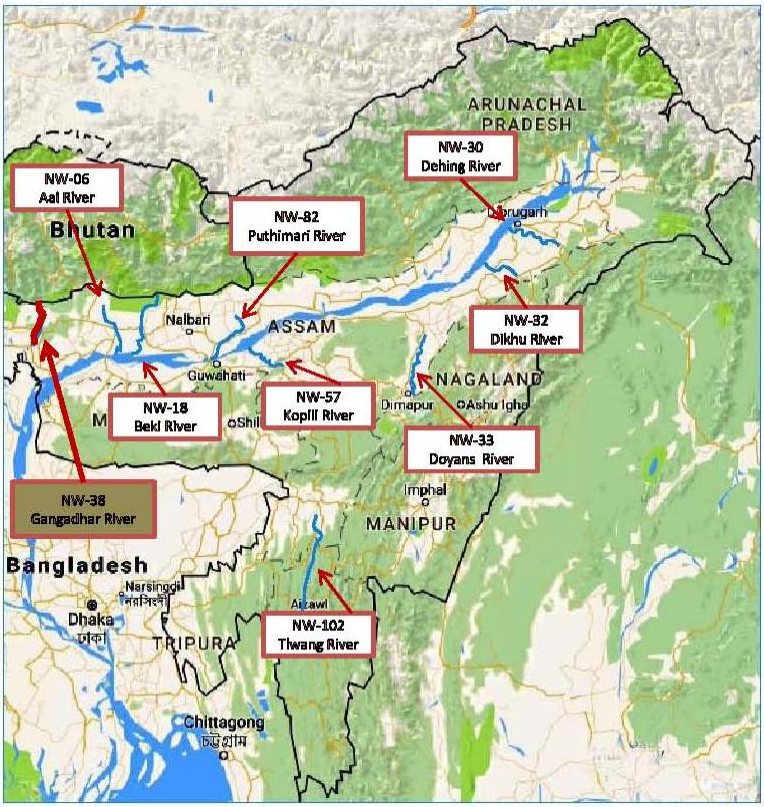
INLAND WATERWAYS AUTHORITY OF INDIA, A-13, SECTOR-1, NOIDA
DIST-GAUTAM BUDHA NAGAR, UTTAR PRADESH, PIN- 201 301(UP)

"FINAL FEASIBILITY REPORT ON HYDROGRAPHIC SURVEY

GANGADHAR RIVER (NW-38) (62 km)

FROM "BANGLADESH BORDER AT BINNACHARA PT III TO PAKRIGURI BRIDGE"

Survey Period from 14.09.15 to 06.10.15



FINAL REPORT ON HYDROGRAPHICAL SURVEY OF GANGADHAR RIVER, ASSAM

REPORT SUBMISSION DATE- 05.11.2018

SUBMITTED BY:

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Acknowledgement

Precision Survey Consultancy (PSC), Salap, Howrah express its sincere gratitude to **IWAI** for awarding the work and guidance for completing this Project of detailed Hydrographic Survey and the Feasibility Report in **Region-II-(Gangadhar River) from Bangladesh Border at Binnachara Pt-III to Pakriguri RCC Bridge (62 km).**

We would like to use this opportunity to pen down our profound gratitude and appreciations to **Ms. Nutan Guha Biswas, IAS, Chairperson, IWAI** for spending their valuable time and guidance for compleing this project of "Detailed Hydrography and Topography survey in Kopili River." PSC would also like to thanks **Shri Pravir Pandey, Vice Chairman, IA&AS., Shri Shashi Bhushan Shukla, Member (Traffic), Shri Alok Ranjan, Member (Finance) and Shri S.K.Gangwar, Member (Technical).**

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List of Abbreviations

CD	Chart Datum
DGPS	Differential Global Positioning Systems
ETS	Electronic Total Station
GPS	Global Positioning Systems
LBM	Local Bench Mark
MSL	Mean Sea Level
RL	Reference Level
SD	Sounding Datum
SBAS	Satellite-Based Augmentation System
TBC	Trimble Business Centre
FRP	Fiber Reinforced Plastic

Table 1- List of Abbreviations

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Salient Features of Gangadhar River

Sl.	*Particulars*	*Details*
1.	Name of the Consultant	Precision Survey consultancy
2.	Region / Cluster number & State(s)	Region II, Assam
3.	a) Waterway name b) NW # c) Total Stretch and length of declared NW (from…. To….; total length) d) Survey Period (… to …)	a) Gangadhar River b) NW-38 c) From Bangladesh Border at Binnachara pt- III (Chainage 0.00 km) to Pakriguri Bridge (Chainage-62.00 km) d) 14th September, 2015 to 06th October, 2015
4.	Tidal & non tidal portions (from… to, length, tidal variation at every 10 km)	There are no Tidal influences or portions found in this zone of River.
5.	LAD status (Least Available Depth) Status	**Observed Depth**

i) < 1.2 m
ii) 1.2 m to 1.4 m
iii) 1.5 m to 1.7 m
iv) 1.8 m to 2.0 m
v) > 2.0 m

Sub-Stretch-1 (0.00 -10.00 km)	Sub-Stretch- 2 (10.00 -20.00 km)	Sub-Stretch - 3 (20.00-30.00 km)	Sub-Stretch-4 (30.00-40.00 km)	Sub-Stretch-5 (40.00-50.00 km)
6.0	6.0	1.0	1.0	0.7
0.9	0.9	1.5	1.5	0.5
0.6	0.6	1.0	1.0	1.4
0.6	0.6	1.35	1.35	1.6
1.9	1.9	5.15	5.15	5.8
Total-10	Total-10	Total-10	Total-10	Total-10

i) < 1.2 m
ii) 1.2 m to 1.4 m
iii) 1.5 m to 1.7 m
iv) 1.8 m to 2.0 m
v) > 2.0 m

Sub-Stretch-6 (50.00-62.00 km)	Total (km)
1.7	16.4
1.5	6.8
1.4	6.0
1.6	7.1
5.8	25.7
Total-12.00	62.00 km

Reduced Depth

i) < 1.2 m
ii) 1.2 m to 1.4 m
iii) 1.5 m to 1.7 m
iv) 1.8 m to 2.0 m
v) > 2.0 m

Sub-Stretch-1 (0.00 -10.00 km)	Sub-Stretch- 2 (10.00 -20.00 km)	Sub-Stretch - 3 (20.00-30.00 km)	Sub-Stretch-4 (30.00-40.00 km)	Sub-Stretch-5 (40.00-50.00 km)
3.0	4.3	3.2	3.3	0.2
1.2	2.1	1.2	1.3	1.2
0.4	1.2	1.0	1.4	1.5
3.1	1.3	2.2	2.1	2.0
2.3	1.1	2.4	1.9	5.1
Total-10	Total-10	Total-10	Total-10	Total-10

i) < 1.2 m
ii) 1.2 m to 1.4 m
iii) 1.5 m to 1.7 m
iv) 1.8 m to 2.0 m
v) > 2.0 m

Sub-Stretch-6 (50.00-62.00 km)	Total (km)
0.2	14.2
1.4	8.4
3.5	9.0
2.5	13.2
4.4	17.2
Total-12	62.00 km

6. Cross structures
i) Dams, weirs, barrages etc (total number; with navigation locks or not)
ii) Bridges, Power cables etc [total number; range of horizontal and vertical clearances]

i) No Dams, weirs or Barrages are found in this zone of river.

ii) Total number of RCC Bridge – Three (3), Rail Bridge- Three (3)

iii) Damage Rail Bridge- one- (1)

Clearance w.r.t H.F.L	Min (m)	Max (m)
Horizontal Clearance (m)	29.02	49.490
Vertical Clearance w.r.t. H.F.L (m)	1.751	4.846

iv) High Tension Lines- Three - (3)

Clearance w.r.t H.F.L	Min (m)	Max (m)
Horizontal Clearance (m)	334.89	660.51
Vertical Clearance w.r.t. H.F.L (m)	5.923	6.321

7. Slope

Reach		River / Canal Bed Level Change (m)	Distance (km)	Slope (m/km)	Slope (cm/km)
From	To				
0.594	11.863	3.089	11.269	0.274	27.41
11.864	16.678	4.815	4.814	1.000	100.02
16.679	24.441	7.763	7.762	1.000	100.01
24.442	34.701	10.26	10.259	1.000	100.01
34.702	48.04	13.339	13.338	1.000	100.01
48.041	62	8.584	13.959	0.615	61.49
Total			61.401	Avg-0.814	Avg-81.49

8. Discharge Report

Sl. No	Chainage (km)	Discharge (Cu.m/sec)	
1	3.245	110.539	**Dated 14.09.15 to 06.10.15**
2	16.678	241.70	
3	24.441	284.78	
4	56.624	168.78	
Avg. Discharge		201.44	

9. i) Present IWT operations

ii) Ferry services, tourism, cargo, if any

i) As follows

ii) Three passenger ferry services named Kathhaltuli Ghat, Lohadhanivi Ghat and Falimari Ghat are available in this zone of River.Cargo is available at Kathhaltuli ferry ghat temporarily in this zone of river.

