IIC TECHNOLOGIES™

Feasibility Report National Waterway-67, Region VI - Malaprabha River Jakanuru to Kudala Sangama (93.5km)

SURVEY PERIOD: 28 MAR 2016 – 25 APR 2016

Volume - I

Prepared for:

Inland Waterways Authority of India
(Ministry of Shipping, Govt. of India)
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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-67 in Region VI – Malaprabha River from Confluence of Krishna River at Kudala Sangama to Jakanuru.

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
SD	Sounding Datum
DGPS	Differential Global Positioning Systems
MLP	Malaprabha
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
LIS	Lift Irrigation Scheme
CWC	Central Water Commission
KJBNL	Krishna Jal Bhagya Nigam Limited
MI	Minor Irrigation
NH	National Highway
SH	State Highway
KPTCL	Karnataka Power Transmission Corporation Limited

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 – VI & Karnataka</td></tr>
<tr><td>3.</td><td>Waterway stretch, NW #
(from…. to; total length)</td><td>National Waterway No – 67
Jakanuru Bridge to Confluence of Krishna, Kudala Sangama (93.5km)</td></tr>
<tr><td>4.</td><td><u>Navigability status</u></td><td>At present non navigable</td></tr>
<tr><td>a)</td><td>Tidal & non tidal portions
(from… to, length, average tidal variation)</td><td>The survey stretch of Malaprabha River is non-tidal.</td></tr>
<tr><td>b)</td><td>Least Spot height status (w.r.t. MSL)
i) Survey period (28th Mar to 25th Apr 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>Malaprabha 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 – 93.5 km</th><th>Total</th></tr>
<tr><td>< 1.2</td><td>30.00</td><td>30.00</td><td>30.00</td><td>3.50</td><td>93.50</td></tr>
<tr><td>1.2 - 1.4</td><td>0.00</td><td>0.00</td><td>0.00</td><td>0.00</td><td>0.00</td></tr>
<tr><td>1.5 - 1.7</td><td>0.00</td><td>0.00</td><td>0.00</td><td>0.00</td><td>0.00</td></tr>
<tr><td>1.8 - 2.0</td><td>0.00</td><td>0.00</td><td>0.00</td><td>0.00</td><td>0.00</td></tr>
<tr><td>> 2</td><td>0.00</td><td>0.00</td><td>0.00</td><td>0.00</td><td>0.00</td></tr>
<tr><td>Total</td><td>30.00</td><td>30.00</td><td>30.00</td><td>3.50</td><td>93.50</td></tr>
</table></td></tr>
<tr><td>c)</td><td>Cross structures
i) Dams, weirs, barrages etc
(total number; with navigation Barrages or not)
ii) Bridges, Power cables etc
[total number; range of horizontal and vertical clearances]</td><td>Cross Structures:
i) Barrages–16 Nos.
ii) Bridges –8 Nos.
Horizontal Clearance –0.935 to 30m
Vertical Clearance – 0.69 to 15.24m w.r.t. HFL
iii) No Navigation Locks - Nil
iv) Power cables – Nil
v) High Tension Lines –5 Nos
vi) Vertical Clearance w.r.t. HFL – 15.0 to 25.0m</td></tr>
<tr><td>d)</td><td>Avg. discharge & no. of days</td><td>As the river is dry, Avg. Discharge cannot be calculated</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 : 0.292</td></tr>
<tr><td>30</td><td>60</td><td>1 : 0.612</td></tr>
<tr><td>60</td><td>90</td><td>1 : 0.627</td></tr>
<tr><td>90</td><td>93.5</td><td>1 : 2.388</td></tr>
</table></td></tr>
</table>

#	Particulars	Details
		Average Slope is 1: 0.581 for entire river stretch
5.	Traffic potential	No Navigational traffic is present in the survey stretch of Malaprabha River.
a)	Present IWT operations, ferry services, tourism, cargo, if any	Group of Monuments at Pattadakal, Badami Caves at Badami are the tourist places available around Malaprabha River.
b)	Important industries within 50 km	APMC Market Yard at APMC is 30km approximately away from Malaprabha River. Ice Factory at Navanagar sector-35 is 31km approximately away from Malaprabha River. HS Kanthi Industrial Gases Pvt Ltd. at Sigikeri, Bagalkot is 18.8km away from river Badami Sugars Ltd. at Badami, Karnataka is 9.46km away from river. Shree Kedarnath Sugar Agro Products Ltd., at Jalageri is 34.34km away from river.
c)	Distance of Rail & Road from Industry	APMC Market Yard at APMC is 3.9km away from Bagalkot Railway Station. Ice Factory at Navanagar sector-35 is 4.20km approximately away from Bagalkot Railway Station. HS Kanthi Industrial Gases Pvt Ltd. at Sigikeri, Bagalkot is 3.1km away from Bagalkot Railway Station. Badami Sugars Ltd. at Badami, Karnataka is 0.83km away from Yerra Goppa Halt Station. Shree Kedarnath Sugar Agro Products Ltd., at Jalageri is 2.09km away from SH44.
6.	Consultant's recommendation for going ahead with TEF / DPR preparation	As the river stretch is dried, No scope of TEF/DPR can be provided for the Malaprabha River. This river stretch is not-viable for navigable channel
7.	Any other information/ comment	Nil

(Signature)

Date: Name of Consultant

1 Introduction

1.1 Background

The stretch of about 93.5kms, of Malaprabha River, from the confluence with River Krishna at Kudala Sangama to the Railway Bridge near the Hole Alur village 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 the river bathymetric and topographic survey was carried out by IIC Technologies Ltd, on behalf of IWAI.

The Malaprabha River originates in the Western Ghats at an elevation of 792 meters above the mean sea level. This part of the Western Ghats is located in the west of Jamboti village at a distance of sixteen kilometers in Khanapur taluk in the Belgaum district of Karnataka after flowing in the east and then in the northeast direction, the river finally joins the Krishna River at Kudala Sangama in Bagalkot district of Karnataka at a height of 488 meters above mean sea level. The river flows for three hundred and four kilometers before merging with the Krishna River. The river has a total catchment area of nearly 11,549 square kilometers. There is a dam known as Renukasagar built on this river. There are various temples situated on the banks of this river. These temples serve as religious spots which are frequented by a number of tourists and pilgrims from varied distant places.

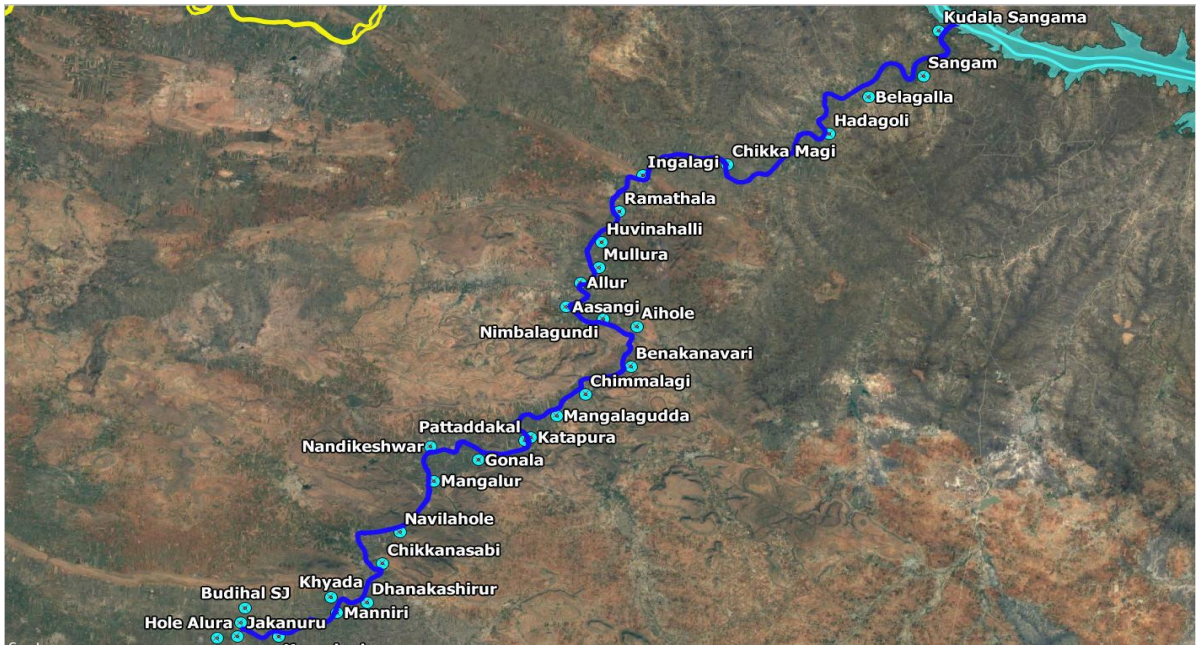


Figure 1 - Locations around Malaprabha River

1.2 Tributaries of Malaprabha River

The Bennihalla, Tuparihalla and Hirehalla are the main tributaries of the Malaprabha River. All these rivers originate in district Dharwad. The Bennihalla, Tuparihalla and Hirehall, all are small streams. The Bennihalla originates at an elevation of 548 meters from sea level.

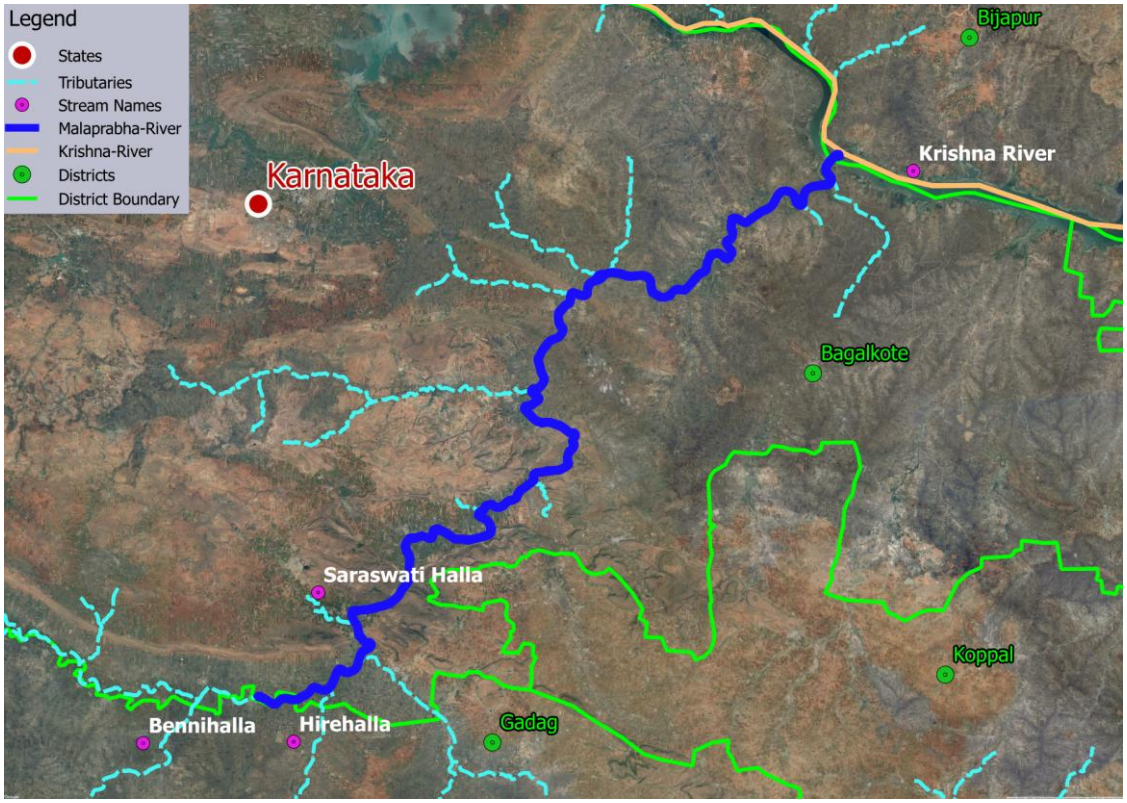


Figure 2 - Tributaries of Malaprabha River

1.3 State/ District through which river passes

The Malaprabha River flows through Gadag and Bagalkote districts of Karnataka State.

State Name	Chainage (km)		Length in km
	From	To	
Karnataka	0.00	93.50	93.50

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 waterway is represented as below:-

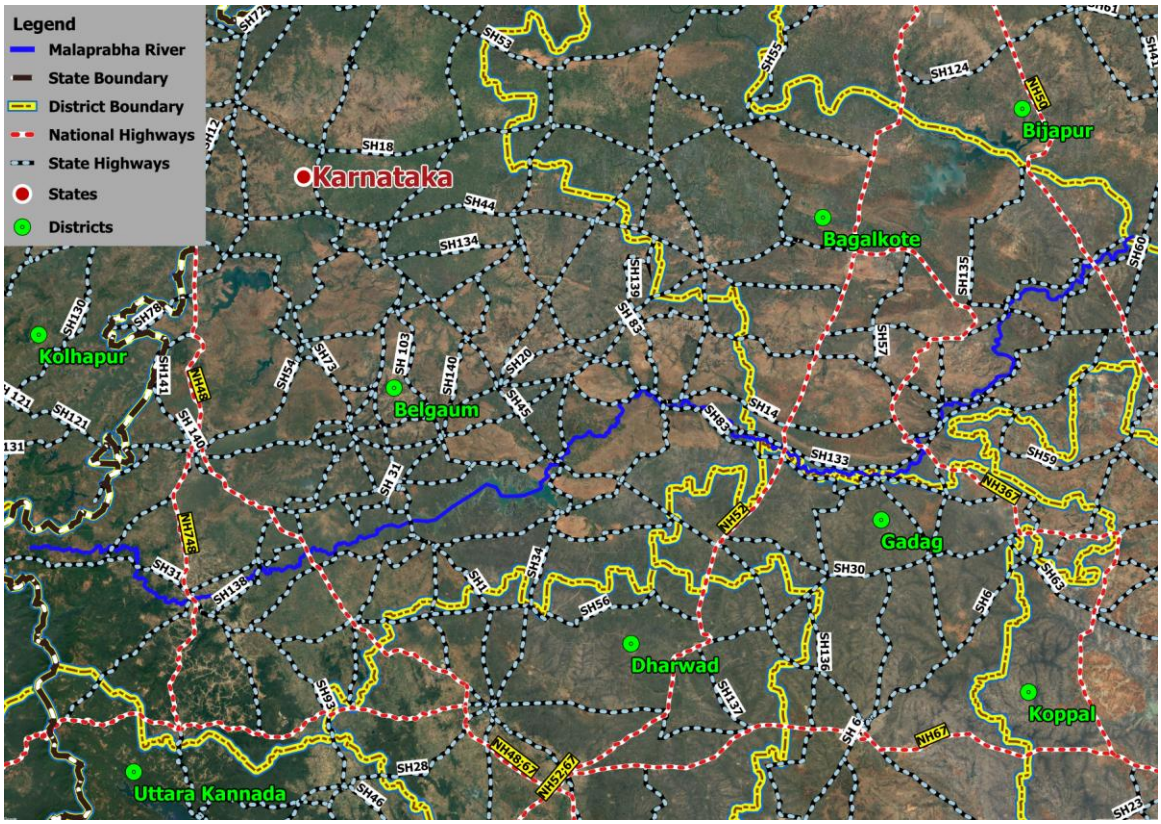


Figure 3 - Full Course of Malaprabha River

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:

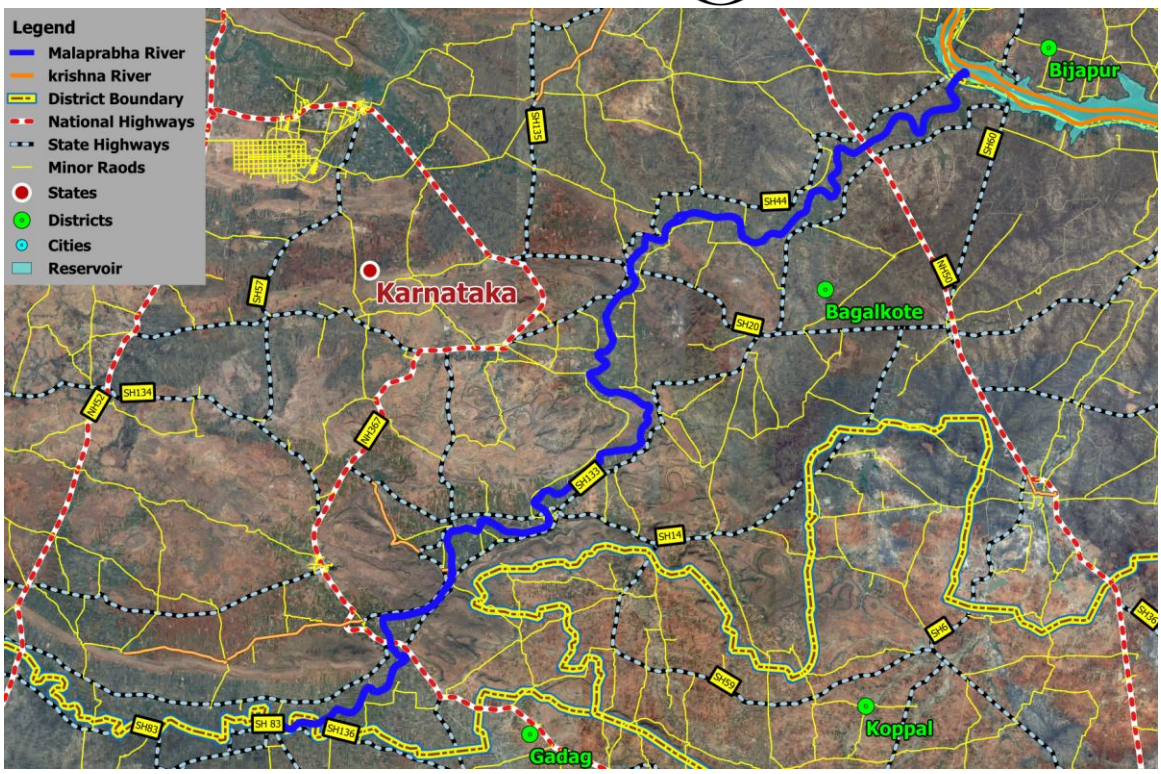


Figure 4 - Course of Malaprabha River

1.5 Scope of work

IIC Technologies Ltd. conducted a topographic survey for the length of 93.5km of Malaprabha from confluence point with River Krishna at Kudala Sangama Lat 16°12'30.22"N, Long 76°04'15.60"E to Bridge at Jakanuru (approx. 0.5km from Jakanuru village) at Lat 15°49'50.87"N, Long 75°38'53.93"E.

