.410	0.000
2	81.270	0.690 *	81.540	6.090 *	82.690	89.26	82.370	53.46 *	81.570	7.000 *	81.400	0.000
3	81.270	0.690 *	81.540	6.090 *	82.670	85.89	82.310	48.53 *	81.550	6.445	81.400	0.000
4	81.270	0.690 *	81.870	19.49 *	82.650	84.96	82.250	42.29	81.550	6.190	81.400	0.000
5	81.260	0.590 *	82.780	93.25 *	82.670	81.54 *	82.190	40.39	81.590	7.733	81.390	0.000
6	81.260	0.590 *	82.750	89.98 *	82.640	83.92	82.150	39.24	81.560	7.278	81.390	0.000
7	81.260	0.590 *	84.180	307.6 *	82.610	79.74	82.120	40.68	81.550	6.390 *	81.390	0.000
8	81.250	0.500 *	86.100	792.9 *	82.500	55.19	82.080	37.88	81.540	6.823	81.390	0.000
9	81.250	0.500 *	84.730	424.3 *	82.420	44.23	82.050	29.85 *	81.530	6.730	81.390	0.000
10	81.250	0.500 *	83.810	239.4 *	82.390	41.60	82.000	32.72	81.520	6.500	81.390	0.000
11	81.250	0.500 *	84.600	395.1 *	82.450	50.45	81.930	36.13	81.520	6.260	81.380	0.000
12	81.250	0.500 *	83.550	196.3 *	82.720	86.77 *	81.875	35.71	81.520	5.673	81.380	0.000
13	81.240	0.420 *	83.770	232.5 *	82.700	93.48	81.810	16.51 *	81.520	4.403	81.380	0.000
14	81.240	0.420 *	84.280	297.1	82.740	94.48	81.780	15.11 #	81.510	5.240 *	81.380	0.000
15	81.240	0.420 *	84.270	325.5 *	82.720	86.77 *	81.740	26.85	81.500	4.098	81.370	0.000
16	81.240	0.420 *	87.925	1593	82.700	88.98	81.760	14.21 *	81.500	3.783	81.370	0.000
17	81.240	0.420 *	87.330	1172	83.100	139.0	81.790	29.23	81.490	3.608	81.370	0.000
18	81.240	0.420 *	86.175	773.1	83.400	175.2	81.770	27.31	81.490	3.703	81.370	0.000
19	81.240	0.420 *	84.955	382.5	83.250	151.8 *	81.760	25.40	81.480	4.450 *	81.370	0.000
20	81.240	0.420 *	84.800	339.4	83.200	155.0	81.750	19.71	81.480	3.498	81.360	0.000

21	81.240	0.420	*	86.560	910.0		83.160	154.4		81.750	13.77	*	81.470	4.200	*	81.360	0.000
22	81.240	0.420	*	85.820	708.6	*	83.700	220.7	*	81.740	16.26		81.460	3.365		81.360	0.000
23	81.240	0.420	*	84.960	382.2		83.620	198.5		81.740	13.34	*	81.460	3.268		81.360	0.000
24	81.420	3.050	*	84.640	311.7		83.180	143.8		81.730	13.11		81.450	3.248		81.350	0.000
25	81.680	10.88	*	84.100	267.4		83.010	130.0		81.720	11.29		81.440	3.123		81.350	0.000
26	82.380	54.30	*	83.200	139.7		83.000	119.0	*	81.710	9.698		81.440	3.108		81.350	0.000
27	82.650	79.49	*	82.980	116.9		82.990	128.4		81.690	8.448		81.430	2.915		81.350	0.000
28	81.760	14.21	*	82.800	99.65		83.100	135.0		81.680	7.977		81.430	3.270	*	81.350	0.000
29	81.480	4.450	*	82.750	89.98	*	82.830	106.6		81.650	7.628		81.420	2.720		81.350	0.000
30	81.220	0.270	*	82.720	94.09		82.450	50.55		81.620	8.660	*	81.420	2.695		81.340	0.000
31				82.710	87.68		82.430	50.54					81.410	2.493			
Ten-Daily Mean																	
I Ten-Daily	81.261	0.603		83.085	198.6		82.594	73.77		82.195	40.92		81.555	6.776		81.395	0.000
II Ten-Daily	81.242	0.436		85.165	570.7		82.898	112.2		81.797	24.62		81.501	4.472		81.373	0.000
III Ten-Daily	81.631	16.79		83.931	291.6		83.043	130.7		81.703	11.02		81.439	3.128		81.352	0.000
Monthly																	
Min.	81.220	0.270		81.540	6.090		82.390	41.60		81.620	7.628		81.410	2.493		81.340	0.000
Max.	82.650	79.49		87.925	1593		83.700	220.7		82.425	53.46		81.590	7.733		81.410	0.000
Mean	81.378	5.943		84.056	351.6		82.851	106.4		81.898	25.52		81.496	4.738		81.373	0.000

Annual Runoff in MCM = 11321 **Annual Runoff in mm 2064**

Peak Observed Discharge = 1593 cumecs on 16/07/2018 Corres. Water Level :87.925 m

Lowest Observed Discharge = 0.000 cumecs on 01/11/2018 Corres. Water Level :81.410 m

Note: River remained in pooling/ no flow condition w.e.f. 01/11/2018 to 31/05/18. Shortage of staff from 01/06/18 to 13/07/18 & Discarded discharge on 14/09/18.

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 2017-18

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	81.340	0.000	81.400	0.000	81.330	0.000	81.240	0.000	81.180	0.000	81.140	0.000
2	81.340	0.000	81.400	0.000	81.330	0.000	81.240	0.000	81.180	0.000	81.140	0.000
3	81.340	0.000	81.400	0.000	81.330	0.000	81.230	0.000	81.180	0.000	81.140	0.000
4	81.340	0.000	81.390	0.000	81.320	0.000	81.230	0.000	81.170	0.000	81.140	0.000
5	81.330	0.000	81.390	0.000	81.320	0.000	81.230	0.000	81.170	0.000	81.140	0.000
6	81.330	0.000	81.390	0.000	81.320	0.000	81.220	0.000	81.170	0.000	81.130	0.000
7	81.330	0.000	81.390	0.000	81.310	0.000	81.220	0.000	81.170	0.000	81.130	0.000
8	81.330	0.000	81.390	0.000	81.300	0.000	81.220	0.000	81.170	0.000	81.130	0.000
9	81.330	0.000	81.390	0.000	81.300	0.000	81.220	0.000	81.170	0.000	81.130	0.000
10	81.330	0.000	81.390	0.000	81.300	0.000	81.220	0.000	81.170	0.000	81.130	0.000
11	81.330	0.000	81.390	0.000	81.290	0.000	81.220	0.000	81.160	0.000	81.130	0.000
12	81.330	0.000	81.390	0.000	81.290	0.000	81.210	0.000	81.160	0.000	81.130	0.000
13	81.330	0.000	81.390	0.000	81.290	0.000	81.210	0.000	81.160	0.000	81.120	0.000
14	81.320	0.000	81.390	0.000	81.280	0.000	81.210	0.000	81.160	0.000	81.120	0.000
15	81.320	0.000	81.390	0.000	81.280	0.000	81.210	0.000	81.160	0.000	81.120	0.000
16	81.320	0.000	81.390	0.000	81.280	0.000	81.210	0.000	81.160	0.000	81.120	0.000
17	81.320	0.000	81.390	0.000	81.280	0.000	81.210	0.000	81.160	0.000	81.120	0.000
18	81.320	0.000	81.390	0.000	81.270	0.000	81.210	0.000	81.160	0.000	81.120	0.000
19	81.320	0.000	81.380	0.000	81.270	0.000	81.200	0.000	81.160	0.000	81.120	0.000
20	81.320	0.000	81.380	0.000	81.260	0.000	81.200	0.000	81.150	0.000	81.120	0.000

21	81.310	0.000	81.370	0.000	81.260	0.000	81.200	0.000	81.150	0.000	81.120	0.000
22	81.400	0.000	81.370	0.000	81.250	0.000	81.200	0.000	81.150	0.000	81.110	0.000
23	81.400	0.000	81.370	0.000	81.250	0.000	81.200	0.000	81.150	0.000	81.110	0.000
24	81.400	0.000	81.360	0.000	81.250	0.000	81.200	0.000	81.150	0.000	81.100	0.000
25	81.400	0.000	81.350	0.000	81.240	0.000	81.190	0.000	81.150	0.000	81.100	0.000
26	81.400	0.000	81.350	0.000	81.240	0.000	81.190	0.000	81.150	0.000	81.100	0.000
27	81.400	0.000	81.350	0.000	81.240	0.000	81.190	0.000	81.150	0.000	81.100	0.000
28	81.400	0.000	81.340	0.000	81.240	0.000	81.190	0.000	81.140	0.000	81.100	0.000
29	81.400	0.000	81.340	0.000			81.180	0.000	81.140	0.000	81.090	0.000
30	81.400	0.000	81.340	0.000			81.180	0.000	81.140	0.000	81.090	0.000
31	81.400	0.000	81.330	0.000			81.180	0.000			81.090	0.000
Ten-Daily Mean												
I Ten-Daily	81.334	0.000	81.393	0.000	81.316	0.000	81.227	0.000	81.173	0.000	81.135	0.000
II Ten-Daily	81.323	0.000	81.388	0.000	81.279	0.000	81.209	0.000	81.159	0.000	81.122	0.000
III Ten-Daily	81.392	0.000	81.352	0.000	81.246	0.000	81.191	0.000	81.147	0.000	81.101	0.000
Monthly												
Min.	81.310	0.000	81.330	0.000	81.240	0.000	81.180	0.000	81.140	0.000	81.090	0.000
Max.	81.400	0.000	81.400	0.000	81.330	0.000	81.240	0.000	81.180	0.000	81.140	0.000
Mean	81.351	0.000	81.377	0.000	81.283	0.000	81.208	0.000	81.160	0.000	81.119	0.000

Peak Computed Discharge = 792.9 cumecs on 08/07/2018 Corres. Water Level :86.100 m

Lowest Computed Discharge = 0.270 cumecs on 30/06/2018 Corres. Water Level :81.220 m