10. Approx distance of Rail & Road from waterway

Nearest Railway station- Golokganj. (0.95 km approx), Srirampur (4.38 km approx)
Name of National Highway close to the River- NH-31, NH-31C, NH-127B

Name of SH-28, SH-12, SH-12A

11. Any other information/ comment

Section-1: Introductory Considerations

1.1 River Course: Background information, Historical Information, Origin, End

The River Gangadhar is originated from the Himalayan region and its flowing towards Kokrajhar and Dhubri district which is situated at the western part of Assam and its confluence with the Brahmaputra River near India-Bangladesh Border. The economy of Dhubri district is depending too much on agriculture. Dhubri district is one of the industrially backward districts of Assam. The industrial sector of the district had been centralized around some particular sectors like handicraft, small scale factories, some forest based industries and other industries like printing press, brick and tiles industry, ice industry, chemical industry etc.

Dhubri district is bounded both by interstate and international border, i.e. West - 78 - Bengal and Bangladesh in the west, Goalpara and Bongaigaon districts of Assam and Garo Hilles district of Meghalaya in the east, Kokrajar district in the north, Bangladesh and the state of Meghalaya in the south. The district is located on the globe between 89.42 to 90.12 degree east longitude and 26.22 to 25.28 degree north latitude. The district is situated at 30 meters above sea level on average.

Figure 1 - Gangadhar River Site Map

1.2 Tributaries / Network of River/ Basin

The Three streams create a river basin in this zone of river-

i) Gangadhar
ii) Kopili
iii) Puthimari

1.3 State / District through which river passes

The river is passing through the Districts of Kokrajhar and Dhubri in State of Assam.

1.4 Map

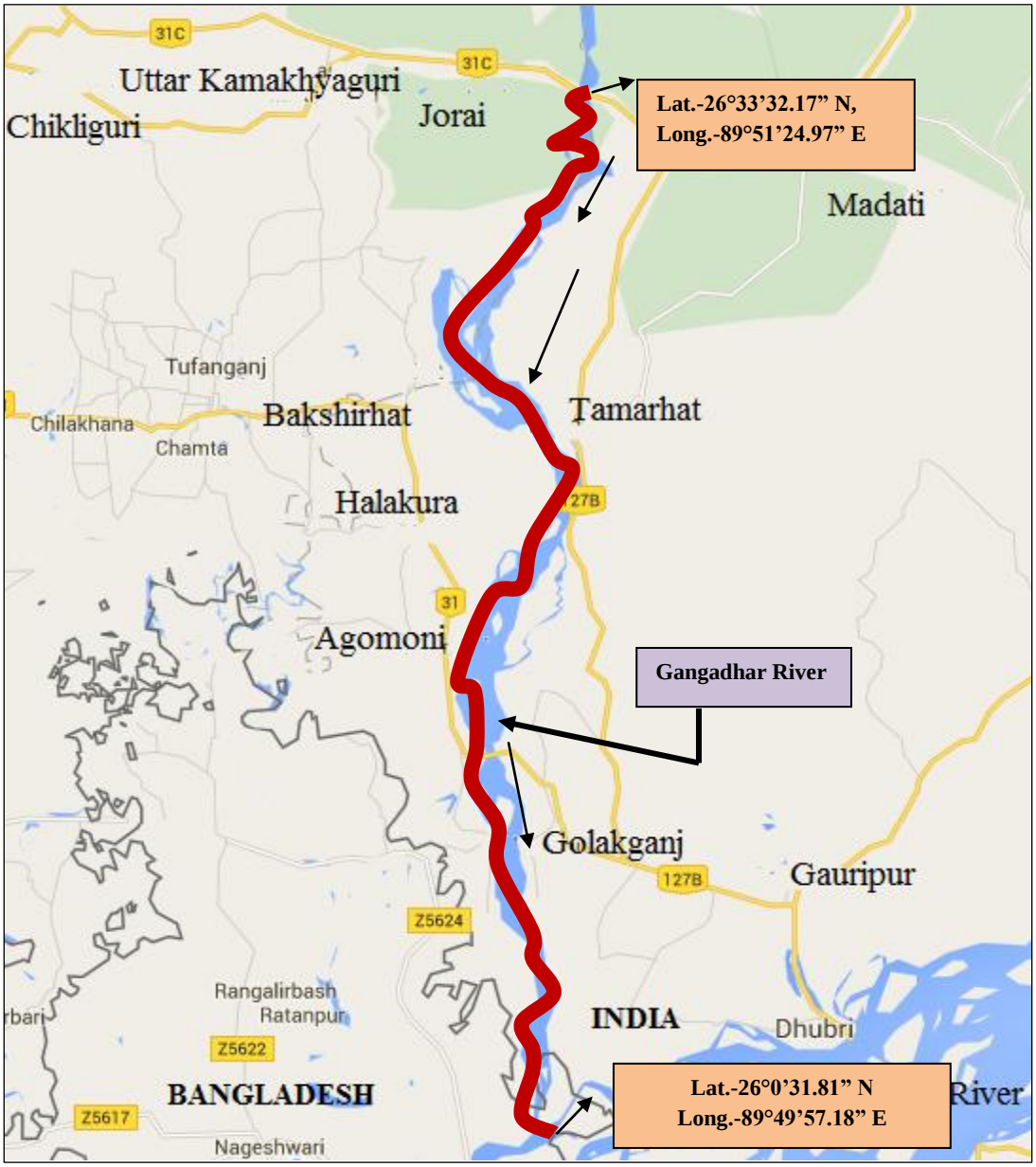


Figure 2- Project Site Map

1.5 River Key Map

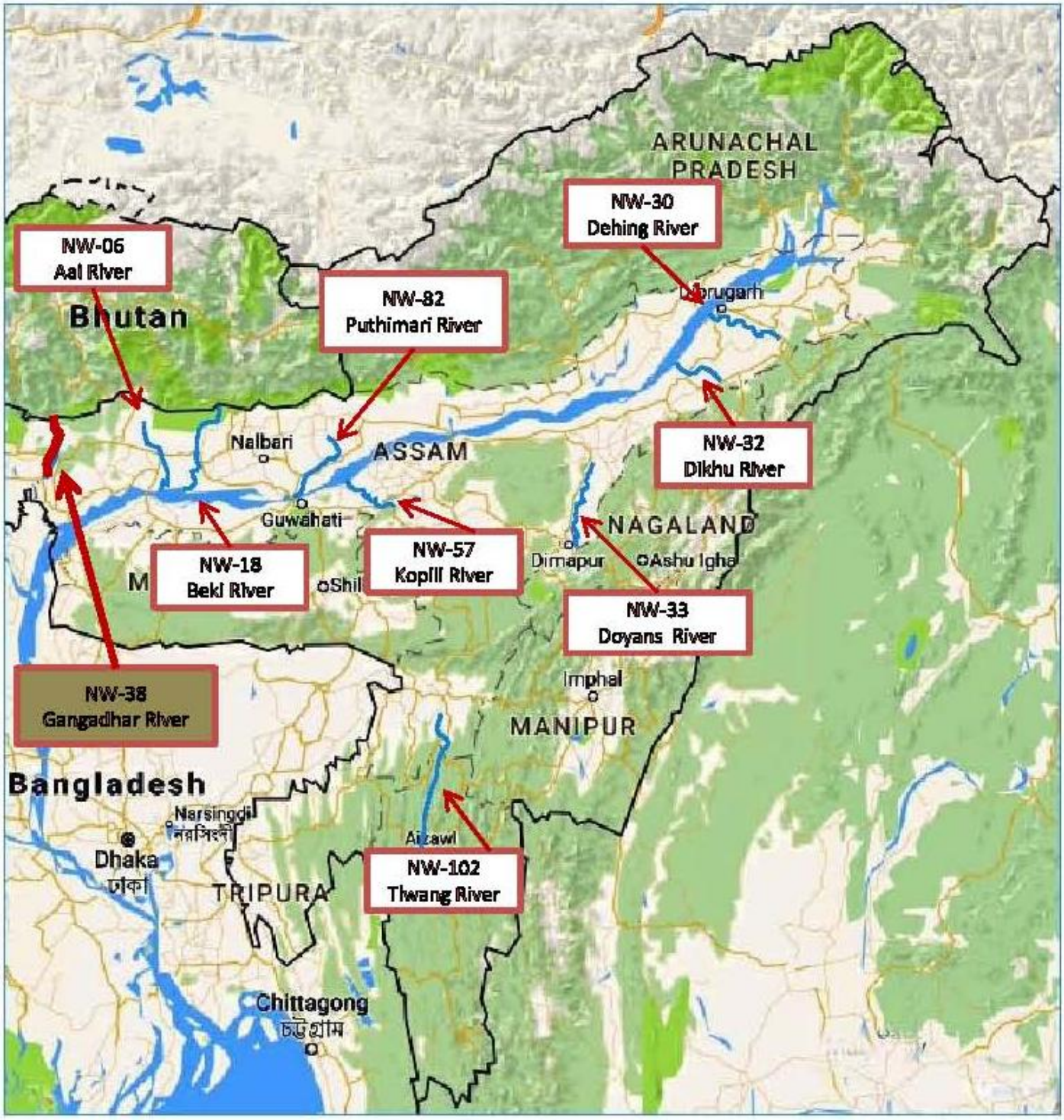


Figure 3- River Key Map

1.6 Scope of work

The Scope of work shall cover all technical aspects of hydrographic survey at par with International Standards including the following for development of the river/canal for inland navigation. The detailed hydrographic survey is to be carried out by using Automated Hydrographic Survey System (using digital Echo sounder for depth measurement, DGPS Beacons Receivers for position fixing and Hypackmax or equivalent software for data logging). The survey is to be conducted in WGS"84 datum.

