Final Feasibility Report
National Waterway-109
Region V – Wainganga-Pranahita River
Kaleshwaram to Chandapur (165.78km)

SURVEY PERIOD: 30 MAY 2016 TO 03 JUL 2016

Volume - I

Prepared for:

Inland Waterways Authority of India
(Ministry of Shipping, Govt. of India)
A-13, Sector – 1, NOIDA
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Uttar Pradesh – 201 301

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26 Oct 2018	Rev – 1.2	INLAND WATERWAYS AUTHORITY OF INDIA	04	04

ACKNOWLEDGEMENT

IIC Technologies Ltd. expresses its sincere gratitude to IWAI for awarding the work of carrying out detailed hydrographic surveys in the New National Waterways in NW-109 in Region V – from Kaleshwaram to Chandapur village.

We would like to use this opportunity to pen down our profound gratitude and appreciations **to Shri Pravir Pandey, IA&AS, Chairman IWAI** for spending his valuable time and guidance for completing this Project. IIC Technologies Ltd., would also like to thank, **Shri Alok Ranjan, ICAS, Member (Finance), Shri Shashi Bhushan Shukla, Member (Traffic), Shri S.K. Gangwar, Member (Technical)** for their valuable support during the execution of project**.**

IIC Technologies Ltd, wishes to express their gratitude to **Capt. Ashish Arya, Hydrographic Chief IWAI, Cdr. P.K. Srivastava ex-Hydrographic Chief and Shri SVK Reddy, Chief Engineer-I** for their guidance and inspiration for this project. IIC Technologies Ltd, would also like to thank **Sh. Rajiv Singhal, A.H.S., IWAI** for his invaluable support and suggestions provided throughout the survey period. IIC Technologies Ltd, is pleased to place on records its sincere thanks to other staff and officers of IWAI for their excellent support and cooperation throughout the survey period.

CONTENTS

List of Abbreviations

CD	Chart Datum
DGPS	Differential Global Positioning Systems
ETS	Electronic Total Station
GPS	Global Positioning Systems
LBM	Local Bench Mark
MSL	Mean Sea Level
RL	Reference Level
SD	Sounding Datum
SBAS	Satellite-Based Augmentation System
TBC	Trimble Business Center
PIA	Project Influence Area
NH	National Highway
SH	State Highway
WNG	Wainganga
GDV	Godavari

SALIENT FEATURES AT A GLANCE

<table>
<tr><th>#</th><th>Particulars</th><th>Details</th></tr>
<tr><td>1.</td><td>Name of Consultant</td><td>IIC Technologies Limited, Hyderabad</td></tr>
<tr><td>2.</td><td>Region number & State(s)</td><td>Region – V – Maharashtra & Telangana</td></tr>
<tr><td>3.</td><td>Waterway stretch, NW # (from…. to; total length)</td><td>National Waterway No – 109
From Kaleshwaram to Chandapur village (165.78 km).</td></tr>
<tr><td>4.</td><td>Navigability status</td><td>At present river is fully dried – No Navigable</td></tr>
<tr><td>a)</td><td>Tidal & non tidal portions (from… to, length, average tidal variation)</td><td>The entire River is non tidal</td></tr>
<tr><td>b)</td><td>Least Spot Height status (w.r.t. MSL)
i) Survey period
(30th May 2016 to 03rd Jul 2016)
ii) < 1.2 m (km)
iii) 1.2 m to 1.4 m (km)
iv) 1.5 m to 1.7 m (km)
v) 1.8 m to 2.0 m (km)
vi) > 2.0 m (km)</td><td>Wainganga-Pranahita River is dry and the survey was conducted by topographic method

<table>
<tr><th>LAD (m)</th><th>0 - 30 km</th><th>30 - 60 km</th><th>60 - 90 km</th><th>90 - 120 km</th><th>120 - 150 km</th><th>150 - 165.78 km</th><th>Total</th></tr>
<tr><td>< 1.2</td><td>30</td><td>30</td><td>30</td><td>30</td><td>30</td><td>15.78</td><td>165.78</td></tr>
<tr><td>1.2 - 1.4</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td></tr>
<tr><td>1.5 - 1.7</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td></tr>
<tr><td>1.8 - 2.0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td></tr>
<tr><td>> 2</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td></tr>
<tr><td>Total</td><td>30</td><td>30</td><td>30</td><td>30</td><td>30</td><td>15.78</td><td>165.78</td></tr>
</table>
</td></tr>
<tr><td>c)</td><td>Cross structures
i) Dams, weirs, barrages etc.
(total number; with navigation locks or not)
ii) Bridges, Power cables etc.
[total number; range of horizontal and vertical clearances]</td><td>Cross structures
i) Bridges – 3 Nos
Horizontal Clearance – 7.55 to 28.121m
Vertical Clearance w.r.t. HFL – 0.00 to 1.036m
ii) Power Cables – Nil
iii) High Tension Lines – 04 Nos
Vertical Clearance w.r.t. HFL – 15.391 to 27.512m</td></tr>
<tr><td>d)</td><td>Avg. discharge & no. of</td><td>As the river is dried so Avg. Discharge cannot be calculated</td></tr>
</table>

<table>
<tr><th>#</th><th>Particulars</th><th>Details</th></tr>
<tr><td></td><td>days</td><td></td></tr>
<tr><td>e)</td><td>Slope (1 in ….)</td><td>
<table>
<tr><th colspan="2">Chainage (km)</th><th rowspan="2">Slope (A/B)</th></tr>
<tr><th>From</th><th>To</th></tr>
<tr><td>0</td><td>30</td><td>1 : 0.204</td></tr>
<tr><td>30</td><td>60</td><td>1 : 0.355</td></tr>
<tr><td>60</td><td>90</td><td>1 : 0.373</td></tr>
<tr><td>90</td><td>120</td><td>1 : 0.563</td></tr>
<tr><td>120</td><td>150</td><td>1 : 0.652</td></tr>
<tr><td>150</td><td>165.78</td><td>1 : 0.581</td></tr>
</table>
Average Slope 1: 0.444
</td></tr>
<tr><td>5.</td><td>Traffic potential</td><td>Non Navigable at present condition</td></tr>
<tr><td>a)</td><td>Present IWT operations, ferry services, tourism, cargo, if any</td><td>No IWT operations had been found. Local Ferry Service by small boats and operation of tourism boats.</td></tr>
<tr><td>b)</td><td>Important industries within 50 km</td><td>• Chandrapur Super Thermal Power Station at Neri is 50.57km away from Wainganga River
• Chandrapur Ferro Alloy Plant at Chauhan colony is 45.49km away from Wainganga River
• Western Coalfields Limited (WCL), a subsidiary of Coal India, has many mines around Ballarpur is 40.26km away from Wainganga River
• Bilt Paper Mill industry at Asthi is 1.22km away from Wainganga River
• Kakatiya Thermal industry at Gudadupalle is 44.23km away from Wainganga River
• National Thermal Power Corporation at Ramagundam is 49.32km away from Wainganga River</td></tr>
<tr><td>c)</td><td>Distance of Rail & Road from Industry</td><td>• Chandrapur Super Thermal Power Station at Neri is 5.63km away from Chandrapur Railway station
• Chandrapur Ferro Alloy Plant at Chauhan colony is 3.66km away from Chandrapur Railway station
• Western Coalfields Limited (WCL), 1.70km away from Balharshah Railway station
• Bilt Paper Mill industry at Asthi 2.30km away from Chandrapur-Kothari-Gondpipri-Aheri Road
• Kakatiya Thermal industry at Gudadupalle is 52.18km away from Warangal Railway Station
• National Thermal Power Corporation at Ramagundam is 2.70km away from Ramagundam Railway Station</td></tr>
<tr><td>6.</td><td>Consultant’s recommendation for going ahead with TEF / DPR preparation</td><td>As the river stretch is dried, No scope of TEF/DPR can be provided Wainganga River. This River Stretch is not-viable for navigable channel.</td></tr>
</table>

#	Particulars	Details
7.	Any other information/ comment	The Wainganga River valley is forested and relatively sparsely populated. Most of the population is concentrated along the river.

(Signature)

Date: Name of Consultant

1 Introduction

1.1 Background

The stretch of about 165.78km, of Wainganga-Pranahita River, from confluence of Wainganga and Godavari river at Kaleshwaram Lat 18°49'33.45"N, Long 079°54'32.82"E to a Bridge near Chandapur village at Lat 20°00'30.16"N, Long 079°47'7.96"E was identified for the Inland Water transport facility as per a study carried out earlier. To assess the feasibility of water transportation, over this stretch of river a bathymetric survey and topographic survey were carried out by IIC Technologies Ltd. on behalf of IWAI.

The origin of Wainganga River is from Mundara village of the Seoni district in the southern slopes of the Satpura Range of Madhya Pradesh, and flows south through Madhya Pradesh and Maharashtra states in a very winding course of approximately 579 km. After joining the Wardha, the united stream, known as the Pranahita, ultimately falls into the Godavari River at Kaleshwaram, Telangana.

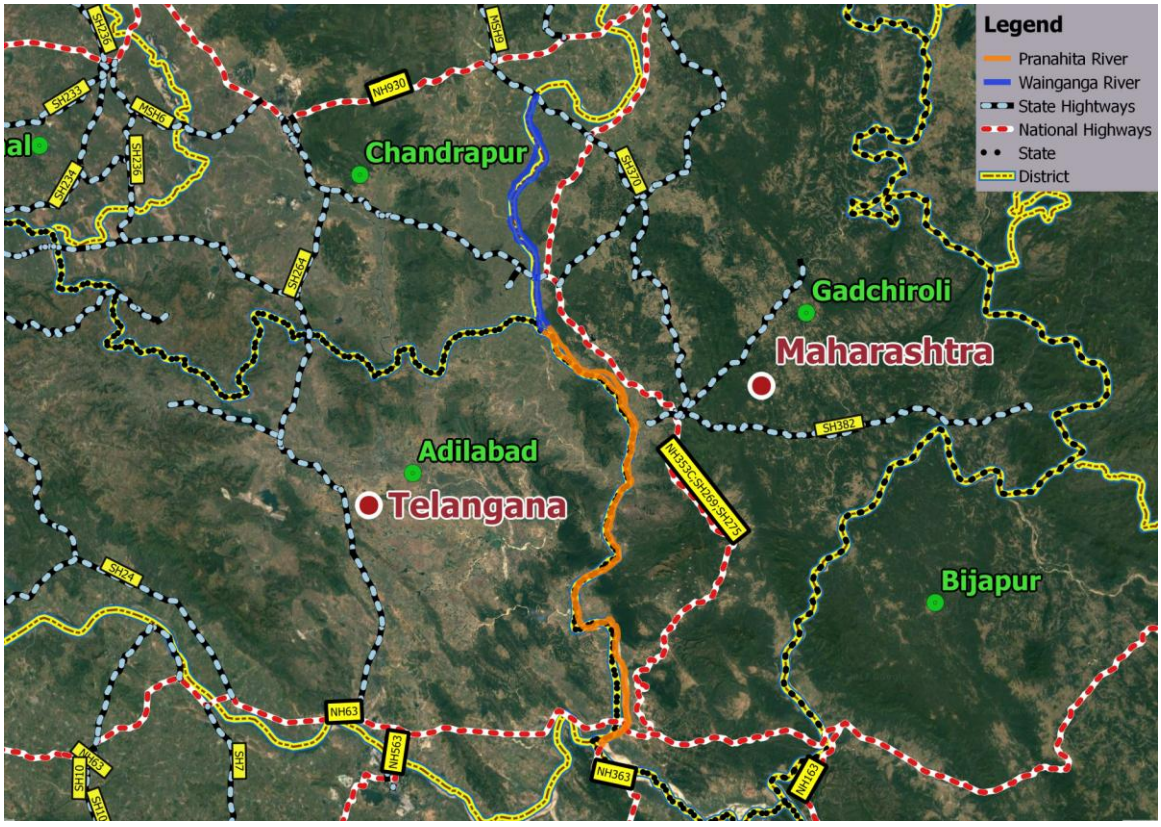


Figure 1 - Location around the survey stretch

1.2 Tributaries / Network of Rivers / Basin

Wainganga-Pranahita River, a major tributary of the Godavari River, the Wainganga River receives numerous tributaries on both bank and drains the western, central and eastern regions of the Balaghat district of Madhya Pradesh, Chandrapur, Gadchiroli, Bhandara, Gondia and Nagpur districts of Maharashtra. The major tributaries of the Wainganga river are Thel, Thanwar, Bagh, Chulband, Gadhvi, Khobragarhi, Kathani joining left bank and Hirri, Chandan, Bawanthari, Kanhan and Mul joining the right bank. The Kathani River originates in the Dhanora Pendhri Hills and merges Wainganga near Gadchiroli city. Chandan River is another important tributary of Wainganga of the Balaghat district.

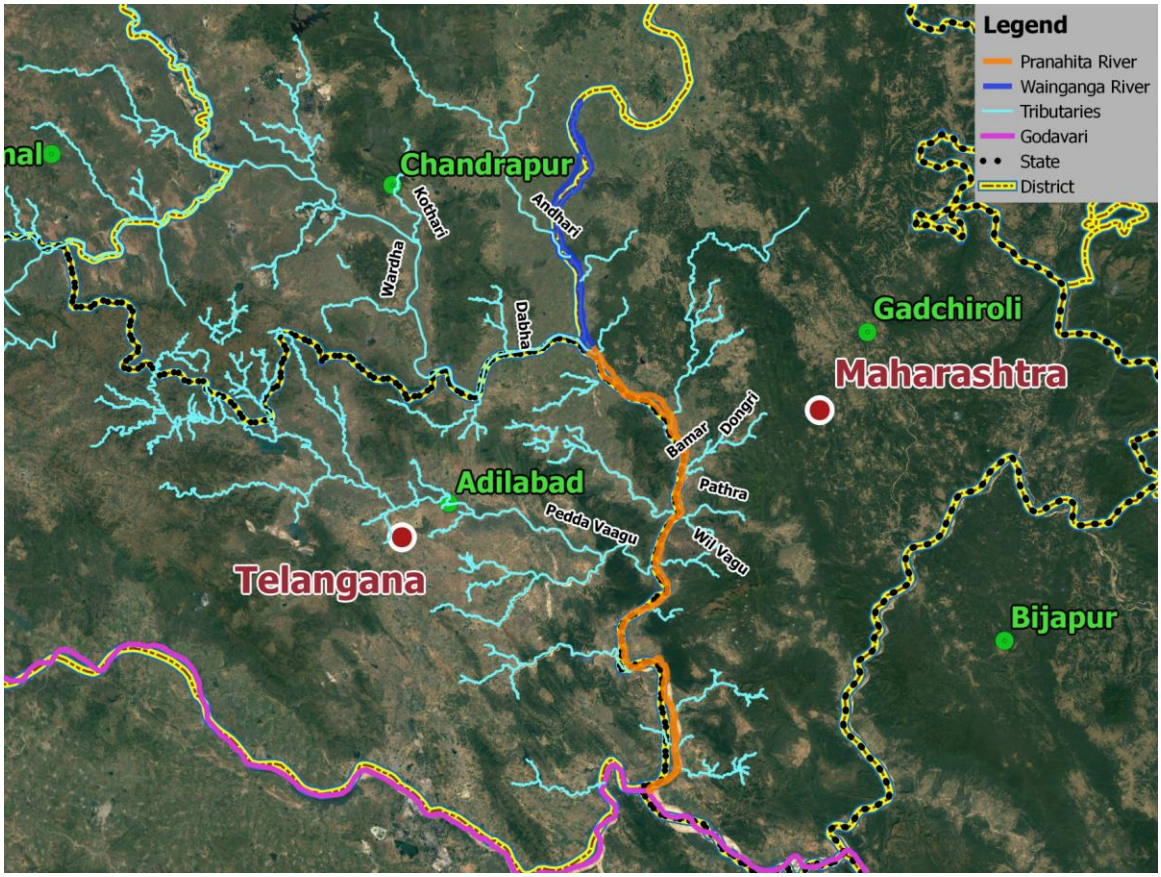


Figure 2 - Tributaries of Wainganga-Pranahita River

The Pranahita begins at the confluence of 2 extensive rivers - the Wardha (catchment area: 46,237 km^2) and the Wainganga (catchment area: 49,677 km^2). As per the survey stretch, the length of the Pranahita River is 112.0km. The tributaries of Pranahita River are Mamda, Nagul vagu, Wil Vagu, Pedda Vagu, Madharam, Bamar, Dongri, Patra. For the survey stretch, the length of the Wainganga River is 53.78km

1.3 State/ District through which river passes

The Wainganga-Pranahita River flows through Chandrapur & Gadchiroli districts of Maharashtra and Karimnagar and Adilabad district of Telangana.