The scope of the work for the conduct of survey of Malaprabha 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 22nd March 2016 by a detach survey party. The detach survey party recovered the GTS Benchmark at Kamatagi established by PWD and gauge near at Cholchguda, and gauge at Kudala Sangama which is located to the right bank of the River Malaprabha, found to be established by CWC. The recce was started from a Jakanuru village, Bagalkot Dist. in Karnataka till the Sangam of Malaprabha and Krishna River at a village near Kudala Sangama. Stretch was examined at four places (Bridge near Jakanuru village, Cholchaguda, Kamatagi and Confluence of Krishna River at Kudala Sangama).

The upper portion of Malaprabha River, which contains small rocky patches and the survey stretch, is maximum dry in nature and availability of water is negligible. This causes the practical inability to use any type of boat for sounding in this area.

The downstream of the River was being observed that it's been slightly widened and though the water was present, it was insufficient to carry bathymetric survey, which being led us to carry the survey in the topographic method. The following observation has been made.

- The survey area is 93.5km, from the Bridge at Jakanuru Village towards downstream up to Kudala Sangama.
- River width varied between 100mtr to 400mtr.
- The work of topography is also very much time consuming and not feasible due to rocks and cliffs on both the banks.

2.2 Survey Resources and Methodology

The actual survey was commenced on 28th March 2016 and completed on 25th Apr 2016. The survey was undertaken on a scale of 1:1,00,000, with a survey line spacing, kept at 100m and plotted on UTM Projection at Zone 43N as directed in the contract specification.

2.2.1 Survey Launch

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

2.2.2 Survey Equipment

Following equipment were employed for the topographic survey.

Equipment	Make	Eqpt. Serial No.	Qty. Employed
DGPS Sets	Trimble R4	5320436971, 5147477181, 5411458719, 5049457042	4
Auto Level	Sokkia Auto level & Accessories	260242, 229490	2
ETS	Electronic Total Station	120595 & 120775	2
Software	TBC	Version 12	1
Software	AUTOCAD	2012	1
Software	Microsoft Office	2013	1

Table 2 - Survey Equipment Used

2.2.3Topographic Survey

The survey was commenced on 26th Mar 2016 and completed on 16th Apr 2016. The weather was sunny throughout the period during survey operations. The weather was favorable with hot climate for the conduct of 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 43N 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, sand patches
- 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 of 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 leveling by DGPS

2.2.4 Bathymetric Survey and Survey Launch

The bathymetric survey by survey launch for the Malaprabha 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.) Reference Level

The GTS station near to the Kamatagi was recovered and the value of 512.731m above MSL at 75°51'57.6103"E 16°05'33.4899"N was collected from Asst. Engineer, PWD Bagalkot. This station was used as the initial reference for vertical control and the Reference Level value of the same was transferred IWAI-BM-MLP-06 and IWAI-BM-MLP-07 through Auto Level (optical leveling method).

The vertical control and the Reference Level value of the same were transferred through Auto Level. The leveling data for establishing the reference level for the newly constructed benchmark pillars are placed at Annexure –10 to this report. The final accepted WGS 84 coordinates and details of station & IWAI Benchmark established during the conduct of survey are as follows:

Figure 6 - PWD Benchmark at Kamatagi (ch. 35.37km), referred to GTP-03

Sl No.	Station	Latitude	Longitude	Height above MSL (m)	Chainage (km)	Source/ Type
1	IWAI BM MLP01	N15°49'49.0569"	E75°38'52.94333"	533.193	93.62	BL Processed
2	IWAI BM MLP02	N15°50'54.4151"	E75°43'08.47790"	531.897	84.35	BL Processed
3	IWAI BM MLP03	N15°54'04.6460"	E75°45'02.38737"	531.139	74.69	BL Processed
4	IWAI BM MLP04	N15°56'26.2153"	E75°48'30.21333"	520.877	63.82	BL Processed
5	IWAI BM MLP05	N15°59'11.0114"	E75°51'04.94434"	513.970	54.47	BL Processed
6	IWAI BM MLP06	N16°02'02.0133"	E75°50'43.13959"	508.528	44.27	Online Processed
7	IWAI BM MLP07	N16°06'00.2821"	E75°52'03.43648"	505.435	34.61	Online Processed
8	IWAI BM MLP08	N16°06'31.2154"	E75°56'37.81567"	497.650	23.61	Online Processed
9	IWAI BM MLP09	N16°09'40.1159"	E75°59'35.66009"	494.022	13.48	BL Processed
10	IWAI BM MLP10	N16°12'26.6647"	E76°03'50.09014"	494.085	0.75	BL Processed

Table 3 - Accepted Station coordinates (WGS-84)

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

2.4 Tidal Influence Zone and tidal variation

The survey stretch of Malaprabha 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 Malaprabha River is of 93.5km stretch which is between Kudala Sangama to Jakanuru. There are many other various barrages present in the survey stretch of the Malaprabha River. The water depth on an average of 0.1 to 0.2 mtr is available near the barrages. The water level is recoded as dry (dead level) in the records held by the dam authorities.

2.5.1 Sounding Datum

The entire river stretch is divided into per-km stretches and the least MSL Value obtained during the topographic survey of the river stretch is considered as Chart Datum for the Dredging Volume calculations.

2.5.2 Datum Calculation

The survey datum adopted as per the gradient of the river and the average water level for 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 (m)	Established CD (m)		KM-Stretch	Least Level w.r.t MSL (m)	Established CD (m)
0-1	483.343	483.343		47.1-48	503.021	503.021
1-2	483.472	483.472		48-49	503.536	503.536
2-3	483.709	483.709		49-49.8	503.813	503.813
3-4	483.543	483.543		49.8-50	504.88	504.88
4-5	484.115	484.115		50-51	504.809	504.809
5-6	484.460	484.460		51-52	505.494	505.494
6-7	484.473	484.473		52-53	505.725	505.725
7-8	484.515	484.515		53-54	506.760	506.760
8-9	484.786	484.786		54-54.4	507.580	507.580
9-10	484.802	484.802		54.4-55	508.204	508.204
10-11	485.161	485.161		55-56	508.504	508.504
11-12	485.508	485.508		56-57	508.928	508.928
12-13	485.310	485.310		57-58	509.497	509.497
13-14	485.663	485.663		58-59	510.264	510.264
14-15	485.865	485.865		59-59.1	510.264	510.264
15-16	485.929	485.929		59.1-60	510.477	510.477

KM-Stretch	Least Level w.r.t MSL (m)	Established CD (m)		KM-Stretch	Least Level w.r.t MSL (m)	Established CD (m)
16-16.3	486.131	486.131		60-61	512.267	512.267
16.3-17	486.529	486.529		61-62	511.853	511.853
17-18	486.669	486.669		62-63	512.495	512.495
18-19	486.906	486.906		63-64	513.278	513.278
19-20	487.135	487.135		64-65	513.490	513.490
20-21	487.319	487.319		65-65.4	513.859	513.859
21-22	487.739	487.739		65.4-66	514.083	514.083
22-23	487.739	487.739		66-67	514.695	514.695
23-24	488.506	488.506		67-68	514.812	514.812
24-24.9	488.689	488.689		68-69	515.332	515.332
24.9-25	488.689	488.689		69-70	515.886	515.886
25-26	488.908	488.908		70-71	516.172	516.172
26-27	489.207	489.207		71-72	516.565	516.565
27-28	489.319	489.319		72-73	517.466	517.466
28-29	489.228	489.228		73-73.1	517.466	517.466
29-29.1	489.228	489.228		73.1-74	518.028	518.028
29.1-30	490.015	490.015		74-75	519.488	519.488
30-31	490.584	490.584		75-76	520.458	520.458
31-32	490.827	490.827		76-77	521.348	521.348
32-32.2	491.236	491.236		77-78	521.448	521.448
32.2-33	491.811	491.811		78-79	521.738	521.738
33-34	492.129	492.129		79-80	522.645	522.645
34-35	492.551	492.551		80-80.8	523.409	523.409
35-35.7	493.867	493.867		80.8-81	523.976	523.976
35.7-36	493.635	493.635		81-82	523.579	523.579
36-37	493.929	493.929		82-83	524.218	524.218
37-38	494.558	494.558		83-84	524.975	524.975
38-39	495.212	495.212		84-85	525.572	525.572
39-40	495.688	495.688		85-86	525.575	525.575
40-40.1	495.688	495.688		86-86.5	526.224	526.224
40.1-41	497.232	497.232		86.5-87	528.126	528.126
41-42	497.963	497.963		87-88	527.670	527.670
42-43	499.206	499.206		88-89	528.976	528.976
43-44	500.033	500.033		89-90	529.428	529.428
44-44.2	501.826	501.826		90-91	530.067	530.067
44.2-45	501.175	501.175		91-92	531.101	531.101
45-46	501.502	501.502		92-93	531.364	531.364
46-47	501.612	501.612		93-93.5	531.230	531.230
47-47.1	501.612	501.612				

Table 4 - Established CD for Stretch-wise

2.6 Average of 06 years minimum Water Levels used

Malaprabha River is non-tidal river body having the primary source of water receiving from dams and ends up in drying summer.

CHOLACHAGUDA CWC GAUGE 2000-2006

WL values in m.

Min/Max	2008	2009	2010	2011	2012	2013	2014
Jan Min.	524.250	524.500					
Jan Max.	524.720	524.770					
Feb Min.	524.410	523.830					
Feb Max.	524.660	524.780					
Mar Min.	523.690	523.580					
Mar Max.	529.450	525.630					
Apr Min.	523.760	525.130					
Apr Max.	524.840	525.440					
May Min.		523.790					
May Max.		525.600					
Jun Min.	523.660	523.780	524.170	524.120	523.940	524.690	524.050
Jun Max.	525.280	527.900	526.275	524.870	524.600	526.470	528.370
Jul Min.	523.520	523.780	524.100	524.010	523.500	523.590	524.040
Jul Max.	524.460	524.710	527.095	527.240	524.030	524.820	526.000
Aug Min.	523.520	523.620	524.225	524.060	523.540	523.650	524.060
Aug Max.	525.300	525.480	529.910	526.620	525.040	526.140	527.940
Sep Min.	523.730	524.150	524.410	524.460	523.500	524.400	524.410
Sep Max.	528.300	527.910	526.100	527.760	526.220	528.710	526.800
Oct Min.	523.750	524.200	524.530	524.820	523.770	524.360	524.310
Oct Max.	526.200	536.610	526.980	527.380	525.800	526.620	526.680
Nov Min.	524.320	524.110	524.600	524.720	523.550	524.480	524.510
Nov Max.	527.330	526.680	531.300	525.100	526.160	524.930	525.760
Dec Min.	523.980						
Dec Max.	528.410						
Yearly Min.	523.520	523.580	524.100	524.010	523.500	523.590	524.040
Yearly Max.	529.450	536.610	531.300	527.760	526.220	528.710	528.370
6yr. Min.	523.5						
6yr. Max.	536.61						
6yr. Ave. Min.	523.763						
6yr. Ave. Max.	526.22						
Value of Chart Datum (CD) adopted					**523.803**		

Table 5 - Cholachguda CWC gauge details form 2000-2006

NARAYANPUR CWC GAUGE 2009-2015

WL values in m.

Min/Max	2009	2010	2011	2012	2013	2014	2015
Jan Min.	491.700	491.780	489.980	491.020	490.600	491.320	491.490
Jan Max.	491.900	491.970	491.360	491.720	491.540	491.700	491.800
Feb Min.	490.480	491.430	490.510	487.660	488.120	490.080	490.520
Feb Max.	491.710	491.990	491.330	491.100	490.500	491.560	491.440
Mar Min.	487.160	489.550	487.320	486.900	487.480	487.520	487.000
Mar Max.	490.430	491.900	490.970	487.780	488.120	490.080	490.510
Apr Min.	485.110	487.000	486.120	486.730	487.160	487.260	486.680
Apr Max.	487.120	489.800	488.320	487.110	487.470	487.520	486.860
May Min.	484.610	486.990	486.440	486.400	486.970	487.310	486.530
May Max.	485.070	487.620	487.020	486.960	487.170	487.980	486.850
Jun Min.	484.920	487.640	486.740	486.050	487.000	488.000	
Jun Max.	485.180	487.900	487.650	486.380	487.600	488.280	
Jul Min.	487.350	488.000	487.400	485.660	487.510	487.860	
Jul Max.	491.700	490.420	490.800	487.370	491.800	491.170	
Aug Min.	491.480	489.370	490.270	487.400	491.240	490.900	
Aug Max.	492.060	491.590	490.840	492.020	492.250	492.250	
Sep Min.	491.850	491.060	488.810	491.490	491.560	491.490	
Sep Max.	492.190	491.740	491.550	492.180	492.250	492.100	
Oct Min.	489.680	491.510	490.820	491.700	491.580	491.140	
Oct Max.	492.060	491.950	492.180	492.180	492.250	492.070	
Nov Min.	491.490	490.980	491.510	491.710	491.330	490.330	
Nov Max.	492.140	492.220	491.840	491.850	491.830	491.860	
Dec Min.	491.690	491.340	491.540	490.920	490.800	490.940	
Dec Max.	492.230	491.650	491.800	491.600	491.830	491.910	
Yearly Min.	484.610	486.990	486.120	485.660	486.970	487.260	486.530
Yearly Max.	492.230	492.220	492.180	492.180	492.250	492.250	491.800
6yr. Min.	484.61						
6yr. Max.	491.8						
6yr. Ave. Min.	486.306						
6yr. Ave. Max.	492.159						
Value of Chart Datum (CD) adopted					**486.268**		

Table 6 - Narayanpur CWC guage details from 1994-2000

2.7 Transfer of Sounding Datum

The Malaprabha River is non-tidal and dry river, lowest MSL level of per-km stretch is considered as the chart datum value at different stretches.

2.8 Table indicating tidal variation at different observation points

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

2.9 Salient features of Dam, Barrages, Barrage

The details of Dams, Barrages were collected during the conduct of survey and the details are as follows:

2.9.1 Salient Features of Madinapur Barrage

Salient Features of Madinapur Barrage		
1	River / Basin	Malaprabha
2	Latitude	16° 8'23.37"N
3	Longitude	75°59'33.89"E
4	District	Bagalkot
5	Location	Madinapur Village
6	No. of gates	22
7	Length	130.16m
8	Width	3.32m
		

Table 7 - Salient Features of Madinapur Barrage

2.9.2 Salient Features of Gangur Barrage

Salient Features of Gangur Barrage		
1	River / Basin	Malaprabha
2	Latitude	16° 6'50.68"N
3	Longitude	75°57'22.32"E
4	District	Bagalkot
5	Location	Gangur
6	No. of gate	24

Salient Features of Gangur Barrage		
7	Length	94.89m
8	Width	6.3m
		

Table 8 - Gangur Barrage Details

2.9.3 Salient Features of Budhihal Barrage

Salient Features of Budhihal Barrage		
1	River / Basin	Malaprabha
2	Latitude	16° 6'56.52"N
3	Longitude	75°56'5.30"E
4	District	Bagalkot
5	Location	Budhihal village
6	No. of gate	18
7	Length	131.84m
8	Width	4.51m
		

Table 9 - Budhihal Barrage Details

2.9.4 Salient features of Murikal Barrage

Salient Features of Murikal Barrage		
1	River / Basin	Malaprabha
2	Latitude	16° 7'32.47"N
3	Longitude	75°54'9.26"E
4	District	Gadag

Salient Features of Murikal Barrage		
5	Location	Murikal Village
6	No. of Gate	14
7	Length of Barrage	73.45m
8	Width	4.54m
9	Total Ayacut	0.34 Ha

Table 10 - Murikal Barrage Details

2.9.5 Salient Features of Ingalagi Barrage

Salient Features of Ingalagi Barrage		
1	River / Basin	Malaprabha
2	Latitude	16° 6'39.72"N
3	Longitude	75°52'56.87"E
4	District	Bagalkot
5	Location	Ingalagi Village
6	No. of Gates	14
7	Length of Barrage	94.42m
8	Width	3.62m

Table 11 - Ingalagi Barrage Details

2.9.6 Salient Features of Kamatagi Barrage

Salient Features of Kamatagi Barrage

Salient Features of Kamatagi Barrage		
1	River / Basin	Malaprabha
2	Latitude	16° 5'21.30"N
3	Longitude	75°52'8.24"E
4	District	Bagalkot
5	Location	Kamatagi Village
6	No. of gates	18
7	Length of Barrage	112.9m
8	Width	6.5m
9	Total Ayacut (Acres)	2.1.36 Ha
10	Water utilization (TMC)	N-A-
		

Table 12 - Kamatagi Barrage Details

2.9.7 Salient Features of Haladur Barrage

Salient Features of Haladur Barrage		
1	River / Basin	Malaprabha
2	Latitude	16° 3'31.85"N
3	Longitude	75°51'15.99"E
4	District	Bagalkot
5	Location	Haladur Village
6	No. of Deck	21
7	Length of Barrage	116.72m
8	Width of Barrage	4.82m
9	Total Ayacut (Acres)	1.26ha
		