- Detailed Hydrographic Survey to assess the navigability of the waterway.
- To collect Water and bottom samples, current meter observation and discharge from the deepest route at every 10 km interval
- To identify cross structures which are obstructing navigation.
- To identify the length of bank protection required.
- The BM is denoted by a "." mark engraved on a plate. The plate is fixed on a 5cm diameter GI pipe. The GI pipe is cemented with construction pillar of 30cmX30cmX150cm.
- The pillar extends 60.cms above ground level. Inscription "IWAI", "PSC" and BM No. can be seen on the face of the pillar.
- The main objective of the Study was to recommend the strategy and programs for the development of the Gangadhar River waterway and to provide an appropriate economic and organizational framework for restoring trade and navigation (cargo and passengers) on the Gangadhar River with an aim to do as follows:
- Improve public and private investments into transport on the Gangadhar River, in accordance with adequate economic and financial analysis;
- Propose enhancement of coordination of activities regarding inland navigation and to set up priorities of public interests;
- Obtain an integrated approach considering water management, energy production, flood control and environmental aspects in the Gangadhar River basin and Propose improvement of the infrastructure.

Section-2: Methodology Adopted to undertake Study

2.1 Methodology Adopted including Resources and equipment used and calibration:-

- **Equipment:-**

Followings equipments were employed for the Bathymetric and topographic survey:-

Table 2

Equipment	Make	Version	Qty Employed
Echo sounder	Bathy MF 500	……	1
Current Meter	AEM 213-D	……	1
Tide Gauge	Manual (Pole type)	-	4
RTK	South S86T		3
GPS Sets	Trimble –Becon Rover SPS 361		1
Software	HYPACK data acquisition	Version 14	1
Software	AUTOCAD	2013	1
Software	Microsoft Office	2013	1

Equipment list

- **Conduct of Survey Work:-**
- **Topographic Survey**

The Topographic survey has been carried out from Bangladesh Border at Binnachara Pt-III (Lat.- 26° 0'31.81"N, Long.- 89°49'57.18"E) to Pakriguri RCC Bridge (Lat.- 26°27'31.57"N, Long.- 89°51'19.50"E). The Topography survey has been carried out from chainage 0.00 km to chainage 62.00 km.

The Topographic survey has been conducted to ascertain in the following survey area:-

- Spot levels
- High bank Line
- Vegetation covered
- Bridges and permanent structures
- Road, culvert and other communication network

GPS RTK (Real Time Kinematic) satellite navigation is a technique used in land survey and in hydrographic survey based on the use of carrier phase measurements of the GPS, GLONASS and / or Galileo signals where a single reference station provides the real-time corrections, providing up to centimeter-level accuracy. When referring to GPS in particular, the system is also commonly referred to as Carrier-Phase Enhancement, CPGPS. RTK systems use a single base station receiver and a number of mobile units. The base station re-broadcasts the phase of the carrier that it measured, and the mobile units compare their own phase measurements with the ones received from the base station. There are several ways to transmit a correction signal from base station to mobile station. The most popular way to achieve real-time, low-cost signal transmission is to use a radio modem, typically in the UHF band. This allows the units to calculate their relative position to millimeters, although their absolute position is accurate only to the same accuracy as the position of the base station.

- **Bathymetry Survey:-**

The Bathymetry survey has been carried out from Chainage 0.00 km to Chainage 62.00 km. The layer of water was sufficient for carrying out the Bathymetry survey. Bathy 500 MF was used to obtain soundings onboard the survey boat. A working frequency of 210 KHz was used for sounding operations. The digital output from the echo sounder was 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 sound velocity was set to 1400 m/s on single beam echo sounder during acquisition. The Daily bar checks were done prior to the sounding operation and before the closing of the sounding operation for the day. Being very shallow depths, the echo sounder depths were also cross-checked in between by using demarcated sounding poles during the conduct of the survey. The sounding lines were run using Survey boat to identify the design line of the Gangadhar river for the possible stretch. 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 was also carried out in the area where the survey boat cannot be operated due to low depth. The hemisphere DGPS and Sounding Pole were used for Spot sounding at shallow locations in the Gangadhar River. The DGPS position along with water depths was recorded simultaneously and the tidal reduction was applied to the obtained depths.

Figure 4- Bathymetry Survey work

2.2 Description of Bench Marks (B.M) / Authentic Reference Level Used:-

For Topographic survey, The Horizontal control has been carried out from the G.T.S level of CWC, situated near the Pakriguri RCC Bridge (NH-31C) provided by IWAI office. The position of the G.T.S Level is:-

Location Name	Geographic position		UTM position		Elevation (m)
	Latitude (N)	Longitude (E)	Northing	Easting	
Pakriguri RCC Bridge	26°27'30.14"	89°51'17.70"	2929608.89	784667.02	51.230 m. w.r.t. M.S.L

Table 3- G.T.S Bench Mark Location

2.3 Tidal Influence Zone and tidal variation in different stretches:-

There are no tidal Influence have been seen in this part of the region of Assam.

2.4 Methodology to fix Chart Datum / Sounding Datum:-

IWAI has provided the Sounding Datum at Sankosh (LRP), Golokganj and at the confluence with Brahmaputra River. The same was used to arrive the sounding datum values at BM pillars and tide gauges.

Sl. No	Place	Sounding Datum w.r.t MSL (Provided by IWAI Office)
1	Sankosh (Chainage-56.540 km)	43.535 meter
2	Golokganj (Chainage-11.272 km)	26.300 meter
3	Confluence of Brahmaputra (Chainage- -3.000 km)	22.264 meter

2.5 Six years minimum Water Levels to arrive at Chart Datum (CD) / Sounding Datum (SD):-

- The CD levels of the Gangadhar River are: –

Sankosh- 43.535 meter (Chainage-56.540 km)

Golokganj- 26.300 meter (Chainage-11.772 km)

Confluence- 22.264 meter (Chainage- -3.000 km)

2.6 Transfer of Sounding Datum table for tidal rivers / canals:-

There is no Tidal influence or Tidal effects found in this zone of river.

2.7 Table Indicating tidal variation at different observation points (say at every 10 Km):-

There is no Tidal influence or Tidal effects found in this zone of river.

2.8 Salient Features of Dam, Barrages, Weirs, Anicut, Locks, Aqueducts etc:-

There are no Dams, Barrage, weirs, Anicut, locks, aqueducts found in this zone of river.

2.9 Description of erected Bench Mark Pillars:-

Station	Chainage (km)	Latitude (N)	Longitude (E)	Easting (m)	Northing (m)	BM Height above MSL (m)	BM Height above SD (m)
BM 1	0.594	26° 0'47.6784"	89°49'21.468"	782521.3340	2880204.2500	29.500	3.192
BM 2	11.863	26° 6'30.4956"	89°48'58.5354"	781655.305	2890744.219	34.513	11.261
BM 3	16.678	26°8'56.0934"	89°48'23.6592"	780589.239	2895205.554	35.079	8.5
BM 4	24.441	26°13'9.2274"	89°48'26.6724"	780504.263	2903000.307	34.286	5.975
BM 5	34.701	26°17'35.2098"	89°50'7.4436"	783123.142	2911249.825	36.363	5.104
BM 6	48.040	26°23'50.2578"	89°49'41.4444"	782148.459	2922780.536	42.731	14.544
BM 7	56.624	26°27'30.1566"	89°51'17.7192"	784667.4979	2929609.4259	51.230	16.028

Table 4 Bench Mark Details

2.10 Description of erected Tide Gauges:-

Tide Gauge No.	Chainage (km)	Location	Easting	Northing	Latitude (N)	Longitude (E)	W.L w.r.t M.S.L (m)	Period of Observation
Gauge Station-(TP) - 1	11.794	Pochim Tokrer Chara	782165.4	2890611.3	26° 6'25.8186"	89°49'16.7730"	27.100	24 Hrs.
Gauge Station-(TP) - 2	0.617	Binnyachara PT-III	783821.981	2880117.295	26° 0'43.939"	89°50'08.134"	26.200	24 Hrs.
Gauge Station-(TP) - 3	56.654	Pakriguri Bridge	784720.2	2929636.7	26°27'31.0026"	89°51'19.6416"	46.450	24 Hrs.
Gauge Station-(TP) - 4	48.035	Near Falimari	782151.6	2922764.5	26°23'49.7358"	89°49'41.5452"	39.500	24 Hrs.
Gauge Station-(TP) - 5	24.652	Kaldoba PT-I	780528.9	2903109.2	26°13'12.7446"	89°48'27.6438"	31.200	24 Hrs.
Gauge Station-(TP) - 6	16.673	Pachim Ratiadaha PT-III	780610.0	2895203.9	26° 8'56.0256"	89°48'24.4044"	28.900	24 Hrs.
Gauge Station-(TP) - 7	34.895	Kaimari PT-V	783473.947	2911470.730	26°17'42.131"	89°50'20.254"	34.200	24 Hrs.