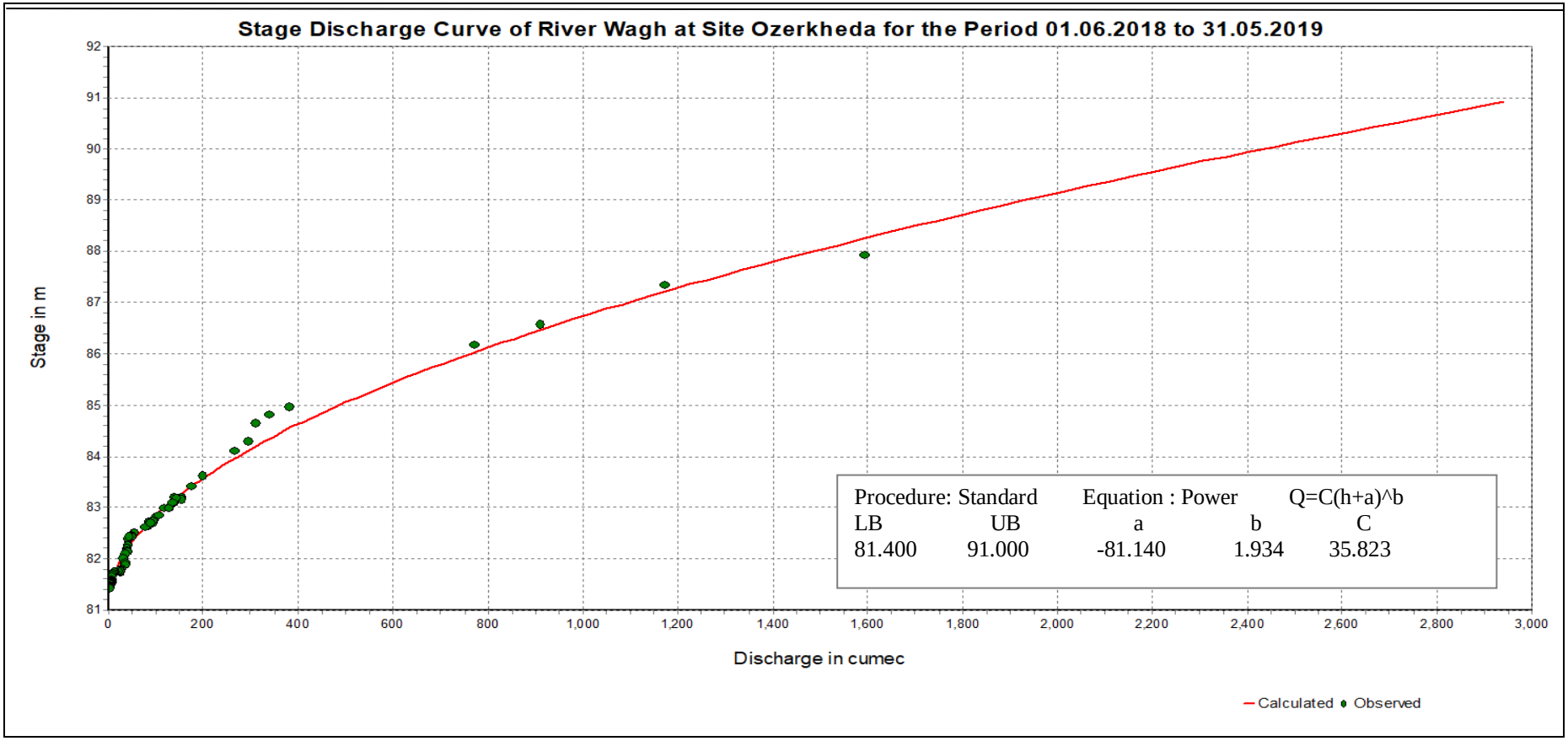
Note: River remained in pooling/ no flow condition w.e.f. 01/11/2018 to 31/05/18. Shortage of staff from 01/06/18 to 13/07/18 & Discarded discharge on 14/09/18.

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)

4.6.1.4 Stage Discharge Curve

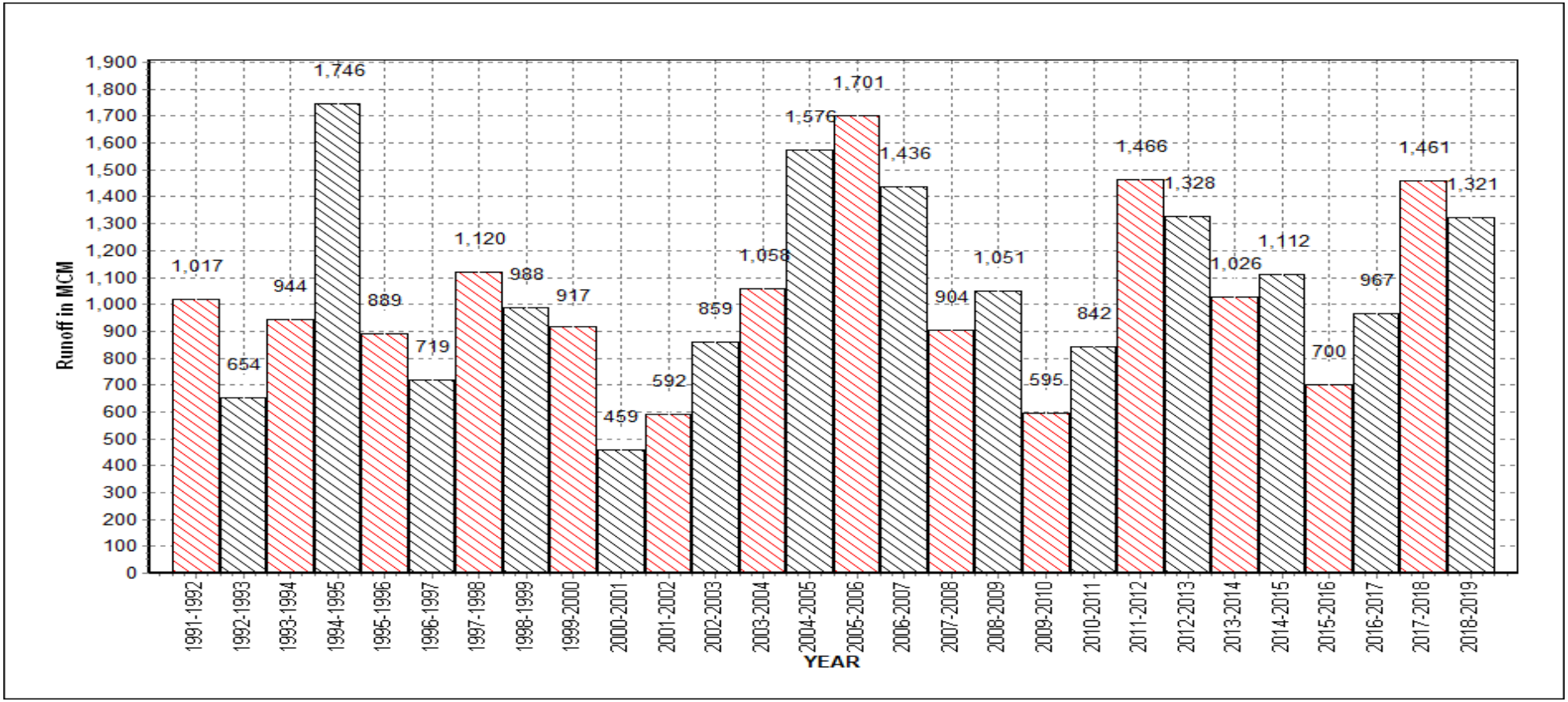
Station Name: Wagh at Ozerkheda (01 02 24 002) Division: Tapi Division, Surat Local River: Wagh Sub -Division: DGSD, CWC, Silvasssa



4.6.1.5 Annual Runoff

Annual Runoff Values Runoff Based on period 1991-2019

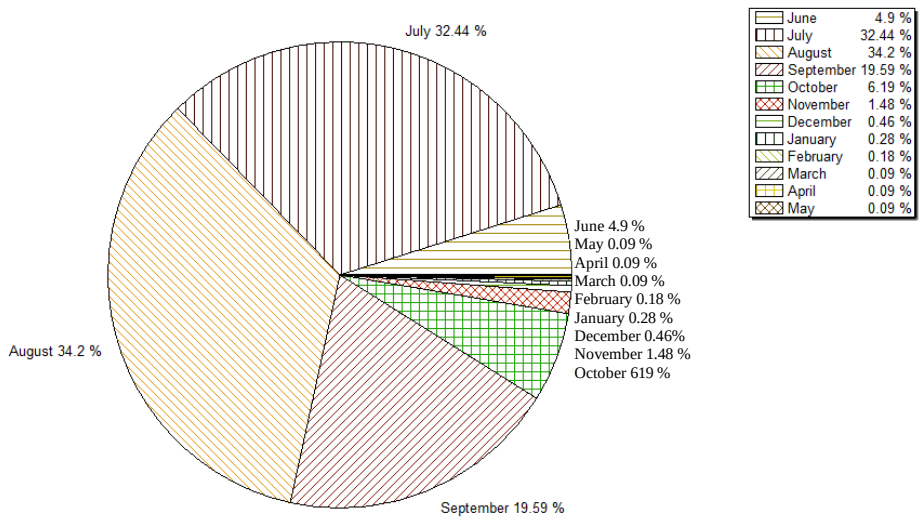
Station Name: Wagh at Ozerkheda (01 02 24 002) Division: Tapi Division, Surat Local River: Wagh Sub -Division: DGSD, CWC, Silvasssa



