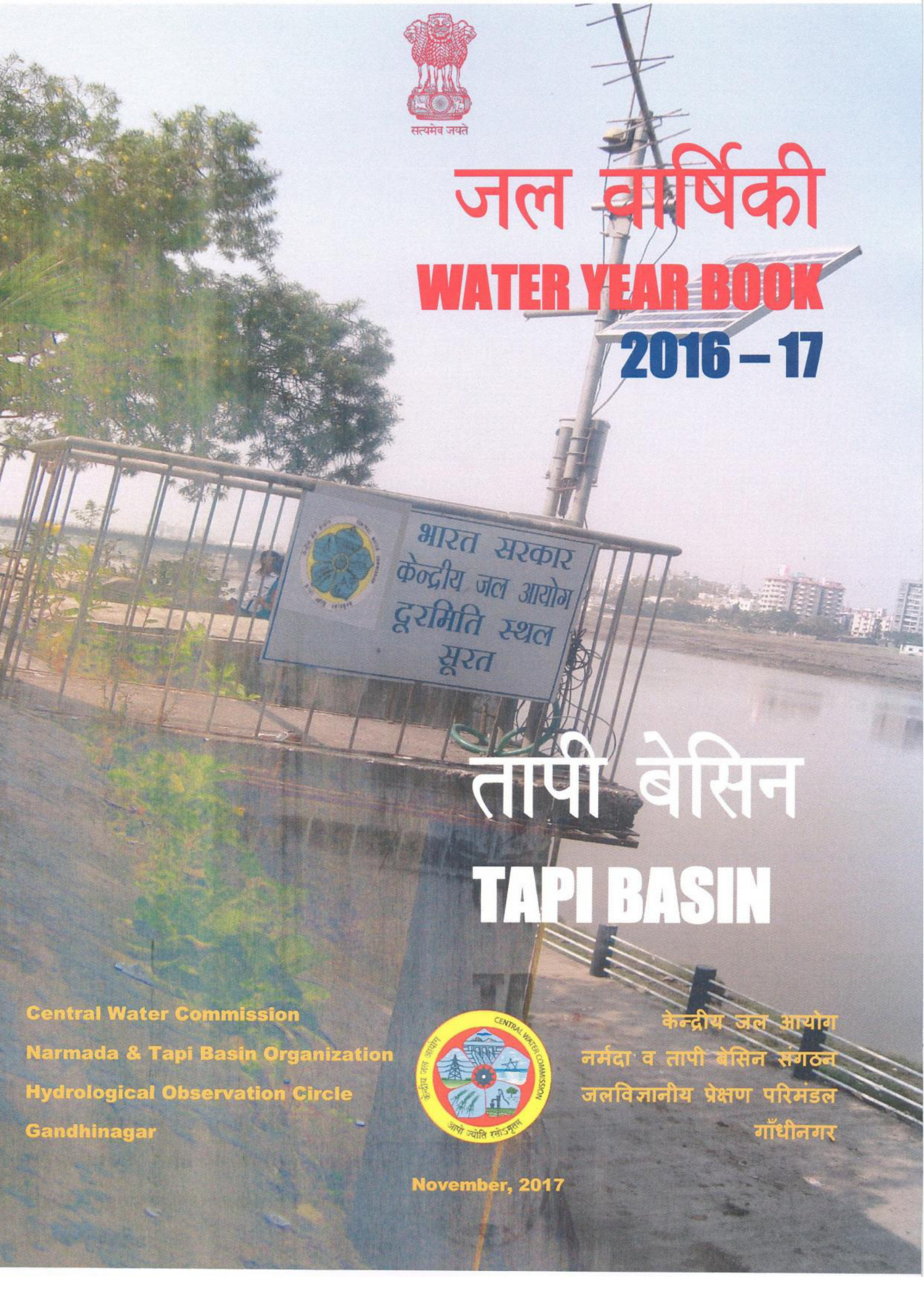

सत्यमेव जयते

जल वार्षिकी
WATER YEAR BOOK
2016 – 17

तापी बेसिन
TAPI BASIN

Central Water Commission
Narmada & Tapi Basin Organization
Hydrological Observation Circle
Gandhinagar

केन्द्रीय जल आयोग
नर्मदा व तापी बेसिन संगठन
जलविज्ञानीय प्रेक्षण परिमंडल
गाँधीनगर

November, 2017

आमुख

राष्ट्रीय जल नीति में मानकीकृत राष्ट्रीय सूचना प्रणाली डेटा वेस और डेटा वैंकों के एक नेटवर्क के साथ गुणवत्ता के आँकड़े उपलब्ध कराने और प्रसंस्करण क्षमताओं में सुधार के लिए मौजूदा केन्द्रीय और राज्य स्तरीय ऐजेन्सियों के एकीकरण की आवश्यकता पर वल दिया गया है। जल के वहु -उपयोगी स्वरूप एवं उसकी वढती मांग को पूरा करने हेतु संसाधनों के अनुकूलतम नियोजन के संदर्भ में संवंधित आँकड़ों का संकलन अतिमहत्वपूर्ण है।

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

जल विज्ञानीय प्रेक्षण परिमंडल गाँधीनगर, नर्मदा तापी वेसिन संगठन के अन्तर्गत केन्द्रीय जल आयोग की एक क्षेत्रीय ईकाई है जिसके अन्तर्गत गुजरात, मध्य प्रदेश, महाराष्ट्र, राजस्थान, दमन एवं दीव एवं दादरा नगर हवेली (केन्द्र शासित प्रदेश) के भाग से होकर पश्चिम की ओर वहने वाली 17 नदियों के अधिसूचित महत्वपूर्ण स्थलों पर जल के सतही प्रवाह के आँकड़े एकत्रित किए जाते हैं ।

तापी मंडल सूरत द्वारा तापी नदी पर, वर्तमान में 6 स्थलों पर सतही प्रवाह का प्रेक्षण किया जा रहा है। इनके आँकड़े इस वार्षिकी 2016-17 में संकलित किए गए हैं।

जल वर्ष 2005-06 से जल वार्षिकी का प्रकाशन केन्द्रीय जल आयोग द्वारा निर्धारित स्वरूप (SWDES) में किया जा रहा है। इस वार्षिकी में सतही प्रवाह के आँकड़ो के साथ - साथ वेसिन से संवंधित सूचनाएँ जैसे कि जलवायु, भूगर्भ विज्ञान, कृषि, भूमि, आदि भी दिये गए हैं।

इस वार्षिकी में दी गयी सूचना एवं संकलित आँकड़ें उन सभी के लिये उपयोगी होंगे जो जल संसाधन से संवंधित किसी भी क्षेत्र में रूचि रखते हैं, ऐसी आशा है। इसे और उपयोगी वनाने हेतु सुझाव आमंत्रित हैं।

वार्षिकी में प्रकाशित आँकड़ों के संकलन, विश्लेषण तथा प्रकाशन हेतु नर्मदा - तापी वेसिन संगठन के अधीनस्थ जल विज्ञानीय प्रेक्षण परिमंडल, गांधीनगर एवं तापी मंण्डल, सूरत के अधिकारियों एवं कर्म चारियों ने जिस समर्पण एवं लगन से कार्य संपादित किया है, वह प्रशंसनीय है।

गांधीनगर (गुजरात)
नवम्बर, 2017

(विमल कुमार)
अधीक्षण अभियंता

Preface

The National Water Policy stresses the need for a standardised national information system with a network of data base and data banks, 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-facetted use.

Central Water Commission is an apex organization of the country concerned with planned development and monitoring in water resources 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 Narmada Tapi Basin Organization of the Central Water Commission, is entrusted with the Hydrological Observation in 17 river basins of Gujarat, Madhya Pradesh, Maharashtra, Rajasthan, Daman & Diu and DNH (UT).

The Tapi Division, headquartered at Surat, under HO Circle, is at present, carrying out hydrological observations at 6 sites on river Tapi and its tributaries, which have been compiled in this Water Year Book 2016-17.

The publication of Water Year Book in SWDES format has been started since the water year 2005-06 as per guidelines 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 also includes trend analysis of annual surface runoff for these basins.

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, on the Water Year Book are most welcome.

The efforts put in by all the concerned officers and staffs of Tapi Division, Surat and Hydrological Observation Circle, Gandhinagar under NTBO, Central Water Commission is gratefully acknowledged.

Vimal Kumar

Gandhinagar (Gujarat)
November, 2017

(Vimal Kumar)
Superintending Engineer

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List of Plates

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
TDS	:	Tapi Division Surat
Neg	:	Negligible
NNW	:	National Net Work

R.Days	:	Remaining days
R.L.	:	Reduced Level
R.D.	:	Reduced Distance
sq km	:	Square Kilometer
WQ	:	Water Quality
W.L	.:	Water Level
W.Year	:	Water Year
WRI Circle	:	Water Resources Investigation Circle
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

Chapter -1: Tapi Basin

1.1 Introduction

Tapi Division, Surat under Hydrological Observation Circle, CWC, Gandhinagar is conducting hydrological observations in the catchments of Tapi River and its tributaries at 18 stations, out of which nine (9) are under Flood Forecasting scheme, three (3) under National Network scheme and six (6) are under 80 - Key Hydrological Observation scheme.

Basin Map of Tapi River, showing CWC sites is enclosed as **plate-1**

The gauge & discharge data of six (6) stations, viz. Tapi at Burhanpur, Purna at Gopalkheda, Purna at Yerli, Tapi at Gidhade , Tapi at Sarangkheda and Tapi at Dedtalai are included in this book. From administrative consideration, the basin is divided into three zones viz. Upper Tapi Zone, Middle Tapi Zone and Lower Tapi Zone each having one Sub- division viz. Upper Tapi Sub-Division, Bhusawal; Middle Tapi Sub-Division, Dhule and Lower Tapi Sub-Division, Surat respectively under the Tapi Division, Surat. Salient features of existing sites in Tapi basin are given in **Table-1**.

1.2 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. The State wise distribution of the drainage area is given in the **table-2**. 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 asin. 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.

Table-1: Salient features of CWC sites of River Tapi at a Glance

SL. No.	Name of Site	River	Code No.	Status	Scheme	Catchment area (Km^2)	Latitude (N) D M S	Longitude (E) D M S
1	2	3	4	5	6	7	8	9
1	Teska	Tapi	NA	GRF	FF	1486	21^0 49′ 00″	77^0 46′ 05″
2	Burhanpur	Tapi	010217002	GDSQ RF	NNW	8487	21^0 17′ 12″	76 ^{0}13′ 18″
3	Dedtalai	Tapi	010217002	GRF	80K	6660	21^0 31′ 00″	76^0 45′ 24″
4	Hathnur	Tapi	010217006	GRF	FF	29430	21^0 04′ 35″	75^0 56′ 43″
5	Bhusawal	Tapi	010217007	GRF	FF	32478	21^0 03′ 54″	75^0 46′56″
6	Lakhpuri	Purna	010217003	GRF	80K	3560	$20^0$50′ 49′	77^0 21′ 41″
7	Gopalkheda	Purna	010217004	GDSQ RF	80K	9500	20^0 52′ 35″	76^0 59′ 14″
8	Yerli	Purna	010217005	GDSRF	NNW	16517	20^0 56′ 11″	76^0 28′ 27″
9	Chikaldhara	NA	NA	RF	FF	NA	$21^0$24′ 04″	77^0 19′ 46″
10	Girna dam	Girna	010217008	GRF	FF	4729	20^0 28′ 42″	74^0 42′ 55″
11	Dahigaon weir	Girna	010217009	GRF	FF	8599	20^0 50′ 05″	75^0 25′ 26 ″
12	Savkheda	Tapi	010217011	GRF	NNW	48136	21^0 08′ 53″	75^0 30′ 54″
13	Morane	Panjhra	010217013	GRF	80 K	1933	20^0 54′ 32″	74^0 42′ 47″
14	Gidhade	Tapi	010217014	GDRF	FF	54750	21^0 17′ 45″	74^0 48′ 45″

15	Sarangkheda	Tapi	010217015	GDSQ RF	80 K	58400	21^0 25′ 55″	74 ^{0} 31′ 37″
16	Ukai	Tapi	010217016	GRF	FF	62225	21^0 14′ 55″	73^0 35′ 25″
17	Ghala	Tapi	010217018	GRF	80 K	63325	21^0 17′ 53″	73^0 01′ 43″
18	Surat	Tapi	010217019	G	FF	63973	21^0 11′ 49″	72^0 46′ 04″
19	Shegaon	Tapi	Telemetry	RF	--	--	20^0 47′ 46″	76^0 08′ 00″
20	Chiklod	Tapi/ Bokar	Telemetry	RF	--	--	21^0 20′ 06″	76^0 00′ 23″
21	Sagbara	Tapi	Telemetry	RF	--	--	21^0 32′ 35″	73^0 47′ 42″
22	Khetia	Tapi	Telemetry	RF	--	--	21^0 39′ 00″	74^0 42′ 06″
23	Nandurbar	Tapi	Telemetry	RF	--	--	21^0 21′ 37″	74^0 14′ 18″
24	Nizampur	Tapi	Telemetry	RF	--	--	21^0 06′ 49″	74^0 19′ 47″

1.3 The River System

1.3.1 Tapi River

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.

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**.

Table-2: **State wise distribution of drainage area**

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.

1.3.2 Major Tributaries of the Tapi River System

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.

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.

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

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.

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.

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.

1.3.3. 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**.

1.3.3.1 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.

1.3.3.2 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

1.3.3.3 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.

1.3.3.4 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.

1.3.3.5 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.

1.3.3.6 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.

1.3.3.7 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

1.3.3.8 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

1.3.2.9 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.

1.3.3.10 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

1.3.3.11 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.

1.3.3.12 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

1.3.3.13 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.

1.3.3.14 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).*

Table–3: **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

1.4 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

1.4.1 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-4.**

Table-4:**Temperature profile of Tapi basin (Mean Monthly Maximum Temperature (°C))**

Month	**Mean Monthly Maximum Temperature (°C)**										
Location / Name of Site	Bhusawal	Yerli	Hathnur	Dedtalai	Gopalkheda	Lakhpuri	Burhanpur	Savkheda	Morane	Gidhade	Sarangkheda
Jun-16	37.4	37.4	38.1	37.0	32.5	37.5	38.5	33.9	*	38.9	38.4
Jul-16	28.8	29.8	29.3	29.3	27.5	29.5	30.8	26.6	*	33.8	32.6
Aug-16	28.9	29.8	28.9	28.3	29.2	29.9	30.5	25.7	*	33.2	31.5
Sep-16	29.7	30.6	31.4	29.8	29.2	29.9	29.5	26.2	*	34.4	33.6
Oct-16	29.8	30.6	30.9	29.7	27.6	32.3	31.3	24.5	*	35.7	34.5
Nov-16	28.7	30.6	30.7	28.1	27.5	28.3	30.7	22	*	34.8	34.5
Dec-16	27.2	29.2	28.7	26.9	28.7	27.1	29.9	20.2	*	34.1	32.9
Jan-17	26.7	28.8	28.6	26.0	28.1	26.4	30.2	17.6	*	31.8	32.5
Feb-17	32.7	33.0	32.8	30.6	28.6	32.3	34.3	21.8	*	34.8	35.5
Mar-17	37.3	36.7	36.7	33.1	31.8	35.7	37.8	26.8	*	38.5	38.6
Apr-17	41.2	41.1	41.4	38.4	34.6	40.4	40.4	39.1	*	40.6	41.6
May-17	42.7	42.8	43.0	41.2	34.8	43.1	40.7	37.3	*	43.1	42.9
Annual Mean	32.6	33.4	33.4	31.5	30.0	32.7	33.7	26.8	*	36.1	35.8

Table-4: **Temperature profile of Tapi basin (Mean Monthly Minimum Temperature (°C))**

Month	Mean Monthly Minimum Temperature (°C)										
Location / Name of Site	Bhusawal	Yerli	Hathnur	Dedtalai	Gopalkheda	Lakhpuri	Burhanpur	Savkheda	Morane	Gidhade	Sarangkheda
Jun-16	26.3	25.5	27.6	25.9	29.2	28.7	29.1	30.1	*	23.6	26.3
Jul-16	23.6	22.9	22.5	24.3	24.4	25.3	25.6	25.3	*	20.7	24.2
Aug-16	22.6	22.5	23.4	23.6	24.9	24.8	25.1	23.9	*	20.2	23.9
Sep-16	22.1	22.1	25.6	24.1	24.4	24.6	24.5	25.0	*	20.0	23.6
Oct-16	19.8	17.4	24.3	21.1	23.9	20.5	21.4	22.9	*	17.7	23.7
Nov-16	13.5	9.3	15.9	15.3	22.6	12.8	15.1	16.9	*	10.8	18.2
Dec-16	11.8	7.0	8.7	11.5	13.8	10.3	13.4	15.0	*	9.5	14.2
Jan-17	12.4	8.4	11.0	11.5	14.6	10.5	13.9	12.6	*	9.6	13.1
Feb-17	16.3	11.4	18.3	17.2	21.9	15.4	17.1	16.0	*	12.2	16.3
Mar-17	20.0	14.2	18.5	19.0	28.0	18.4	20.3	21.5	*	15.1	18.7
Apr-17	24.7	19.8	29.0	22.3	31.1	24.8	22.5	27.6	*	18.8	22.7
May-17	29.	25.6	30.6	24.6	31.2	30.7	27.8	29.4	*	24.1	28.0
Annual Mean	20.2	17.2	21.3	20.0	24.2	20.6	21.3	22.2	*	16.9	21.1

* instrument not working

1.4.2 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-5** and average rainfall recorded at various sites is given under **table- 6.**

Table-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	998.4
2.	Purna	Left	274	18929	29.1	710.0
3.	Middle Tapi, Hathnur to Ukai excluding Girna.	Main	305	22734	34.9	734.6
4.	Girna	Left	260	10061	15.4	652.5
5.	Lower Tapi-from Ukai to confluence to sea near Surat	Main	129	2920	4.5	1222.7

Table -6: **Rainfall at sites in Tapi Basin**

Average Annual Rainfall for the period, since inception-2016							
Sl No	Name of Site	District	Seasonal Average Rainfall (mm)				Total Annual Average Rainfall
			Winter monsoon	Pre monsoon	South-west monsoon	post monsoon	
			(Jan-Feb)	(Mar-May)	(June-Sept)	(Oct-Dec)	
1	Teska	Betul (MP)	0.0	0.0	1097.6	27.6	1135.7
2	Lakhpuri	Akola (MS)	17.6	31.1	675.2	78.1	784.2
3	Chikhaldara	Amarawati (MS)	28.9	40.7	1425.4	84.3	1570.2
4	Gopalkheda	Akola (MS)	17.3	24.0	639.2	55.2	734.6
5	Dedtalai	Burhanpur (MP)	13.7	20.1	842.7	55.0	916.3
6	Burhanpur	Burhanpur (MP)	15.6	25.9	759.5	67.6	855.9
7	Yerli	Buldana (MS)	13.5	20.6	595.9	80.1	709.2
8	Hathnur-Dam	Jalgaon (MS)	15.8	18.5	616.7	72.4	708.4
9	Bhusawal	Jalgaon (MS)	11.7	24.1	641.3	63.4	718.8
10	Girna	Nasik (MS)	4.9	19.9	557.6	78.8	648.2

11	Dahigaon	Jalgaon(MS)	8.3	24.8	699.7	65.6	771.9
12	Savkheda	Jalgaon (MS)	5.2	21.7	607.3	52.4	682.3
13	Morane	Dhule(MS)	5.9	12.8	492.3	62.4	568.4
14	Gidhade	Dhule(MS)	5.2	10.7	521.9	44.5	576.9
15	Sarangkheda	Nandurbar (MS)	2.8	15.0	560.7	45.9	623.8

1.4.3 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-.7** shows wind data of Tapi basin.

Table-7: **Wind speed and direction profile of Tapi Basin**

Month	**Average wind Speed km/h**									
Location / Name of Site	Bhusawal	Yerli	Hathnur	Dedtalai	Gopalkheda	Burhanpur	Savkheda	Morane	Gidhade	Sarangkheda
Jan-16	0.8	3.3	1.1	*	3.0	1.0	1.7	*	0.5	0.1
Feb-16	1.2	4.2	1.9	*	3.6	1.5	3.5	*	0.7	0.2
Mar-16	3.9	5.0	1.3	*	4.5	1.4	4.0	*	1.6	0.8
Apr-16	1.5	6.1	1.3	*	4.5	1.8	7.1	*	3.3	2.9
May-16	3.1	11.6	1.7	*	6.3	4.6	7.4	*	7.4	5.0
Jun-16	2.9	11.2	1.5	*	6.7	4.4	11.6	*	7.8	4.4
Jul-16	3.3	8.5	1.9	*	4.5	3.2	4.7	*	3.6	2.1
Aug-16	0.8	6.7	1.4	*	4.4	3.5	4.5	*	3.3	1.7
Sep-16	1.0	5.5	*	*	3.4	2.3	5.0	*	2.8	2.2
Oct-16	0.4	2.7	*	*	2.3	1.0	2.1	*	1.0	0.7
Nov-16	0.6	1.9	*	*	1.9	1.1	0.9	*	0.7	0.3
Dec-16	0.5	2.1	*	*	1.5	1.1	0.8	*	0.7	0.3
Annual Mean	1.7	5.7	1.0	0.0	3.9	2.2	4.4	*	2.8	1.7

* instrument not working

1.4.4 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-8**.

Table-8: **Relative Humidity Data for Tapi basin**

Month	% Morning Humidity					
Location / Name of Site	Bhusawal	Yerli	Dedtalai	Gopalkheda	Lakhpuri	Burhanpur
Jan-16	82.5	69.0	57.0	75.2	74.5	72.7
Feb-16	71.7	66.2	58.8	69.6	59.8	66.0
Mar-16	56.2	49.9	52.8	62.2	54.8	60.4
Apr-16	50.1	41.9	41.9	61.1	40.8	47.4
May-16	54.4	46.7	51.0	60.6	48.7	56.9
Jun-16	71.8	70.6	65.4	70.3	70.5	76.3
Jul-16	85.8	85.2	81.8	78.1	91.7	93.1
Aug-16	87.9	86.5	81.6	81.3	90.1	92.1
Sep-16	88.7	86.5	79.3	81.9	92.5	92.6
Oct-16	88.5	85.3	81.8	82.6	86.0	86.1
Nov-16	77.6	78.7	74.6	75.5	83.5	75.3
Dec-16	67.9	78.7	68.4	75.9	84.6	79.0
Annual Mean	73.6	70.4	66.2	72.9	73.1	74.8

Month	% Evening Humidity					
Location / Name of Site	Bhusawal	Yerli	Dedtalai	Gopalkheda	Lakhpuri	Burhanpur
Jan-16	36.7	30.7	47.0	67.0	47.0	41.6
Feb-16	32.2	27.4	4.9	64.1	35.2	36.4
Mar-16	23.1	20.7	37.1	60.7	32.4	35.5
Apr-16	19.3	13.0	26.1	59.4	26.5	28.1
May-16	23.9	17.9	33.0	67.3	30.1	30.9
Jun-16	46.0	38.1	47.3	68.6	46.0	53.6
Jul-16	83.6	76.0	80.7	78.1	79.9	84.9
Aug-16	81.0	68.8	79.9	79.9	79.2	77.9
Sep-16	82.0	65.1	75.3	77.4	82.0	81.0
Oct-16	75.3	61.8	74.4	79.4	72.0	68.7
Nov-16	52.5	50.0	57.7	76.8	56.0	51.4
Dec-16	52.5	48.6	53.1	65.0	59.3	44.7
Annual Mean	50.7	43.2	51.4	70.3	53.8	52.9

1.5 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-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

1.6 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-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)

1.7 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

1.8 Major/ Medium/Multipurpose/Irrigation projects

At present there are 28 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 -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

Table -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

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

1.9 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:

1.9.1 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.

1.9.2 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.

1.9.3 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.

1.9.4 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.

1.9.5 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.

Chapter-2: Stream flow Data

2.1 Methodology

Gauge Measurement

Water level or stage of the river is measured as its elevation above the G.T.S. datum. Water level measurement is conducted by reading non - recording gauges as specified in IS: 4080-1967. Series of vertical staff gauges have been fixed at three sections at every Site. The gauge posts are generally of wood or concrete with cut at water face arrangements and fixed securely in vertical position by anchoring them in M - 150 concrete base of suitable size. Enamelled vertical gauge plates with metric markings are fixed on the gauge posts so that gauges can be read to an accuracy of 0.005 m.

Out of three gauge lines the central one is used as Station Gauge line and the readings of other two lines are used for calculation of water surface slope. During non-monsoon season gauges are read thrice daily (0800, 1300 and 1800 hrs.) and during monsoon gauges are read hourly, at the station gauge line.

Discharge Observation

Discharges are observed once a day starting from 0800 hours at all the sites by area - velocity method, except on Sundays and holidays. For non-observation days, the discharges are computed from the stage and discharge relation prepared, from the observed data for that water year.

The stream width is 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/ nylon rope stretched across the river width with markings indicated thereon when the river width and depth permitted wading. For large width and deep flow conditions segmentation is done using simple trigonometric method for which pivot point and segment blocks have been constructed at each site.

The depth is measured by using sounding rod 3 to 6 metres long adopting specifications given in IS: 3912-1966. When the river flow is very deep and swift, lead lines / echo sounders are used. Necessary Air and Wet line corrections are made to the sounding observations as provided in IS: 1192-1981. The velocity is

measured as per IS: 3918 - 1966 by using a cup type current meter conforming to specifications given in IS: 3910-1966.

The current meter is lowered at the requisite depth (0.6d) in a vertical at every segment by suspension equipment as specified in IS: 6064-1971.

In high velocities, boats fitted with power engines or motor launches are used. Drift is measured and corrections for the same are made. Where observations by boat or launch are not possible, measurement of velocity is conducted from bridge or cable way. When the above procedures are not possible then velocity is measured by float observations. The observations are recorded in a standard format for calculation of total river flow.

Equipment used for observation

Table-14: List of equipment used in observation

Sl. No	Name of Equipment	By Wading	By Bridge	By Boat	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	√	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
15	Echo Sounder	X	X	√	X

Morphology: No significant morphological changes have been observed at sites.

Narrative description /special information on hydrological conditions is as Under

a) SRRG information for important G and D sites during flood period: - One Self recording rain gauge and one Ordinary rain gauge are available at sites.

b) Flood Hydrograph details enclosed in data part.

c) Extent of flooding:- No unprecedented flood experienced during 2015-16

d) Breaching of embankments and other structures, if any: - There had been no incident of major breaches during 2015-16

e) Substantial changes in river morphology: - Study of river cross sections of last few years indicates that there is no appreciable change in the river morphology at sites.

f) Drought / Water scarcity: - Water scarcity is not experienced and hence no drought in this zone.

2.2 Data Availability of Existing Sites

Table-15: **Data availability of existing sites**

Sl.No	Station Name	River	Station Code No.	Type	Data available	
					From	To
1	Burhanpur	Tapi	010217002	GDSQRF		
				Gauge	16.06.1972	Contd...
				Discharge	14.09.1972	-do-
				Sediment	23.12.1972	-do-
				W Q	01.06.1977	-do-
				RF	15.06.1970	-do-
2	Gopalkheda	Purna	010217004	GDSQ RF		
				G	17.02.1977	-do-
				D	17.02.1977	-do-
				S	30.07.1979	-do-
				WQ	01.08.1979	-do-
				RF	01.01.1980	-do-
3	Yerli	Purna	010217005	GDSRF		
				G	11.11.1971	-do-
				D	01.03.1972	-do-
				S	09.04.1973	-do-
				RF	04.09.1979	-do-
				WQ	01.06.1977	31/05/05
4	Gidhade	Tapi	01 02 17014	GDRF		
				G	15.06.1969	
				D	19.06.1990	-do-
				RF	03.07.1971	-do-
				WQ	01.09.1990	31/05/05
5	Sarangkheda	Tapi	0102 17015	GDSQRF	--	
				G	29.07.1976	Contd..
				D	19.10.1977	-do-

				S	13.07.1984	-do-
				WQ.	01.01.1980	-do-
				RF	15.06.1986	-do-
6	Dedtalai	Tapi	0102 17001	GDSRFQ		
				Gauge	06.01.77	Contd..
				Discharge	12.12.77 06-02-2014 *	31.05.05
				Sediment	24.01.84	31.05.05
				Water Qly.	01.08.79	31.05.05
				RF	11.08.84	Contd..