Table 5 Tide Gauge Details

2.11 Chart Datum / Sounding Datum and Reductions details:-

Sl no	CWC gauge / Dam / Barrage / Weir / Anicut / 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 w.r.t. MSL (m)	Correction in WL data for Bathymetric survey (m)	Topo level data to be converted as depth for volume calculation w.r.t. SD (m)
	A	B	C (50% stretch is to be selected on both side of tide gauge)	D +ve indicates above MSL -ve indicates below MSL	E	F = (E- WL data in MSL)	G = (E- Topo levels in MSL)
1	GS-(TP)- 3	56.654	52.3-62.00		43.579	-2.871	Gangadhar Reduced Topo.xyz
2	Sankosh (LRP)	56.540		43.535			Submitted in Soft Copy
3	GS -(TP)- 4	48.035	41.7-52.3		40.261	0.761	
						0.861	
4	GS-(TP)- 7	34.895	29.8-41.7		35.202	1.002	
						0.702	
5	GS-(TP)- 5	24.652	20.7-29.8		31.259	0.059	
						0.159	
6	GS-(TP)- 6	16.673	14.0-20.7		28.187	-0.713	
7	GS-(TP)- 1	11.794	6.0-14.0		26.308	-0.821	
8	Golokganj	11.772		26.300		-0.792	
9	GS -(TP)- 2	0.617	0.0-6.0		23.252	-2.948	
10	Confluence (23)	-3.000		22.264			

Table 6 Chart Datum / Sounding Datum & Reduction Details

2.12 High Flood Level (H.F.L.) at known gauge stations and cross-structures:-

Sl no	Location and description of CWC gauge / Dam / Barrages / Weirs / Anicut / Locks / Aqueducts / BM	Cross-structure details	Chainage (km)	Established HFL / MHWS / FSL / MWL / FRL w.r.t. M.S.L (m)	Computed HFL at Cross-Structures w.r.t. M.S.L (m)
1	Sankosh (LRP)		56.540	49.100	
2	Golokganj		11.772	30.950	

Table 7 HFL Details

2.13 Average Bed Slope:-

Reach		River / Canal Bed Level Change (m)	Distance (km)	Slope (m/km)	Slope (cm/km)
From	To				
0.594	11.863	3.089	11.269	0.274	27.41
11.864	16.678	4.815	4.814	1.000	100.02
16.679	24.441	7.763	7.762	1.000	100.01
24.442	34.701	10.26	10.259	1.000	100.01
34.702	48.04	13.339	13.338	1.000	100.01
48.041	62	8.584	13.959	0.615	61.49
Total			61.401	Avg-0.814	Avg-81.49

Table 8 Average Bed Slope

2.14 Details of Dam/Barrage/Weirs/Anicut etc. w.r.t M.S.L:-

There are no Dams, Barrage, weirs, Anicut found in this river zone.

2.15 Details of Locks:-

There are no locks found in this river zone.

2.16 Details of Aqueducts:-

There are no Aqueducts found in this river zone.

2.17 Details of existing Bridge and Crossing over waterway:-

There are Three RCC Bridges, Three Rail Bridges and one damage Rail Bridge situated in this zone of river. The Details are tabulated below:-

Chainage (km)	Location	Cross Structure Details	Position				Length (m)	Width (m)	No. Of Piers	Horizontal Clearance (m)	Vertical Clearance w.r.t H.F.L (m)
			Easting	Northing	Latitude (N)	Longitude (E)					
11.863	Golakganj village	Damage Rail Bridge	781700.3297	2890729.9060	26° 6'29.97"	89°49'0.13"	294.92	5.03	5	46.48	1.751
11.894	Golakganj Village	Rail Bridge	782284.8896	2890702.4630	26° 6'28.68"	89°49'21.11"	626.22	7.14	12	49.49	2.463
16.701	Paschim Ratiadaha Pt.-III	RCC Bridge	781001.2472	2895323.2049	26° 8'59.62"	89°48'38.56"	489.52	10.62	11	29.02	3.216
54.807	Simultapu Block	Rail Bridge	785252.4283	2927871.5979	26°26'34.08"	89°51'37.40"	338.63	6.74	6	46.11	2.36
54.961	Simultapu Block	Rail Bridge	785269.4942	2928028.6922	26°26'38.38"	89°51'38.14"	288.83	5.56	5	45.65	1.94
56.660	Pakriguri	Pakriguri RCC Bridge	784686.5011	2929686.1476	26°27'32.63"	89°51'18.45"	355.83	10.30	7	38.67	4.846
56.680	Pakrikuri	Pakriguri RCC Bridge	784692.2177	2929704.8741	26°27'33.21"	89°51'18.68"	351.38	10.91	7	40.42	4.622

Table 9- Bridge Details

2.18 Details of other Cross structures, pipe-lines, under water cables:-

No other Cross structures, pipe lines and cables are found in this zone of river.

2.19 High Tension Lines / Electric Lines/Tele-communication lines:-

Three High Tension lines are situated in this zone of river. The Details are tabulated below:-

Line	Chainage (km)	Location	Position				No. Of Piers	Horizontal clearance (m)	Vertical clearance w.r.t H.F.L (m)	Remarks
			Latitude (N)	Longitude (E)	Easting (m)	Northing (m)				
High Tension	16.815	Pachim Ratiadaha PT-III	26°09'3.66"	89°48'39.38"	781020.97	2895447.98	8	475.16	6.321	Complete
High Tension	53.644	Simultapu No. II	26°25'54.23"	89°51'53.07"	785712.98	2926677.89	8	660.51	5.923	Complete
High Tension	55.101	Simultapu No. II	26°25'54.23"	89°51'54.34"	785748.18	2926678.67	8	334.89	6.05	Complete

Table 10- High Tension Lines Details

2.20 Current Meter and Discharge Details:-

Stretch No.	Chainage (km)	Position				Observed Depth (m) (D)	Velocity (m/sec.)	Average Velocity (m/sec.)	X-Sectional area (Sq. m.)	Discharge (Cu.m/sec)
		Latitude (N)	Longitude (E)	Easting (m)	Northing (m)		0.5 D			
1	3.245	26°02'10.583"	89°49'57.081"	783456.5900	2882778.0100	1.2	0.325	0.325	340.12	110.539
2	16.678	26°08'54.859"	89°48'25.913"	780652.663	2895168.951	1.3	0.490	0.490	493.27	241.70
3	24.441	26°13'08.643"	89°48'28.319"	780550.434	2902983.306	2.0	0.491	0.491	580.02	284.78
4	56.624	26°27'28.411"	89°51'22.625"	784804.667	2929558.680	1.5	0.485	0.485	348.01	168.78

Table 11 Current Meter Details

2.21-a. Soil Sample Locations:-

Sample No.	Chainage (km)	Latitude (N)	Longitude (E)	Easting (m)	Northing (m)	Depth (m)
1	0.594	26°00'34.239"	89°50'08.693"	783844.00	2879819.00	3.5
2	11.863	26°06'28.864"	89°49'03.175"	781785.39	2890696.81	2.6
3	16.678	26°08'54.859"	89°48'25.913"	780652.66	2895168.95	1.3
4	24.441	26°13'08.643"	89°48'28.319"	780550.43	2902983.31	2.0
5	34.701	26°17'53.697"	89°50'32.034"	783793.00	2911834.00	1.8
6	48.040	26°23'46.22"	89°49'41.48"	782152.22	2922656.15	2.2
7	56.624	26°27'28.411"	89°51'22.625"	784804.67	2929558.68	1.5

Table 12- Soil sample Locations

b. Water Sample Locations:-

Sample No.	Chainage (km)	Latitude (N)	Longitude (E)	Easting (m)	Northing (m)	Total Depth (d) (m)	Mid-Depth (0.5d) (m)
1	0.594	26°00'34.239"	89°50'08.693"	783844.00	2879819.00	3.5	1.75
2	11.863	26°06'28.864"	89°49'03.175"	781785.39	2890696.81	2.6	1.3
3	16.678	26°08'54.859"	89°48'25.913"	780652.66	2895168.95	1.3	0.65
4	24.441	26°13'08.643"	89°48'28.319"	780550.43	2902983.31	2.0	1
5	34.701	26°17'53.697"	89°50'32.034"	783793.00	2911834.00	1.8	0.9
6	48.040	26°23'46.22"	89°49'41.48"	782152.22	2922656.15	2.2	1.1
7	56.624	26°27'28.411"	89°51'22.625"	784804.67	2929558.68	1.5	0.75

Table 13- Water Sample Locations

Section-3: Description of Waterways

3.1 From Chainage 0.000 Km. to Chainage 10.000 Km. from (Brahmaputra confluence to Nalia Village)

Figure 5- Chainage 0.00 km to Chainage 10.00 km

The River width of Gangadhar River from Chainage 0.00 Km. to Chainage 10.00 Km is approximately 311m to 391m. The average water portion of the river is 350 m.