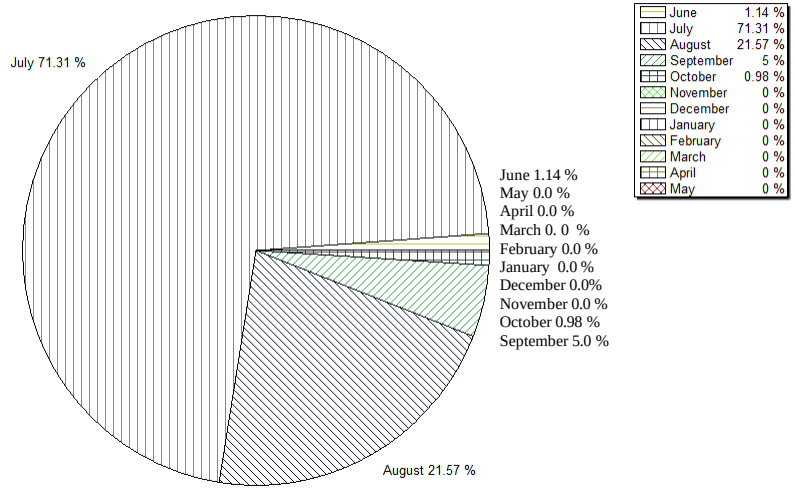
4.6.1.6 Monthly Average Runoff

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 1991-2018

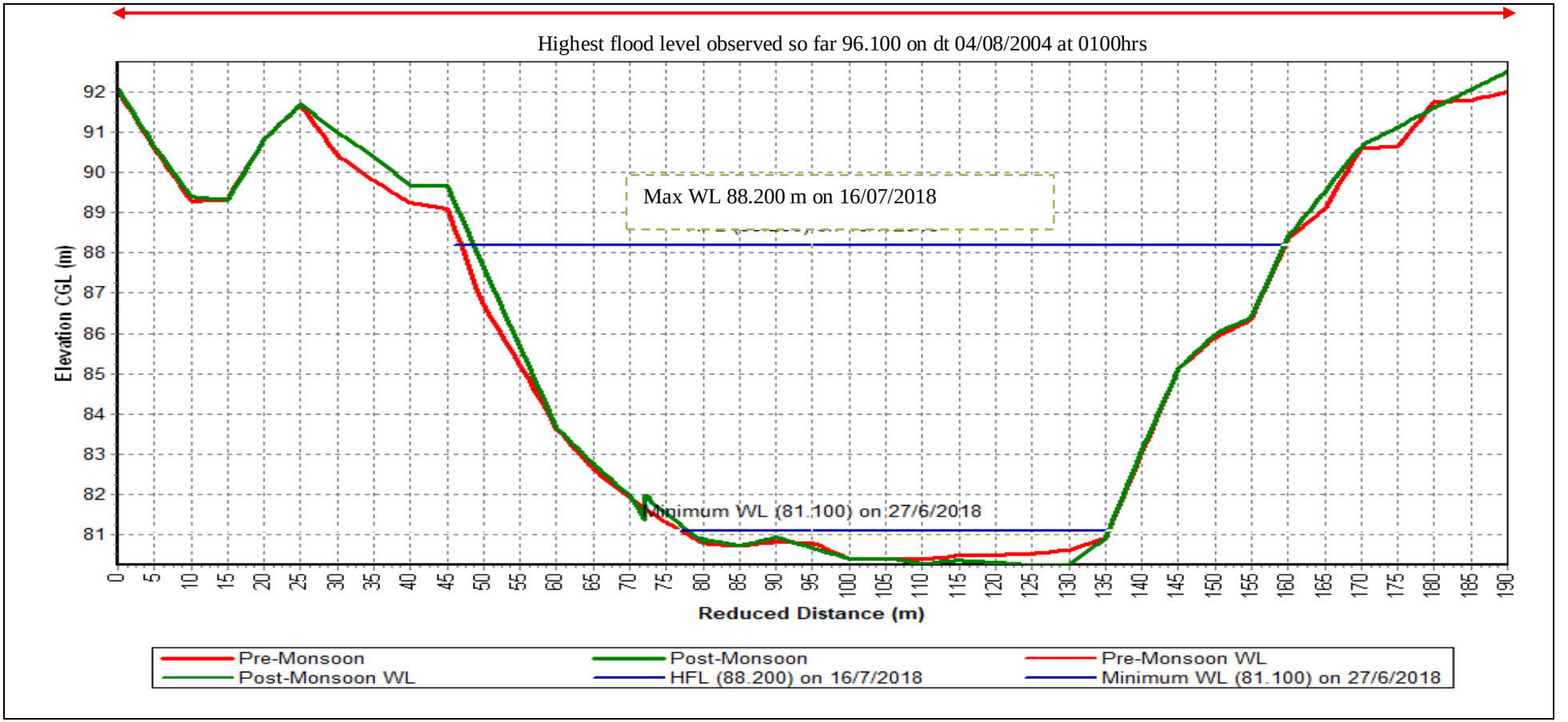


Monthly Average Runoff Based on period 2018-19



4.6.1.7 Superimposed cross section

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

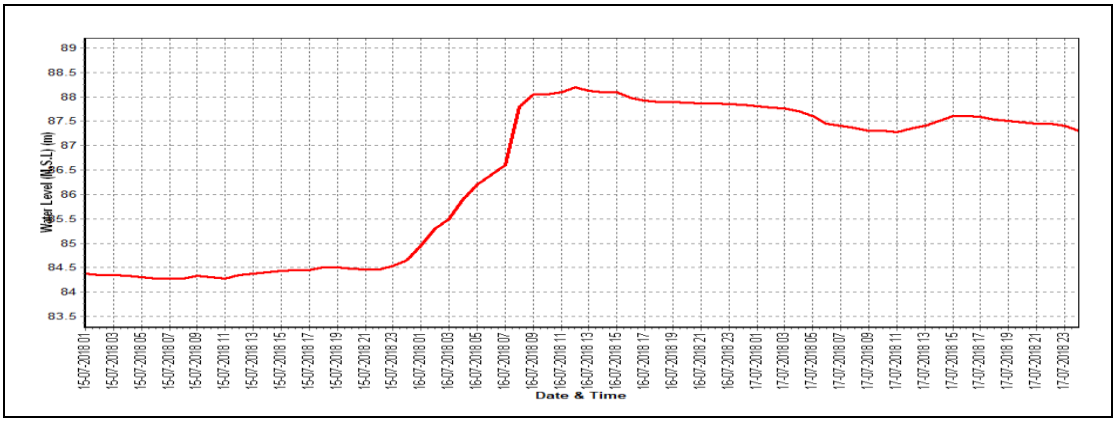


4. 6.1.8 Water Level vs. Time- Graph of Highest Flood Peaks during 2018-19

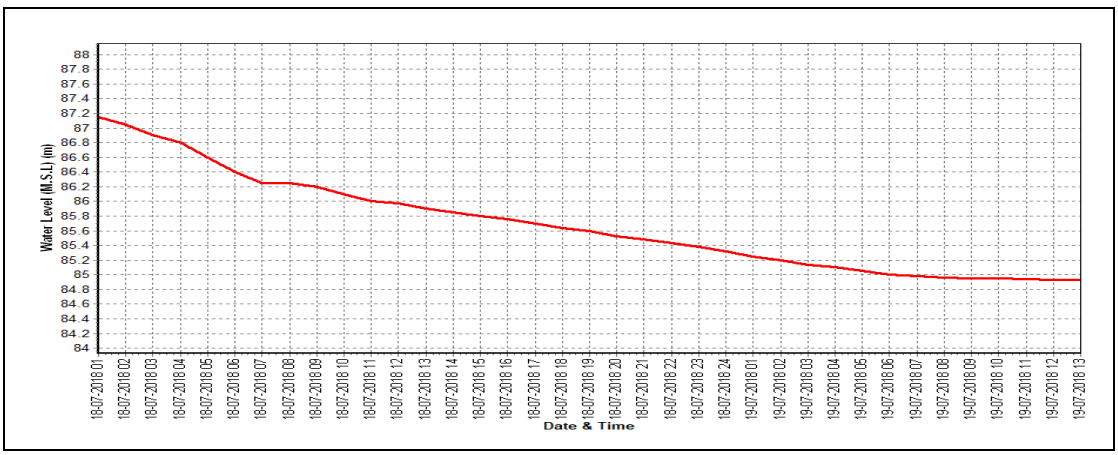
Station Name: Wagh at Ozerkheda
Local River: Wagh

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

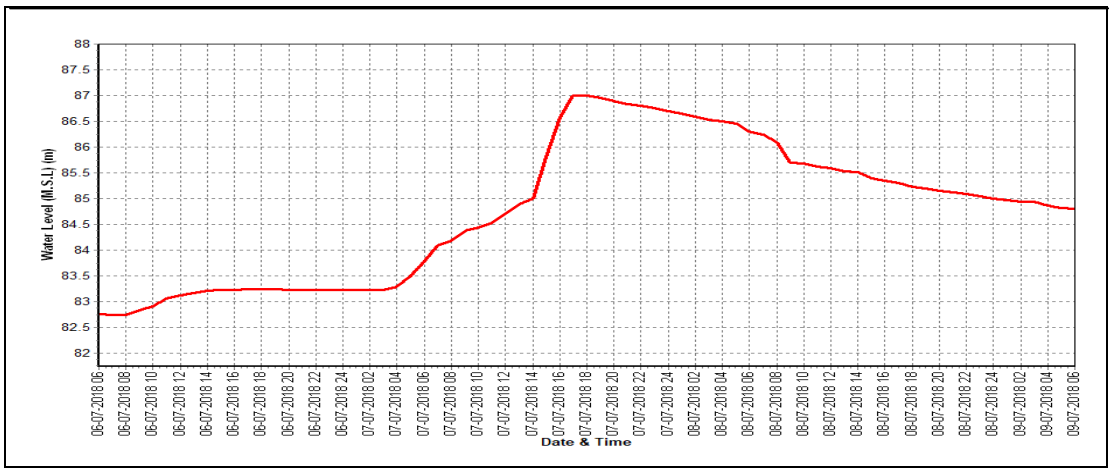
Water level vs. Time graph of I flood peak during the year 2018-19



Water level vs. Time graph of II flood peak during the year 2018-19



Water level vs. Time graph of III flood peak during the year 2018-19



4.6.2 Damanganga Basin

4.6.2.1 History sheet

History Sheet

			Water Year	**:**	**2018-19**
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
2013-2014	416.8	99.750	24/09/2013	0.000	96.400	01/06/2013
2014-2015	450.3	99.850	30/07/2014	0.000	96.460	01/06/2014
2015-2016	269.1	99.000	29/07/2015	0.000	96.400	01/06/2015
2016-2017	558.8	100.300	02/08/2016	0.000	96.370	01/06/2016
2017-2018	815.4	101.400	14/07/2017	0.000	96.410	01/06/2017
2018-2019	1026.0	102.300	17/07/2018	0.000	96.620	11/11/2018

4.6.2.2 Annual Maximum Flood Peak

Year	Annual Maximum flood Peak (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
2013	100.740	23/07/2013	24:00:00
2014	102.800	30/07/2014	17:00:00
2015	99.300	28/07/2015	16:00:00
2016	103.740	10/07/2016	20:00:00
2017	102.420	28/07/2017	15:00:00
2018	102.870	16/07/2018	13:00:00

4.6.2.3 Summary of Data

Stage Discharge Data for the period 2018-19

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	96.370	0.000 *	96.740	2.040 *	97.700	73.52	97.680	63.19	97.280	19.94	96.740	1.815
2	96.370	0.000 *	96.740	2.040 *	97.640	72.86	97.730	58.23 *	97.230	21.19 *	96.740	1.747
3	96.360	0.000 *	96.730	1.850 *	97.560	58.62	97.670	52.91 *	97.260	19.58	96.720	1.661
4	96.360	0.000 *	96.760	2.460 *	97.610	64.66	97.660	59.10	97.320	20.64	96.720	1.670 *
5	96.360	0.000 *	96.860	5.020 *	98.240	112.5 *	97.680	60.51	97.280	20.63	96.690	1.507
6	96.360	0.000 *	97.300	25.36 *	98.030	105.2	97.640	52.12	97.160	19.35	96.670	1.264
7	96.360	0.000 *	97.770	61.90 *	97.960	92.70	97.600	51.69	97.110	14.84 *	96.670	0.880 *
8	96.360	0.000 *	97.700	55.54 *	97.600	51.40	97.550	44.14	97.080	14.39	96.660	1.009
9	96.360	0.000 *	97.670	52.91 *	97.570	49.91	97.540	42.20 *	97.060	13.96	96.640	0.946
10	96.360	0.000 *	97.660	52.05 *	97.620	58.46	97.520	43.82	97.050	7.391	96.620	0.852
11	96.360	0.000 *	98.540	151.9 *	97.670	67.76	97.500	43.69	97.030	6.613	96.620	0.000
12	96.350	0.000 *	98.400	132.8 *	97.720	57.33 *	97.490	43.05	96.960	5.147	96.610	0.000
13	96.350	0.000 *	98.900	253.0	97.930	83.92	97.370	29.87 *	96.920	4.737	96.610	0.000
14	96.350	0.000 *	99.480	323.4	97.940	84.48 *	97.320	21.56	96.870	5.320 *	96.610	0.000
15	96.350	0.000 *	99.870	388.2 *	97.890	73.52 *	97.300	21.41	96.840	4.152	96.590	0.000
16	96.350	0.000 *	101.400	773.9	97.860	82.88	97.340	27.90 *	96.830	3.868	96.580	0.000
17	96.350	0.000 *	102.300	1026	98.240	114.5	97.380	24.70	96.800	3.833	96.570	0.000
18	96.350	0.000 *	101.360	701.2	99.870	390.8	97.360	24.52	96.790	2.920	96.560	0.000
19	96.340	0.000 *	100.410	520.6	99.240	263.9 *	97.350	21.31	96.780	2.900 *	96.560	0.000
20	96.340	0.000 *	99.470	306.8 #	98.820	184.9	97.340	21.10	96.780	2.791	96.560	0.000