States	Chainage (km)		Length in km
	From	To	
Telangana/Maharashtra	0.00	114.0	114.0
Maharashtra	114.0	165.78	51.78
Total	**0.00**	**165.78**	**165.78**

Table 1 - State wise waterway

1.4 Maps

1.4.1 Full course of the waterway

The map displaying the state boundary with road and rail network for the course of water way is represented as below:

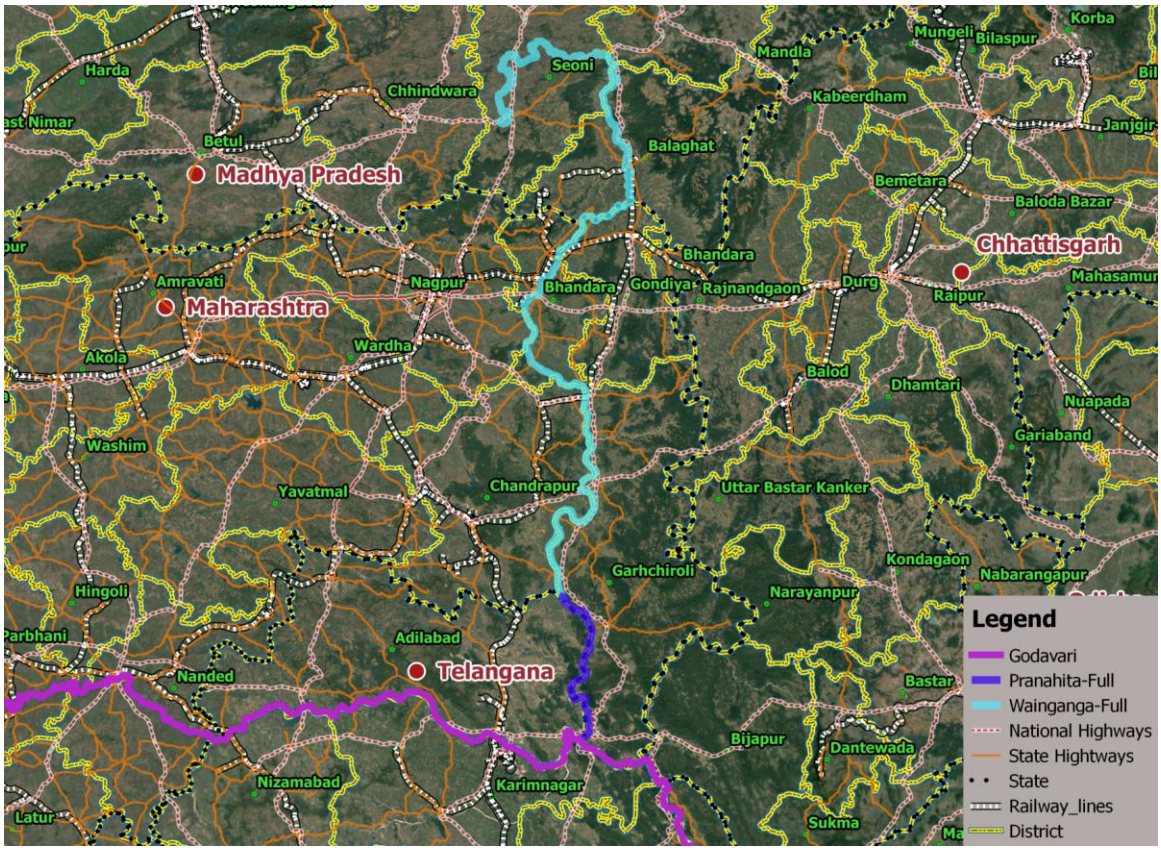


Figure 3 - Full Course of Wainganga-Pranahita River

1.4.2 Course of the waterway under study

The map displaying the state boundary with road and rail network for the course of water way is represented as below:

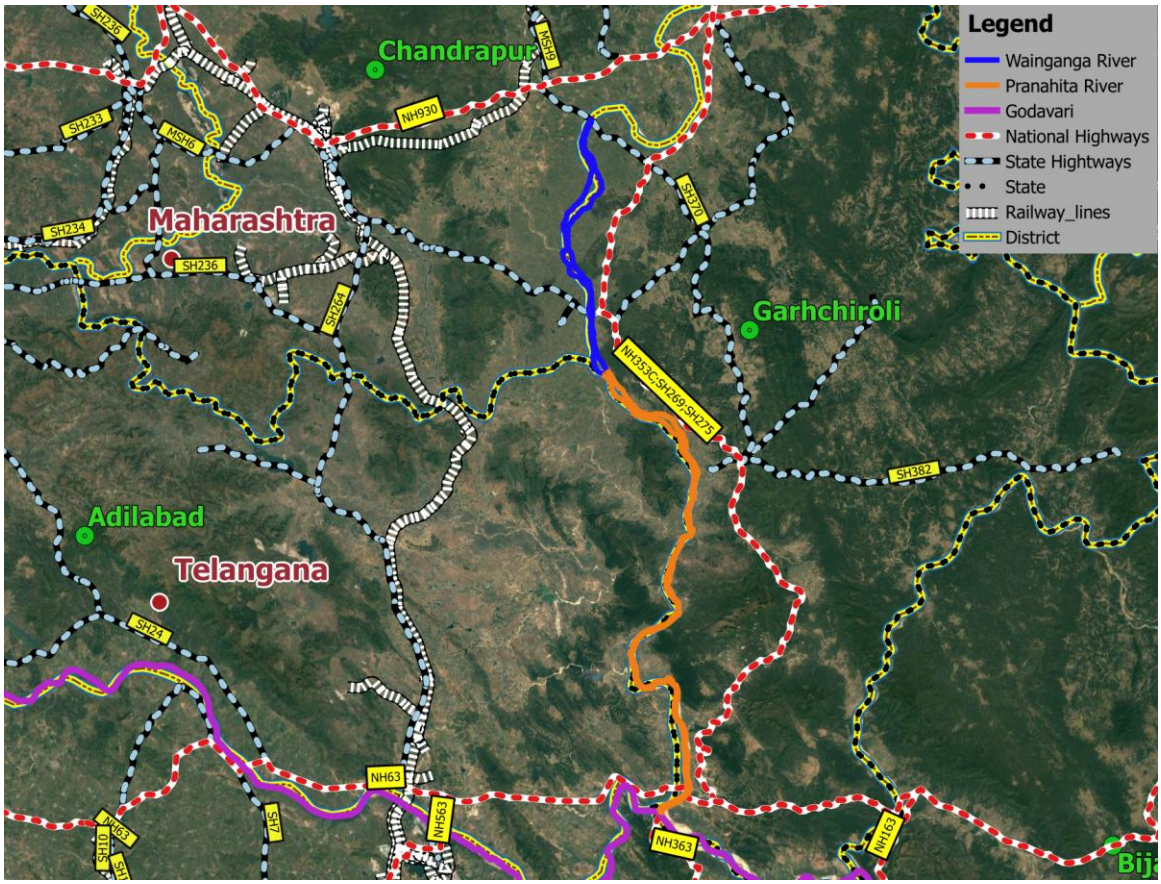


Figure 4 - Course of Wainganga-Pranahita River

1.5 Scope of work

IIC Technologies Ltd. conducted a topographic survey of the Wainganga-Pranahita River from Kaleshwaram Lat 18°49'33.45" N, Long 079°54'32.82"E to a Bridge near Chandapur village at Lat 20°00'30.16" N, Long 079°47'7.96"E. Bathy survey was unable to conduct due to the insufficient of water depth throughout the Stretch.

The scope of the work for the conduct of survey of Wainganga-Pranahita River includes:

- Undertake bathymetric and topographic survey of proposed waterway.
- Establishing horizontal and vertical control stations

- Construction of benchmark pillars and establishing its reduced level w.r.to Mean Sea Level
- Setting up and deployment of water level gauges
- Current velocity and discharge measurements
- Collection and analysis of water and bottom samples.
- A collection of topographic features including existing cross structures.
- Preparation of inventory of industries in the project influence area (PIA)
- Analysis of survey data, including assessment of water availability for navigation.
- Preparation of survey charts and feasibility report

2 Methodology Adopted to undertake Study

2.1 Recce

Advance recce of the survey area was undertaken in early 25th May 2016 by a detach survey party. The recce was started from Kaleshwaram, Karimnagar Dist., in Telangana to Chandapur Village Yavatmal Dist. in Maharashtra. The stretch was examined at six places, namely Kaleshwaram a place where Pranahita confluence with Godavari, Tekada village, Avalmari village, Chaprala village near to confluence of Painganga with Wainganga, Asthi village near a bridge crossing Wainganga and another place near a bridge crossing Wainganga at Chandapur village were area found fully rocky and bushes growth both side of the banks.

The following observation has been made.

- The survey area is 165.78km, from Kaleshwaram to Chandapur village.
- River width varied between 100m to 300m.
- The Topography Survey work is challenging due to rocks and thick vegetation growth and cliffs on both sides of the banks.

It was observed that most of the River stretch was dry and preliminary queries revealed that the River remains dry for most of the year. Hence a decision was taken to undertake topographic survey initially for the complete River stretch, the hydrographic survey would be undertaken depending on the field conditions and availability of water in limited pockets of the River stretch under consideration.

2.2 Survey Resources and Methodology

The survey was commenced on 30th May 2016 and completed on 03rd Jul 2016. The survey was undertaken on a scale of 1:10000, with a sounding line spacing kept at 200m and plotted on UTM Projection (Zone 44N) as directed by the contract specifications.

2.2.1 Survey Launch

The bathymetric survey was unable to conduct due to the unavailability of sufficient water in the River stretch.

2.2.2 Survey Equipment

Following equipment was employed in the topographic survey.

Equipment	Make	Equipment. Serial No.	Qty. Employed
DGPS Sets	Trimble R3/R4	-	5
Auto Level	Sokkia Auto level & Accessories	-	2
ETS	Electronic Total Station	120595, 120840	2
Software	TBC	Version 12	1
Software	AUTOCAD	2012	1
Software	Microsoft Office	2013	1

Table 2 - Survey Equipment Used

2.2.3 Topography Survey

The survey commenced on 30th May 2016 and completed on 3rd July 2016. The weather was sunny throughout the period during survey operations. The weather was favorable with moderate hot climate for the conduct of the survey and the weather condition remains same for the entire duration of the survey.

The survey was undertaken as per the line plan provided and the spot level points in the cross line were spaced at 20m interval. The Plotting of the chart was done on UTM Projection at Zone 44N as directed in the contract specifications. The spot levels along the river were obtained by using Trimble DGPS. The data was post processed using Trimble Business Center to get the precise position and MSL height values of the rover locations. The topographic survey for the entire survey stretch was conducted to collect the following data:-

- Spot levels
- Delineation of Islands
- Fixing of bridges and marks

- Assess the type of river bank
- Extending the vertical and horizontal control throughout the survey area
- Collection of local information along the river Banks

The details on all spot levels are provided in the respective sheets being presented along-with this report. Additionally, a soft copy of the same in XYZ format is being handed over as deliverable data.

Figure 5 - Spot levelling by DGPS

2.2.4 Bathymetric Survey and Survey Launch

The bathymetric survey by survey launch for the Wainganga-Pranahita River was not able to be conducted due to non-availability of sufficient water depth throughout the river.

2.2.5 Calibration

The equipment used for the survey was calibrated by the equipment supplier. The equipment calibration certificates are placed at Annexure-14 to this report.

2.3 Description of Bench Marks (B.M.) / Authentic Reference Level

The IWAI BM Pillars were constructed as per specification and erected at an average distance of 10 Km along the river stretch from starting to end chainage of the river. The value of these benchmarks w.r.t. MSL was obtained by leveling them to the Local benchmarks established earlier.

The value of these marks w.r.t. MSL was obtained by leveling them to the IWAI BM Pillar from Godavari BM Pillar namely IWAI BM GDV-21 and thereafter one pillar to another.

IWAI BM GDV-21 Benchmark is located on the road side of Godavari River near Village–Ramjapur, District–Gadchiroli. State – Maharashtra with MSL height of 100.110m. The final accepted co-ordinates and reduced level (R.L) values of these Bench Marks and other station established for setting up of reference DGPS base stations are as below:

Sl. No.	Station	Chainage (km)	Latitude	Longitude	Height above MSL (m)	Source/ Type
1	IWAI BM GDV-21	-0.440	18°48'14.00859" N	079°57'14.00992" E	100.110	Reference
2	IWAI BM WNG-01	12.105	18°54'27.88371" N	079°57'53.16495" E	110.744	BL Processing
3	IWAI BM WNG-02	24.827	19°00'52.72810" N	079°56'50.34643" E	107.331	BL Processing
4	IWAI BM WNG-03	31.917	19°03'22.53495" N	079°54'14.86968" E	111.075	BL Processing
5	IWAI BM WNG-04	41.632	19°05'36.38216" N	079°52'09.37948" E	123.245	BL Processing
6	IWAI BM WNG-05	50.974	19°08'16.92268" N	079°55'02.92316" E	112.928	BL Processing
7	IWAI BM WNG-06	62.698	19°13'42.75127" N	079°55'44.81281" E	125.743	BL Processing
8	IWAI BM WNG-07	72.663	19°18'12.92932" N	079°58'12.95635" E	122.705	BL Processing
9	IWAI BM WNG-08	85.425	19°24'59.94556" N	079°58'34.47513" E	127.858	BL Processing
10	IWAI BM WNG-09	94.558	19°29'20.17563" N	079°56'19.85044" E	133.957	BL Processing
11	IWAI BM WNG-10	103.180	19°31'01.23539" N	079°52'00.69102" E	139.468	BL Processing
12	IWAI BM WNG-11	113.656	19°35'28.46679" N	079°48'29.67892" E	147.025	BL Processing
13	IWAI BM WNG-12	123.891	19°40'38.74484" N	079°47'17.44872" E	153.807	BL Processing
14	IWAI BM WNG-13	135.767	19°46'30.64848" N	079°45'11.07600" E	162.542	BL Processing
15	IWAI BM WNG-14	143.975	19°50'23.00152" N	079°45'26.10696" E	166.348	BL Processing
16	IWAI BM WNG-15	155.014	19°55'21.50827" N	079°47'48.55425" E	174.785	BL Processing
17	IWAI BM WNG-16	165.776	20°00'20.46324" N	079°47'19.88779" E	184.654	BL Processing

Table 3 - Accepted station coordinates (WGS-84)

The details of horizontal and vertical control established and methodology followed for the conduct of the survey is placed at Annexure-8.

2.4 Tidal Influence Zone and Tidal Variation

The survey stretch of Wainganga-Pranahita River is non-tidal water body and no influence of tidal force was observed throughout the survey period.

2.5 Methodology to fix Chart Datum / Sounding Datum

The Wainganga-Pranahita River is to 165.78km stretch which is between Kaleshwaram to Chandapur village. There are no dams and barrages present in the survey stretch of the Wainganga-Pranahita River. The water depth by an average of

0.1 to 0.2 mtr is available in small pockets. The water level is recorded as Dry (dead level) in the records held by the CWC Gauge authorities.

2.5.1 Sounding Datum

The Wainganga-Pranahita River is to 165.78km stretch which is between Kaleshwaram to Chandapur village. The entire River stretch is divided into per-km stretches and the least MSL Value obtained during the conduct of a Topographic survey for the stretch is considered as Chart Datum for the Dredging Volume calculations

2.5.2 Datum Calculation

The datum for calculation of dredge volume needs to be adopted as per the gradient of the River and the average water level of the River. The datum for calculation of dredge volume was accepted as the least spot height in the stretch for the entire River. The newly established sounding datum is established by assuming the least value of the Spot height for every 01km of the River stretch.

Km Stretch	Least Level w.r.t. MSL	Established CD (m)		Km Stretch	Least Level w.r.t. MSL	Established CD (m)
0 - 1	93.513	92.987		83 - 84	116.751	124.396
1 - 2	93.620	93.22		84 - 85	116.723	124.721
2 - 3	93.820	93.36		85 - 86	117.123	125.154
3 - 4	94.017	93.547		86 - 87	117.925	125.695
4 - 5	94.214	93.78		87 - 88	118.325	126.019
5 - 6	94.476	93.967		88 - 89	118.735	126.452
6 - 7	94.629	94.153		89 - 90	119.068	126.885
7 - 8	94.844	94.34		90 - 91	120.069	127.426
8 - 9	94.918	94.527		91 - 92	120.033	127.751
9 - 10	95.027	94.713		92 - 93	120.364	128.184
10 - 11	95.148	94.9		93 - 94	121.066	128.617
11 - 12	95.242	95.087		94 - 95	121.963	129.05
12 - 13	95.374	95.273		95 - 96	122.092	129.483
13 - 14	95.466	95.413		96 - 97	123.110	129.915
14 - 15	95.602	95.646		97 - 98	123.181	130.348
15 - 16	95.716	95.786		98 - 99	124.092	130.781
16 - 17	95.882	96.02		99 - 100	125.017	131.214
17 - 18	95.994	96.206		100 - 101	125.587	131.647
18 - 19	96.058	96.346		101 - 102	125.823	132.08
19 - 20	96.145	96.533		102 - 103	126.356	132.621
20 - 21	96.286	97.015		103 - 104	126.718	132.946
21 - 22	96.400	97.448		104 - 105	127.123	133.379
22 - 23	96.513	97.881		105 - 106	127.623	133.811

Km Stretch	Least Level w.r.t. MSL	Established CD (m)		Km Stretch	Least Level w.r.t. MSL	Established CD (m)
23 - 24	96.628	98.314		106 - 107	128.073	134.244
24 - 25	96.776	98.747		107 - 108	128.725	134.677
25 - 26	96.835	99.288		108 - 109	129.589	135.11
26 - 27	96.985	99.613		109 - 110	130.357	135.543
27 - 28	97.267	100.045		110 - 111	131.115	135.976
28 - 29	97.811	100.478		111 - 112	131.842	136.409
29 - 30	98.338	101.02		112 - 113	132.342	136.842
30 - 31	98.702	101.452		113 - 114	132.869	137.275
31 - 32	99.256	101.885		114 - 115	133.113	137.708
32 - 33	99.685	102.318		115 - 116	133.823	138.14
33 - 34	100.001	102.643		116 - 117	134.627	138.573
34 - 35	100.347	103.076		117 - 118	135.501	139.006
35 - 36	100.563	103.509		118 - 119	135.771	139.547
36 - 37	100.925	103.942		119 - 120	137.561	139.872
37 - 38	101.033	104.374		120 - 121	137.559	140.305
38 - 39	101.247	104.807		121 - 122	138.245	140.846
39 - 40	101.959	105.24		122 - 123	139.333	141.171
40 - 41	102.321	105.673		123 - 124	140.225	141.604
41 - 42	102.857	106.106		124 - 125	141.426	142.037
42 - 43	103.033	106.539		125 - 126	142.357	142.387
43 - 44	103.704	107.08		126 - 127	142.763	142.654
44 - 45	104.110	107.513		127 - 128	143.459	142.988
45 - 46	104.310	107.946		128 - 129	144.033	143.189
46 - 47	104.683	108.379		129 - 130	145.066	143.523
47 - 48	104.712	108.703		130 - 131	145.219	143.724
48 - 49	104.801	109.136		131 - 132	145.754	143.991
49 - 50	104.927	109.569		132 - 133	147.244	144.258
50 - 51	105.201	110.002		133 - 134	147.228	144.526
51 - 52	106.028	110.435		134 - 135	148.839	144.793
52 - 53	106.017	110.868		135 - 136	148.317	145.061
53 - 54	106.614	111.301		136 - 137	148.917	145.328
54 - 55	107.039	111.734		137 - 138	149.505	145.662
55 - 56	107.124	112.167		138 - 139	150.004	145.863
56 - 57	108.019	112.6		139 - 140	150.350	146.197
57 - 58	109.017	113.032		140 - 141	151.040	146.464
58 - 59	109.087	113.574		141 - 142	151.606	146.665
59 - 60	109.201	114.006		142 - 143	152.426	146.932
60 - 61	110.017	114.439		143 - 144	153.125	147.2
61 - 62	110.017	114.764		144 - 145	153.216	147.467
62 - 63	110.017	115.197		145 - 146	154.438	147.735
63 - 64	110.214	115.63		146 - 147	154.455	148.002
64 - 65	110.617	116.063		147 - 148	155.458	148.269
65 - 66	110.917	116.496		148 - 149	156.664	148.537
66 - 67	111.229	116.928		149 - 150	157.262	148.871
67 - 68	111.527	117.361		150 - 151	158.750	149.071

Km Stretch	Least Level w.r.t. MSL	Established CD (m)		Km Stretch	Least Level w.r.t. MSL	Established CD (m)
68 - 69	111.629	117.903		151 - 152	158.458	149.339
69 - 70	112.414	118.227		152 - 153	158.658	149.606
70 - 71	112.424	118.768		153 - 154	160.616	149.874
71 - 72	113.027	119.093		154 - 155	159.654	150.141
72 - 73	113.004	119.526		155 - 156	160.252	150.408
73 - 74	114.000	119.959		156 - 157	161.164	150.676
74 - 75	113.968	120.392		157 - 158	161.868	150.943
75 - 76	114.000	120.825		158 - 159	162.644	151.211
76 - 77	114.214	121.257		159 - 160	163.065	151.478
77 - 78	114.951	121.799		160 - 161	163.243	151.812
78 - 79	114.735	122.231		161 - 162	164.438	152.013
79 - 80	115.209	122.664		162 - 163	164.512	152.28
80 - 81	115.509	122.989		163 - 164	165.014	152.548
81 - 82	115.710	123.422		164 - 165	165.785	152.815
82 - 83	116.212	123.855		165 - 165.78	166.245	153.214

Table 4 - Established CD for per kilometer stretch

2.6 Average of 06 years minimum Water Levels to arrive at CD

The chart datum is calculated for the erected benchmarks with the provided tide gauge details from IWAI. It has been observed that there are CWC gauge data available on this stretch and the CWC gauges of Kaleshwaram, Tekra and Asthi were used for the calculation of CD value for this river stretch. The CD value is calculated for the years of span i.e. from 2009 to 2015. The tide poles were not erected as the river was having only small pockets of water and boat survey could not be possible for the river stretches.