Table 13 - Haladur Barrage Details

2.9.8 Salient Features of Asaangi Barrage

Salient Features of Asangi Barrage		
1	River / Basin	Malaprabha
2	Latitude	16° 2'0.25"N
3	Longitude	75°50'43.71"E
4	District	Bagalkot
5	Location	Asaangi Village
6	No. of Gate	14
7	Length of Barrage	80.05m
8	Width	4.22m
9	Total Ayacut (Acres)	1.08ha
10	Water utilization (TMC)	N/A

Table 14 - Asaangi Barrage Details

2.9.9 Salient Features of Nimbulagundi Barrage

Salient Features of Nimbulagundi Barrage		
1	River / Basin	Malaprabha
2	Latitude	16° 1'17.95"N
3	Longitude	75°51'38.73"E
4	District	Bagalkot
5	Location	Nimbulagundi
6	No. of Gate	18
7	Length of Barrage	87.45m
8	Width	5.81m
9	Total Ayacut (Acres)	0.45ha

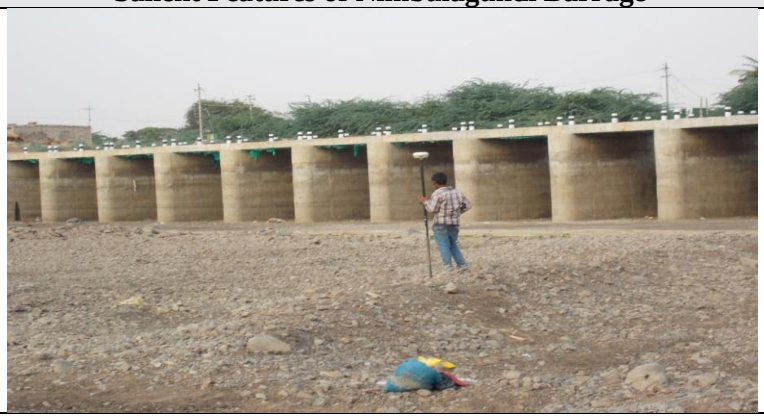
Salient Features of Nimbulagundi Barrage


Table 15 - Nimbulagundi Barrage Details

2.9.10 Salient Features of Aihole Barrage

Salient Features of Aihole Barrage		
1	River / Basin	Malaprabha
2	Latitude	16° 0'34.02"N
3	Longitude	75°52'39.56"E
4	District	Bagalkot
5	Location	Aihole
6	No. of Gate	11
7	Length of Barrage	52.64m
8	Width	4.12m
9	Total Ayacut (Acres)	0.52ha
		

Table 16 - Aihole Barrage Details

2.9.11 Salient Features of Nagaral Barrage

Salient Features of Nagral Barrage		
1	River / Basin	Malaprabha
2	Latitude	15°59'12.10"N
3	Longitude	75°51'5.03"E
4	District	Bagalkot
5	Location	Nagral village
6	No. of Deck	25

Salient Features of Nagral Barrage		
7	Length of Barrage	68.62m
8	Width	3.8m
9	Total Ayacut (Acres)	0.59Ha

Table 17 - Nagral Barrage Details

2.9.12 Salient Features of Mangalagudda Barrage

Salient Features of Mangalagudda Barrage		
1	River / Basin	Malaprabha
2	Latitude	15°57'47.24"N
3	Longitude	75°49'14.33"E
4	District	Bagalkot
5	Location	Mangalagudda Village
6	No. of Gates	16
7	Length of Barrage	84.7m
8	Width	2.7m
9	Total Ayacut (Acres)	1.40Ha

Table 18 - Mangalgudda Barrage Details

2.9.13 Salient Features of Gonal Barrage

Salient Features of Gonal Barrage		
1	River / Basin	Malaprabha
2	Latitude	15°56'25.54"N
3	Longitude	75°47'36.81"E
4	District	Bagalkot
5	Location	Gonal village

Salient Features of Gonal Barrage		
6	No. of gates	15
7	Length of Barrage	84.13m
8	Width	2.26m
9	Total Ayacut (Acres)	0.89Ha

Table 19 - Gonal Barrage Details

2.9.14 Salient Features of Mangalur Barrage

Salient Features of Mangalur Barrage		
1	River / Basin	Malaprabha
2	Latitude	15°54'48.73"N
3	Longitude	75°45'30.74"E
4	District	Gadag
5	Location	Mangalur
6	No. of gates	49
7	Length of Barrage	123.69m
8	Width	2.6m
9	Total Ayacut (Acres)	1.56Ha

Table 20 - Mangalur Barrage Details

2.9.15 Salient Features of Cholachaguda Barrage

Salient Features of Cholachguda Barrage		
1	River / Basin	Malaprabha
2	Latitude	15°52'17.28"N
3	Longitude	75°43'27.72"E
4	District	Bagalkot

Salient Features of Cholachguda Barrage		
5	Location	Cholachguda village
6	No. of gates	28
7	Length of Barrage	135.68m
8	Width	3.41m
9	Total Ayacut (Acres)	2.86Ha
		

Table 21 - Cholachaguda Barrage Details

2.9.16 Salient Features of Manneri Barrage

Salient Features of Manneri Barrage		
1	River / Basin	Malaprabha
2	Latitude	15°50'31.77"N
3	Longitude	75°42'14.88"E
4	District	Bagalkot
5	Location	Manneri village
6	No. of gates	18
7	Length of Barrage	99.1m
8	Width	4.66m
9	Total Ayacut (Acres)	1.68Ha
		

Table 22 - Manneri Barrage Details

2.10 Erected IWAI Benchmark 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 PWD Kamatagi GTS (512.731m MSL) provided by Assistant Engineer PWD, Bagalkot and Karnataka.

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)	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. Established CD (m)
1	IWAI BM MLP01	93.62	Jakanuru	15°49'49.05691"N 75°38'52.94333"E	569394.286 1750270.602	533.193	531.23	1.963
2	IWAI BM MLP02	84.35	Dhankashirur	15°50'54.41518"N 75°43'08.47790"E	576988.705 1752303.659	531.897	525.572	6.325
3	IWAI BM MLP03	74.69	Navilahole	15°54'04.64604"N 75°45'02.38737"E	580355.909 1758160.966	531.139	519.488	11.651
4	IWAI BM MLP04	63.82	Pattadkal	15°56'26.21534"N 75°48'30.21333"E	586519.147 1762534.233	520.877	513.278	7.599
5	IWAI BM MLP05	54.47	Nagral	15°59'11.01141"N 75°51'04.94434"E	591098.806 1767616.557	513.970	507.58	6.390
6	IWAI BM MLP06	44.27	Asaangi	16°02'02.01331"N 75°50'43.13959"E	590429.283 1772868.651	508.528	501.826	6.702
7	IWAI BM MLP07	34.61	Kamtgi	16°06'00.28213"N 75°52'03.43648"E	592784.834 1780200.367	505.435	492.551	12.884
8	IWAI BM MLP08	23.61	Budhihal	16°06'31.21544"N 75°56'37.81567"E	600931.804 1781186.687	497.650	488.506	9.144
9	IWAI BM MLP09	13.48	Madinapuir	16°09'40.11590"N 75°59'35.66009"E	606187.127 1787016.484	494.022	485.663	8.359
10	IWAI BM MLP10	0.75	Kudal Sangama	16°12'26.66473"N 76°03'50.09014"E	613717.211 1792172.502	494.085	483.343	10.742

Table 23 - Accepted Benchmark coordinates w. r. t CD

2.11 Chart Datum / Sounding Datum and Reductions Details

Due to unavailability of water in Malaprabha River, the spot leveling by topographic method was attempted for the entire survey stretch of Malaprabha 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 is forwarded as soft copy along with the report.

2.12 HFL values of Bridges/Cross Structures

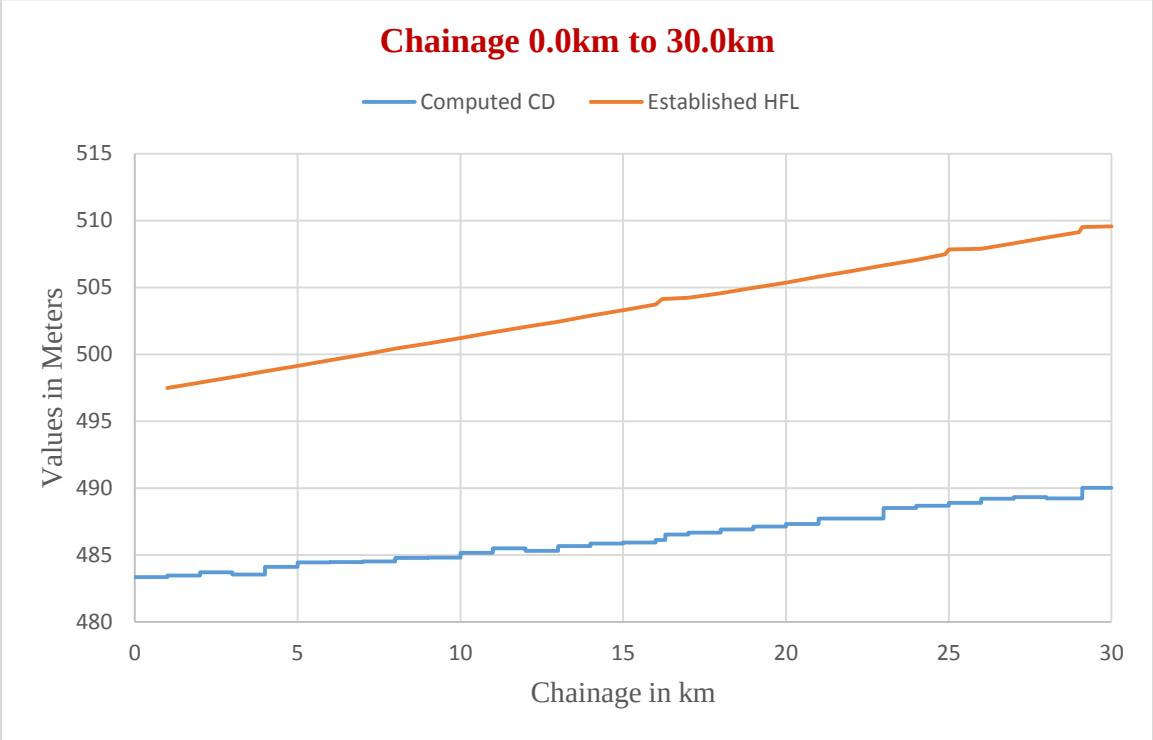
The established HFL value of 492.250m, 530.893m w.r.t MSL for Narayanpur and Cholachaguda CWC Gauge was provided by Dam Authority, Narayanpur and Asst. Eng. Minor Irrigation Badami. The HFL value for the remaining survey

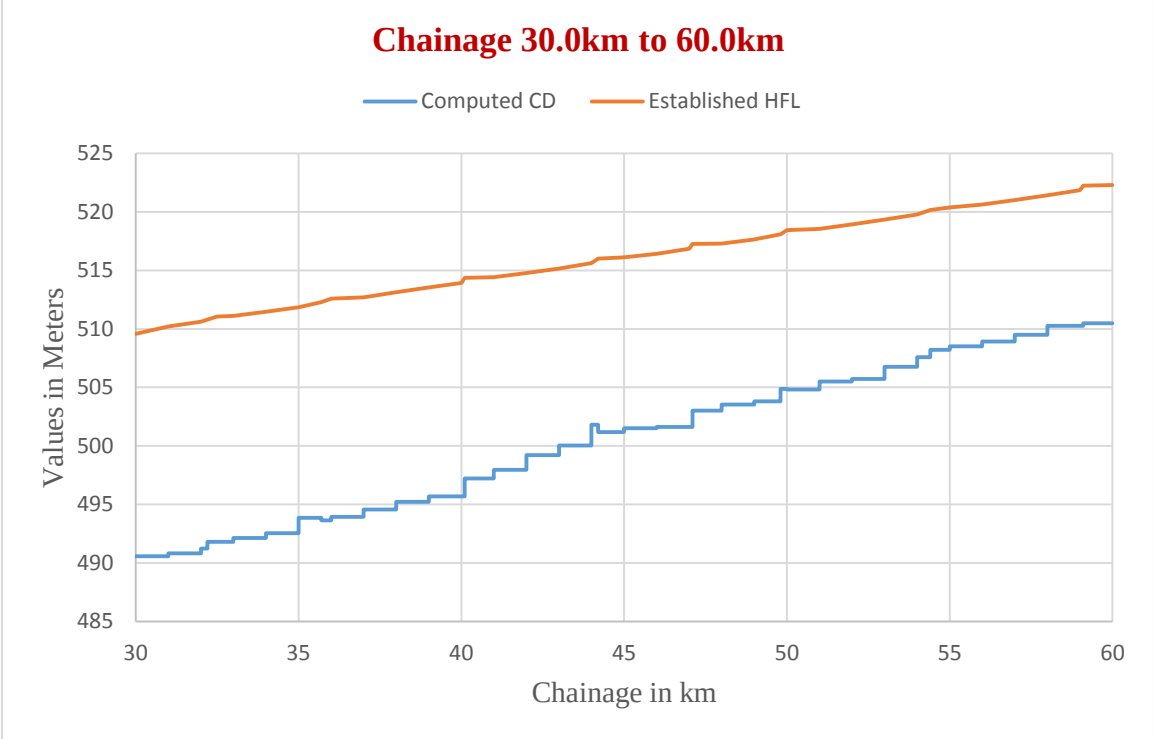
stretch is computed for the Malaprabha River. The details of established and computed HFL values for the entire stretch is as follows:

Sl. No.	Location and description of CWC gauge Barrages / Weirs / Anicut / Barrages / Aqueducts	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	Narayanpur	Dam	-12.200 (downstream)	492.250	-
2	Huvanur	Highway Bridge	11.131	-	502.051
3	Madinapur	LIS/Barrage	16.246	-	504.179
4	Gangur	LIS/Barrage	22.065	-	506.604
5	Budhihal	LIS/Barrage	24.962	-	507.792
6	Murikal	LIS/Barrage	29.111	-	509.525
7	Ingalagi	LIS/Barrage	32.197	-	511.059
8	Kamatagi	Highway Bridge	35.430	-	512.396
9	Kamatagi	LIS/ Barrage	35.798	-	512.544
10	Haladur	Road Bridge	40.112	-	514.326
11	Asaangi	LIS/Barrage	44.262	-	516.058
12	Nimbalgundi	LIS/Barrage	47.086	-	517.246
13	Aihole	LIS/Barrage	49.763	-	518.335
14	Nagral	LIS/Barrage	54.465	-	520.315
15	Mangalagudda	LIS/Barrage	59.120	-	522.246
16	Pattadkal	Highway Bridge	61.781	-	523.384
17	Gonal	LIS/Barrage	65.427	-	524.869
18	Manglur	Highway Bridge	72.903	-	527.987
19	Cholachaguda	Gauge	79.974	530.893	
20	Cholachguda	Highway Bridge	80.285	-	530.992
21	Cholachaguda	LIS/Barrage	80.893	-	531.239
22	Manneri	LIS/Barrage	86.545		533.912
23	Jakanuru	Road way Bridge	93.224	-	536.387
24	Jakanuru	Railway bridge	93.589	-	536.486

Table 24 - HFL values of Bridges/Cross Structures

2.13 Graph: Sounding Datum and HFL vs Chainage





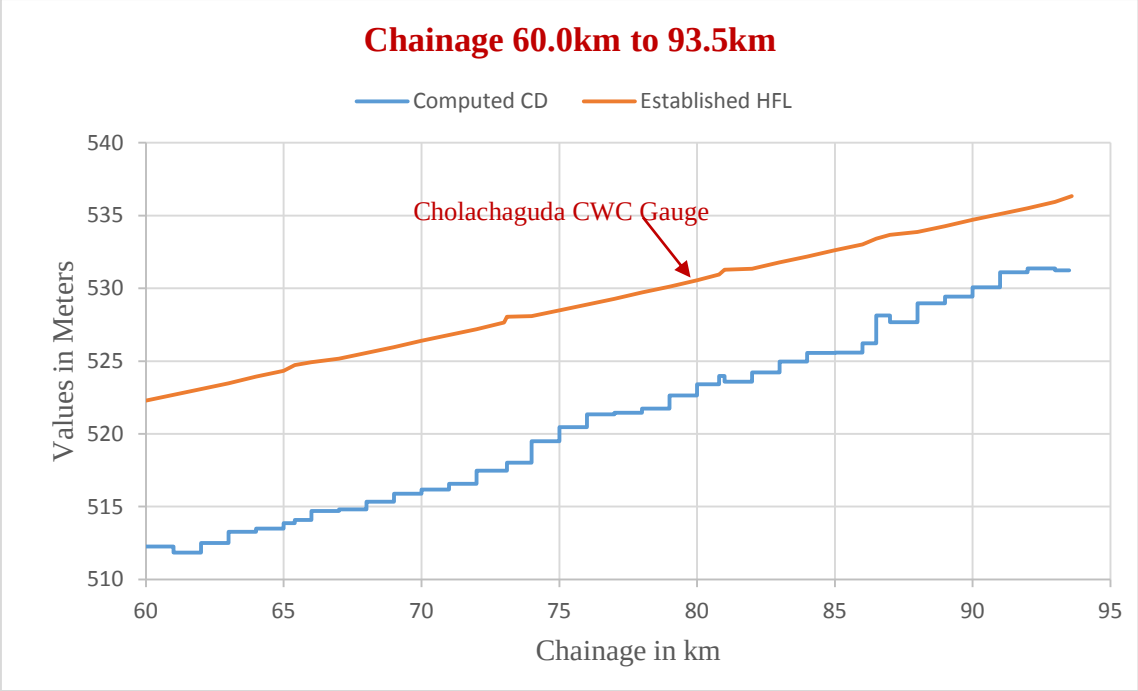


Figure 7 - Sounding Datum and HFL vs Chainage

2.14 Average Bed Slope

The average bed slope of Malaprabha 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 - 484.472	Ch. 30 - RBL - 493.236	8.764	30	1 : 0.292
Ch. 30 - RBL - 493.236	Ch. 60 - RBL - 511.602	18.366	30	1 : 0.612
Ch. 60 - RBL - 511.602	Ch. 90 - RBL - 530.401	18.799	30	1 : 0.627
Ch. 90 - RBL - 530.401	Ch. 93.5 - RBL - 538.758	8.357	3.5	1 : 2.388

