FINAL FEASIBILITY REPORT ON DETAILED HYDROGRAPHIC SURVEY TONS RIVER FROM GANGA CONFLUENCE AT SIRSA (CH 0 KM), TO CHAKGHAT BRIDGE ON NATIONAL HIGHWAY 27 (CH 73.250 KM).

NATIONAL WATERWAY NO- 103

VOLUME- I

Submitted To

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SIPL would also like to thank **Shri Pravir Pandey, IA & AS, Chairman, Shri Alok Ranjan, ICAS, Member (Finance) and Shri Shashi Bhushan Shukla, Member (Traffic).**

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List of Abbreviations

SD	Sounding Datum
CD	Chart Datum
RTK	Real time Kinematic
DGPS	Differential Global Positioning Systems
TS	Total Station
GPS	Global Positioning Systems
BM	Bench Mark
MSL	Mean Sea Level
RL	Reference Level
HFL	Highest Flood Level
HTL	High Tension Line
CH	Chainage
WGS	World Geodetic System
UTM	Universal Transverse Mercator
LAD	Least Available Depth

SALIENT FEATURES AT A GLANCE

REGION-VII				
Consultant: Strabag India Pvt Ltd.				
Name	**TONS RIVER**		**NW- 103**	
Length	73.250 km FROM GANGA CONFLUENCE AT SIRSA TO CHAKGHAT BRIDGE ON NATIONAL HIGHWAY 27			
State	Uttar Pradesh			
Survey Period	08th February 2016 to 18th February 2016			
Tidal / Non-tidal	Non Tidal			
Availability of Reduced Depth (mtrs)				
	0-25KM	**25-50KM**	**50-73.25KM**	**TOTAL**
<1.2	8.15	7.1	13.5	28.75
1.2-1.4	5.6	3.5	5.25	14.35
1.5-1.7	3.85	5.2	2.1	11.15
1.8-2	3.1	6.1	1.2	10.4
>2.0	4.3	3.1	1.2	8.6
TOTAL	25	25	23.25	73.25
Average Slope per KM (m)	0.155	0.356	0.758	
Width Range (m)	170	190	230	
Bathy Survey conducted for Length (Km)	**25**	**25**	**16.25**	**66.25**
Dredging Quantity (Observed) cu.m.				
				TOTAL
Class 1	81,493.94	95,811.33	1,31,399.15	3,08,704.42
Class 2	2,03,826.47	2,28,997.99	2,51,131.09	6,83,955.55
Class 3	4,94,465.34	4,83,835.19	4,42,544.41	14,20,844.94
Class 4	7,89,916.86	7,20,628.39	6,15,666.82	21,26,212.07
Dredging Quantity (Reduced) cu.m.				
				TOTAL
Class 1	2,98,217.15	4,41,591.99	3,41,422.70	10,81,231.84
Class 2	5,15,652.67	7,61,774.92	5,76,219.71	18,53,647.30
Class 3	9,22,873.79	12,03,617.23	9,26,762.44	30,53,253.46
Class 4	12,87,341.71	15,63,833.20	12,20,725.81	40,71,900.72
No. of Bridge				

8				
Clearances less than Class (no.)				
Class	**Horizontal**	**Vertical**		
Class 1	4	5		
Class 2	7	5		
Class 3	8	7		
Class 4	8	7		
No. of Dams, Barrages, Weirs, Anicut etc.				
2				
Chainage (km)	**Structure Name**		**Location**	**Remarks**
68.03	Tons Aqueduct		Tons Aqueduct	**Syphon**
69.4	Tons Barrage		Gargata	
Number of days Water not available				
CWC Gauge	Meja Road			
Chainage (km)	10.21			
	Yearly data	Yearly data up to 2007.		
Cargo availability				
Nil				
Passenger Movement				
Nil				
Present IWT use				
Nil				
Recommendation of the Consultant				
Meja super thermal power plant (NTPC) at Ch.33.5 km under construction near about 900m distance from the River. No Existing Industry along Waterway. Rock at Ch.39.8 km and further steep gradient in upstream. There are no any existing Ghats, Jetty, Terminal and existing facilities for Navigation. There is no existing Cargo Movement presently.				
Viable or not-viable				
Further discussion may be carried out with NTPC for their requirement. Accordingly, development work may be explored up to 35 kms.				

(Signature)

Date: Name of Consultant

SECTION – I: INTRODUCTORY CONSIDERATIONS

1.1 **River Course**. Inland Waterways Authority of India has awarded contract of detailed Hydrographic Survey and feasibility report in Region VII, the National Waterways including assessment of river training works and further development cost, for eco-friendly navigation in the waterways, to Strabag India Pvt. Ltd.

The Tamsa River (also known as the Tons River) is a tributary of the Ganges flowing through the Indian states of Pradesh and Uttar Pradesh. The tons rises in a tank at Tamakund in the kaimur range at an elevation 0f 610 meters (2,000 ft.).It flows through the fertile district of satna and Rewa at the edge of the purwa plateau, the tons and its tributaries from a number of waterfalls. The river receives the Belan in U.P and Join the Ganga at sirsa, about 311 kilometers (193mi) downstream of the confluence of the Ganga and Yamuna. The total length of the river is 264 kilometers (164 mi). The tons river while descending through the rewa plateau and draining northwards makes a vertical fall of 70m known as purwa fall. Some of the more notable waterfalls on tributaries of the tons river, as they come down from rewa plateau are chachai falls (127m) on the Beehar River.

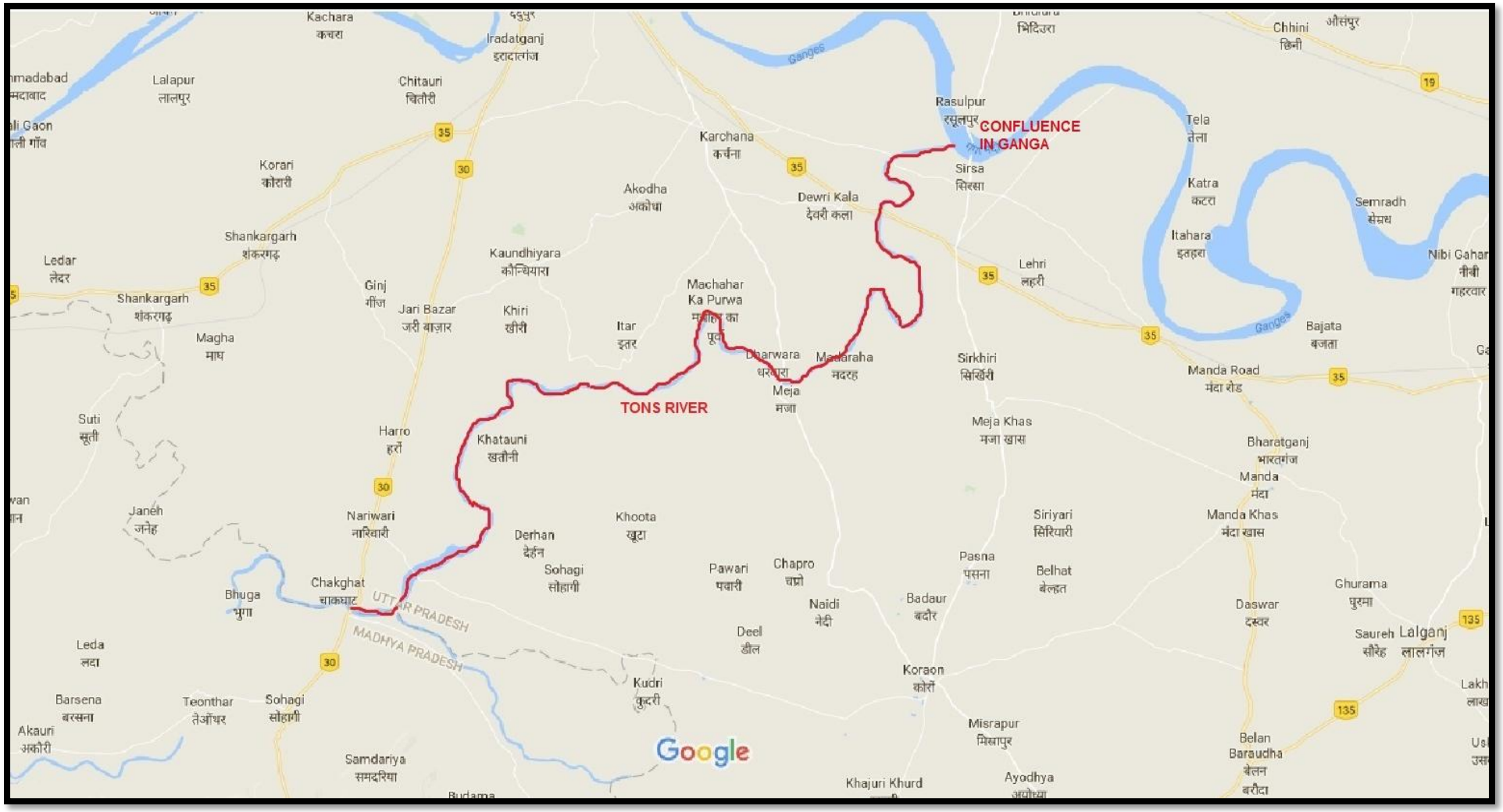
The feasibility study of Tons River being envisaged for the development the waterway navigation. It is expected to boost the much needed irrigation projects and water way transportation in and around the river, which will provide a better living standards of the local populace

This river has also got importance in Hinduism. As this is the river on which Rama spent his first night during the 14 years of forest exile. When Rama left Ayodhya people followed him and were not ready to return to their homes. In the evening Rama, Lakshmana and Sita and all the people reached the banks of the Tamas. Rama and everyone agreed to spend the night at the banks of the Tamas River and continue the journey next morning. Rama left people sleeping and continued the journey further

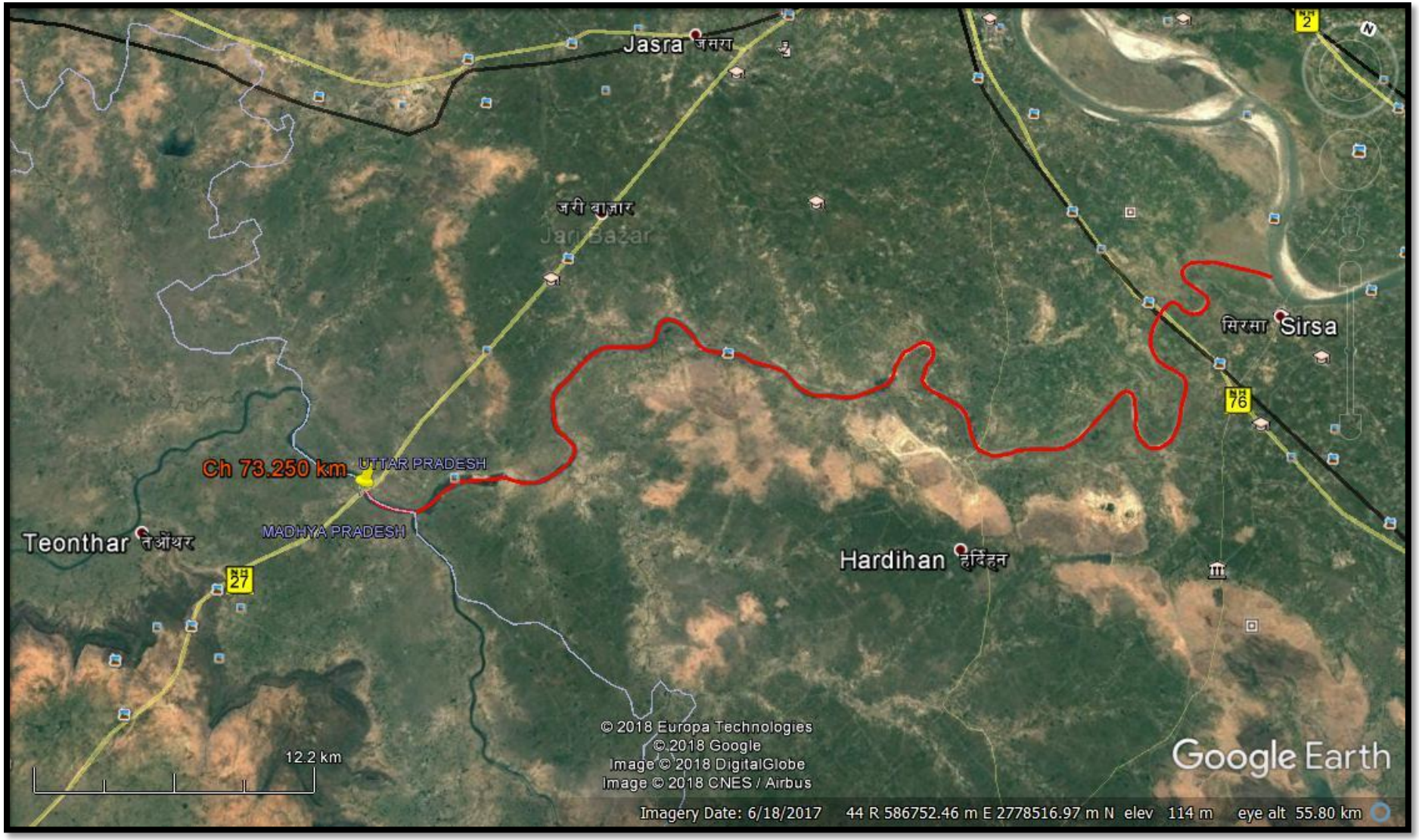
1.2 **Tributaries**. Its tributaries are Beehar, Mahana, and Belan River.

1.3 **States & Districts**. The Tons rises in a tank at Tamakund in the Kaimur Range. It flows through the fertile districts of Satna and Rewa and State of Madhya Pradesh & Uttar Pradesh. The course of waterway understudy of Tons River is 73.25 km length in of the river from Ganga confluence to upstream.

1.4 (a) **Full Course of Waterway**.



1.4 (b) **Course of Waterway under study**.