* Site upgraded for Q observation

2.2.1 Availability of Data of closed sites and sites with reduced Status

Table-16: **Availability of data of closed site**

Sl. No	Station Name	River / Tributary	Station Code No.	Type	Data available	
					From	To
1	Lakhpuri	Tapi/Purna	0102 17003	GDRFQ		
				Gauge	16.02.77	Contd..
				Discharge	18.02.77	31.05.05
				Water Qly	03.11.86	31.05.05
				Rainfall	01.09.81	Contd..
2	Savkheda	Tapi	0102 17011	GDSRFQ		
				Gauge	06.04.72	Contd..
				Discharge	10.04.72	31.05.05
				Sediment	01.11.72	31.05.05
				Water Qty.	01.06.77	31.05.05
				RF	01.01.85	Contd..
3	Morane	Tapi/ Panjhra	0102 17012	GDRFQ		
				Gauge	17.07.76	Contd…
				Discharge	02.11.77	31.05.05
				W. Quality	01.09.90	31.05.05
				RF	01.11.91	Contd
4	Dapuri	Tapi/ Girna	0102 17010	GDSRFQ		
				Gauge	21.09.71	31.05.05
				Discharge	21.01.72	31.05.05
				Silt	01.07.73	31.05.05
				WQ	01.06.77	31.05.05
				RF	01.06.85	31.05.05
5	Malkheda	Tapi/ Bori	0102 17012	GDQRF		
				Gauge	17.07.76	31.05.05
				Discharge	02.11.77	31.05.05
				W Qly.	01.09.90	31.05.05
				RF	01.06.87	31.05.05
6	Ghala	Tapi	01 0217 018	GDRFQ		
				Gauge	15.08.77	Contd..
				Discharge	01.06.78	31.05.05

				Water Qty.	01.08.83	31.05.05
				RF	01.06.78	Contd..
7	Kakrapar	Tapi	0102 17017	GRF		
				Gauge	01.06.69	15.10.04
				Rainfall	01.06.69	15.10.04

2.3 Explanatory notes

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

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

ii] Discharge is given in cubic metre per second.

iii] Discharges given are observed daily discharges.

iv] Discharges are expressed as 0.000 when river bed is dry and also when there is stagnation of water i.e. velocity is observed as NIL.

v] Discharges indicated with asterisk (*) mark are Estimated discharges as per rating curve equation corresponding to stage at 0800 hours of that day. Discharges indicated with (**#)** marks are estimated discharges of the discarded points.

vi] The Zero of Gauge is a datum level / R. L. fixed for a given site, which is kept1 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.

Vii] Discharges are rounded off to:

a] Nearest full integer when more than 1000.

b] Nearest first decimal figures when between 100 and 1000

c] Nearest two decimal figures when between 10 and 100

d] Nearest three decimal figures when less than 10.

Viii] Maximum and minimum discharges are taken from the observed daily flows.

ix] Runoff in mm is the notional depth of water in millimetres over the catchment area equivalent to annual runoff calculated at the discharge measurement station. It is computed using the relation

$$\text{Runoff (mm)} = \frac{\text{Annual runoff } (mm^3) \times 1000}{\text{Catchment area } (km^2)}$$

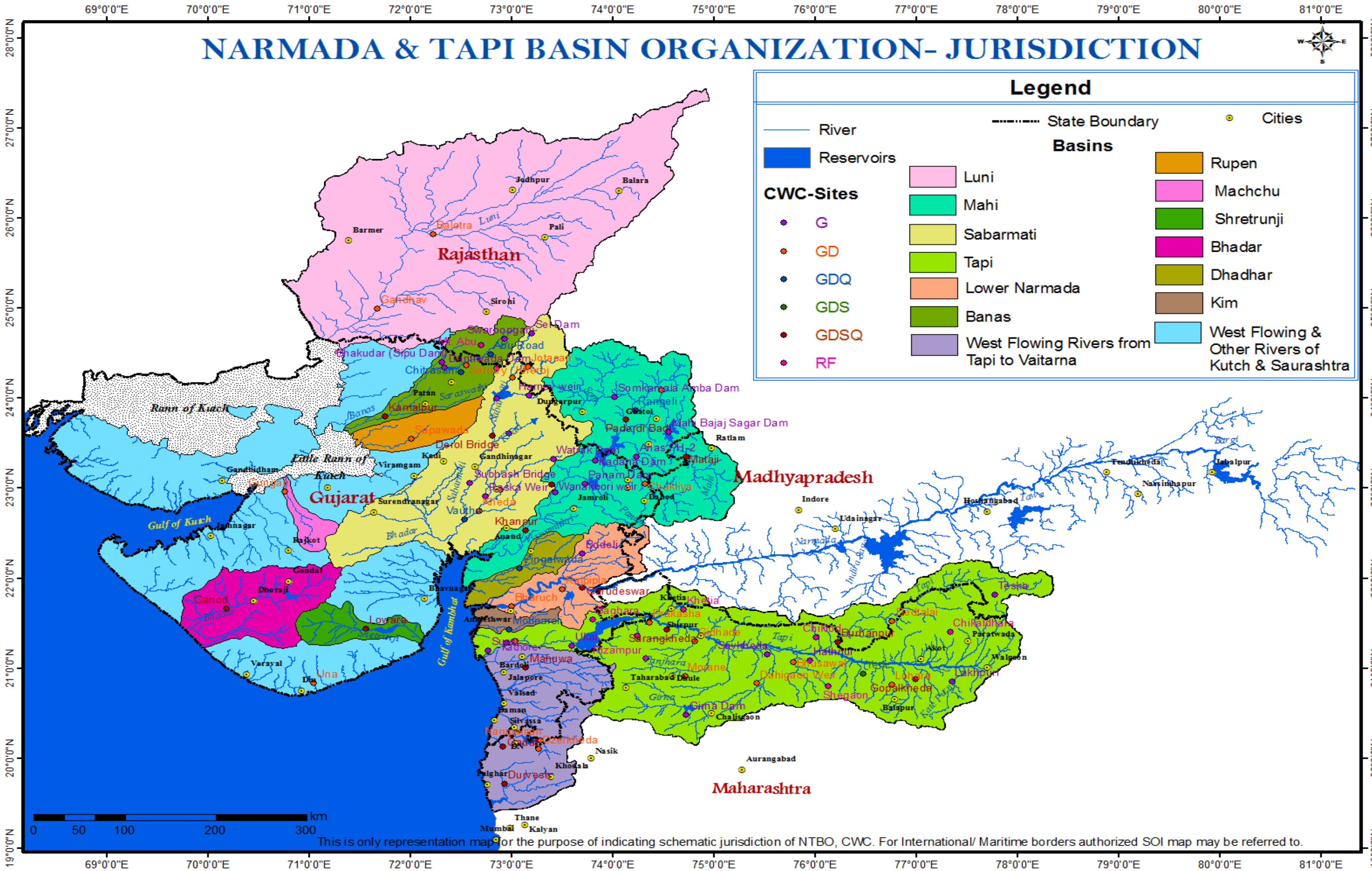
x] Peak and lowest flow correspond to the highest and lowest water levels recorded during the period of record.

xi] Measuring authority refers to the field division responsible for the operation of the gauging station.

xii] The gauging station code number is a unique NINE digit number, which facilitates storage and retrieval of flow data in data banks. The first two digits are identifier of measuring authority, third and fourth digits represent Basin / Zone and fifth and sixth digit refer to independent river Basins in the zone, seven eight and nine digits indicate site numbers.

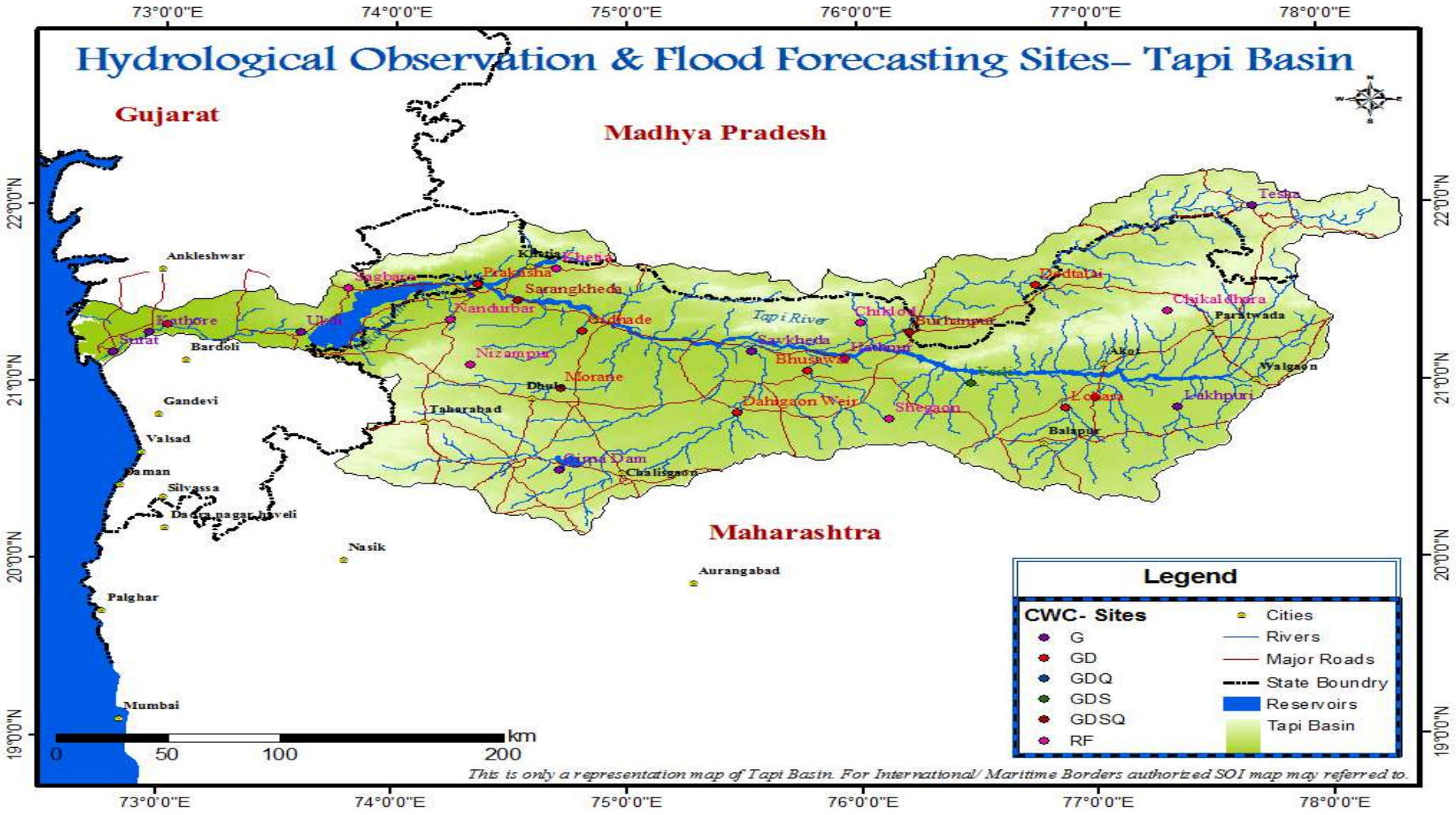
xiii] The month and the year from which data available in the data banks is indicated against record available

Plate no-1



NARMADA & TAPI BASIN ORGANIZATION- JURISDICTION
Legend
River
Reservoirs
State Boundary
Cities
Basins
CWC-Sites
G
GD
GDQ
GDS
GDSQ
RF
Luni
Mahi
Sabarmati
Tapi
Lower Narmada
Banas
West Flowing Rivers from Tapi to Vaitarna
Rupen
Machchu
Shretrunji
Bhadar
Dhadhar
Kim
West Flowing & Other Rivers of Kutch & Saurashtra
Rajasthan
Gujarat
Madhyapradesh
Maharashtra
Rann of Kutch
Little Rann of Kutch
Gulf of Kutch
Gulf of Khambhat
Jodhpur
Barmer
Pali
Sirohi
Indore
Jabalpur
Aurangabad
Nasik
Thane
Mumbai
Kalyan
km
0 50 100 200 300
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.

Plate no-2A


Hydrological Observation & Flood Forecasting Sites– Tapi Basin
Gujarat
Madhya Pradesh
Maharashtra
Tapi River
Ankleshwar
Bardoli
Surat
Kathore
Ukai
Gandevi
Valsad
Daman
Silvassa
Dadra nagar haveli
Palghar
Mumbai
Nasik
Aurangabad
Taharabad
Dhule
Nizampur
Morane
Sarangkheda
Prakasha
Nandurbar
Sindhade
Sakhreda
Bhusawal
Dahigaon Weir
Shegaon
Hathnur
Chhidgaon
Burhanpur
Bodhtalai
Chikaldhara
Paratwada
Akot
Walgaon
Lohara
Lakhpuri
Balapur
Tesha
Girna Dam
Chalisgaon
Legend
CWC- Sites
G
GD
GDQ
GDS
GDSQ
RF
Cities
Rivers
Major Roads
State Boundry
Reservoirs
Tapi Basin
km
0
50
100
200
This is only a representation map of Tapi Basin. For International/ Maritime Borders authorized SOI map may referred to.
73°0'0"E
74°0'0"E
75°0'0"E
76°0'0"E
77°0'0"E
78°0'0"E
22°0'0"N
21°0'0"N
20°0'0"N
19°0'0"N

LINE DIAGRAM OF RIVER TAPI BASIN

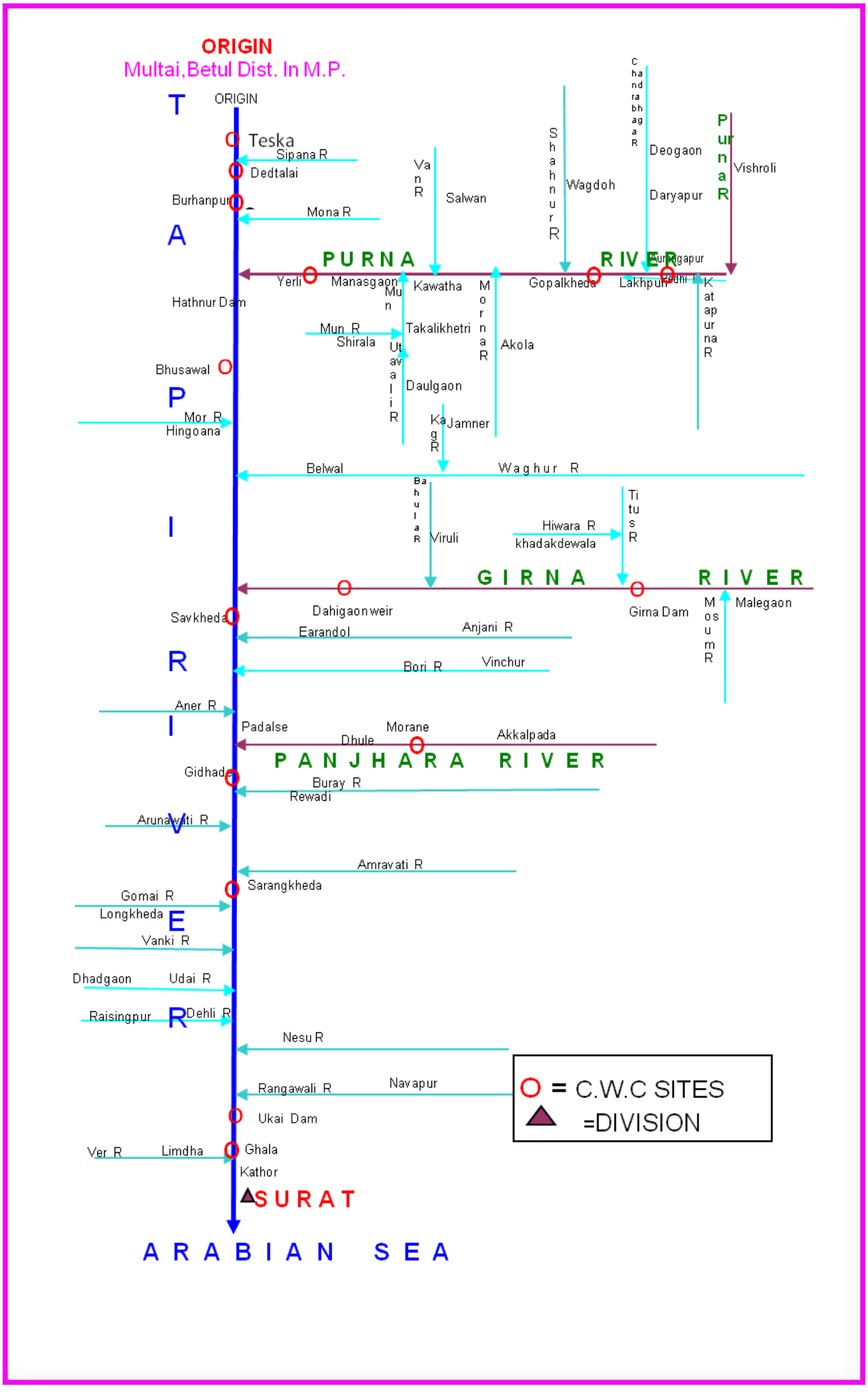
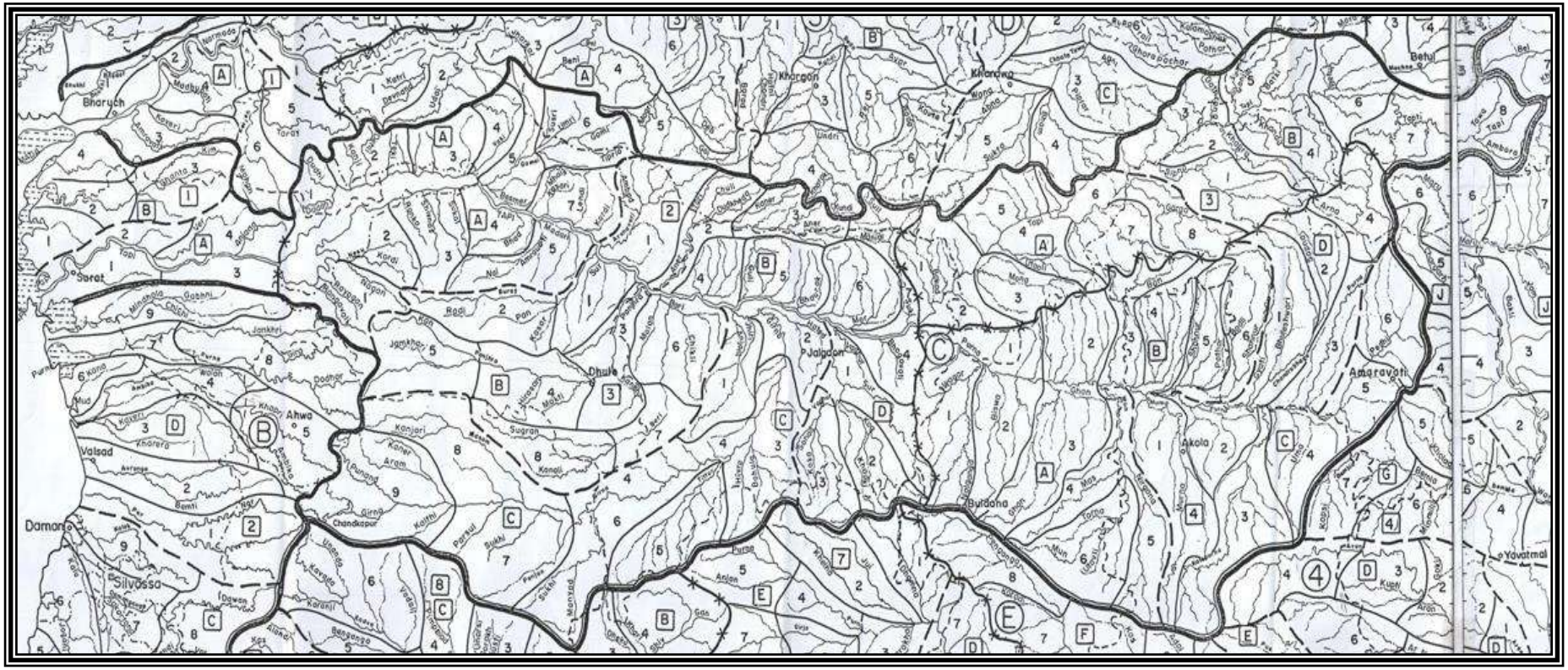


Plate no-3

Watershed Map of Tapi River Basin (As per Watershed Atlas of India Published by: Department of Agriculture and Cooperation, Ministry of Agriculture, Krishi Bhavan New Delhi (1990)



Chapter-3 Hydrological data

3.1 Burhanpur

3.1.1 History sheet

Site	**:**	**Tapi at Burhanpur**	**Code**	**:**	**01 02 17 002**
State	:	Madhya Pradesh	District		Khandwa
Basin	:	Tapi	Independent River	:	-
Tributary	:		Sub Tributary	:	
Sub-Sub Tributary	:		Local River	:	
Division	:	Tapi Division Surat	Sub-Division	:	Upper Tapi 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

3.1.2 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

3.1.3 Summary of Data

Stage Discharge data for the period 2016 to 2017

Station Name: Tapi at Burhanpur (01 02 17 002) Division: Tapi Division Surat Local River: Tapi Sub Division: Upper Tapi 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	215.170	0.000	215.430	0.000	218.400	537.0 *	218.050	368.4	217.695	353.8	215.870	54.02
2	215.160	0.000	215.500	0.000	219.915	1258 #	218.450	545.0	218.530	509.1 *	215.840	51.88
3	215.150	0.000	216.050	0.000	219.835	1217 #	218.330	514.5	218.045	404.6 #	215.810	49.85
4	215.140	0.000	216.100	0.000	221.900	2245	217.950	347.2 *	217.735	362.4	215.770	39.96
5	215.120	0.000	216.160	0.000	219.235	872.0	217.745	272.6	217.505	271.0	215.740	34.15
6	215.120	0.000	216.100	0.000	219.325	929.8	217.674	239.9	217.510	277.7	215.700	38.10 *
7	215.100	0.000	218.725	674.4	220.850	1747 *	217.560	194.1	217.740	376.5	215.700	29.35
8	215.080	0.000	217.600	177.0	219.800	1199 #	217.540	193.0	217.475	259.0	215.680	29.08
9	214.960	0.000	217.285	87.30	219.260	909.5	217.500	176.3	217.630	321.9 *	215.660	29.13
10	214.820	0.000	219.450	1026 *	218.960	578.9 #	217.440	170.1	217.675	321.5	215.640	26.77
11	214.800	0.000	219.275	878.1	218.625	740.7	217.400	139.4 *	217.420	282.6 *	215.600	26.32
12	214.770	0.000	220.900	2077	218.560	597.4	217.370	120.7	217.290	259.1 *	215.580	23.83
13	214.750	0.000	221.675	2126	218.540	554.8	217.340	118.9 *	217.000	165.9	215.560	25.99 *
14	214.730	0.000	218.875	706.7	218.430	550.2 *	217.310	97.24	216.795	148.2	215.540	24.39 *
15	214.710	0.000	218.425	591.7	218.320	502.3 *	217.280	88.96	216.690	134.9	215.510	22.39
16	214.690	0.000	218.085	416.3	218.275	501.7	217.270	95.88 *	216.470	128.5 *	215.480	19.24
17	214.660	0.000	217.910	331.1 *	218.115	403.2	217.530	247.2	216.315	121.1	215.450	18.59
18	214.640	0.000	217.850	314.2	217.980	339.8	218.310	497.9 *	216.240	97.75 #	215.440	18.08
19	214.620	0.000	217.990	437.6	217.845	264.8	217.675	312.1	216.215	99.55	215.430	16.93
20	214.600	0.000	218.120	396.6	217.745	272.7	217.700	332.5	216.190	96.66	215.380	12.95 *

21	214.580	0.000	217.885	300.8	217.700	248.7 *	217.905	388.6	216.170	97.10	215.330	9.381
22	214.570	0.000	217.685	221.5	217.680	244.4	218.200	469.9	216.130	89.78	215.290	5.274
23	214.560	0.000	217.665	223.7	217.670	227.2	217.835	307.1	216.080	78.15 *	215.280	4.723
24	214.540	0.000	218.250	472.2 *	217.615	211.5	217.795	378.9	216.050	88.02	215.270	5.158
25	214.530	0.000	218.230	475.3	217.590	207.4 *	218.850	582.5 *	216.030	83.44	215.270	6.533
26	214.510	0.000	218.775	681.7	217.575	199.1	218.360	496.2	216.020	79.28	215.260	6.327
27	214.500	0.000	218.930	723.0	217.525	169.0	217.740	368.0	215.990	75.40	215.260	6.150 *
28	214.490	0.000	219.900	1250 #	217.610	214.8 *	217.480	248.6	215.980	72.94	215.250	5.775
29	214.490	0.000	219.005	787.0	217.665	240.9	217.330	228.9	215.960	70.21	215.240	5.949
30	214.490	0.000	218.605	649.8	217.695	273.4	217.510	334.7	215.940	62.27 *	215.240	5.844
31			218.340	510.9 *	217.610	224.6			215.915	56.89		
Ten-Daily Mean												
I Ten-Daily	215.082	0.000	216.840	196.4	219.748	1149	217.824	302.1	217.754	345.7	215.741	38.23
II Ten-Daily	214.697	0.000	218.910	827.6	218.243	472.7	217.519	205.1	216.663	153.4	215.497	20.87
III Ten-Daily	214.526	0.000	218.479	572.3	217.630	223.7	217.900	380.3	216.024	77.59	215.269	6.111
Monthly												
Min.	214.490	0.000	215.430	0.000	217.525	169.0	217.270	88.96	215.915	56.89	215.240	4.723
Max.	215.170	0.000	221.675	2126	221.900	2245	218.850	582.5	218.530	509.1	215.870	54.02
Mean	214.768	0	218.090	533.4	218.511	602.6	217.748	295.8	216.788	188.6	215.502	21.74

Annual Runoff in MCM = 4398 **Annual Runoff in mm = 518**

Peak Observed Discharge = 2245 cumecs on 04-08-2016 **Corres. Water Level :221.900 m**

Lowest Observed Discharge = 0.000 cumecs on 01-06-2016 **Corres. Water Level :215.170 m**

Note: River in pooling condition i.e. negligible flow during 1/6/16 to 06/07/16 and from 07-03-17 to 31-05-17