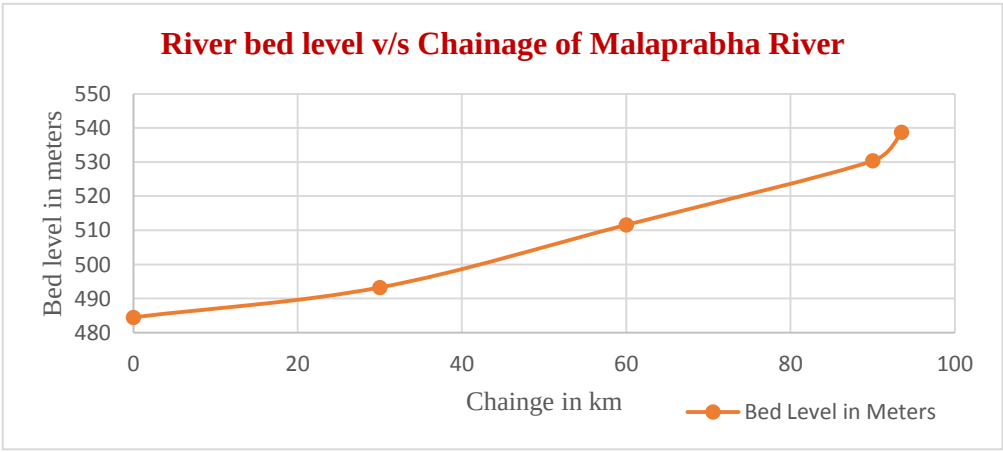


Table 25 - Average Bed Slope

2.15 Details of Dam, Barrages, Weirs, Anicut

Sl No	Structure Name	Chainage (km)	Location	Position (Lat Long)	Position (UTM)	Length (m)	Width (m)	Height w.r.t. MSL (m)	Present condition
				Left Bank	Left Bank				
				Right Bank	Right Bank				
1	Madinapur Barrage	16.25	Madinapur	**Left Bank:** 16°8'22.09"N 75°59'37.48"E	**Left Bank:** 606252.747 1784618.962	130.16	3.32	495.514	Operational
				Right Bank: 16°8'23.32"N 75°59'33.31"E	**Right Bank:** 606128.700 1784656.164				
2	Gangur Barrage	22.06	Gangur	**Left Bank:** 16°6'49.20"N 75°57'22.06"E	**Left Bank:** 602243.621 1781745.403	94.89	6.3	495.892	Operational
				Right Bank: 16°6'52.34"N 75°57'22.59"E	**Right Bank:** 602258.919 1781841.960				
3	Budhihal Barrage	24.96	Budhihal	**Left Bank:** 16°6'56.21"N 75°56'2.80"E	**Left Bank:** 599888.112 1781950.040	131.84	4.51	505.157	Operational
				Right Bank: 16°6'56.69"N 75°56'7.30"E	**Right Bank:** 600021.723 1781965.390				
4	Murikal Barrage	29.11	Murikal	**Left Bank:** 16°7'31.41"N 75°54'9.65"E	**Left Bank:** 596522.148 1783016.770	73.45	4.54	500.164	Operational
				Right Bank: 16°7'33.59"N 75°54'8.82"E	**Right Bank:** 596497.201 1783083.650				
5	Ingalagi Barrage	32.20	Ingalagi	**Left Bank:** 16°6'38.39"N 75°52'56.46"E	**Left Bank:** 594355.054 1781378.080	94.42	3.6	500.608	Operational
				Right Bank: 16°6'41.42"N 75°52'57.54"E	**Right Bank:** 594386.738 1781471.328				
6	Kamatagi Barrage	35.80	Kamatagi	**Left Bank:** 16°5'22.03"N 75°52'10.25"E	**Left Bank:** 592992.196 1779025.749	112.95	6.5	504.813	Operational
				Right Bank: 16°5'20.19"N 75°52'6.52"E	**Right Bank:** 592881.617 1778968.741				
7	Haladur Barrage	40.11	Haladur	**Left Bank:** 16°3'32.44"N 75°51'18.29"E	**Left Bank:** 591462.407 1775651.679	116.72	4.82	505.602	Operational
				Right Bank: 16°3'31.34"N 75°51'14.37"E	**Right Bank:** 591346.068 1775617.396				
8	Assangi Barrage	44.26	Assangi	**Left Bank:** 16°1'58.93"N 75°50'43.88"E	**Left Bank:** 590451.673 1772773.993	80.05	4.22	507.381	Operational
				Right Bank: 16°2'1.58"N 75°50'43.45"E	**Right Bank:** 590438.562 1772855.373				
9	Nimbulagundi Barrage	47.09	Nimbalgundi	**Left Bank:** 16°1'19.64"N 75°51'38.78"E	**Left Bank:** 592088.189 1771573.350	87.45	5.81	508.981	Operational
				Right Bank: 16°1'16.59"N	**Right Bank:** 592071.934				

Sl No	Structure Name	Chainage (km)	Location	Position (Lat Long)	Position (UTM)	Length (m)	Width (m)	Height w.r.t. MSL (m)	Present condition
				Left Bank Right Bank	Left Bank Right Bank				
				75°51'38.22"E	1771479.557				
10	Aihole Barrage	49.86	Aihole	**Left Bank:** 16°0'33.41"N 75°52'40.41"E **Right Bank:** 16°0'34.64"N 75°52'38.71"E	**Left Bank:** 593925.809 1770160.403 **Right Bank:** 593875.123 1770197.987	52.64	4.12	508.727	Operational
11	Nagral Barrage	54.46	Nagral	**Left Bank:** 15°59'11.09"N 75°51'5.21"E **Right Bank:** 15°59'13.78"N 75°51'4.82"E	**Left Bank:** 591106.693 1767619.004 **Right Bank:** 591094.762 1767701.618	68.62	3.8	513.617	Operational
12	Mangalgudda Barrage	59.12	Mangalagudda	**Left Bank:** 15°57'46.16"N 75°49'13.19"E **Right Bank:** 15°57'48.57"N 75°49'15.11"E	**Left Bank:** 587787.229 1764995.824 **Right Bank:** 587844.015 1765070.105	84.77	2.7	516.755	Operational
13	Gonal Barrage	65.43	Gonal	**Left Bank:** 15°56'24.10"N 75°47'36.55"E **Right Bank:** 15°56'26.94"N 75°47'36.56"E	**Left Bank:** 584923.923 1762463.106 **Right Bank:** 584923.889 1762550.377	84.77	2.7	516.731	Operational
14	Mangalur Barrage	73.06	Mangalur	**Left Bank** 15°54'48.01"N 75°45'33.10"E **Right Bank:** 15°54'49.21"N 75°45'29.05"E	**Left Bank:** 581264.360 1759496.763 **Right Bank:** 581143.800 1759533.199	123.69	2.6	526.455	Operational
15	Cholachgudda Barrage	80.89	Cholachgudda	**Left Bank:** 15°52'19.11"N 75°43'29.59"E **Right Bank:** 15°52'15.77"N 75°43'26.21"E	**Left Bank:** 577607.670 1754908.320 **Right Bank:** 577507.500 1754805.340	135.68	3.41	529.303	Operational
16	Manneri Barrage	86.55	Manneri	**Left Bank:** 15°50'31.57"N 75°42'16.01"E **Right Bank:** 15°50'32.16"N 75°42'12.36"E	**Left Bank:** 575430.450 1751596.380 **Right Bank:** 575321.700 1751614.050	99.1	4.66	537.282	Operational

Table 26 - Cross Structures w.r.t. MSL

2.16 Details of Locks

There are no Locks present in the survey stretch of Malaprabha River.

2.17 Details of Aqueducts

There are no Aqueducts present in the survey stretch of Malaprabha River.

2.18 Details of Bridges and Crossings over waterway

Sl. No	Structure Name and for road / rail	Chainage (km)	Type of Structure (RCC / Iron / Wooden)	Location	Position (Lat Long)	Position (UTM)	Length (m)	Width (m)	No of Piers	HC (clear distance Between piers) (m)	VC w.r.t. HFL (m)	Remarks (complete / under - construction), in use or not, condition
					Left Bank Right Bank	Left Bank Right Bank						
1	Huvanur Bridge (Sholapur-Mangalore Highway)	11.12	Iron	Huvanur	**Left Bank:** 16°9'49.77"N 76°0'41.82"E **Right Bank:** 16°10'2.50"N 76°0'32.88"E	**Left Bank:** 608150.606 1787322.731 **Right Bank:** 607883.174 1787712.63	486.37	8.53	22	23.159	15.20	Complete & Ops
2	Huvanur Bridge (Mangalore-Sholapur Highway)	11.13	RCC	Huvanur	**Left Bank:** 16°9'49.58"N 76°0'41.37"E **Right Bank:** 16°10'2.13"N 76°0'32.41"E	**Left Bank:** 608137.27 1787316.827 **Right Bank:** 607869.271 1787701.192	482.00	8.53	22	21.955	15.24	Complete & Ops
3	Kamatagi Bridge	35.43	RCC	Kamatagi	**Left Bank:** 16°5'32.16"N 75°52'9.80"E **Right Bank:** 16°5'32.44"N 75°51'59.45"E	**Left Bank:** 592977.517 1779336.982 **Right Bank:** 592669.992 1779344.296	247.00	7.66	09	27.040	3.90	Complete & Ops
4	Pattadkal Bridge	61.78	RCC	Pattadakal	**Left Bank:** 15°57'9.94"N 75°48'58.97"E **Right Bank:** 15°57'7.67"N 75°48'55.28"E	**Left Bank:** 587368.857 1763881.167 **Right Bank:** 587259.429 1763810.983	135.84	6.12	08	12.000	04.00	Complete & Ops
5	Mangaluru Bridge	72.90	RCC	Mangalur	**Left Bank:** 15°54'53.35"N 75°45'34.50"E **Right Bank:** 15°54'54.38"N 75°45'28.74"E	**Left Bank:** 581305.392 1759661.003 **Right Bank:** 581134.006 1759692.031	176.61	5.19	50	0.935	1.47	Complete & Ops
6	Cholachguda Bridge	80.29	RCC	Guleguda	**Left Bank:** 15°52'33.06"N 75°43'20.87"E **Right Bank:** 15°52'33.43"N 75°43'16.55"E	**Left Bank:** 577346.85 1755336.077 **Right Bank:** 577218.334 1755347.003	129.61	5.63	13	9.79	1.33	Complete & Ops
7	Jakanuru Bridge	93.22	RCC	Hole Alur	**Left Bank:** 15°49'46.91"N 75°39'5.46"E **Right Bank:** 15°49'50.30"N 75°39'6.80"E	**Left Bank:** 569766.817 1750205.785 **Right Bank:** 569806.354 1750310.075	100.64	7.70	19	4.36	0.69	Complete & Ops
8	Jakanuru Railway Bridge	93.59	Iron	Hole Alur	**Left Bank:** 15°49'45.67"N 75°38'53.48"E **Right Bank:** 15°49'58.54"N 75°38'55.08"E	**Left Bank:** 569410.571 1750166.58 **Right Bank:** 569456.944 1750562.189	395.33	5.85	11	30	11.31	Complete & Ops

Table 27 - Bridges crossing over waterway

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

No other cross structures, pipe-lines found in the survey stretch of Malaprabha River.

2.20 Details of High Tension Lines/Electric lines/Tele-communication lines

Sl No	Type of line	Chainage (km)	Location	Position (Lat Long)	Position (UTM)	Vertical clearance w.r.t. HFL(m)	Remarks (complete / under - construction)
				Left Bank Right Bank	Left Bank Right Bank		
1	HTP	12.64	Madinapur village	**Left Bank:** 16°09'46.634"N 75°59'53.126"E **Right Bank:** 16°09'48.442"N 75°59'53.937"E	**Left Bank:** 606704.898 1787219.31 **Right Bank:** 606728.711 1787274.99	15	Complete
2	HTP	13.23	Madinapur village	**Left Bank:** 16°09'47.812"N 75°59'36.358"E **Right Bank:** 16°09'48.624"N 75°59'34.937"E	**Left Bank:** 606206.73 1787253.09 **Right Bank:** 606164.406 1787277.85	15	Complete
3	HTP	35.78	Kamatagi village	**Left Bank:** 16°05'22.400"N 75°52'10.164"E **Right Bank:** 16°05'20.675"N 75°52'6.314"E	**Left Bank:** 592989.606 1779037.11 **Right Bank:** 592875.444 1778983.63	23	Complete
4	HTP	80.11	Golebagudda village	**Left Bank:** 15°52'38.934"N 75°43'18.979"E **Right Bank:** 15°52'38.694"N 75°43'17.374"E	**Left Bank:** 577290 1755516.4 **Right Bank:** 577242.299 1755508.84	19	Complete
5	HTP	92.39	Hole Alur village	**Left Bank:** 15°49'33.843"N 75°39'29.739"E **Right Bank:** 15°49'34.863"N 75°39'30.311"E	**Left Bank:** 570490.303 1749806.54 **Right Bank:** 570507.222 1749837.94	25	Complete

Table 28 - High Tension Lines

2.21 Current Meter and Discharge details

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

2.22 Water Samples Locations

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

3 Description of Waterway

The waterway of Malaprabha River within survey limits can be broadly divided in to four stretches in accordance with the gradient of the river. The details are as follows:

3.1 Sub-Stretch-01: Kudala Sangama to Ingalagi (Chainage 0.0km to 30.0km)

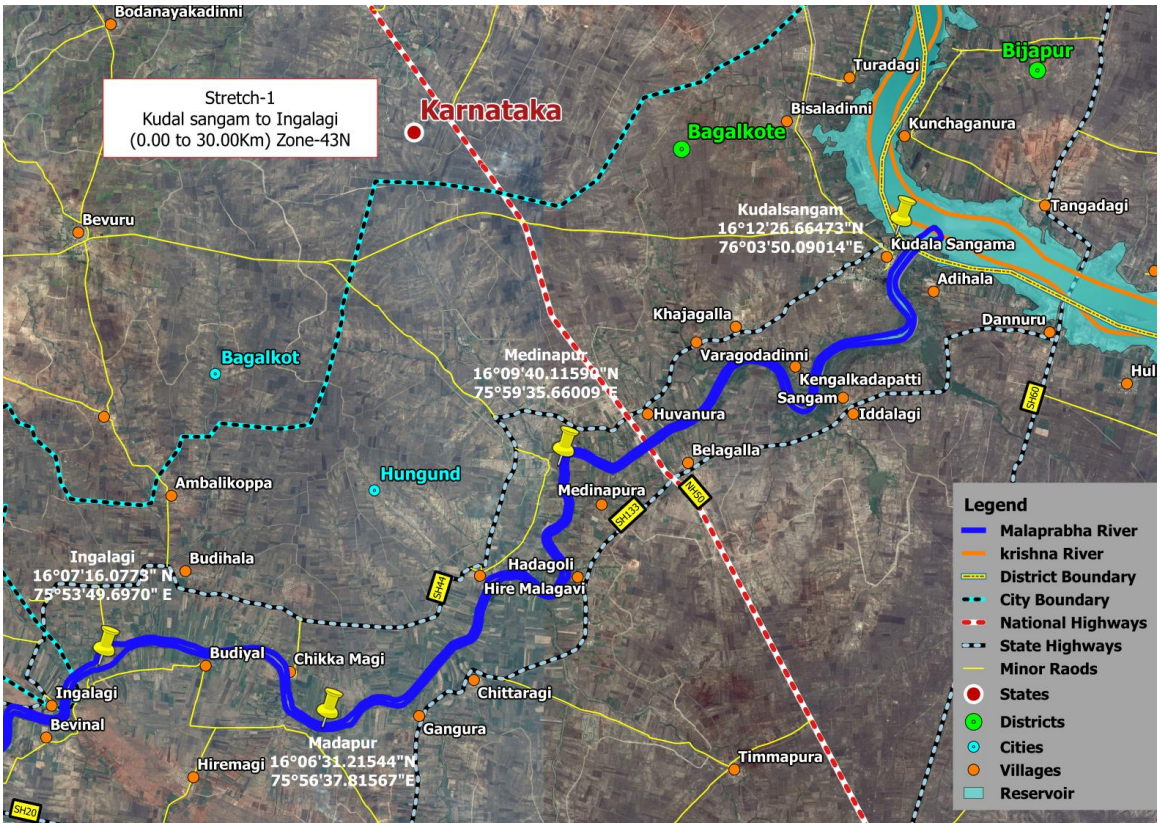


Figure 8 - Stretch-1 Kudal Sangam to Ingalagi

- **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.

This stretch is between 0 to 30.0km chainage of Kudala Sangama to Ingalagi Village. This stretch forms the upstream portion of the Kudala Sangama Temple, which is the confluence point of Malaprabha and Krishna River. It's a Holy place where people usually take bath. The place is a village about 19km (12 mi) from Hungund. Close by is the holy pilgrim center and the renowned temple of Sangameshwara, on the river bank, at the confluence of the Krishna and the

Malaprabha Rivers. Formerly it was known as Kappadi sangama where Basaveshwara's teacher Ishanaguru lived.