1.5 **Scope of Works**. Strabag India Pvt Ltd. conducted hydrographic and topographic survey of Tons River from Ganga confluence at Sirsa (Ch. 0 km) Lat25°16'31.82"N, Long 82° 4'59.82"E to Chakghat bridge on National highway 27 (Ch. 73.25km), Lat25° 2'3.47"N, Long 81°43'43.71"Eto Bridge on State Highway 9, was carried out 08th February 2016 to 18th February 2016. The scope of the work for the conduct of survey of Tons River includes: -

- Undertake bathymetric and topographic survey of National 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.
- Analysis of survey data, including assessment of water availability for navigation.
- Preparation of survey charts and feasibility report

SECTION – 2: METHODOLOGY ADOPTED TO UNDERTAKE STUDY

2.1 **Methodology**. The detailed bathymetric and topographic survey of Tons river (73.25km) from Ganga confluence at Sirsa (Ch. 0 km) Lat25°16'31.82"N, Long 82° 4'59.82"E to Bridge on National Highway 27 (Ch.73.25 km), Lat 25° 2'3.47"N, Long 81°43'43.71"Ewas carried out 08th February 2016 to 18th February2016.Details of Horizontal and Vertical Control adopted for the survey of tons river is placed at Annexure 7 to this report. The survey was undertaken with cross-section corridor of 150m and line spacing of 150m.The plotting of chart was done on UTM projection at zone 44N as per specification. Details of survey chart scheming and sample fair sheet is placed at Annexure 15 to this report.

2.1(a) **Personnel and Resources.** Total 32 personnel were involved which includes Party Chief, Sr. Surveyors, surveyors, helpers, cooks and drivers for the task in addition to resources viz. vehicles, logistics etc. which are tabulated below.

2.1(b) **Equipment Used**. Various equipment's were used during the survey operations which is tabulated below as well as elaborately described in the succeeding paragraphs.

HYDROGRAPHIC SURVEY EQUIPMENTS

Equipment	**Make**	**Qty. Deployed**
Echo sounder	500 DF dual Frequency	2
DGPS	Trimble SPS 356/461	2
Current Meter	Vertical Axis-Cup Type	1
Grab Sampler	Vanveen grab	1
Software	HYPACK data acquisition	1
Tide Pole	Manual	06

TOPOGRAPHIC SURVEY EQUIPMENTS

Equipment	Make	Qty. Deployed
GPS Sets	Trimble Spectra	5
Auto Level	Leica	2
Total Station	Topcon	1
Total Station	Leica	1
Software	HYPACK data acquisition	1
Software	AutoCAD	1
Software	Trimble Spectra Survey office v.8	1

2.1(c) **Topographic Survey.** The Topographic survey was carried out 08th February 201618th February2016. The weather was sunny, for most of the survey period. The survey was undertaken as per the approved line provided by IWAI. The spot level points in the crossline were spaced at 10 m interval. The plotting of the chart was done on UTM Projection at Zone 44N. The spot levels along the river banks and dry river beds were obtained by using Trimble DGPS in RTK mode. The topographic survey for the entire survey stretch was conducted to collect the following data: -

- Spot levels of the River bed and Banks
- 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

Topographic Spot Levelling by Trimble DGPS

The details of all spot levels are provided in the respective sheets being presented along with this report. The details of bank protection and features across the river are Placed at Annexure 5 & 6 respectively. Additionally, a soft copy of the same in XYZ format is being handed over as deliverable data.

2.1(d) **Bathymetric Survey.** Bathy 500 DF Echo Sounder was used to obtain soundings onboard the survey boat. The working frequency of 210 and 33 kHz was used for sounding operations. Trimble SP 461/ 356 DGPS was used for positioning. The digital output from the echo sounder and DGPS were automatically fed to the HYPACK data logging software on a real-time basis for the acquisition of survey data. No breakdown of equipment was reported and the performance of the equipment was found to be satisfactory during the entire duration of the survey. The cross lines were run perpendicular to the orientation of river flow (i.e. perpendicular to the orientation of depth contours) in respective stretches. The spot sounding/Topographic Spot leveling was also carried out in the area where the survey boat cannot be operated due to the low depth.

Bathymetric Survey operation

2.1(e) **Calibration.** The equipment used for the survey was calibrated by the equipment supplier. The equipment calibration certificates are placed at Annexure - 13 to this report.

2.2 **Description of Bench Mark.** Trimble Spectra Precision DGPS system was used in standalone static observation mode for 24 hrs. For establishment of geodetic control in the survey area. Extension of the geodetic control was achieved by setting up BM pillars throughout the river stretches at every 10km chainage. Co-ordinates of such pillars were established by simultaneous Static observations between established and new stations. The data was processed using Spectra Precision Survey Office software. Details of these BM pillars along with stationed recovery descriptions is mentioned at Annexure 9. Benchmark was recovered near Katka Rail Bridge, Meja Road, UP. Relevant pictures are also being attached for reference. Levelling was carried out from BM to TBM & TBM to BM and required accuracy was achieved. Simultaneous GPS observation was carried out at TBM, near CWC gauge and LBM at Meja road U.P. RL value86.068m of the CWC bench mark is 86.068m. Levelling data being enumerated subsequently.

CWC BM at Meja road, Allahabad at Ch. 10.21 km

NAME OF BM	VALUE OF CWC BM (m)	Latitude	Longitude
CWC Meja Road	86.068	25°14'14.70"N	82° 2'27.53"E

2.3 **Tidal Influence Zone and Tidal Variation**. Total 73.25 km length of river stretch was completely non-tidal. However, tidal observations were undertaken as per

tender document for the entire duration of the survey. Tidal data being attached at **Annexure- 3**along with this report.

2.4 **Methodology to Fix Sounding Datum**. The average water level of minimum of last six year data at meja road & Ganga confluence at sirsa and CWC gauge of tons Aqueduct was provided by IWAI as sounding datum. Sounding datum for all the tide gauge fixed on interpolating method from established gauge of CWC .In dry areas, Sounding Datum was established as per deepest bed level of the river. The details of established datum value for stretches are as tabulated below:-

Stretch (KM)		**Established SD wrt MSL (m)**
From	**To**	
0.00	4.90	66.558
4.90	13.00	66.771
13.00	19.30	67.017
19.30	26.20	67.267
26.20	34.20	67.570
34.20	38.80	67.900
38.80	40.80	70.000
40.80	47.70	73.000
47.70	57.70	77.000
57.70	63.80	79.000
63.80	65.50	80.000
65.50	66.40	85.570
66.40	67.50	87.000
67.50	68.50	88.500
68.50	69.50	90.000
69.50	70.30	90.600
70.30	72.80	91.500
72.80	73.25	92.500

2.5 **Maximum and Minimum Water Level**. Maximum and minimum water level of CWC Gauges data in sounding datum at para 2.4 and HFL at para 2.10.

2.6 **Salient Features of Dam, Barrages, Weirs, Anicuts, Locks and Aqueducts, etc**. There is only one Gargata barrage (Ch. 69.40 km) in the whole river stretch.

Salient Features	
Attribute	**Value**
Gate for under Sluice-Number	5
Pond Level (m)	94
Structure Code	W00351
Status of BWA construction	Completed
Basin	Ganga
Under Sluice bay-Number	5
Length of Barrage and Anicuts (m)	500
State	Uttar Pradesh
Seismic Zone	Seismic Zone-II
No.of bay(i.e. number of openings)	1
Year of Commencement	1980
Width of Bay(m)	434.5
Name of the Barrage/Weir/Anicuts	Tons Weir
Type of Spillway gate	other
Width of the river(m)	550
Gates of under Sluice-Size(m)	11X3.5

Salient Features	
Attribute	**Value**
Name of the Lift	Tons Lift Station
State	Uttar Pradesh
Basin	Ganga
Status	CM
Offtake Point	RS
Number of Pumps	12
Type of Pump	Centrifugal
Horse Power of Pumps	5100 HP (425 each)
Lift Height (m)	13.7
Discharge (Cumec)	16.9

2.7 **Description of Erected Bench Mark Pillars**. New Bench Mark Pillar (08 Nos) were constructed as per the Specification of Tender Documents. The Extension of Horizontal and Vertical Control was carry out by base line processing with the nearest reference station. Details of erected BM pillars is Place at **Annexure 9**. The final accepted co-ordinate and Reference Level value of Tons BM Pillar are as below:-

Sr. No	Station	Chainage (KM)	Latitude (N)	Longitude (E)	Easting (m)	Northing (m)	HT above MSL (m)	SD wrt MSL (m)
1	BAS MJA RD		25°08'41,655	81°58'46,765	598743.741	2781351.688	96.123	-
2	BAS AT JAWA		24°58'08,435	81°58'46,765	549399.279	2761605.329	117.62	-
3	TO P1	0.100	25°16'27.02"	82° 4'58.56"	609039.496	2795747.812	77.458	66.558
4	TO P2	9.820	25°14'29.68"	82° 2'28.09"	604858.576	2792104.851	84.647	66.771
5	TO P3	22.28	25°11'42.25"	82° 2'2.80"	604190.879	2786948.694	86.925	67.267
6	TO P4	29.89	25° 9'5.84"	81°58'54.04"	598942.404	2782097.115	87.778	67.570
7	TO P5	41.71	25° 9'0.17"	81°54'57.66"	592325.149	2781876.758	80.195	73.00
8	TO P6	52.76	25° 8'33.50"	81°49'26.50"	583058.543	2780996.822	83.417	77.00
9	TO P7	61.82	25° 5'6.34"	81°48'42.42"	581862.717	2774616.966	95.261	79.00
10	TO P8	70.12	25° 2'9.72"	81°45'29.67"	576493.963	2769152.244	96.648	91.500

Static Observation at Ch. 9.82 km & Static observation at Meja Road Base

2.8 **Description of Erected Tide Gauges**. Tide gauges were erected throughout the river stretch. Water level reading as per prescribed format along with chainage is mentioned at **Annexure 3**. The Detail of erected tide pole which are used for reduction of Sounding is as follows.

Tide Gauge No	Location	Chainage (km)	Easting/Northing (m)	Zero of Tide Gauge W.r.t MSL (m)	Period of Observation
TP1	Sirsa	0.1	609013.821E 2795774.783N	66.247	During the Conduct of Bathy Survey
TP2	Katka	9.76	604730.600E 2792053.750N	66.249	During the Conduct of Bathy Survey
TP3	Kona village	22.3	604050.056E 2786992.577N	67.342	During the Conduct of Bathy Survey
TP4	Kohadar village	29.9	598986.389E 2782237.386N	68.235	During the Conduct of Bathy Survey
TP5	Piparau village	41.75	592222.658E 2781896.803N	73.36	During the Conduct of Bathy Survey
TP6	HarbariLakhapur	52.8	583035.400E 2780961.535N	77.508	During the Conduct of Bathy Survey
TP7	Kauhat village	61.83	581776.564E 2774635.806N	79.85	During the Conduct of Bathy Survey
TP8	Chhapar village	70.12	576394.174E 2769168.959N	91.499	During the Conduct of Bathy Survey

Levelling & Tide Observation at Pillar No 01 Ch. 0.100 km

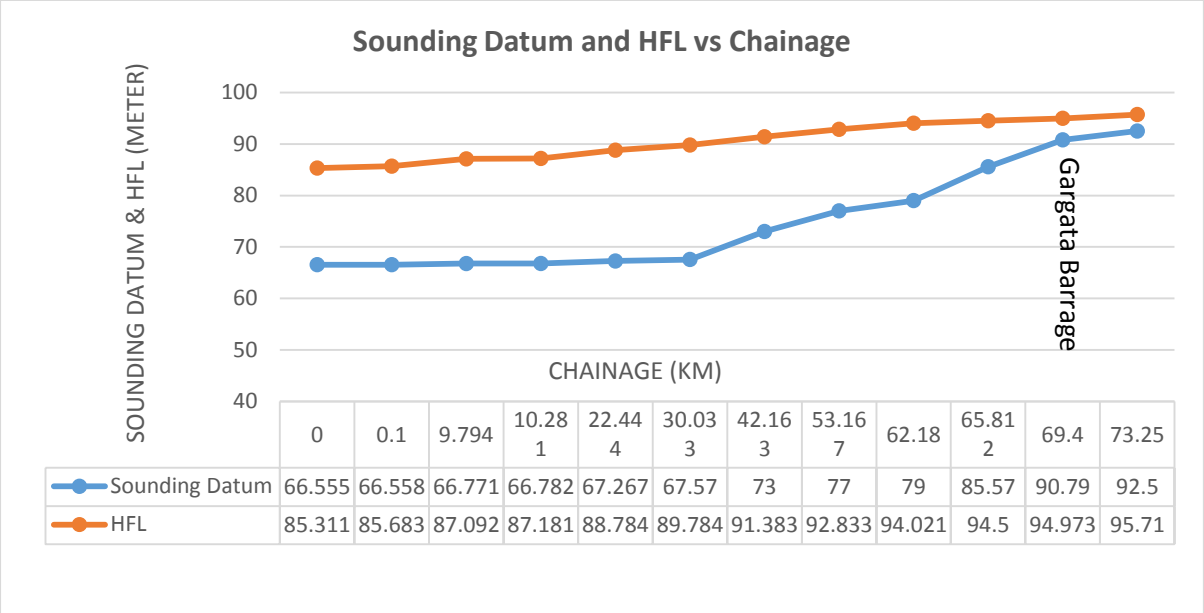
2.9 **Chart Datum/ Sounding Datum and Reduction Details.** Sounding Datum reduction table being mentioned below:-

Sl#	Location of CWC gauge / Dam / Barrage / Weir / Anicuts / Bench Mark / tide gauges	Chainage (km)	Stretch for corrected soundings and topo levels (km)	Established Sounding Datum w.r.t. MSL (m) at col. A.	Sounding Datum of Tide Gauge wrt MSL (m)	Correction in WL data for Bathymetric survey (m)	Topo level data converted as depth for volume calculation wrt SD (m)	HFL (m)
	A	B	C	D +ve indicates above MSL -ve indicates below MSL	E	F = (E- WL data in MSL)	G = (E- topo levels in MSL)	
		73.250	72.8-73.25		**92.500**	**Details at Annexure-3.**	**A separate soft copy of xyz file is created.**	95.710
	TO_P8	70.635	70.3-72.8		**91.500**			95.135
	Gargata barrage	69.400	69.4-70.017	**90.790**				94.973
		69.000	68.5-69.5		**90.000**			94.920
		68.000	67.5-68.5		**88.500**			94.788
		67.000	66.4-67.5		**87.000**			94.656
	CWC TONS AQUADUCT	65.812	65.5-66.4		**85.570**			94.500
		65.500	63.8-65.5		**80.000**			94.458
	TO_P7	62.180	57.7-63.8		**79.000**			94.021
	TO_P6	53.167	47.7-57.7		**77.000**			92.833
	TO_P5	42.163	40.8-47.7		**73.000**			91.383
	ROCKS	39.380	38.8-40.8		**70.000**			91.016
		38.300	34.2-38.8		**67.900**			90.873
	TO_P4	30.033	26.2-34.2		**67.570**			89.784
	TO_P3	22.444	19.3-26.2		**67.267**			88.784
	TO_P2A	16.162	13.0-19.3		**67.017**			87.956
	CWC MEJA ROAD	10.281		66.782				87.181
	TO_P2	9.794	4.9-13.0		**66.771**			87.092
	TO_P1	0.100	0.0-4.9		**66.558**			85.683
	Ganga Confl. (1507.15)	0.000		66.555				85.311
	CWC SIRSA (1505)	-2.150		66.508				84.920

2.10 **HFL at Gauge Stations and Cross-Structures**. HFL at CWC Gauge station Meja Road CWC Gauge and Tons Aqueduct/Tons has already been established by the CWC department and HFL for the waterway was derived as per change in the ground profile of the river.