KALESHWARAM CWC GAUGE 2009-15							
WL values in m.							
Min/Max	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**
Jan Min.	92.900	92.920	93.510	93.280	93.390	93.680	93.280
Jan Max.	93.050	93.070	93.670	93.650	93.640	93.980	93.610
Feb Min.	92.940	92.860	93.470	93.120	93.340	93.570	93.330
Feb Max.	93.000	93.050	93.660	93.430	93.620	93.840	93.610
Mar Min.	92.880	92.860	93.390	92.850	93.280	93.550	93.240
Mar Max.	93.010	93.040	93.670	93.100	93.520	93.990	93.640
Apr Min.	92.790	92.700	93.250	92.680	93.040	93.190	92.980
Apr Max.	92.900	92.850	93.390	92.950	93.290	93.640	93.220
May Min.	92.700	92.630	93.120	92.540	92.840	93.120	92.950
May Max.	92.860	92.870	93.290	92.670	93.020	93.400	93.380

KALESHWARAM CWC GAUGE 2009-15							
WL values in m.							
Jun Min.	92.750	92.710	93.210	92.500	92.870	93.040	
Jun Max.	93.010	93.420	94.290	94.550	100.470	93.350	
Jul Min.	93.060	93.390	93.880	93.180	94.540	93.210	
Jul Max.	99.020	99.740	97.340	99.400	104.340	101.180	
Aug Min.	93.480	96.690	94.580	95.650	98.090	94.660	
Aug Max.	97.780	102.690	99.090	101.040	104.480	97.650	
Sep Min.	93.560	96.760	94.970	95.770	95.930	94.380	
Sep Max.	97.110	103.790	101.010	102.050	99.480	101.840	
Oct Min.	93.260	94.770	94.050	94.200	95.580	93.900	
Oct Max.	94.570	96.640	94.730	97.160	99.950	94.550	
Nov Min.	93.220	94.180	93.610	93.680	94.250	93.510	
Nov Max.	95.290	94.990	94.040	94.460	95.710	94.000	
Dec Min.	92.990	93.660	93.370	93.490	94.020	93.280	
Dec Max.	94.190	94.150	93.580	93.700	94.240	93.630	
Yearly Min.	**92.700**	**92.630**	**93.120**	**92.500**	**92.840**	**93.040**	**92.950**
Yearly Max.	**99.020**	**103.790**	**101.010**	**102.050**	**104.480**	**101.840**	**93.640**
6yr. Min.	**92.500**						
6yr. Max.	**104.480**						
6yr. Ave. Min.	**92.847**						
6yr. Ave. Max.	**102.032**						
Value of Chart Datum (CD) adopted	**92.847**						

Table 5 - Kaleshwaram Gauge Data from 2009 to 2015

TEKRA CWC GAUGE 2009-15							
WL values in m.							
Min/Max	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**
Jan Min.	96.930	97.230	97.140	97.250	97.190	97.950	97.190
Jan Max.	97.050	97.480	97.380	97.930	97.420	98.240	97.670
Feb Min.	96.790	97.010	97.120	97.100	97.130	97.780	97.460
Feb Max.	96.950	97.290	97.290	97.510	97.430	98.130	97.660
Mar Min.	96.680	96.930	96.930	96.930	96.990	97.580	97.270
Mar Max.	96.780	97.220	97.260	97.090	97.330	98.570	97.610
Apr Min.	96.580	96.760	96.760	96.750	96.740	97.290	96.980
Apr Max.	96.680	96.920	97.060	96.920	96.980	97.540	97.260
May Min.	96.530	96.690	96.840	96.670	96.550	97.190	96.940
May Max.	96.600	96.870	97.130	96.750	96.720	97.370	97.110
Jun Min.	96.530	96.780	97.050	96.650	96.530	97.080	
Jun Max.	96.760	97.650	98.070	98.960	106.190	97.520	

TEKRA CWC GAUGE 2009-15							
WL values in m.							
Jul Min.	96.810	97.590	97.570	96.970	99.190	97.490	
Jul Max.	104.480	104.790	102.550	105.310	111.290	107.710	
Aug Min.	97.820	100.640	98.610	100.370	102.570	98.630	
Aug Max.	102.790	109.130	103.910	107.570	112.090	102.230	
Sep Min.	98.190	100.270	99.470	100.230	99.530	98.870	
Sep Max.	101.650	109.590	107.590	109.060	103.560	108.970	
Oct Min.	97.670	98.920	98.220	98.190	99.730	98.330	
Oct Max.	99.100	100.100	99.190	100.910	105.120	98.960	
Nov Min.	97.640	97.870	97.470	97.440	98.330	97.790	
Nov Max.	99.640	98.890	98.230	98.590	99.660	98.460	
Dec Min.	97.230	97.300	97.310	97.250	98.140	97.170	
Dec Max.	97.830	97.850	97.560	97.550	98.310	97.740	
Yearly Min.	**96.530**	**96.690**	**96.760**	**96.650**	**96.530**	**97.080**	**96.940**
Yearly Max.	**104.480**	**109.590**	**107.590**	**109.060**	**112.090**	**108.970**	**97.670**
6yr. Min.	**96.530**						
6yr. Max.	**112.090**						
6yr. Ave. Min.	**96.775**						
6yr. Ave. Max.	**108.630**						
Value of Chart Datum (CD) adopted	**96.775**						

Table 6 - Tekra Gauge Data from 2009-2015

ASTHI CWC GAUGE 2009-15						
WL values in m.						
Min/Max	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**
Jan Min.	142.45	142.67	142.83	142.75	142.74	142.88
Jan Max.	142.75	143.17	143.29	143.9	143.23	143.66
Feb Min.	142.25	142.52	142.77	142.46	142.77	142.8
Feb Max.	142.47	143.09	143.14	143.32	143.16	143.43
Mar Min.	142.18	142.45	142.52	142.39	142.55	142.67
Mar Max.	142.25	142.77	142.81	142.71	143.25	144.01
Apr Min.	142.11	142.23	142.45	142.33	142.33	142.53
Apr Max.	142.18	142.51	142.51	142.58	142.65	142.72
May Min.	142.08	142.22	142.34	142.3	142.26	142.43
May Max.	142.14	142.62	142.66	142.41	142.47	142.68
Jun Min.	142.23	142.37	142.35	142.27	142.24	142.37
Jun Max.	142.9	143.34	144.14	144.23	150.28	142.83
Jul Min.	142.77	142.63	143.15	142.57	144.66	142.52
Jul Max.	149.54	149.19	148	147.51	151.91	152.48
Aug Min.	143.16	145.37	143.54	145.38	147.22	144.46
Aug Max.	147.6	152.31	147.66	151.37	153.71	148.04
Sep Min.	143.71	145	144.19	145.08	144.92	144.02

ASTHI CWC GAUGE 2009-15						
WL values in m.						
Sep Max.	146.47	152.57	151.73	151.7	147.47	149.6
Oct Min.	143.25	144.19	143.82	143.84	144.73	143.46
Oct Max.	144.92	144.92	144.6	145.26	148.4	144.69
Nov Min.	143.25	143.17	142.86	143.11	143.14	142.84
Nov Max.	145.94	144.1	143.83	144.46	144.82	144.15
Dec Min.	142.56	143.06	142.72	142.8	143.05	142.53
Dec Max.	143.59	143.46	143.17	143.32	143.54	142.86
Yearly Min.	**142.08**	**142.22**	**142.34**	**142.27**	**142.24**	**142.37**
Yearly Max.	**149.54**	**152.57**	**151.73**	**151.7**	**153.71**	**152.48**
6yr. Min.	**142.08**					
6yr. Max.	**153.71**					
6yr. Ave. Min.	**142.253**					
6yr. Ave. Max.	**151.955**					
Value of Chart Datum (CD) adopted				**142.253**		

Table 7 - Asthi Gauge Data from 2009-2015

2.7 Transfer of Sounding Datum

The Wainganga-Pranahita River is non-tidal river and lowest MSL level of per-km stretch is considered as the datum value for the computing sounding datum at different stretches.

2.8 Table indicating tidal variation at Different Observation Points

The survey stretch of the Wainganga-Pranahita River is non-tidal river and the river dries fully during the summer season.

2.9 Salient features of Dam, Barrages, Weirs, etc.

There are no Dam, Barrages and Anicut, locks and Aqueducts in full stretch of the Wainganga-Pranahita River.

2.10 Erected Bench Mark Pillars

New bench Mark Pillars were constructed as per specification at suitable locations as specified in the contract. The extension of horizontal control was made by the baseline processing of 06 hourly DGPS observations carried out with the nearest reference station. The value of these benchmarks w.r.t. MSL was obtained by Auto leveling from the IWAI BM GDV-21 as Reference Bench Mark to IWAI BM WNG-01 and thereafter one pillar to another. The final accepted co-ordinates and a Reference Level value of IWAI BM Pillars are as below:

Sl. No	Station	Chainage (km)	Location	Latitude (N) Longitude (E)	Easting (E) Northing (N)	BM Height above MSL (m)	CD w.r.t. MSL (m)	BM Height w.r.t. CD (m)
1	IWAI BM WNG-01	12.105	Kota Pochampalli	18°54'27.88371"N 79°57'53.16495"E	390977.324 2090938.927	110.744	95.374	15.37
2	IWAI BM WNG-02	24.827	Tekada	19°00'52.72810"N 79°56'50.34643"E	389210.135 2102779.699	107.331	96.776	10.555
3	IWAI BM WNG-03	31.917	Ramannatetha Ray	19°03'22.53495"N 79°54'14.86968" E	384693.099 2107412.545	111.075	99.256	11.819
4	IWAI BM WNG-04	41.632	Kottapalli	19°05'36.38216"N 79°52'09.37948"E	381051.483 2111550.348	123.245	102.857	20.388
5	IWAI BM WNG-05	50.974	Lankachen	19°08'16.92268"N 79°55'02.92316"E	386153.668 2116453.353	112.928	105.201	7.727
6	IWAI BM WNG-06	62.698	Watra	19°13'42.75127"N 79°55'44.81281" E	387439.036 2126461.896	125.743	110.017	15.726
7	IWAI BM WNG-07	72.663	Devalmari	19°18'12.92932"N 79°58'12.95635" E	391814.055 2134741.131	122.705	113.004	9.701
8	IWAI BM WNG-08	85.425	Aheri	19°24'59.94556"N 79°58'34.47513"E	392516.229 2147249.316	127.858	117.123	10.735
9	IWAI BM WNG-09	94.558	Bori	19°29'20.17563"N 79°56'19.85044"E	388639.069 2155272.839	133.957	121.963	11.994
10	IWAI BM WNG-10	103.180	Machhigatta	19°31'01.23539"N 79°52'00.69102"E	381104.098 2158427.881	139.468	126.718	12.75
11	IWAI BM WNG-11	113.656	Chaparala	19°35'28.46679"N 79°48'29.67892"E	375010.446 2166684.955	147.025	132.869	14.156
12	IWAI BM WNG-12	123.891	Borghat Rith	19°40'38.74484"N 79°47'17.44872"E	372973.728 2176238.634	153.807	140.225	13.582
13	IWAI BM WNG-13	135.767	Jairampur	19°46'30.64848"N 79°45'11.07600"E	369373.117 2187084.014	162.542	148.317	14.225
14	IWAI BM WNG-14	143.975	Gangapur Chak	19°50'23.00152"N 79°45'26.10696"E	369863.080 2194224.221	166.348	153.125	13.223
15	IWAI BM WNG-15	155.014	Ekodi	19°55'21.50827"N 79°47'48.55425"E	374072.624 2203371.407	174.785	160.252	14.533
16	IWAI BM WNG-16	165.776	Ghargaon	20°00'20.46324"N 79°47'19.88779"E	373305.458 2212568.484	184.654	166.245	18.409

Table 8 - Accepted Benchmark coordinates with established Chart Datum

2.11 Chart Datum / Sounding Datum and Reductions Details

The water availability in Wainganga-Pranahita River is very less and the spot leveling by topographic method was attempted for the entire survey stretch of Wainganga-Pranahita River. The least MSL level for the per-kilometer stretch was obtained as the established chart Datum. The details of Topo level converted as Depth for volume calculation are forwarded as soft copy along with the report.

2.12 HFL/MHWS values of Bridges/Cross Structures

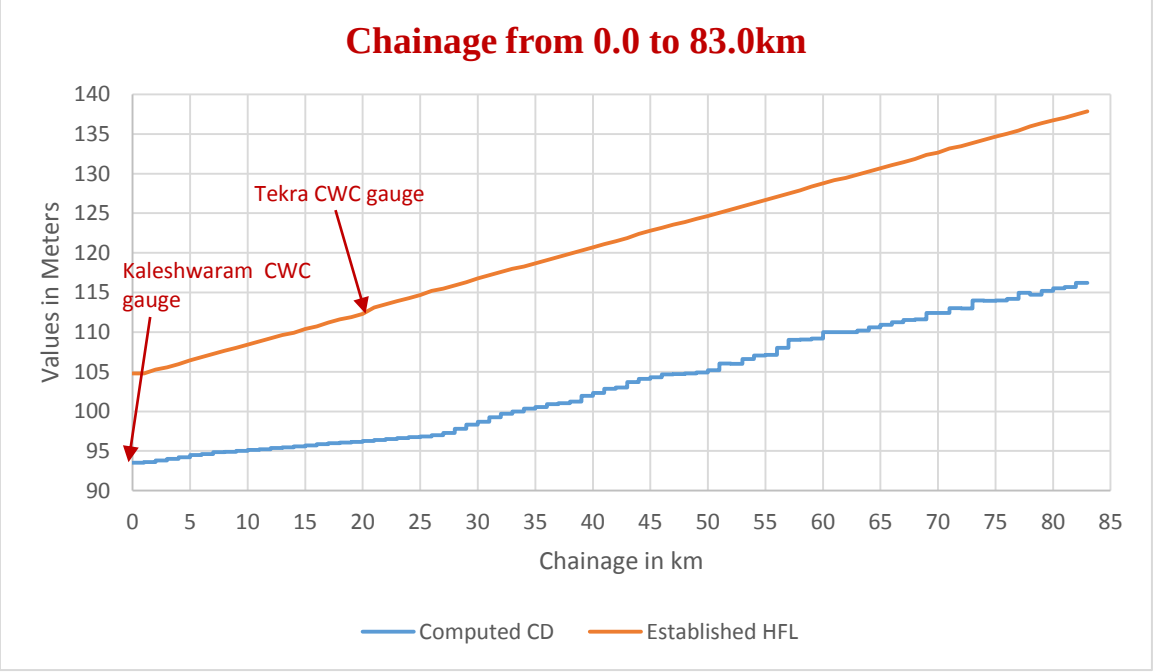
The established HFL value of the Kaleshwaram CWC gauge, Tekra CWC gauge and Ashti CWC gauge w.r.t MSL in the last 20 years was provided by IWAI. The HFL

value for the remaining survey stretch is computed for the Wainganga-Pranahita River. The details of established and computed HFL values for the entire stretch are as follows:-

Sl#	Location and description of CWC gauge / Bridges	Cross-structure details	Chainage (km)	Established HFL / FRL w.r.t. MSL (m)	Computed HFL at Cross-Structures w.r.t. MSL (m)
	A	B	C	D	E
1	Kaleshwaram CWC gauge	Gauge	-0.837	104.480	-
2	Tekra CWC gauge	Gauge	20.130	112.800	-
3	Wainganga Road Bridge	Bridge	123.823	-	154.299
4	Asthi Bridge	Bridge	124.576	-	154.598
5	Ashti CWC gauge	Gauge	124.877	154.720	-
6	Mul- Charmoshi Road Bridge	Bridge	165.780	-	178.570

Table 9 - HFL values of Bridges/Cross structures

2.13 Graph: Sounding Datum and HFL vs Chainage



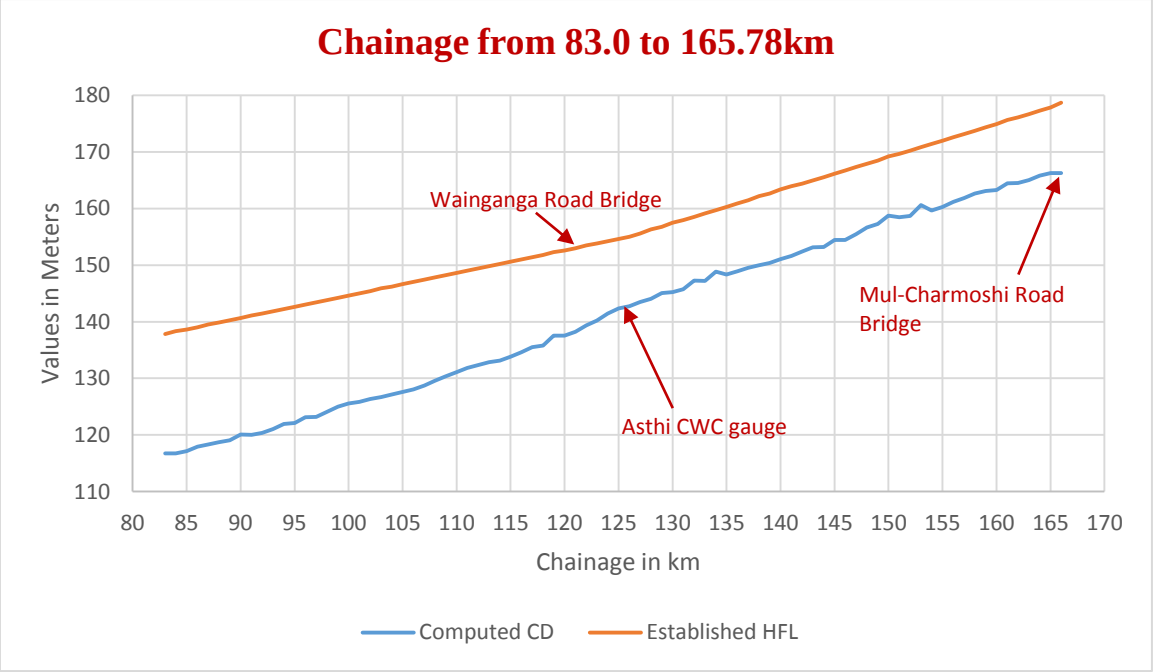


Figure 6 - Sounding Datum and HFL vs Chainage

2.14 Average Bed Slope

The average bed slope of the Wainganga-Pranahita River is as follows:

Reach and River-bed Level (RBL)		River-bed Level Change (m) (A)	Distance (km) (B)	Slope (A:B)
From	To			
Ch. 0 - RBL_93.823	Ch. 30 - RBL_99.946	6.123	30	1 : 0.204
Ch. 30 - RBL_99.946	Ch. 60 - RBL_110.595	10.649	30	1 : 0.355
Ch. 60 - RBL_110.595	Ch. 90 - RBL_121.779	11.184	30	1 : 0.373
Ch. 90 - RBL_121.779	Ch. 120 - RBL_138.683	16.904	30	1 : 0.563
Ch. 120 - RBL_138.683	Ch. 150 - RBL_158.254	19.571	30	1 : 0.652
Ch. 150 - RBL_158.254	Ch. 165.78 - RBL_167.428	9.174	15.78	1 : 0.581