Figure 9 - Temple at confluence of Krishna (0.0 km chainage)

Medinapur is surrounded by Muddebihal Taluk towards north, Kushtagi Taluk towards south, Bagalkot Taluk towards west, Badami Taluk towards west. Nandanoor, Huvanoor, Bisanakoppa, Varagodadinni, Khajagal and Kudala Sangama are the nearest village. Medinapur is a small village/hamlet in Hungund Taluk in Bagalkot District of Karnataka State, India. It comes under Medinapur Panchayath. It belongs to Belgaum Division. It is located 49km towards east from District Bagalkot.

This stretch is surrounded by Muddebihal Taluk towards north, Kushtagi Taluk towards south, Bagalkot Taluk towards west, Badami Taluk towards west. Nandanoor, Huvanoor, Bisanakoppa, Varagodadinni, Khajagal and Kudala Sangama are the nearest village. Malaprabha River is being merged with Confluence of River Krishna at Kudala Sangama.

Madapur is a small village/hamlet in Hungund Taluk in Bagalkot District of Karnataka State, India. It comes under Madapur Panchayath. It belongs to Belgaum Division. It is located 49km towards east from District Bagalkot.

Muddebihal, Lingsugur, Ron, Talikota are the nearby cities to this stretch.

During survey it was observed that two nos. of highway bridge is constructed near Havanur village and two small barrages/Lift near Madinapur and Gangur were being constructed in this stretch.

Hungund is the nearest town to this stretch. Road connectivity is there from Hungund to the nearby villages. There is no railway station near to this stretch in less than 10km. However Hubli Junction Railway Station is major railway station which is 140km near to this vicinity.

Kudala Sangama, Dhannur, Chowdakamaladinni, Khajagal, Kammadatta, Iddalgi, Binalkoppa, Huvanur, Nandanoor, Ganjihaal, Medinapur, Chikmalagavi, Papathnal, Khairwadgi Gangur, Yeranaikanal, Ingalagi are the nearby villages within 2 to 5km radius of this stretch, and is being well connected by Karnataka state highway no 44 Hungund to Bagalkot.

In this river stretch, some nalas were found nearby villages Kamadatta, Iddalgi, Ganjihaal, Varagodadinni, Chikmalagavi, Papathnal, Basawannal, Yeraanaiknal. During the survey the nalas were found to be dry but as per the localities during rainy season these nalas will have full water and nearby villagers are used to take bath.

Bajra, Grapes, beans are the three kind of crops which are being cultivated by local villagers upon this stretch. Also found sugarcane fields upon this stretch at some places.

Due to unavailability of water in this stretch hydrography data collection could not obtained. Near Kudala Sangama found negligible water, so the stretch is being surveyed by topographic methods.

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	16.3	0.000	0.000	16300	693,968.57	693,968.57	-0.300	0.000	16300	877,369.52	877,369.52
I	16.3	24.9	0.000	0.000	8600	368,439.70	1,062,408.27	-0.300	0.000	8600	467,699.12	1,345,068.64
I	24.9	29.1	0.000	0.000	4200	180,947.09	1,243,355.36	-0.300	0.000	4200	229,410.12	1,574,478.76
I	29.1	30	0.000	0.000	900	38,576.29	1,281,931.65	-0.300	0.000	900	49,459.31	1,623,938.07
II	0	16.3	0.000	0.000	16300	1,056,832.36	1,056,832.36	-0.300	0.000	16300	1,293,401.57	1,293,401.57
II	16.3	24.9	0.000	0.000	8600	561,203.51	1,618,035.87	-0.300	0.000	8600	689,665.78	1,983,067.35
II	24.9	29.1	0.000	0.000	4200	275,611.70	1,893,647.57	-0.300	0.000	4200	338,382.25	2,321,449.60
II	29.1	30	0.000	0.000	900	58,757.90	1,952,405.47	-0.300	0.000	900	72,801.26	2,394,250.86
III	0	16.3	0.000	0.000	16300	1,596,526.85	1,596,526.85	-0.300	0.000	16300	1,891,271.77	1,891,271.77

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.
III	16.3	24.9	0.000	0.000	8600	848,152.64	2,444,679.49	-0.300	0.000	8600	1,008,859.81	2,900,131.58
III	24.9	29.1	0.000	0.000	4200	416,561.26	2,861,240.75	-0.300	0.000	4200	495,167.83	3,395,299.41
III	29.1	30	0.000	0.000	900	88,804.14	2,950,044.89	-0.300	0.000	900	106,305.76	3,501,605.17
IV	0	16.3	0.000	0.000	16300	1,925,588.26	1,925,588.26	-0.300	0.000	16300	2,233,804.82	2,233,804.82
IV	16.3	24.9	0.000	0.000	8600	1,023,402.34	2,948,990.60	-0.300	0.000	8600	1,191,623.33	3,425,428.15
IV	24.9	29.1	0.000	0.000	4200	502,640.00	3,451,630.60	-0.300	0.000	4200	584,920.73	4,010,348.88
IV	29.1	30	0.000	0.000	900	107,156.15	3,558,786.75	-0.300	0.000	900	125,452.29	4,135,801.17

Table 29 - Dredging Quantity Details

a) Observed and Reduced Bed Profile of the stretch

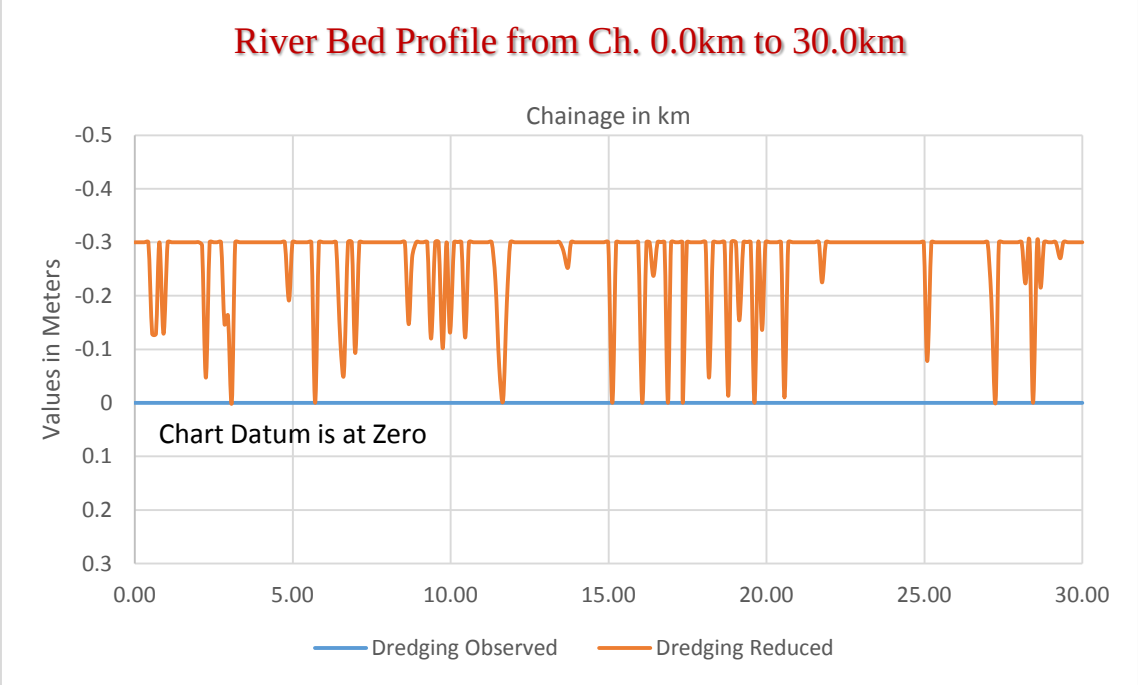


Figure 10 - River Bed Profile

3.2 Sub-Stretch 02: Ingalagi to Mangalguda (Chainage 30.0km to 60.0km)

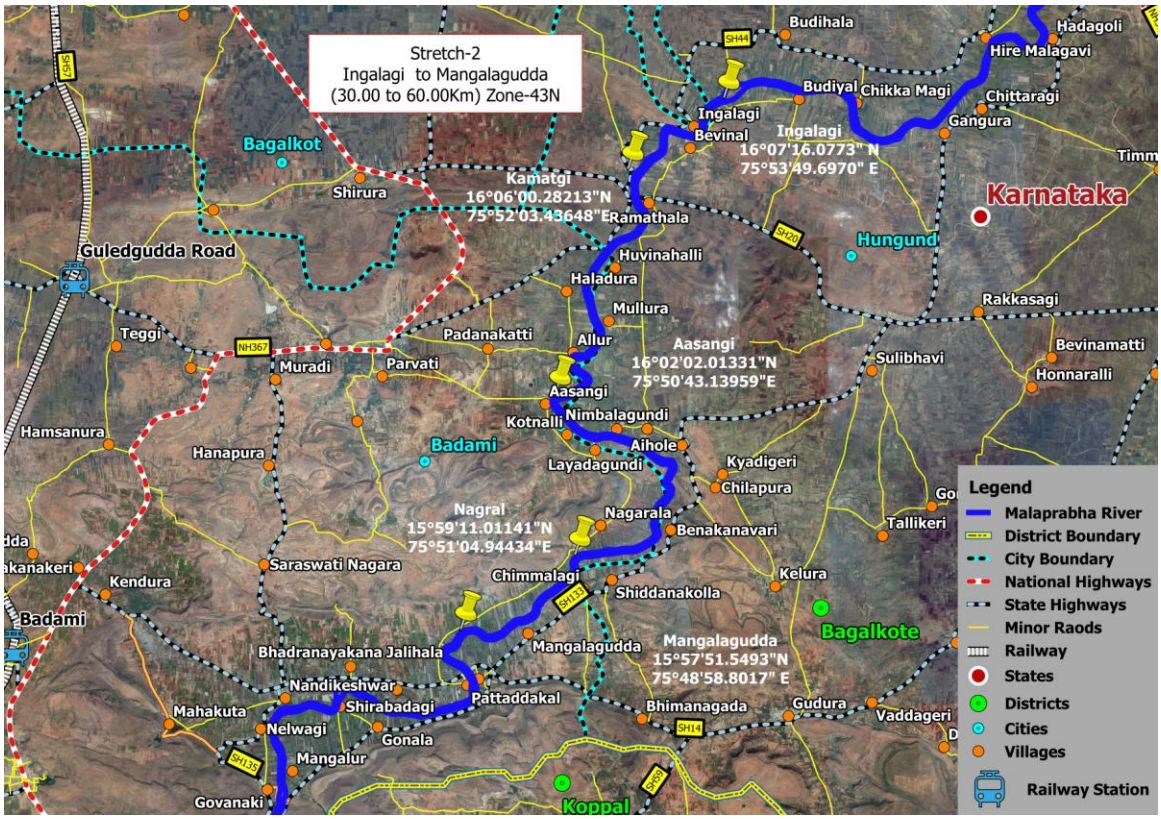


Figure 11 - Stretch-2 Ingalagi to Mangalguda

- **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.

This stretch is between 30.0 to 60.0km chainage of Village Ingalagi to Mangalagudda. Due to protected nature of the river banks the encroachment to the waterways in not found in this stretch.

This stretch is well connected by road. Karnataka State highway 20, 13, 44, in Karnataka passes through Kaladgi. The state highway passing through Hungund connects at about 12km and merged with National Highway 218 (India) passing through Hungund (Sholapur Mangalore) connect at 50km. The nearest railway station is Bagalkot. All these modes of transports connect Kamatagi to Hubli, Bijapur, Raichur and Belgaum by road and connect Kaladgi to Gadag and Bijapur by train.

In this stretch we found 4 well known villages named as Kamatagi, Shirur, Guledgudda, and Aihole. All these villages are well connected by road from Bagalkot and Gudur.

Kamatagi is a Village in Hungund Taluk in Bagalkot District of Karnataka State, India. It belongs to Belgaum Division. It is located 22km towards east from District Bagalkot. 27km from Hungund.

Kamatagi, Budanagad, Ramathal, Injanawari, Huvinahalli, haladur, alur, Kaliguda, Mullur, Padannakati, Kalliguda, Nibmalagundi, Layagundi, Parwat, Nagral, chimallagi are the nearby villages upon this stretch. And all this villages upon this stretch is being well connected to road.

Guddur and Guledgudda are the nearby taluks in this vicinity. And Karnataka state highway numbers 57, 59 are being connected with Bagalkot and Hunagund.

River Malaprabha is being used for cultivation of mainly Bajra in this stretch.

In this stretch we found 7 nos. of Barrages named as Kamatagi Barrage, Haladur Barrage, Asaangi Barrage, Nibalagundi Barrage, Aihole Barrage, Nagral Barrage, Mangalgudda Barrage. Also near to Kamatagi a highway bridge is being constructed on Karnataka state highway no 20 in between Bagalkot to Hungund.

Kamatagi Bridge is constructed upon the Malaprabha River. It starts from Badami Bypass Junction-Pattadakallu road from 2.87km to 21.53km and Pattadakallu-Kamatagi road from 0.00km to 22.28km including additional length for Badami bypass 2.19km in Bagalkot district.

Figure 12 - Kamatagi Bridge (ch. 35.43km)

Kamatagi Barrage is constructed on Malaprabha River. It's a small barrage. Water from the barrage mainly used for the cultivation purpose. Local farmers lift the water from this for cultivation.

Haladur Barrage is constructed across the Malaprabha River. It is located between Habinahulli and haladur. It is main source for irrigation area. Irrigation area covers about 215 hectares.

Aasangi Barrage is a small barrage constructed upon River Malaprabha near to Aasangi Village. It is operational only rainy season. During summer the down and upstream of the barrage is dry in nature.

Nimbulagundi is a small barrage constructed upon Malaprabha River near to Nimbulagundi village. During survey it was observed that the upstream and downstream was having lack of water.

Near Aihole village a barrage is constructed upon Malaprabha River upon this stretch. Though observed some water patches towards downstream of this barrage, but due to negligible depth topographic survey carried out.

Figure 13 - Few water patch downstream Aihole Barrage

Nagaral is a village in Mudhol Taluk in Bagalkot District of Karnataka State, India. It belongs to Belgaum Division. It is located 66km towards west from district headquarter Bagalkot. A barrage is constructed upon Ghataprabha River upon this stretch. It is in between Nagral and Chimulogi village.

Mangalagudda Barrage is being constructed upon Malaprabha River near Mangalguda village. It is a small barrage, few water patches had seen at the downstream of the barrage which was negligible to conduct bathymetric survey.

Bajra, Grapes, beans are the three kind of crop is being cultivated by local villagers upon this stretch

Due to unavailability of water in this stretch hydrography data collection could not obtained. It was found that the river width varies in between 100m.

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	32.2	0.000	0.000	2200	93,928.53	1,375,860.18	-0.300	0.000	2200	120,446.03	1,744,384.10
I	32.2	35.7	0.000	0.000	3500	149,476.18	1,525,336.36	-0.300	0.000	3500	190,534.23	1,934,918.33
I	35.7	40.1	0.000	0.000	4400	188,759.33	1,714,095.69	-0.300	0.000	4400	240,963.61	2,175,881.94
I	40.1	44.2	0.000	0.000	4100	174,285.59	1,888,381.28	-0.300	0.000	4100	223,895.28	2,399,777.22
I	44.2	47.1	0.000	0.000	2900	124,038.43	2,012,419.71	-0.300	0.000	2900	158,186.98	2,557,964.20
I	47.1	49.8	0.000	0.000	2700	115,654.47	2,128,074.18	-0.300	0.000	2700	149,117.59	2,707,081.79
I	49.8	54.4	0.000	0.000	4600	196,301.76	2,324,375.94	-0.300	0.000	4600	249,501.04	2,956,582.83
I	54.4	59.1	0.000	0.000	4700	200,761.28	2,525,137.22	-0.300	0.000	4700	256,959.49	3,213,542.32
I	59.1	60	0.000	0.000	900	38,394.38	2,563,531.60	-0.300	0.000	900	48,540.58	3,262,082.90
II	30	32.2	0.000	0.000	2200	143,055.76	2,095,461.23	-0.300	0.000	2200	177,283.22	2,571,534.08
II	32.2	35.7	0.000	0.000	3500	227,665.48	2,323,126.71	-0.300	0.000	3500	280,812.44	2,852,346.52
II	35.7	40.1	0.000	0.000	4400	287,507.44	2,610,634.15	-0.300	0.000	4400	354,922.94	3,207,269.46
II	40.1	44.2	0.000	0.000	4100	265,463.50	2,876,097.65	-0.300	0.000	4100	329,201.62	3,536,471.08
II	44.2	47.1	0.000	0.000	2900	188,929.36	3,065,027.01	-0.300	0.000	2900	233,227.53	3,769,698.61
II	47.1	49.8	0.000	0.000	2700	176,158.43	3,241,185.44	-0.300	0.000	2700	219,138.40	3,988,837.01
II	49.8	54.4	0.000	0.000	4600	298,992.56	3,540,178.00	-0.300	0.000	4600	368,044.70	4,356,881.71
II	54.4	59.1	0.000	0.000	4700	305,782.76	3,845,960.76	-0.300	0.000	4700	378,170.44	4,735,052.15
II	59.1	60	0.000	0.000	900	58,472.23	3,904,432.99	-0.300	0.000	900	71,675.01	4,806,727.16
III	30	32.2	0.000	0.000	2200	216,219.85	3,166,264.74	-0.300	0.000	2200	258,845.81	3,760,450.98
III	32.2	35.7	0.000	0.000	3500	344,086.31	3,510,351.05	-0.300	0.000	3500	410,461.15	4,170,912.13
III	35.7	40.1	0.000	0.000	4400	434,539.82	3,944,890.87	-0.300	0.000	4400	518,638.69	4,689,550.82
III	40.1	44.2	0.000	0.000	4100	401,224.74	4,346,115.61	-0.300	0.000	4100	480,243.66	5,169,794.48
III	44.2	47.1	0.000	0.000	2900	285,533.19	4,631,648.80	-0.300	0.000	2900	340,836.67	5,510,631.15
III	47.1	49.8	0.000	0.000	2700	266,244.48	4,897,893.28	-0.300	0.000	2700	319,492.28	5,830,123.43
IV	49.8	54.4	0.000	0.000	4600	451,887.66	5,349,780.94	-0.300	0.000	4600	538,402.22	6,368,525.65
IV	54.4	59.1	0.000	0.000	4700	462,171.92	5,811,952.86	-0.300	0.000	4700	552,188.78	6,920,714.43
IV	59.1	60	0.000	0.000	900	88,362.37	5,900,315.23	-0.300	0.000	900	104,938.41	7,025,652.84
IV	30	32.2	0.000	0.000	2200	260,897.69	3,819,684.44	-0.300	0.000	2200	305,442.87	4,441,244.04
IV	32.2	35.7	0.000	0.000	3500	415,192.48	4,234,876.92	-0.300	0.000	3500	484,620.29	4,925,864.33
IV	35.7	40.1	0.000	0.000	4400	524,330.54	4,759,207.46	-0.300	0.000	4400	612,310.60	5,538,174.93
IV	40.1	44.2	0.000	0.000	4100	484,129.94	5,243,337.40	-0.300	0.000	4100	566,679.66	6,104,854.59
IV	44.2	47.1	0.000	0.000	2900	344,533.85	5,587,871.25	-0.300	0.000	2900	402,385.78	6,507,240.37
IV	47.1	49.8	0.000	0.000	2700	321,259.55	5,909,130.80	-0.300	0.000	2700	376,865.22	6,884,105.59
IV	49.8	54.4	0.000	0.000	4600	545,264.00	6,454,394.80	-0.300	0.000	4600	635,835.64	7,519,941.23