21	96.340	0.000	*	100.500	622.7		98.790	178.7		97.370	29.87	*	96.770	2.670	*	96.560	0.000
22	96.340	0.000	*	100.200	461.9	*	99.250	265.7	*	97.370	25.39		96.770	2.637		96.560	0.000
23	96.340	0.000	*	99.750	385.1		98.780	177.3		97.320	26.62	*	96.770	2.462		96.550	0.000
24	96.330	0.000	*	99.270	309.2		98.480	146.4		97.300	21.36		96.770	2.639		96.550	0.000
25	96.460	0.000	*	98.920	234.9		98.210	104.5		97.270	21.31		96.760	2.361		96.550	0.000
26	96.860	5.020	*	98.760	204.7		97.980	82.83	*	97.250	9.831		96.760	2.351		96.550	0.000
27	96.850	4.720	*	98.560	194.6		98.010	97.12		97.220	9.741		96.760	2.289		96.550	0.000
28	96.800	3.380	*	97.980	95.72		97.910	80.14		97.200	9.383		96.760	2.460	*	96.550	0.000
29	96.750	2.250	*	97.860	70.53	*	97.810	71.06		97.360	23.77		96.750	2.091		96.550	0.000
30	96.750	2.250	*	97.790	82.25		97.730	63.98		97.420	33.30	*	96.750	1.962		96.540	0.000
31				97.750	74.15		97.700	63.82					96.750	1.883			
Ten-Daily Mean																	
I Ten-Daily	96.362	0.000		97.193	26.12		97.753	73.99		97.627	52.79		97.183	17.19		96.687	1.335
II Ten-Daily	96.349	0.000		100.013	457.8		98.318	140.4		97.375	27.91		96.860	4.228		96.587	0.000
III Ten-Daily	96.582	1.762		98.849	248.7		98.241	121.1		97.308	21.06		96.761	2.346		96.551	0.000
Monthly																	
Min.	96.330	0.000		96.730	1.850		97.560	49.91		97.200	9.383		96.750	1.883		96.540	0.000
Max.	96.860	5.020		102.300	1026		99.870	390.8		97.730	63.19		97.320	21.19		96.740	1.815
Mean	96.431	0.587		98.690	244.3		98.108	112.1		97.437	33.92		96.929	7.742		96.608	0.445

Annual Runoff in MCM = 1066 **Annual Runoff in mm = 1395**

Peak Observed Discharge = 1026 cumecs on 17/07/2018 Corres. Water Level :102.300 m

Lowest Observed Discharge = 0.000 cumecs on 11/08/2018 Corres. Water Level : 96.620 m

Note: River remained in pooling/ no flow condition w.e.f. 11/11/2018 to 31/05/2019, Shortage of staff from 01/06/2018 to 12/07/2018 & discharge discarded on 20/07/2018.

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 2018-19

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	96.540	0.000	96.570	0.000	96.540	0.000	96.510	0.000	96.480	0.000	96.460	0.000
2	96.540	0.000	96.570	0.000	96.540	0.000	96.510	0.000	96.480	0.000	96.460	0.000
3	96.540	0.000	96.570	0.000	96.540	0.000	96.510	0.000	96.480	0.000	96.460	0.000
4	96.540	0.000	96.570	0.000	96.530	0.000	96.510	0.000	96.480	0.000	96.460	0.000
5	96.540	0.000	96.570	0.000	96.530	0.000	96.510	0.000	96.480	0.000	96.450	0.000
6	96.530	0.000	96.570	0.000	96.530	0.000	96.510	0.000	96.480	0.000	96.450	0.000
7	96.530	0.000	96.560	0.000	96.530	0.000	96.510	0.000	96.480	0.000	96.450	0.000
8	96.530	0.000	96.560	0.000	96.530	0.000	96.510	0.000	96.480	0.000	96.450	0.000
9	96.530	0.000	96.560	0.000	96.530	0.000	96.510	0.000	96.480	0.000	96.450	0.000
10	96.530	0.000	96.560	0.000	96.530	0.000	96.510	0.000	96.470	0.000	96.450	0.000
11	96.530	0.000	96.560	0.000	96.530	0.000	96.500	0.000	96.470	0.000	96.450	0.000
12	96.530	0.000	96.560	0.000	96.520	0.000	96.500	0.000	96.470	0.000	96.440	0.000
13	96.530	0.000	96.560	0.000	96.520	0.000	96.500	0.000	96.470	0.000	96.440	0.000
14	96.520	0.000	96.560	0.000	96.520	0.000	96.500	0.000	96.470	0.000	96.440	0.000
15	96.520	0.000	96.550	0.000	96.520	0.000	96.500	0.000	96.470	0.000	96.430	0.000
16	96.520	0.000	96.550	0.000	96.520	0.000	96.500	0.000	96.470	0.000	96.430	0.000
17	96.520	0.000	96.550	0.000	96.520	0.000	96.500	0.000	96.470	0.000	96.430	0.000
18	96.520	0.000	96.550	0.000	96.520	0.000	96.500	0.000	96.470	0.000	96.430	0.000
19	96.520	0.000	96.550	0.000	96.520	0.000	96.490	0.000	96.470	0.000	96.430	0.000
20	96.520	0.000	96.550	0.000	96.520	0.000	96.490	0.000	96.470	0.000	96.430	0.000

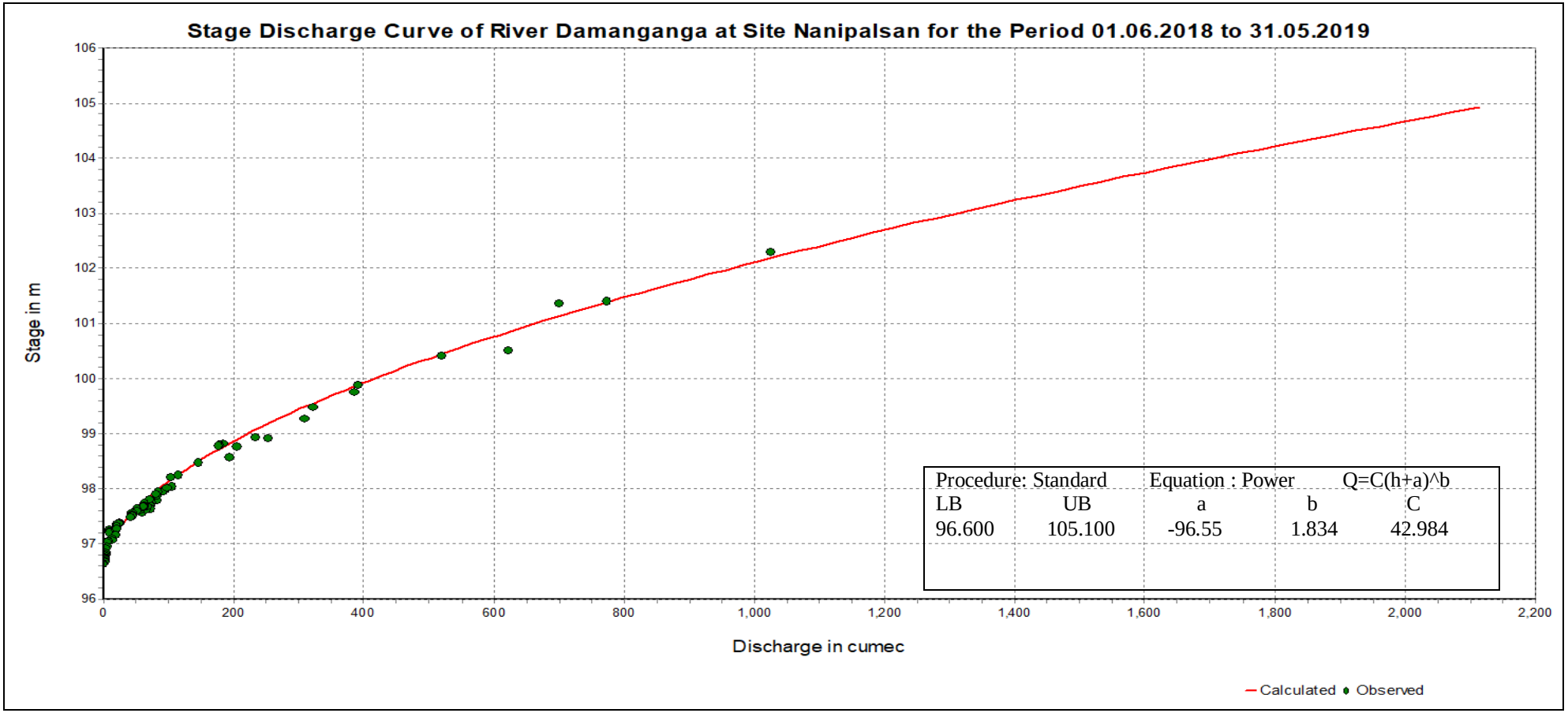
21	96.510	0.000	96.550	0.000	96.520	0.000	96.490	0.000	96.470	0.000	96.430	0.000
22	96.580	0.000	96.550	0.000	96.520	0.000	96.490	0.000	96.470	0.000	96.430	0.000
23	96.580	0.000	96.550	0.000	96.520	0.000	96.490	0.000	96.460	0.000	96.430	0.000
24	96.580	0.000	96.540	0.000	96.520	0.000	96.490	0.000	96.460	0.000	96.420	0.000
25	96.580	0.000	96.540	0.000	96.520	0.000	96.490	0.000	96.460	0.000	96.420	0.000
26	96.580	0.000	96.540	0.000	96.510	0.000	96.490	0.000	96.460	0.000	96.420	0.000
27	96.580	0.000	96.540	0.000	96.510	0.000	96.490	0.000	96.460	0.000	96.420	0.000
28	96.580	0.000	96.540	0.000	96.510	0.000	96.490	0.000	96.460	0.000	96.420	0.000
29	96.580	0.000	96.540	0.000			96.490	0.000	96.460	0.000	96.420	0.000
30	96.570	0.000	96.540	0.000			96.480	0.000	96.470	0.000	96.420	0.000
31	96.570	0.000	96.540	0.000			96.480	0.000			96.420	0.000
Ten-Daily Mean												
I Ten-Daily	96.535	0.000	96.566	0.000	96.533	0.000	96.510	0.000	96.479	0.000	96.454	0.000
II Ten-Daily	96.523	0.000	96.554	0.000	96.521	0.000	96.498	0.000	96.470	0.000	96.435	0.000
III Ten-Daily	96.572	0.000	96.543	0.000	96.516	0.000	96.488	0.000	96.463	0.000	96.423	0.000
Monthly												
Min.	96.510	0.000	96.540	0.000	96.510	0.000	96.480	0.000	96.460	0.000	96.420	0.000
Max.	96.580	0.000	96.570	0.000	96.540	0.000	96.510	0.000	96.480	0.000	96.460	0.000
Mean	96.544	0.000	96.554	0.000	96.524	0.000	96.498	0.000	96.471	0.000	96.437	0.000

Peak Computed Discharge = 461.9 cumecs on 22/07/2018 **Corres. Water Level :100.200 m**
Lowest Computed Discharge = 0.040 cumecs on 01/06/2018 **Corres. Water Level :96.370 m**

Note: River remained in pooling/ no flow condition w.e.f. 11/11/2018 to 31/05/2019, Shortage of staff from 01/06/2018 to 12/07/2018 & discharge discarded on 20/07/2018.
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)