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 2016 to 2017

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

Day	Dec		Jan		Feb		Mar		Apr		May	
	W.L	Q	WL	Q	WL	Q	WL	Q	WL	Q	WL	Q
1	215.240	5.773	215.210	3.860 *	215.180	3.169	215.130	0.969	215.020	0.000	214.850	0.000
2	215.230	5.657	215.210	4.095	215.180	3.199	215.130	0.936	215.000	0.000	214.840	0.000
3	215.230	5.686	215.210	4.048	215.180	2.719	215.130	0.912	215.000	0.000	214.830	0.000
4	215.230	4.730 *	215.200	3.042	215.170	2.593	215.130	0.861	214.990	0.000	214.820	0.000
5	215.230	5.435	215.200	2.988	215.170	2.310 *	215.130	1.060 *	214.980	0.000	214.810	0.000
6	215.230	5.370	215.200	3.027	215.170	2.687	215.120	0.810	214.970	0.000	214.800	0.000
7	215.230	5.161	215.200	2.914	215.160	1.970 #	215.120	0.000	214.960	0.000	214.800	0.000
8	215.230	5.040	215.200	3.450 *	215.160	2.044	215.120	0.000	214.950	0.000	214.800	0.000
9	215.230	5.498	215.200	2.816	215.160	2.065	215.120	0.000	214.940	0.000	214.790	0.000
10	215.230	5.458	215.200	2.804	215.160	2.019	215.120	0.000	214.930	0.000	214.780	0.000
11	215.230	4.730 *	215.200	2.730	215.150	1.582	215.120	0.000	214.920	0.000	214.770	0.000
12	215.230	4.730 *	215.200	3.962	215.150	1.650 *	215.120	0.000	214.910	0.000	214.760	0.000
13	215.230	5.571	215.200	3.837	215.150	1.500	215.120	0.000	214.910	0.000	214.750	0.000
14	215.220	4.290 #	215.200	3.729	215.150	1.472	215.120	0.000	214.900	0.000	214.740	0.000
15	215.220	5.626	215.200	3.450 *	215.150	1.436	215.120	0.000	214.900	0.000	214.730	0.000
16	215.220	5.533	215.200	3.580	215.150	1.401	215.120	0.000	214.900	0.000	214.720	0.000
17	215.220	5.435	215.190	3.423	215.150	1.343	215.120	0.000	214.900	0.000	214.720	0.000
18	215.220	4.290 *	215.190	3.249	215.150	1.319	215.120	0.000	214.890	0.000	214.720	0.000
19	215.220	5.340	215.190	3.521	215.150	1.650 *	215.120	0.000	214.890	0.000	214.720	0.000
20	215.220	5.283	215.190	3.371	215.150	1.287	215.120	0.000	214.880	0.000	214.720	0.000

21	215.220	4.946	215.190	3.174	215.140	1.277	215.110	0.000	214.880	0.000	214.720	0.000
22	215.220	4.829	215.190	3.050 *	215.140	1.120	215.110	0.000	214.870	0.000	214.720	0.000
23	215.220	4.760	215.190	3.054	215.140	1.089	215.110	0.000	214.870	0.000	214.720	0.000
24	215.220	4.669	215.180	2.928	215.140	1.340 *	215.110	0.000	214.860	0.000	214.710	0.000
25	215.220	4.290 *	215.180	2.813	215.140	1.068	215.110	0.000	214.860	0.000	214.700	0.000
26	215.210	4.569	215.180	2.813 *	215.140	1.340 *	215.100	0.000	214.860	0.000	214.700	0.000
27	215.210	4.447	215.180	2.718	215.140	1.073	215.090	0.000	214.860	0.000	214.700	0.000
28	215.210	4.503	215.180	3.438	215.130	0.995	215.080	0.000	214.860	0.000	214.690	0.000
29	215.210	4.411	215.180	2.680 *			215.070	0.000	214.860	0.000	214.680	0.000
30	215.210	4.305	215.180	3.208			215.050	0.000	214.860	0.000	214.670	0.000
31	215.210	4.190	215.180	3.195			215.040	0.000			214.660	0.000
I Ten-Daily	215.231	5.381	215.203	3.304	215.169	2.478	215.125	0.555	214.974	0.000	214.812	0.000
II Ten-Daily	215.223	5.083	215.196	3.485	215.150	1.464	215.120	0.000	214.900	0.000	214.735	0.000
III Ten-Daily	215.215	4.538	215.183	3.006	215.139	1.163	215.089	0.000	214.864	0.000	214.697	0.000
Monthly												
Min.	215.210	4.190	215.180	2.680	215.130	0.995	215.040	0.000	214.860	0.000	214.660	0.000
Max.	215.240	5.773	215.210	4.095	215.180	3.199	215.130	1.060	215.020	0.000	214.850	0.000
Mean	215.223	4.986	215.194	3.257	215.154	1.74	215.111	0.179	214.913	0	214.746	0

Peak Computed Discharge = 1747 cumecs on 07-08-2016 Corres. Water Level :220.850 m

Lowest Computed Discharge = 1.060 cumecs on 05-03-2017 Corres. Water Level :215.130 m

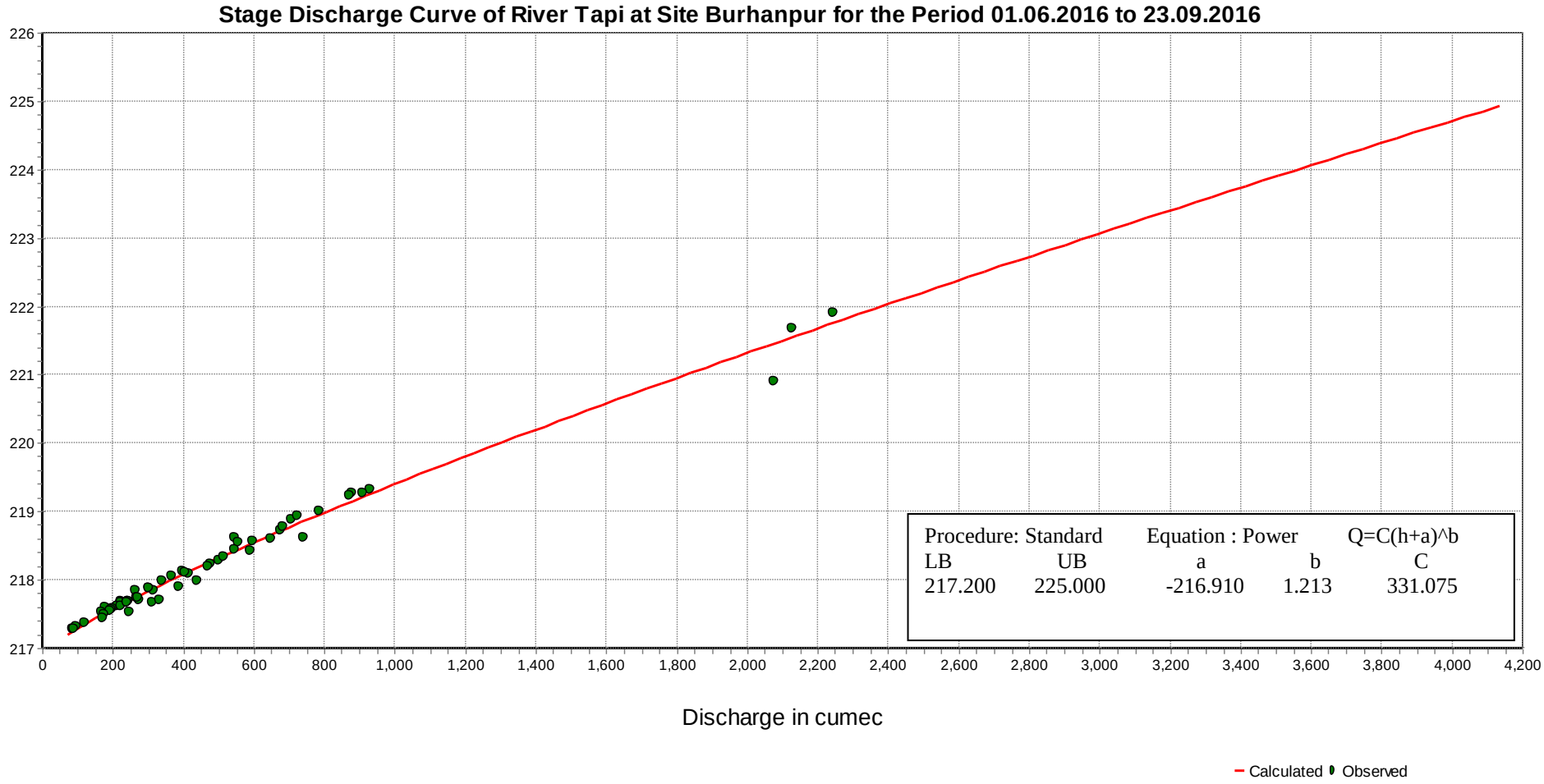
Note: River in pooling condition i.e. negligible flow during 1/6/16 to 06/07/16 and from 07-03-17 to 31-05-17

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

#Discarded and estimated

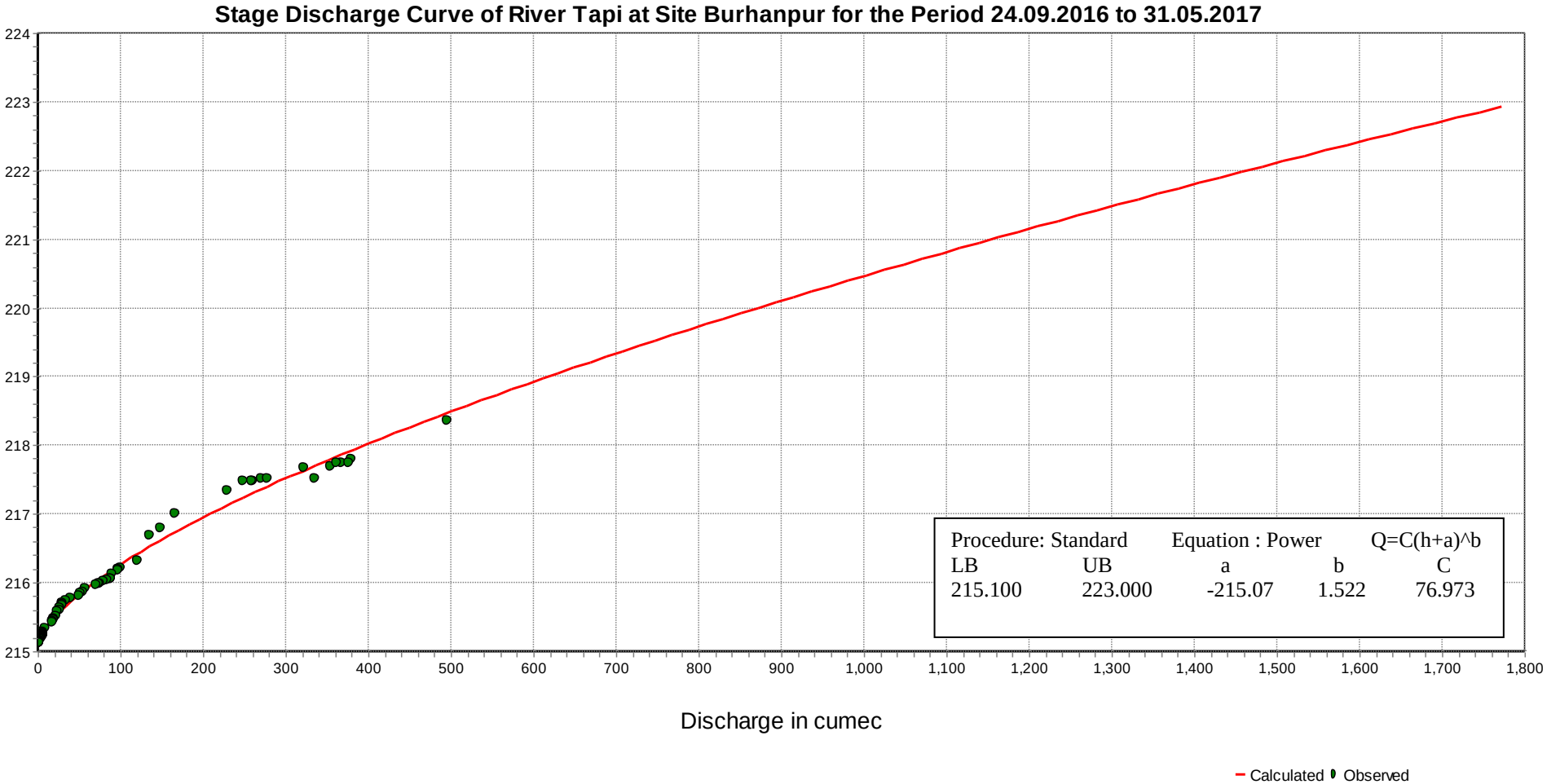
3.1.4 Stage Discharge Curve

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



3.1.4 Stage Discharge Curve

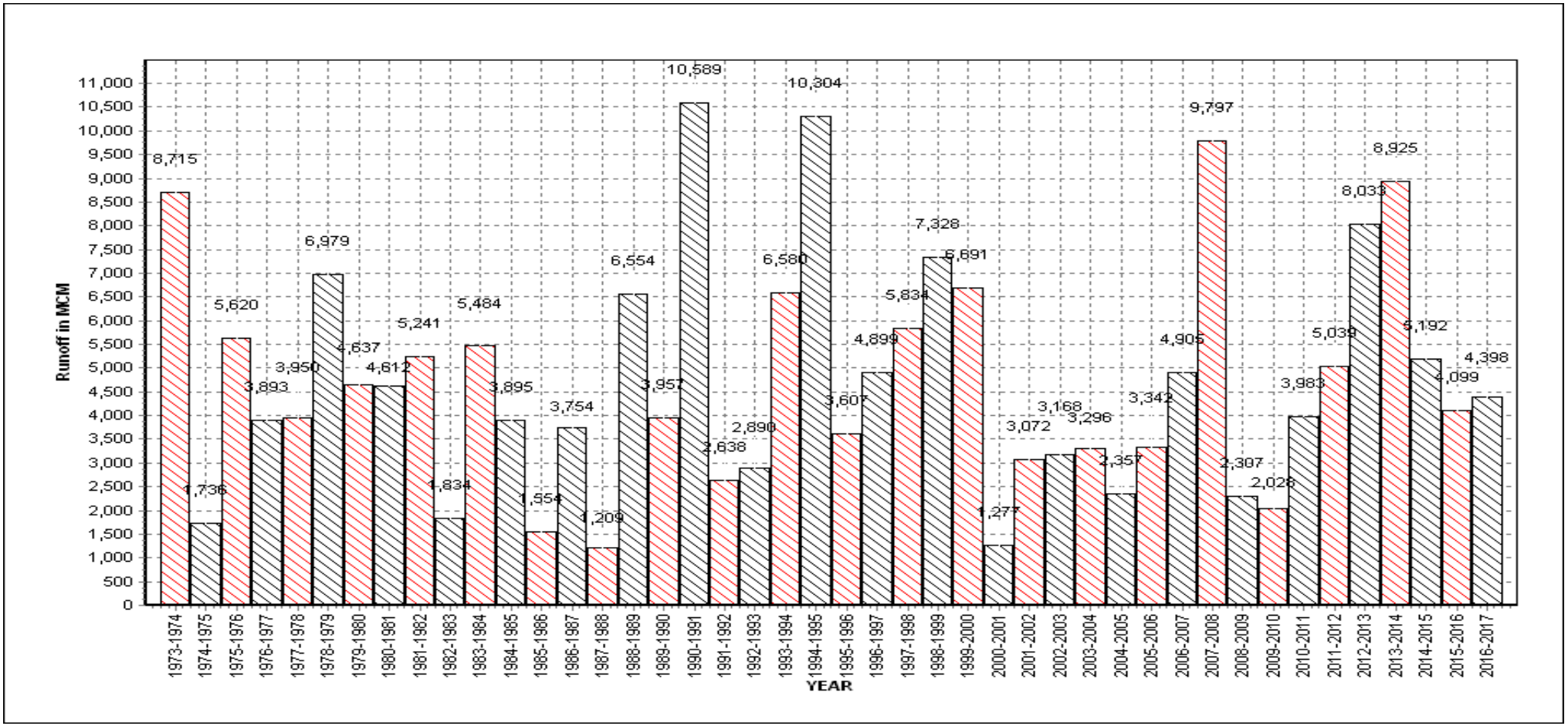
Station Name: Tapi at Burhanpur (01 02 17 002) Division: Tapi Division Surat Local River: Tapi Sub Division: Upper Tapi Bhusawal



3.1.5 Annual Runoff

Annual Runoff for the period 1973-2017

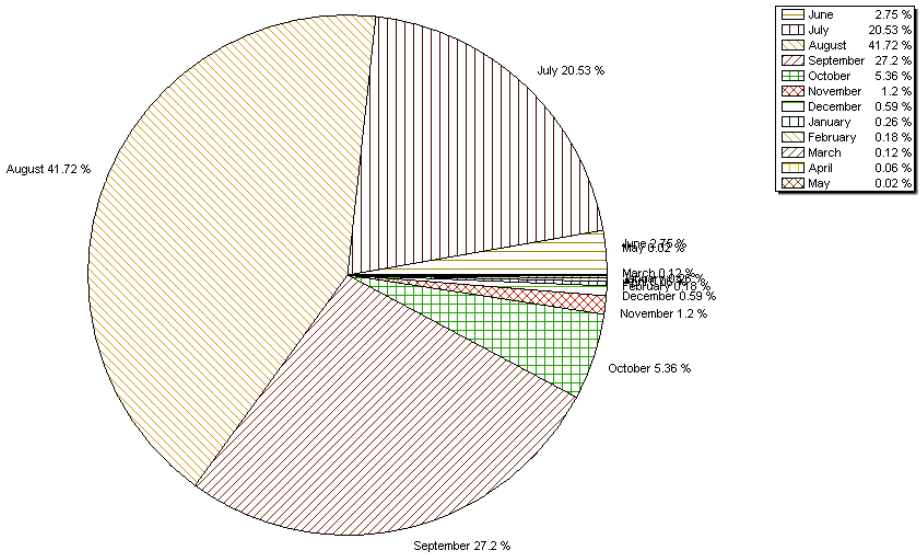
Station Name: Tapi at Burhanpur (01 02 17 002) Division: Tapi Division Surat Local River: Tapi Sub Division: Upper Tapi Bhusawal



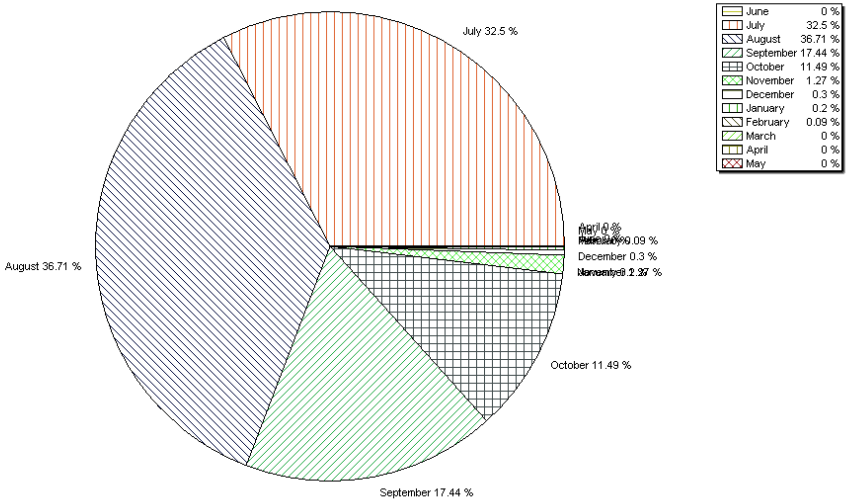
3.1.6 Monthly average Runoff

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

Monthly Average Runoff Based on period 1971-2016

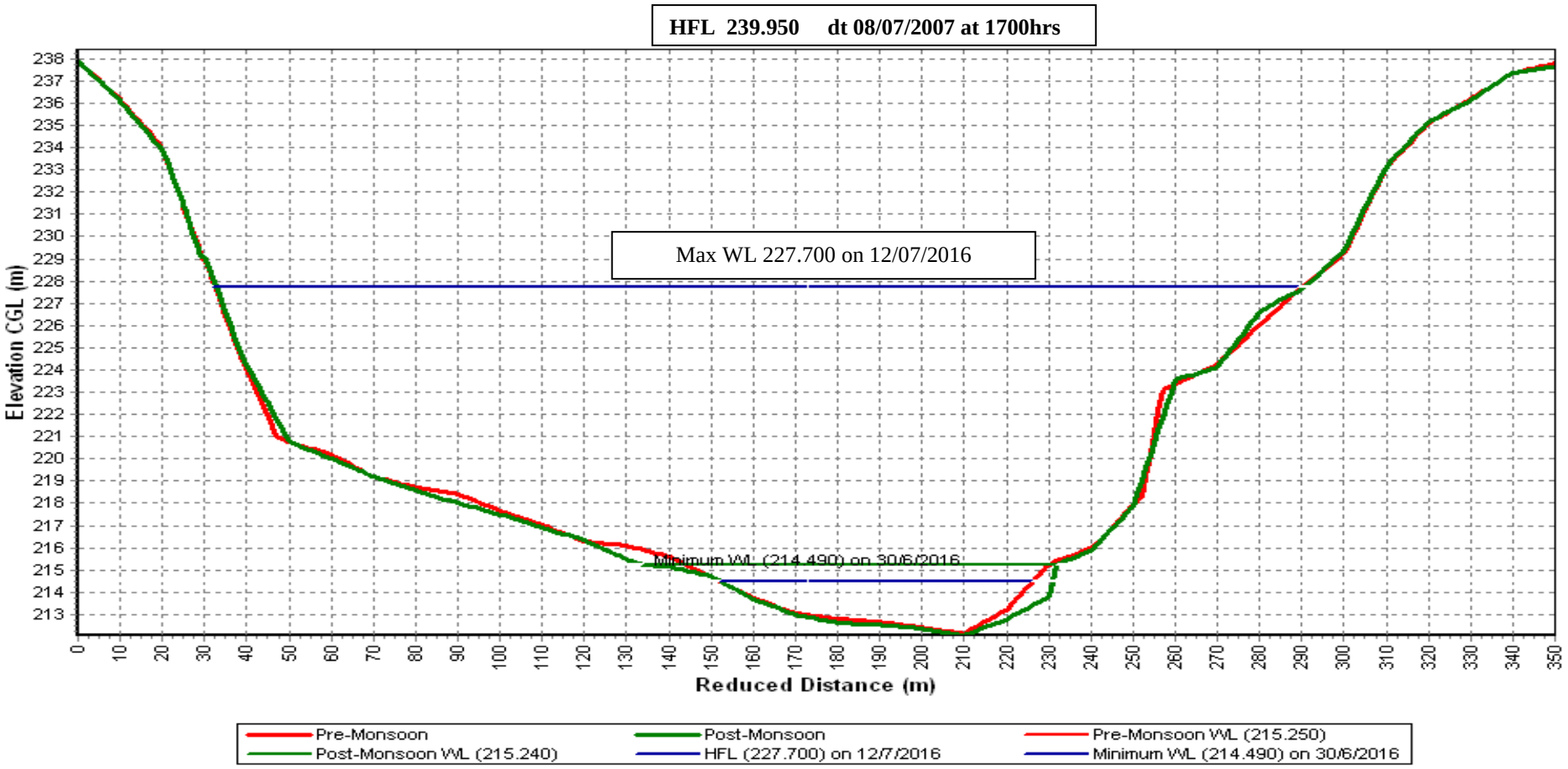


Monthly Runoff Based on period 2016-2017



3.1.7 Superimposed cross section

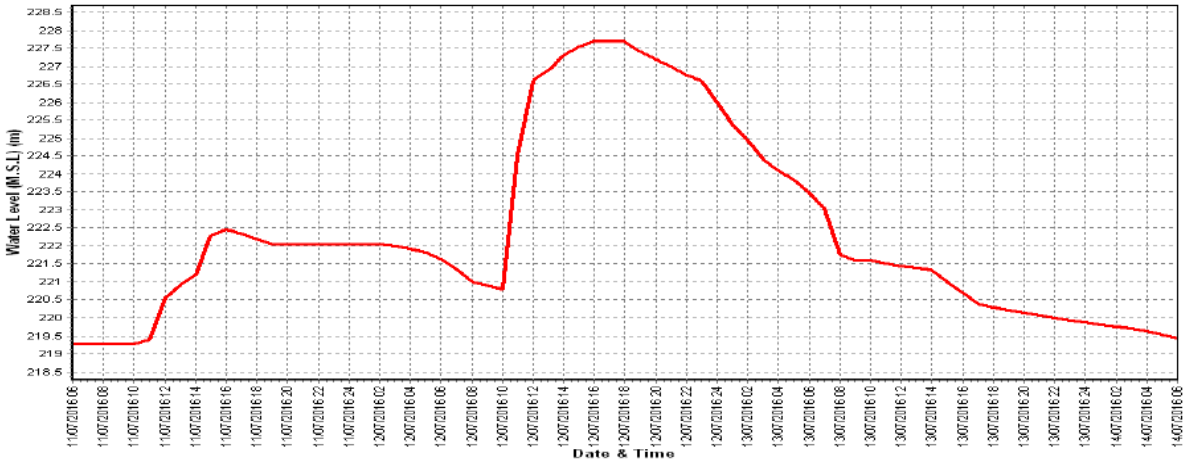
Station Name: Tapi at Burhanpur (01 02 17 002) Division: Tapi Division Surat Local River: Tapi Sub Division: Upper Tapi Bhusawal



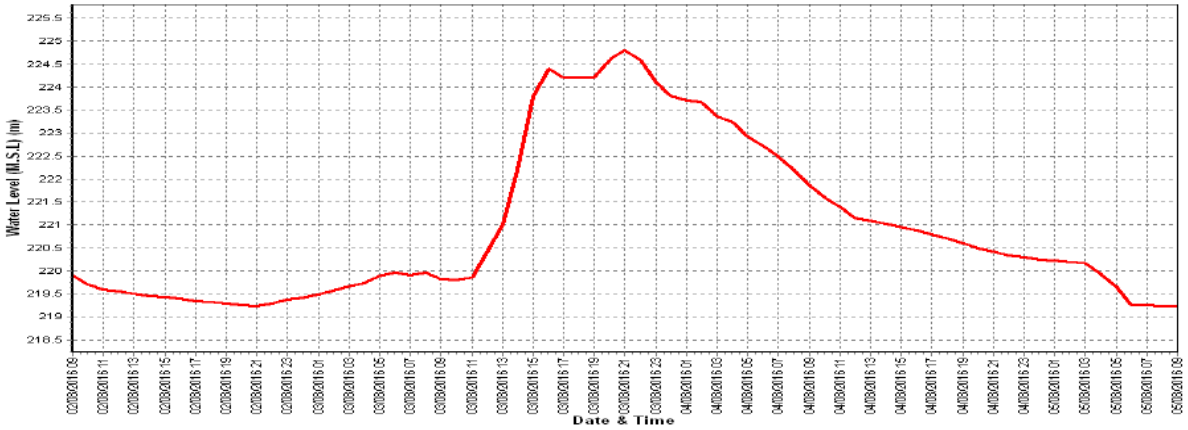
3.1.8 WL vs Time Graph of I, II, III peak

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

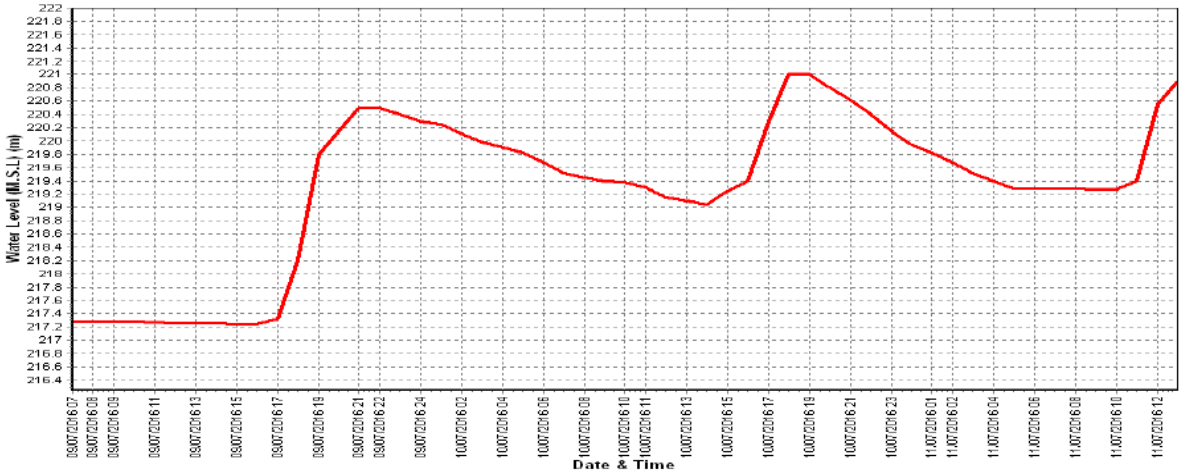
Water level vs Time Graph of Highest (I) flood peak during the water year 2016-17