During the Survey it was noticed that Binnychara pt-IV, Berbhangi Pt II village, Nalia village are situated left bank side of the river and Dhubri, Golokganj, Tamarhat, Kamandanga. BM-1 is situated near at chainage of 0.594 km. Paddy land is also found both sides bank of the river.

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.)	Min. Depth (m)	Max. Depth (m)	Length of Shoal (m)	Dredging Qty. (cu.m.)
I	0.00	10.00	0.5	8.0	1000	17144.32	-0.3	7.2	3800	52614.53
II	0.00	10.00	0.4	8.1	1000	28539.08	-0.3	7.3	5700	90347.36
III	0.00	10.00	0.3	8.3	3000	56839.22	-0.3	7.5	7700	160888.8
IV	0.00	10.00	0.2	8.5	3900	87944.87	-0.3	7.7	9000	224990.59

3.2 From chainage 10.00Km to Chainage 20.00 Km (Nayachara village to Belguri Pt II Village)

Figure 6- Chainage 10.00 km to Chainage 20.00 km

The river width of Gangadhar River from Chainage10.00 Km. to Chainage 20.00 Km is 585m to 777m approximate width. The average water portion of the river is 600m.

During the survey it was noticed that damage Rail Bridge and a Rail Bridge is situated near at chainage of 11.863 km and 11.894 km respectively. The position of the Bridges are (Lat: 26° 6'29.97"N, Long: 89°49'0.13"E), (Lat: 26° 6'28.68"N, Long: 89°49'21.11"E). The Rail Bridge is linked with Balajan railway station. BM-2 is also situated near at chainage of 11.863km. An RCC Bridge is also found near at chainage of 16.701km. The Position of the Bridge is (Lat: 26° 8'59.62"N, Long: 89°48'38.56"E). One H.T Line is found near at chainage of 16.815km. Gauripur village, Golokganj village, Uchita village are situated right bank side of the river and Agamani village, Nalia village, Paschim Konuri pt III village, Paschim Ratia daha pt I village are situated left bank side of the river.

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.)	Min. Depth (m)	Max. Depth (m)	Length of Shoal (m)	Dredging Qty. (cu.m.)
I	10.00	20.00	0.2	15.1	5600	44960.53	-0.3	14.8	7400	86402.47
II	10.00	20.00	0.1	15.2	6700	76050.52	-0.3	14.9	9000	138362.34
III	10.00	20.00	0.1	15.3	8100	133198.48	-0.3	15.0	9000	233186.8
IV	10.00	20.00	0.1	15.4	9000	178140.43	-0.3	15.1	9000	311307.46

Figure 7 Rail Bridge (Chainage- 11.894 km)

Figure 8 RCC Bridge (Chainage-16.701 km)

3.3 From Chainage 20.00 Km to Chainage 30.00 Km (Paschim Maisha village to Lohajani village)

Figure 9- Chainage 20.00 km to Chainage 30.00 km.

Gangadhar River from Chainage 20.00 Km. to Chainage 30.00 Km is 1000m to 1664m approximate width .The average water portion of the river is 40-45 m.

During the survey it was noticed that BM-4 is situated near at chainage of 24.441km.Halakura village, Baksirhat village, Lohajani village, Paschim maisha pt-I, Kaldoba pt-I village, Bhangaduli village are situated left bank side of the river and Gosai gaon, Purni village, Boro choraikhola village, Paschim Moragodadhar village are situated right bank side of the river. Both side paddy lands are also found near the bank side of the river. Lohadhani Ferry Ghat is located near at chainage of 28.700 km. The position of this ferry ghat is (Lat:- 26°15'1.62"N, Long:- 89°49'58.73"E).

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.)	Min. Depth (m)	Max. Depth (m)	Length of Shoal (m)	Dredging Qty. (cu.m.)
I	20.00	30.00	0.5	6.9	3700	33022.6	-0.1	7.9	4100	92087.8
II	20.00	30.00	0.3	7.1	5000	65842	-0.3	7.1	5100	151543.3
III	20.00	30.00	0.1	7.3	6100	130300.3	-0.3	7.5	6000	252973.1
IV	20.00	30.00	0.01	7.5	6900	192283.05	-0.3	7.7	7200	329485.07

Figure 10- Lohadhani Ferry Ghat (Chainage-28.700 km)

3.4 From Chainage 30.00 Km to Chainage 40.00 Km (Uttarmora To Paschim Ratiadaha Pt.III village)

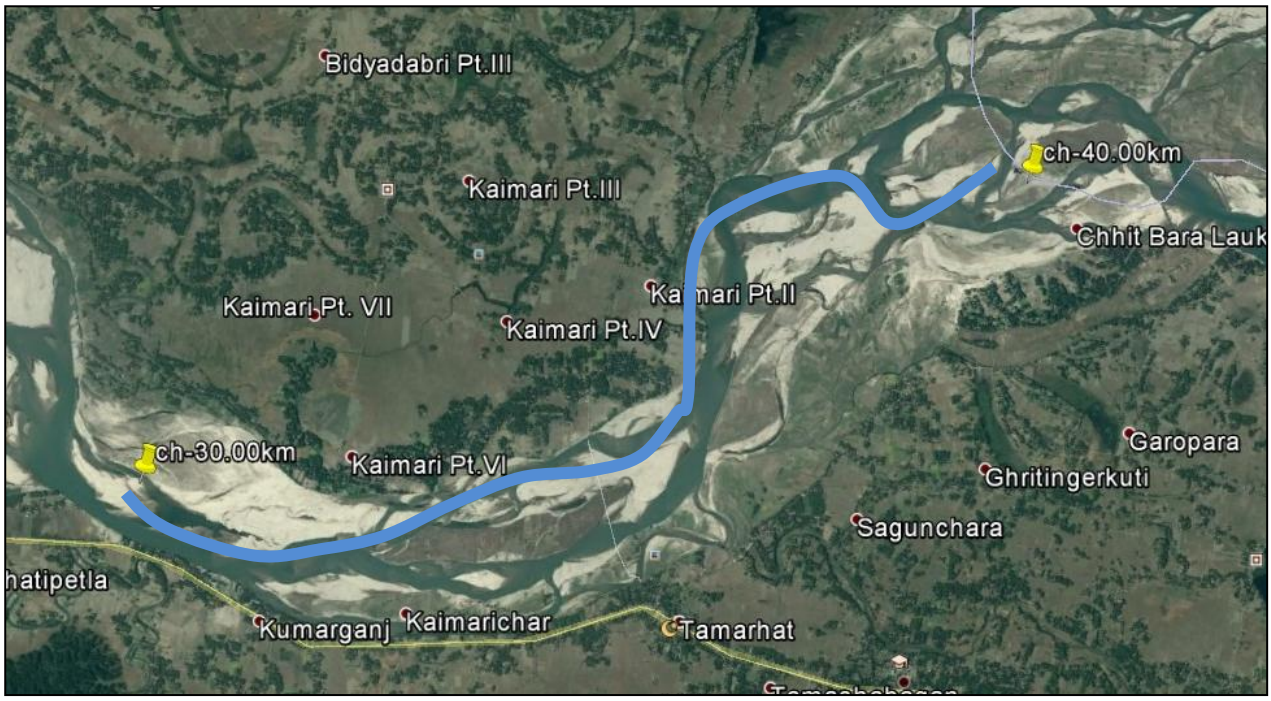


Figure 11- Chainage 30.00km to Chainage 40.00km

The River width of Gangadhar River from chainage 30.00 km. to Chainage 40.00 km is 432m to 1418.24m approximate width. The average water portion of the river is 500m.

BM 5 is located near at chainage of 34.701km. Kaimari Pt-IV, Bholarkhas village are situated left bank side of the river and Kumarganj, Kaimarichar village, Tamarhat village, Sagunchara village, Garopara village are situated right bank side of the river.Some irrigation canals and outlets are also found in the left bank side of the river. Kathhaltuli Ghat is located near at chainage of 35.305 km. The position of this Ferry ghat is (Lat:- 26°17'51.24"N, Long:- 89°50'39.94"E).

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.)	Min. Depth (m)	Max. Depth (m)	Length of Shoal (m)	Dredging Qty. (cu.m.)
I	30.00	40.00	0.5	9.3	7500	33810.65	0.3	9.2	4400	20962
II	30.00	40.00	0.3	9.31	8000	58995.5	0.1	9.21	4700	32337
III	30.00	40.00	0.1	9.02	8000	175089.6	-0.1	9.0	8000	145301.1
IV	30.00	40.00	0.1	9.33	8000	203718.22	-0.3	9.2	7500	125987.32

Figure 12-Kathhaltuli Ghat (Chainage-35.305 km)

3.5 From Chainage 40.0 Km to Chainage 50.00 Km (Paschim Ratiadaha pt.III To Salundanga Village)

Figure 13- Chainage 40.00 km to Chainage 50.00 km

The river width of Gangadhar River from Chainage 40.00Km.to Chainage 50.00 Km is 465m to 1073m approximate width. The average water portion of the river is 500m.