Reach and River-bed Level (RBL)		River-bed Level Change (m) (A)	Distance (km) (B)	Slope (A:B)
From	To			

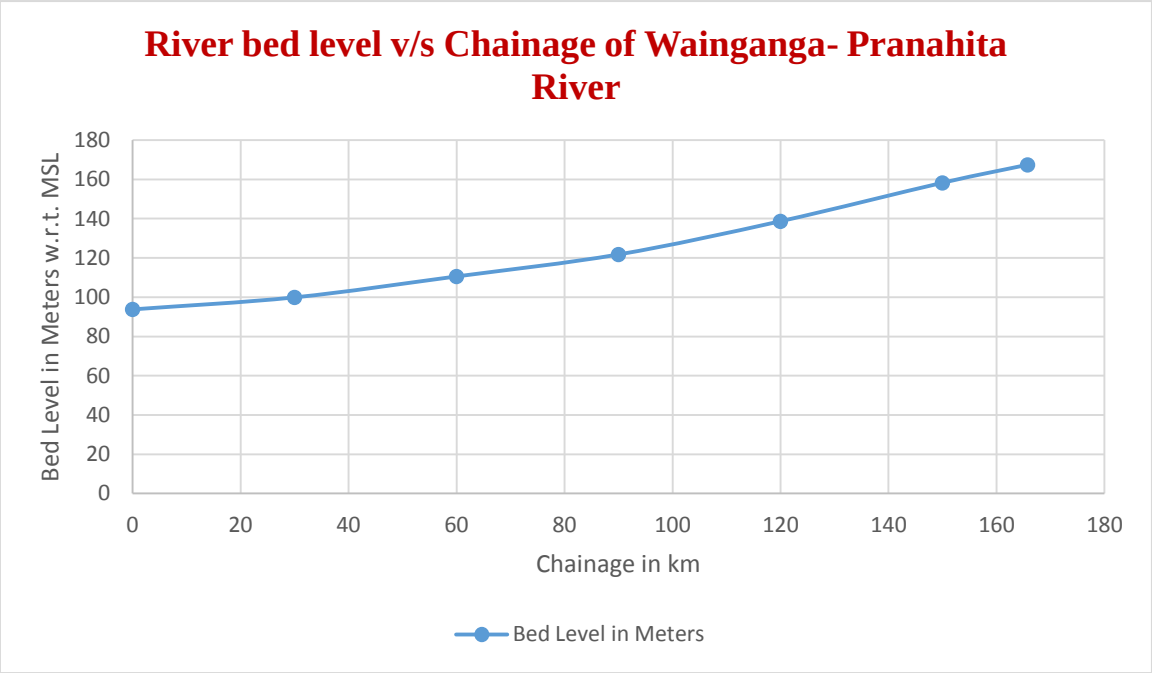


Table 10 - Average Bed Slope

2.15 Details of Dam, Barrages, Weirs, Anicut, etc.

There are no Dams, Barrages, Weirs and Anicut present in the entire survey stretch of Wainganga-Pranahita River.

2.16 Details of Locks

There are no Locks present in the entire survey stretch of Wainganga-Pranahita River.

2.17 Details of Aqueducts

There are no Aqueducts present in the survey stretch of Wainganga-Pranahita River.

2.18 Details of existing Bridges and Crossings over waterway

Sl. No	Structure Name and for road / rail	Chainage (km)	Type of Structure RCC / Iron	Location	Position (Lat Long)	Position (UTM)	Length (m)	Width (m)	No of Piers	HC (clear dist. Betwee	VC w.r.t. HFL (m)	Remarks (complete / under - constructi

					Left Bank Right Bank	Left Bank Right Bank				n piers) (m)		on), in use or not, condition
1	Wainganga Road Bridge	123.823	RCC	Asthi	**Left Bank:** 19°40'38.301"N 79°46'57.621"E **Right Bank:** 19°40'38.170"N 79°47'16.749"E	**Left Bank:** 372396.234 2176229.123 **Right Bank:** 372953.232 2176221.111	756	10.017	39	11.651	0.00	Completed and in use
2	Asthi Bridge	124.576	RCC	Asthi	**Left Bank:** 19°41'0.15"N 79°46'51.24"E **Right Bank:** 19°41'3.49"N 79°47'15.49"E	**Left Bank:** 372215.220 2176902.15 **Right Bank:** 372922.110 2176999.78	715	5.710	-	7.550	0.00	Old Bridge /Damaged
3	Mul-Charmoshi	165.780	RCC	Chamorshi	**Left Bank:** 20°00'36.669"N 79°46'59.211"E **Right Bank:** 20°00'21.196"N 79°47'19.457"E	**Left Bank:** 372708.219 2213071.099 **Right Bank:** 373293.122 2212591.121	558	4.976	24	28.121	1.036	Completed and in use

Table 11 - Bridges crossing over waterway

2.19 Details of other Cross structures, pipe-lines, underwater cables

There are numerous small pipeline connections between the drinking water well and shore Pump houses on the Wainganga-Pranahita River, however, no major Pipelines or under water cables cross-through the Wainganga-Pranahita River.

2.20 Details of High Tension Lines

Sl. No	Type of line	Chainage (km)	Location	Position (Lat Long)	Position (UTM)	No. of Piers	HC (clear distance Between piers (m)	VC w.r.t. HFL (m)	Remark (complete/ under – construction)
				Left Bank Right Bank	Left Bank Right Bank				
1	HTL	123.503	Asthi	**Left Bank:** 19°40'25.451"N 79°46'54.314"E **Right Bank:** 19°40'29.957"N 79°47'19.317"E	**Left Bank:** 372297.123 2175834.754 **Right Bank:** 373026.210 2175968.109	-	-	23.998	Completed
2	HTL	123.674	Asthi	**Left Bank:** 19°40'32.742"N 79°46'57.212"E **Right Bank:** 19°40'33.564"N 79°47'18.771"E	**Left Bank:** 372383.122 2176058.322 **Right Bank:** 373011.111 2176079.099	-	-	15.391	Completed
3	HTL	123.857	Asthi	**Left Bank:** 19°40'39.514"N 79°46'54.380"E **Right Bank:** 19°40'39.293"N 79°47'19.388"E	**Left Bank:** 372302.134 2176267.098 **Right Bank:** 373030.322 2176255.098	-	-	25.268	Completed
4	HTL	165.749	Pardi	**Left Bank:**	**Left Bank:**	-	-	27.512	Completed

Sl. No	Type of line	Chainage (km)	Location	Position (Lat Long)	Position (UTM)	No. of Piers	HC (clear distance Between piers (m)	VC w.r.t. HFL (m)	Remark (complete/ under – construction)
				Left Bank Right Bank	Left Bank Right Bank				
				20°00'36.371"N 79°46'58.491"E	372687.210 2213062.077				
				Right Bank: 20°00'20.083"N 79°47'18.672"E	**Right Bank:** 373270.055 2212557.055				

Table 12- High Tension Lines

2.21 Current Meter and Discharge details

Current meter observation is not done in Wainganga-Pranahita River due to non-availability of water.

2.22 Water Samples

Water Samples were not collected in Wainganga-Pranahita River due to non-availability of water.

3 Description of waterway

The Waterway of Wainganga-Pranahita River coming within survey limits is divided into six stretches in accordance with the topographic feature and nature of river stream. The details are as follows:

3.1 Sub Stretch 1: Kaleshwaram to Ramannapetha Ray (Chainage 0.00km to 30.00km)

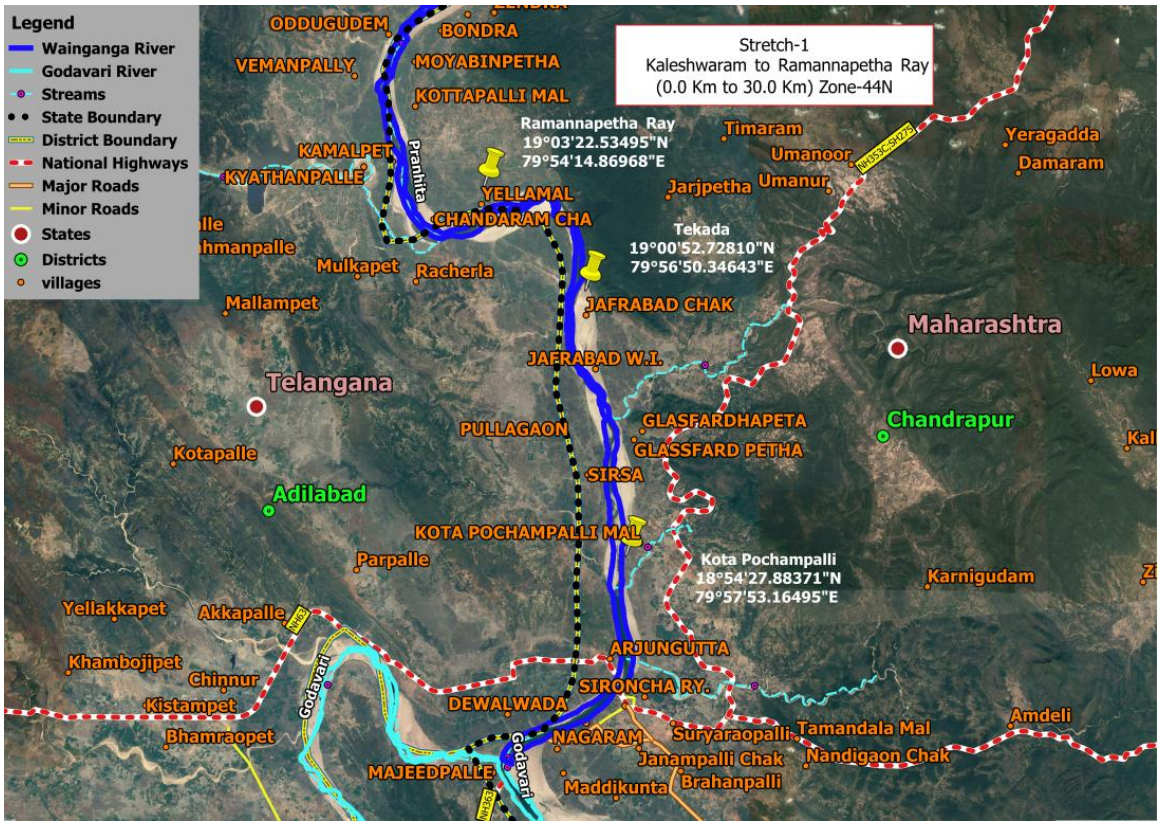


Figure 7 - Stretch-1 Kaleshwaram to Ramannapetha Ray

- **Bathymetry Survey**

  a) No bathymetric survey is conducted due to the unavailability of water

- **Topographic Survey**

  b) 30km of the length of the stretch for which the Topographic survey has been carried out.

Stretch-1 has covered 30.00km i.e. from 0.0km to 30.00km from Kaleshwaram to Ramannapetha Ray village.

The survey commenced from Kaleshwaram, Karimnagar district, State Telangana. It separates the two states along this stretch for Maharashtra and Telangana. Kaleswaram is well connected by road from various cities like Hyderabad, Warangal

and Karimnagar. The “IWAI BM” pillars in this stretch were erected on the left bank of the river.

Kaleswaram is a hub of temples of various Gods and Goddess including the famous Kaleshwara Muketeswara Swamy Temple, Saraswati Temple, Adimukteswara Temple and Hanuman Temple. Kaleshwaram is a Village in Mahadevpur Mandal in Karimnagar District of Telangana State. It is located 107km towards East from District headquarters Karimnagar, 14km from Mahadevpur and is 90km from Ramagundam railway station & Godavarikhani.

Mahadevpur, Damerakunta, Bommapur are the nearby Villages to Kaleshwaram. Kaleshwaram is surrounded by Mahadevpur Mandal towards the South, Chennur Mandal towards the west, Kotapally Mandal towards the North, Kataram Mandal towards the South. Ramagundam, Mancherial, Mandamarri, Bellampalle is the nearby Cities to Kaleshwaram.

This Place is on the border of the Karimnagar District and Gadchiroli District. Gadchiroli District Sironcha is east towards this place. It is near to the Maharashtra State Border. Ramagundam is the Nearest Town to Kaleshwaram. Ramagundam is 47km from Kaleshwaram. Road connectivity is there from Ramagundam to Kaleshwaram.

There is no railway station near to Kaleshwaram in less than 10km. However, there are railway Stations from nearby town Ramagundam. The Warangal Railway Station is a major railway station situated 109km from Kaleshwaram.

Kota Pochampalli is a Village in Sironcha Taluka in Gadchiroli District of Maharashtra. It is located 174km towards the South from District headquarters Gadchiroli and 874km from State capital Mumbai.

Kota Pochampalli is surrounded by Mahadevpur Taluka towards the South, Chennur Taluka towards the west, Kotapally Taluka towards the west, Kataram Taluka towards South. Mandamarri, Ramagundam, Mancherial, Bellampalle are the nearby Cities to Pochampalli.

Tekla is a Village in Bhamaragad Taluka in Gadchiroli District of Maharashtra State. It is located 123km towards the South from District headquarters Gadchiroli and is 951km from State capital Mumbai.

Tekla is surrounded by Etapalli Taluka towards west, Aheri Taluka towards west, Orchha (Abhujmad) Taluka towards east, Bhopal Patnam Taluka towards south. Bade Bacheli, Gadchiroli, Kagaznagar, Kondagaon are the nearby Cities to Tekla.

Gadchiroli is the nearby town to Tekla having road connectivity. There are no features across the river. There are two pump house along the river side. The river bed is completely dry and sandy in nature.

Figure 8 - Kaleshwaram Muketeswaram Swamy Temple (01 km downstream from survey stretch)

Class	Chainage (km)		Observed					Reduced w.r.t. Sounding Datum				
	From	To	Min. depth (m)	Max. depth (m)	Length of Shoal (m)	Dredging Qty. (cu.m.)	Accumulated Qty.	Min. Depth (m)	Max. Depth (m)	Length of Shoal (m)	Dredging Qty. (cu.m.)	Accumulated Qty.
I	0	30	0.000	0.000	30000	1,292,585.55	1,292,585.55	-0.300	0.000	30000	1,608,468.76	1,608,468.76
II	0	30	0.000	0.000	30000	1,970,016.10	1,970,016.10	-0.300	0.000	30000	2,376,194.36	2,376,194.36
III	0	30	0.000	0.000	30000	2,975,511.74	2,975,511.74	-0.300	0.000	30000	3,479,267.59	3,479,267.59
IV	0	30	0.000	0.000	30000	3,590,354.18	3,590,354.18	-0.300	0.000	30000	4,116,929.51	4,116,929.51

Table 13 - Dredging Quantity Details

3.1.1 Observed and reduced Bed Profile of the stretch

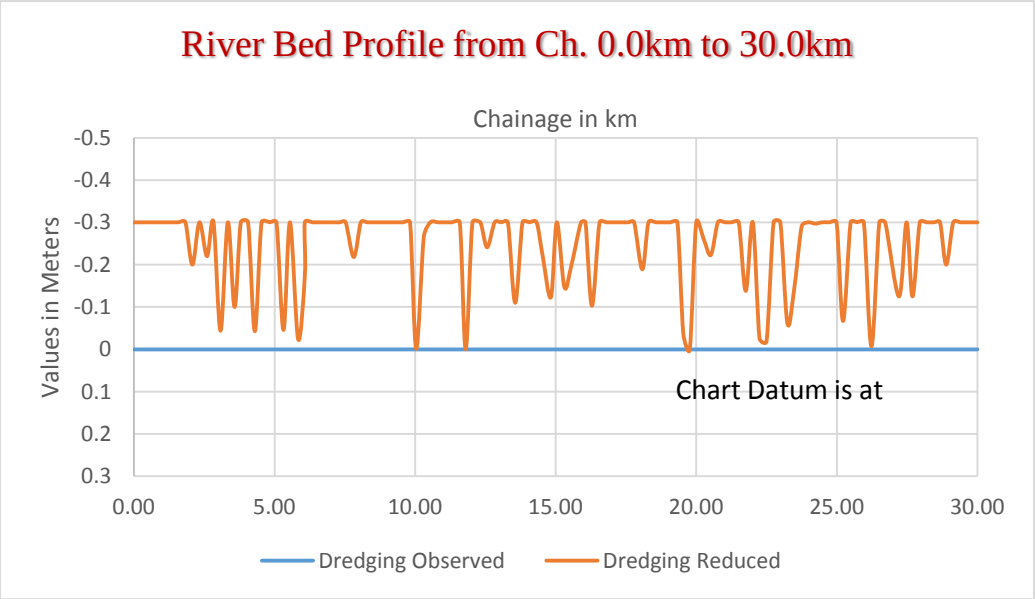


Figure 9 - River Bed Profile

3.2 Sub-Stretch-2: Ramannapetha to Avalmari (30.0km to 60.0km)

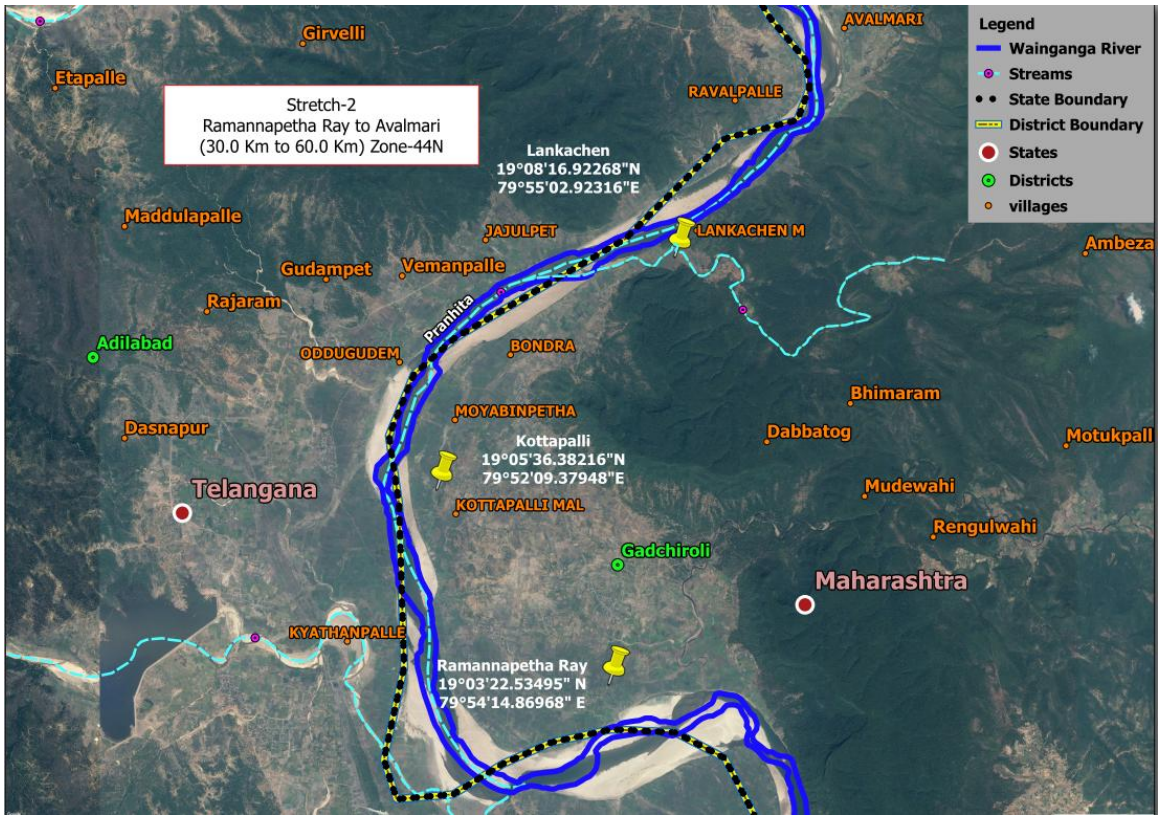


Figure 10 - Ramannapetha to Avalmari

- **Bathymetry Survey**

  a) No bathymetric survey is conducted due to the unavailability of water

- **Topographic Survey**

  b) 30km of the length of the stretch for which the Topographic survey has been carried out.