Sl	Location and Description of CWC Gauge/ Dam/etc.	Cross-Structure Details	Chainage (km)	Established HFL wrt MSL (m)	Computed HFL at Cross – Structure wrt MSL (m)
	A	B	C	D	E
1	Ganga Confl	Sirsa	0.00	84.920	
2	Panasa Bridge	Panasa	3.92		85.786
3	Katka Bridge	Katka	9.72		87.072
4	Katka Rail Bridge	Katka	10.02		87.181
5	Meja Road CWC Gauge	Meja Road	10.21	87.181	
6	Kohrar Bridge	Kohrar	29.93		89.607
7	Kakrahi Bridge	Kakrahi	45.11		91.473
8	Udhrenga Bridge	Udhrenga	56.62		92.928
9	Gaughat Bridge	Gaughat	68.03		94.50
10	Tons Aqueduct/Tons	Gaughat	65.812	94.50	
11	Chakghat Bridge	Chakghat	73.25		94.972

2.11 **Graph: Sounding Datum and HFL vs Chainage**



	0	0.1	9.794	10.281	22.444	30.033	42.163	53.167	62.18	65.812	69.4	73.25
Sounding Datum	66.555	66.558	66.771	66.782	67.267	67.57	73	77	79	85.57	90.79	92.5
HFL	85.311	85.683	87.092	87.181	88.784	89.784	91.383	92.833	94.021	94.5	94.973	95.71

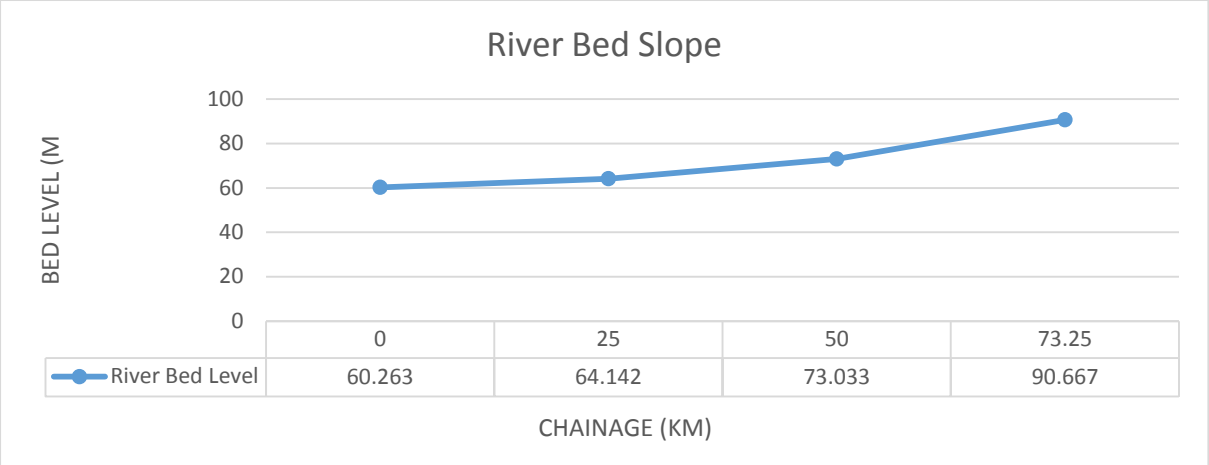
HFL AND SOUNDING DATUM TABLE

GAUGE NAME	CHAINAGE (KM)	SOUNDING DATUM(M)	HFL(M)
Ganga Confl. (1507.15)	0	66.555	85.311
TO_P1	0.1	66.558	85.683
TO_P2	9.794	66.771	87.092
CWC MEJA ROAD	10.281	66.782	87.181
TO_P3	22.444	67.267	88.784
TO_P4	30.033	67.570	89.784
TO_P5	42.163	73.000	91.383
TO_P6	53.167	77.000	92.833
TO_P7	62.18	79.000	94.021
CWC TONS AQUADUCT	65.812	85.570	94.500
Gargata barrage	69.4	90.790	94.973
	73.25	92.500	95.710

2.12 **Average Bed Slope**. Average bed slope of the whole river stretch being tabulated below: -

Chainage (KM)		**River Bed Level (m)**		**River Bed Level Change (m)**	**Distance (km)**	**Slope**
From (km)	**To (m)**	**From(m)**	**To(m)**			
Ch. 0.0 km	Ch. 25.0 km	60.263	64.142	3.879	25	1:6445
Ch. 25.0 km	Ch. 50.00 km	64.142	73.033	8.891	25	1:2812
Ch. 50.00 km	Ch. 73.250 km	73.033	90.667	17.634	23.25	1:1318

BED SLOPE VS CHAINAGE GRAPH



2.13 **Details of Dam, Barrages, Weirs, Anicuts, etc**. There is only one barrage Gargata Barrage at Ch. 69.40 km.

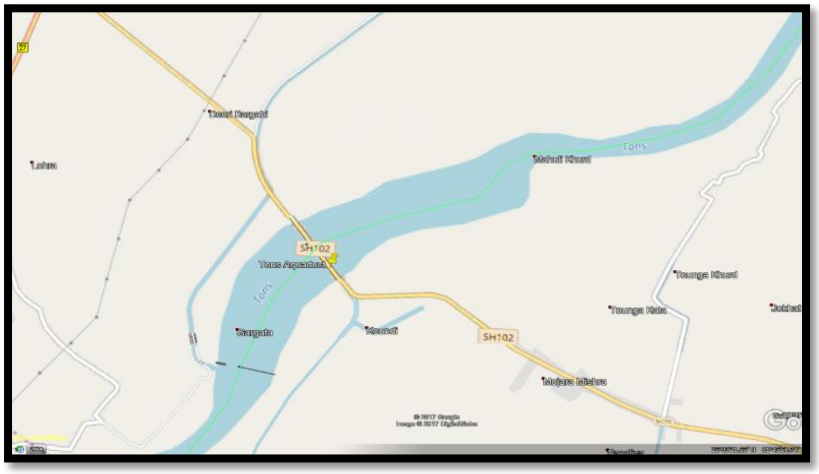
Sl No	Structure Name	Chainage (km)	Location	Position (Lat Long)		Position (UTM)		Length (m)	Width (m)	Height w.r.t. --- (m)	Present condition
				Left Bank	Right Bank	Left Bank	Right Bank				
1	Tons Barrage/Irrigation Pump House	69.4	Gargata U.P	25° 2'32.73"N 81°45'46.89"E	25° 2'35.57"N 81°45'29.40"E	576971.640E 2769862.380N	576481.280E 2769947.700N	500M	8.5M	11.0M	Completed

Gargata Barrage at Ch 69.40 km

2.14 **Details of Locks**. There is no any lock present in the survey stretch.

2.15 **Details of Aqueducts**. There is one aqueduct at Ch. 68.03 km this portion the river.

Chainage (km)	Location	Position (Lat Long)		Position (UTM)		Bed Level (m)	FSL (m)	Length (m)	Width (m)	Height w.r.t. --- (m)	Present condition
		Left Bank	Right Bank	Left Bank	Right Bank						
68.03	Gaughat	25° 3'1.69"N 81°46'4.85"E	25° 3'21.17"N 81°45'47.94"E	577469.180E 2770756.920N	576992.66E 2771352.55N	99.72	102.82	802.700 (Survey Stretch)	14.2	3.1	Completed



Tons Aquduct at Ch 68.03 km

2.16 **Details of Existing Bridges & Crossings**. There are total 09 in no's bridges are present across the river. Details is tabulated below: -

Sl No	Structure Name	Chainage (km)	Position (Lat Long)		Position (UTM)		Length (m)	Width (m)	No of Piers	Horizontal clearance (Distance Between piers) (m)	Vertical clearance from HFL (m)
			Left Bank	Right Bank	Left Bank	Right Bank					
1	Panasa Bridge	3.92	25°16'1.30"N 82° 2'48.85"E	25°16'11.12"N 82° 2'43.32"E	605417.641E 2794927.368N	605260.333E 2795228.604N	339.83	7.4	12	29.69	3.91
2	Katka Bridge	9.72	25°14'30.58"N 82° 2'28.67"E	25°14'33.21"N 82° 2'16.21"E	604874.937E 2792132.925N	604525.623E 2792210.669N	357.86	8.12	11	34.58	2.957
3	Katka Rail Bridge	10.02	25°14'21.36"N 82° 2'27.12"E	25°14'23.37"N 82° 2'14.09"E	604833.749E 2791848.914N	604468.223E 2791907.165N	370.15	13.5	08	49.38	5.505
4	Kohrar Bridge	29.93	25° 9'5.74"N 81°58'53.29"E	25° 9'16.22"N 81°58'56.84"E	598921.263E 2782094.056N	599018.46E 2782417.035N	337.26	6.6	10	35.67	2.793

Sl No	Structure Name	Chainage (km)	Position (Lat Long)		Position (UTM)		Length (m)	Width (m)	No of Piers	Horizontal clearance (Distance Between piers) (m)	Vertical clearance from HFL (m)
			Left Bank	Right Bank	Left Bank	Right Bank					
5	Kakrahi Bridge	45.11	25° 9'2.26"N 81°53'3.49"E	25° 9'11.77"N 81°53'5.38"E	589128.652E 2781919.282N	589179.063E 2782212.010 N	297	7.5	10	31.2	2.248
6	UdhrengaPipaPul	56.55	25° 7'17.51"N 81°47'48.79"E	25° 7'20.71"N 81°47'41.06"E	580336.481E 2778642.186N	580119.861E 2778739.704N	237.55	3.5	-	-	-
7	U/C Udhrenga Bridge	56.62	25° 7'15.98"N 81°47'49.10"E	25° 7'18.83"N 81°47'40.09"E	580345.343E 2778595.824N	580092.393E 2778681.081N	237.94	8	10	24.84	1.672
8	Gaughat Bridge	68.03	25° 3'2.47"N 81°46'4.82"E	25° 3'21.12"N 81°45'48.67"E	577469.179E 2770780.653N	577013.240E 2771351.158N	730.3	6.5	58	11.81	5.236
9	Chakghat Bridge	73.25	25° 1'58.45"N 81°43'38.59"E	25° 2'10.35"N 81°43'51.11"E	573382.378E 2768788.657N	573731.883E 2769156.194N	507.18	10	21	24.16	9.84

2.17 **Details of Other Cross-Structures**. There is no other cross-structures present in the waterway.

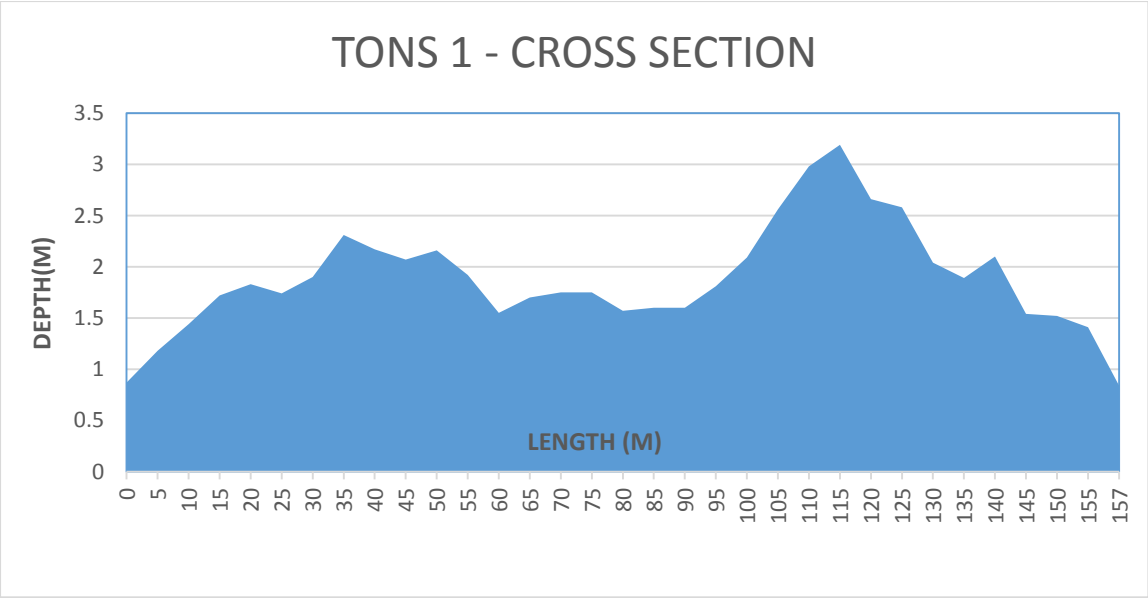
2.18 **High Tension Lines / Electric Lines / Tele-Communication Lines**. Details of HT lines and electric pole is tabulated below:-

Sl No	Cross-Structure Name	Chainage (km)	Position (Lat Long)		Position (UTM)		Vertical clearance w.r.t HFL (m)	Remarks
1	HT Line	9.21	5°14'42.46"N 82° 2'35.92"E	25°14'50.94"N 82° 2'23.66"E	605074.00E 2792499.500N	604729.005E 2792757.289N	21	Completed
2	HT Line	15.9	25°12'2.53"N 82° 3'57.23"E	25°12'0.85"N 82° 3'43.07"E	607388.000E 2787597.000N	606992.000E 2787542.500N	24	Completed
3	HT Line	18.02	25°10'54.76"N 82° 3'33.28"E	25°11'3.16"N 82° 3'27.46"E	606734.932E 2785507.881 N	606569.500E 2785764.500N	25	Completed
4	HT Line	18.09	5°10'53.15"N 82° 3'30.98"E	25°11'2.59"N 82° 3'25.20"E	606670.561E 2785457.889N	606506.500E 2785746.500N	26	Completed
5	HT Line	18.14	5°10'51.86"N 82° 3'29.79"E	25°11'1.82"N 82° 3'24.09"E	606637.908E 2785417.283N	606475.500E 2785722.500N	28	Completed
6	HT Line	18.17	25°10'51.71"N 82° 3'28.43"E	25°11'1.01"N 82° 3'23.29"E	606599.245E 2785412.920N	606453.000E 2785697.000N	27	Completed
7	HT Line	28.41	25° 9'14.88"N 81°59'51.94"E	25° 9'27.54"N 81°59'39.29"E	600561.000E 2782387.000N	600204.500E 2782774.500N	25	Completed
8	HT Line	28.8	25° 9'11.54"N 81°59'36.44"E	25° 9'22.56"N 81°59'26.75"E	600128.500E 2782281.000N	599854.500E 2782618.000N	26	Completed
9	HT Line	28.82	25° 9'11.31"N 81°59'36.09"E	25° 9'22.23"N 81°59'26.21"E	600118.000E 2782274.000N	599839.500E 2782608.500N	28	Completed