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.
IV	54.4	59.1	0.000	0.000	4700	557,669.69	7,012,064.49	-0.300	0.000	4700	651,751.61	8,171,692.84
IV	59.1	60	0.000	0.000	900	106,619.26	7,118,683.75	-0.300	0.000	900	123,981.18	8,295,674.02

Table 30 - Dredging Quantity Details

a) Observed and reduced Bed Profile of the stretch

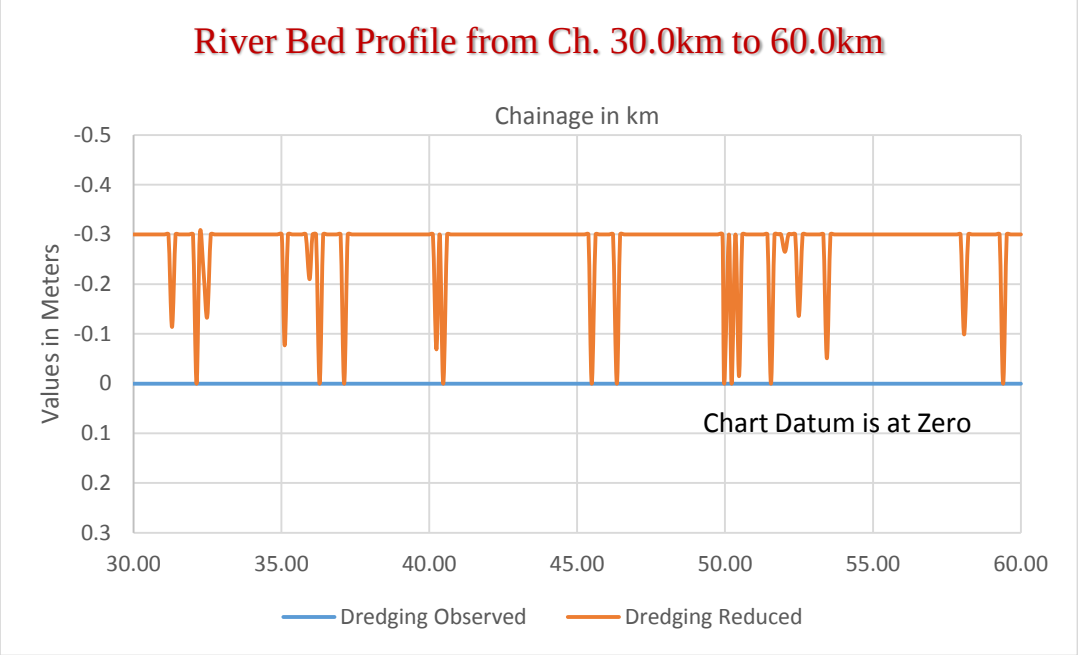


Figure 14 - River Bed Profile

3.3 Sub Stretch 03: Mangalaguda to Katharaki (Chainage 60.0km to 90.0km)

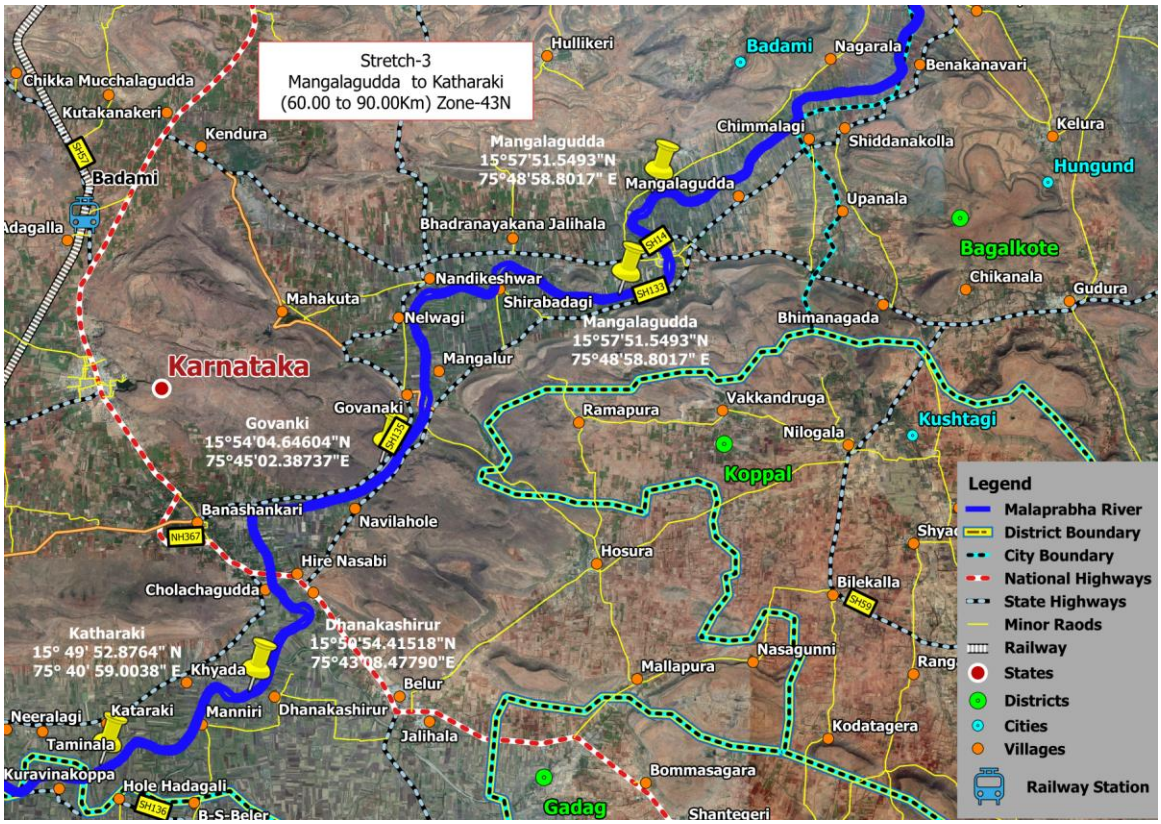


Figure 15 - Stretch-3 Mangalaguda to Katharaki

- **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.

This stretch is between 60.0 to 90.0km chainage of Mangalagudda to Katharaki. Due to protected nature of the river banks the encroachment to the waterways in not found in this stretch.

Pattadkal, Cholchagudda, Dhanshankshirur, Yarragopaa, Govanki are the famous villages under this stretch.

Pattadkal is a village in Badami Taluk in Bagalkot District of Karnataka State, India. It belongs to Belgaum Division. It is located 34km towards south from District Bagalkot.

Dhanakashirur is a small village/hamlet in Badami Taluk in Bagalkot District of Karnataka State, India. It comes under Dhanakashirur Panchayath. It belongs to Belgaum Division.

Govanaki is a small village/hamlet in Badami Taluk in Bagalkot District of Karnataka State, India. It comes under Govanaki Panchayath. It belongs to Belgaum Division. It is located 34km towards south from District Bagalkot.

Yerra Goppa Hal Rail Way Station, Badami Railway Station are the very nearby railway stations to Dhanakashirur. However Hubli Junction Railway Station is major railway station 95km near to Dhanakashirur.

This stretch is surrounded by Ron Taluk towards south, Bagalkot Taluk towards north, Naragund Taluk towards west, Ramdurg Taluk towards west.

Ron, Nargund, Ramdurg, Navalgund are the nearby cities to this stretch. It was being observed that five bridges are being constructed upon Malaprabha River upon this stretch. Also it was observed that 5 numbers of small barrages exists upon this stretch.

Near to Patadkal village a bridge is being constructed upon Karnataka state highway number 14 and 59. Which is the connectivity between Bhimnabad to Badami.

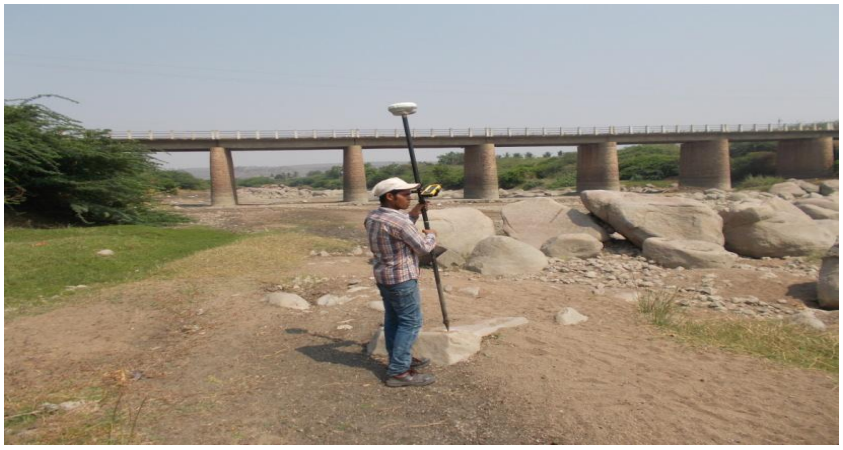


Figure 16 - Patadkal Bridge (ch. 61.78km)

Near Mangalur village under Karnataka state highway a RCC bridge is constructed upon Malaprabha River. It's a small village which is the connectivity between Govanki to Manglur. After two kilometer it merges with state highway no 135 towards Badami.

Figure 17 - Mangalur Bridge (ch. 72.90km)

Near village Gullegudda village a highway bridge constructed upon Malaprabha River near Cholachguda. It's constructed upon state highway number 57 which is connecting between Bagalkot and Badami.

Figure 18 - Cholachagudda Bridge (ch. 80.29km)

Gonal barrage is a small barrage constructed on the Malaprabha River. It is located on Gonal village. It is main source of cultivation.

Mangalur Barrage is a small barrage which has constructed upon Malaprabha River. This barrage water is main source for cultivation. Mangalur, Govanki, Newagi are the nearest village which is coming under this vicinity

Cholachguda is a small barrage constructed upon Malaprabha River at Cholachguda under Badami district. Hirensabi, Chikensabi are the nearby villages to this barrage.

It was observed that near Pattadkal and Cholachguda village the river is being a bit wider of 150 meter. Though there is presence of some big cities under this stretch no industries was being observed. The main source of cultivation is to utilize the rain water. Bajra and sugarcane are the main cultivation under this stretch. The river bank is unprotected in nature. During survey near Cholchgudda a High Tension power line is found crossing the river.

Pattadkal, Gonal, Mangalur, Govanki, Nelwagi, Rampur, Nandikeshwar, Navilahole, Chikkenasbi, Dhankashirur, Jalihal, Cholachagudda are the nearby villages upon this stretch, which are well connected by road ways, to Bagalkot, Badami, and Hungund.

Due to unavailability of water in this stretch hydrography data collection could not obtained. It was found that the river width varies in between 100m to 150m.

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	65.4	0.000	0.000	5400	231,020.28	2,794,551.88	-0.300	0.000	5400	295,594.86	3,557,677.76
I	65.4	73.1	0.000	0.000	7700	329,520.44	3,124,072.32	-0.300	0.000	7700	421,061.70	3,978,739.46
I	73.1	80.8	0.000	0.000	7700	331,293.22	3,455,365.54	-0.300	0.000	7700	421,345.09	4,400,084.55
I	80.8	86.5	0.000	0.000	5700	243,210.11	3,698,575.65	-0.300	0.000	5700	309,198.16	4,709,282.71
I	86.5	90	0.000	0.000	3500	150,318.33	3,848,893.98	-0.300	0.000	3500	193,087.24	4,902,369.95
II	60	65.4	0.000	0.000	5400	351,882.41	4,256,315.40	-0.300	0.000	5400	434,915.97	5,241,643.13
II	65.4	73.1	0.000	0.000	7700	501,011.12	4,757,326.52	-0.300	0.000	7700	619,103.24	5,860,746.37
II	73.1	80.8	0.000	0.000	7700	504,612.07	5,261,938.59	-0.300	0.000	7700	621,165.48	6,481,911.85
II	80.8	86.5	0.000	0.000	5700	370,440.97	5,632,379.56	-0.300	0.000	5700	455,758.42	6,937,670.27
II	86.5	90	0.000	0.000	3500	228,957.86	5,861,337.42	-0.300	0.000	3500	283,849.05	7,221,519.32
III	60	65.4	0.000	0.000	5400	531,836.97	6,432,152.20	-0.300	0.000	5400	635,031.16	7,660,684.00
III	65.4	73.1	0.000	0.000	7700	755,408.47	7,187,560.67	-0.300	0.000	7700	902,189.18	8,562,873.18
III	73.1	80.8	0.000	0.000	7700	762,668.96	7,950,229.63	-0.300	0.000	7700	908,244.64	9,471,117.82
III	80.8	86.5	0.000	0.000	5700	559,885.78	8,510,115.41	-0.300	0.000	5700	666,433.06	10,137,550.88
III	86.5	90	0.000	0.000	3500	346,041.99	8,856,157.40	-0.300	0.000	3500	413,989.52	10,551,540.40
IV	60	65.4	0.000	0.000	5400	641,728.77	7,760,412.52	-0.300	0.000	5400	749,583.41	9,045,257.43
IV	65.4	73.1	0.000	0.000	7700	911,180.83	8,671,593.35	-0.300	0.000	7700	1,064,571.60	10,109,829.03
IV	73.1	80.8	0.000	0.000	7700	920,267.61	9,591,860.96	-0.300	0.000	7700	1,072,554.85	11,182,383.88
IV	80.8	86.5	0.000	0.000	5700	675,574.18	10,267,435.14	-0.300	0.000	5700	787,056.76	11,969,440.64

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.
IV	86.5	90	0.000	0.000	3500	417,546.50	10,684,981.64	-0.300	0.000	3500	488,513.05	12,457,953.69