4.6.2.4 Stage Discharge Curve

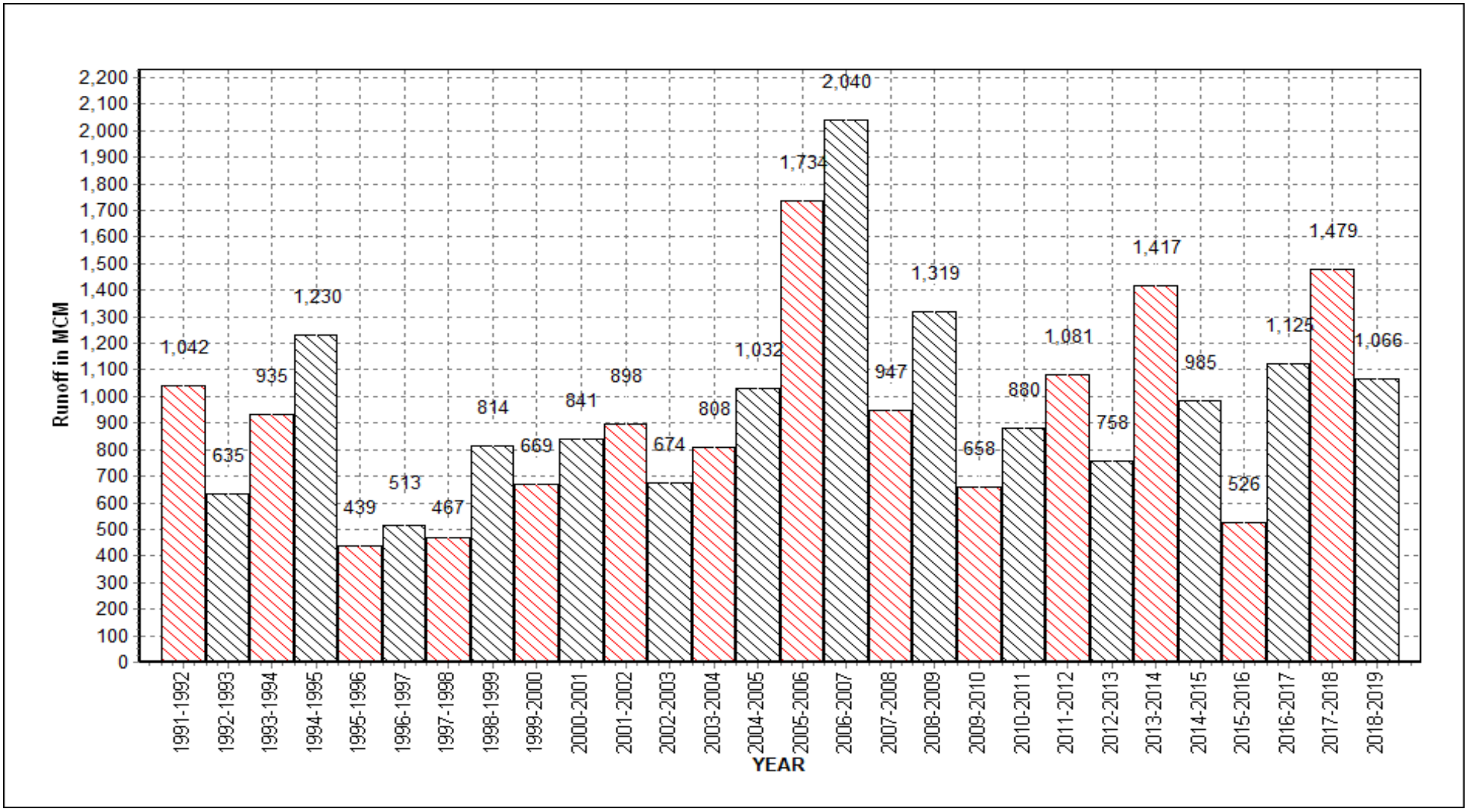
Station Name: Damanganga at Nanipalsan (01 02 24 001) Division : Tapi Division, Surat Local River: Damanganga Sub -Division: DGSD, CWC, Silvassa



4.6.2.5 Annual runoff

Annual Runoff values for the year 1991-2019

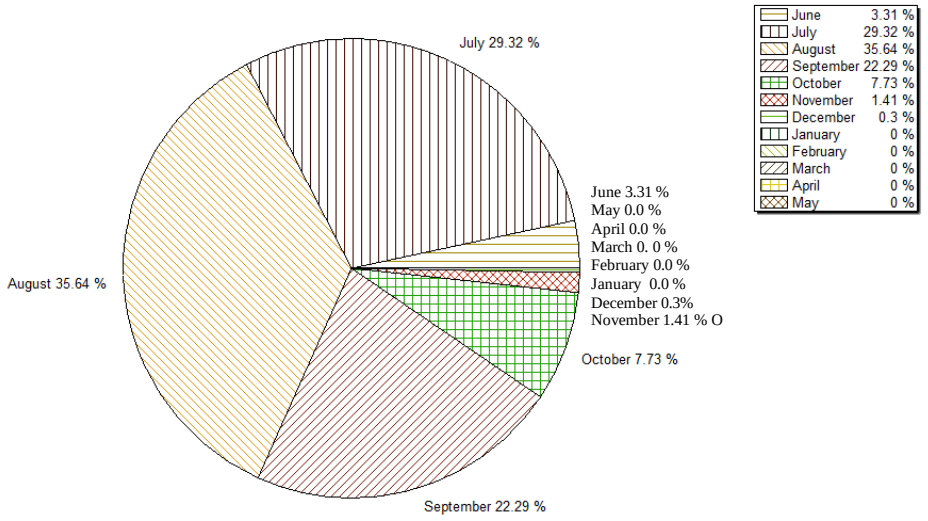
Station Name: Damanganga at Nanipalsan (01 02 24 001) Division : Tapi Division, Surat Local River: Damanganaga Sub -Division : DGSD, CWC, Silvassa



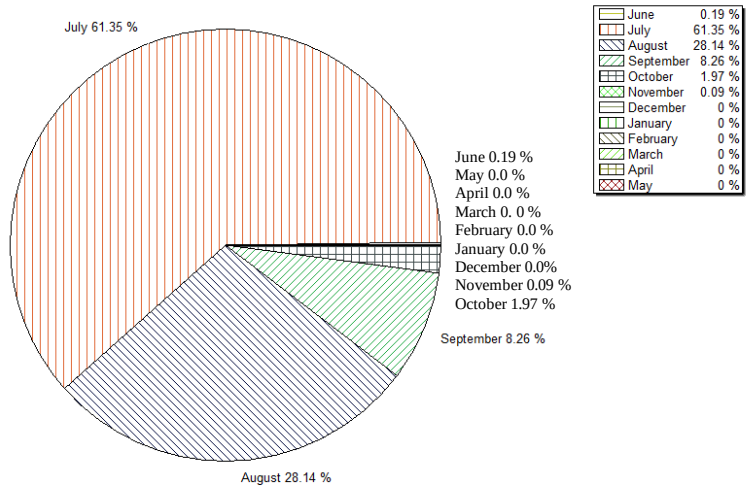
5.6.2.6 Monthly Average Runoff

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 1991-2018

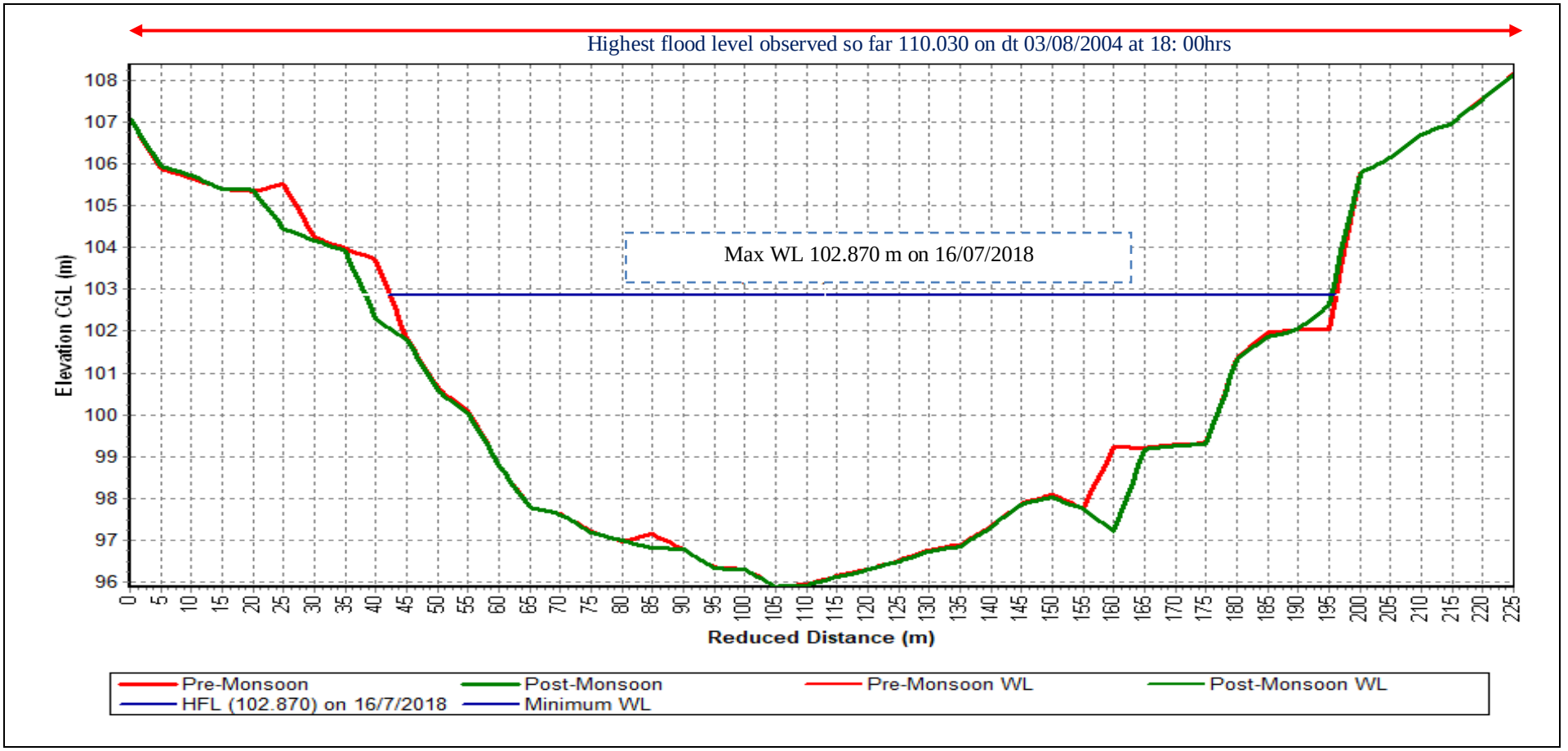


Monthly Average Runoff Based on period 2018-19



4.6.2.7 Superimposed cross section

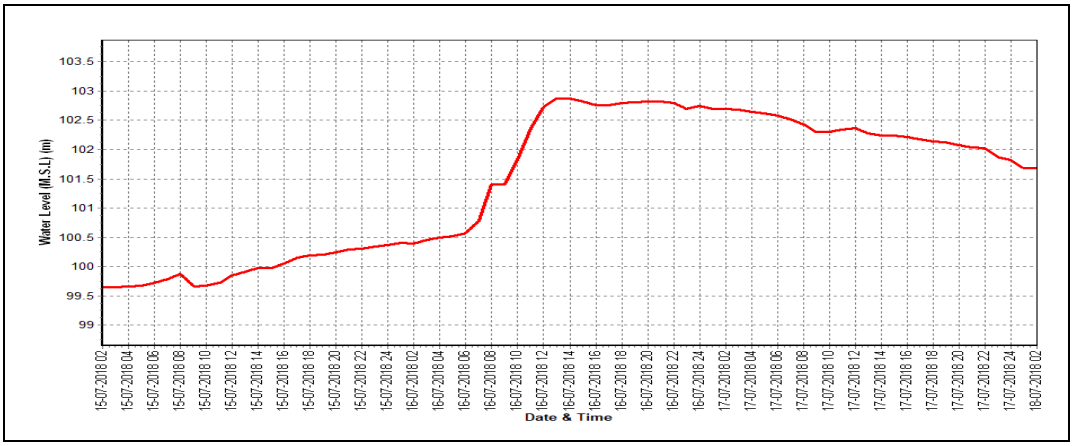
Station Name: Damanganga at Nanipalsan (01 02 24 001) Division : Tapi Division, Surat Local River: Damanganga Sub-Division:DGSD, CWC, Silvasa