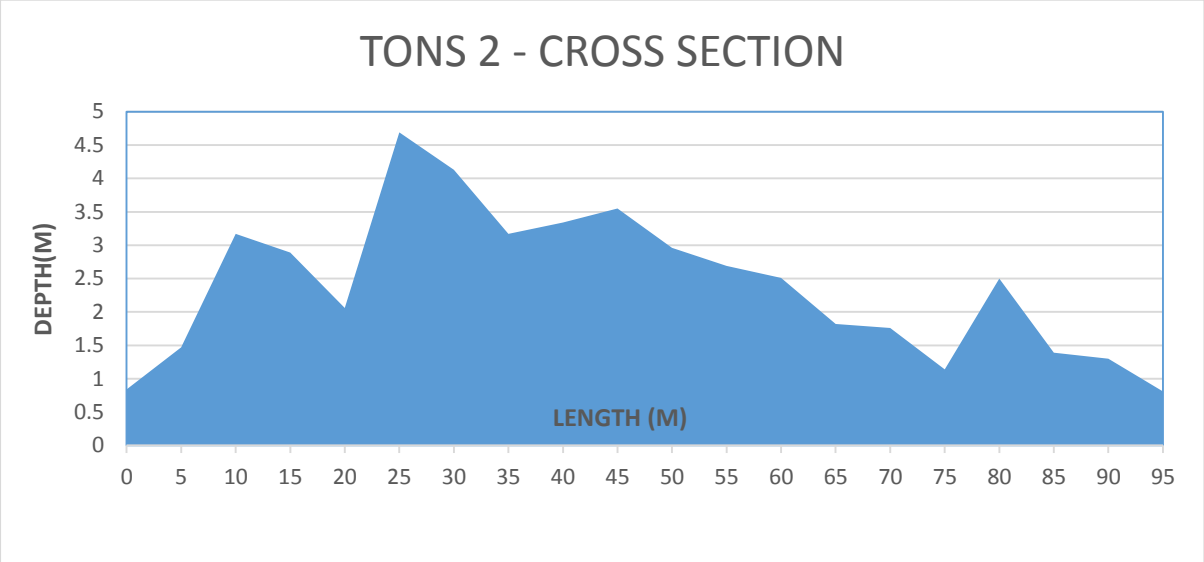
2.19 **Current Meter and Discharge Details**. Current meter observations and discharge calculations were undertaken at every 10 km interval approximately. Details of the same is tabulated below:-

Site Name	Chainage KM	EASTING (m)	NORTNING (m)	Latitude	Longitude	Observed Depth(m)	Velocity mtrs/sec	X-Sectional Area (sq. m)	Discharge M3/Sec
TON 1	0.100	608121.230	2795785.880	25°16'28.50"N	82° 4'25.76"E	3.19	0.65	302.55	196.658
TON 2	10.00	604684.740	2792257.840	25°14'34.72"N	82°02'21.94"E	4.69	0.5	236.825	118.413
TON 3	20.43	605174.370	2786868.290	25°11'39.41"N	82°02'37.94"E	3.76	0.32	137.704	44.065
TON 4	30.00	598778.150	2782261.640	25°09'11.23"N	81°58'48.23"E	2.64	0.52	101.495	52.777
TON 5	40.85	593830.460	2783371.280	25°09'48.44"N	81°55'51.80"E	7.35	0.62	852.029	528.258
TON 6	51.00	582810.210	2780875.510	25°08'29.64"N	81°49'17.62"E	4.64	0.5	675.852	337.926
TON 7	61.10	581434.020	2774822.030	25°05'13.12"N	81°48'27.18"E	6.68	0.47	620.762	291.758
TON 8	70.15	574437.310	2768636.180	25°01'53.32"N	81°44'16.21"E	1.78	0.65	64.694	42.051

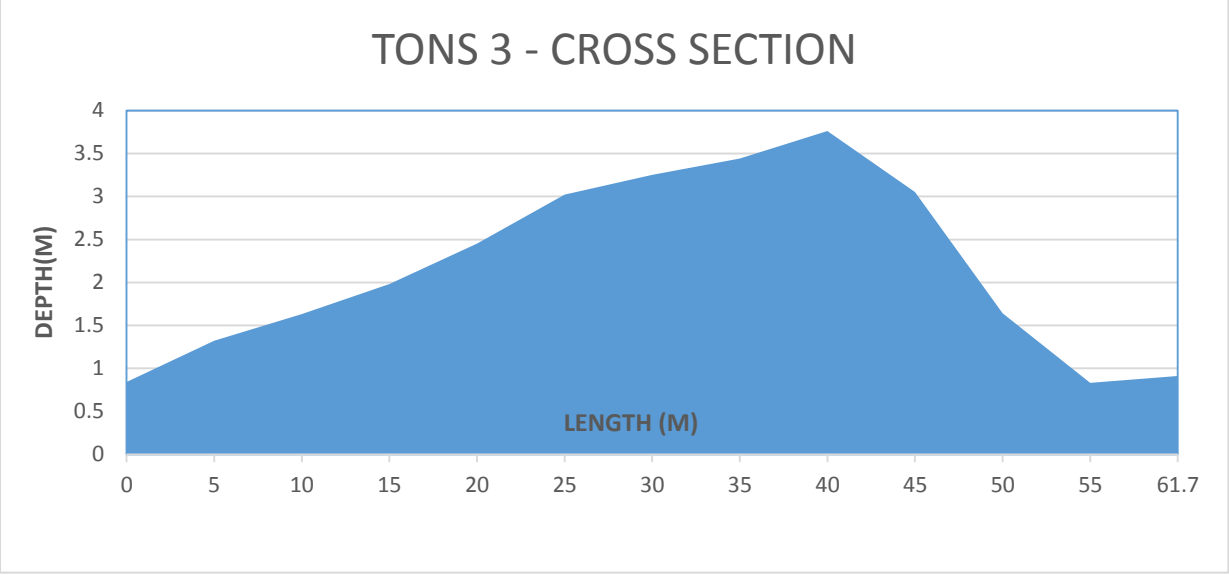
TONS 1- CROSS SECTION



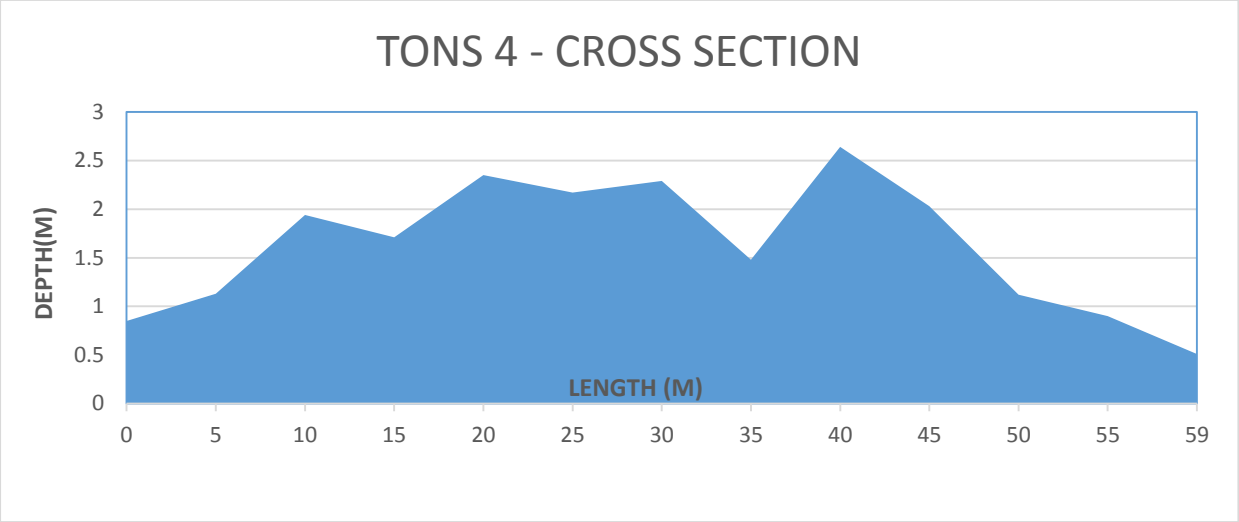
TONS 2- CROSS SECTION



TONS 3- CROSS SECTION



TONS 4- CROSS SECTION



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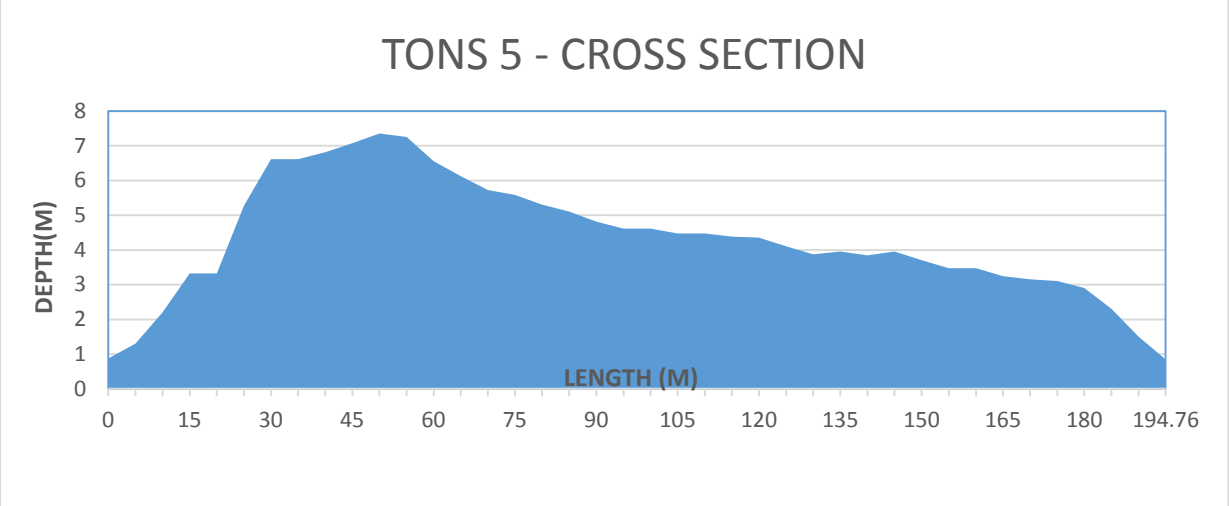
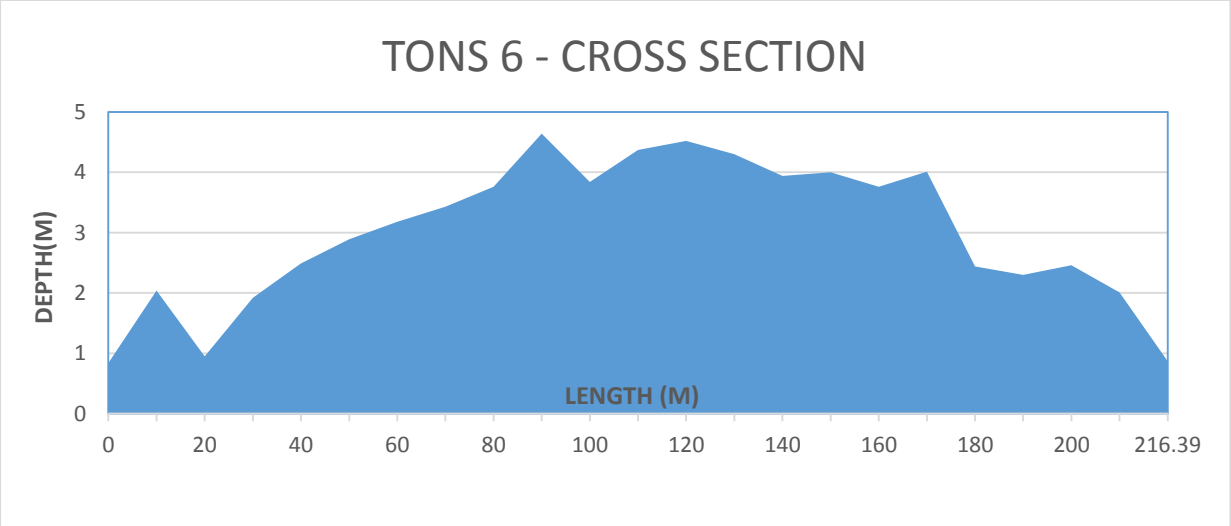
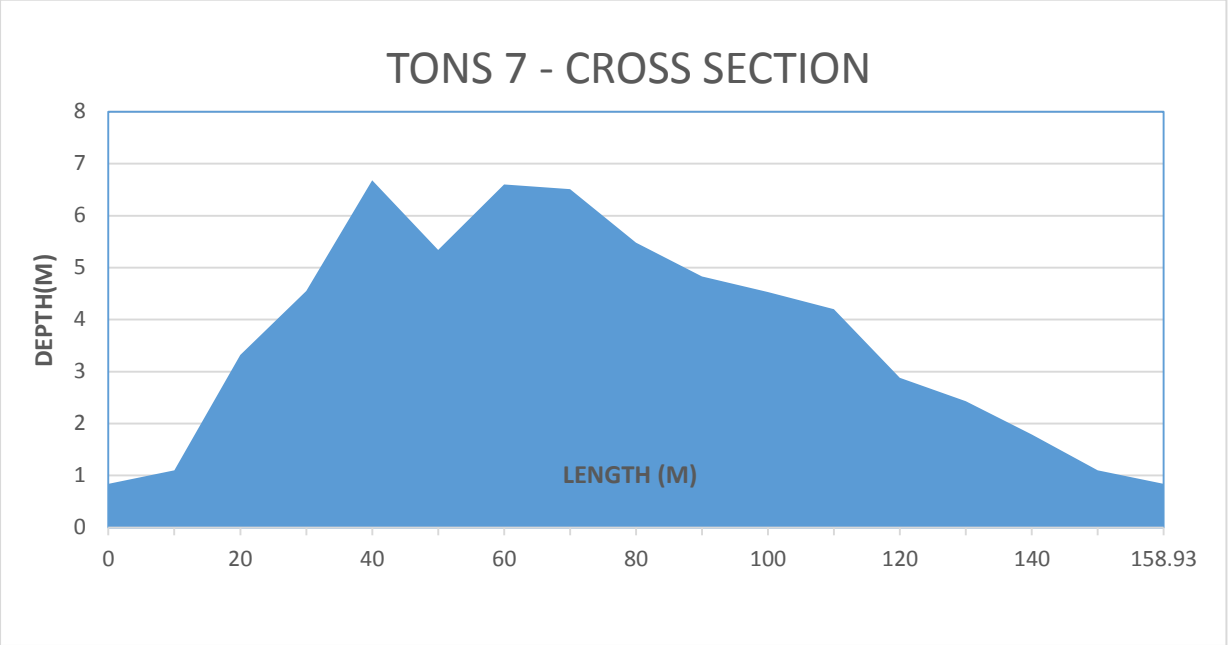