Table 31 - Dredging Quantity Details

a) Observed and reduced Bed Profile of the stretch

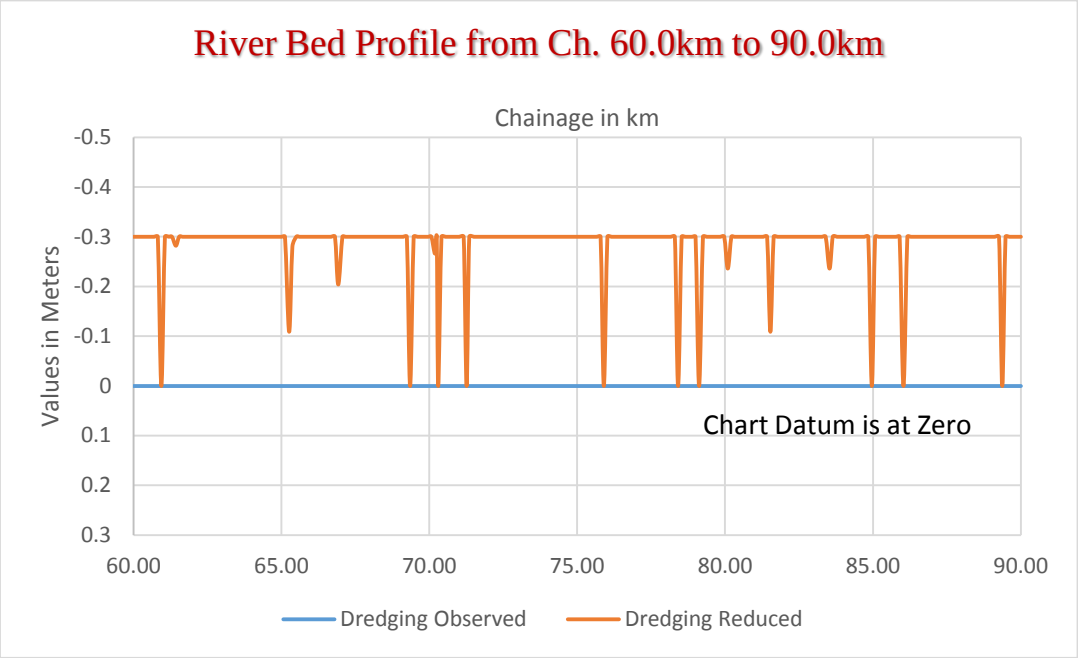


Figure 19 - River Bed Profile

3.4 Sub-Stretch 04: Katharaki to Jakanuru (Chainage 90.0km to 93.5km)

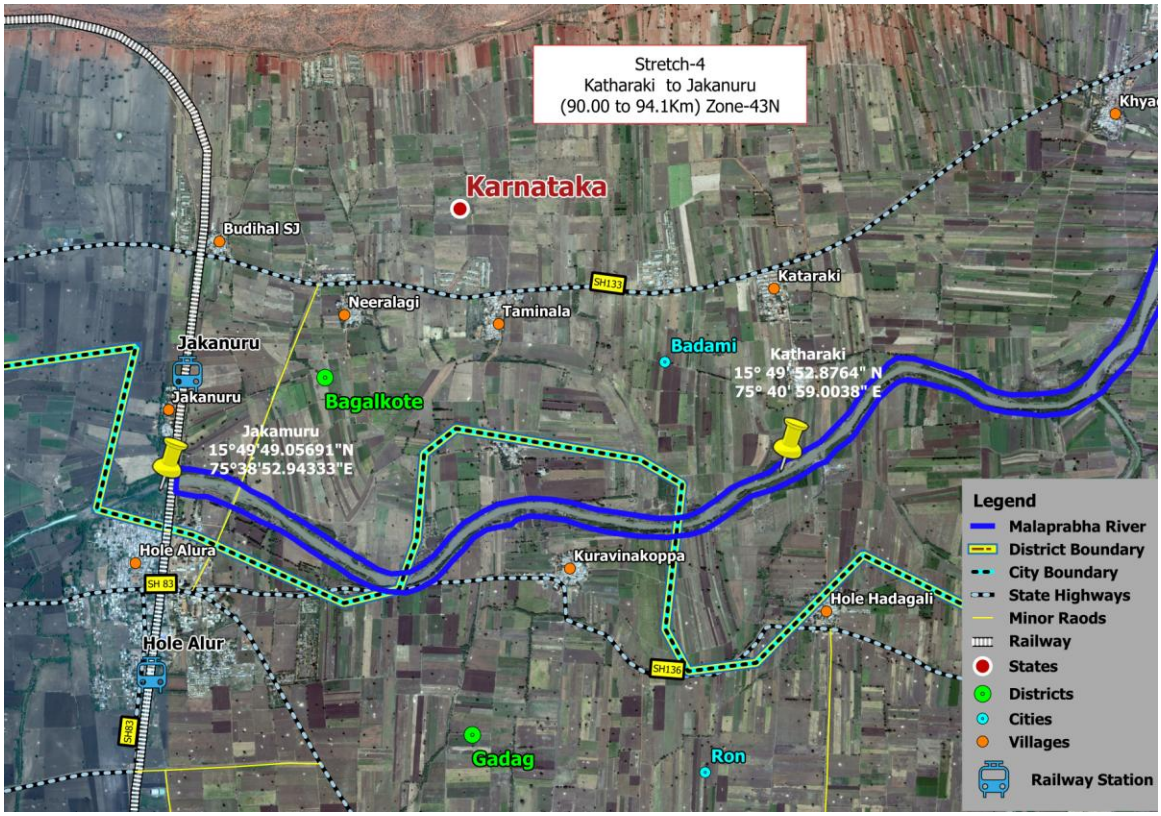


Figure 20 - Stretch-4 Katharaki to Jakanuru

- **Bathymetry Survey**
  a) No bathymetric survey is conducted due to the unavailability of water
- **Topographic Survey**
  b) 3.5 km of the length of the stretch for which the topographic survey has been carried out.

This stretch is between 90.0 to 93.5km chainage of Katharaki to Jakanuru. Due to protected encroachment of the river bank waterway is not possible.

Manneri is the only one barrage present in this stretch. This is used by farmers to their irrigation purposes. During monsoon it is used for own lift by farmers. Badami is the nearby city upon this stretch. Karnataka state highway number 63, 83, 133, 14, 136 is being surrounded by this stretch. Thaminal Kyada, Katharaki, Hebbali, Hole manur, Hungundi, Madalagiri, Jalihal, Thaminal are the nearby villages upon this stretch.

Holihosur (Jakanuru) is a village in Bylahongal Taluk in Belgaum District of Karnataka State, India. It belongs to Belgaum Division. It is located 32km towards East from District Belgaum. 11km from Bylahongal.

This stretch is surrounded by Kadrolli (6km), M.k.hubli (6km), Dastikoppa (6km), Tigadi (8km), Marganakoppa (10km) are the nearby villages to Holihosur. And also Khanapur Taluk towards west, Belgaum Taluk towards west, Parasgad Taluk towards east, Dharwad Taluk towards south.

Badami, Jalihal are the nearby railway station upon this stretch.

Near village Jakanuru a small bridge is constructed. Its old bridge is being connected from Badami to Holealur. This bridge is connecting to the Karnataka state highway 136 to 83.

Figure 21 - Jakanuru Bridge (ch. 93.22km)

Also it was found that a railway bridge is being constructed upon Malaprabha River, which is in between Jakanuru to Holealur.

Figure 22 - Jakanuru Railway Bridge (ch. 93.59km)

Sugarcane and Bajara crops were being found cultivated by local people, at both of the banks of this stretch. Though Badami is a famous place for tourism, there is no major industries found in this 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	90	93.5	0.000	0.000	3500	150,248.11	3,999,142.09	-0.300	0.000	3500	191,502.38	5,093,872.33
II	90	93.5	0.000	0.000	3500	228,844.22	6,090,181.64	-0.300	0.000	3500	281,504.81	7,503,024.13
III	90	93.5	0.000	0.000	3500	345,871.61	9,202,029.01	-0.300	0.000	3500	410,995.80	10,962,536.20
IV	90	93.5	0.000	0.000	3500	417,341.07	11,102,322.71	-0.300	0.000	3500	485,418.77	12,943,372.46

Table 32 - Dredging Quantity Details

a) Observed and reduced Bed Profile of the stretch

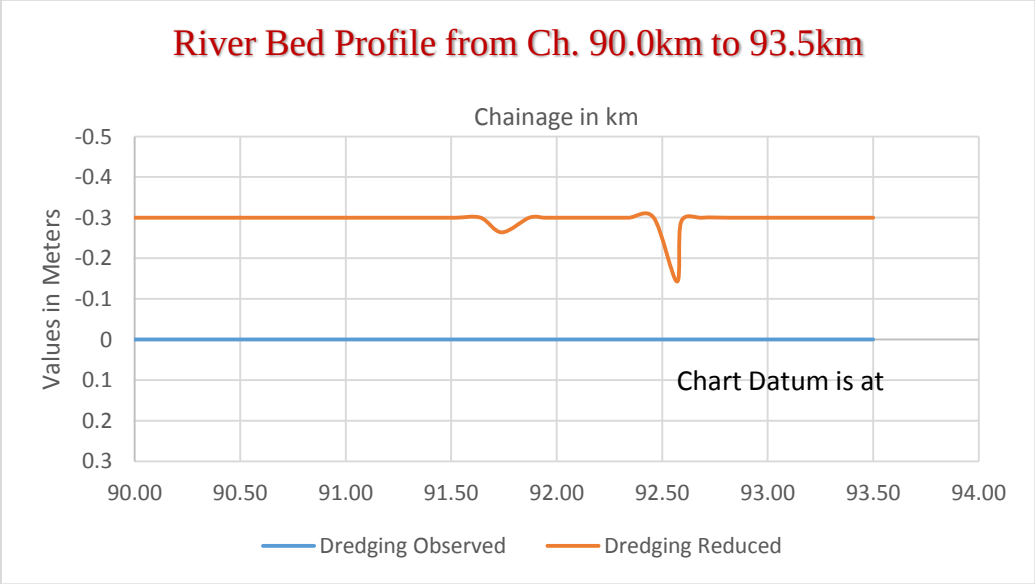


Figure 23 - River Bed Profile

3.5 Other aspects of waterway

3.5.1 Details of Irrigation Canals and Outlets

Cholachguda Barrage is the main source of cultivation. Manneri Barrage is the main source for irrigation area. Irrigation area covers about 465 hectares.

3.5.2 Irrigation/Drinking water

Malaprabha Dam is the shortest dam in Karnataka built across Malaprabha River. It is situated in a narrow gorge called 'Peacock gorge,' the length of the dam is about 155 m. This dam is designed mainly to meet the irrigation and drinking

water requirements of the people of Belgaum, Dharwad, Gadag, and Bagalkot. Malaprabha Dam is located 3km from Saundatti Yellamma Temple. Saundattti in Belgaum District is 38km from Dharwad, 58km from Hubli and 112km from Belgaum.

3.5.3 Crops

In this river stretch, agriculture is the main occupation of the people in the district Bagalkot. The geographical area is 658777ha and the newly sown area is 469783ha which us 71.3 of the geographic area. The major crops grown area Jowar, Maize, Wheat, Bajra, sugarcane, sunflower, pulses, grapes and groundnut. Net Irrigated area is 212872 ha which constitutes 45.3% of the newly sown area and the remaining 54.7 of the rain fed.

Out of the net irrigated area, nearly 60% is through surface water resources and the remaining 40% through groundwater. Almatti Dam is a major dam built across the Krishna at Alamatti in Basavanabagewadi taluk of Bijapur district, which provides irrigation facility of Karnataka. Thus the Krishna the Malaprabha and the Malaprabha canals systems cater to the irrigation needs in parts of Hunagund and Badami taluks of the district.

3.5.4 Industries

In this stretch of Malaprabha River, Bagalkot is main hub for cement, agriculture, sugar, silk and handloom industries. It is one of the two handloom units (other is Dharwad) in India from where woven khadi is obtained and transported to Karnataka Khadi Gramodyoga Samyukta Sangha based in Hubli (which is the only licensed flag production and supply unit in India) Flag of India. Many new industries are planning to begin in Bagalkot. New cement industries have been registered and are waiting for the permission to commissioning. There are other small-scale industries like Cement Pipe Industry which produce cement pipes, Bangle Industries which produce bangles, Match Stick Industries, Agarbatti Industries, and Plastic Bag Industries etc. in Bagalkot.

At the outskirts of Bagalkot city there are many small-scale industries set up. These come under the Vidyagiri area of Bagalkot city, which is the latest extension of the city. Small-scale industries like Ceramic Tile Industry, tyre industry, Stone Cutting and polishing Industry, milk Dairy etc. are running successfully.

Badami Sugars Ltd. at Badami, Karnataka is 0.83km away from Yerra Goppa Halt Station. Shree Kedarnath Sugar Agro Products Ltd., at Jalageri is 2.09km away from SH44

3.5.5 Important cities/towns

The Major town situated near to Malaprabha River is Bagalkot on the starting chainage and Badami at the end chainage. These areas are well connected by road and public transport system in the cities.

3.5.6 Road Network

3.5.6.1 National Highway

The National Highway NH367 which passes through Gulleguda to Jalihal at district Bagalkot, Karnataka. The National Highway NH50 passes through Hungund to Bijapur

3.5.6.2 State Highway

The state highway passing through Malaprabha River are as follows:

Sl. No.	State Highway Number	Passage through Districts	Passage through Cities	Passage
1	SH44	Bagalkot	Hungund	Hungund to Shirur
3	SH20	Bagalkot	Hungund	Shirur to Aminagad
4	SH83	Bagalkot	Shirur	Rona to Jaknuru
5	SH136	Bagalkot	Gulledgudda	Holealur to Jaknuru
6	SH133	Bagalkot	Badami	Cholachgudda to Jalihal

Table 33 - State Highways

3.5.6.3 Major District Roads

Bagalkot is well connected by road to other cities of the state like Hubli, Belgaum, and Bijapur etc. There are a number of KSRTC buses playing between Bagalkot and neighboring cities. Regular KSRTC and MSRTC buses also ply between Bagalkot and Sholapur.

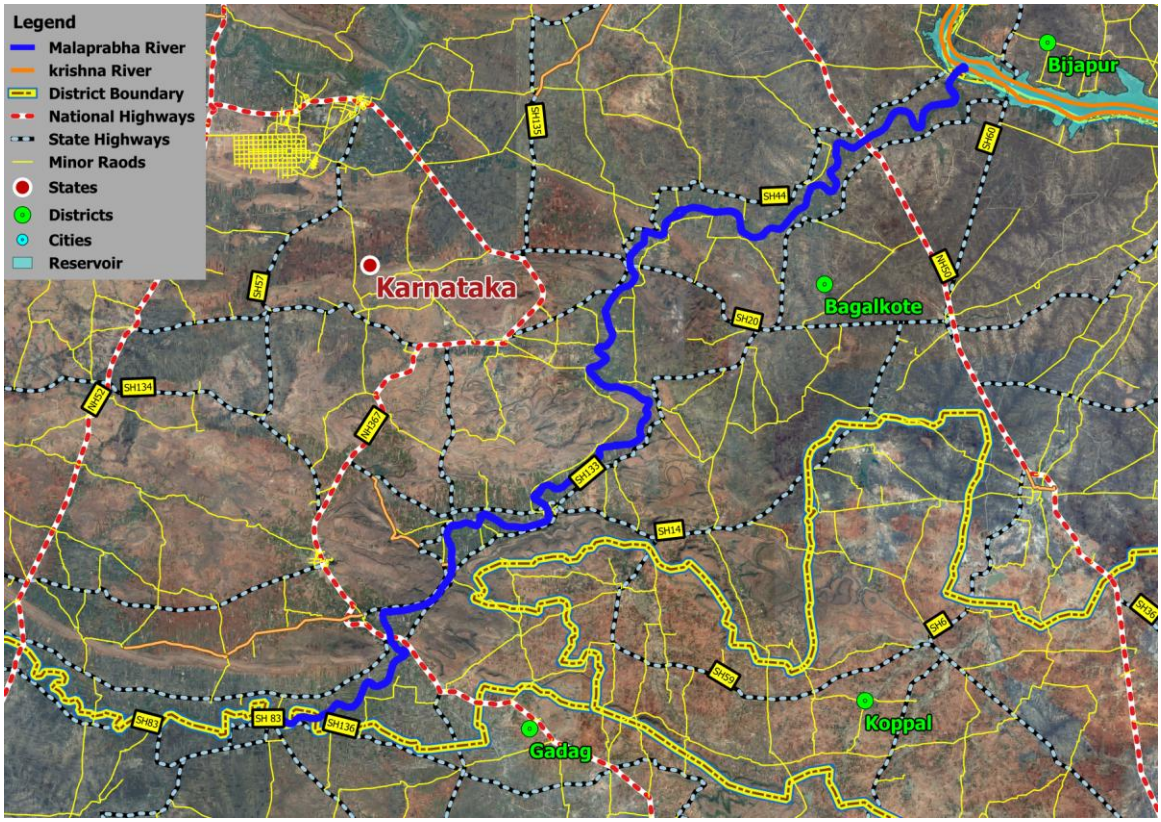


Figure 24 - Road Network

3.5.7 Railway Network

In this stretch Bagalkot and Badami is connected by a broad gauge railway line (Badami to Bagalkot line) to Bijapur on the South Western Railway (SWR) towards the north and to Hubli junction on the South Western Railway towards the south. Bagalkot is connected with direct trains to Bijapur, Solapur, Gadag, Dharwad, Bellary, Mysore, Bengaluru, Hubli, Hyderabad, Mumbai and Ahmedabad. Bagalkote is under South Western Railway (SWR)

The nearest major airports to Bagalkot are the Belgaum Airport which is 121kms and the Dabolim Airport in Goa which is 218km from Bagalkot.

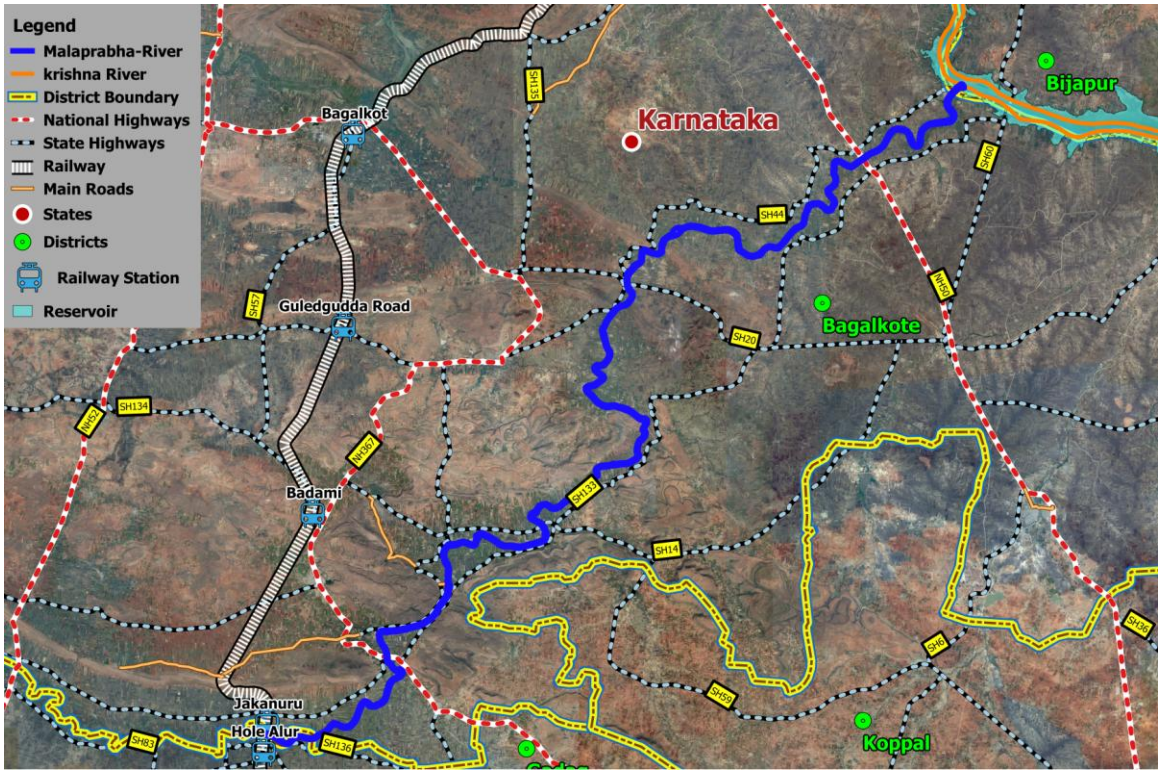


Figure 25 - Railway Stations

3.5.8 Land Use

This river stretch is under Bagalkot District, the land use is divided into Forest area, Cultivation area and Net area Sown.