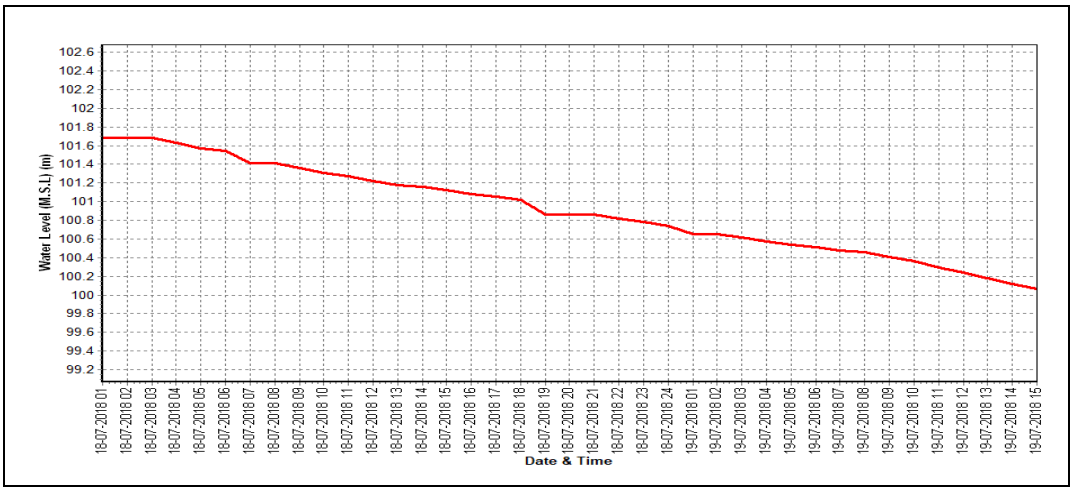
4.6.2.8 Water Level vs. Time- Graph of Highest Flood Peaks during 2018-19

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

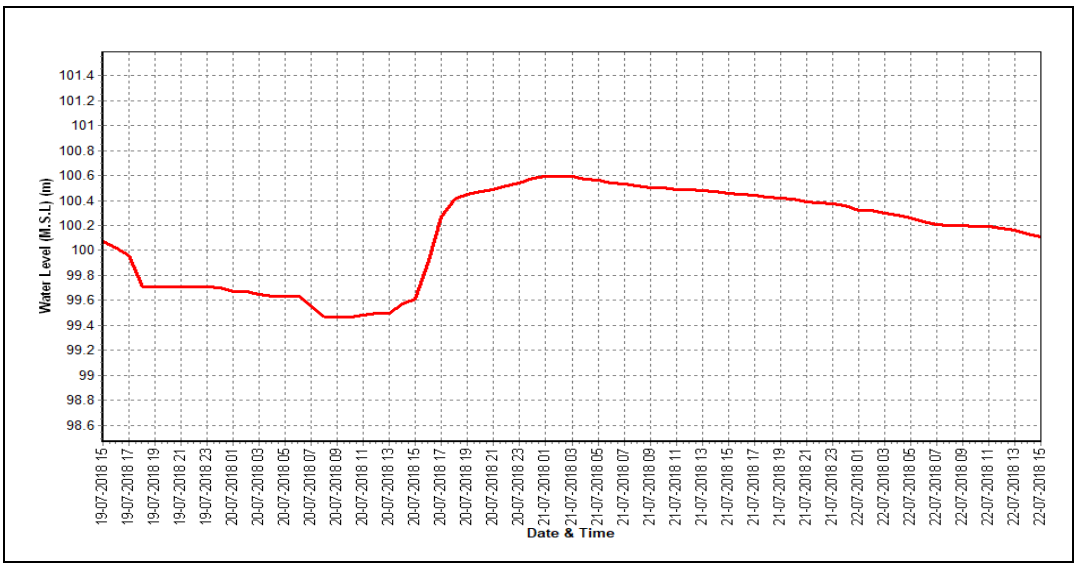
Water level vs. Time graph of I flood peak during the year 2018-19



Water level vs. Time graph of II flood peak during the year 2018-19



Water level vs. Time graph of III flood peak during the year 2018-19



4.7 Kim basin

4.7.1 Kim at Motinaroli

4.7.1.1 History sheet

HISTORY SHEET

			Water Year	**:**	**2018-19**
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	10.140	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	47.64	13.480	04/09/2012	0.000	7.720	07/01/2013
2013-2014	399.3	15.150	23/09/2013	0.000	7.790	09/10/2014
2014-2015	498.0	13.740	01/08/2014	0.000	7.660	02/06/2014
2015-2016	538.4	15.000	28/07/2015	0.000	7.840	21/12/2015
2016-2017	33.46	10.480	19/09/2016	0.000	7.720	07/06/2016
2017-2018	188.1	12.700	28/08/2017	0.000	7.730	11/01/2018
2018-2019	607.4	15.325	21/07/2018	0.000	7.700	10/06/2018

4.7.1.2 Annual Maximum Flood peak

Year	Annual Maximum Flood peak (m)	Date	Hour
1990	7.320	20/11/1990	08:00:00
1991	10.160	01/08/1991	08:00:00
1992	17.660	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
2013	18.710	25/09/2013	22:00:00
2014	14.780	01/08/2014	02:00:00
2015	17.240	21/07/2015	23:00:00
2016	11.700	19/09/2016	16:00:00
2017	13.910	25/06/2017	01:00:00
2018	15.420	21/07/2018	15:00:00

4.7.1.3 Summary of data

Stage Discharge Data for the period 2018-19

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	7.880	2.359	7.800	0.000	9.300	25.20 #	8.760	13.47	8.310	7.090	8.180	5.693
2	7.890	2.380	7.700	0.000	9.200	22.57 #	8.780	13.36 *	8.240	5.460 *	8.190	5.860
3	7.880	2.330 *	7.700	0.000	9.195	22.44 #	8.800	13.73 *	8.220	5.700	8.190	5.877
4	7.880	6.090	8.850	11.87	9.090	19.88 #	9.080	22.14	8.180	5.120	8.180	4.830 *
5	8.510	6.474	8.870	12.26	9.070	19.41 *	9.090	17.75	8.180	4.976	8.180	5.646
6	8.310	6.188	8.885	12.89	9.080	19.64 #	8.850	14.72	8.150	4.957	8.170	4.640
7	8.180	5.526	8.860	12.59	9.090	19.88 #	8.750	13.77	8.120	4.240 *	8.170	4.730 *
8	7.900	1.213	8.855	11.92	8.580	8.816	8.700	12.10	8.150	4.747	8.160	4.371
9	7.800	1.223	8.860	11.38	8.400	8.627	8.690	11.75 *	8.120	3.020	8.140	4.088
10	7.700	0.000	8.570	10.68	8.300	8.235	8.650	11.82	8.150	4.637	8.140	4.149
11	7.700	0.000	8.875	12.32	8.250	8.081	8.630	10.45	8.160	4.648	7.850	2.140 *
12	7.700	0.000	10.200	0.000	8.200	5.030 *	8.610	9.910	8.150	4.639	7.800	1.381
13	7.700	0.000	9.100	0.000	8.300	8.440	8.600	10.26 *	8.130	4.582	7.790	0.000
14	7.700	0.000	9.450	0.000	8.260	8.175	8.560	8.690	8.250	5.570 *	7.790	0.000
15	7.690	0.000	9.430	0.000	8.200	5.030 *	8.590	10.37	8.340	7.373	7.800	0.000
16	7.690	0.000	12.650	0.000	8.200	7.403	8.560	9.640 *	8.370	8.508	7.820	0.000
17	7.690	0.000	12.700	0.000	8.400	8.639	8.530	11.26	8.390	8.674	7.810	0.000
18	7.690	0.000	11.800	0.000	9.300	25.20 *	8.500	10.76	8.380	7.976	7.810	0.000
19	7.700	0.000	9.200	22.57 #	9.400	28.00 *	8.480	10.03	8.380	7.948	7.800	0.000
20	7.700	0.000	9.180	22.07 #	9.000	17.83 *	8.450	9.390	8.390	8.625	7.810	0.000

21	7.700	0.000	15.325	607.4		8.785	10.93		8.440	7.900	*	8.400	7.370	*	7.810	0.000
22	7.700	0.000	14.100	410.6	*	10.050	50.68	*	8.450	9.370		8.420	8.671		7.800	0.000
23	7.680	0.000	9.400	28.00	#	9.200	22.57	*	8.480	8.460	*	8.360	7.553		7.800	0.000
24	7.680	0.000	9.100	20.11	#	9.150	25.07		8.470	9.890		8.360	7.460		7.800	0.000
25	7.680	0.000	9.620	34.79	#	9.020	19.03		8.440	9.260		8.350	7.304		7.810	0.000
26	8.840	12.15	8.900	15.70	#	8.900	15.70	*	8.460	9.690		8.140	4.497		7.800	0.000
27	8.800	12.10	9.750	39.22	#	8.870	12.72		8.430	9.010		8.200	6.012		7.810	0.000
28	8.180	5.916	9.400	28.00	#	8.860	14.49	#	8.420	8.960		8.240	5.460	*	7.820	0.000
29	8.100	5.665	9.500	30.97	*	8.770	13.97		8.390	8.480		8.200	5.992		7.820	0.000
30	7.900	0.000	9.300	25.20	#	8.820	15.81		8.370	6.990	*	8.210	6.072		7.820	0.000
31			9.400	28.00	#	8.875	16.71					8.190	5.883			
Ten-Daily Mean																
I Ten-Daily	7.993	3.378	8.495	8.359		8.931	17.47		8.815	14.46		8.182	4.995		8.170	4.988
II Ten-Daily	7.696	0.000	10.259	5.696		8.551	12.18		8.551	10.08		8.294	6.854		7.808	0.352
III Ten-Daily	8.026	3.584	10.345	115.3		9.027	19.79		8.435	8.801		8.279	6.570		7.809	0.000
Monthly																
Min.	7.680	0.000	7.700	0.000		8.200	5.030		8.370	6.990		8.120	3.020		7.790	0.000
Max.	8.840	12.15	15.325	607.4		10.050	50.68		9.090	22.14		8.420	8.674		8.190	5.877
Mean	7.905	2.321	9.720	45.44		8.842	16.59		8.600	11.11		8.253	6.154		7.929	1.78

Annual Runoff in MCM = 243 Annual Runoff in mm = 303

Peak Observed Discharge = 607.4 cumecs on 21/07/2018 Corres. Water Level :15.325 m

Lowest Observed Discharge = 0.000 cumecs on 10/06/2018 Corres. Water Level : 7.700 m

Note: River remained in pooling/ no flow condition w.e.f. 10/06/18 to 25/06/18, 30/06/2018 to 03/07/2018, 12/07/18 to 18/07/18, 13/11/18 to 11/12/18, 27/12/18 to 06/03/19 & 25/03/2019 to 05/05/2019; Shortage of staff from 12/17/18 to 18/07/18 from 18/08/18 to 23/08/18, discharge discarded on 19/07/18, 20/07/18, from 23/07/18 to 31/07/18 , from 01/08/18 to 07/08/18 & on 28/10/18.