Stretch-2 has covered 30.00 km, i.e. from 30.00 to 60.00 km from Ramannapetha to Avalmari village.

In this stretch of river only scattered flow of water is observed and is there is no sufficient water for navigation and hydrographic survey using a survey boat could not be carried out. The spot levels by topographic survey method were measured using Trimble R4 GPS.

In this stretch the river is flowing in between two states Maharashtra and Telangana. There are no features along and across the river. The IWAI BM pillars as erected on the left bank of the river.

Ramannatetha village is located in Sironcha Tehsil of Gadchiroli district in Maharashtra. It is situated 60km away from sub-district headquarter Sironcha and 210km away from district headquarter Gadchiroli. Nearby villages in this stretch along the river are Yellamal, Chandaram, Vithalraopeta, Kyathanpalle, Moyabinpetha, Vemanpally, Jajulpet, Bondra and Darshewada

There is no railway station near to Ramannatetha in less than 10km. The Warangal Railway Station is a major railway station situated 206km from Ramannatetha. Gadchiroli is the nearby by towns to Yellamal having road connectivity to Yemali.

Kotapalli is a Village in Sironcha Taluka in Gadchiroli District of Maharashtra State, India and it belongs to Vidarbh region and Nagpur Division. It is located 174km towards the South from District headquarters Gadchiroli and is 874km from State capital Mumbai.

Kotapalli is surrounded by Mahadevpur Taluka towards the South, Chennur Taluka towards the west, Kotapally Taluka towards the west, Kataram Taluka towards the South. Mandamarri, Ramagundam, Mancherial, Bellampalle are the nearby Cities to Kotapalli.

Kotapalli is on the border of the Gadchiroli District and Karimnagar District. Karimnagar District Mahadevpur is South towards this place. It is near to the Telangana State Border. Mancherial, Warangal, Ballarpur, Gadchiroli is the nearby by towns to Kotapalli having road connectivity to Kotapalli.

There is no railway station near to Kotapalli in less than 10 km. Kazipet Town Railway Station (near to Warangal), Mancherial Railway Station (near to Mancherial), Ravindrakhani Railway Station (near to Mancherial), Warangal Rail Way Station (near to Warangal) are the Railway stations reachable from nearby towns.

Lankachen M village is located in Aheri Tehsil of Gadchiroli district in Maharashtra. It is situated 25km away from sub-district headquarter Aheri and is 200km away from district headquarter Gadchiroli.

Class	Chainage (km)		Observed					Reduced w.r.t. Sounding Datum				
	From	To	Min. Depth (m)	Max. Depth (m)	Length of Shoal (m)	Dredging Qty. (cu.m.)	Accumulated Qty.	Min. Depth (m)	Max. Depth (m)	Length of Shoal (m)	Dredging Qty. (cu.m.)	Accumulated Qty.
I	30	60	0.000	0.000	30000	1,293,082.06	2,585,667.61	-0.300	0.000	30000	1,613,407.38	3,221,876.14
II	30	60	0.000	0.000	30000	1,969,550.64	3,939,566.74	-0.300	0.000	30000	2,381,761.42	4,757,955.78
III	30	60	0.000	0.000	30000	2,976,759.22	5,952,270.96	-0.300	0.000	30000	3,488,418.10	6,967,685.69
IV	30	60	0.000	0.000	30000	3,591,863.71	7,182,217.89	-0.300	0.000	30000	4,126,446.45	8,243,375.96

Table 14 - Dredging Quantity Details

3.2.1 Observed and reduced Bed Profile of the stretch

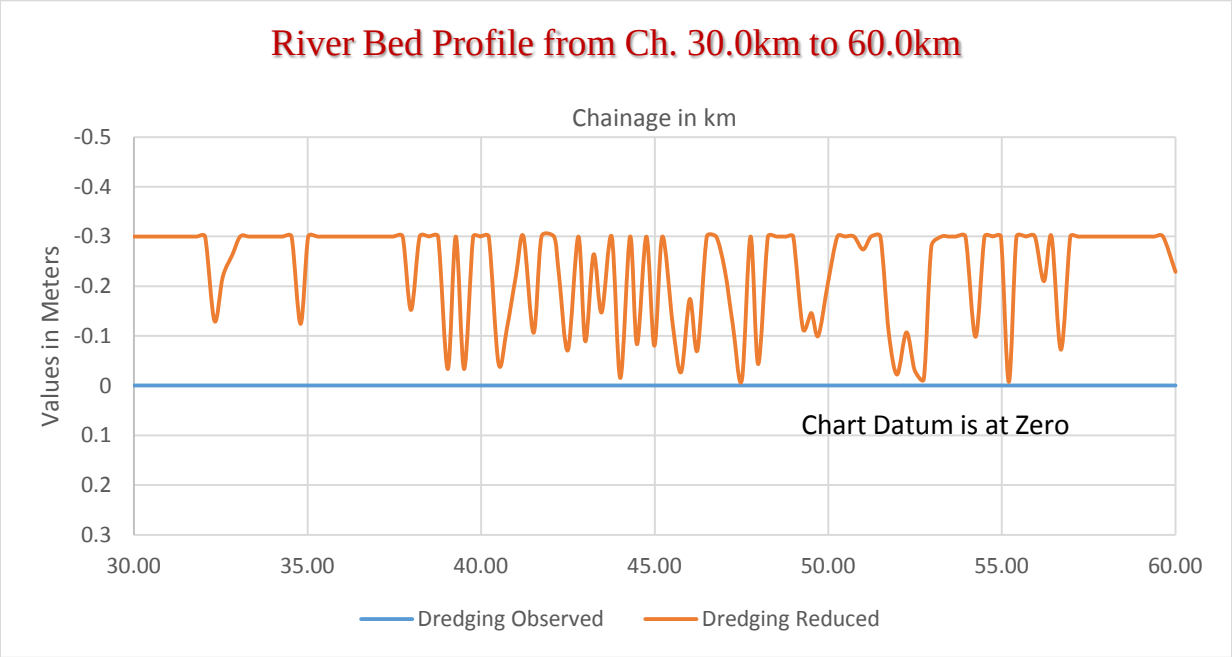


Figure 11 - River bed Profile

3.3 Sub-Stretch-3: Avalmari to Mahagaon Kh. (60.0km to 90.0km)

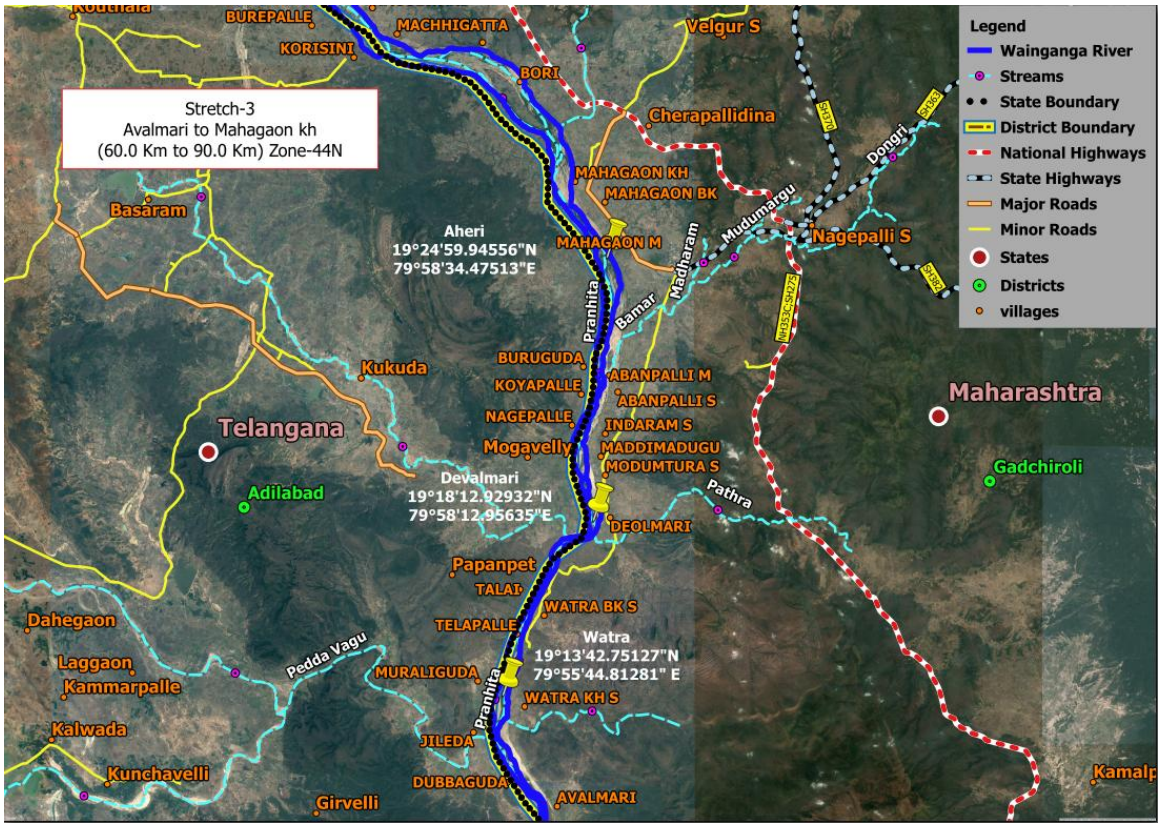


Figure 12 - Stretch-03 Avalmari to Mahagaon Kh.

- **Bathymetry Survey**

  a) No bathymetric survey is conducted due to the unavailability of water

- **Topographic Survey**

  b) 30km of the length of the stretch for which the Topographic survey has been carried out.

Stretch-3 has covered 30.00 km i.e. from 60.00 to 90.00 km from Avalmari to Mahagaon Kh village. In this river stretch, very shallow and small pocket of water is available and hydrographic survey by survey boat could not be conducted. The spot leveling for the entire area was conducted by topographic survey method.

In this stretch the river is flowing in between two states, Maharashtra and Telangana There are 04 pump house along the river side. The "IWAI BM" pillars are erected on the left bank of the river.

Murliguda, Telapalle, Talai, Thikapally and Devalmari villages are along the river in this stretch. Watra Khu. S. is a Village in Aheri Taluka in Gadchiroli District of Maharashtra. It is located 101km towards South from District headquarters Gadchiroli and is 879km from State capital Mumbai.

Watra Khu. S. is surrounded by Bejjur Taluka towards west, Mulchera Taluka towards North, Etapalli Taluka towards east and Kouthala Taluka towards west. Kagaznagar, Bellampalle, Mandamarri, Mul are the nearby Cities to Watra Khu. S. This Place is on the border of the Gadchiroli District and Adilabad District. Adilabad District Bejjur is west towards this place. It is near to the Telangana State Border. Ballarpur, Gadchiroli is the nearby by towns to Watra Khu. S having road connectivity to Watra Khu.

There is no railway station near to Watra Khu in less than 10km Balharshah Railway Station (near to Ballarpur), Wasanapura Rail Way Station (near to Ballarpur) are the Railway stations reachable from nearby towns. The Warangal Rail Way Station is major railway station which is situated 184km from Watra Khu.

Aheri town is located in Gadchiroli district on the left banks of Wainganga River. Iti is also tehsil and district sub-division in state of Maharashtra. Devalmari is a Village in Aheri Taluka in Gadchiroli District of Maharashtra State, India. It belongs to Vidarbh region. It belongs to Nagpur Division. It is located 114km towards the South from District headquarters Gadchiroli and is 13km from Aheri.

Nagepalli M. is the nearby Villages to Devalmari. Devalmari is surrounded by Bejjur Taluka towards west, Vemanpally Taluka towards South, Dahegaon Taluka towards west, Kouthala Taluka towards west. Kagaznagar, Bellampalle, Mandamarri, Mancherial are the nearby Cities to Devalmari.

Nagepalli M. is on the border of the Gadchiroli District and Adilabad District. Adilabad District Bejjur is west towards this place. It is near to the Telangana State Border. Ballarpur, Gadchiroli is the nearby by towns to Devalmari having road connectivity to Devalmari.

There is no railway station near to Devalmari in less than 10 km. The Balharshah Railway Station (near to Ballarpur), Wasanapura Rail Way Station (near to Ballarpur) are the Rail way stations reachable from nearby towns. The Warangal Rail Way Station is major railway station situated 171km from Devalmari.

Class	Chainage (km)	Observed	Reduced w.r.t. Sounding Datum

	From	To	Min. depth (m)	Max. depth (m)	Length of Shoal (m)	Dredging Qty. (cu.m.)	Accumulated Qty.	Min. Depth (m)	Max. Depth (m)	Length of Shoal (m)	Dredging Qty. (cu.m.)	Accumulated Qty.
I	60	90	0.000	0.000	30000	1,293,747.83	3,879,415.44	-0.300	0.000	30000	1,639,282.25	4,861,158.39
II	60	90	0.000	0.000	30000	1,970,575.16	5,910,141.90	-0.300	0.000	30000	2,414,968.25	7,172,924.03
III	60	90	0.000	0.000	30000	2,978,303.12	8,930,574.08	-0.300	0.000	30000	3,530,202.78	10,497,888.47
IV	60	90	0.000	0.000	30000	3,593,724.62	10,775,942.51	-0.300	0.000	30000	4,170,470.08	12,413,846.04

Table 15 - Dredging Quantity Details

3.3.1 Observed and reduced Bed Profile of the stretch

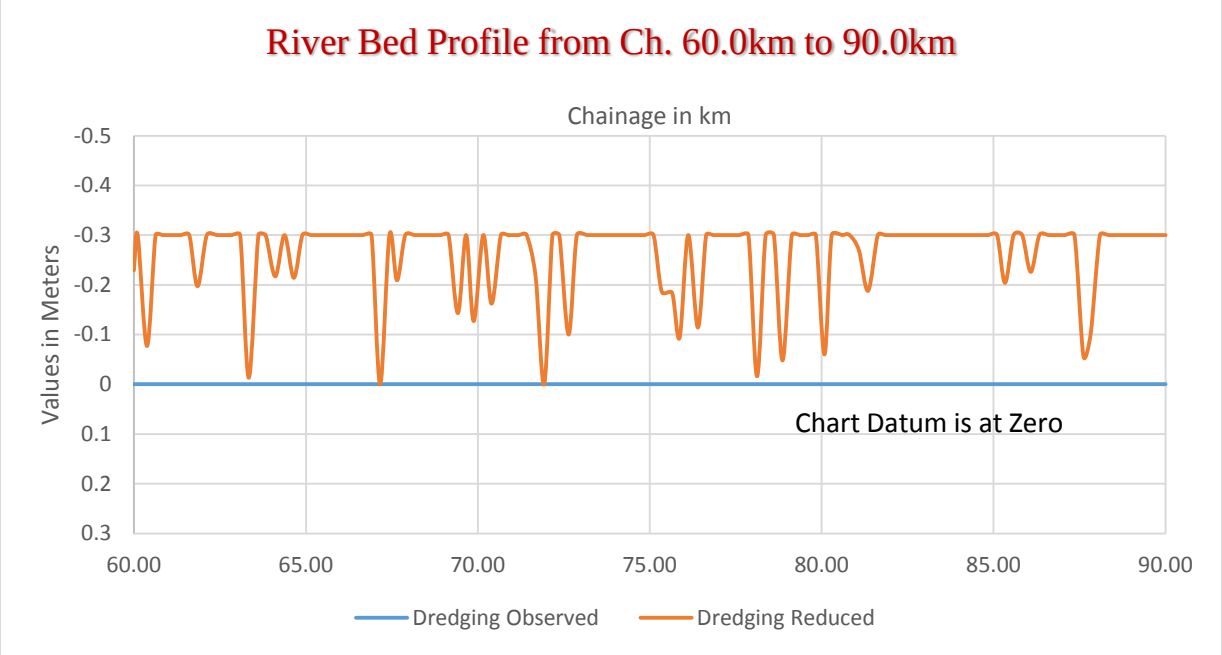


Figure 13 - River bed Profile

3.4 Sub-Stretch-4: Mahagaon Kh. to Illur (90.0km to 120.0km)

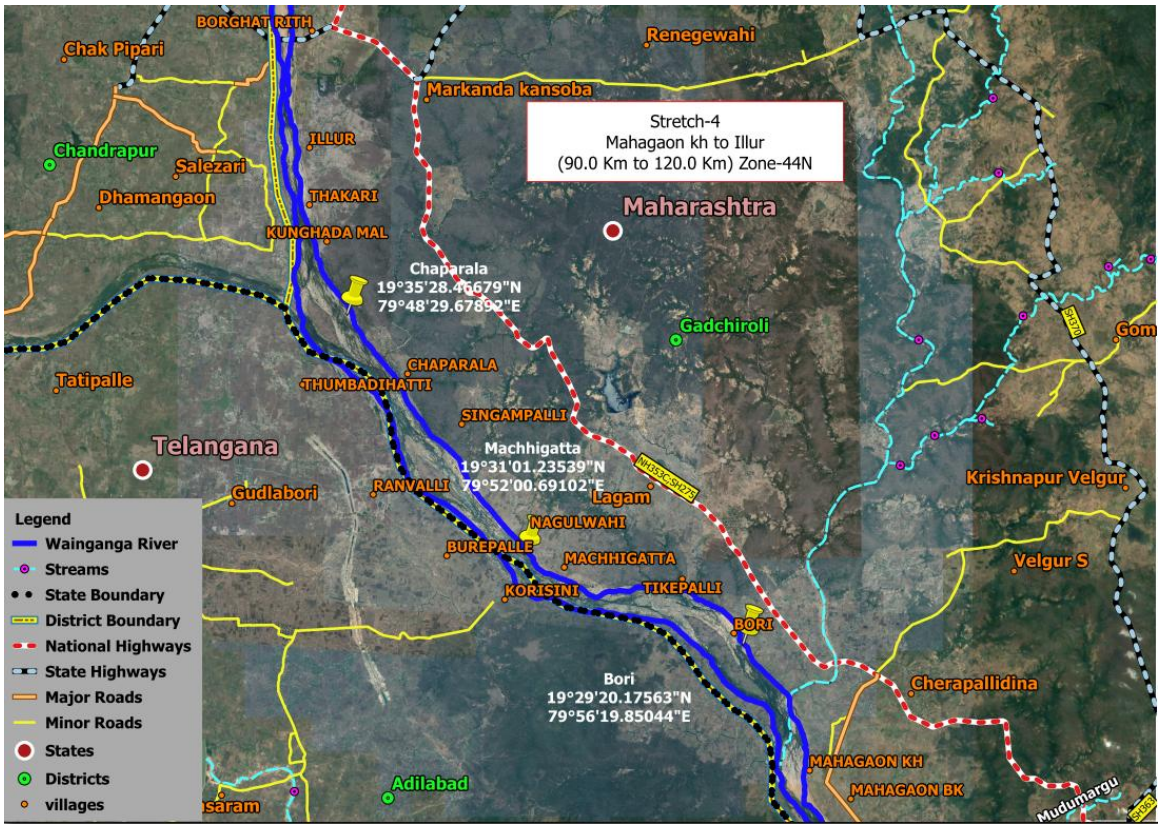


Figure 14 - Mahagaon Kh. to Illur

- **Bathymetry Survey**

  a) No bathymetric survey is conducted due to the unavailability of water

- **Topographic Survey**

  b) 30km of the length of the stretch for which the Topographic survey has been carried out.