- Geographical area – 658.9 ha
- Cultivable area – 2.0 ha
- Forest area – 81.1 ha
- Land under nonagricultural use – 28.80 ha
- Permanent pastures – 3.4 ha
- Cultivable wasteland – 2.2 ha
- Barren and uncultivable land – 24.8ha

3.5.9 Construction Material

The Bagalkot district is having a cluster of cement industries and limestone. The distinct stone is popularly known as "Malakheda Stone".

3.5.10 Conditions of banks

River Bank is unprotected along the Malaprabha River.

3.5.11 Jetties and Terminals

Lack of the jetties and Terminals along the River.

3.5.12 Cargo Movement

Lack of the cargo movements along the River.

3.5.13 Passenger Ferry Services

No Passenger Ferry Services available in the River.

3.5.14 Historic importance

Historically it is the home land of great Chalukya Dynasty. Aihole is place described as the laboratory for architecture rather university of Indian architecture. Badami is famous internationally for caves carved in monolithic single stone in the period of Immadi Pulakeshi-I along with historical famous temples of Pattadakal, Mahakuteshwar temple in Mahakuta, Shivayogmandir and Banashankari temple in Badami. Mudhol is the birth place of great poet "Ranna". Bilagi taluka Galagali village is famous for Galava Maharshi. Jamakhandi was the capital city during the period of "Patawardhana" Kingdom.

Kudala Sangama the place where the great social revolutionist of 12th century lord "Basavanna" was educated. The galaxy of sharana's lived in this Holy Land is itself a matter of pride.

Malaprabha River meets with Krishna River at Kudala Sangama, which is a very holy place.

Figure 26 - Kudala Sangama Temple at merging point of Malaprabha and Krishna (ch. 0.0km)

3.5.15 Tourism

In this stretch Bagalkot town is the district headquarters of the Bagalkot district situate in Karnataka State. And Badami district situated in Karnataka state.

Bagalkot is mostly preferred by travelers. The go to destination for types of travelers, be it family, kids and couples, Bagalkot is, however, mostly preferred. The best season or months to visit places in Bagalkot are February, November, December. There are 37 tourist places in Bagalkot. The main attraction here is Aihole, Badami, and Pattadakallu which are known for their historical monuments and temples.

Annual tourist footfalls in Bagalkot district is nearly 35 lakhs per year (2014 tourist data). Thus, the average tourist footfalls in each tourist destination will be 5 lakhs.

Kudala Sangama as well as the Giri Sagar are the tourism place, where people take bath in the river to wash away their faultiness at the merging point of Malaprabha and Krishna.

In this stretch Badami is known for rock sculpture and temple architecture. The city was founded by a Chlukya ruler named Pulakesi in the 6th century. The Chalukyas are credited with building many cave temples here between the 6th and the 8th centuries. A few tourist places of interest of Badami include the Badami Fort, a Buddhist Cave.

Pattadkal is a great centre of Chalukyan art, noted for its temples and inscriptions. According to inscriptions, the place was known by the names Kisuvolal (Red Town) or Pattada Kisuvolal. The literary work Hammira Kavya of 1540. Quotes the place as Pattashilapura and Hammirapura.

Early inscriptions call this town Āryapura and Ārya-vole. According to mythology Aihole is the place where Parashurama washed his axe after killing the Kshatriyas. Aihole has historical significance and is called as cradle of Hindu rock architecture (Cradle of Indian architecture). Many temples and caves of historical importance can be found at Aihole.

Badami is a small town located in Karnataka. It is known for rock sculpture and temple architecture. The town was originally known as Vatapi and was the seat of government of the Badami Chalukyas in the 6th century AD. Badami was the

Chalukya Dynasty's capital from the 6th to 8th century AD. The city was founded by a Chlukya ruler named Pulakesi in the 6th century.

Banashankari Amma Temple or Banashankari temple is a Hindu shrine located at Cholachagudd near Badami, in Bagalkot district, Karnataka, India. The temple is popularly called Banashankari or Vanashankari since it is located in the Tilakaaranya forest. The temple deity is also called the Shakambhari an incarnation of the goddess Parvati.

The temple attracts devotees from Karnataka as well as the neighbouring state of Maharashtra. The original temple was built by the 7th century Kalyani Chalukya kings, who worshipped goddess Banashankari as their tutelary deity. The current 18th century structure was built by a Maratha chieftain. The temple celebrates its annual festival called Banashankari jatre, in the months of January or February. The festival comprises cultural programs, boat festival as well as a Rath yatra, when the temple goddess is paraded around the city in a chariot.

Figure 27 - Tourist places near to Malaprabha River.

4 Terminals

4.1 Details of Terminal survey carried out

Malaprabha River survey stretch could not find any adequate place for terminal proposal, 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.

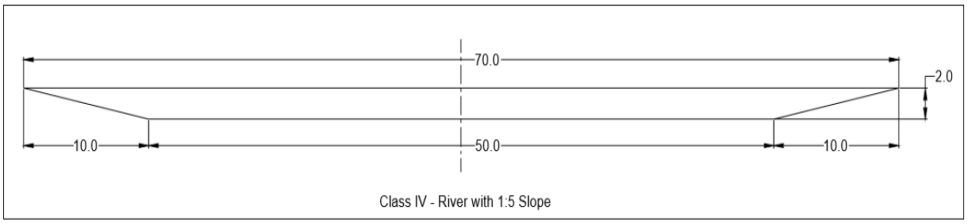
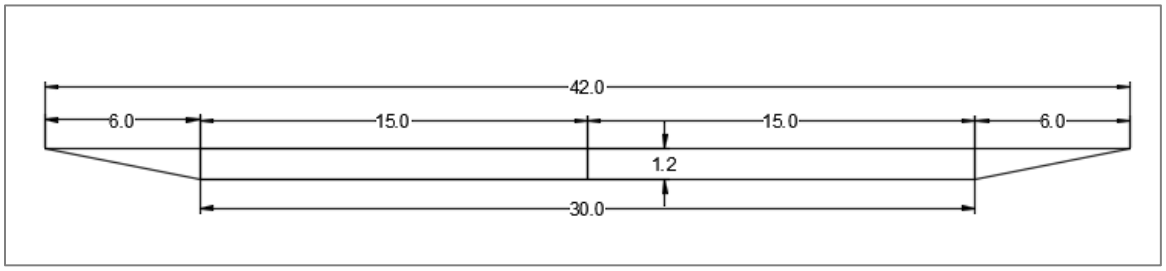


Figure 28 - Fairway Channel Dimensions 50m X 2m

5.2 Calculation of Dredging Quantity

The dredge volume calculations were accomplished using the HYPACK dredge volume computation utility. A channel profile of dimensions mentioned at para 2.3.9 in RFP. For clarity and ease of calculations, the complete channel profile was divided into segments of 1km each (enclosed at Annexure-3). The Tin v/s Channel with Hypack Standard volume algorithm was used to calculate the dredge volume in each segment. The stretch wise summary of the dredge volume is as follows:

5.2.1 Class I

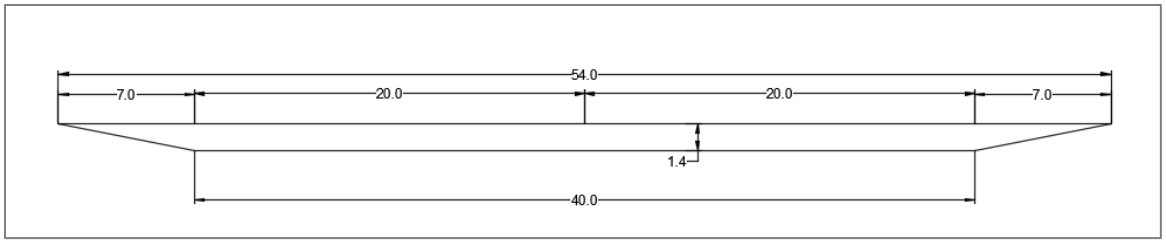


Location		Chainage (km)		Observed					Reduced w.r.t. Sounding Datum				
From	To	From	To	Min. Depth (m)	Max. Depth (m)	Length of Shoal (m)	Dredging Qty. (cu.m.)	Accumulated Qty.	Min. Depth (m)	Max. Depth (m)	Length of Shoal (m)	Dredging Qty. (cu.m.)	Accumulated Qty.
Kudal Sangam	Ingalagi	0	30	0.000	0.000	30000	1,281,931.65	1,281,931.65	-0.300	0.000	30000	1,623,938.07	1,623,938.07

Ingalagi	Mangalguda	30	60	0.000	0.000	30000	1,281,599.95	2,563,531.60	-0.300	0.000	30000	1,638,144.83	3,262,082.90
Mangalguda	Katharaki	60	90	0.000	0.000	30000	1,285,362.38	3,848,893.98	-0.300	0.000	30000	1,640,287.05	4,902,369.95
Katharaki	Jakanuru	90	93.5	0.000	0.000	3500	150,248.11	3,999,142.09	-0.300	0.000	3500	191,502.38	5,093,872.33
					Total	**93500**	**3,999,142.09**	**3,999,142.09**		**Total**	**93500**	**5,093,872.33**	**5,093,872.33**

Table 34 - Class I - Stretch wise Dredge Volumes

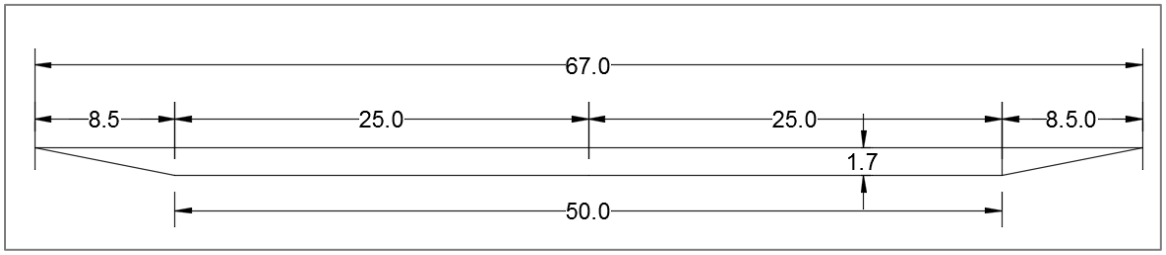
5.2.2 Class II



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.**
Kudal Sangam	Ingalagi	0	30	0.000	0.000	30000	1,952,405.47	1,952,405.47	-0.300	0.000	30000	2,394,250.86	2,394,250.86
Ingalagi	Mangalguda	30	60	0.000	0.000	30000	1,952,027.52	3,904,432.99	-0.300	0.000	30000	2,412,476.30	4,806,727.16
Mangalguda	Katharaki	60	90	0.000	0.000	30000	1,956,904.43	5,861,337.42	-0.300	0.000	30000	2,414,792.16	7,221,519.32
Katharaki	Jakanuru	90	93.5	0.000	0.000	3500	228,844.22	6,090,181.64	-0.300	0.000	3500	281,504.81	7,503,024.13
					Total	**93500**	**6,090,181.64**	**6,090,181.64**		**Total**	**93500**	**7,503,024.13**	**7,503,024.13**

Table 35 - Class II - Stretch wise Dredge Volumes

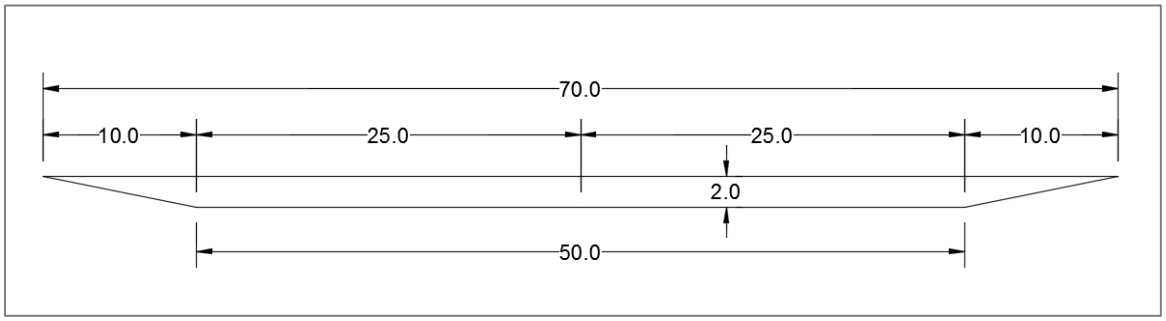
5.2.3 Class III



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.
Kudal Sangam	Ingalagi	0	30	0.000	0.000	30000	2,950,044.89	2,950,044.89	-0.300	0.000	30000	3,501,605.17	3,501,605.17
Ingalagi	Mangalguda	30	60	0.000	0.000	30000	2,950,270.34	5,900,315.23	-0.300	0.000	30000	3,524,047.67	7,025,652.84
Mangalguda	Katharaki	60	90	0.000	0.000	30000	2,955,842.17	8,856,157.40	-0.300	0.000	30000	3,525,887.56	10,551,540.40
Katharaki	Jakanuru	90	93.5	0.000	0.000	3500	345,871.61	9,202,029.01	-0.300	0.000	3500	410,995.80	10,962,536.20
					Total	**93500**	**9,202,029.01**	**9,202,029.01**		**Total**	**93500**	**10,962,536.20**	**10,962,536.20**

Table 36 - Class III - Stretch wise Dredge Volumes

5.2.4 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.
Kudal Sangam	Ingalagi	0	30	0.000	0.000	30000	3,558,786.75	3,558,786.75	-0.300	0.000	30000	4,135,801.17	4,135,801.17
Ingalagi	Mangalguda	30	60	0.000	0.000	30000	3,559,897.00	7,118,683.75	-0.300	0.000	30000	4,159,872.85	8,295,674.02
Mangalguda	Katharaki	60	90	0.000	0.000	30000	3,566,297.89	10,684,981.64	-0.300	0.000	30000	4,162,279.67	12,457,953.69
Katharaki	Jakanuru	90	93.5	0.000	0.000	3500	417,341.07	11,102,322.71	-0.300	0.000	3500	485,418.77	12,943,372.46
					Total	**93500**	**11,102,322.71**	**11,102,322.71**		**Total**	**93500**	**12,943,372.46**	**12,943,372.46**

Table 37 - Class IV - Stretch wise Dredge Volumes

6 Conclusion

The aim is to undertake bathymetric survey, 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 Malaprabha River is 93.5km in length and is not being explored for any navigational possibility. The survey stretch starts from the Kudala Sangama to Jakanur. The stretch wise minimum and maximum width range, average width and average slope of the waterway are as below:-

Sl. No.	Location		Chaiange (km)		Width Range of the waterway		Average Width	Average slope (in m/km)
	From	To	From	To	Min	Max		
1	Kudala Sangam	Ingalagi	0	30	99.10	429.03	130.06	1 : 0.292
2	Ingalagi	Mangalguda	30	60	99.51	294.51	124.56	1 : 0.612
3	Mangalguda	Katharaki	60	90	96.14	252.44	125.48	1 : 0.627
4	Katharaki	Jakanuru	90	93.50	104.63	155.29	120.53	1 : 2.388

Table 38 - 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:-

Reduced w.r.t. CD Dredging Values					
Class	**0 – 30 (km)**	**30 – 60 (km)**	**60 – 90 (km)**	**90 – 93.50 (km)**	**Total**
I	1,623,938.07	1,638,144.83	1,640,287.05	191,502.38	**5,093,872.33**
II	2,394,250.86	2,412,476.30	2,414,792.16	281,504.81	**7,503,024.13**
III	3,501,605.17	3,524,047.67	3,525,887.56	410,995.80	**10,962,536.20**
IV	4,135,801.17	4,159,872.85	4,162,279.67	485,418.77	**12,943,372.46**

Table 39 - 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 with Navigational channel & Navigational lock is required to maintain the minimum depth required for navigation and regulate the water level in the river. No cargo movement or passenger movement is envisaged through this river. The class-wise details of reduced depth at different stretches of the waterways are as tabulated below:-

Sl.No.	**Chaiange (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	93.5	**3.5**	100%	0	0 %	0	0 %	0	0 %	0	0 %
Total			**93.5**	**100%**	**0**	**0 %**	**0**	**0 %**	**0**	**0 %**	**0**	**0 %**

Table 40 - Class-wise availability of reduced depth of the waterway

6.3 Modifications/ improvement measures

Improvement measures for design and depth improvement are required on 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 Malaprabha River. The limitation for improvement of navigational aspects includes the gradient of the river, non-availability of the water throughout the period and presence of various

Barrages. 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	7	4	0	**03 HT line is less than required 19m**
II	8	5		
III	8	5		
IV	8	5		

Table 41 - 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 year. The river banks are well connected with the road network and major distribution of settlements are there near to Bagalkot and Badami Cities. The road is near parallel on both sides throughout the river stretch. On discussion with the Assistant Engineers of Minor Irrigation, Bagalkot, Karnataka, no scope for the future development of the river was recommended for navigational purpose. There are no major industries present in the area.

The purpose of the survey was for assessing the river stretch from Kudala Sangama to Jakanuru for the development of water transport facilities in the new National Waterway (NW-67). 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