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 2018-19

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	7.820	0.000	7.690	0.000	7.690	0.000	7.700	0.000	7.650	0.000	7.700	0.000
2	7.810	0.000	7.690	0.000	7.690	0.000	7.650	0.000	7.650	0.000	7.800	0.000
3	7.810	0.000	7.700	0.000	7.690	0.000 *	7.650	0.000	7.650	0.000	7.800	0.000
4	7.790	0.000	7.700	0.000	7.690	0.000 *	7.660	0.000	7.650	0.000	7.820	0.000
5	7.790	0.000	7.690	0.000	7.700	0.000 *	7.850	0.000	7.650	0.000	7.850	0.000
6	7.790	0.000	7.690	0.000	7.700	0.000 *	8.000	0.000	7.660	0.000	8.100	3.692
7	7.800	0.000	7.960	0.000	7.690	0.000 *	8.200	3.734 *	7.680	0.000	8.100	3.688
8	7.810	0.000	7.700	0.000	7.680	0.000 *	8.220	4.002 *	7.700	0.000	8.090	3.578
9	7.800	0.000	7.700	0.000	7.680	0.000 *	8.215	3.962	7.700	0.000	8.100	3.557
10	7.820	0.000	7.680	0.000	7.690	0.000 *	8.210	5.140 *	7.690	0.000	8.120	3.719
11	7.820	0.000	7.680	0.000	7.700	0.000 *	8.230	4.120	7.680	0.000	8.100	3.522
12	8.180	5.614	7.680	0.000	7.680	0.000 *	8.240	4.184	7.690	0.000	8.090	3.970 *
13	8.200	5.911	7.690	0.000	7.710	0.000 *	8.340	4.493	7.700	0.000	8.090	3.513
14	8.390	8.536	7.690	0.000	7.700	0.000 *	8.230	4.194	7.700	0.000	8.100	3.540
15	8.300	6.830	7.700	0.000	7.700	0.000 *	8.220	3.642	7.700	0.000	8.200	3.815
16	8.300	6.140 *	7.700	0.000	7.680	0.000 *	8.250	4.328	7.680	0.000	8.220	4.061
17	8.300	6.910	7.680	0.000	7.700	0.000 *	8.330	6.490 *	7.680	0.000	8.200	3.809
18	8.330	7.205	7.690	0.000	7.680	0.000 *	8.330	4.375	7.680	0.000	8.210	5.140 *
19	8.300	6.853	7.690	0.000	7.710	0.000 *	8.300	4.220	7.690	0.000	8.250	5.570 *
20	8.320	6.991	7.680	0.000	7.720	0.000 *	8.300	4.184	7.700	0.000	8.230	4.132

21	8.300	6.908	7.690	0.000	7.700	0.000 *	8.290	6.020 *	7.700	0.000	8.220	3.806
22	8.250	6.828	7.700	0.000	7.690	0.000 *	8.280	4.084	7.700	0.000	8.230	4.319
23	8.240	5.460 *	7.680	0.000	7.670	0.000 *	8.330	4.398	7.690	0.000	7.980	0.000
24	8.250	6.756	7.690	0.000	7.680	0.000 *	8.320	4.300 *	7.690	0.000	7.970	0.000
25	8.240	5.460 *	7.700	0.000	7.690	0.000 *	7.980	0.000	7.640	0.000	7.980	0.000
26	8.220	6.263	7.700	0.000	7.700	0.000 *	7.930	0.000	7.640	0.000	7.850	0.000
27	7.810	0.000	7.690	0.000	7.700	0.000 *	7.900	0.000	7.640	0.000	7.830	0.000
28	7.820	0.000	7.700	0.000	7.680	0.000 *	7.800	0.000	7.640	0.000	7.800	0.000
29	7.800	0.000	7.700	0.000			7.700	0.000	7.630	0.000	7.790	0.000
30	7.700	0.000	7.700	0.000			7.680	0.000	7.690	0.000	7.780	0.000
31	7.700	0.000	7.700	0.000			7.680	0.000			7.750	0.000
Ten-Daily Mean												
I Ten-Daily	7.804	0.000	7.720	0.000	7.690	0.000	7.936	1.684	7.668	0.000	7.948	1.823
II Ten-Daily	8.244	6.099	7.688	0.000	7.698	0.000	8.277	4.423	7.690	0.000	8.169	4.107
III Ten-Daily	8.030	3.425	7.695	0.000	7.689	0.000	7.990	1.709	7.666	0.000	7.925	0.739
Monthly												
Min.	7.700	0.000	7.680	0.000	7.670	0.000	7.650	0.000	7.630	0.000	7.700	0.000
Max.	8.390	8.536	7.960	0.000	7.720	0.000	8.340	6.490	7.700	0.000	8.250	5.570
Mean	8.026	3.183	7.701	0.000	7.693	0.000	8.065	2.576	7.675	0.000	8.011	2.175

Peak Computed Discharge = 410.6 cumecs on 22/07/2018 Corres. Water Level :14.100 m
Lowest Computed Discharge = 0.000 cumecs on 03/02/2019 Corres. Water Level : 7.690 m

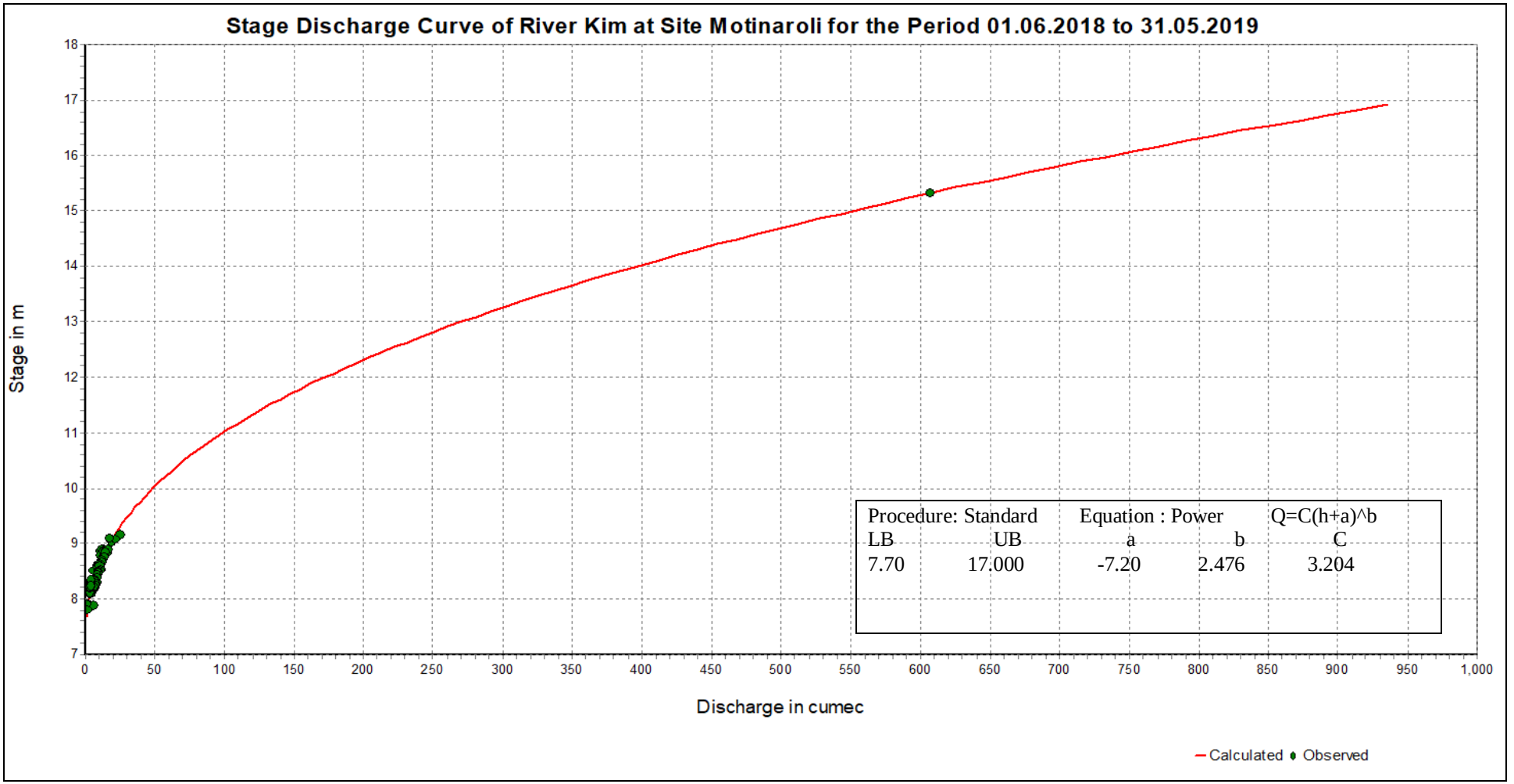
Note: River remained in pooling/ no flow condition w.e.f. 10/06/18 to 25/06/18, 30/06/2018 to 03/07/2018, 12/07/18 to 18/07/18, 13/11/18 to 11/12/18, 27/12/18 to 06/03/19 & 25/03/2019 to 05/05/2019; Shortage of staff from 12/17/18 to 18/07/18 from 18/08/18 to 23/08/18, discharge discarded on 19/07/18, 20/07/18, from 23/07/18 to 31/07/18 , from 01/08/18 to 07/08/18 & on 28/10/18.

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)

4.7.1.4 Stage Discharge Curve

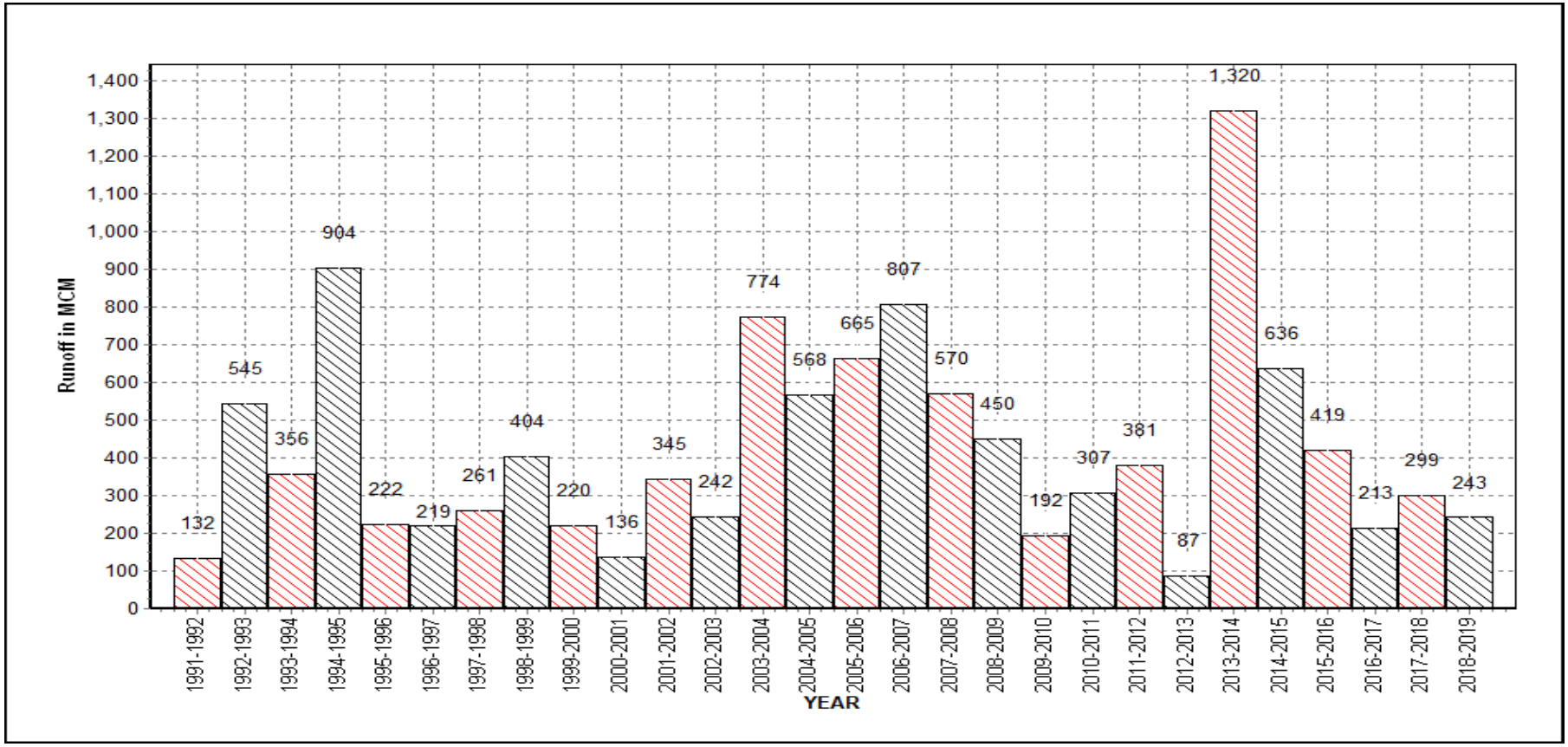
Station Name: Kim at Motinaroli (01 02 16 001) Division : Tapi Division, Surat Local River: Kim Sub -Division : LNSD, CWC, Bharuch