Water level vs Time Graph of Highest (II) flood peak during the water year 2016-17



Water level vs Time Graph of Highest (III) flood peak during the water year 2016-17



Gopalkheda

3.2.1 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 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

3.2.2 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

3.2.3 Summary of Data

Stage Discharge data for the period 2016 to 2017

Station Name: Purna at Gopalkheda (01 02 17 004) Division : Tapi Division Surat Local River: Purna Sub Division: Upper Tapi 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	238.500	127.4	237.910	67.93	237.140	23.69	236.960	16.16	236.550	5.974
2		0.000	237.300	37.99	239.480	196.1	236.950	14.94	237.320	33.02 *	236.530	5.441
3		0.000	241.480	341.8 *	239.870	204.8	237.125	24.42	238.960	102.8	236.520	5.223
4		0.000	239.955	214.3	240.840	264.8	237.110	24.19 *	237.700	51.22 *	236.500	5.000
5		0.000	239.075	106.1	239.675	199.5	236.970	15.80	237.215	30.63	236.480	4.719
6		0.000	238.110	73.69 *	238.285	117.2	236.880	13.87	237.100	25.89	236.470	3.990 *
7		0.000	236.950	16.87	238.810	118.0 *	236.820	11.63	237.090	24.77	236.460	3.456
8	RIVER DRY	0.000	236.860	15.71	238.535	99.74 #	236.770	11.09	236.970	21.36	236.460	3.185
9		0.000	237.015	17.02	238.065	81.18	236.720	9.832	237.820	57.51 *	236.440	2.790
10		0.000	239.600	175.8 *	237.955	68.72	236.660	8.736	237.630	40.97	236.420	2.970 #
11		0.000	245.970	866.6 *	237.665	61.79	236.630	7.920 *	237.260	30.41 *	236.390	0.000
12		0.000	248.100	1168 *	237.555	38.80	236.600	7.062	237.180	27.03 *	236.390	0.000
13		0.000	246.380	922.2 *	237.485	38.57	236.580	6.600 *	237.105	24.74	236.380	0.000
14		0.000	238.815	96.71	237.420	37.55 *	236.610	7.252	237.060	20.52	236.360	0.000
15		0.000	237.880	55.05	237.350	34.36 *	236.740	10.89	237.010	18.97	236.320	0.000
16		0.000	237.580	43.02	237.280	38.50	236.955	19.52	236.830	13.96 *	236.310	0.000
17		0.000	237.300	32.14 *	237.230	26.89	238.150	63.58	236.780	16.84	236.300	0.000
18		0.000	237.040	18.74	237.120	23.06	237.590	45.68 *	236.760	15.87	236.250	0.000
19		0.000	237.010	17.69	237.030	22.47	237.125	24.95	236.750	15.30	236.210	0.000
20		0.000	237.000	14.18	236.970	21.63	238.050	64.55	236.740	14.65	236.180	0.000

21	RIVER DRY	0.000		236.980	13.45		236.940	17.75	*	237.080	24.21		236.750	11.50		236.170	0.000
22	236.370	2.050	*	236.950	14.22		236.890	19.77		236.960	17.60		236.720	10.80		236.150	0.000
23	236.410	2.770	*	239.205	163.7		236.850	17.71		236.980	14.94		236.690	9.610	*	236.120	0.000
24	237.650	48.67	*	237.780	55.38	*	236.810	16.32		237.255	38.05		236.670	8.779		236.100	0.000
25	237.020	20.43		237.710	77.80		236.780	12.35	*	237.690	50.71	*	236.650	8.369		236.060	0.000
26	236.810	13.31	*	238.725	123.8		236.730	10.80	*	238.150	71.05		236.640	8.292		RIVER DRY	0.000
27	236.650	8.470	#	243.260	530.3	*	236.730	10.74		237.505	38.14		236.630	7.692			0.000
28	238.300	114.4		244.000	616.5	*	236.720	10.50	*	237.815	45.07		236.610	7.181			0.000
29	237.345	34.14	#	239.200	128.5		236.710	10.33		237.190	24.33		236.600	6.432			0.000
30	239.650	170.5		238.010	67.93		236.795	17.67		237.050	18.67		236.590	6.850	*		0.000
31				237.960	65.15	*	236.800	16.03					236.570	6.514			0.000
Ten-Daily Mean																	
I Ten-Daily				238.484	112.7		238.943	141.8		236.914	15.82		237.477	40.44		236.483	4.275
II Ten-Daily				240.307	323.4		237.311	34.36		237.103	25.80		236.947	19.83		236.309	0.000
III Ten-Daily	237.356	46.08		239.071	168.8		236.796	14.54		237.368	34.28		236.647	8.365		236.120	0.000
Monthly																	
Min.	236.370	2.050		236.860	13.45		236.710	10.33		236.580	6.600		236.570	6.432		236.060	0.000
Max.	239.650	170.5		248.100	1168		240.840	264.8		238.150	71.05		238.960	102.8		236.550	5.974
Mean	237.356	46.08		239.281	200.6		237.654	61.98		237.128	25.3		237.012	22.41		236.341	1.71

Annual Runoff in MCM = 868 **Annual Runoff in mm = 91**

Peak Observed Discharge = 264.80 cumecs on 04-08-2016 **Corres. Water Level :240.840 m**

Lowest Observed Discharge = 0.000 cumecs on 11-11-2016 **Corres. Water Level :236.390 m**

Note: River Dry from 01/06/2016/ to 21/06/2016 and from 26/11/2016 to 31/05/2017 no flow from 22/06/2016 to 24/06/2016 and 11/11/2016 to 25/11/2016

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 2016 to 2017

Station Name: Purna at Gopalkheda (01 02 17 004) Division : Tapi Division Surat Local River: Purna Sub Division: Upper Tapi 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		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		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	RIVER	0.000	RIVER	0.000	RIVER	0.000	RIVER	0.000	RIVER	0.000	RIVER	0.000
11	DRY	0.000	DRY	0.000	DRY	0.000	DRY	0.000	DRY	0.000	DRY	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		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.		0.000		0.000		0.000		0.000		0.000		0.000
Max.		0.000		0.000		0.000		0.000		0.000		0.000
Mean		0.000		0.000		0.000		0.000		0.000		0.000

Peak Computed Discharge = 1168 cumecs on 12-07-2016 Corres. Water Level :248.100 m

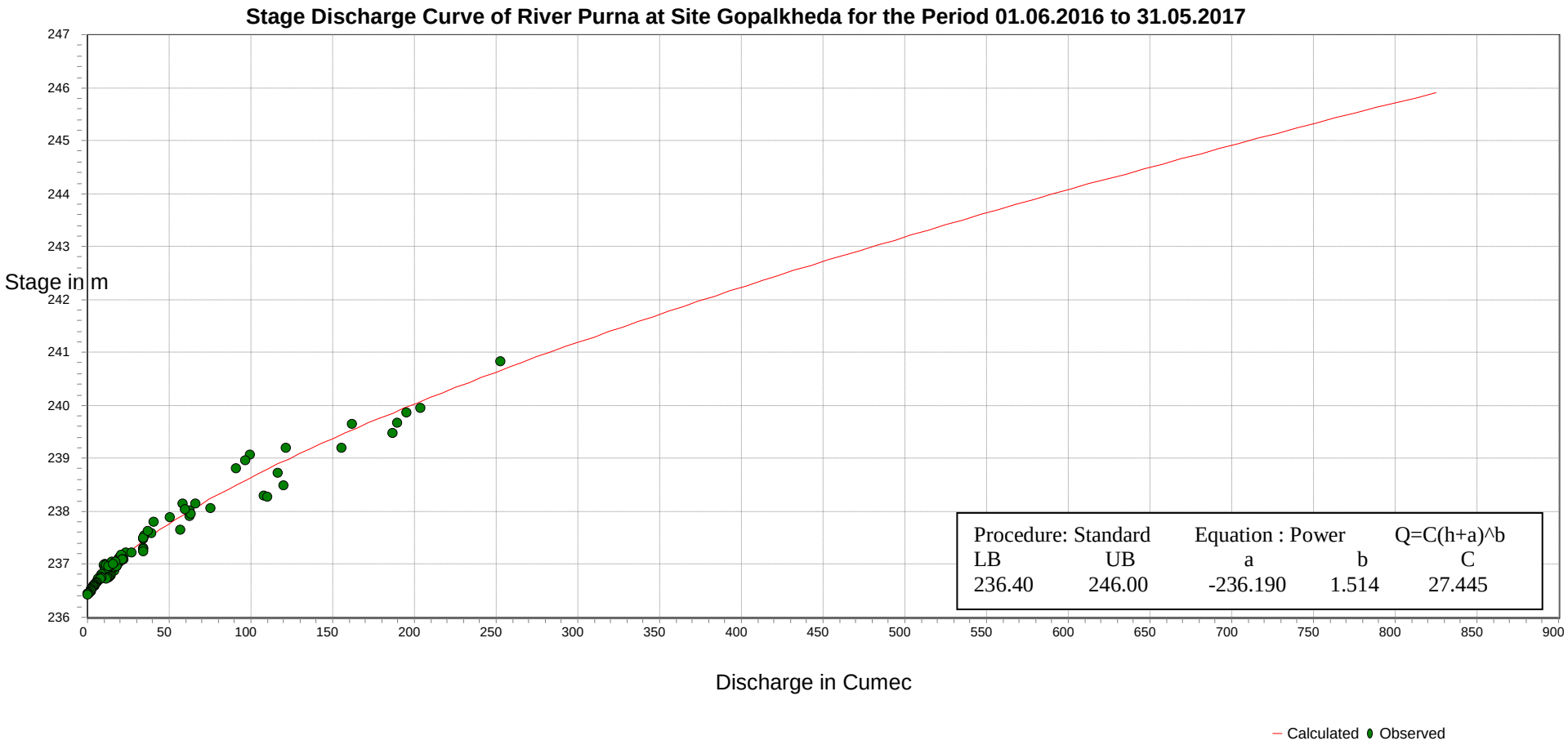
Lowest Computed Discharge = 2.050 cumecs on 22-06-2016 Corres. Water Level :236.370 m

Note: River Dry from 01/06/2016/ to 21/06/2016 and from 26/11/2016 to 31/05/2017 no flow from 22/06/2016 to 24/06/2016 and 11/11/2016 to 25/11/2016

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

3.2.4 Stage Discharge Curve

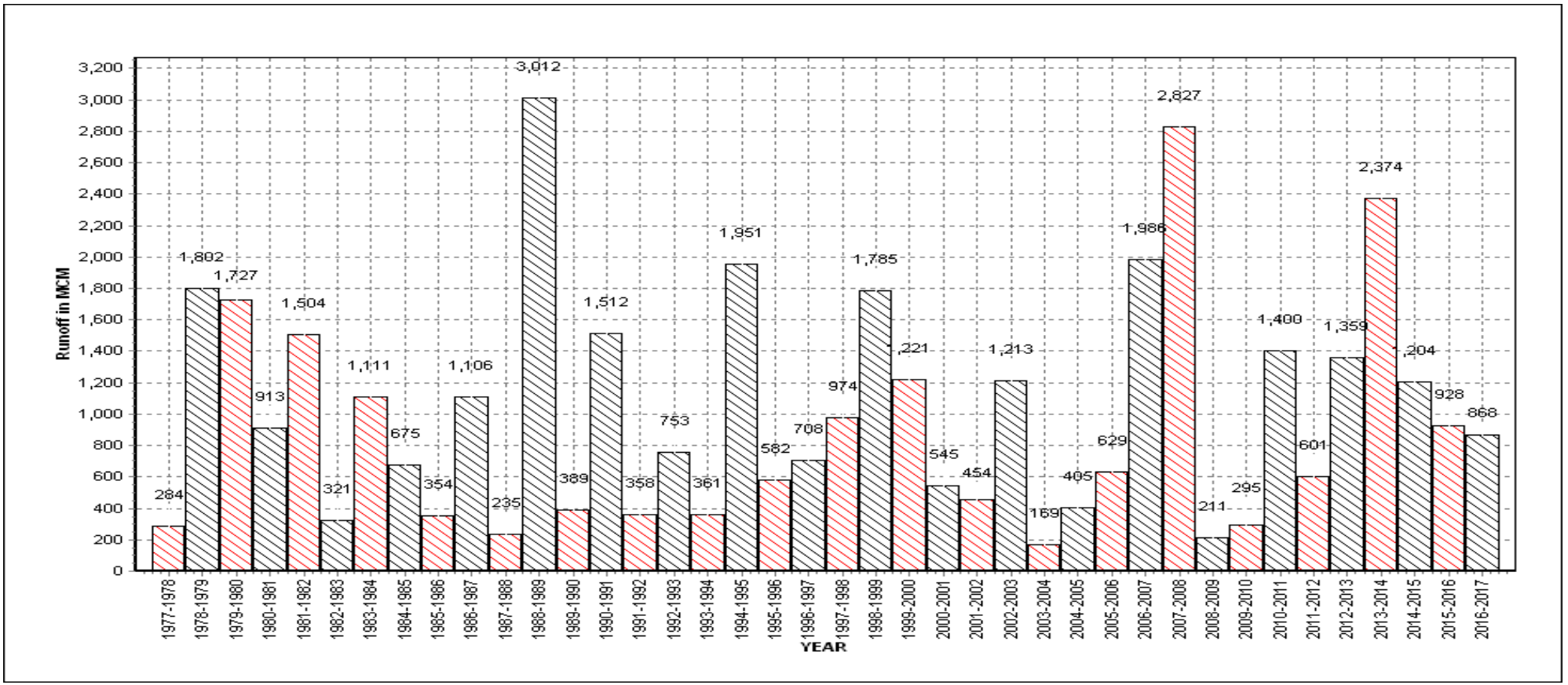
Station Name: Purna at Gopalkheda (01 02 17 004) Division : Tapi Division Surat Local River: Purna Sub Division: Upper Tapi Bhusawal



3.2.5 Annual runoff

Annual Runoff for the period 1977-2016

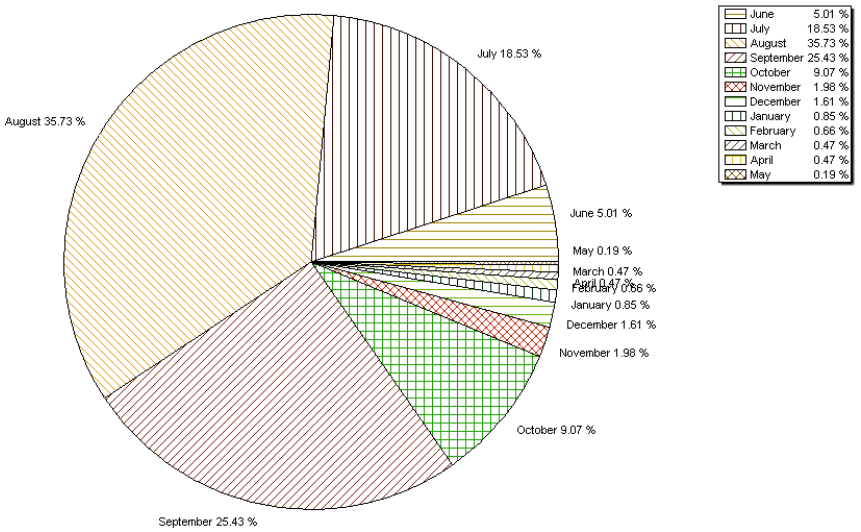
Station Name: Purna at Gopalkheda (01 02 17 004) Division : Tapi Division Surat Local River: Purna Sub Division: Upper Tapi Bhusawal



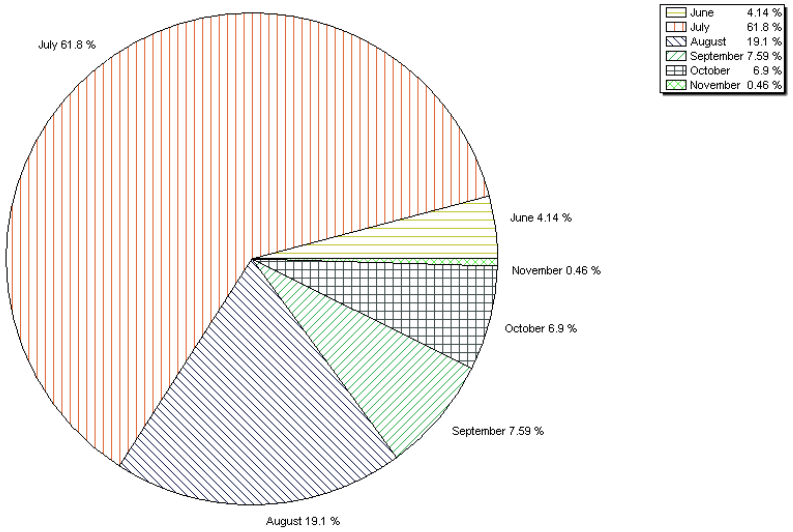
3.2.6 Monthly average Runoff

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

Monthly Average Runoff Based on period 1977-2016

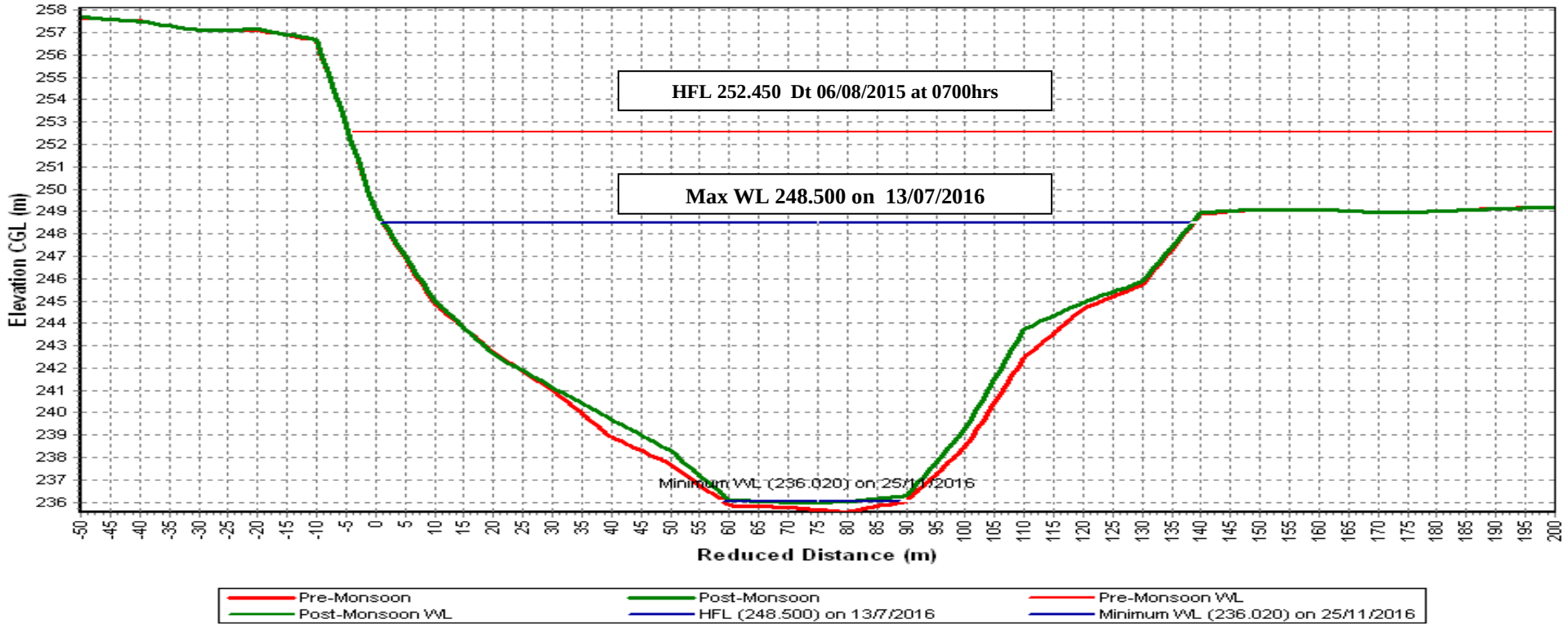


Monthly Runoff Based on period 2016-2017



3.2.7 Superimposed cross section

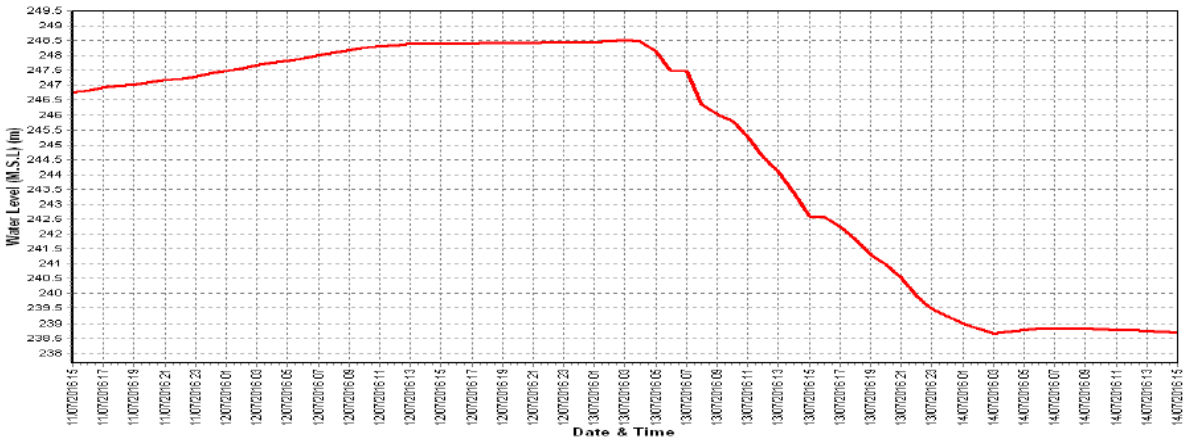
Station Name: Purna at Gopalkheda (01 02 17 004) Division : Tapi Division Surat Local River: Purna Sub Division: Upper Tapi Bhusawal



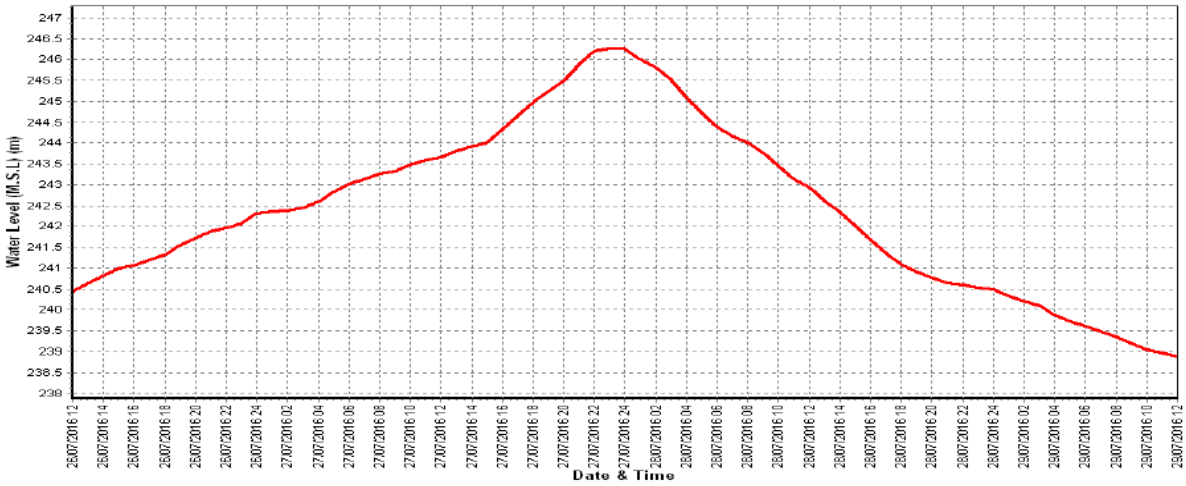
3.2.8 WL vs Time graph of highest I, II, III peak

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

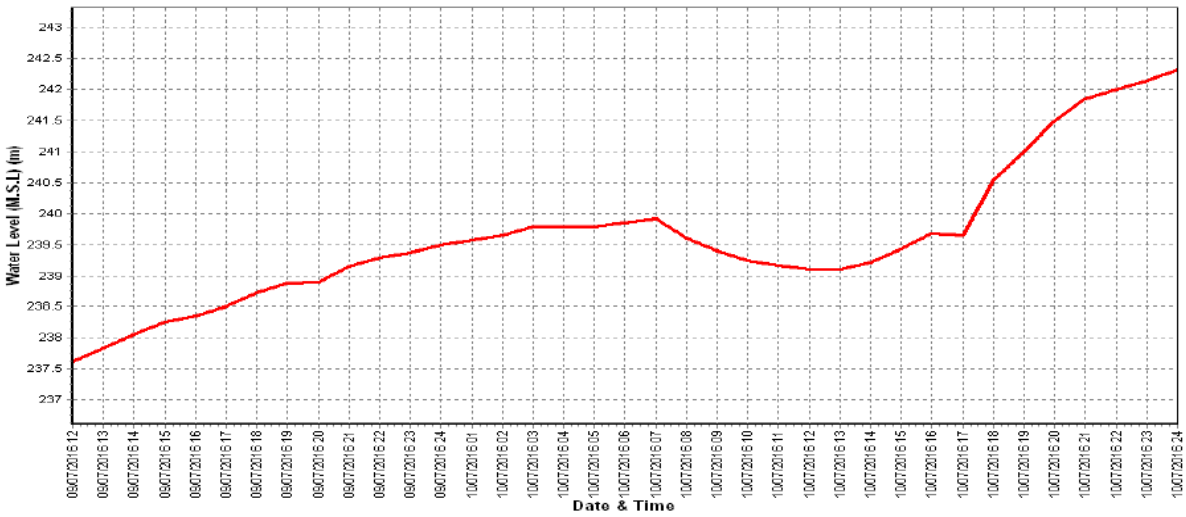
Water level vs Time Graph of Highest (I) flood peak during the water year 2016-17



Water level vs Time Graph of Highest (II) flood peak during the water year 2016-17



Water level vs Time Graph of Highest (III) flood peak during the water year 2016-17



3.3 Yerli

3.3.1 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 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

3.3.2 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

3.3.3 Summary of Data

Stage Discharge data for the period 2016 to 2017

Station Name: Purna at Yerli (01 02 17 005) Division: Tapi Division, Surat Local River: Sub Division: Upper Tapi, 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	RIVER DRY	0.000	215.850	178.2	215.670	161.2	215.100	64.07	214.950	40.28	214.530	4.504
2		0.000	215.450	116.3	217.150	390.2	215.635	123.4	214.930	34.95 *	214.500	3.784
3		0.000	215.180	62.05 *	216.675	299.5	215.280	91.93	216.300	266.4	214.500	3.643
4		0.000	216.840	394.7	218.000	588.1	215.030	45.18 *	215.965	226.2	214.480	3.134
5		0.000	215.490	120.3	217.310	410.0	214.920	27.33	215.570	132.7	214.460	2.838
6		0.000	215.950	172.0 *	216.420	242.4	214.810	20.19	215.390	104.9	214.440	0.750 *
7		0.000	215.080	54.10	216.200	214.8 *	214.790	19.10	215.350	99.45	214.410	0.100 #
8		0.000	214.870	25.25	216.750	314.1	214.765	12.71	214.950	39.33	214.390	0.000
9		0.000	214.800	22.35	216.210	197.3	214.700	11.82	215.010	43.07 *	214.380	0.000
10		0.000	214.900	32.06 *	216.025	183.3	214.650	10.48	215.800	175.3	214.370	0.000
11		0.000	218.925	995.9	215.500	137.0	214.630	10.12 *	215.300	76.74 *	214.370	0.000
12		0.000	222.950	2172 *	215.440	122.6	214.470	1.730 #	215.130	56.23 *	214.360	0.000
13		0.000	222.400	1968 *	215.320	111.1	214.540	4.840 *	215.010	46.58	214.350	0.000
14		0.000	217.575	439.6	215.280	74.22 *	214.540	7.996	214.950	40.53	214.340	0.000
15		0.000	215.870	185.2	215.270	72.97 *	214.510	5.016	214.840	28.62	214.330	0.000
16		0.000	215.410	109.9	215.190	55.44	214.580	10.58	214.830	25.62 *	214.320	0.000
17		0.000	215.290	75.47 *	215.100	51.05	214.885	27.03	214.750	12.00	214.310	0.000
18		0.000	214.950	35.63	214.980	42.26	215.630	122.0 *	214.790	21.83	214.300	0.000
19		0.000	215.000	51.90	215.030	43.63	215.290	75.47 #	214.780	21.18	214.300	0.000
20		0.000	215.010	44.37	214.875	24.57	215.055	51.15	214.730	10.97	214.290	0.000