Stretch-4 has covered 30.00 km i.e. from 90.00 to 120.00 km from Mahagaon Kh. to Illur. In this river stretch, very shallow and small pocket of water is available and hydrographic survey by survey boat could not be conducted. The spot leveling for the entire area was conducted by topographic survey method.

In this stretch, the river is flowing in between two states Maharashtra and Telangana. There are no features across and along the river. The river is completely dry and river bed is rocky in nature. The IWAI Bm pillars are errected on the left bank of the river.

Near Chaprala village Painganga-Wardha River meets Wainganga River, from this junction of the meeting Wainganga River is called by Pranahita River.

Chaprala village is located in Chamorshi Taluka in Gadchiroli District of Maharashtra State, It comes under Chaparala panchayath. There is a famous Hanuman Temple on the left bank of the river downstream. Many tourists come and visit this temple.

This village is on the border of the Gadchiroli District and Chandrapur District. Bori, Kultha, Tikepalli, Yella, Korisni and Machhigatta are nearby villages around the stretch. Bori is a Village in Aheri Taluka in Gadchiroli District of Maharashtra. It is located 89km towards South from District headquarters Gadchiroli and is 14km from Aheri and 872km from State capital Mumbai.

Shantigram, Khamancheru, Aheri, Sundarnagar and Nagepalli M. are the nearby Villages to Bori. Bori is surrounded by Bejjur Taluka towards south, Mulchera Taluka towards North, Kouthala Taluka towards west, Etapalli Taluka towards East. Kagaznagar, Bellampalle, Mul, Rajura are the nearby Cities to Bori.

This Place is on the border of the Gadchiroli District and Adilabad District. It is near to the Telangana State Border. Ballarpur, Gadchiroli is the nearby by towns to Bori having road connectivity to Bori

There is no railway station near to Bori in less than 10km Balharshah Railway Station (near to Ballarpur), Wasanapura Railway Station (near to Ballarpur) are the Railway stations reachable from nearby towns. The Warangal Railway Station is major railway station situated 194km from Bori.

Figure 15 - Hanuman Temple at Chaparala (125 km chainage)

Class	Chainage (km)	Observed	Reduced w.r.t. Sounding Datum

	From	To	Min. depth (m)	Max. depth (m)	Length of Shoal (m)	Dredging Qty. (cu.m.)	Accumulated Qty.	Min. Depth (m)	Max. Depth (m)	Length of Shoal (m)	Dredging Qty. (cu.m.)	Accumulated Qty.
I	90	120	0.000	0.000	30000	1,294,925.93	5,174,341.37	-0.300	0.000	30000	1,637,467.66	6,498,626.05
II	90	120	0.000	0.000	30000	1,972,365.82	7,882,507.72	-0.300	0.000	30000	2,413,133.29	9,586,057.32
III	90	120	0.000	0.000	30000	2,981,036.36	11,911,610.44	-0.300	0.000	30000	3,528,595.77	14,026,484.24
IV	90	120	0.000	0.000	30000	3,597,027.80	14,372,970.31	-0.300	0.000	30000	4,169,322.32	16,583,168.36

Table 16 - Dredging Quantity Details

3.4.1 Observed and reduced Bed Profile of the stretch

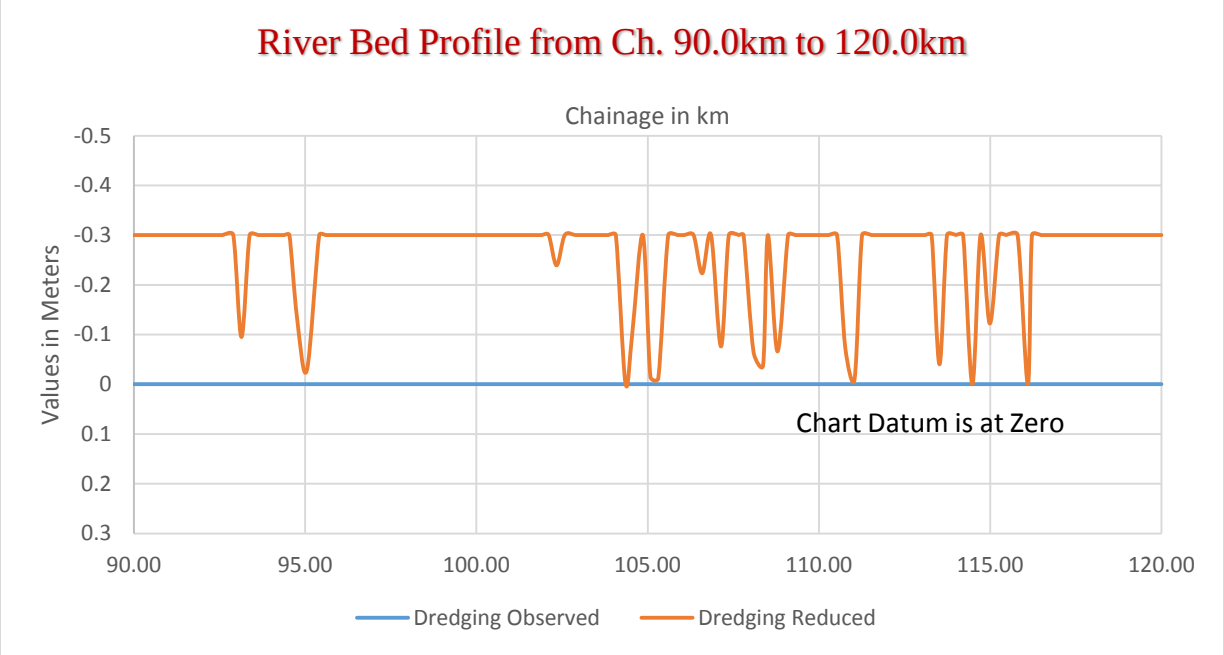


Figure 16 - River bed Profile

3.5 Sub-Stretch-5: Illur to Juni Ladholi (120.0km to 150.0km)

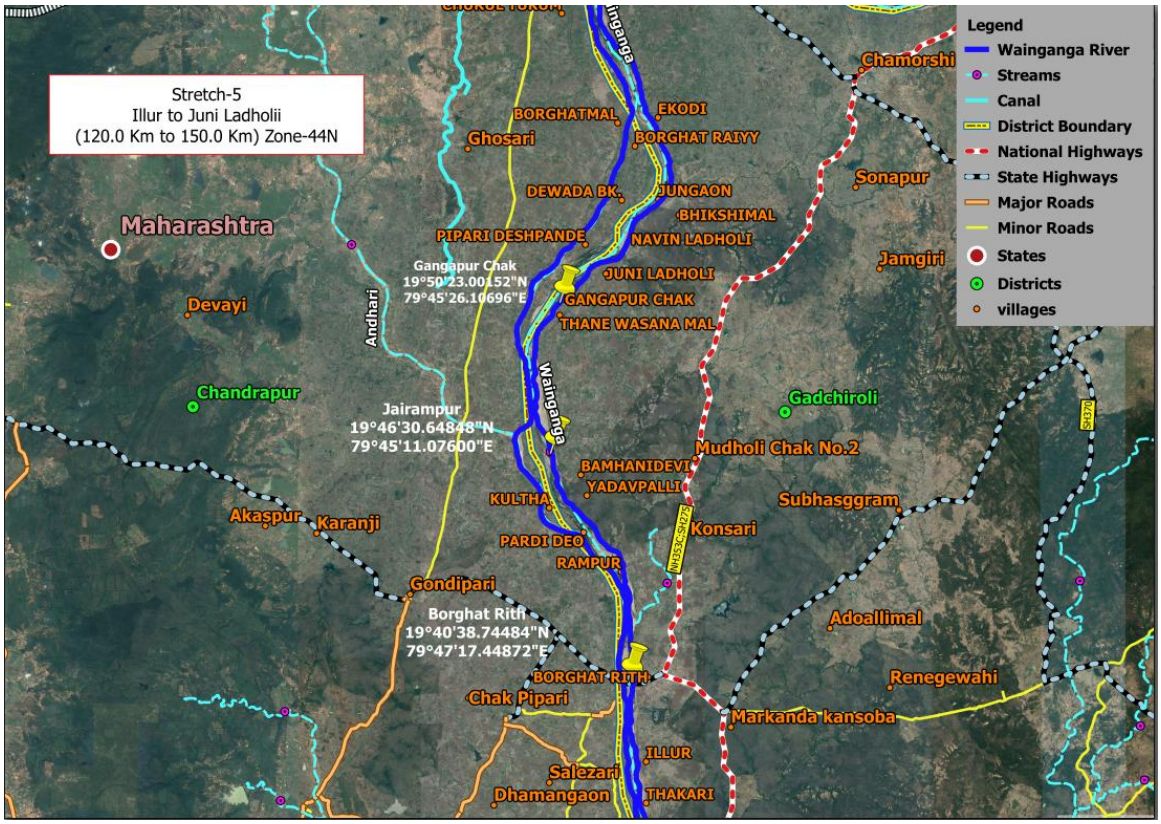


Figure 17 - Illur to Juni Ladholi

- **Bathymetry Survey**

  a) No bathymetric survey is conducted due to the unavailability of water

- **Topographic Survey**

  b) 30km of the length of the stretch for which the Topographic survey has been carried out.

Stretch-5 has covered 30.00 km i.e. from 120.00 km to 150.00 km from Illur to Juni Ladholi village.

In this stretch, the river is flowing in Maharashtra state. There are pump house along the river side. The river is completely dry and river bed is rocky in nature. The IWAI Bm pillars are errected on the left bank of the river

Kunghada, Ramangatta, Thakari, Panora, Illur, Ralapeth, Alapalli Masahat, Ashti and Borgat Rith are villages/Town/City around this stretch. Borghat Rith village is

located in Chamorshi Tehsil and belongs to the Gadchiroli district of Maharashtra. Nearest towns / cities to Borghat Rith village are Chamorshi, Aheri, Armori, Bhamragad, Desaiganj and Dhanora. Ashti city/Tehsil is located in Beed District in the state of Maharashtra. The majority of the population in Ashti is Hindu.

At Chainage 123.823km Wainganga Road Bridge is constructed across the river. It is connecting Borghat Rith and Tarsa Bk. villages. The old bridge which is fully damaged situated on 124.576 km chainage is also abandoned in nature.

Figure 18 - Wainganga Road Bridge (123.823 km chainage)

Figure 19 - Pump Houses (129.444 km chainage & 143.828 km chainage)

Class	Chainage (km)		Observed					Reduced w.r.t. Sounding Datum				
	From	To	Min. depth (m)	Max. depth (m)	Length of Shoal (m)	Dredging Qty. (cu.m.)	Accumulated Qty.	Min. Depth (m)	Max. Depth (m)	Length of Shoal (m)	Dredging Qty. (cu.m.)	Accumulated Qty.
I	120	150	0.000	0.000	30000	1,294,883.07	6,469,224.44	-0.300	0.000	30000	1,634,399.71	8,133,025.76
II	120	150	0.000	0.000	30000	1,972,299.05	9,854,806.77	-0.300	0.000	30000	2,409,493.88	11,995,551.20
III	120	150	0.000	0.000	30000	2,980,929.51	14,892,539.95	-0.300	0.000	30000	3,524,525.95	17,551,010.19
IV	120	150	0.000	0.000	30000	3,596,896.47	17,969,866.78	-0.300	0.000	30000	4,165,166.27	20,748,334.63

Table 17 - Dredging Quantity Details

3.5.1 Observed and reduced Bed Profile of the stretch

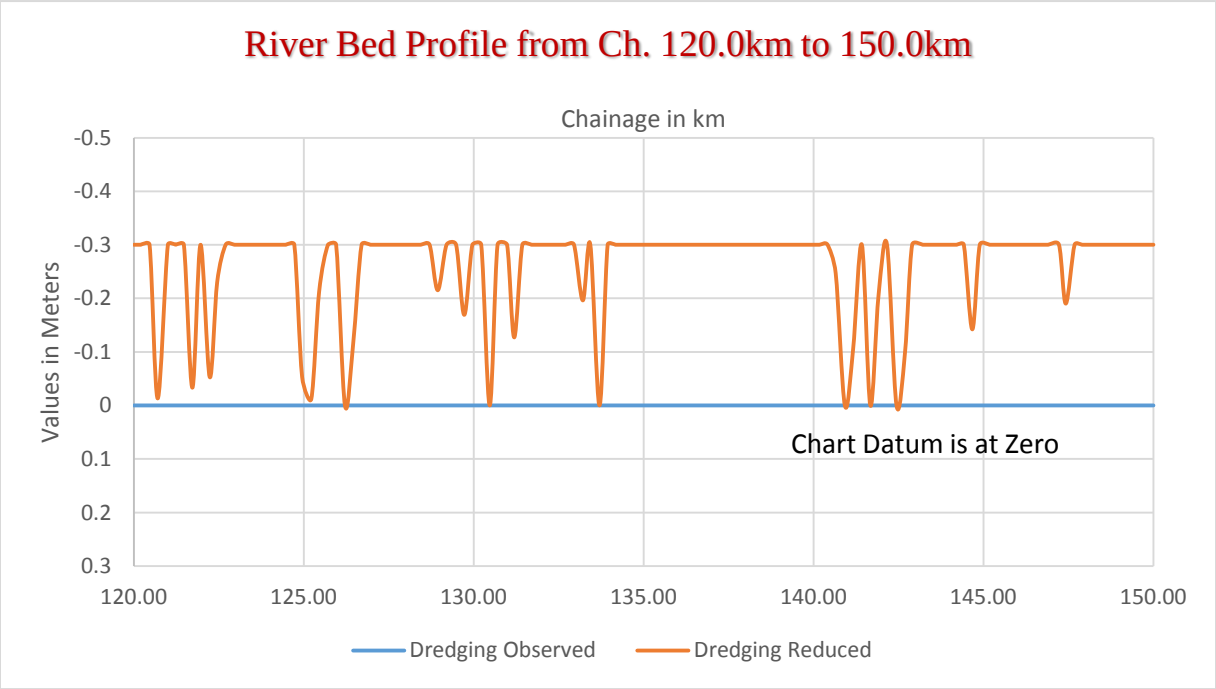


Figure 20 - River bed Profile

3.6 Sub-Stretch-6: Juni Ladholi to Chandarpur (150.0km to 165.78km)

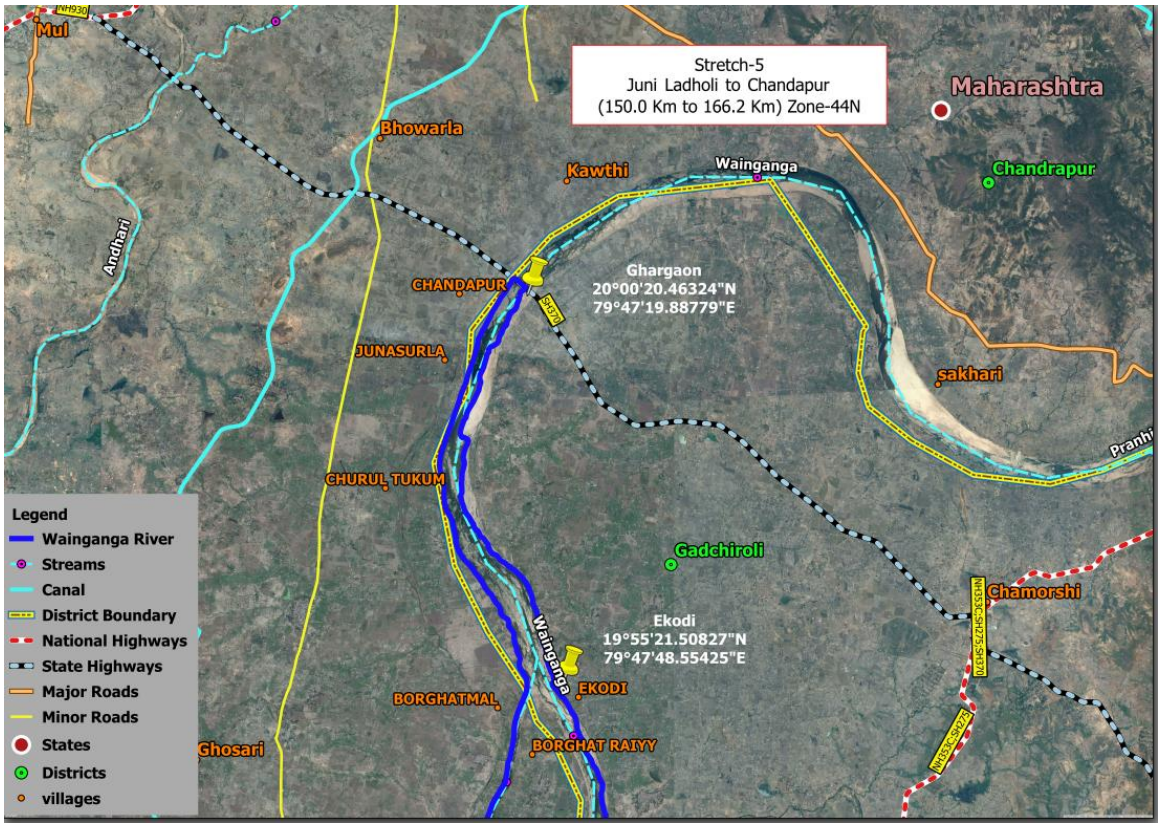


Figure 21 - Juni Ladholi to Chandapur

- **Bathymetry Survey**

  a) No bathymetric survey is conducted due to the unavailability of water

- **Topographic Survey**

  b) 15.78km of the length of the stretch for which the Topographic survey has been carried out.

Stretch-6 has covered 15.78 km i.e. from 150.0km to 165.78km from Juni Ladholi to Chandarpur village.

In this stretch, the river is flowing in Maharashtra state. The feature along the river (01) Pump house, (01) Irrigation Water supply unit and (01) Temple near village Junasurla. There are no features across along the river. The river is completely dry and rocky nature. The IWAI BM pillars are erected on the left bank of the river

Chak Thana, Juni Ladholi, Navin Ladholi, Gowardhan, Nandgaon, Dewada Bk, Jungaon, Bondala Bk, Borghat Raii, Borghatmal, Ekodi, Korambi, Weltur Rith, Weltur Tukum, Kanholi, Saganapur, Nawegaon Bhujala, Wagholi, Dotkuli, Khandala, Junasurla, Chandapur and Ghargaon villages are around the stretch.