4.7.1.5 Annual runoff

Annual Runoff values for the period 1991-2019

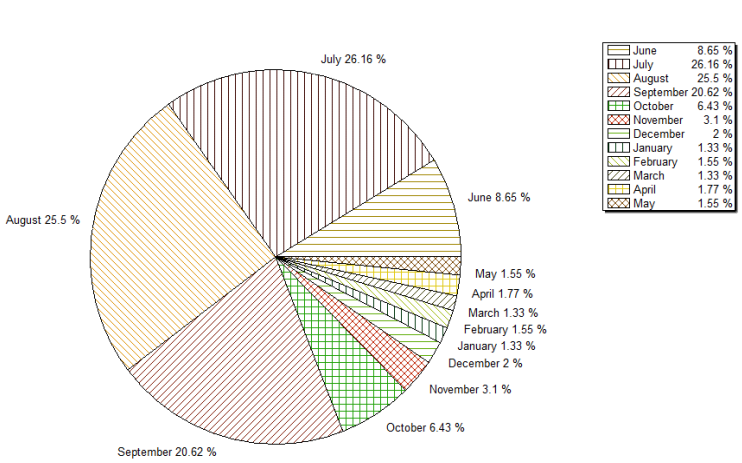
Station Name: Kim at Motinaroli (01 02 16 001) Division: Tapi Division, Surat Local River: Kim Sub -Division: LNSD, CWC, Bharuch



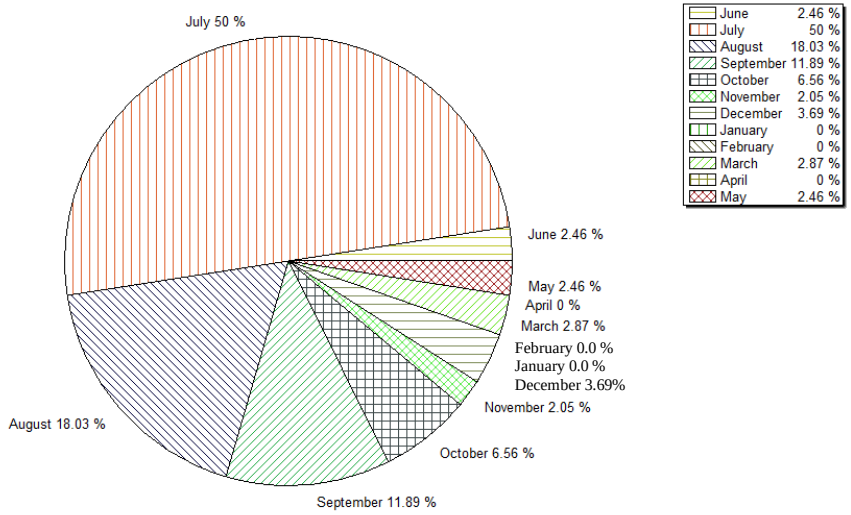
4.7.1.6 Monthly average Runoff

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 1991-2018

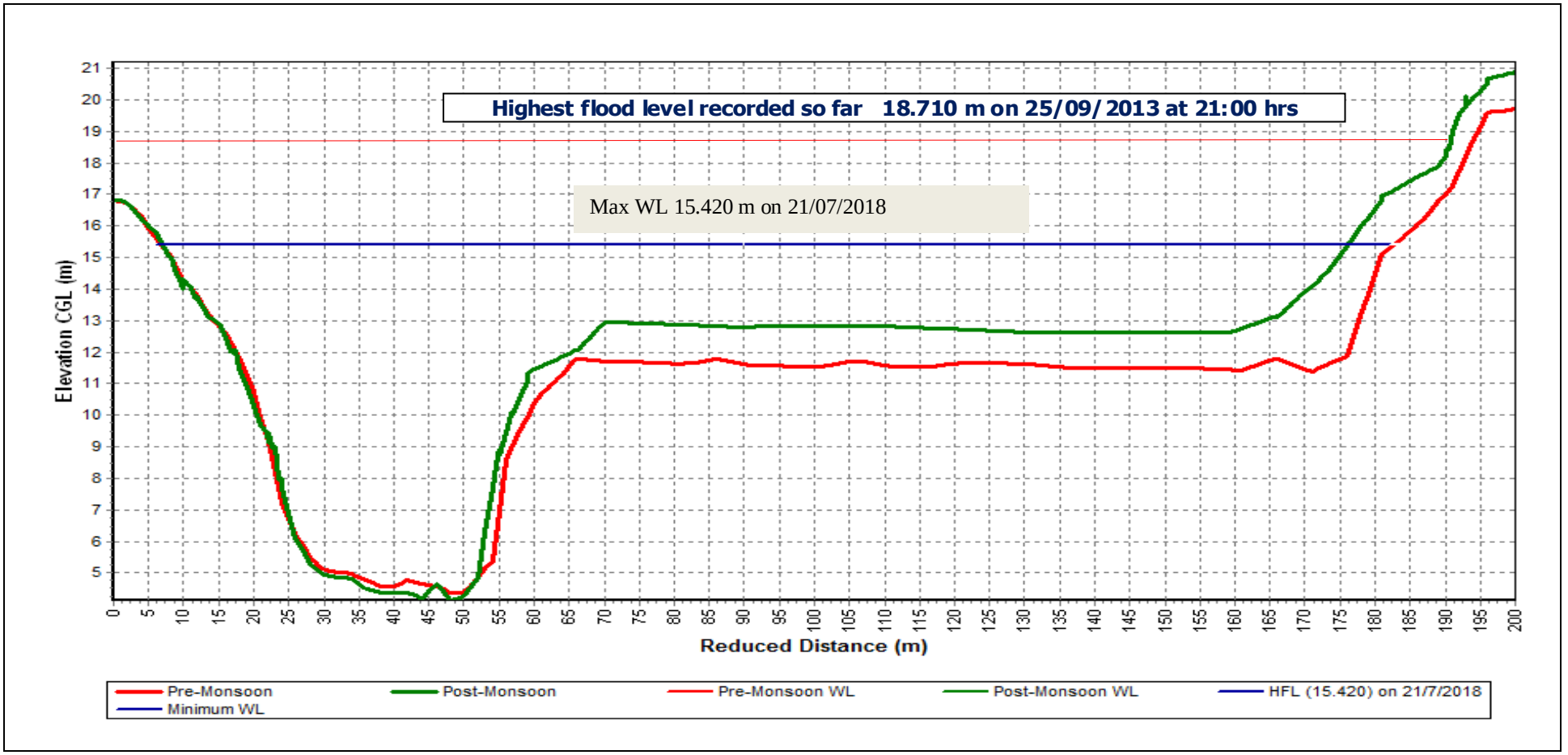


Monthly Average Runoff on period 2018-19



4.7.1.7 Superimposed cross section

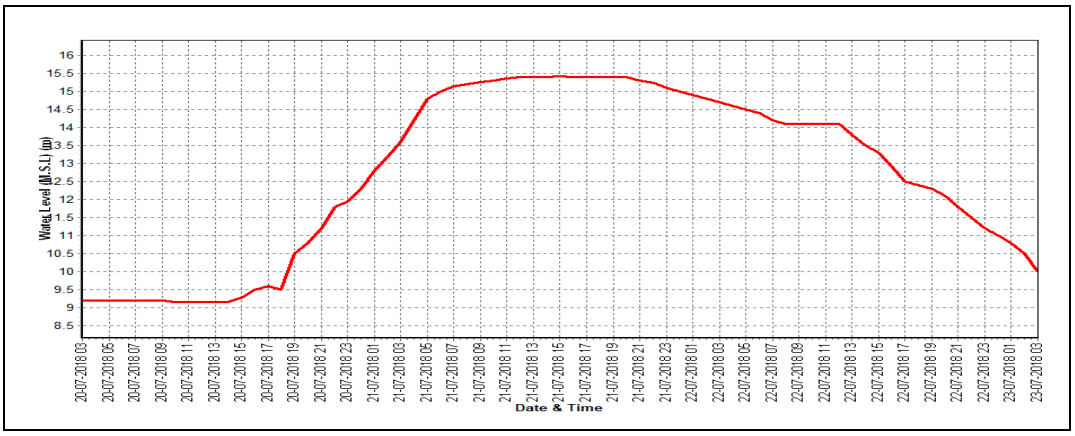
Station Name: Kim at Motinaroli (01 02 16 001) Division : Tapi Division, Surat Local River: Kim Sub -Division : LNSD, CWC, Bharuch



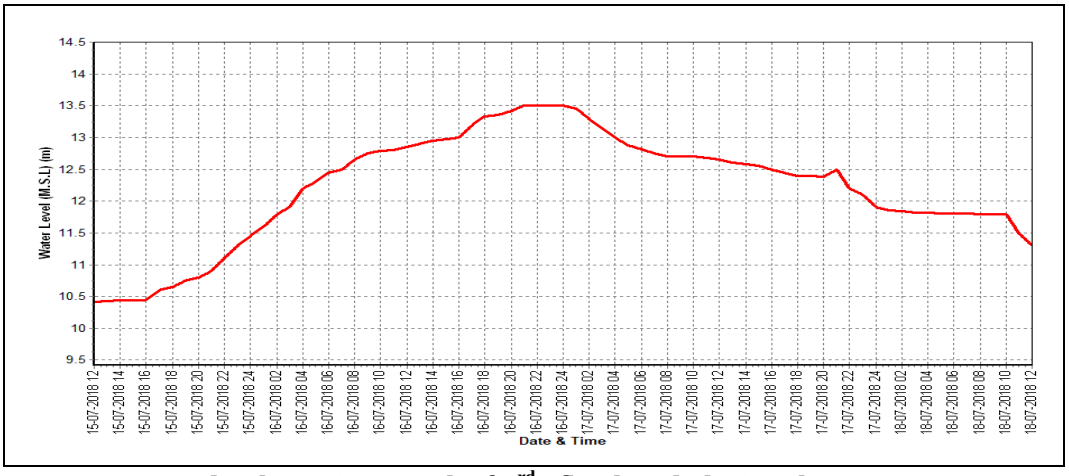
4.7.1.8 Water Level vs. Time Graph of highest flood peaks during 2018-19

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 2018-19



Water level vs. Time graph of 2nd flood peak during the year 2018-19



Water level vs. Time graph of 3rd flood peak during the year 2018-19