21	RIVER DRY	0.000	215.000	48.29	214.850	21.72	215.290	78.55	214.660	9.668	214.280	0.000
22		0.000	214.940	34.76	214.840	21.87	215.040	51.93	214.640	8.736	214.280	0.000
23		0.000	214.900	29.55	214.820	20.74	215.015	48.34	214.630	10.12 *	214.270	0.000
24	214.300	0.000 *	217.400	458.7 *	214.810	19.87	214.900	37.12	214.630	8.542	214.260	0.000
25	215.045	77.62	216.200	224.4	214.810	23.87 *	215.020	44.12 *	214.620	7.823	214.260	0.000
26	214.850	27.41 *	216.625	359.3	214.810	19.55	215.390	106.9	214.620	7.071	214.250	0.000
27	214.570	9.933	218.050	642.7	214.800	19.13	215.840	154.2 *	214.600	6.869	214.250	0.000
28	215.250	86.29	221.385	1525	214.800	23.02 *	215.290	86.15	214.600	6.519	214.240	0.000
29	215.315	90.66	218.500	668.9	214.780	14.99	215.305	89.98	214.570	5.792	214.240	0.000
30	214.965	50.45	216.400	241.0	214.800	18.21	215.140	66.36	214.560	5.900 *	214.230	0.000
31			215.960	173.7 *	214.805	19.98			214.550	5.079		
I Ten-Daily			215.441	117.7	216.641	300.1	214.968	42.62	215.422	116.3	214.446	1.875
II Ten-Daily			217.338	607.8	215.198	73.49	214.813	31.60	214.911	34.03	214.327	0.000
III Ten-Daily	214.899	48.91	216.851	400.5	214.811	20.27	215.223	76.36	214.607	7.465	214.256	0.000
Monthly												
Min.	214.300	0.000	214.800	22.35	214.780	14.99	214.470	1.730	214.550	5.079	214.230	0.000
Max.	215.315	90.66	222.950	2172	218.000	588.1	215.840	154.2	216.300	266.4	214.530	4.504
Mean	214.899	48.91	216.553	376.2	215.526	127.7	215.001	50.19	214.968	51.13	214.343	0.625

Annual Runoff in MCM = 1648 **Annual Runoff in mm = 100**

Peak Observed Discharge = 1525.0 cumecs on 28-07-2016 Corres. Water Level :221.385 m

Lowest Observed Discharge = 0.000 cumecs on 08-11-2016 Corres. Water Level :214.390 m

Note: 08/11/2016 to 12/12/2016 Negligible Flow. River Dry from 01/06/2016 to 23/06/16 and 13/12/16 to 31/05/17

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 2016 to 2017

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

Day	Dec		Jan		Feb		Mar		Apr		May	
	W.L	Q	WL	Q	WL	Q	WL	Q	WL	Q	WL	Q
1	214.230	0.000	RIVER DRY	0.000	RIVER DRY	0.000	RIVER DRY	0.000	RIVER DRY	0.000	RIVER DRY	0.000
2	214.220	0.000		0.000		0.000		0.000		0.000		0.000
3	214.210	0.000		0.000		0.000		0.000		0.000		0.000
4	214.210	0.000		0.000		0.000		0.000		0.000		0.000
5	214.200	0.000		0.000		0.000		0.000		0.000		0.000
6	214.190	0.000		0.000		0.000		0.000		0.000		0.000
7	214.180	0.000		0.000		0.000		0.000		0.000		0.000
8	214.150	0.000		0.000		0.000		0.000		0.000		0.000
9	214.090	0.000		0.000		0.000		0.000		0.000		0.000
10	214.010	0.000		0.000		0.000		0.000		0.000		0.000
11	214.000	0.000		0.000		0.000		0.000		0.000		0.000
12	214.000	0.000		0.000		0.000		0.000		0.000		0.000
13	RIVER DRY	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	214.169	0.000		0.000		0.000		0.000		0.000		0.000
II Ten-Daily	214.000	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
Monthly												
Min.	214.000	0.000		0.000		0.000		0.000		0.000		0.000
Max.	214.230	0.000		0.000		0.000		0.000		0.000		0.000
Mean	214.141	0		0.000		0.000		0.000		0.000		0.000

Peak Computed Discharge = 2172 cumecs on 12/07/2016 Corres. Water Level :222.950 m

Lowest Computed Discharge =0.000 cumecs on 24/06/2016 Corres. Water Level :214.300 m

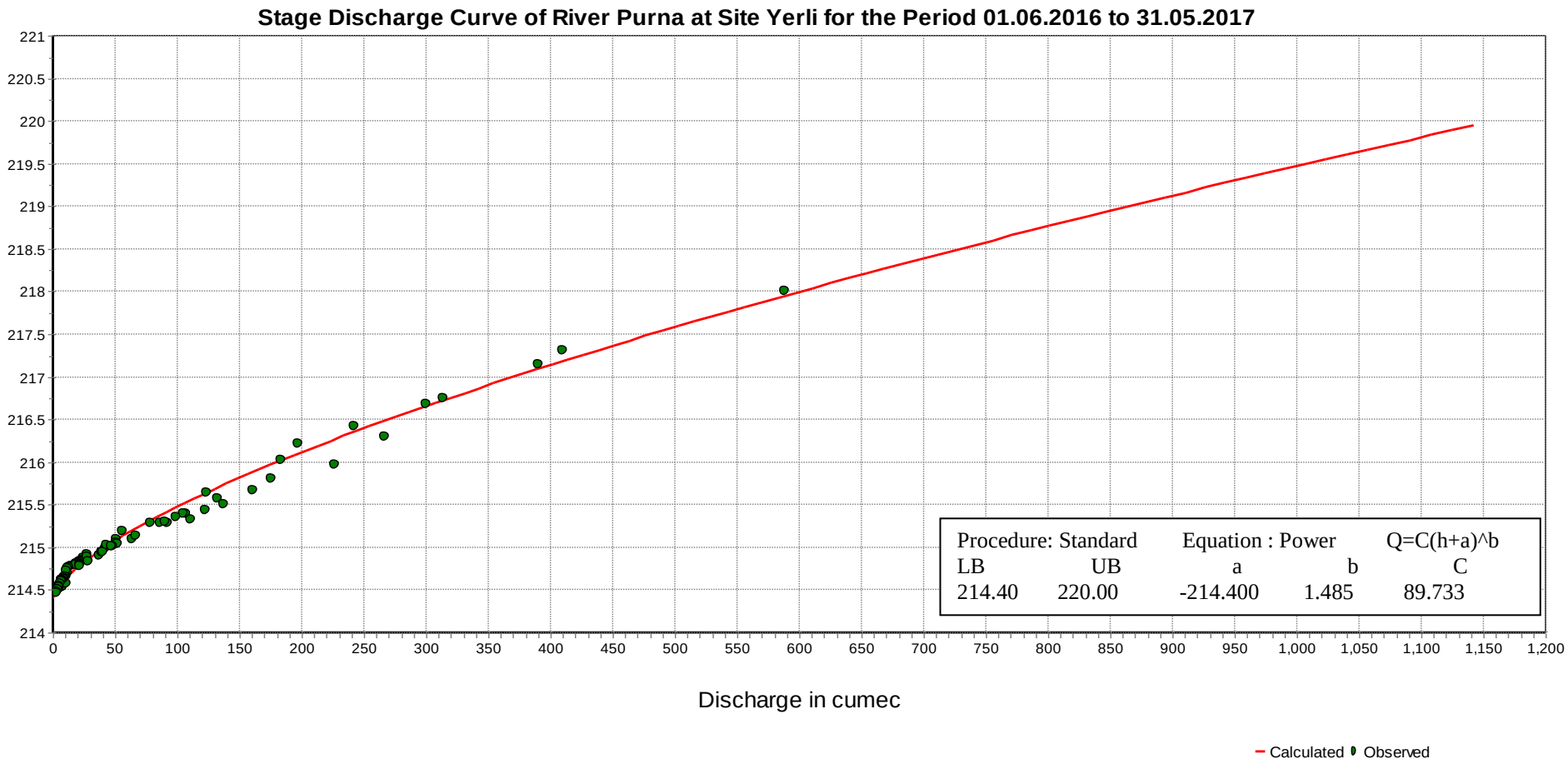
Note: 08/11/2016 to 12/12/2016 Negligible Flow. River Dry from 01/06/2016 to 23/06/16 and 13/12/16 to 31/05/17

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

#Discarded and estimated

3.3.4 Stage Discharge Curve

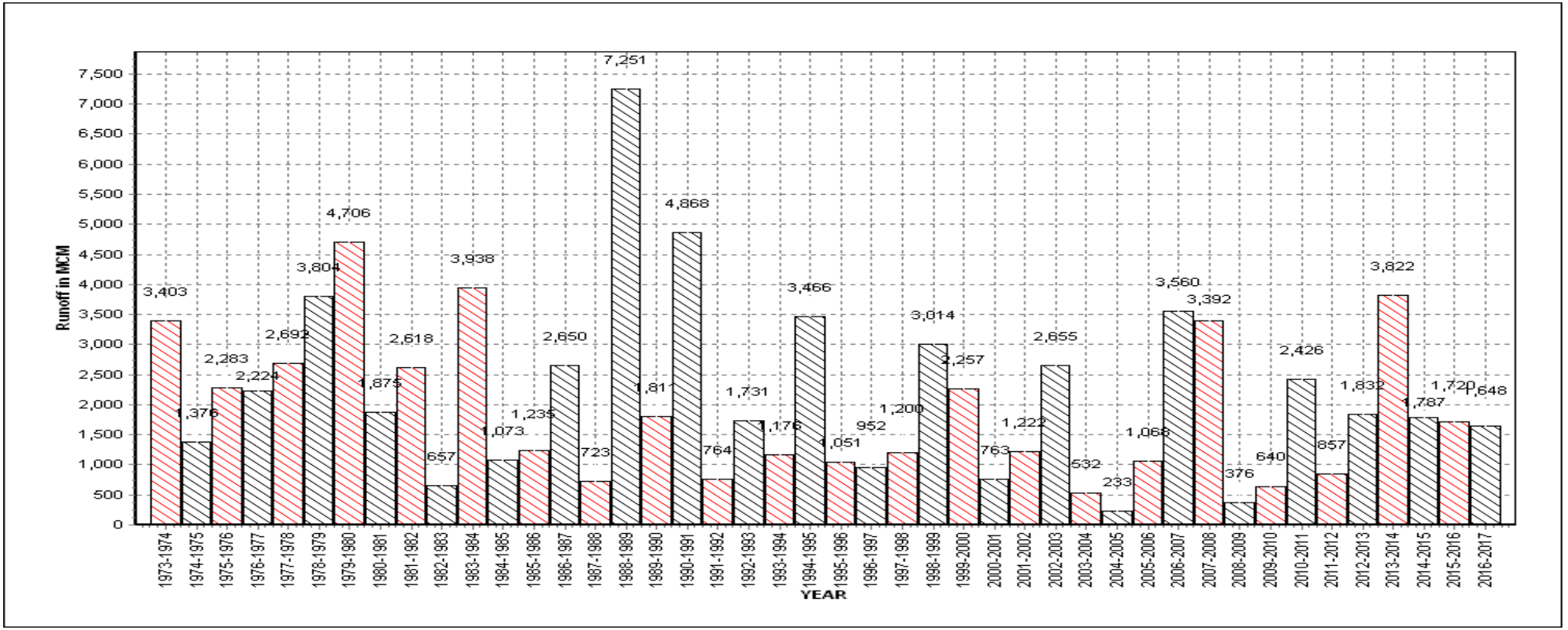
Station Name: Purna at Yerli (01 02 17 005) Division: Tapi Division, Surat Local River:Purna Sub Division: Upper Tapi, Bhusawal



3.3.5 Annual runoff

Annual Runoff for the period 1973-2016

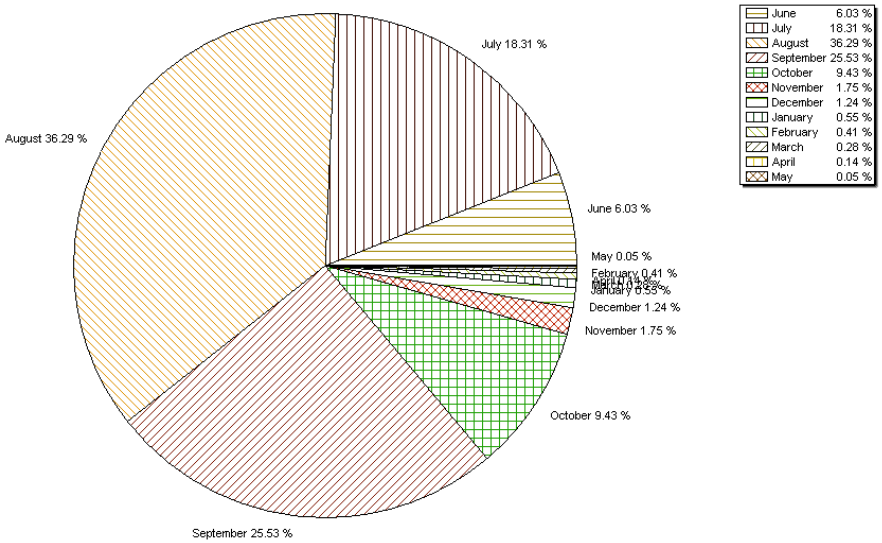
Station Name: Purna at Yerli (01 02 17 005) Division: Tapi Division, Surat Local River:Purna Sub Division: Upper Tapi, Bhusawal



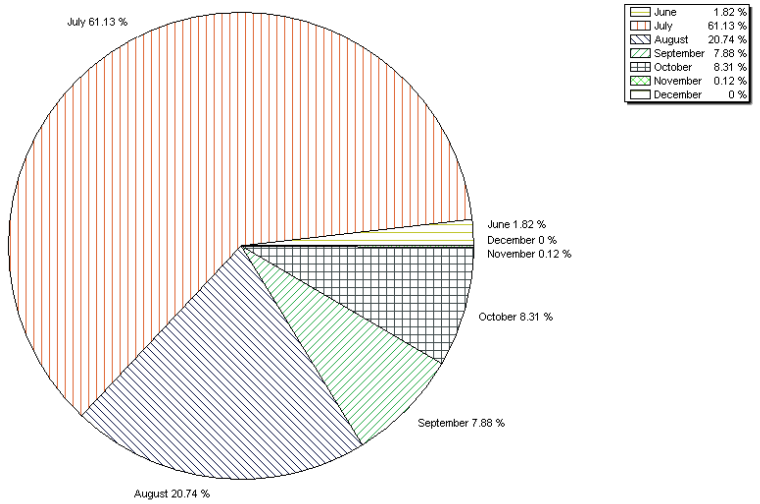
3.3.6 Monthly average Runoff

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

Monthly Average Runoff Based on period 1973-2016



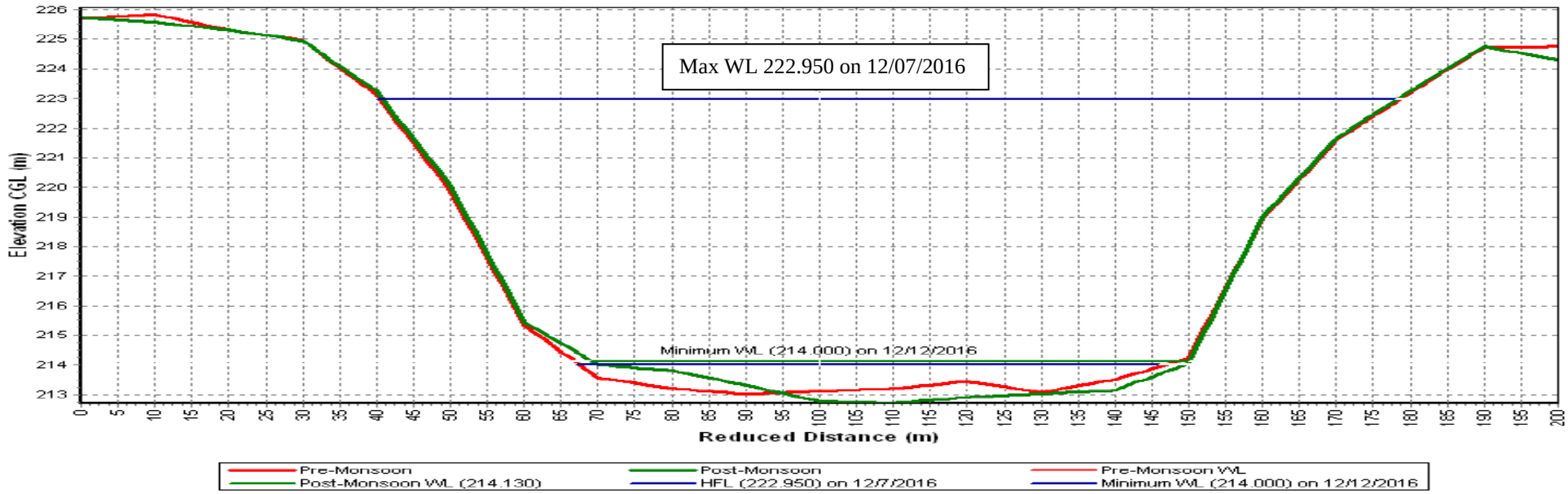
Monthly Runoff Based on period 2016-2017



3.3.7 Superimposed cross section

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

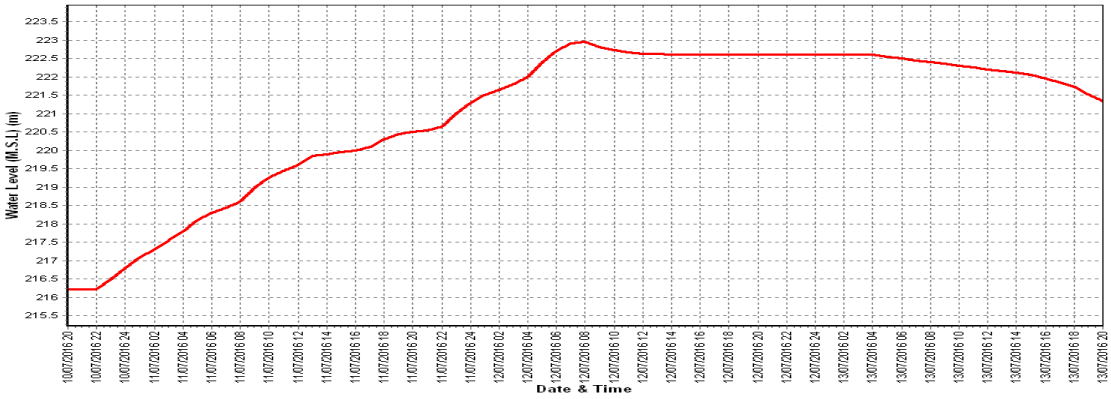
HFL 233.700 Dt 07/08/2006 at 12:00 hrs



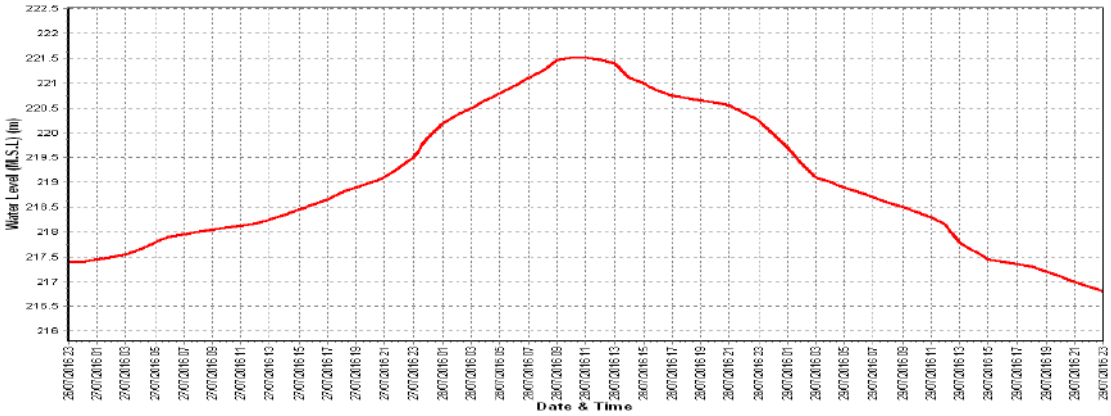
3.3.8 WL vs Time graph of highest I, II, III peak

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

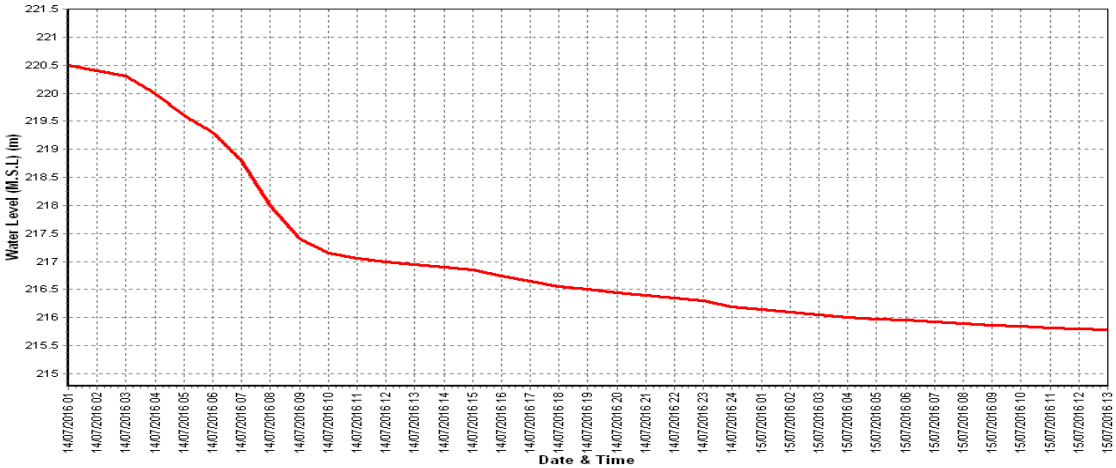
Water level vs Time Graph of Highest (I) flood peak during the water year 2016-17



Water level vs Time Graph of Highest (II) flood peak during the water year 2016-17



Water level vs Time Graph of Highest (III) flood peak during the water year 2016-17



3.4. Gidhade

3.4.1 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 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

3.4.2 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

3.4.3 Summary of Data

Stage Discharge data for the period 2016 to 2017

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	127.300	0.000	130.000	0.000	123.150	480.4	126.650	0.000	128.900	0.000	132.150	0.000
2	127.280	0.000	128.900	0.000	123.090	457.0	128.550	0.000	130.900	0.000	132.200	0.000
3	127.280	0.000	128.180	0.000	124.505	1298	129.200	0.000	129.600	0.000	132.400	0.000
4	127.260	0.000	128.080	0.000	126.600	2896 #	129.300	0.000	130.200	0.000	132.380	0.000
5	127.250	0.000	127.000	0.000	125.900	2752	128.400	0.000	130.700	0.000	132.250	0.000
6	127.240	0.000	127.650	0.000	124.800	1460	128.530	0.000	129.600	0.000	132.180	0.000
7	127.220	0.000	126.300	0.000	124.200	979.2 *	129.050	0.000	128.750	0.000	132.210	0.000
8	127.210	0.000	126.300	0.000	125.050	1584	129.500	0.000	127.500	0.000	132.280	0.000
9	127.200	0.000	126.000	0.000	124.350	1275	130.200	0.000	129.000	0.000	132.350	0.000
10	127.200	0.000	124.950	0.000	123.800	1044	130.750	0.000	129.400	0.000	132.430	0.000
11	126.820	0.000	126.500	0.000	123.600	953.1	131.300	0.000	128.680	0.000	132.460	0.000
12	126.780	0.000	126.700	2835	123.525	585.4	131.680	0.000	128.000	0.000	132.300	0.000
13	126.740	0.000	130.450	7720	123.280	317.0	131.980	0.000	131.100	0.000	132.300	0.000
14	126.720	0.000	127.300	3723	123.300	503.6 *	131.700	0.000	132.000	0.000	132.300	0.000
15	126.680	0.000	125.090	1626	123.210	463.9 *	131.960	0.000	132.050	0.000	132.350	0.000
16	126.650	0.000	123.950	833.1 #	123.100	377.0	131.780	0.000	131.870	0.000	132.300	0.000
17	126.630	0.000	123.350	526.3 *	122.825	265.4	131.750	0.000	132.169	0.000	132.300	0.000
18	126.620	0.000	123.310	508.1 #	122.580	196.6	130.380	0.000	132.000	0.000	132.280	0.000
19	126.620	0.000	123.150	438.2 #	122.450	176.7	130.800	0.000	132.080	0.000	132.260	0.000
20	126.620	0.000	122.900	338.4 *	122.380	141.0	130.650	0.000	132.000	0.000	132.260	0.000

21	126.630	0.000	123.350	526.3 *	122.100	99.60 *	130.480	0.000	132.350	0.000	132.260	0.000
22	126.630	0.000	122.720	211.2	121.980	86.78	130.870	0.000	132.400	0.000	132.280	0.000
23	126.640	0.000	122.480	110.1	121.950	77.92	128.700	0.000	132.380	0.000	132.280	0.000
24	126.640	0.000	122.250	134.6 *	121.950	74.22	130.200	0.000	132.360	0.000	132.280	0.000
25	126.630	0.000	124.050	890.3 #	121.970	73.15 *	129.750	0.000	132.280	0.000	132.260	0.000
26	126.650	0.000	122.860	171.8	121.970	76.13	129.500	0.000	132.450	0.000	132.250	0.000
27	126.630	0.000	124.350	539.9 #	121.960	73.92	130.480	0.000	132.520	0.000	132.240	0.000
28	126.640	0.000	124.475	1152 #	121.960	71.27 *	129.300	0.000	132.350	0.000	132.210	0.000
29	126.650	0.000	125.600	1869	122.050	118.9	127.250	0.000	132.400	0.000	132.190	0.000
30	131.100	0.000	124.200	979.2 #	122.065	124.5	126.150	0.000	132.400	0.000	132.160	0.000
31			123.500	597.1 *	122.100	122.9			132.300	0.000		
Ten-Daily Mean												
I Ten-Daily	127.244	0.000	127.336	0.000	124.545	1423	129.013	0.000	129.455	0.000	132.283	0.000
II Ten-Daily	126.688	0.000	125.270	1855	123.025	398.0	131.398	0.000	131.195	0.000	132.311	0.000
III Ten-Daily	127.084	0.000	123.621	652.9	122.005	90.84	129.268	0.000	132.381	0.000	132.241	0.000
Monthly												
Min.	126.620	0.000	122.250	0.000	121.950	71.27	126.150	0.000	127.500	0.000	132.150	0.000
Max.	131.100	0.000	130.450	7720	126.600	2896	131.980	0.000	132.520	0.000	132.460	0.000
Mean	127.005	0	125.351	830	123.153	619.5	129.893	0	131.054	0	132.278	0

Annual Runoff in MCM = 3882 **Annual Runoff in mm = 71**

Peak Observed Discharge = 7720.00 cumecs on 13-07-2016 Corres. Water Level :130.450m

Lowest Observed Discharge = 0.000 cumecs on 01-06-2016 Corres. Water Level :127.300 m

Note: River remained in pooling condition from. 01/06/2016 to 11/07/16 and 01/09/2016 to 31/05/2017
No release or negligible release during this period from existing barrage in D/S of site.