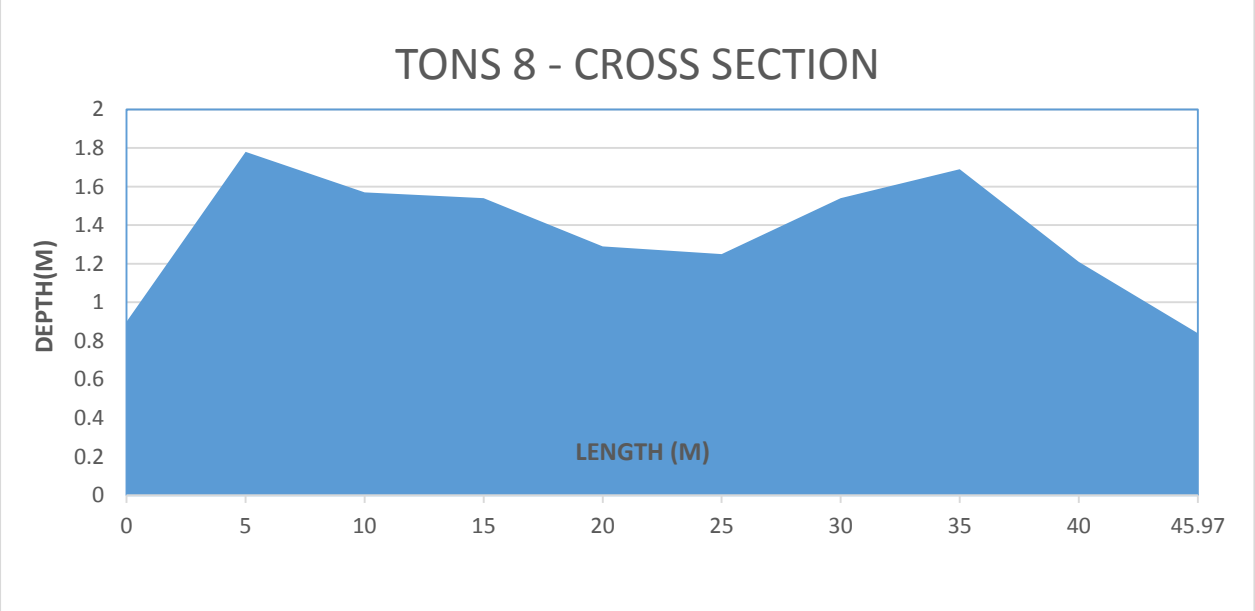
TONS 6- CROSS SECTION



TONS 7- CROSS SECTION



TONS 8- CROSS SECTION



2.20(a) **Soil Sample Locations**. Details of soil sample location being appended below:-

Site Name	Chainage KM	EAST	NORTNING	Latitude	Longitude	Depth (m)
TON 1	0.100	608121.23	2795785.88	25°16'28.50"N	82° 4'25.76"E	1.9
TON 2	10.00	604684.74	2792257.84	25°14'34.72"N	82°02'21.94"E	1.1
TON 3	20.43	605174.370	2786868.290	25°11'39.41"N	82°02'37.94"E	3.4
TON 4	30.00	598778.150	2782261.640	25°09'11.23"N	81°58'48.23"E	2.3
TON 5	40.85	593830.460	2783371.280	25°09'48.44"N	81°55'51.80"E	5.2
TON 6	51.00	582810.210	2780875.510	25°08'29.64"N	81°49'17.62"E	4.7
TON 7	61.10	581434.020	2774822.030	25°05'13.12"N	81°48'27.18"E	6.8
TON 8	70.15	574437.310	2768636.180	25°01'53.32"N	81°44'16.21"E	0.6

2.20(b) **Water Samples**. Water sample locations are tabulated below:-

Site Name	Chainage KM	EAST	NORTNING	Latitude	Longitude	Depth (m)	Mid-Depth (0.5d) (m)
TON 1	0.100	608121.23	2795785.88	25°16'28.50"N	82° 4'25.76"E	1.9	0.95
TON 2	10.00	604684.74	2792257.84	25°14'34.72"N	82°02'21.94"E	1.1	0.55
TON 3	20.43	605174.370	2786868.290	25°11'39.41"N	82°02'37.94"E	3.4	1.7
TON 4	30.00	598778.150	2782261.640	25°09'11.23"N	81°58'48.23"E	2.3	1.15
TON 5	40.85	593830.460	2783371.280	25°09'48.44"N	81°55'51.80"E	5.2	2.6
TON 6	51.00	582810.210	2780875.510	25°08'29.64"N	81°49'17.62"E	4.7	2.35
TON 7	61.10	581434.020	2774822.030	25°05'13.12"N	81°48'27.18"E	6.8	3.4
TON 8	70.15	574437.310	2768636.180	25°01'53.32"N	81°44'16.21"E	0.6	0.3

SECTION-3

3.**Description of Waterway**.

3.1 **Sub-Stretch 1: From Ch 0 km to Ch 25 km**. This stretch of the surveyed river is having length of 25 km and average width of 170m. Bench Mark pillars 1, 2& 3 are located in this section at Ch. 0.10 km, Ch. 9.82 km and Ch. 22.0 km respectively. Details of BM pillars along with station recovery descriptions is placed in Annexure 9. Soil and water samples were collected at Ch. 0.1 km, Ch. 10.0 km and Ch.20.43 km. Report from authorized laboratory for the same being attached with Annexure 11& 12. Current meter observation and discharge measurement were carried out at Ch. 0.1, 10.0 km. and 20.430 km in this river stretch, the surveyed river length is having sufficient depth in most of the places for plying of boats. In some places, shallow patches, and water barriers and Small I land can be noticed. Water pump house are also prominent for the irrigational purpose throughout the waterway. There is neither any forest zone nor restricted zone. Farmers were seen engaging in agricultural activities. Primary crops are mustard, wheat, beans, peas, tomato, cabbage, carrot, radish, etc.

From Ch 0 km to 25 km

Dredging quantity for substretch-1

	Chainage (km)		Observed				Reduced wrt Sounding Datum			
Type	**From**	**To**	**Min Depth (m)**	**Max Depth (m)**	**Length of Shoal (m)**	**Dredging Qty (cu.m)**	**Min Depth (m)**	**Max Depth (m)**	**Length of Shoal (m)**	**Dredging Qty (cu.m)**
Class-I	0	25	0	14.1	3,250.00	81,493.94	-0.2	14.09	7,700.00	2,98,217.15
Class-II	0	25	0	14.1	4,800.00	2,03,826.47	-0.3	14.09	9,650.00	5,15,652.67
Class-III	0	25	0	14.1	6,300.00	4,94,465.34	-0.3	14.09	10,650.00	9,22,873.79
Class-IV	0	25	0	14.1	8,800.00	7,89,916.86	-0.3	14.09	12,150.00	12,87,341.71

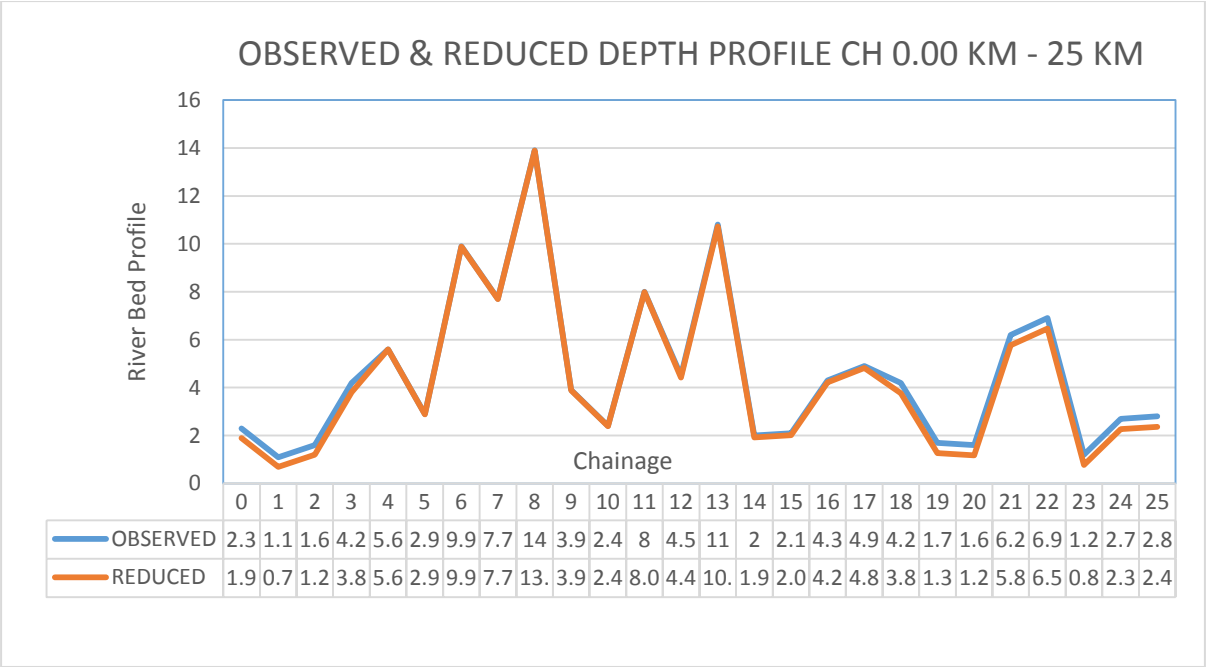
(a) **Bathymetry Survey & Topographic Survey**.

SUB-STRETCH-1 (0-25 KM)		
Type of Survey	**Chainage (km)**	**Remarks**
Bathymetry Survey	0.00 km to 25.0 km	covered by bathymetric survey
Topographic Survey	0.0 km to 25.0 km	Riverbank, prominent features along the bank.

Ganga Confluence at Ch 0 km

Chainage (km)		River Bed Level (m)		River Bed Level Change (m)	Slope
From	To	From	To		
0.0	25	60.263	64.142	3.879	1:6445

(c) **Observed & Reduced Depth Profile of the Stretch**. Both observed and reduced depth along with slope being mentioned below:-



	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
OBSERVED	2.3	1.1	1.6	4.2	5.6	2.9	9.9	7.7	14	3.9	2.4	8	4.5	11	2	2.1	4.3	4.9	4.2	1.7	1.6	6.2	6.9	1.2	2.7	2.8
REDUCED	1.9	0.7	1.2	3.8	5.6	2.9	9.9	7.7	13.	3.9	2.4	8.0	4.4	10.	1.9	2.0	4.2	4.8	3.8	1.3	1.2	5.8	6.5	0.8	2.3	2.4

(d) **Prominent Dam/ Barrage**. There is neither any dam nor any barrage exists in this stretch.

(d) **Tidal Stretch**. This 25 km of river stretch is completely non-tidal.

(e) **Bank**. This portion of the river is having un-protected bank only around the bridge pitch are protecetd

Pitch Protected at Ch 10.02 km

(f) **Hindrances**. Strong fishing nets across the river, shallow depth and under water plankton are hindrances for navigation.

Under Water Plankton at Ch 2.65 km & Bamboo stickat Ch 8.70 km

(g) **Encroachment**. No encroachment was observed in this stretch.

(h) **Protected Area**. There is no wildlife, Defence, Atomic power plant and any other protected area present in this river stretch.

(i) **NH/ SH**. National Highway 76 across the river i.e Katka Bridge at Ch 9.72 km.

(j) **Railway Station**. Katka Railway Bridge runs across the river at Ch 10.02 km. Meja road and Bhirpur railway station exist at 5 km towards western side and 5.3 km eastern side respectively from the river.

(k) **Land Use Pattern**. Land on either banks of the river being utilised for either agricultural or residential purpose.

(l) **Crops**. Both the banks of Tons river are very fertile. Primary crops are mustard and wheat but seasonal vegetable crops are also cultivated viz. peas, cauliflower, potato, tomato, cabbage, carrot, radish, etc. (winter crops).

Crops at Ch. 15.6 km & Ch. 18.0 km

(m) **Bulk Construction Material**. There is neither any factory for construction material nor any raw material available along the river stretch.

(n) **Existing Industry**. There is no major or minor industry exists in this stretch.

(o) **Existing Ghats, Jetties and Terminals**. There is no ghat, jetty and terminal was observed in this portion.

(p) **Cargo Movement**. There is no cargo movement observed in this portion of the water way during the course of survey.

(p) **Prominent City/ town or Place of Worship**. Prominent towns are Sirsa, and Meja Road and Mirzapur is major city.

(q) **Ferry**. There is no ferry service available in this river stretch.

(r) **Water Sports Recreational Facilities**. There is no facility for water sports in this section. However, at Ganga confluence it can be developed due to water availability throughout the year.

(s) **Fishing Activity**. Small wooden boats were seen engaging in fishing activity in this river portion.

Fishing Activity at Ch. 5.8 km & Ch. 19.6 km

(t) **Sand Mining**. No sand mining activity was found in this stretch.

(u) **Tributaries**. There is no tributary of Tons river present in this portion.

(v) **Details of Irrigational Canals**. There is no irrigational canal present in this section.

(w) **Details of Nalas**. There is no drain/ nala observed polluting the river in this portion.

(x) **Usage of Water**. Water in this portion primarily irrigation purpose.