Ekodi village is located in Gondia Taluka /District of Maharashtra State. It belongs to Vidarbh region and Nagpur Division. It is located in District headquarters Gondia nearby cities to Ekodi are Gondiya, Tirora, Wara Seoni and Balaghat.

Chandapur village is located in Mul Tehsil of Chandrapur district in Maharashtra. It is situated 24km away from sub-district headquarter Mul and 53km away from district headquarter Chandrapur.

Chamorshi town/ tehsil is located in Gadchiroli district in the state of Maharashtra. It is located near the left bank of the Wainganga River, a tributary of the Pranahita River which meets the Godavari River. Mul city is located in Chandrapur district. It is also the Municipal Council of the city in state of Maharashtra.

At Chainage 165.780km Mul-Chamorshi Highway Bridge is crossing across Wainganga River. It is connecting Ghargaon and Rajgad villages.

Figure 22 - Mul-Chamorshi Highway Bridge (165.780 km chainage)

Figure 23 - Pump house (161.360 km chainage) and water plant (165.834 km chainage)

Figure 24 - Temple (165.795 km chainage)

Class	Chainage (km)		Observed					Reduced w.r.t. Sounding Datum				
	From	To	Min. depth (m)	Max. depth (m)	Length of Shoal (m)	Dredging Qty. (cu.m.)	Accumulated Qty.	Min. Depth (m)	Max. Depth (m)	Length of Shoal (m)	Dredging Qty. (cu.m.)	Accumulated Qty.
I	150	165.78	0.000	0.000	15780	668,936.07	7,138,160.51	-0.300	0.000	15780	850,821.34	8,983,847.10
II	150	165.78	0.000	0.000	15780	1,018,885.50	10,873,692.27	-0.300	0.000	15780	1,252,866.08	13,248,417.28
III	150	165.78	0.000	0.000	15780	1,539,948.73	16,432,488.68	-0.300	0.000	15780	1,830,364.91	19,381,375.10
IV	150	165.78	0.000	0.000	15780	1,858,163.52	19,828,030.30	-0.300	0.000	15780	2,161,499.15	22,909,833.78

Table 18 - Dredging Quantity Details

3.6.1 Observed and reduced Bed Profile of the stretch

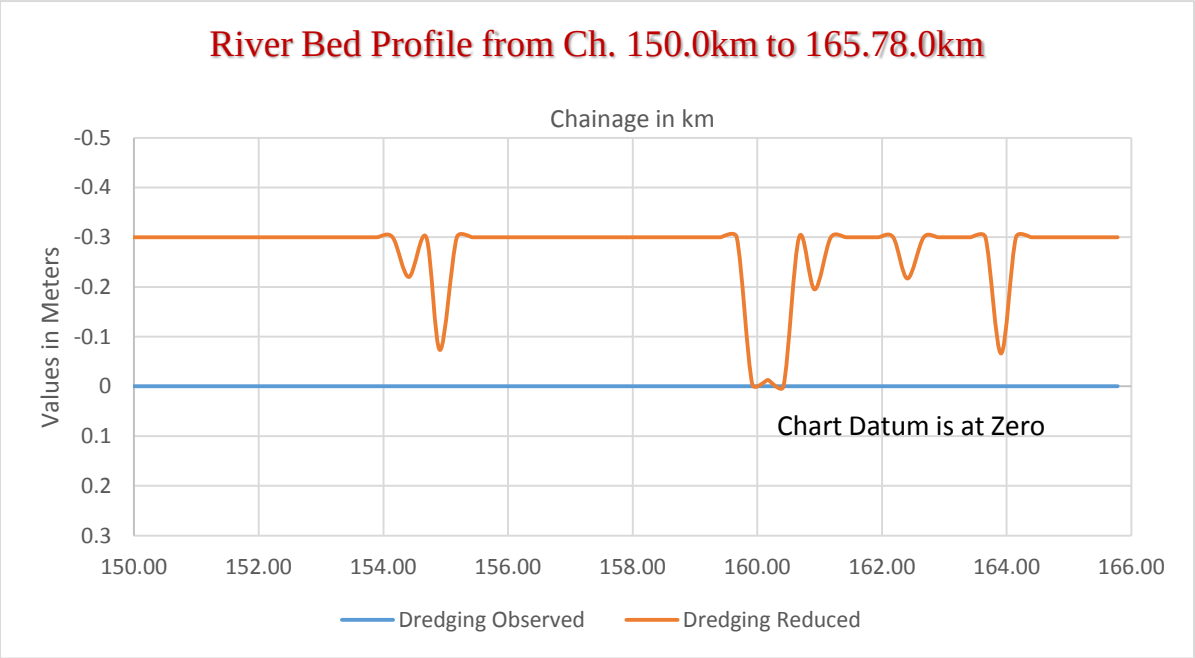


Figure 25 - River bed Profile

3.7 Other aspects of Waterway

3.7.1 Details of Irrigation Canals and outlets

The first River Port is likely to be established in Bhandara City, which is approx. 150 km upstream of the survey stretch. The river is also likely to be used for river transportation under the national waterways project.

The river does not have any dams built on it so far in the survey stretch, however, as per local input, water project to construct a barrage with the project envisioned at an estimated cost of Rs.38,500 crore is known as the Pranahita-Chevella lift irrigation scheme and a joint project between the Maharashtra and Telangana is planned.

The River is used for water transport between Sironcha (MH) and Kaleswaram (TS) by small boats during water availability period.

3.7.2 Industries

The Wainganga-Pranahita River valley is forested and sparsely populated, except in the northern industrial area around Nagpur in Maharashtra state. Most of the population is concentrated along the river, where rice is extensively irrigated. Bilt Paper Mill industry (122.0 km chianage) at Asthi 2.30km away from Chandrapur-Kothari-Gondpipri-Aheri Road

3.7.3 Crops

Flooding in the Wainganga sub basin has been a major problem in the past. As agriculture is not grooming-up in the area the farmer's suicides had been rising in Vidarbah region. Agriculture and the economy need a boost through integrated River Basin Management Plan. Untreated waste water from Nagpur city is released in Wainganga from its tributaries, like Kanhan, etc. resulting pollution of surface water and groundwater.

The basin faces problems from Naxalite operating in the dense deciduous forests, especially in the Gadchiroli district. This makes the issue of social and economic development more complex. Most of the basin receives a rainfall of about 150cm during the monsoon months. Despite this fact, there are very few water conservation structures in the mainstream of the river, and there are only few irrigation schemes.

Attention needs to be given in developing water conservation structures and putting together ware user groups and ensure reliable and efficient ware delivery. Despite the fact that the region houses some of the most ancient tribes and deciduous forests in India, tourism has not developed considerably. Absence of agricultural allied activities like oil processing units (from soya beans, cottonseed), power looms and mills (processed cotton), vegetable processing units, have resulted in stagnated economic growth of the region. This needs to be revived through integrated and visionary planning.

3.7.4 Important cities/towns

Balaghat and Bhandara are the major urban hub cities situated just on the bank of the Wainganga River while Pauni and Desaiganj are the small urban center situated on the bank of this River.

The Government of Maharashtra is developing Protection Wall for Bhandara City to protect the Major City from the heavy Flooding of River. The flood protection bund encircles Bhandara City from East and South directions. Wainganga River is water lifeline of these cities and primary source of Water. The Balaghat and Bhandara Municipal Council have a water treatment plants and fields pipeline to Wainganga River.

3.7.5 Road Network

3.7.5.1 National Highway

Two national highways are passing along the Wainganga-Pranahita River. National Highway number NH-353C which is passing through the villages Amravati,

Rangyapalli, Venkatapur, Bamani, Allapalli, Asthi, Chamorshi and towards Gadchiroli. National Highway number NH-63 also known as Nizamabad-Mancherial-Jagdalpur road is passing through Brahan palli, Sironcha in Gadchiroli District, Arjungutta and Rapanpalli in Adilabad District. NH-353C and NH-63 intersect at Tamdala in Gadchiroli district, Maharashtra.

3.7.5.2 State Highway

There are two State Highway parallel along the river stretch SH 275 and SH 370

3.7.5.3 Major District Roads

There are no Major District Roads are there it is connected to NH-353C and NH-63 by the village roads. Which are passing along the river.

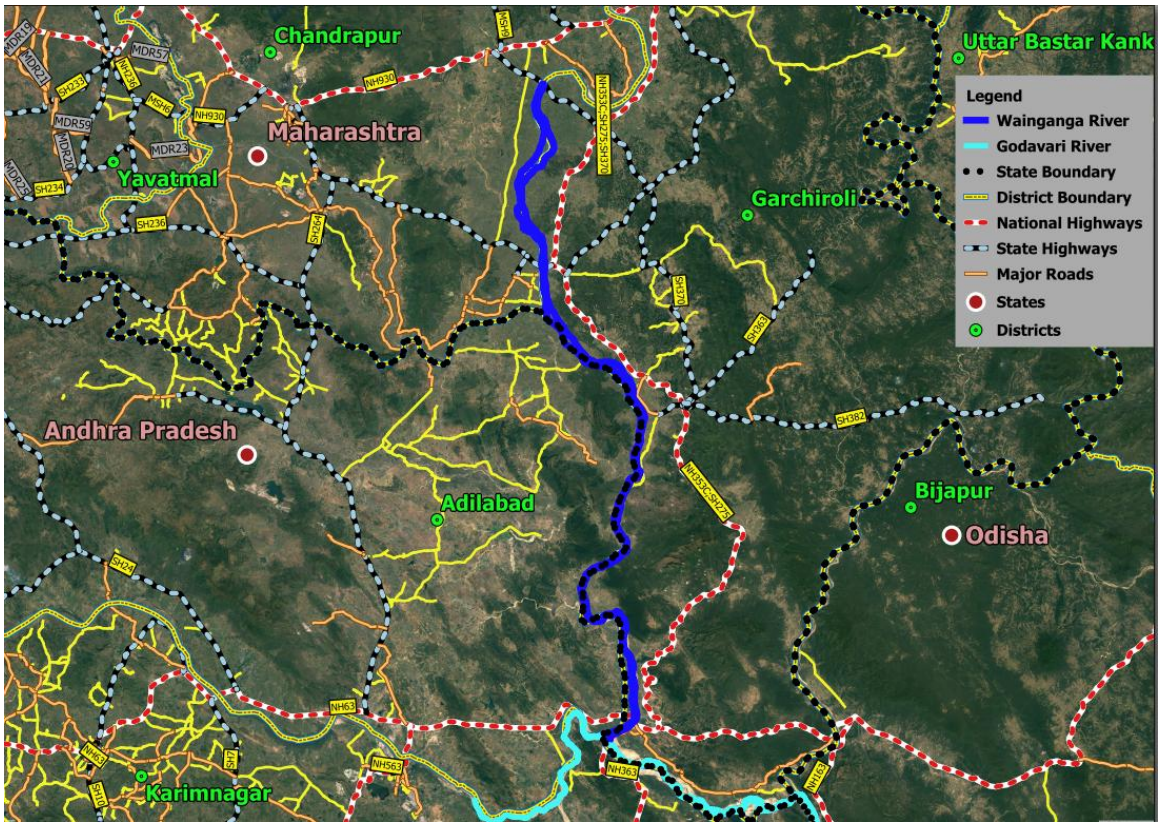


Figure 26 - Road Network

3.7.6 Railway Network

The Jabalpur - Balaghat section of South East Central Railway runs north to south through the district, along the valley of the Satpura Mountains and Wainganga River valley. The line was formerly narrow gauge (2 ft 6 in (762 mm)) for its entire length, but the section between Balaghat to Gondia was converted to broad gauge in 2005–

06, connecting Balaghat to India's national broad gauge network for the first time. Work is underway to convert the Balaghat-Jabalpur section to broad gauge as well. A Broad gauge line runs to the west from Balaghat to Katangi. And there is a line to Bharveli for Maganese transport. Balaghat is directly connected by bus with larger cities such as Bhopal, Nagpur, Indore Jabalpur, Raipur etc.

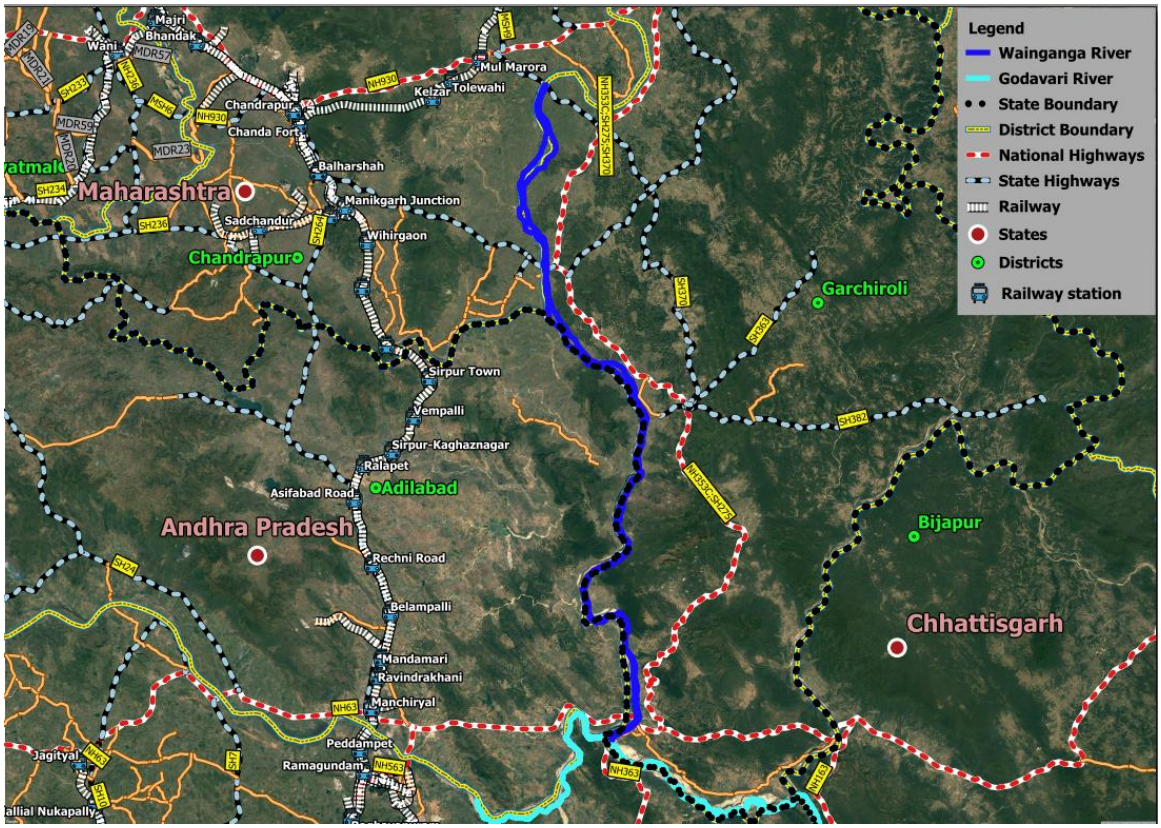


Figure 27 - Railway Stations

3.7.7 Land Use

Total Geographical area of Gadchiroli district is 14412.0 Sq.km. Out of this area, 11694.0 Sq.km. i.e.78.40 % of the land is included in the reserve or protected forest category. Out of the remaining area, only 1960.0 Sq.km. of the land is under cultivation and constitutes only 13.14 % of the total land of the district.

Inhabited Area	1028.0 Sq.Km (6.89 %)
Agriculture Area	1960.0 Sq.Km (13.14 %)
Industrial Area	2.0 Sq.Km (0.02%)
Forest Cover	11694.0 Sq.Km (78.40%)
Wastelands	231.0 Sq.Km (1.55%)

Table 19 - Land Use

3.7.8 Construction Material

The area being near to Gadchiroli district, all types of modern construction materials like cement, Iron etc. are available in bulk quantity.

3.7.9 Condition of Banks

Bank is unprotected along the River.

3.7.10 Jetties and Terminals

Lack of the jetties and Terminals along the River.

3.7.11 Cargo Movement

Lack of the cargo movements along the River.

3.7.12 Passenger Ferry Services

In Wainganga-Pranahita River between Beldar Colony, Sironcha, Maharashtra and Arjungutta, Kotapally Mandal, Adilabad District Telangana which is state border. It was having small passenger boat near the banks. In conversation with the local people of both Telangana and Maharashtra people we came to know that these boats are used when the river is filled with rain water during Monsoon season. It is used for transportation of men from Sironcha to Arjungutta river bank.

Local people are facing problem in travelling between Sironcha to Arjungutta via road because there is no bridge near to this place which is a time consuming as well as an economical loss to them. On visual inspection of the bank it is recommended for developing the bank for Passenger Ferry services. It will save the time and economic loss of the local people.

3.7.13 Historic importance

It is the historical and tourist place in the Gadchiroli District and is famous of Markanda Temple. The population for Markanda is about 1000. Markanda temple is constructed on the bank of Wainganga on the east side in 196 x 168 sq,ft area. Earlier, there were 24 temples. At present, there are only 18 temples existing, out of them only 4 temples are in good condition. The maintain temple of Markanda was distracted by striking of Lightening 300 years before.

Indian Archaeological Depart first time had recorded this 120 years before in its survey, Late Dr. V.V. Mirashi popular discoverer of antiquities and Padmabhushan, Mahamahopadhyaya wrote that Markanda temples are excellent which are not found anywhere in southern part.

Some part of the story of Ramayana, Mahabharata is also connected with these groups of temples.

A great fair is held here on the occasion of Mahashivratri. Thousands of devotees gather at the place. The district administration maintains peace and discipline during the fair. Some people shave their heads in the name of their fathers; some worships God Shiva for the long life of their son. On this occasion, the ceremony goes on, on the bank of Wainganga.

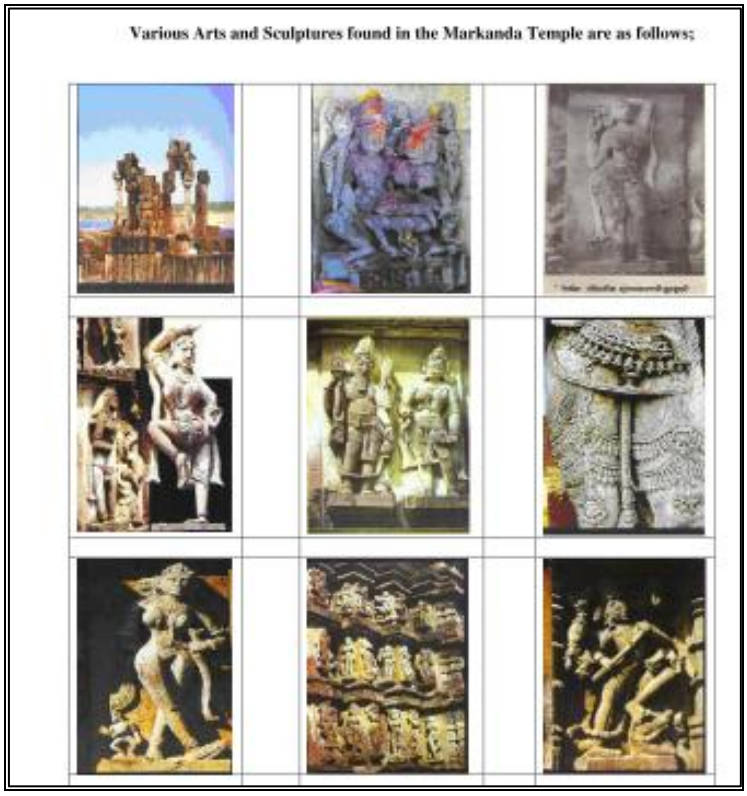


Figure 28 - Markanda Temple sculptures (12 km upstream of survey stretch)

3.7.14 Tourism

Kaleswaram is the site of a temple of the Hindu god Lord Shiva. The temple is significant because of the two Shiva Lingas that are found on a single pedestal. This Linga is named Lord Shiva and Lord Yama. Collectively, they knew as Kaleshwara Mukteswara Swamy. Kaleshwaram is one of three Shiva temples mentioned in Trilinga Desham, or "Land of Three Lingas." The holy place draws tourists during the Karthika Month of the Indian Calendar, 16 November – 15 December. Holy baths are held during 6-17 of December. People who bathe here first visit Lord Ganesha,

then pray for Lord Yama and then to Lord Shiva. The temple is open from 4:00 a.m.-1:00 p.m. and 3:30-9:00 p.m.