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 2016 to 2017

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	132.150	0.000	131.400	0.000	130.720	0.000	130.070	0.000	129.400	0.000	128.530	0.000
2	132.150	0.000	131.400	0.000	130.680	0.000	130.050	0.000	129.370	0.000	128.500	0.000
3	132.140	0.000 *	131.370	0.000	130.650	0.000	130.050	0.000	129.320	0.000	128.480	0.000
4	132.100	0.000	131.350	0.000	130.620	0.000	130.020	0.000	129.280	0.000	128.500	0.000
5	132.050	0.000	131.300	0.000	130.600	0.000	130.000	0.000	129.250	0.000	128.450	0.000
6	132.000	0.000	131.280	0.000	130.600	0.000	129.980	0.000	129.220	0.000	128.450	0.000
7	132.000	0.000	131.260	0.000	130.570	0.000	129.950	0.000	129.200	0.000	128.400	0.000
8	131.960	0.000	131.250	0.000	130.570	0.000	129.920	0.000	129.200	0.000	128.380	0.000
9	131.950	0.000	131.230	0.000	130.540	0.000	129.900	0.000	129.180	0.000	128.350	0.000
10	131.900	0.000	131.200	0.000	130.500	0.000	129.870	0.000	129.160	0.000	128.340	0.000
11	131.900	0.000	131.170	0.000	130.470	0.000	129.850	0.000	129.140	0.000	128.320	0.000
12	131.850	0.000	131.150	0.000	130.450	0.000	129.850	0.000	129.120	0.000	128.300	0.000
13	131.850	0.000	131.120	0.000	130.430	0.000	129.800	0.000	129.100	0.000	128.280	0.000
14	131.830	0.000	131.100	0.000	130.400	0.000	129.780	0.000	129.070	0.000	128.260	0.000
15	131.800	0.000	131.080	0.000	130.380	0.000	129.780	0.000	129.040	0.000	128.240	0.000
16	131.800	0.000	131.050	0.000	130.360	0.000	129.760	0.000	129.000	0.000	128.210	0.000
17	131.780	0.000	131.030	0.000	130.340	0.000	129.730	0.000	128.970	0.000	128.180	0.000
18	131.760	0.000	131.000	0.000	130.310	0.000	129.700	0.000	128.950	0.000	128.150	0.000
19	131.740	0.000	130.980	0.000	130.300	0.000	129.680	0.000	128.920	0.000	128.100	0.000
20	131.740	0.000	130.960	0.000	130.280	0.000	129.650	0.000	128.880	0.000	128.070	0.000

21	131.700	0.000	130.950	0.000	130.260	0.000	129.630	0.000	128.830	0.000	128.050	0.000
22	131.650	0.000	130.900	0.000	130.250	0.000	129.600	0.000	128.800	0.000	128.000	0.000
23	131.620	0.000	130.870	0.000	130.230	0.000	129.570	0.000	128.760	0.000	128.000	0.000
24	131.600	0.000	130.850	0.000	130.200	0.000	129.530	0.000	128.730	0.000	127.950	0.000
25	131.580	0.000	130.830	0.000	130.170	0.000	129.530	0.000	128.700	0.000	127.920	0.000
26	131.560	0.000	130.800	0.000	130.150	0.000	129.500	0.000	128.670	0.000	127.900	0.000
27	131.540	0.000	130.800	0.000	130.120	0.000	129.480	0.000	128.650	0.000	127.860	0.000
28	131.500	0.000	130.760	0.000	130.100	0.000	129.460	0.000	128.630	0.000	127.830	0.000
29	131.480	0.000	130.750	0.000			129.450	0.000	128.600	0.000	127.800	0.000
30	131.460	0.000	130.750	0.000			129.450	0.000	128.570	0.000	127.780	0.000
31	131.440	0.000	130.740	0.000			129.450	0.000			127.720	0.000
Ten-Daily Mean												
I Ten-Daily	132.040	0.000	131.304	0.000	130.605	0.000	129.981	0.000	129.258	0.000	128.438	0.000
II Ten-Daily	131.805	0.000	131.064	0.000	130.372	0.000	129.758	0.000	129.019	0.000	128.211	0.000
III Ten-Daily	131.557	0.000	130.818	0.000	130.185	0.000	129.514	0.000	128.694	0.000	127.892	0.000
Monthly												
Min.	131.440	0.000	130.740	0.000	130.100	0.000	129.450	0.000	128.570	0.000	127.720	0.000
Max.	132.150	0.000	131.400	0.000	130.720	0.000	130.070	0.000	129.400	0.000	128.530	0.000
Mean	131.793	0	131.054	0	130.402	0	129.743	0	128.990	0	128.171	0

Peak Computed Discharge = 979.2 cumecs on 07/08/2016 Corres. Water Level :124.200 m

Lowest Computed Discharge = 0.000 cumecs on 03/12/2016 Corres. Water Level :132.140 m

Note: River remained in pooling condition from. 01/06/2016 to 11/07/16 and 01/09/2016 to 31/05/2017

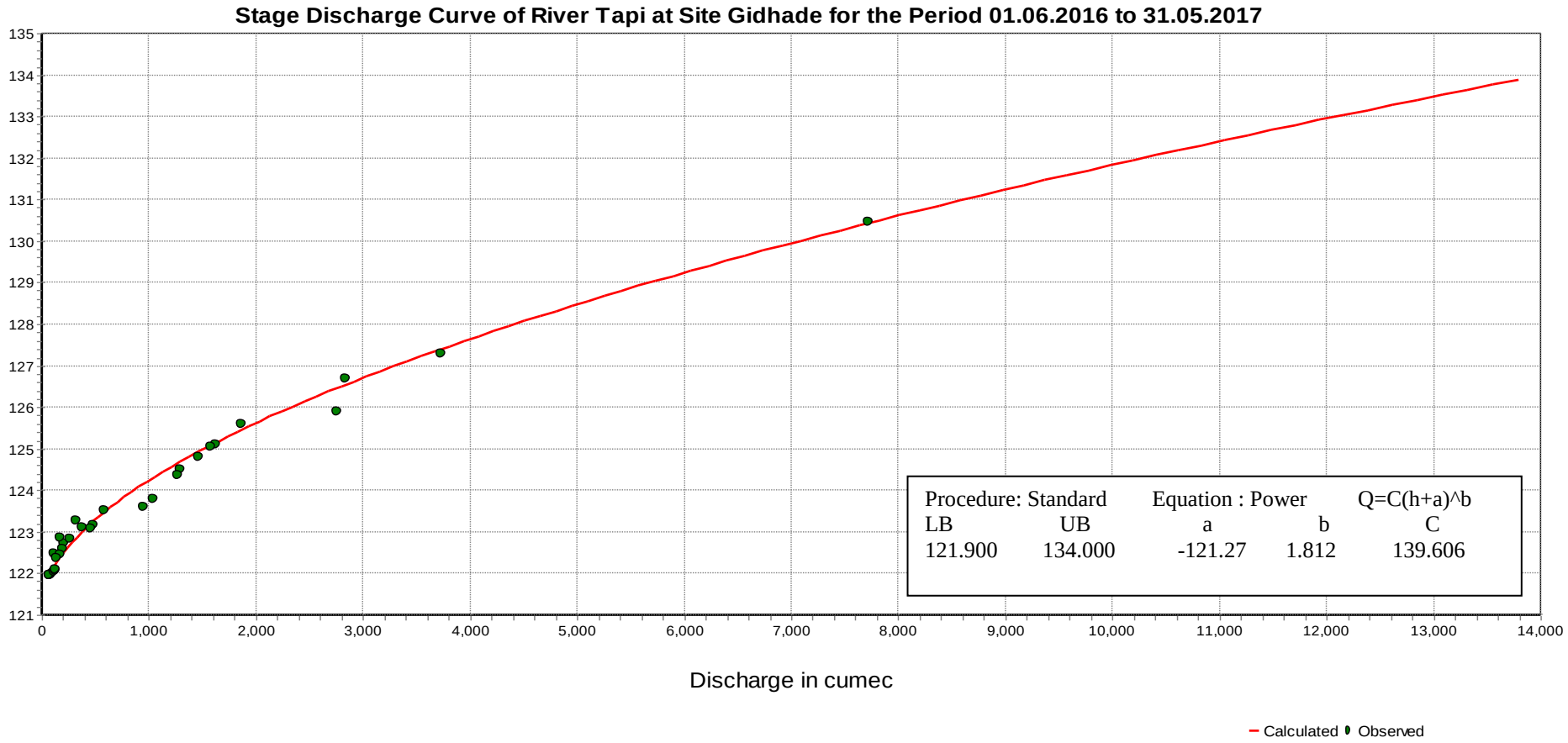
No release or negligible release during this period from existing barrage in D/S of site.

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

#Discarded and estimated

3.4.4 Stage Discharge Curve

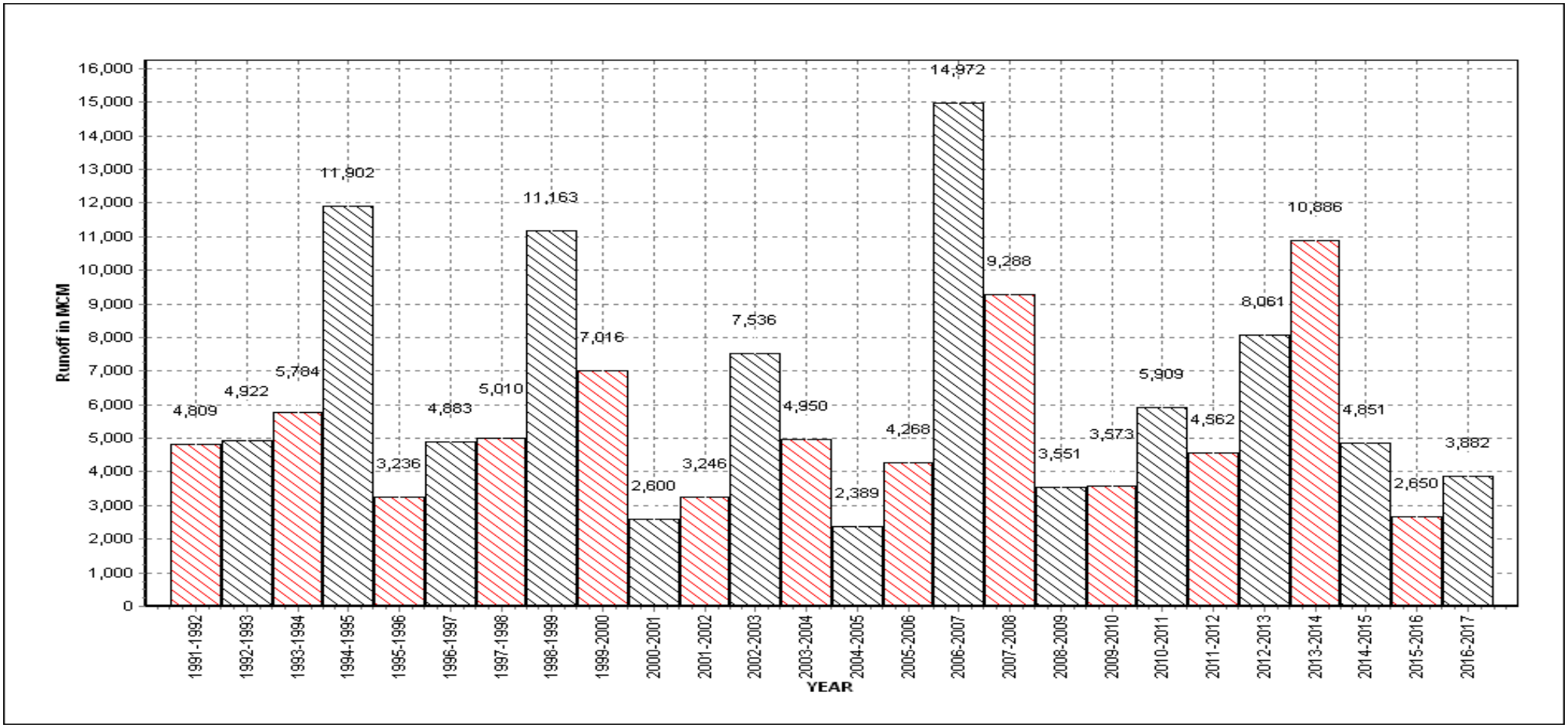
Station Name: Tapi at Gidhade (01 02 17 014) Division: Tapi Division Surat Local River:Tapi Sub Division: Middle Tapi Sub Division Dhule



3.4.5 Annual Runoff

Annual Runoff for the period 1991 to 2016

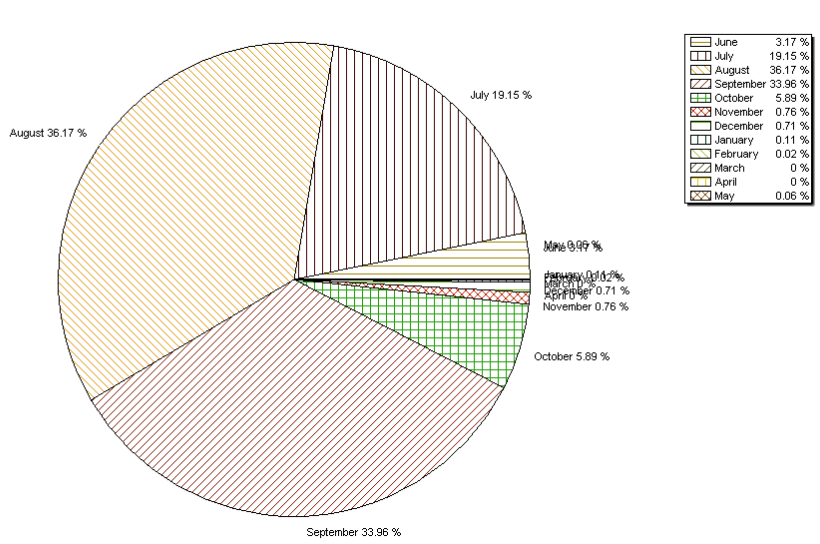
Station Name: Tapi at Gidhade (01 02 17 014) Division: Tapi Division Surat Local River:Tapi Sub Division: Middle Tapi Sub Division Dhule



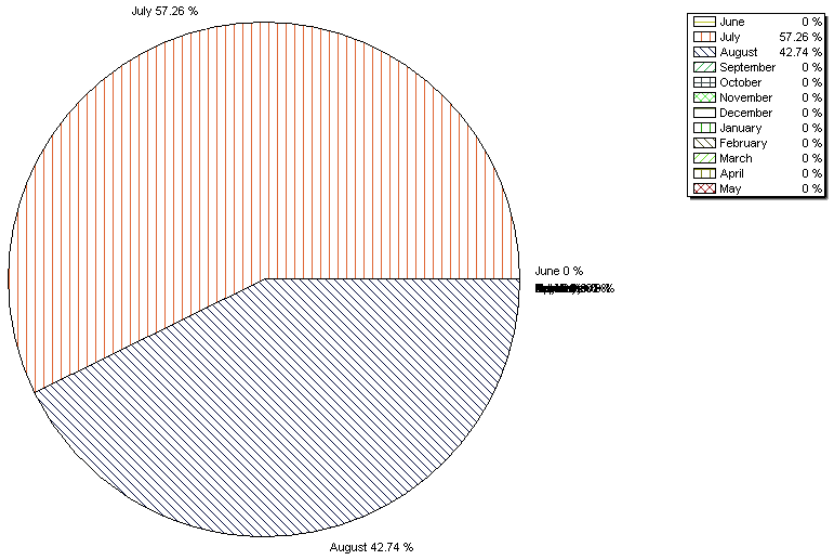
3.4.6 Monthly average Runoff

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 1991-2016

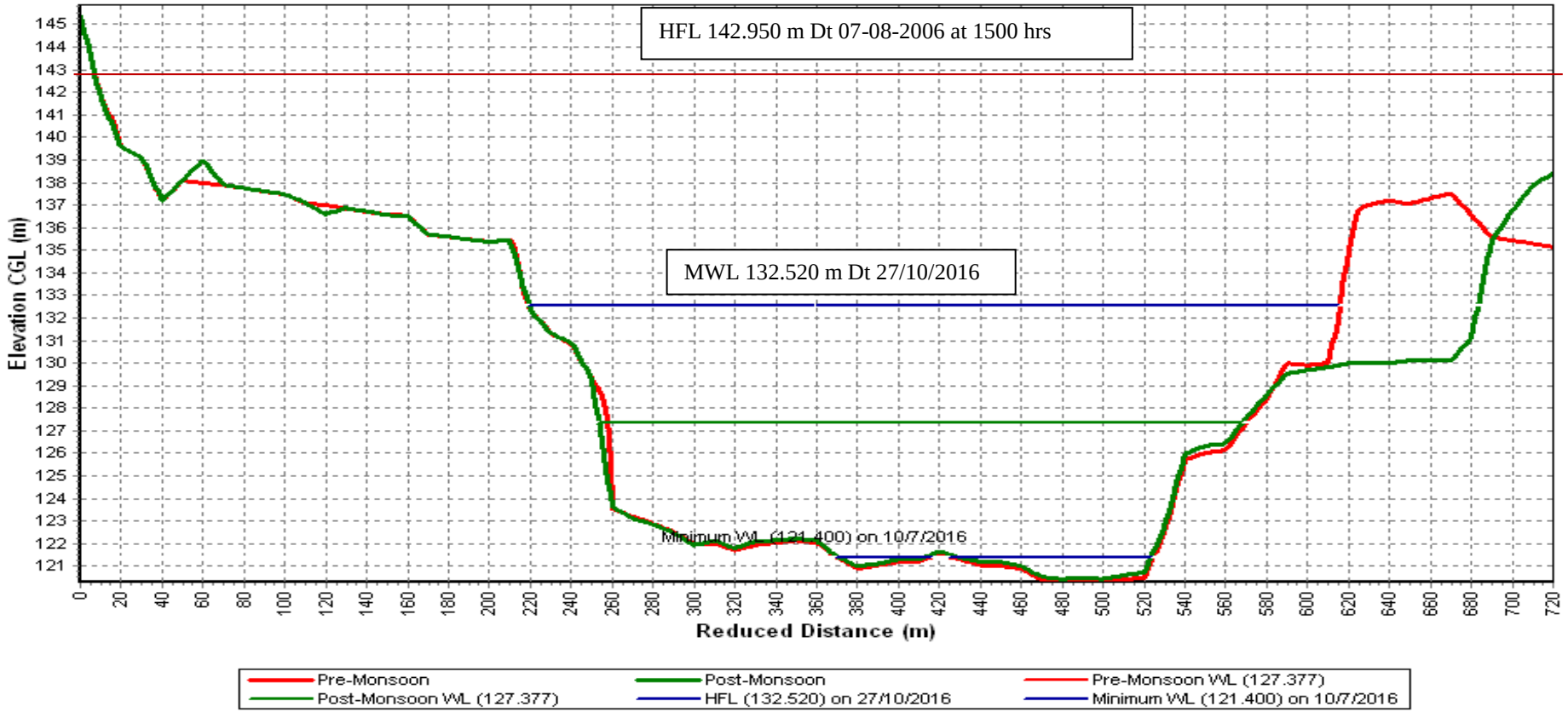


Monthly Runoff Based on period 2016-2017



3.4.7 Superimposed cross section

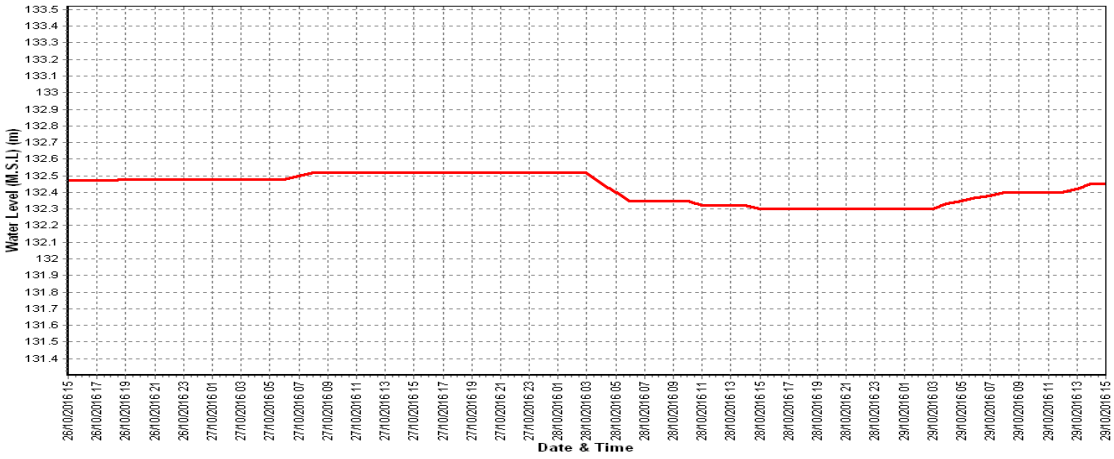
Station Name: Tapi at Gidhade (01 02 17 014) Division: Tapi Division, Surat Local River:Tapi Sub Division: Middle Tapi, Dhule



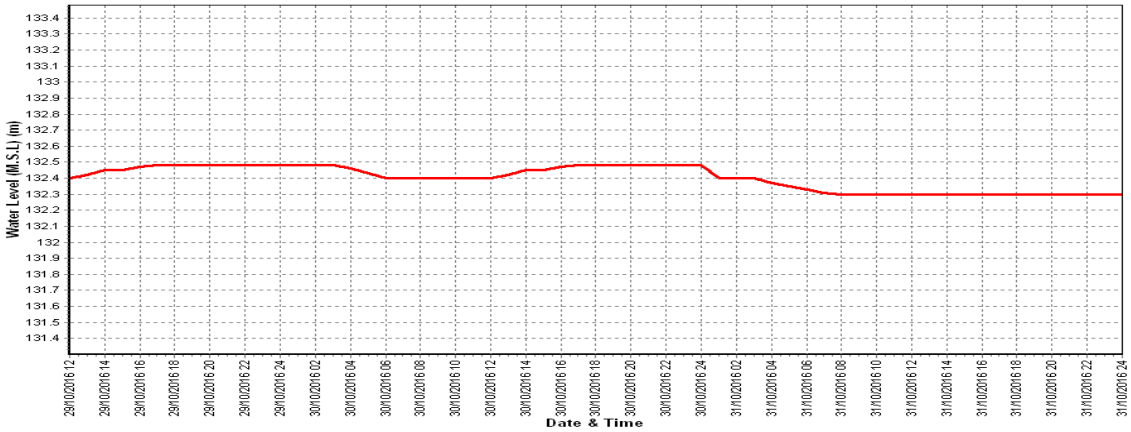
3.4.8 WL vs Time Graph of I,II,III peak

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

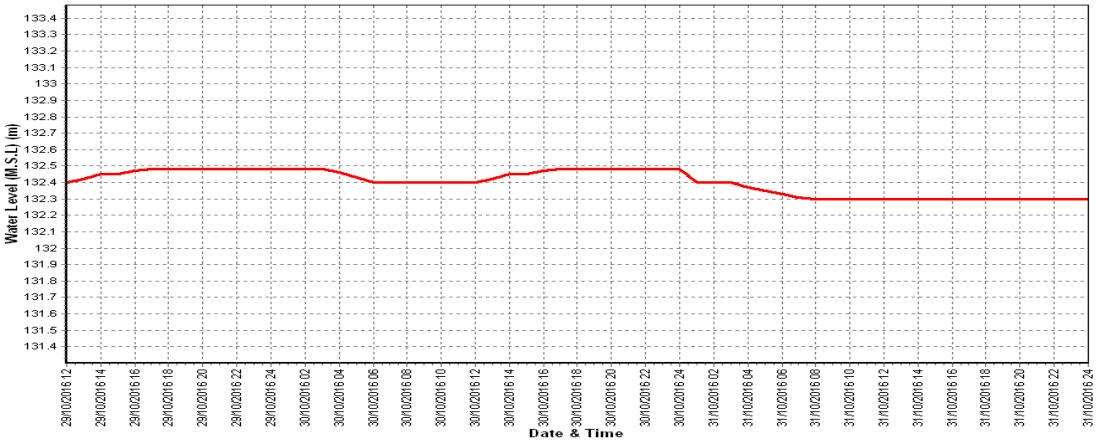
Water level vs Time Graph of Highest (I) flood peak during the water year 2016-17



Water level vs Time Graph of Highest (II) flood peak during the water year 2016-17



Water level vs Time Graph of Highest (III) flood peak during the water year 2016-17



3.5 Sarangkheda

3.5.1 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 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

3.5.2 Annual Maximum flood peak

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

3.5.3 Summary of Data

Stage Discharge data for the period 2016 to 2017

Station Name: Tapi at Sarangkheda (01 02 17 015) Division: Tapi Division Surat Local River:Tapi Sub Division: Middle Tapi 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	109.500	0.000	111.050	608.6	109.500	0.000	112.100	0.000	112.450	0.000
2		0.000	110.200	0.000	110.900	564.0	109.975	136.2 #	112.250	0.000	112.500	0.000
3		0.000	110.200	0.000	112.300	1511	110.500	0.000	112.100	1224 #	112.500	0.000
4		0.000	110.200	0.000	112.900	1927	111.000	0.000	112.100	1224 *	112.500	0.000
5		0.000	110.600	378.0 #	114.050	2541	111.000	0.000	112.150	1258 *	112.500	0.000
6		0.000	110.350	271.6 *	112.500	1616	110.000	0.000	112.150	1258 #	112.400	0.000
7		0.000	110.800	471.2 #	112.020	1171 *	110.250	0.000	112.150	0.000	112.400	0.000
8		0.000	110.550	355.8 #	112.750	1658	110.250	0.000	112.200	0.000	112.300	0.000
9		0.000	110.750	416.8	112.250	1449	110.250	0.000	111.900	0.000	112.300	0.000
10		0.000	110.250	232.5 *	111.800	1064	110.250	0.000	112.100	0.000	112.300	0.000
11		0.000	111.750	1031	111.500	915.5	110.250	0.000	112.200	0.000	112.300	0.000
12		0.000	113.750	2501	111.450	899.8	110.200	0.000	111.900	0.000	112.300	0.000
13		0.000	117.000	5701	111.100	627.7	110.200	0.000	112.150	0.000	112.300	0.000
14		0.000	115.350	3943 #	111.100	623.3 *	110.200	0.000	112.300	0.000	112.300	0.000
15		0.000	112.950	1832 #	111.100	623.3 *	110.150	0.000	112.300	0.000	112.300	0.000
16		0.000	111.600	855.7	110.900	509.9	110.100	0.000	112.300	0.000	112.300	0.000
17		0.000	111.050	597.0 *	110.750	427.6	110.150	0.000	112.350	0.000	112.300	0.000
18		0.000	110.700	308.8	110.450	327.1	111.700	0.000	112.400	0.000	112.300	0.000
19		0.000	110.800	463.9	110.300	250.5	112.700	1944	112.300	0.000	112.300	0.000
20		0.000	110.600	378.0 #	110.250	235.8	112.200	1291 #	112.300	0.000	112.300	0.000

21	RIVER DRY	0.000	110.700	304.7	110.100	177.8 *	111.800	0.000	112.400	0.000	112.300	0.000
22		0.000	110.700	304.9	109.900	134.0	111.700	0.000	112.400	0.000	112.300	0.000
23		0.000	110.600	272.5	109.900	134.9	111.400	0.000	112.350	0.000	112.300	0.000
24		0.000	110.400	291.9 *	109.900	135.7	111.500	0.000	112.350	0.000	112.300	0.000
25		0.000	111.300	711.5	109.900	113.0 *	111.500	0.000	112.450	0.000	112.300	0.000
26		0.000	111.200	594.8	109.900	125.3	111.900	1093 #	112.500	0.000	112.300	0.000
27		0.000	112.000	1190	109.850	98.41 *	112.550	1536 #	112.500	0.000	112.300	0.000
28		0.000	111.950	1159	109.500	0.000	112.050	1191 #	112.350	0.000	112.300	0.000
29		0.000	113.600	2390	109.500	0.000	112.000	0.000	112.400	0.000	112.300	0.000
30		0.000	112.300	1538	109.500	0.000	111.950	0.000	112.450	0.000	112.300	0.000
31		0.000	111.650	937.1 *	109.500	0.000			112.500	0.000		
Ten-Daily Mean												
I Ten-Daily		0.000	110.340	212.6	112.252	1411	110.298	13.62	112.120	496.3	112.415	0.000
II Ten-Daily		0.000	112.555	1761	110.890	544.1	110.785	323.5	112.250	0.000	112.300	0.000
III Ten-Daily		0.000	111.491	881.3	109.768	83.56	111.835	382.0	112.423	0.000	112.300	0.000
Monthly												
Min.		0.000	109.500	0.000	109.500	0.000	109.500	0.000	111.900	0.000	112.300	0.000
Max.		0.000	117.000	5701	114.050	2541	112.700	1944	112.500	1258	112.500	0.000
Mean		0.000	111.463	949.4	110.931	660.3	110.972	239.7	112.269	160.1	112.338	0

Annual Runoff in MCM = 5362 **Annual Runoff in mm = 92**

Peak Observed Discharge = 5701.0 cumecs on 13-07-2016 Corres. Water Level :117.000 m
Lowest Observed Discharge = 0.000 cumecs on 01-07-2016 Corres. Water Level :109.500 m

All Gates of Sarangkheda Barrage closed /river in pooling condition from 01-06-16 to 30-06-16, 01/07/16 to 04/07/16, 28/08/16 to 01/09/16,03/09/16 to 18/09/16, 21/09/16 to 25/09/16, 29/09/16 to 02/10/16, 04/10/16 to 05/10/16 and 07/10/16 to 31/05/17.