(y) **Details of Cross-Structures**. There are three bridges in this stretch. Details are enumerated below:-

Sl No	Structure Name	Chainage (km)	Position (Lat Long)		Position (UTM)		Length (m)	Width (m)	No of Piers	Horizontal clearance (Distance Between piers) (m)	Vertical clearance from HFL (m)	Remarks
			Left Bank	Right Bank	Left Bank	Right Bank						
1	Panasa Bridge	3.92	25°16'1.30"N 82° 2'48.85"E	25°16'11.12"N 82° 2'43.32"E	605417.641E 2794927.368N	605260.333E 2795228.604N	339.83	7.4	12	29.69	3.910	Completed
2	Katka Bridge	9.72	25°14'30.58"N 82° 2'28.67"E	25°14'33.21"N 82° 2'16.21"E	604874.937E 2792132.925N	604525.623E 2792210.669N	357.86	8.12	11	34.58	2.957	Completed
3	Katka Rail Bridge	10.02	25°14'21.36"N 82° 2'27.12"E	25°14'23.37"N 82° 2'14.09"E	604833.749E 2791848.914N	604468.223E 2791907.165N	370.15	13.5	08	49.38	5.508	Completed

Panasa Bridge at Ch 3.92 km &Katka Bridge at Ch 9.72 km

Katka Rail Bridge at Ch 10.02 km

There are six High tension lines cross the river in this stretch. Details are enumerated below:-

Sl No	Cross-Structure Name	Chainage (km)	Position (Lat Long)		Position (UTM)		Vertical clearance w.r.t HFL (m)	Remarks
1	HT Line	9.21	25°14'42.46"N 82° 2'35.92"E	25°14'50.94"N 82° 2'23.66"E	605074.00E 2792499.500N	604729.005E 2792757.289N	21	Completed
2	HT Line	15.9	25°12'2.53"N 82° 3'57.23"E	25°12'0.85"N 82° 3'43.07"E	607388.000E 2787597.000N	606992.000E 2787542.500N	24	Completed
3	HT Line	18.02	25°10'54.76"N 82° 3'33.28"E	25°11'3.16"N 82° 3'27.46"E	606734.932E 2785507.881 N	606569.500E 2785764.500N	25	Completed
4	HT Line	18.09	25°10'53.15"N 82° 3'30.98"E	25°11'2.59"N 82° 3'25.20"E	606670.561E 2785457.889N	606506.500E 2785746.500N	26	Completed
5	HT Line	18.14	25°10'51.86"N 82° 3'29.79"E	25°11'1.82"N 82° 3'24.09"E	606637.908E 2785417.283N	606475.500E 2785722.500N	28	Completed
6	HT Line	18.17	25°10'51.71"N 82° 3'28.43"E	25°11'1.01"N 82° 3'23.29"E	606599.245E 2785412.920N	606453.000E 2785697.000N	27	Completed

HT Line at Ch 9.21km &Ch 15.90 km

HT Line at Ch 18.02 km, Ch 18.09 and Ch. 18.140 km

HT Line at Ch 18.17km

3.2 **Sub-Stretch 2: From Ch 25 km to Ch 50 km**. This stretch of the surveyed river is having length of 25 km and average width of 190m. Bench Mark pillars 1 &2 are located in this section at Ch. 30.0 km and Ch. 41.2 km respectively. Details of BM pillars along with station recovery descriptions is placed in Annexure 9. Soil and water samples were collected at Ch. 0.1 km and Ch. 10.0 km. Report from authorized laboratory for the same being attached with Annexure11& 12. Current meter observation and discharge measurement were carried out at Ch. 30.0 & 40.85 km. In this river stretch. The surveyed river length is having sufficient depth in most of the places for plying of boats. In some places, shallow patches and natural rocks can be noticed. In few places, sand mining activities are also relevant. Low draft boats can ply throughout the year in the surveyed river. Rocky islands, underwater plants and shallow patches can be noticed. Pump house are also prominent for the irrigational purpose. NTPC Power Plant under construction near about 500m distance from the River there is neither any forest zone nor restricted zone. Farmers were seen engaging in agricultural activities. Primary crops are mustard, wheat, beans, peas, tomato, cabbage, carrot, radish, etc.

From Ch 25km to 50 km

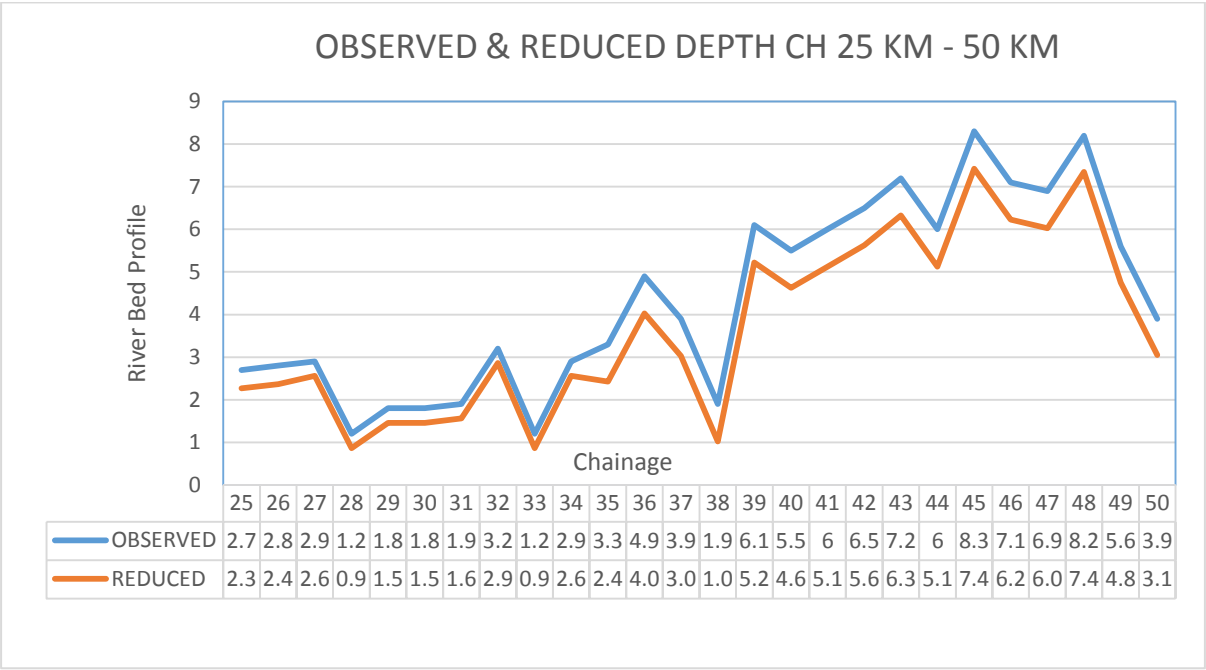
Dredging quantity for substretch-2

	Chainage (km)		Observed				Reduced wrt Sounding Datum			
Type	From	To	Min Depth (m)	Max Depth (m)	Length of Shoal (m)	Dredging Qty (cu.m)	Min Depth (m)	Max Depth (m)	Length of Shoal (m)	Dredging Qty (cu.m)
Class-I	25	50	0	8.5	2,850.00	95,811.33	-0.3	7.625	10,450.00	4,41,591.99
Class-II	25	50	0	8.5	5,150.00	2,28,997.99	-0.3	7.625	11,850.00	7,61,774.92
Class-III	25	50	0	8.5	6,000.00	4,83,835.19	-0.3	7.625	12,450.00	12,03,617.23
Class-IV	25	50	0	8.5	8,100.00	7,20,628.39	-0.3	7.625	18,400.00	15,63,833.20

(a) **Bathymetry Survey & Topographic Survey**.

SUB-STRETCH-2 (25-50 KM)		
Type of Survey	**Chainage (km)**	**Remarks**
Bathymetry Survey	25 km to 50 km	covered by bathymetric survey
Topographic Survey	25 km to 50 km	Riverbank, prominent features along the bank.

(c) **Observed & Reduced Depth Profile of the Stretch**.Both observed and reduced depth along with slope being mentioned below:-



Chainage (km)		River Bed Level (m)		River Bed Level Change (m)	Slope
From	To	From	To		
25	50	64.142	73.033	8.891	1:2812

(d) **Prominent Dam/ Barrage**. There is neither any dam nor any barrage exists in this stretch.

(d) **Tidal Stretch**. This 25 km of river stretch is completely non-tidal.

(e) **Bank**. This portion of the river is having un-protected, only around the bridge bank are protected.

Pitch Protected at Ch 45.11 km

(f) **Hindrances**. Strong fishing nets across the river, shallow depth and under water plankton are hindrances for navigation.

h

Shallow depth at Ch 30.50 km & Plankton at Chainage Ch 32.7 km

(g) **Encroachment**. No encroachment was observed in this stretch.

(h) **Protected Area**. There is no wildlife, Defence, Atomic power plant and any other protected area present in this river stretch.

(i) **NH/ SH**. There is no any SH & NH in this stretch only loacal road are pass from the river.

(j) **Railway Station**. Meja Road Raiway Station is located 12 km towards north eastern side from the river.

(k) **Land Use Pattern**. Land on either banks of the river being utilised for either agricultural or residential purpose.

(l) **Crops**. Both the banks of Tons river are very fertile. Primary crops are mustard and wheat but seasonal vegetable crops are also cultivated viz. peas, cauliflower, potato, tomato, cabbage, carrot, radish, etc. (winter crops).

(m) **Bulk Construction Material**. There is neither any factory for construction material nor any raw material available along the river stretch.

(n) **Existing Industry**. There is only Meja super thermal power plant exists in this stretch.

Meja super thermal power plant(NTPC) at Ch 33.5 to 41.50 km

(o) **Existing Ghats, Jetties and Terminals**. There is no ghat, jetty and terminal was observed in this portion.

(p) **Cargo Movement**. There is no cargo movement observed in this portion of the water way during the course of survey.

(p) **Prominent City/ town or Place of Worship**. There are mejakhas and Kohrar prominent town present in this section.

(q) **Ferry**. There is no ferry service available in this river stretch.

(r) **Water Sports Recreational Facilities**. There is no facility for water sports in this section.

(s) **Fishing Activity**. Fishing activity was monitored in this section.

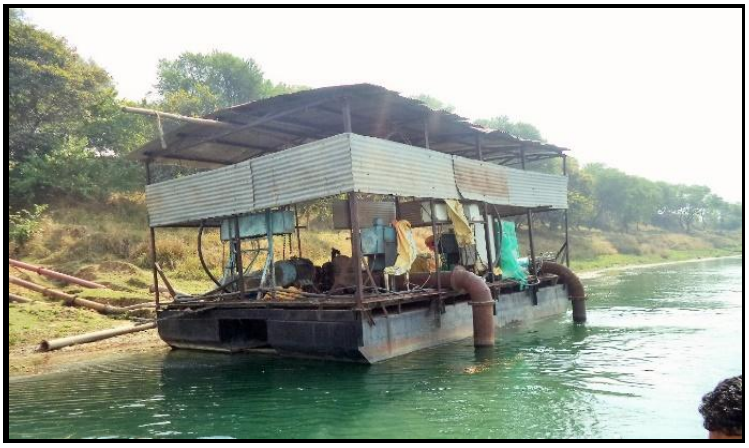
Fishing Activity at Ch 27.50 km

(t) **Sand Mining**. Sand mining activity is also relevant by boat and tractor in this stretch.

Sand Mining Activity at Ch 35.70 km

(u) **Tributaries**. There is no tributary of Tons river present in this portion.

(v) **Details of Irrigational Canals**. There is no irrigational canal, only water pump is also prominent for the irrigational purpose in this section.



Water Pump at Ch 35.60 km

(w) **Details of Nalas**. There is no drain/ nala observed polluting the river in this portion.

(x) **Usage of Water**. Water in this portion primarily irrigation purpose.

(y) **Details of Cross-Structures**. There are two bridges in this stretch. Details are enumerated below:-

Sl No	Structure Name	Chainage (km)	Position (Lat Long)		Position (UTM)		Length (m)	Width (m)	No of Piers	Horizontal clearance (Distance Between piers) (m)	Vertical clearance from HFL (m)	Remarks
			Left Bank	Right Bank	Left Bank	Right Bank						
1	Kohrar Bridge	29.93	25° 9'5.74"N 81°58'53.29"E	25° 9'16.22"N 81°58'56.84"E	598921.263E 2782094.056N	599018.46E 2782417.035 N	337.26	6.6	10	35.67	2.793	Completed
2	Kakrahi Bridge	45.11	25° 9'2.26"N 81°53'3.49"E	25° 9'11.77"N 81°53'5.38"E	589128.652E 2781919.282N	589179.063E 2782212.010 N	297	7.5	12	31.20	2.248	Completed

Kohar Bridge at Ch 29.93 km& Kakrahi Bridge at Ch. 45.11 km

There are Three High tension line cross the river in this stretch. Details are enumerated below:-

Sl No	Cross-Structure Name	Chainage (km)	Position (Lat Long)		Position (UTM)		Vertical clearance w.r.t HFL (m)	Remarks
1	HT Line	28.41	25° 9'14.88"N 81°59'51.94"E	25° 9'27.54"N 81°59'39.29"E	600561.000E 2782387.000N	600204.500E 2782774.500N	25	Completed
2	HT Line	28.80	25° 9'11.54"N 81°59'36.44"E	25° 9'22.56"N 81°59'26.75"E	600128.500E 2782281.000N	599854.500E 2782618.000N	26	Completed
3	HT Line	28.82	25° 9'11.31"N 81°59'36.09"E	25° 9'22.23"N 81°59'26.21"E	600118.000E 2782274.000N	599839.500E 2782608.500N	28	Completed

High tension line at Ch 28.41,28.80 & 28.82 km

3.3 **Sub-Stretch 3: From Ch 50 km to Ch 73.25 km**. This stretch of the surveyed river is having length of 23.25 km and average width of 230m. Bench Mark pillar 3 no's is located in this section at Ch. 52.10 km, Ch. 62.0 km & Ch. 70.05 km. Details of BM pillar along with station recovery descriptions is placed at Annexure 9. Soil and water samples were collected at Ch.51.1, 61.1& 70.15 km. Report from authorized laboratory for the same being attached with Annexure 11& 12. Current meter observation and discharge measurement were carried out at Ch.51.1, 61.1& 70.15 km. In this river stretch. There is having shallow patches and Natural Rock in this Section. Gargata barrage of Irrigation department .In this barrage water flows to through small canal name is belan Nahar or canal. Chakghat is Boarder of Uttar Pradesh and Madhya Pradesh, there is neither any forest zone nor restricted zone. Farmers were seen engaging in agricultural activities. Primary crops are mustard, wheat, beans, peas, tomato, cabbage, carrot, radish, etc.