From this chainge, left bank side of the river is located as a village area. It has been noticed that, one Rail bridge crossed over the river near at chainage of 44.6 km and one footbridge is situated for using for people, the rail line is passing Balajan Rail Station. The Rail Bridge location is (Lat- 26° 6'29.01"N, Long- 89°49'9.21"E). BM- 2 is located nearby Rail Bridge at a distance of 48mt approximately left side of the river bank. Nalia village is situated at a distance of 463mt (approx) left side of the river bank. The Bitumen road is passed beside left bank side of the river. Nalia village is situated at a distance of 301.2351mt approximately. BM 6 is situated near at chainage of 48.040km. Falimari ferry ghat is located in this stretches near at chainage of 46.442 km. The position of the ferry ghat (Lat:- 26°23'15.51"N, Long:- 89°49'14.00"E)

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.)	Min. Depth (m)	Max. Depth (m)	Length of Shoal (m)	Dredging Qty. (cu.m.)
I	40.00	50.00	0.9	6.7	6100	28360	0.3	6.1	1500	1672.6
II	40.00	50.00	0.9	6.7	8100	78430.6	0.3	6.2	2300	5603.8
III	40.00	50.00	0.9	7.1	8000	118976.2	0.3	7.1	3900	16339.3
IV	40.00	50.00	0.01	7.1	9100	263662.46	0.01	7.1	8000	59277.66

Figure 14- Falimari ferry ghat (chainage-46.442 km)

3.6 From Chainage 50.00 Km to Chainage 62.00 Km (Bakshirhat to Pakriguri Village)

Figure 15- Chainage 50.00 km to Chainage 62.00 km

The River width of Gangadhar River from Chainage 40.00 Km. to Chainage 62.00 Km is approximately 311m to 391m. The average water portion of the river is 350 m.

During the survey the surveyor noticed that a bamboo garden is located at the left bank of the river and the village areas are situated at a distance of 7mt approximately from the garden. On the other side, Right side of the river bank is located totally Bheri area, people of the Bheri area is connected with fishing farming. BM -7 is located near at chainage of 56.624 Km. near the river bank. Here Two Rail bridges are crossed over the river, which is communicated between west Bengal to Assam. The Two Rail bridges location are (Lat-26°26'38.38"N, Long- 89°51'38.14"E), (Lat-26°26'34.64"N, Long- 89°51'33.47"E) and here one foot path is situated for using village people. Left side of the river bank is located as a Bheri area. The house area is situated at a distance of 8mt approximately from the right side of the river bank. Maximum portion of this area is located as a paddy land; here one High tension tower is crossed over the river near at chainage of 3.5km. The tower location is Lat-26°26'0.34"N, Long-89°51'30.20"E). Shimul Tapu Block FP School is situated at a distance 51MT (Approx) from the river bank. Fulibari Village is situated near at chainage 10.00 km left side of the river bank.

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.)	Min. Depth (m)	Max. Depth (m)	Length of Shoal (m)	Dredging Qty. (cu.m.)
I	50.00	62.00	0.5	5.8	8000	57666.1	0.4	5.8	4200	18949.4
II	50.00	62.00	0.3	5.8	8300	96659	0.3	5.8	5700	38062.4
III	50.00	62.00	0.3	5.9	11000	251250.2	0.2	5.9	7400	105796.1
IV	50.00	62.00	0.1	5.9	11000	295334.77	0.1	6.1	8200	173419.6

Figure 16 Pakriguri RCC Bridge (Chainage-56.660 km and 56.680 km)

Figure 17 Pakriguri Rail Bridge (Chainage- 54.807km and 54.961 km)

- **Bathymetry Survey**

➢ **Length of the stretch for which the Bathymetric survey has been carried out:-**

The Bathymetry survey has been carried out from to the confluence point with Brahmaputra River (Lat.- 26° 0'31.81"N, Long.- 89°49'57.18"E) to Pakriguri RCC Bridge (Lat.- 26°27'31.57"N, Long.- 89°51'19.50"E). The length of the Bathymetric survey is 0.00 km to 62.00 km.

Date of Survey	Type of survey	Chainage	
		From (km)	To (km)
02.10.15	Bathymetry Survey	0.00	6.00
01.10.15	Bathymetry Survey	6.00	14.00
30.09.15	Bathymetry Survey	14.00	24.500
29.09.15	Bathymetry Survey	24.500	34.800
28.09.15	Bathymetry Survey	34.800	42.135
27.09.15	Bathymetry Survey	42.135	48.300
26.09.15	Bathymetry Survey	48.300	56.205
22.09.15	Bathymetry Survey	56.205	62.00

- **Topographic Survey:**

➢ **Length of the stretch for which the Topographic survey has been carried out:-**

The Topographic survey has been carried out from to the Confluence point with Brahmaputra River (Lat.- 26° 0'31.81"N, Long.- 89°49'57.18"E) to Pakriguri RCC Bridge (Lat.- 26°27'31.57"N, Long.- 89°51'19.50"E). The length of the topography survey is 0.00 km to 62.00 km.

a) Observed and reduced Bed Profile of the stretch:-

The observed and reduced bed profile has been described in Annexure No -2.

b) Prominent Dams / Barrage:-

There are no Dams, Barrage found in this zone of River.

c) Tidal stretch, tidal range. Pondage stretch / length of Dam, Barrages, Weirs, Anicut, Locks:-

There are no Dams, Barrages, weirs, Anicut; Locks are found in this zone of river.

d) Description of stretch w.r.t. different depths, widths, current, discharge:-

The stretch-wise description has been shown in the salient features.

e) Conditions of banks (protected, un-protected):-

Gangadhar River annually bears the brunt of floods and where embankment construction and repairing seems like permanent affair. Displacement of people living on the banks of rivers due to river bank erosion is another major issue here. The tributaries continue to erode the banks rapidly. The River banks are constantly being changed by means of flood of very high magnitude, channel widening, and change in channel pattern and of river bank erosion. To protect the shore and its properties various methods are in use like, geobags filling with sand, porcupine (triangle shaped concrete structure), sand bags and boulder bags called Gabions are in use to strengthen the embankments. The river banks are protected by Bouldering Pitching from chainage 54.500km to 56.600km on the left bank portion of the river and the Bituminus road side are also protected the both bank side from chainage 11.500km to 12km, 16.500km to 17km, 29km to 31km. But some places are becoming unprotected due to floods and soil erosion. During the Rainy season, the river flooded its banks as well as the villages and agriculture lands are destroyed. So it must be needed the bank protection immediately. The Irrigation canal and outlets have been located near at chainage of 36.600km, 39.000km, 41.000km, 43km, 49km, 52km left bank side of the river and 45.500km, 45.700km, 49km, 49.500km and 53.807km right bank side of the river.

f) Hindrances - Hyacinth, rocks, rapid waterfalls, steep gradient, forest, wild-life sanctuary, security issues. Obstruction (if any) for navigation, e.g. fishing stakes:-

The river is carrying a large amount of water every year particularly in the Rainy season. Chakrasila wildlife sanctuary is located near the bank side of the river. The wild life sanctuary becomes a security issue which prevent the other states and made strong defence for the states.

g) Encroachment to the waterway:-

N.A

h) Details of Protected Area- Wildlife, Defence, Atomic Power Plants and any other issue attached to it:-

In the bank side, the dense forest has been found where the violent animal lives. Besides, some wild life sanctuary like Chakrasila wildlife sanctuary is situated. So forest side and Wildlife area have become Unapproachable.

i) NH/SH/MDR along and/or within 5 km from the waterways:-

NH 127B, NH 31C are two major way in this zone of river. Two Pakriguri RCC Bridges are situated near at chainage of 56.660km and 56.680km respectively which are communicated between Siliguri and Assam. Another RCC bridge is situated near at chainage of 16.701km which is communicated between Bakshirhat to Gauripur.

j) Railway Line and Stations in the vicinity:-

The North Frontier Railway (NFR) is the only Railway network in this region of the river and the nearest railway stations are the Srirampur Railway Station and the Jorai Railway station are situated distance of 4.36km and 4.6km approximately. Two Railways communication are located near at chainage of 54.807km and 54.961km respectively which is communicated between West Bengal to Assam. Another rail bridge is situated near at chainage of 11.894km which is linked with Balajan

Railway station. The another Railway stations are the Boxirhat, Bidyardabari, Agomani Railway Stations are situated on the right portion of the river at an avg. Distance of 5km (approx) and the Railway Stations like Mongalajhar, Basbari, Moterjhar, Golakganj and the Balajan Railway Stations are the nearest Railway Station are situated on the left portion of the river at an avg. Distance 4km (approx).

k) Land Use Pattern along Waterway on visual assessment:-

The major portion of the right bank of the river is occupied by agriculture. Major crops are rice, tea, mustard, sugarcane, black dhal, vegetables like, radish, cabbage, cauliflower, etc. The left bank mostly occupied with scattered forest area and agriculture. The most important forest products are timber, bamboo and firewood.