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 2016 to 2017

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

Day	Dec		Jan		Feb		Mar		Apr		May	
	W.L	Q	WL	Q	WL	Q	WL	Q	WL	Q	WL	Q
1	112.300	0.000	112.000	0.000	111.400	0.000	110.900	0.000	110.200	0.000	109.800	0.000
2	112.300	0.000	112.000	0.000	111.400	0.000	110.850	0.000	110.200	0.000	109.700	0.000
3	112.300	0.000	112.000	0.000	111.400	0.000	110.800	0.000	110.200	0.000	109.700	0.000
4	112.300	0.000	112.000	0.000	111.350	0.000	110.800	0.000	110.200	0.000	109.700	0.000
5	112.300	0.000	112.000	0.000	111.350	0.000	110.800	0.000	110.200	0.000	109.650	0.000
6	112.300	0.000	111.900	0.000	111.350	0.000	110.800	0.000	110.200	0.000	109.650	0.000
7	112.300	0.000	111.900	0.000	111.350	0.000	110.800	0.000	110.200	0.000	109.650	0.000
8	112.300	0.000	111.900	0.000	111.300	0.000	110.800	0.000	110.150	0.000	109.650	0.000
9	112.300	0.000	111.900	0.000	111.300	0.000	110.750	0.000	110.150	0.000	109.650	0.000
10	112.300	0.000	111.800	0.000	111.300	0.000	110.700	0.000	110.150	0.000	109.650	0.000
11	112.300	0.000	111.800	0.000	111.300	0.000	110.700	0.000	110.100	0.000	109.600	0.000
12	112.300	0.000	111.800	0.000	111.200	0.000	110.700	0.000	110.100	0.000	109.600	0.000
13	112.300	0.000	111.750	0.000	111.200	0.000	110.700	0.000	110.100	0.000	109.550	0.000
14	112.300	0.000	111.750	0.000	111.200	0.000	110.700	0.000	110.050	0.000	109.500	0.000
15	112.300	0.000	111.750	0.000	111.200	0.000	110.650	0.000	110.050	0.000	109.400	0.000
16	112.300	0.000	111.750	0.000	111.100	0.000	110.600	0.000	110.050	0.000	109.400	0.000
17	112.300	0.000	111.750	0.000	111.100	0.000	110.550	0.000	110.050	0.000	109.350	0.000
18	112.300	0.000	111.750	0.000	111.000	0.000	110.500	0.000	110.000	0.000	109.350	0.000
19	112.300	0.000	111.700	0.000	111.000	0.000	110.500	0.000	110.000	0.000	109.300	0.000
20	112.300	0.000	111.700	0.000	111.000	0.000	110.500	0.000	110.000	0.000	109.300	0.000

21	112.300	0.000	111.700	0.000	111.000	0.000	110.500	0.000	109.900	0.000	109.300	0.000
22	112.300	0.000	111.700	0.000	111.000	0.000	110.500	0.000	109.900	0.000	109.300	0.000
23	112.300	0.000	111.700	0.000	111.000	0.000	110.500	0.000	109.900	0.000	109.250	0.000
24	112.300	0.000	111.600	0.000	110.900	0.000	110.450	0.000	109.900	0.000	109.250	0.000
25	112.300	0.000	111.600	0.000	110.900	0.000	110.400	0.000	109.800	0.000	109.250	0.000
26	112.200	0.000	111.600	0.000	110.900	0.000	110.400	0.000	109.800	0.000	109.250	0.000
27	112.200	0.000	111.500	0.000	110.900	0.000	110.400	0.000	109.800	0.000	109.250	0.000
28	112.200	0.000	111.500	0.000	110.900	0.000	110.350	0.000	109.800	0.000	109.250	0.000
29	112.200	0.000	111.500	0.000			110.350	0.000	109.800	0.000	109.150	0.000
30	112.200	0.000	111.500	0.000			110.300	0.000	109.800	0.000	109.150	0.000
31	112.200	0.000	111.400	0.000			110.250	0.000			109.150	0.000
Ten-Daily Mean												
I Ten-Daily	112.300	0.000	111.940	0.000	111.350	0.000	110.800	0.000	110.185	0.000	109.680	0.000
II Ten-Daily	112.300	0.000	111.750	0.000	111.130	0.000	110.610	0.000	110.050	0.000	109.435	0.000
III Ten-Daily	112.245	0.000	111.573	0.000	110.938	0.000	110.400	0.000	109.840	0.000	109.232	0.000
Monthly												
Min.	112.200	0.000	111.400	0.000	110.900	0.000	110.250	0.000	109.800	0.000	109.150	0.000
Max.	112.300	0.000	112.000	0.000	111.400	0.000	110.900	0.000	110.200	0.000	109.800	0.000
Mean	112.281	0	111.748	0	111.154	0	110.597	0	110.025	0	109.442	0

Peak Computed Discharge = 1258.0 cumecs on 05/10/2016 Corres. Water Level :112.150 m

Lowest Computed Discharge = 98.41 cumecs on 27/08/2016 Corres. Water Level :109.850 m

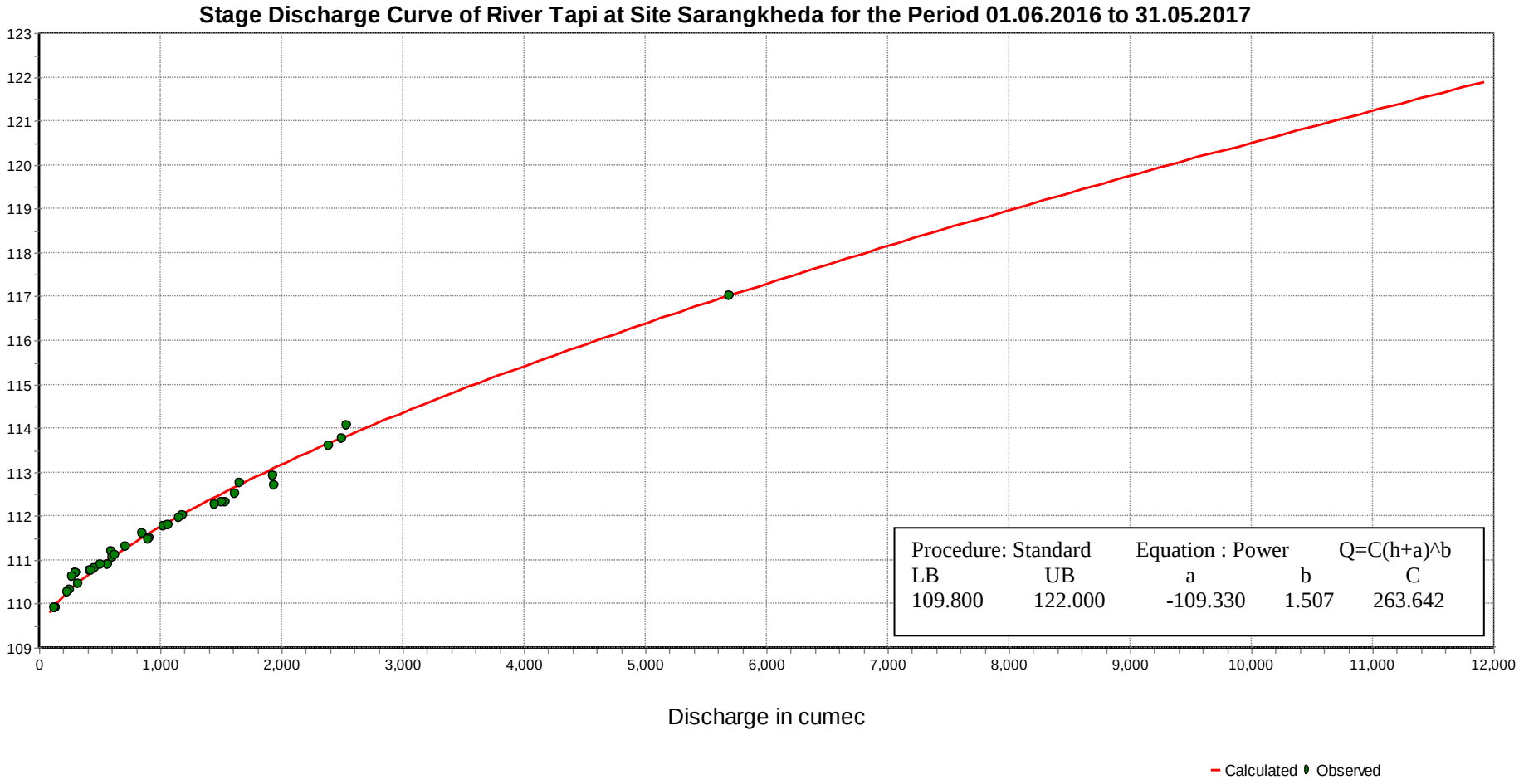
All Gates of Sarangkheda Barrage closed /river in pooling condition from 01-06-16 to 30-06-16, 01/07/16 to 04/07/16, 28/08/16 to 01/09/16,03/09/16 to 18/09/16, 21/09/16 to 25/09/16, 29/09/16 to 02/10/16, 04/10/16 to 05/10/16 and 07/10/16 to 31/05/17.

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

#Discarded and estimated

3.5.4 Stage Discharge Curve

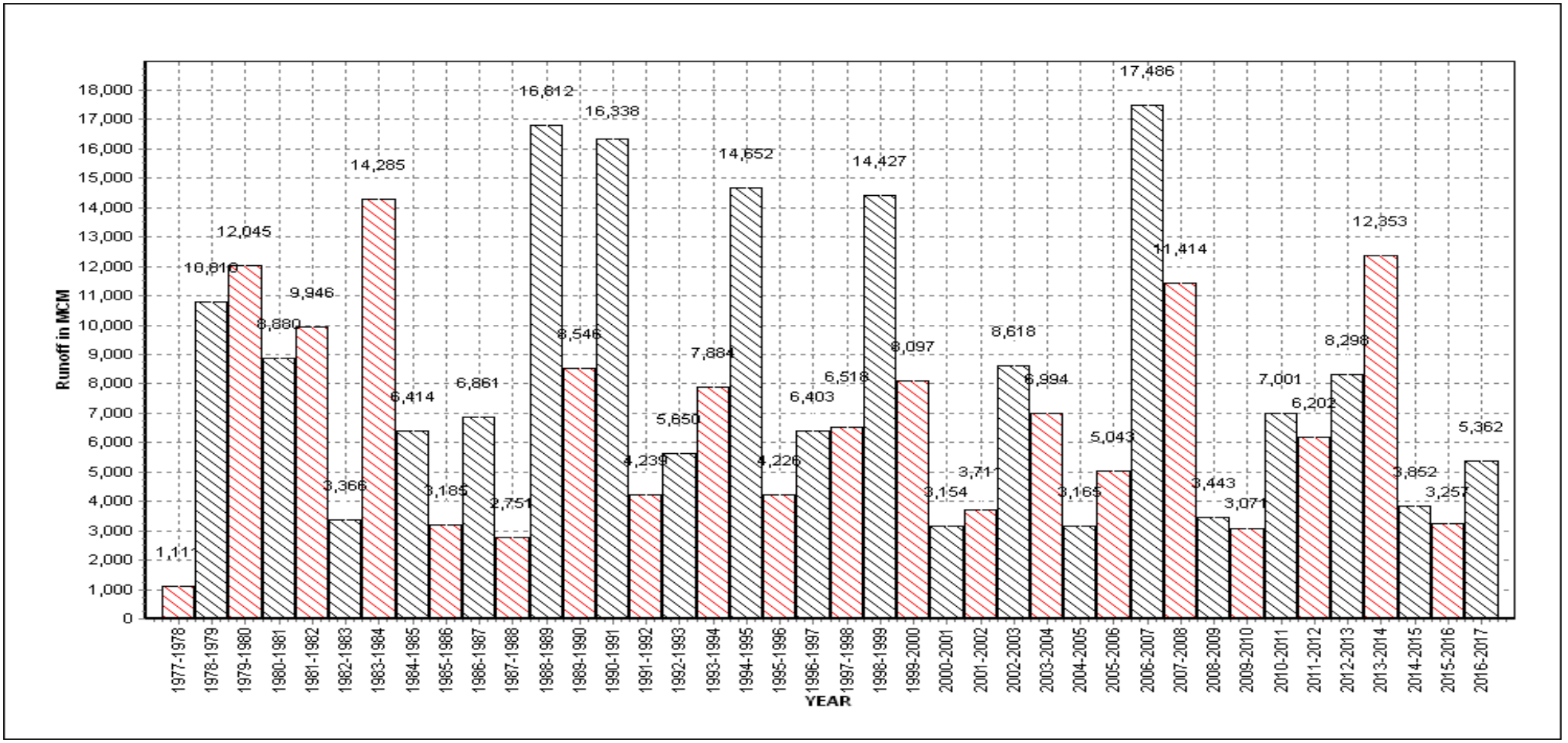
Station Name: Tapi at Sarangkheda (01 02 17 015) Division: Tapi Division Surat Local River: Tapi Sub Division: Middle Tapi Dhule



3.5.5 Annual runoff

Annual Runoff for the period 1977-2016

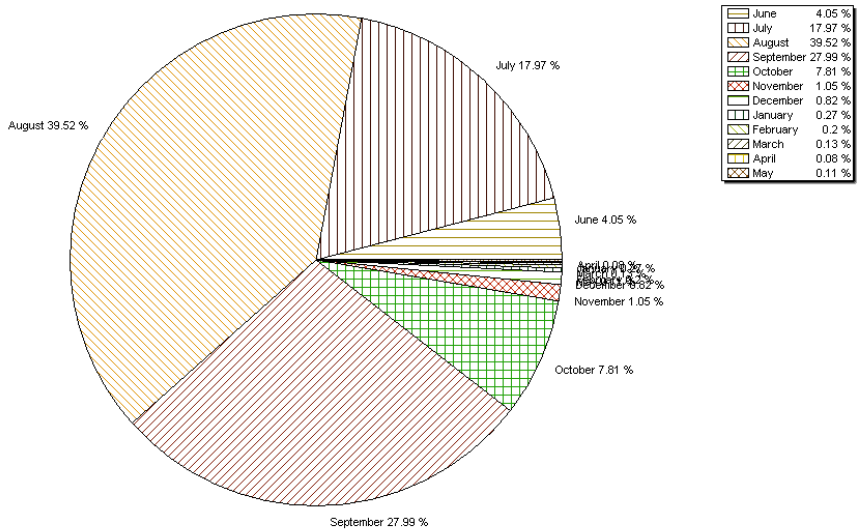
Station Name: Tapi at Sarangkheda (01 02 17 015) Division: Tapi Division Surat Local River:Tapi Sub Division: Middle Tapi Dhule



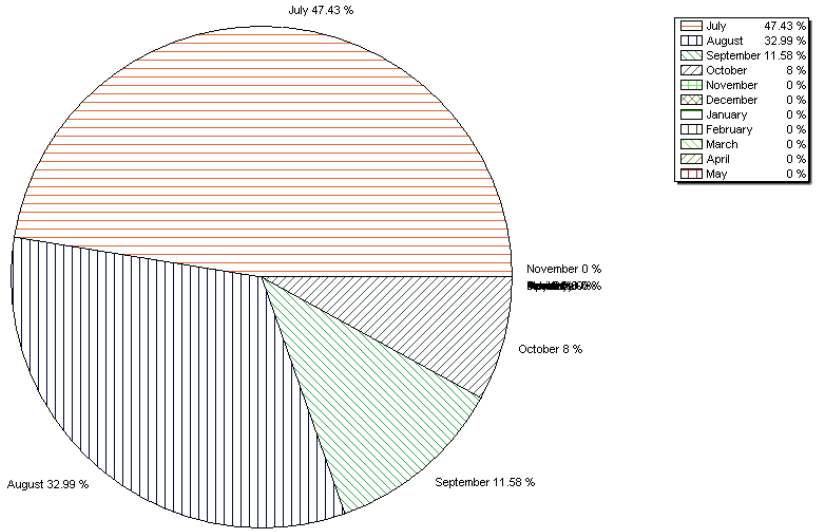
3.5.6 Monthly Average Runoff

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

Monthly Average Runoff Based on period 1971-2016

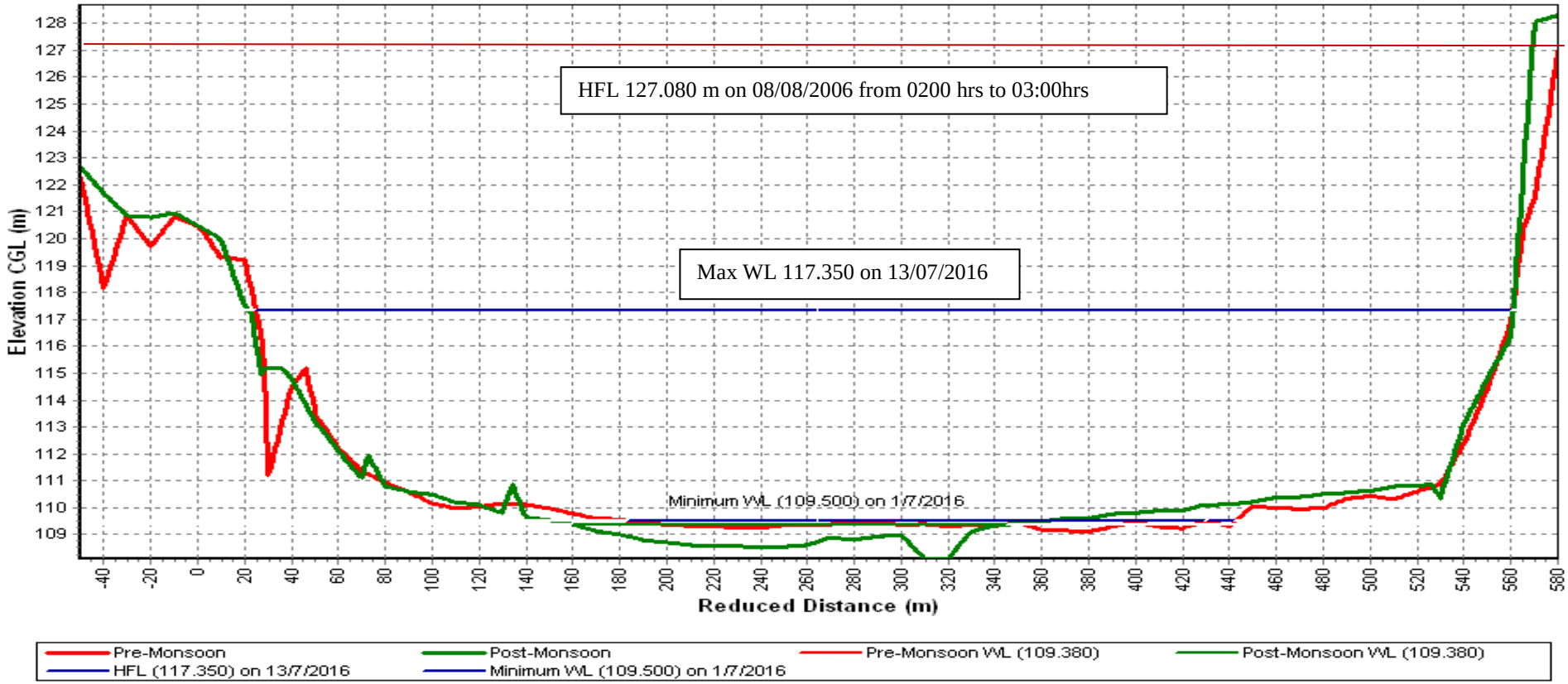


Monthly Runoff Based on period 2016-2017



3.5.7 Superimposed cross section

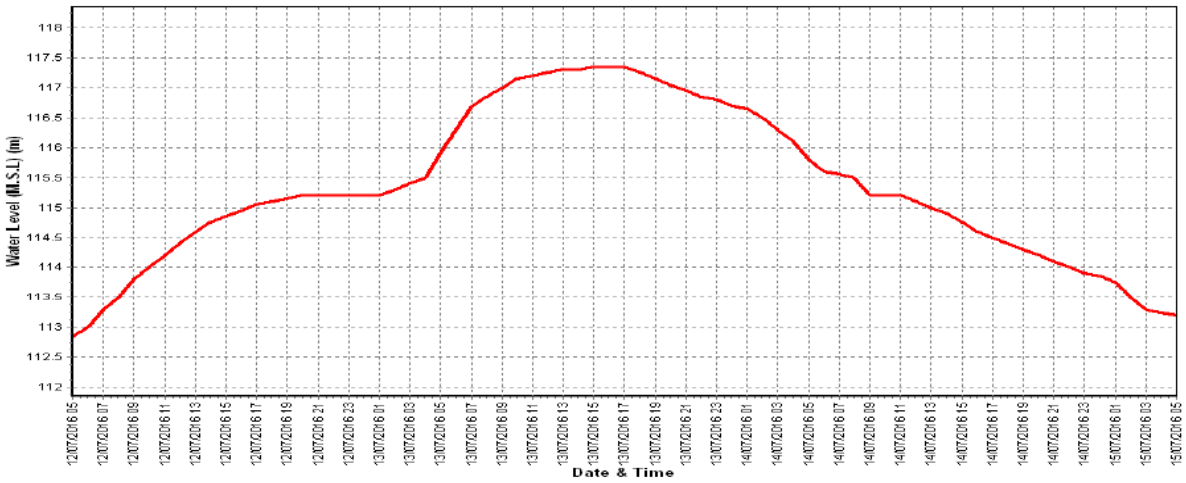
Station Name: Tapi at Sarangkheda (01 02 17 015) Division: Tapi Division Surat Local River:Tapi Sub Division: Middle Tapi Dhule



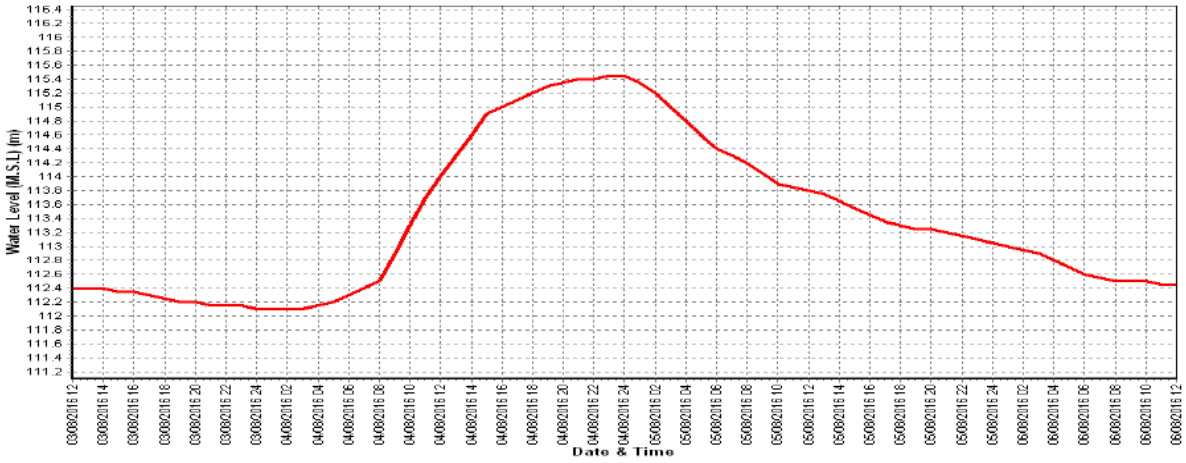
3.5.8 WL vs Time Graph of I,II,III peak

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

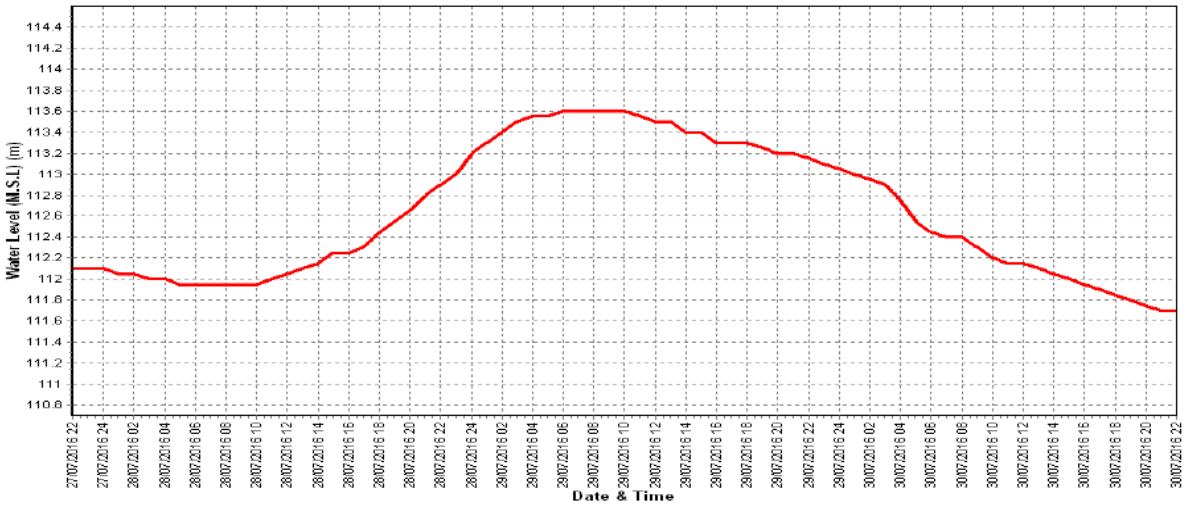
Water Level v/s Time graph of Highest (I) Flood Peak during the water year 2016-17



Water Level v/s Time graph of Highest (II) Flood Peak during the water year 2016-17



Water Level v/s Time graph of Highest (III) Flood Peak during the water year 2016-17



3.6 Dedtalai

3.6.1 History Sheet

			Water Year	**:**	**2016-2017**
Site	**:**	**Tapi at Dedtalai**	**Code**	**:**	**01 02 17 001**
State	:	Madhya Pradesh	District		Khandwa
Basin	:	Brahmani-Baitarani	Independent River	:	Tapi
Tributary	:	Tapi	Sub Tributary	:	
Sub-Sub Tributary	:		Local River	:	Tapi/Tapi
Division	:	Surat	Sub-Division	:	Upper Tapi 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
2016-17	4506	282.325	12/07/2016	0.000	271.690	01/06/2016