4 Terminals

4.1 Details of Terminal survey carried out

In this river stretch could not find any adequate proposed terminal, due to the unavailability of water in this stretch.

5 Fairway Development

5.1 Fairway Dimensions

As per the specification of the survey, dredging quantity was required to be estimated for a channel dimension of 50m x 2m with Side slope of 1:5, along with the deepest route.

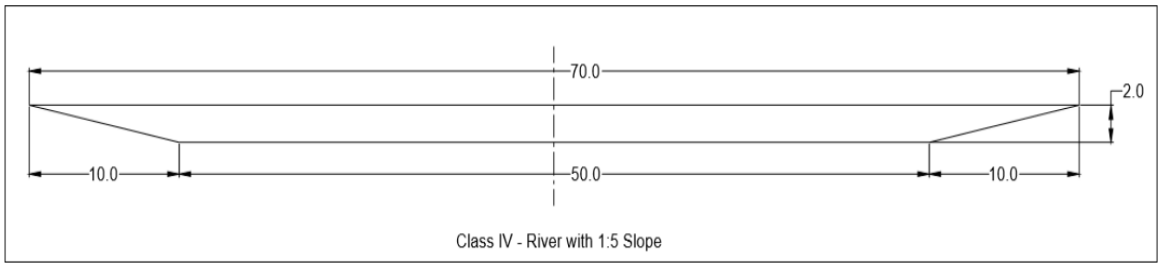
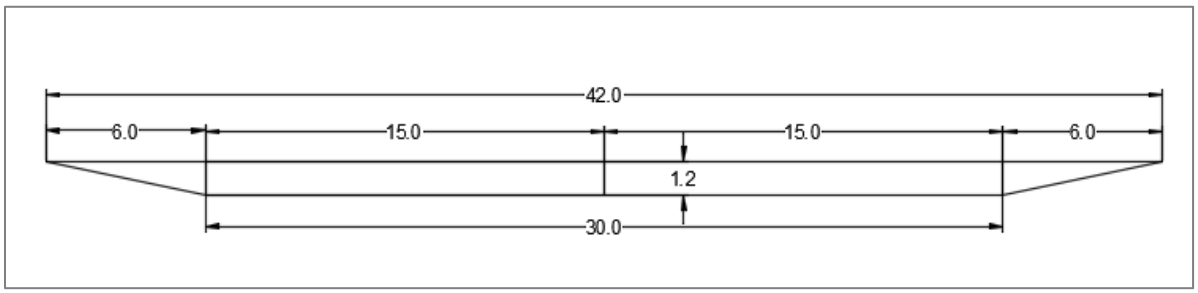


Figure 29 - Fairway Channel Dimensions 50m X 2m

5.2 Calculation of Dredging Quantity

The dredge volume calculations were accomplished using the HYPACK dredge volume computation utility. The channel template was created as per the different classification and kilometer wise dredging calculation was carried out (Enclosed at Annexure-2). The Hypack Standard volume algorithm was used to calculate the dredge volume in each segment. The stretch wise summary of the dredge volume for different class of fairway is as follows:-

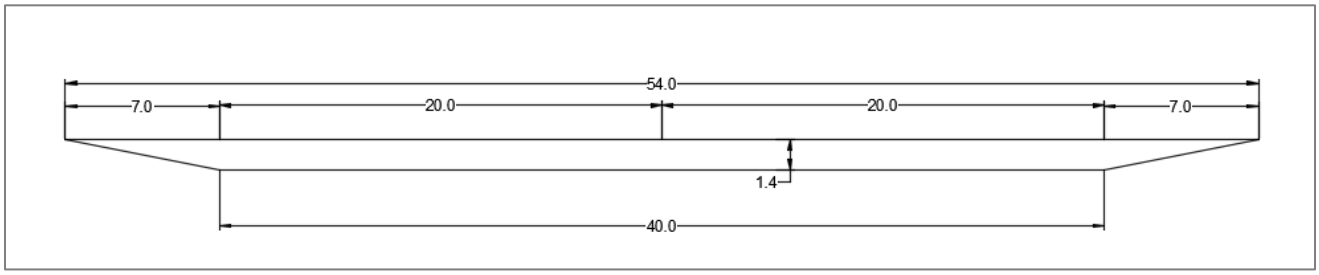
Class I



Class I														
Location		Chainage (km)		Observed					Reduced w.r.t. Sounding Datum					
From	To	From	To	Min. Depth (m)	Max. Depth (m)	Length of Shoal (m)	Dredging Qty. (cu.m.)	Accumulated Qty.	Min. Depth (m)	Max. Depth (m)	Length of Shoal (m)	Dredging Qty. (cu.m.)	Accumulated Qty.
Kaleshwaram	Ramannapetha Ray	0	30	0.000	0.000	30000	1,292,585.55	1,292,585.55	-0.300	0.000	30000	1,608,468.76	1,608,468.76
Ramannapetha Ray	Avalmari	30	60	0.000	0.000	30000	1,293,082.06	2,585,667.61	-0.300	0.000	30000	1,613,407.38	3,221,876.14
Avalmari	Mahagaon Kh.	60	90	0.000	0.000	30000	1,293,747.83	3,879,415.44	-0.300	0.000	30000	1,639,282.25	4,861,158.39
Mahagaon Kh.	Illur	90	120	0.000	0.000	30000	1,294,925.93	5,174,341.37	-0.300	0.000	30000	1,637,467.66	6,498,626.05
Illur	Juni Ladholi	120	150	0.000	0.000	30000	1,294,883.07	6,469,224.44	-0.300	0.000	30000	1,634,399.71	8,133,025.76
Juni Ladholi	Chandapur	150	165.78	0.000	0.000	15780	668,936.07	7,138,160.51	-0.300	0.000	15780	850,821.34	8,983,847.10
Total						**165780**	**7,138,160.51**	**7,138,160.51**	**Total**		**165780**	**8,983,847.10**	**8,983,847.10**

Table 20 - Dredge Volumes-Class I

Class II

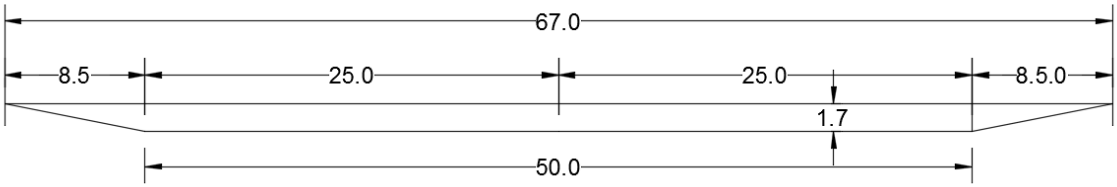


Class II													
Location		Chainage (km)		Observed					Reduced w.r.t. Sounding Datum				
From	To	From	To	Min. Depth (m)	Max. Depth (m)	Length of Shoal (m)	Dredging Qty. (cu.m.)	Accumulated Qty.	Min. Depth (m)	Max. Depth (m)	Length of Shoal (m)	Dredging Qty. (cu.m.)	Accumulated Qty.
Kaleshwaram	Ramannapetha Ray	0	30	0.000	0.000	30000	1,970,016.10	1,970,016.10	-0.300	0.000	30000	2,376,194.36	2,376,194.36
Ramannapetha Ray	Avalmari	30	60	0.000	0.000	30000	1,969,550.64	3,939,566.74	-0.300	0.000	30000	2,381,761.42	4,757,955.78
Avalmari	Mahagaon Kh.	60	90	0.000	0.000	30000	1,970,575.16	5,910,141.90	-0.300	0.000	30000	2,414,968.25	7,172,924.03
Mahagaon Kh.	Illur	90	120	0.000	0.000	30000	1,972,365.82	7,882,507.72	-0.300	0.000	30000	2,413,133.29	9,586,057.32

Class II													
Location		Chainage (km)		Observed					Reduced w.r.t. Sounding Datum				
From	To	From	To	Min. Depth (m)	Max. Depth (m)	Length of Shoal (m)	Dredging Qty. (cu.m.)	Accumulated Qty.	Min. Depth (m)	Max. Depth (m)	Length of Shoal (m)	Dredging Qty. (cu.m.)	Accumulated Qty.
Illur	Juni Ladholi	120	150	0.000	0.000	30000	1,972,299.05	9,854,806.77	-0.300	0.000	30000	2,409,493.88	11,995,551.20
Juni Ladholi	Chandapur	150	165.78	0.000	0.000	15780	1,018,885.50	10,873,692.27	-0.300	0.000	15780	1,252,866.08	13,248,417.28
Total						**165780**	**10,873,692.27**	**10,873,692.27**	**Total**		**165780**	**13,248,417.28**	**13,248,417.28**

Table 21 - Dredge Volumes-Class II

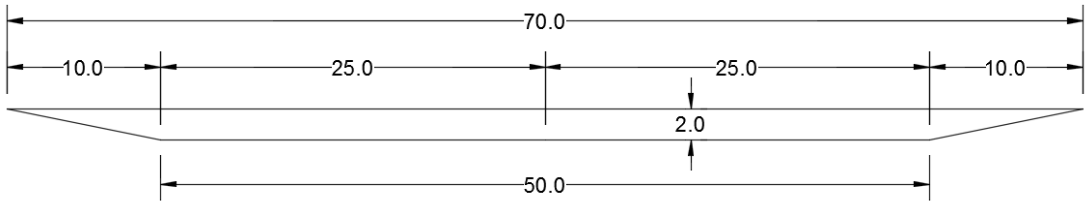
Class III



Class III													
Location		Chainage (km)		Observed					Reduced w.r.t. Sounding Datum				
From	To	From	To	Min. Depth (m)	Max. Depth (m)	Length of Shoal (m)	Dredging Qty. (cu.m.)	Accumulated Qty.	Min. Depth (m)	Max. Depth (m)	Length of Shoal (m)	Dredging Qty. (cu.m.)	Accumulated Qty.
Kaleshwaram	Ramannapetha Ray	0	30	0.000	0.000	30000	2,975,511.74	2,975,511.74	-0.300	0.000	30000	3,479,267.59	3,479,267.59
Ramannapetha Ray	Avalmari	30	60	0.000	0.000	30000	2,976,759.22	5,952,270.96	-0.300	0.000	30000	3,488,418.10	6,967,685.69
Avalmari	Mahagaon Kh.	60	90	0.000	0.000	30000	2,978,303.12	8,930,574.08	-0.300	0.000	30000	3,530,202.78	10,497,888.47
Mahagaon Kh.	Illur	90	120	0.000	0.000	30000	2,981,036.36	11,911,610.44	-0.300	0.000	30000	3,528,595.77	14,026,484.24
Illur	Juni Ladholi	120	150	0.000	0.000	30000	2,980,929.51	14,892,539.95	-0.300	0.000	30000	3,524,525.95	17,551,010.19
Juni Ladholi	Chandapur	150	165.78	0.000	0.000	15780	1,539,948.73	16,432,488.68	-0.300	0.000	15780	1,830,364.91	19,381,375.10
Total						**165780**	**16,432,488.68**	**16,432,488.68**	**Total**		**165780**	**19,381,375.10**	**19,381,375.10**

Table 22 - Dredge Volumes-Class III

Class IV



Class IV													
Location		Chainage (km)		Observed					Reduced w.r.t. Sounding Datum				
From	To	From	To	Min. Depth (m)	Max. Depth (m)	Length of Shoal (m)	Dredging Qty. (cu.m.)	Accumulated Qty.	Min. Depth (m)	Max. Depth (m)	Length of Shoal (m)	Dredging Qty. (cu.m.)	Accumulated Qty.
Kaleshwaram	Ramannapetha Ray	0	30	0.000	0.000	30000	3,590,354.18	3,590,354.18	-0.300	0.000	30000	4,116,929.51	4,116,929.51
Ramannapetha Ray	Avalmari	30	60	0.000	0.000	30000	3,591,863.71	7,182,217.89	-0.300	0.000	30000	4,126,446.45	8,243,375.96
Avalmari	Mahagaon Kh.	60	90	0.000	0.000	30000	3,593,724.62	10,775,942.51	-0.300	0.000	30000	4,170,470.08	12,413,846.04
Mahagaon Kh.	Illur	90	120	0.000	0.000	30000	3,597,027.80	14,372,970.31	-0.300	0.000	30000	4,169,322.32	16,583,168.36
Illur	Juni Ladholi	120	150	0.000	0.000	30000	3,596,896.47	17,969,866.78	-0.300	0.000	30000	4,165,166.27	20,748,334.63
Juni Ladholi	Chandapur	150	165.78	0.000	0.000	15780	1,858,163.52	19,828,030.30	-0.300	0.000	15780	2,161,499.15	22,909,833.78
Total						**165780**	**19,828,030.30**	**19,828,030.30**	**Total**		**165780**	**22,909,833.78**	**22,909,833.78**

Table 23 - Dredge Volumes-Class IV

6 Conclusion

The aim is to undertake bathymetric surveys, topographic survey, collection of data on cargo movement, industry survey, tourism facilities, etc., in the project area; prepare detailed hydrographic survey charts, topographic survey charts, and feasibility report.

6.1 Description of Waterways

The surveyed stretch of the Wainganga-Pranahita River is 165.78km in length and is not being explored for any navigational possibility. This survey stretch starts from the confluence of the Wainganga-Pranahita River near Kaleshwaram to Chandapur village.

The stretch wise minimum and maximum width range, average width and average slope of the waterway are as below:-

Sl. No.	Location	Chainage (km)	Width Range of the waterway	Average Width	Average slope (in m/km)

	From	To	From	To	Min	Max		
1	Kaleshwaram	Ramannapetha Ray	0	30	104.28	628.89	366.59	1 : 0.204
2	Ramannapetha Ray	Avalmari	30	60	115.45	571.72	343.59	1 : 0.355
3	Avalmari	Mahagaon Kh.	60	90	182.63	1830.00	1006.32	1 : 0.373
4	Mahagaon Kh.	Illur	90	120	179.01	1830.00	1004.51	1 : 0.563
5	Illur	Juni Ladholi	120	150	112.98	2286.00	1199.49	1 : 0.652
6	Juni Ladholi	Chandapur	150	165.78	256.20	3095.00	1675.60	1 : 0.581

Table 24 - Stretch wise Average width and slope of waterway

6.2 Methods for making waterway feasible

The waterway may be developed as a Class IV navigational River by carrying out capital dredging to achieve the navigability. The class-wise details of reduced dredging quantities of the waterways are as tabulated below:-

Class	0 – 30 (km)	30 – 60 (km)	60 – 90 (km)	90 – 120 (km)	120 – 150 (km)	150 - 165.78 (km)	Total
I	1,608,468.76	1,613,407.38	1,639,282.25	1,637,467.66	1,634,399.71	850,821.34	**8,983,847.10**
II	2,376,194.36	2,381,761.42	2,414,968.25	2,413,133.29	2,409,493.88	1,252,866.08	**13,248,417.28**
III	3,479,267.59	3,488,418.10	3,530,202.78	3,528,595.77	3,524,525.95	1,830,364.91	**19,381,375.10**
IV	4,116,929.51	4,126,446.45	4,170,470.08	4,169,322.32	4,165,166.27	2,161,499.15	**22,909,833.78**

Table 25 - Class-wise Reduced Dredging quantity

Due to the continuous gradient of the river and the water level will not be available during the summer season the navigation aspect will not be fulfilled throughout the year. The Barrage/Navigational lock is required to maintain the minimum depth required for navigation and regulate the water level in the river. The class-wise details of reduced depth at different stretches of the waterways are as tabulated below:-

Sl. No	Chainage (km)		< 1.2		1.2 - 1.4		1.5 - 1.7		1.8 - 2.0		> 2.0	
	From	To	Availability of Depth (km)	% of availability	Availability of Depth (km)	% of availability	Availability of Depth (km)	% of availability	Availability of Depth (km)	% of availability	Availability of Depth (km)	% of availability
1	0	30	30	100%	0	0 %	0	0 %	0	0 %	0	0 %
2	30	60	30	100%	0	0 %	0	0 %	0	0 %	0	0 %
3	60	90	30	100%	0	0 %	0	0 %	0	0 %	0	0 %
4	90	120	30	100%	0	0 %	0	0 %	0	0 %	0	0 %
5	120	150	30	100%	0	0 %	0	0 %	0	0 %	0	0 %
6	150	165.78	15.78	100%	0	0 %	0	0 %	0	0 %	0	0 %
Total			**165.78**	**100%**	**0**	**0 %**	**0**	**0 %**	**0**	**0 %**	**0**	**0 %**

Table 26 - Class-wise availability of reduced depth of the waterway

6.3 Modifications/ improvement measures

Improvement measures for design and depth improvement are required for the first phase of the development. River banks being not prominent and no signs of erosion of River banks are found in the entire stretch of the Wainganga-Pranahita River. The limitation for improvement of navigational aspects includes the gradient of the River, non-availability of the water throughout the period. The class-wise modification details of cross structure and high tension line clearance are as tabulated below:-

Bridges Clearances less than Class			High Tension lines Clearances less than Class	
Class	**Horizontal**	**Vertical**	**Horizontal**	**Vertical**
I	3	3	0	1
II	3	3		
III	3	3		
IV	3	3		

Table 27 - Bridges and HTL Clearances less than Class no.

6.4 Recommendation

There is no major scope for a navigational aspect of the waterway due to its geographic condition and non-availability of water throughout the region. The River banks are well connected with the road network and major distribution of settlements are there near to Sironcha, Aheri and Asthi town in Gadchiroli district, Maharashtra on the right bank and Annaram, Sirsa, Algaon, Gudem and Ranvalli in Adilabad district, Telangana on the left bank. The road is a near parallel on both sides throughout the River stretch. There are no major industries present in the entire stretch of Wainganga-Pranahita River. No scope for the future development of the River was recommended for navigational purpose and the survey Stretch is not-viable for development as navigable channel.

The purpose of the survey was for assessing the River stretch from Kaleswaram to Chandapur for the development of water transport facilities in the new National Waterway (NW-109). All conspicuous objects within and in the vicinity of the survey area have been fixed. The deliverable sheets contain mean sea level values of elevation information, important landmarks with the state of the River banks. The survey is considered complete in all respects.

7 Details of Annexures

Volume - II