From Ch 50 km to 73.25 km

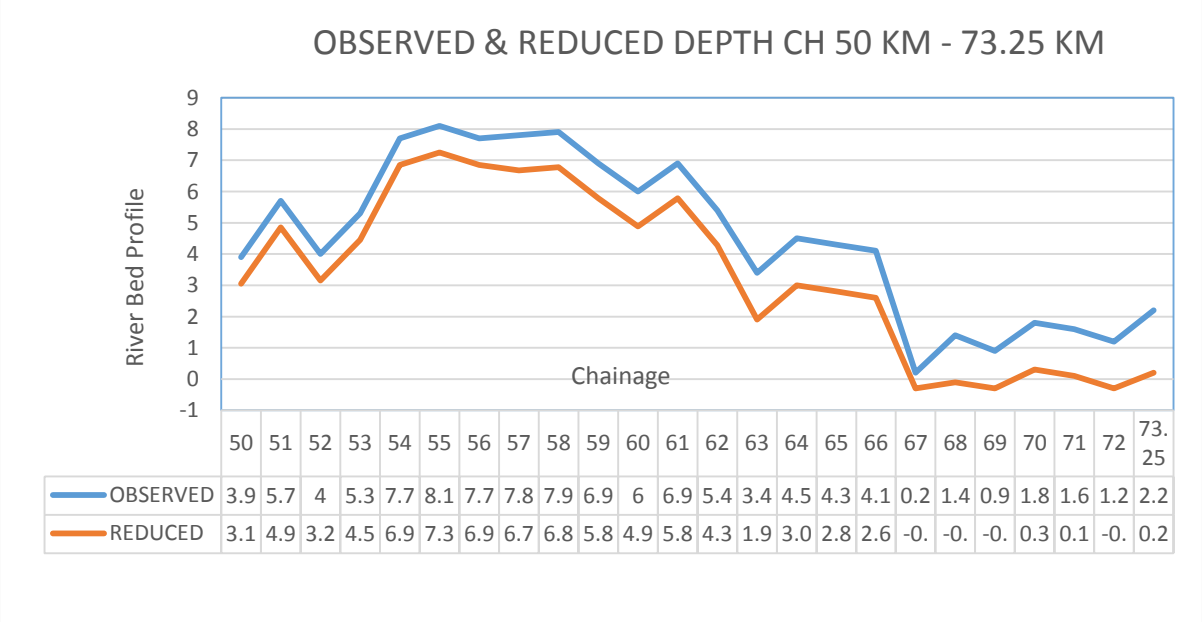
Dredging quantity for substretch-3

	Chainage (km)		Observed				Reduced wrt Sounding Datum			
Type	**From**	**To**	**Min Depth (m)**	**Max Depth (m)**	**Length of Shoal (m)**	**Dredging Qty (cu.m)**	**Min Depth (m)**	**Max Depth (m)**	**Length of Shoal (m)**	**Dredging Qty (cu.m)**
Class-I	50	73.25	0	8.6	3,700.00	1,31,399.15	-0.3	7.48	9,600.00	3,41,422.70
Class-II	50	73.25	0	8.6	4,800.00	2,51,131.09	-0.3	7.48	10,800.00	5,76,219.71
Class-III	50	73.25	0	8.6	5,550.00	4,42,544.41	-0.3	7.48	10,150.00	9,26,762.44
Class-IV	50	73.25	0	8.6	7,250.00	6,15,666.82	-0.3	7.48	11,050.00	12,20,725.81

(a) **Bathymetry Survey & Topographic Survey**.

SUB-STRETCH-3 (50-73.25 KM)		
Type of Survey	**Chainage (km)**	**Remarks**
Bathymetry Survey	50 km to 65 km	covered by bathymetric survey
	72.0 km to 73.250 km	covered by bathymetric survey
Topographic Survey	72.0 km to 73.25 km	Being Dry/Very Shallow covered by topographic method
	50 km to 73.25 km	Riverbank, prominent features along the bank.

(c) **Observed & Reduced Depth Profile of the Stretch**. Both observed and reduced depth along with slope being mentioned below:-



	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73.25
OBSERVED	3.9	5.7	4	5.3	7.7	8.1	7.7	7.8	7.9	6.9	6	6.9	5.4	3.4	4.5	4.3	4.1	0.2	1.4	0.9	1.8	1.6	1.2	2.2
REDUCED	3.1	4.9	3.2	4.5	6.9	7.3	6.9	6.7	6.8	5.8	4.9	5.8	4.3	1.9	3.0	2.8	2.6	-0.	-0.	-0.	0.3	0.1	-0.	0.2

Chainage (km)		River Bed Level (m)		River Bed Level Change (m)	Slope
From	To	From	To		
0.0	73.25	73.033	90.667	17.634	1:2475

(d) **Prominent Dam/ Barrage**. There is only one Gargata barrage exists in this stretch.

Gargata Barrage at Ch 69.40 km

(d) **Tidal Stretch**. This 23.25 km of river stretch is completely non-tidal.

(e) **Bank**. This portion of the river is having un-protected, only around the bridge bank and near Gargata Barrage are Pitch protected.

River Bank Pitch Protected at Ch 69.37 km

(f) **Hindrances**. Shallow depth and Rock Boulders seems to be hindrance for navigation.

Rock & ShSallow Depth at Ch 65.0 km to 72.0 km

(g) **Encroachment**. No encroachment was observed in this stretch.

(h) **Protected Area**. There is no wildlife, Defence, Atomic power plant and any other protected area present in this river stretch.

(i) **NH/ SH**. National Highway 27 of the state of Uttar Pradesh and Madhy pradesh Boarder cross the river.

(j) **Railway Station**. There is no any Railway station within 40 km onlly Allahabad located 46 km towards north-western side from the river.

(k) **Land Use Pattern**. Land on either banks of the river being utilised for either agricultural or residential purpose.

(l) **Crops**. Both the banks of Tons river are very fertile. Primary crops are mustard and wheat but seasonal vegetable crops are also cultivated viz. peas, cauliflower, potato, tomato, cabbage, carrot, etc. (winter crops).

(m) **Bulk Construction Material**. There is neither any factory for construction material nor any raw material available along the river stretch.

(n) **Existing Industry**. There is no major or minor industry exists in this stretch.

(o) **Existing Ghats, Jetties and Terminals**. There is no ghat, jetty and terminal was observed in this portion.

(p) **Cargo Movement**. There is no cargo movement observed in this portion of the water way during the course of survey.

(p) **Prominent City/ town or Place of Worship**. The only town in this section is Chakghat.

(q) **Ferry**. There is no ferry service available in this river stretch.

(r) **Water Sports Recreational Facilities**. There is no facility for water sports in this section.

(s) **Fishing Activity**. Fishing activity was monitored in this section.

Fishing activity at Ch 54.31 km

(t) **Sand Mining**. No sand mining activity was found in this stretch.

(u) **Tributaries**. The Belan River tributary was noticed at Ch. 70.53 km upstream left side of the river at village Chhaper.

(v) **Details of Irrigational Canals**. There is Belan irrigational nahar at Ch. 68.03 km present in this section.

(w) **Details of Nalas**. There is no drain/ nala observed polluting the river in this portion.

(x) **Usage of Water**. Water in this portion primarily irrigation purpose.

(y) **Details of Cross-Structures**. There are five bridges in this stretch. Details are enumerated below:-

Sl No	Structure Name	Chainage (km)	Position (Lat Long)		Position (UTM)		Length (m)	Width (m)	No of Piers	Horizontal clearance (Distance Between piers) (m)	Vertical clearance from HFL (m)	Remarks
			Left Bank	Right Bank	Left Bank	Right Bank						
1	UdhrengaPipaPul	56.55	25° 7'17.51"N 81°47'48.79"E	25°7'20.71"N 81°47'41.06"E	580336.481E 2778642.186N	580119.861E 2778739.704N	237.55	3.5	-	-	-	Completed
2	U/C Udhrenga Bridge	56.62	25° 7'15.98"N 81°47'49.10"E	25°7'18.83"N 81°47'40.09"E	580345.343E 2778595.824N	580092.393E 2778681.081N	237.94	8	10	24.84	1.672	Under construction
3	Gaughat Bridge	68.03	25° 3'2.47"N 81°46'4.82"E	25°3'21.12"N 81°45'48.67"E	577469.179E 2770780.653N	577013.240E 2771351.158N	730.3	6.5	58	11.81	7.691	Completed
4	Chakghat Bridge	73.25	25° 1'58.45"N 81°43'38.59"E	25°2'10.35"N 81°43'51.11"E	573382.378E 2768788.657N	573731.883E 2769156.194N	507.18	10	21	24.16	9.84	Completed

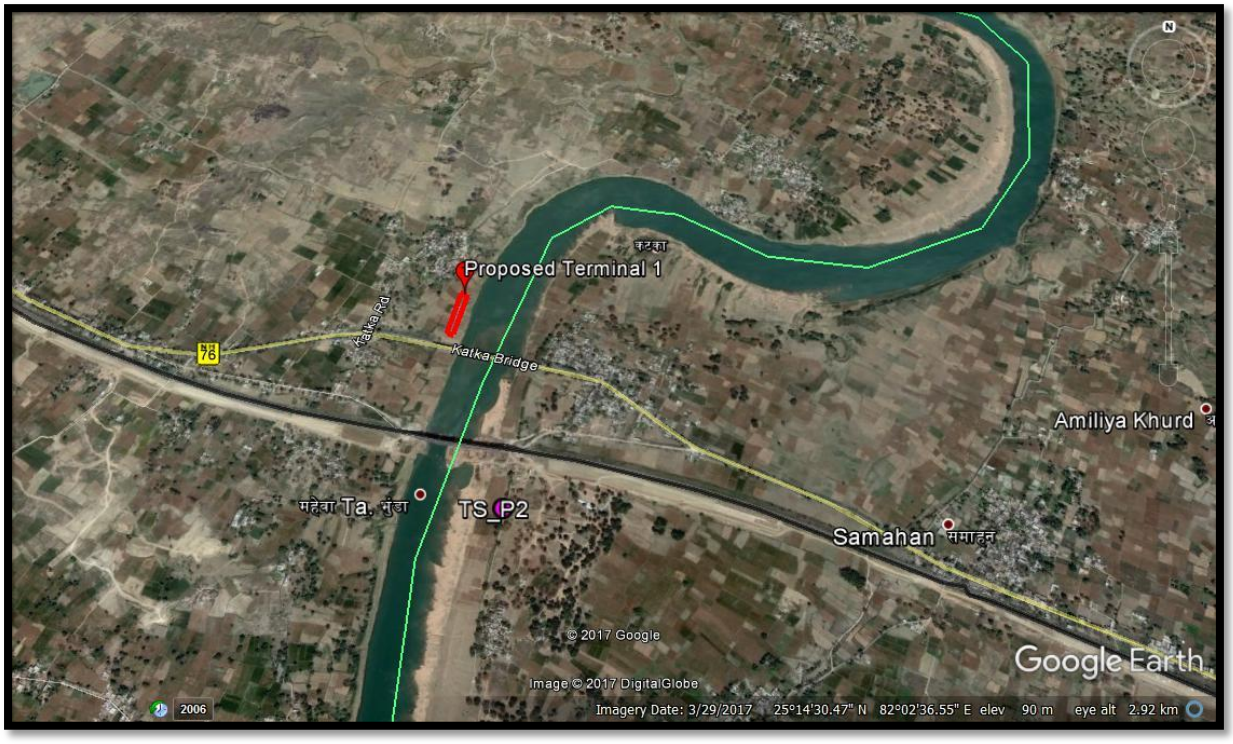
Pipa Pul at Ch 56.55 km& U/C Udhrenga Bridge at Ch 56.62

Gaughat Bridge at Ch 68.03 km&KM Chakghat Bridge and U/C Bridge at Ch 73.25 km

SECTION – 4

4.1**Terminals.** There is no terminal present in this waterway. However, development of terminal at Katka and Mai Khurd is recommended due to depth availability throughout the year proximity to the road rail networks. NH76 across the Tons River and NTPC thermal Power plant in Mai Khurd. Meja Railway stations are located 5.70 km away from the proposed terminal respectively. This proposed terminal will cater for passenger as well as cargo movement throughout the river. Details of the proposed terminal being tabulated below:-

Sl No	Ch. (km)	Location	Position (Lat/ long)		Position (UTM)		Length (m)	Width (m)	Area (sq.m)	Present Land Use
			Start	End	Start	End				
1	9.57	Katka	25°14'38.87"N 82° 2'19.37"E	25°14'34.18"N 82° 2'18.07"E	604612.240E 2792385.600N	604576.670E 2792240.300N	150	20	3000	Agricultural Land
2	40.65	Mai Khurd	25° 9'20.65"N 81°55'33.48"E	25° 9'14.49"N 81°55'25.31"E	593323.520 E 2782512.940 N	593096.830E 2782322.590N	300	50	15000	Agricultural Land



Proposed Terminal-1 at Ch. 9.57 km

Proposed Terminal-2 at Ch. 40.65 km

SECTION – 5

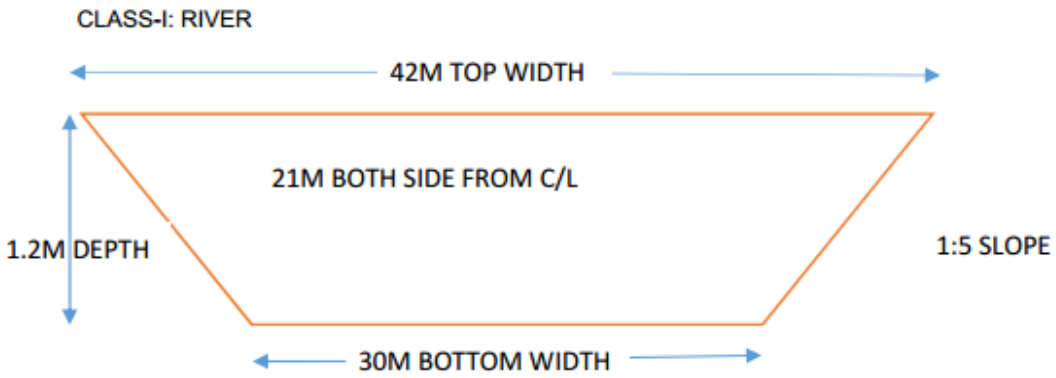
5.1 Fairway Development

The dredging channel is designed by linking deepest sounding of each cross sections and the dredging quantity is estimated for developing a navigable channel with the following dimension. The best suitable dredging channel class for the survey stretch of Tons River is identified as Class-III and the dredge volume for the Class I to Class-IV were also calculated for the entire survey stretch. The details of Fairway channel dimension used for the dredging calculation are as follows: -