l) Crops / Agriculture in the region on visual assessment:-

The Major crops along the river is Paddy, jute, Tea, Rice, Wheat, Maize, Sorghum, gram, Millets, Sugarcane and Spices are cultivated here.

m) Availability of Bulk / Construction Material:-

There are light no's of cement factories and the brick fields located and the sand are available from the river.

n) Existing Industries along Waterway with their types and details:-

The Number of industries are situated on the bank of the river, like cement, wood and other small industries like small foundries are available .The state of Assam is not an industrially developed state and the position of Kokrajhar district in industrial scenario of the state is insignificant. The district has 22 registered factories and about 900 small scale units (1.8 percent of the state total). The district has four handloom training centres, three weavers' extension services units and three handloom production centres.

o)Existing Ghats, Jetties and Terminals (with conditions and facilities). Existing navigation facilities (if any):-

Sl no	Chainage (Km)	Name of Ferry Ghat	Easting	Northing	Latitude (N)	Longitude (E)	Remarks
1	28.700	Lohadhani Ghat	782936.3604	2906550.46	26°15'1.62"	89°49'58.73"	Temporary Jetty
2	35.305	Kathhaltuli Ghat	784014.07	2911763.17	26°17'51.24"	89°50'39.94"	
3	46.442	Falimari Ghat	781411.05	2921694.50	26°23'15.51"	89°49'14.00"	

p) Existing Cargo Movement:-

Three Passenger Ferry services are available in this zone of river near at chainage of 28.700 km, 35.305 km and 46.442 km. Cargo is available in this zone of river at Kathhaltuli ferry ghat temporarily. But there is a lot of scope to operate the cargo movement communicating with NH-127B and Railway lines like Golokganj, Srirampur etc.

q) Prominent City / Town / Places of Worship / Historical places for Tourism:-

Alipurduar, Tufanganj, Cooch Bihar , Chakchoka, Gossaigaon, Tamarhat, Bakshirhat, Halakura, Barshijhora Pt.I, Gouripur and Golakganj are the main towns and villages situated on the both bank side of the river.

r) Village / colonies along the sub-stretch and approx. Population:-

Gangadhar River includes with many village sites. Pakriguri village, Nama Parap Hakriguri village, Eshemultapur village, Gorumarachor village, Shivbadoloyguri village, Garopara villageBherbheri village are located right bank side of the river and Khunipara village, Fulibari village, Dakhin falimari village, Lohadhani village, Bakshirhat village are located left bank side of the river.

s) Availability of Passenger Ferry Services with facilities and Annual movement data:-

Sl no	Chainage (Km)	Name of Ferry Ghat	Easting	Northing	Latitude (N)	Longitude (E)	Remarks
1	28.700	Lohadhani Ghat	782936.3604	2906550.46	26°15'1.62"	89°49'58.73"	Minor Ferry Services
2	35.305	Kathhaltuli Ghat	784014.07	2911763.17	26°17'51.24"	89°50'39.94"	
3	46.442	Falimari Ghat	781411.05	2921694.50	26°23'15.51"	89°49'14.00"	

t) Available and probable Water Sport Recreational Facilities:-

There are no water sport recreational facilities available in this zone of river.

u) Fishing activities:-

Gangadhar river is the lifeline of the people of Dhubri districts.Golokganj, Bakshirhat are also important places for fishing culture.Gangadhar provides diverse habitat in its downstream for living biota such as stream, riparian zones and wetlands etc. Gangadhar has some of the richest riverine fisheries in India. The river has over fish species and forms an important component of livelihood and nutritional security in the downstream stretches in Assam. The wetlands are ecologically and economically important for the local people. Fishing in Gangadhar River is very famous among the people.

v)Sand mining:-

Illegal river sand mining across the country is on the rise for past many years in Indian, which results in adverse impact on river system and dependent communities. In Gangadhar gravel mining was noticed during the survey period. Besides this, sand is also exported to other states as it becomes demandful for making Building or Industries.

w) Tributaries:-

The three streams create a river basin in this zone of river:

i) Gangadhar
ii) Kopili
iii) Puthimari

x)Details of Irrigation Canals and Outlets:-

The Irrigation Canal and outlets have been found near at chainage of 36.600km, 39.000km, 41.000km, 43km, 49km, 52km left bank side of the river and 45.500km, 45.700km, 49km, 49.500km and 53.807km right bank side of the river. The Canal supplies the valuable water for the cultivation which is the main occupation of the surrounding Farmers. But the Canals become dangerous in the Rainy season. As a result, the bank of the river sometimes is to be flooded.

y)Details of Nalas. Polluted water discharge in to the rivers and treatment plants (if any):-

There are no Nalas found in this zone of river.

z)Usage of water (drinking, irrigation, industries, navigation etc.) Water quality:-

In Recent time's man avoid to drinking the water of the river but the water is essential for cultivation which is the main occupation for the villagers of this region. The water is also used in the industrial hubs. Ferry services are also navigable in this region of river. The water is used as irrigation purposes. With the help of the irrigation system, the cultivation can easily accessible. Irrigation Canals supply the sufficient water for the cultivation.

AA) Photographs of Cross structure in each stretch with description, location, Chainage, clearance and Conditions:-

The Two Pakriguri RCC bridges are situated near at chainage of 56.660km and 56.680km which are communicated between Siliguri to Assam. The Bridges have a good horizontal and vertical clearance. The bridges locations are (Lat: 26°27'32.63"N, Long: 89°51'18.45"E) (Lat: 26°27'33.21"N, Long: 89°51'18.68"E).

Two Rail Bridges are situated near at chainage of 54.807km and 54.961km respectively which are communicated between West Bengal to Assam. The Bridges have a good horizontal and vertical clearance. The Bridges location are (Lat: 26°26'34.08"N, Long: 89°51'37.40"E), (Lat: 26°26'38.38"N, Long: 89°51'38.14"E).

This RCC Bridge is situated near at chainage of 16.701km which is communicated between Gauripur to Baksirhat. The Bridges have a good horizontal and vertical clearance. The Bridges location is (Lat: 26° 8'59.62"N, Long: 89°48'38.56"E).

The Railway Bridge is situated near at chainage of 11.894km which is linked with Balajan Railway station. The Bridges have a good horizontal and vertical clearance. The Bridges location is (Lat: 26° 6'28.68"N, Long: 89°49'21.11"E).

Section 4: Terminals

There is no existing terminal found in this zone of river.

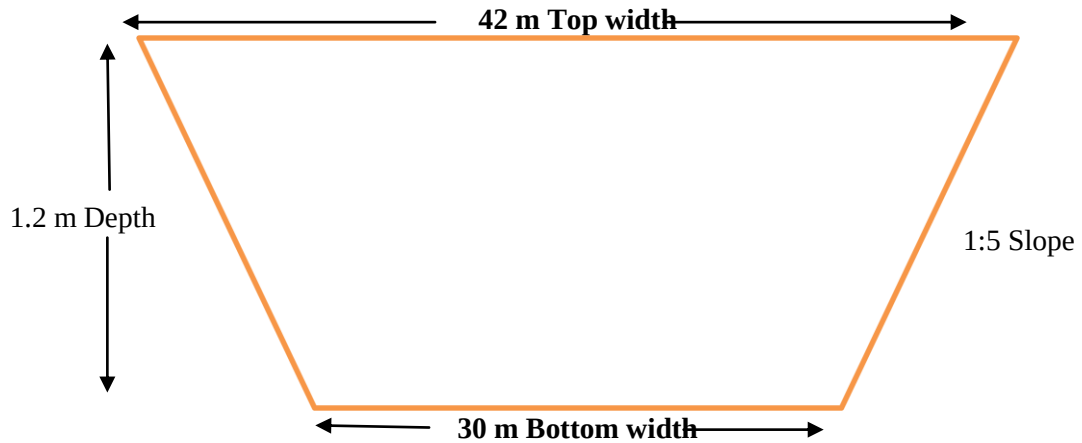
4.1 Details of Land use, owner etc:-

The both side banks of the River Gangadhar used for cultivation. The Farmers are cultivated their crops with using this fertile land and grows a huge amount of crops every year. Besides, some portions of the land are surrounded by small industries and Forests. Though bolder pitching is found in some places, But in Recent times, the bank of the river has been worn away in some places for lack of trees. Sometimes, the land of the river has been changed into a heap of garbage. As a result, the river side becomes polluted land. In the Monsoon period, Flood and erosion has been affected both side of the river bank.