3.6.2 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

3.6.3 Summary of Data

Stage Discharge data for the period 2016 to 2017

Station Name: Tapi at Dedtalai (01 02 17 01) Division: Tapi Division Surat Local River:Tapi Sub Division: : Upper Tapi 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	271.690	0.000	273.180	0.000	275.910	428.0	276.050	714.6	275.450	155.5	272.250	0.000
2	271.690	0.000	272.130	0.000 #	276.505	831.4	276.010	628.5	275.750	331.4 *	272.190	0.000
3	271.690	0.000	272.280	0.000	278.200	1735 #	275.645	295.9	275.670	336.9	272.180	0.000
4	271.680	0.000	272.700	0.000	277.750	1733	275.480	0.000	275.430	123.6	272.180	0.000
5	271.680	0.000	273.850	0.000	276.830	936.4	275.400	0.000	275.350	144.7	272.170	0.000
6	271.680	0.000	273.530	0.000	276.460	455.3	275.320	0.000	275.320	129.8	272.170	0.000
7	271.670	0.000	275.740	160.5	277.560	1345 *	275.290	0.000	275.470	139.0	272.170	0.000
8	271.670	0.000	275.150	52.82 *	276.775	865.4	275.270	0.000	275.370	100.6	272.480	0.000
9	271.670	0.000	275.530	171.3	276.370	665.6	275.250	0.000	275.570	242.3 *	272.500	0.000
10	271.670	0.000	276.258	597.8 *	276.240	622.2	275.230	0.000	275.450	202.5	272.500	0.000
11	271.670	0.000	278.050	1315	275.940	436.6	275.200	0.000	275.310	0.000	272.500	0.000
12	271.660	0.000	282.325	4506	276.030	557.0	275.170	0.000	275.260	0.000	272.500	0.000
13	271.660	0.000	276.895	954.1 #	275.890	485.1	275.150	0.000	275.210	0.000	272.300	0.000
14	271.660	0.000	275.150	52.82 #	275.870	392.5 *	275.140	0.000	275.170	0.000	272.100	0.000
15	271.660	0.000	275.150	52.82 #	275.830	372.0 *	275.110	0.000	275.140	0.000	272.050	0.000
16	271.650	0.000	275.150	52.82 #	275.780	420.6	275.100	0.000	275.120	0.000	272.050	0.000
17	271.650	0.000	275.600	256.9 *	275.590	370.8	276.080	753.0	275.100	0.000	272.000	0.000
18	271.650	0.000	275.550	184.6	275.520	331.5	275.600	256.9 *	275.090	0.000	272.000	0.000
19	271.650	0.000	275.685	488.1	275.480	0.000	275.450	301.5	275.080	0.000	272.450	0.000
20	271.650	0.000	275.520	270.4	275.430	0.000	275.560	142.8	275.070	0.000	272.650	0.000

21	271.650	0.000	275.450	171.8	275.400	0.000	275.445	156.2	275.050	0.000	272.850	0.000
22	271.650	0.000	275.380	133.7	275.390	0.000	275.530	224.8	274.990	0.000	273.100	0.000
23	271.650	0.000	275.975	356.9	275.370	0.000	275.370	172.6	274.940	0.000	273.200	0.000
24	271.650	0.000	275.800	356.7 *	275.350	0.000	275.490	174.5	274.900	0.000	273.450	0.000
25	271.900	0.000	275.490	218.1	275.340	0.000	275.900	408.0 *	274.840	0.000	273.700	0.000
26	271.780	0.000	275.840	266.2	275.330	0.000	275.650	295.4	274.780	0.000	273.850	0.000
27	271.700	0.000	276.010	364.7	275.270	0.000	275.430	173.0	274.720	0.000	273.950	0.000
28	271.730	0.000	276.510	732.3	275.480	0.000	275.320	136.8	274.670	0.000	274.000	0.000
29	271.780	0.000	275.935	427.4	275.390	0.000	275.280	131.3	272.880	0.000	274.100	0.000
30	271.940	0.000	275.770	280.8	275.380	0.000	275.350	147.9	272.630	0.000	274.150	0.000
31			275.640	276.5 *	275.330	0.000			272.410	0.000		
Ten-Daily Mean												
I Ten-Daily	271.679	0.000	274.035	98.25	276.860	961.7	275.495	163.9	275.483	190.6	272.279	0.000
II Ten-Daily	271.656	0.000	276.508	813.3	275.736	336.6	275.356	145.4	275.155	0.000	272.260	0.000
III Ten-Daily	271.743	0.000	275.800	325.9	275.366	0.000	275.477	202.1	274.255	0.000	273.635	0.000
Monthly												
Min.	271.650	0.000	272.130	0.000	275.270	0.000	275.100	0.000	272.410	0.000	272.000	0.000
Max.	271.940	0.000	282.325	4506	278.200	1735	276.080	753.0	275.750	336.9	274.150	0.000
Mean	271.693	0	275.459	409.7	275.967	418.8	275.442	170.5	274.942	61.49	272.725	0

Annual Runoff in MCM = 2826 **Annual Runoff in mm = 732**

Peak Observed Discharge = 4506.00 cumecs on 12-07-2016 **Corres. Water Level :282.325 m**

Lowest Observed Discharge = 0.000 cumecs on 01-06-2016 **Corres. Water Level :271.690 m**

Note: pooling condition from 01-06-2016 to 06-07-2016, 04/09/16 TO 16/09/2016 and 11/10/16 to 31/05/17.

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 2016 to 2017

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

Day	Dec		Jan		Feb		Mar		Apr		May	
	W.L	Q	WL	Q	WL	Q	WL	Q	WL	Q	WL	Q
1	274.150	0.000	274.350	0.000	272.460	0.000	272.370	0.000	272.300	0.000	272.220	0.000
2	274.150	0.000	274.340	0.000	272.450	0.000	272.370	0.000	272.300	0.000	272.220	0.000
3	274.200	0.000	274.320	0.000	272.430	0.000	272.360	0.000	272.300	0.000	272.220	0.000
4	274.250	0.000	274.300	0.000	272.400	0.000	272.360	0.000	272.290	0.000	272.210	0.000
5	274.350	0.000	274.270	0.000	272.400	0.000	272.360	0.000	272.290	0.000	272.210	0.000
6	274.400	0.000	274.210	0.000	272.400	0.000	272.360	0.000	272.290	0.000	272.210	0.000
7	274.450	0.000	274.130	0.000	272.400	0.000	272.360	0.000	272.290	0.000	272.210	0.000
8	274.450	0.000	274.030	0.000	272.400	0.000	272.360	0.000	272.280	0.000	272.210	0.000
9	274.450	0.000	273.870	0.000	272.400	0.000	272.350	0.000	272.280	0.000	272.210	0.000
10	274.450	0.000	273.750	0.000	272.400	0.000	272.350	0.000	272.280	0.000	272.200	0.000
11	274.450	0.000	273.630	0.000	272.400	0.000	272.350	0.000	272.280	0.000	272.200	0.000
12	274.450	0.000	273.500	0.000	272.400	0.000	272.350	0.000	272.270	0.000	272.200	0.000
13	274.450	0.000	273.400	0.000	272.400	0.000	272.340	0.000	272.270	0.000	272.190	0.000
14	274.440	0.000	273.230	0.000	272.390	0.000	272.340	0.000	272.270	0.000	272.190	0.000
15	274.440	0.000	273.180	0.000	272.390	0.000	272.340	0.000	272.270	0.000	272.190	0.000
16	274.440	0.000	273.090	0.000	272.390	0.000	272.340	0.000	272.270	0.000	272.190	0.000
17	274.440	0.000	272.990	0.000	272.380	0.000	272.330	0.000	272.260	0.000	272.190	0.000
18	274.430	0.000	272.970	0.000	272.380	0.000	272.330	0.000	272.260	0.000	272.190	0.000
19	274.430	0.000	272.920	0.000	272.380	0.000	272.330	0.000	272.260	0.000	272.180	0.000
20	274.430	0.000	272.820	0.000	272.380	0.000	272.320	0.000	272.250	0.000	272.180	0.000

21	274.430	0.000	272.730	0.000	272.380	0.000	272.320	0.000		272.250	0.000	272.180	0.000
22	274.430	0.000	272.650	0.000	272.380	0.000	272.320	0.000		272.250	0.000	272.180	0.000
23	274.420	0.000	272.590	0.000	272.370	0.000	272.320	0.000		272.250	0.000	272.180	0.000
24	274.410	0.000	272.520	0.000	272.370	0.000	272.320	0.000		272.240	0.000	272.170	0.000
25	274.410	0.000	272.480	0.000	272.370	0.000	272.320	0.000		272.240	0.000	272.170	0.000
26	274.410	0.000	272.480	0.000	272.370	0.000	272.320	0.000		272.230	0.000	272.170	0.000
27	274.410	0.000	272.470	0.000	272.370	0.000	272.310	0.000		272.230	0.000	272.160	0.000
28	274.400	0.000	272.470	0.000	272.370	0.000	272.310	0.000		272.230	0.000	272.160	0.000
29	274.390	0.000	272.470	0.000			272.310	0.000		272.230	0.000	272.160	0.000
30	274.380	0.000	274.460	0.000			272.310	0.000	*	272.230	0.000	272.160	0.000
31	274.360	0.000	274.460	0.000			272.310	0.000	*			272.160	0.000
Ten-Daily Mean													
I Ten-Daily	274.330	0.000	274.157	0.000	272.414	0.000	272.360	0.000		272.290	0.000	272.212	0.000
II Ten-Daily	274.440	0.000	273.173	0.000	272.389	0.000	272.337	0.000		272.266	0.000	272.190	0.000
III Ten-Daily	274.405	0.000	272.889	0.000	272.372	0.000	272.315	0.000		272.238	0.000	272.168	0.000
Monthly													
Min.	274.150	0.000	272.470	0.000	272.370	0.000	272.310	0.000		272.230	0.000	272.160	0.000
Max.	274.450	0.000	274.460	0.000	272.460	0.000	272.370	0.000		272.300	0.000	272.220	0.000
Mean	274.392	0	273.390	0	272.393	0	272.337	0		272.265	0	272.189	0

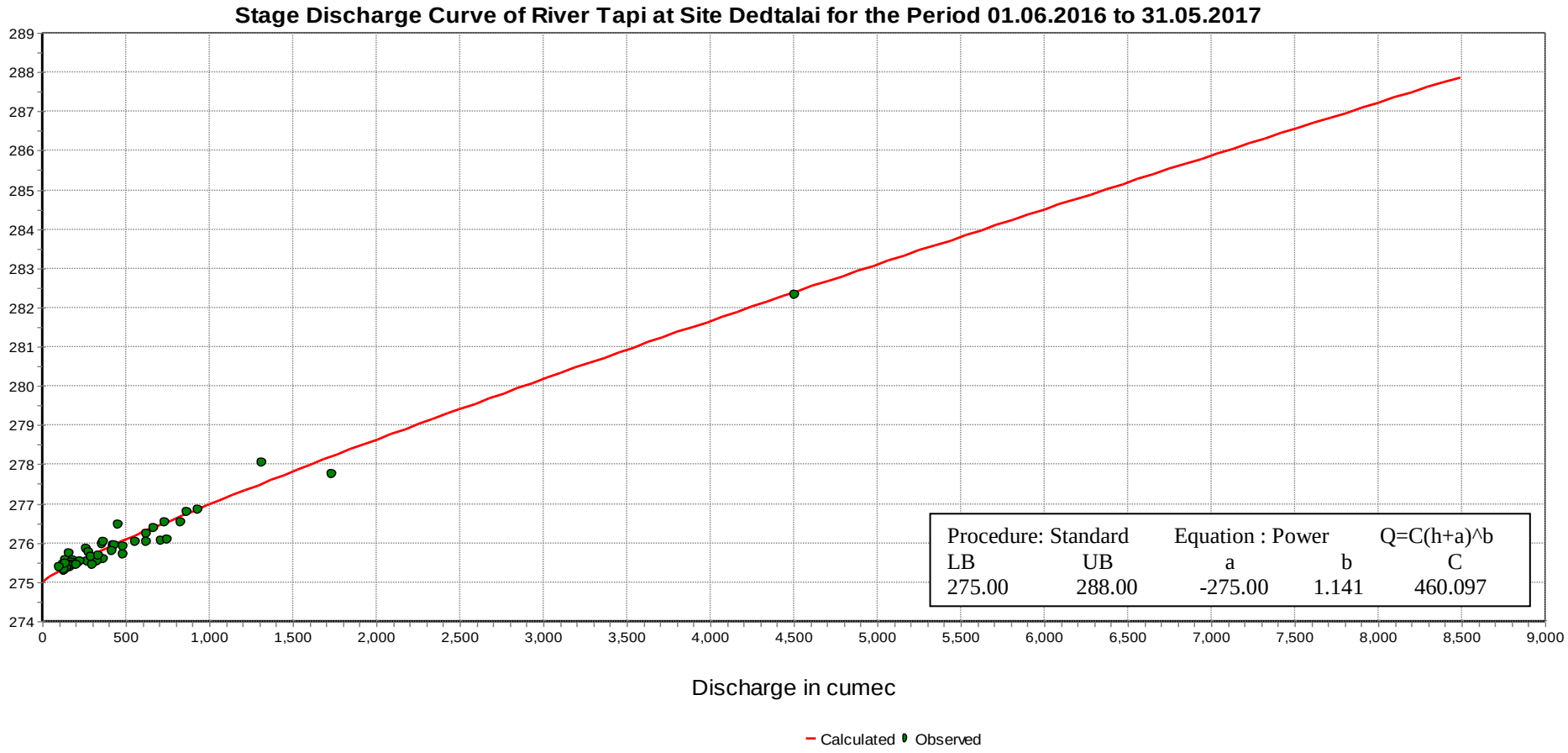
Peak Computed Discharge = 1345 cumecs on 07-08-2016 Corres. Water Level :277.560 m
Lowest Computed Discharge = 0.00 cumecs on 30-03-2017 Corres. Water Level :272.310 m

Note: pooling condition from 01-06-2016 to 06-07-2016, 04/09/16 TO 16/09/2016 and 11/10/16 to 31/05/17.

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

3.6.4 Stage Discharge Curve

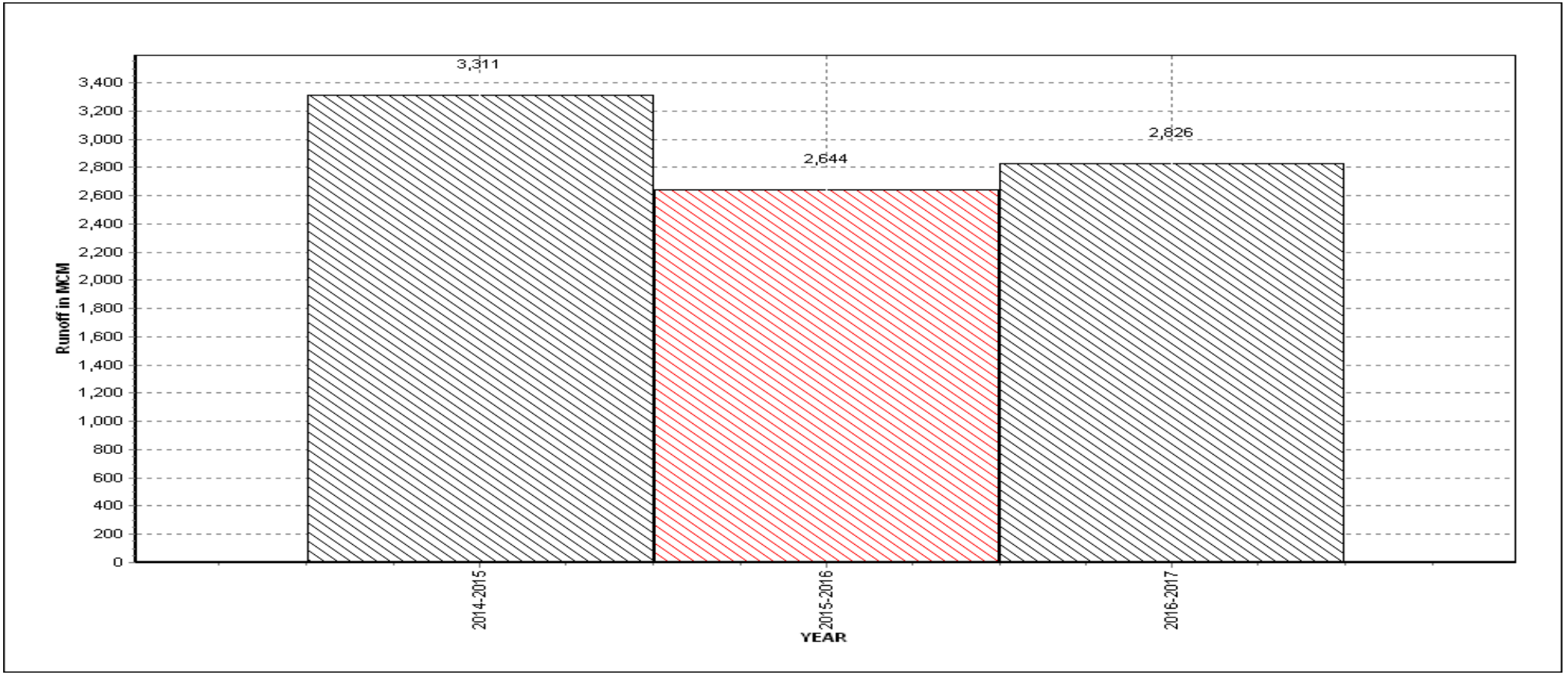
Station Name: Tapi at Dedtalai (01 02 17 01) Division: Tapi Division Surat Local River: Tapi Sub Division: : Upper Tapi Bhusawal



3.6.5 Annual runoff

Annual Runoff for the period 1977-2016

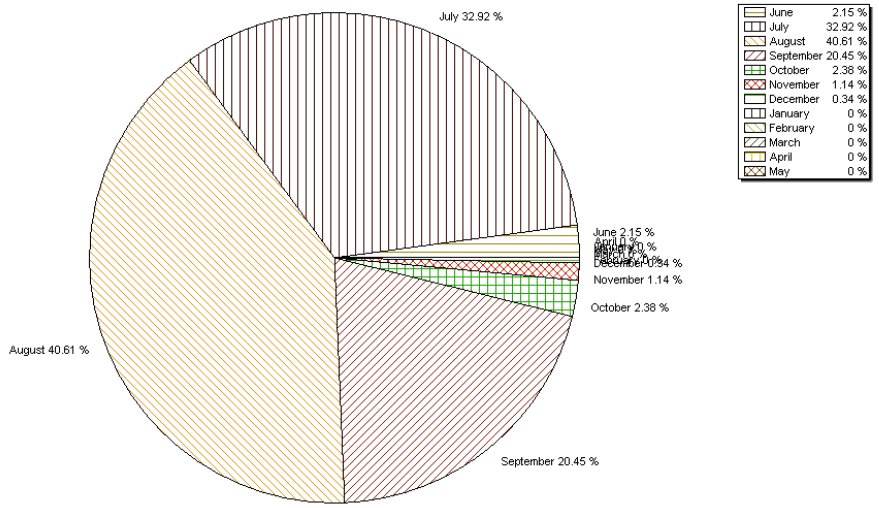
Station Name: Tapi at Dedtalai (01 02 17 01) Division: Tapi Division Surat Local River:Tapi Sub Division: : Upper Tapi Bhusawal



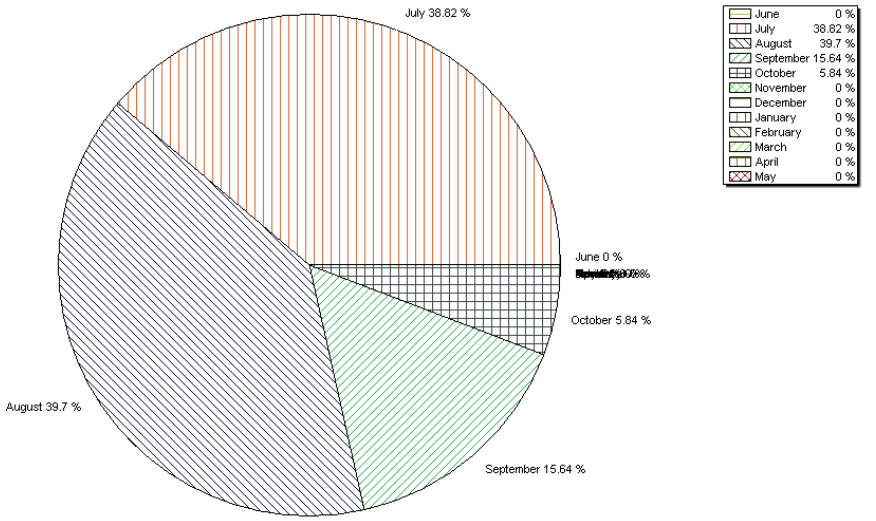
3.6.6 Monthly Average Runoff

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

Monthly Average Runoff Based on period 2015-2016

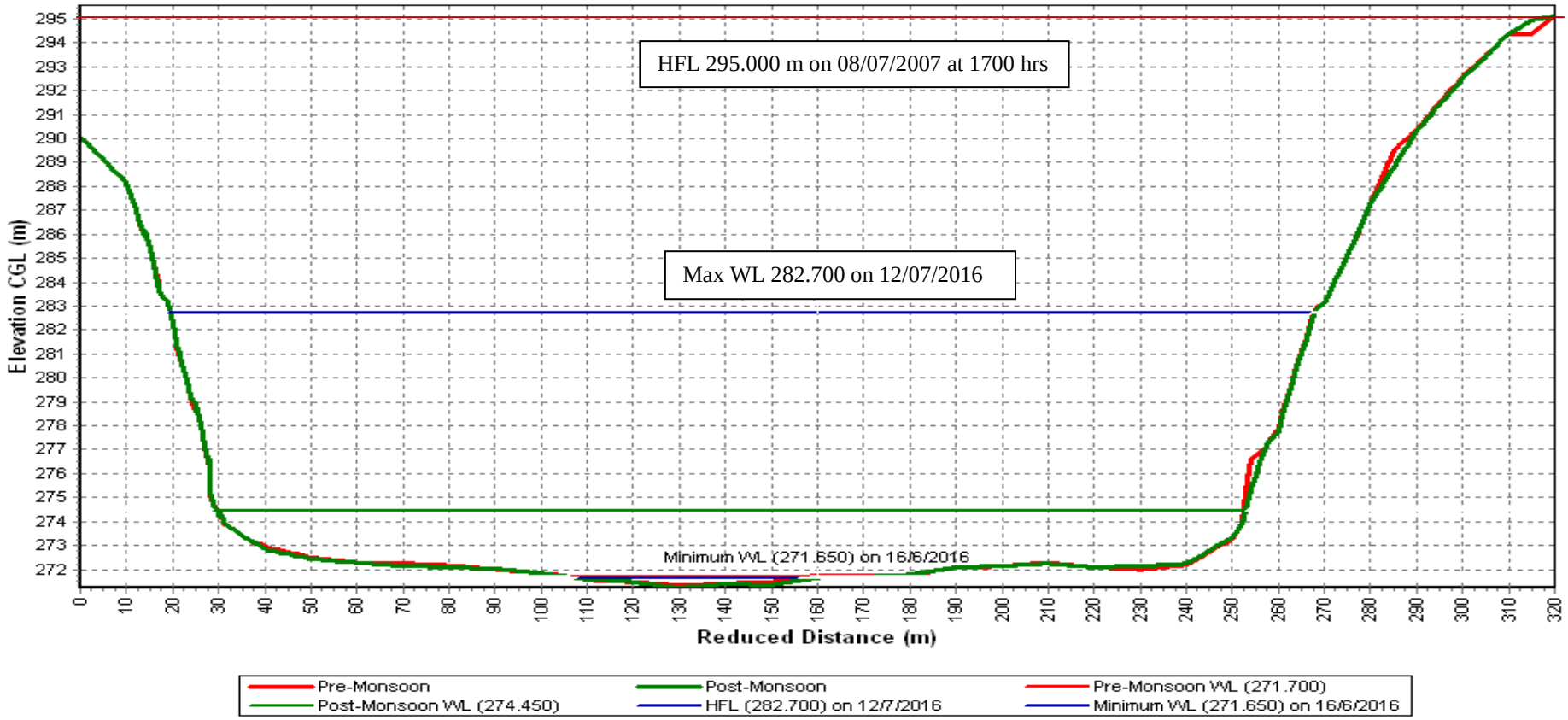


Monthly Runoff Based on period 2016-2017



3.6.7 Superimposed cross section

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

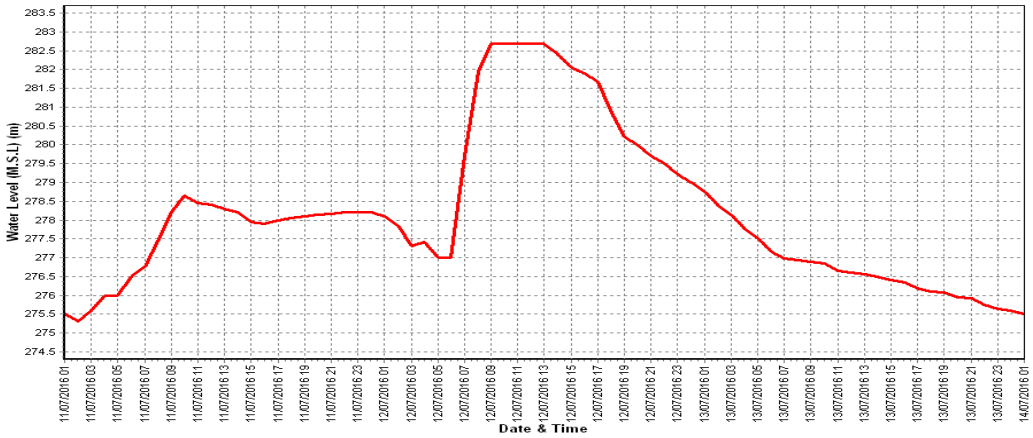


3.6.8 WL vs Time Graph of I,II,III peak

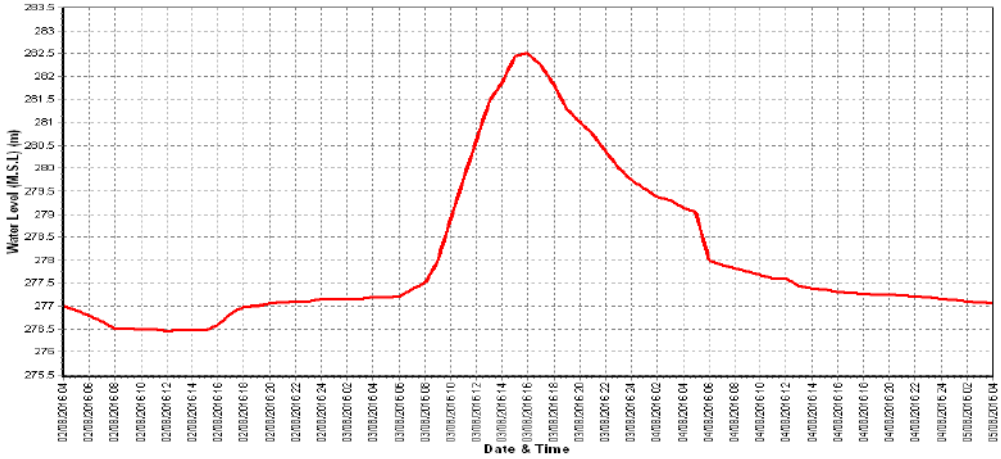
Station Name: Tapi at Dedtalai (01 02 17 01) Division: Tapi Division Surat

Local River: Sub Division: Upper Tapi Bhusawal

Water Level v/s Time graph of Highest (I) Flood Peak during the water year 2016-17



Water Level v/s Time graph of Highest (II) Flood Peak during the water year 2016-17



Water Level v/s Time graph of Highest (III) Flood Peak during the water year 2016-17