Class of Channel Depth (m) Bottom	Depth (m)	Bottom width (m)	Slope
Class -I	1.2	30	1:5
Class -II	1.4	40	1:5
Class -III	1.7	50	1:5
Class -IV	2.0	50	1:5

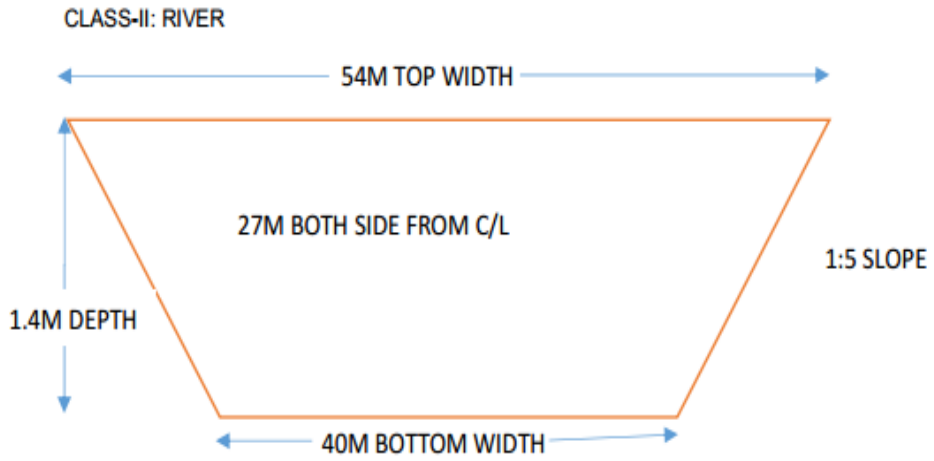
5.2 Calculation of Dredging Quantity The dredge volume calculations were accomplished using the HYPACK dredge volume computation utility. For clarity and ease of calculations, the complete channel profile was divided into segments of 1 km each (enclosed at Annexure-2). The Tin v/s Channel volume with Hypack Standard algorithm was used to calculate the dredge volume. The stretch wise summary of the dredge volume for a different class of fairway is as follows: -

1) 30m x 1.2m with side slope 1:5, along the deepest route.



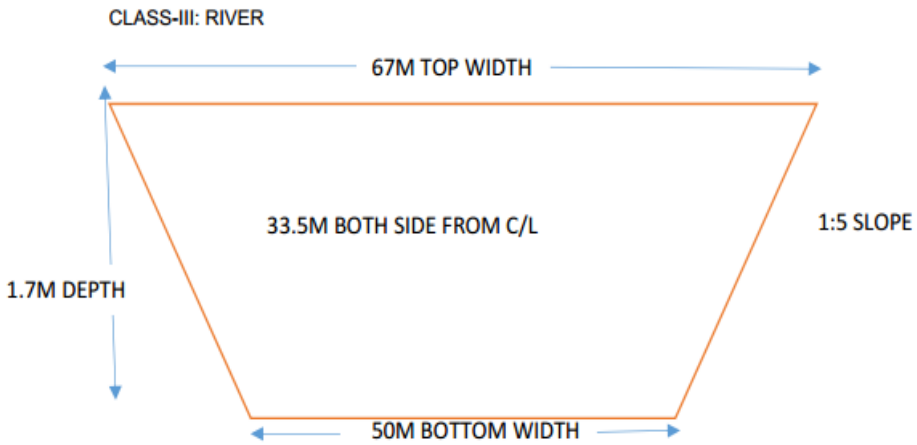
CLASS - I											
Chainage (km)		**Observed**					**Reduced w.r.t Sounding Datum**				
From	**To**	**Min. Depth (m)**	**Max. Depth (m)**	**Length of Shoal (m)**	**Dredging Qty (Cu.m)**	**Cumulative Drg. Qty. (cu.m)**	**Min. Depth (m)**	**Max. Depth (m)**	**Length of Shoal (m)**	**Dredging Qty (Cu.m)**	**Cumulative Drg. Qty. (cu.m)**
Sirsa Ch. 0 Km	Bhatauti Ch. 25 KM	0.0	13.9	3,250.00	81,493.94	81,493.94	-0.2	13.9	7,700.00	2,98,217.15	2,98,217.15
Bhatauti Ch. 25 KM	Pirhata Bisaura Ch. 50 KM	0.0	8.3	2,850.00	95,811.33	1,77,305.27	-0.3	7.4	10,450.00	4,41,591.99	7,39,809.14
Pirhata Bisaura Ch. 50 KM	Chakghat Bridge Ch. 73.25 KM	0.0	8.1	3,700.00	1,31,399.15	3,08,704.42	-0.3	7.3	9,600.00	3,41,422.70	10,81,231.84

2) 40m x 1.4m with side slope 1:5, along the deepest route.



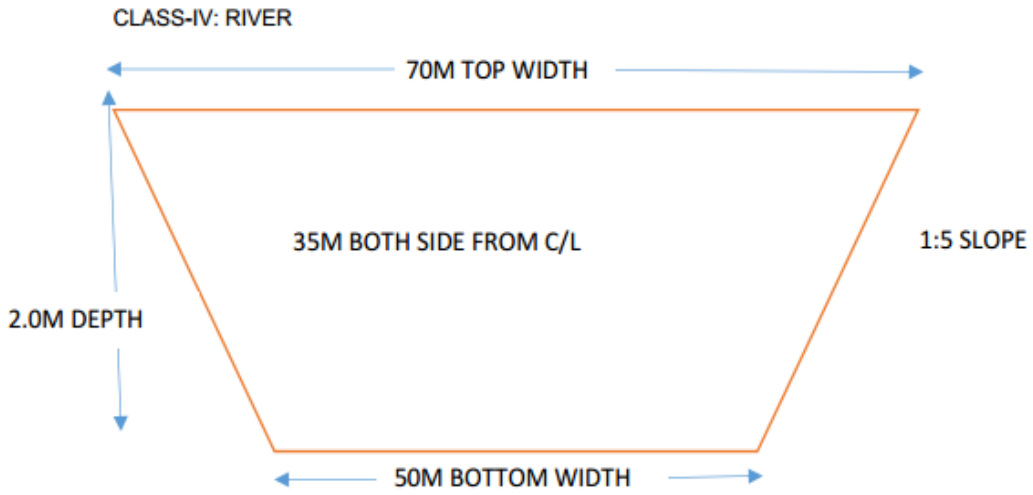
CLASS - II											
Chainage (km)		**Observed**					**Reduced w.r.t Sounding Datum**				
From	**To**	**Min. Depth (m)**	**Max. Depth (m)**	**Length of Shoal (m)**	**Dredging Qty (Cu.m)**	**Cumulative Drg. Qty. (cu.m)**	**Min. Depth (m)**	**Max. Depth (m)**	**Length of Shoal (m)**	**Dredging Qty (Cu.m)**	**Cumulative Drg. Qty. (cu.m)**
Sirsa Ch. 0 Km	Bhatauti Ch. 25 KM	0.0	13.9	4,800.00	2,03,826.47	2,03,826.47	-0.3	13.9	9,650.00	5,15,652.67	5,15,652.67
Bhatauti Ch. 25 KM	Pirhata Bisaura Ch. 50 KM	0.0	8.3	5,150.00	2,28,997.99	4,32,824.46	-0.3	7.4	11,850.00	7,61,774.92	12,77,427.59
Pirhata Bisaura Ch. 50 KM	Chakghat Bridge Ch. 73.25 KM	0.0	8.1	4,800.00	2,51,131.09	6,83,955.55	-0.3	7.3	9,800.00	5,76,219.71	18,53,647.30

3) 50m x 1.7m with side slope 1:5, along the deepest route.



CLASS - III											
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)**	**Cumulative Drg. Qty. (cu.m)**	**Min. Depth (m)**	**Max. Depth (m)**	**Length of Shoal (m)**	**Dredging Qty (Cu.m)**	**Cumulative Drg. Qty. (cu.m)**
Sirsa Ch. 0 Km	Bhatauti Ch. 25 KM	0.0	14.1	6,300.00	4,94,465.34	4,94,465.34	-0.3	14.1	10,650.00	9,22,873.79	9,22,873.79
Bhatauti Ch. 25 KM	Pirhata Bisaura Ch. 50 KM	0.0	8.5	6,000.00	4,83,835.19	9,78,300.53	-0.3	7.6	12,450.00	12,03,617.23	21,26,491.02
Pirhata Bisaura Ch. 50 KM	Chakghat Bridge Ch. 73.25 KM	0.0	8.6	5,550.00	4,42,544.41	14,20,844.94	-0.3	7.5	10,150.00	9,26,762.44	30,53,253.46

4) 50m x 2.0m with side slope 1:5, along the deepest route.



CLASS - IV											
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)**	**Cumulative Drg. Qty. (cu.m)**	**Min. Depth (m)**	**Max. Depth (m)**	**Length of Shoal (m)**	**Dredging Qty (Cu.m)**	**Cumulative Drg. Qty. (cu.m)**
Sirsa Ch. 0 Km	Bhatauti Ch. 25 KM	0.0	14.1	8,800.00	7,89,916.86	7,89,916.86	-0.3	14.1	12,150.00	12,87,341.71	12,87,341.71
Bhatauti Ch. 25 KM	Pirhata Bisaura Ch. 50 KM	0.0	8.5	8,100.00	7,20,628.39	15,10,545.25	-0.3	7.6	18,400.00	15,63,833.20	28,51,174.91
Pirhata Bisaura Ch. 50 KM	Chakghat Bridge Ch. 73.25 KM	0.0	8.6	7,250.00	6,15,666.82	21,26,212.07	-0.3	7.5	11,050.00	12,20,725.81	40,71,900.72

SECTION – 6

6. **Conclusion**. The river corridor consists of a length of 73.25 km from sirsa at Ganga confluence (Ch. 0 km) to Bridge on National Highway 27 (Ch.73.25 km). The whole river is non-tidal and is one of the tributary of Ganga. Sounding operation was carried out from Ch. 0 km to Ch. 73.25 km. Total length of the waterway is having different range of depths. The surveyed river stretch can be used as navigable channel throughout the year with certain precautions and restrictions. Natural rocks can be noticed in many places, which may also be posed as navigational hazards. Canal system and pump house are also prominent for the irrigational purpose throughout the waterway. In few places, sand mining activities are also relevant. Low draft boats can ply throughout the year in the surveyed river. Rocky islands, underwater plants and shallow patches can be noticed in numerous occasions which may be posed as hindrance for waterway navigation. The surveyed stretch of Tons River is utilized by small boat for ferry services and the waterway can be best utilized for cargo transfer and passenger ferry service on improving the depth of existing waterway. There are eight cross structures and nine high-tension line exist in the waterway, which are presently in use. The dredging on the Waterway will improve the depth of the channel for any navigational requirement. The River banks are well connected with the road network and are moderately connected with Railway Network. The road is near parallel on both sides throughout the river stretch.

The 28.75 km of river length is having depth below 1.2 m, 14.35 km of river length is having depth between1.2 m to 1.4 m, 11.15 km of river length is having depth between 1.5 m to 1.7 m and 10.40 km of river length is having depth between 1.8 m to 2.0 m. The length of river having depth more than 2 m is 8.60 km only. There is only one barrage, Gargata Barrage(Ch.69.40 km) and one aqueduct at ch 68.03 km exists in theSurvey stretch.Total 09 no’s cross structure and Minimum and maximum horizontal clearance of cross structures are 11.81m and 49.38m respectively. Minimum and maximum vertical clearances of cross structures are 3.91m & 9.84m wrt HFL respectively. Total 09 no’s power cable cross the river and Min & max vertical clearance of power cables are 21m & 28.0m wrt HFL respectively.

There is neither any protected area (Atomic/ Port/ Wildlife/ Research) nor any hindrance exist in the whole waterway. Information gather from local populace that the availability of maximum water is only during monsoon season. There is no cargo, passenger ferry and tourism facility is available in the river stretch. Both banks of the Tons River is very much fertile. Cultivation of wheat, mustard, peas, potato and carrot etc. has been noticed during the course of survey. Land along the river is mainly utilized for agricultural purpose. However, in some places, it is also used as residential purposes. The whole river stretch is well connected with the rail and road networks within 5 to 10 Km. Prominent cities are Sirsa, Katka, Meja and Chakghat. There are no any ferry services in the present survey stretch. There is no water sport facility available in the whole river portion. There are no any tourism facilities are present in the whole river only tourism facilities are Vindhyachal at Mirzapur approx. 35km from waterway. Cities along the river viz. Sirsa, Meja, and Chakghat, etc. are well connected with both rail and road networks.

There is no terminal present in this waterway. However, development of terminals at Katka (Ch. 9.57 km) and Mai Khurd (Ch.40.65km) seems viable. These places are well connected by rail and road networks. These proposed terminals will cater for passenger as well as cargo movement throughout the river.

The feasibility survey were carried out at river Tons river (length 73.25 km) Sirsa, Ganga confluence (Ch. 0 km) to Chakghat Bridge on National Highway 27 (Ch.73.250 km).The Dredging quantity being tabulated below: -

Class	Dredging. Qty. (cu.m)
Class I	10,81,231.84
Class II	18,53,647.30
Class III	30,53,253.46
Class IV	40,71,900.72

Average width of the whole river corridor is 100m – 170m and hence development of dredging channel as per Class III being strongly recommended. Construction of check dam at Ch. 2.00 km being recommended for availability of water throughout

the year. The river bed slope stretch-1 (0 to 25 km) is 0.155 m/km, Stertche-2 (25 to 50 km) 0.355m/km and stretch-3 (50-73.25 km) 0.758 m/km.

Consultant Recommendation

- Average width of the river is 100-170m.
- Average slope of the river is 1:0.423
- Total 08 number of bridges were found and 05 no's of bridges required to be modified for development of declared waterway in Class-I
- Meja super thermal power plant (NTPC) at Ch.33.5 km (Lat 25°08'43.09"N, Long 81° 56'26.72"E) under construction near about 900m distance from the River.
- There is no Major Industries along the river.
- Rock at Ch.39.38 km and further steep gradient in upstream.
- There are no any existing Ghats, Jetties, Terminals and existing facilities for Navigation.
- The dredging required is as follow.

Class	Reduced (Cu.m)
Class IV up to 35 km	24,25,670.30

Conclusion of feasibility study.

Further discussion may be carried out with NTPC for their requirement. Accordingly, development works may be explored up to 35 km.

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