Section 5: Fairway development:-

Dredging sections, summary of depths and dredging quantity for different classification of waterways (stretch-wise)

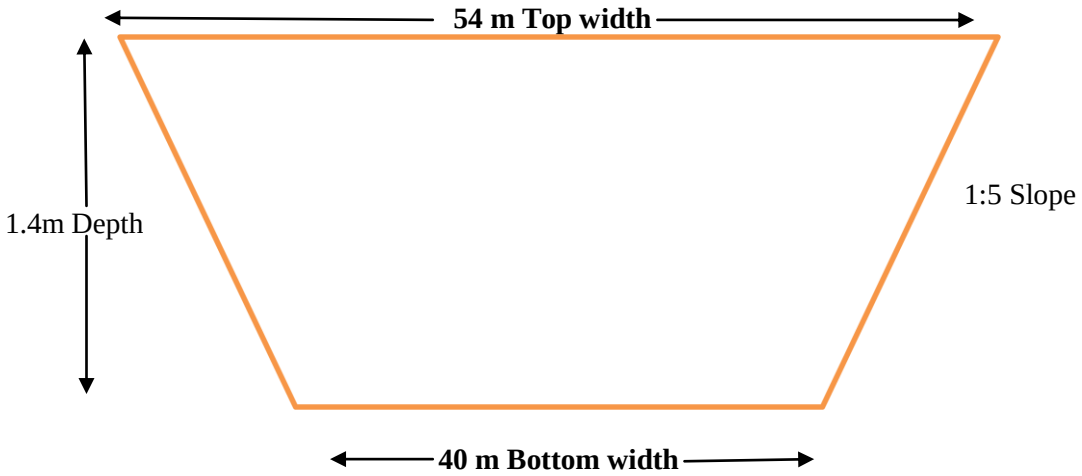
Class-I: - (Channel design: - Bottom width- 30 meter, Top width- 42 meter)



Location		Chainage (km)		As per Observed Soundings						As per Reduced Soundings					
From	To	From	To	Min. depth (m)	Max depth (m)	Length of Shoal (m)	Avg Depth of cut (m)	Dredging Qty. (cubic meter)	Cumulative Dredging Qty (cubic meter)	Min Depth (m)	Max Depth (m)	Length of Shoal (m)	Avg Depth of cut (m)	Dredging Qty. (cubic meter)	Cumulative Dredging Qty (cubic meter)
Brahmaputra Confluence	Nalia Village	0.00	10.00	0.5	8.0	1000	0.519	17144.32	17144.32	-0.3	7.2	3800	0.419	52614.53	52614.53
Nayachara village	Belguri Pt II village	10.00	20.00	0.2	15.1	5600	0.243	44960.53	62104.85	-0.3	14.8	7400	0.353	86402.47	139017.00
Paschim Maisha village	Lohajani Village	20.00	30.00	0.5	6.9	3700	0.270	33022.60	95127.45	-0.1	7.9	4100	0.680	92087.80	231104.80
Uttarmora Village	Paschim Ratiadaha Pt III	30.00	40.00	0.5	9.3	7500	0.136	33810.65	128938.10	0.3	9.2	4400	0.144	20962.00	252066.80
Paschim Ratiadaha Pt III	Salundanga Village	40.00	50.00	0.9	6.7	6100	0.140	28360.00	157298.10	0.3	6.1	1500	0.033	1672.60	253739.40
Bakshirhat village	Pakriguri Village	50.00	62.00	0.5	5.8	8000	0.218	57666.10	214964.20	0.4	5.8	4200	0.136	18949.39	272688.79
Total						31900		214964.20		Total		25400		272688.79	

Table 14- Dredging quantity in class-I

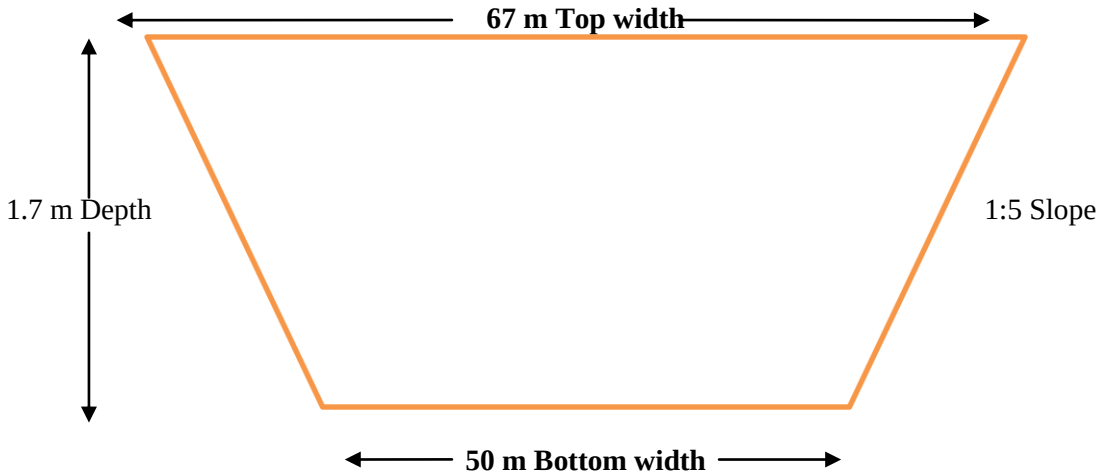
Class-II: - (Channel design: - Bottom width- 40 meter, Top width- 54 meter)



Location		Chainage (km)		As per Observed Soundings						As per Reduced Soundings					
From	To	From	To	Min. depth (m)	Max depth (m)	Length of Shoal (m)	Avg Depth of cut (m)	Dredging Qty. (cubic meter)	Cumulative Dredging Qty (cubic meter)	Min. Depth (m)	Max Depth (m)	Length of Shoal (m)	Avg Depth of cut (m)	Dredging Qty. (cubic meter)	Cumulative Dredging Qty (cubic meter)
Brahmaputra Confluence	Nalia Village	0.00	10.00	0.4	8.1	1000	0.648	28539.08	28539.08	-0.3	7.3	5700	0.360	90347.36	90347.36
Nayachara village	Belguri Pt II village	10.00	20.00	0.1	15.2	6700	0.257	76050.52	104589.6	-0.3	14.9	9000	0.349	138362.34	228709.7
Paschim Maisha village	Lohajani Village	20.00	30.00	0.3	7.1	5000	0.299	65842	170431.6	-0.3	7.1	5100	0.674	151543.3	380253
Uttarmora Village	Paschim Ratiadaha Pt III	30.00	40.00	0.3	9.31	8000	0.167	58995.5	229427.1	0.1	9.21	4700	0.156	32337	412590
Paschim Ratiadaha Pt III	Salundanga Village	40.00	50.00	0.9	6.7	8100	0.219	78430.6	307857.7	0.3	6.2	2300	0.055	5603.8	418193.8
Bakshirhat village	Pakriguri Village	50.00	62.00	0.3	5.8	8300	0.264	96659.02	404516.72	0.3	5.8	5700	0.151	38062.37	456256.17
Total						37100		404516.72		Total		32500		456256.17	

Table 15- Dredging quantity in class-II

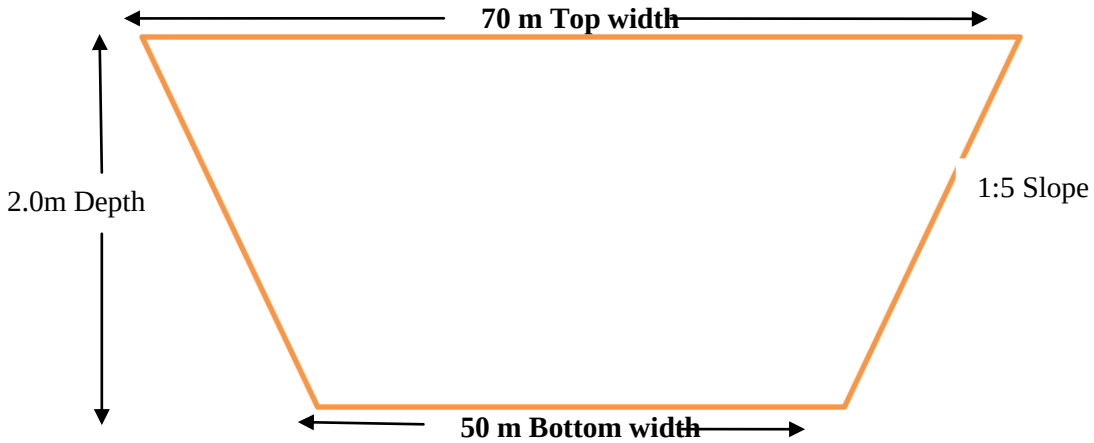
Class-III: - (Channel design: - Bottom width- 50 meter, Top width- 67 meter)



Location		Chainage (km)		As per Observed Soundings						As per Reduced Soundings					
From	To	From	To	Min depth (m)	Max depth (m)	Length of Shoal (m)	Avg Depth of cut (m)	Dredging Qty. (cubic meter)	Cumulative Dredging Qty (cubic meter)	Min Depth (m)	Max Depth (m)	Length of Shoal (m)	Avg Depth of cut (m)	Dredging Qty. (cubic meter)	Cumulative Dredging Qty (cubic meter)
Brahmaputra Confluence	Nalia Village	0.00	10.00	0.3	8.3	3000	0.344	56839.22	56839.22	-0.3	7.5	7700	0.379	160888.8	160888.8
Nayachara village	Belguri Pt II village	10.00	20.00	0.1	15.3	8100	0.298	133198.48	190037.7	-0.3	15	9000	0.470	233186.8	394075.6
Paschim Maisha village	Lohajani Village	20.00	30.00	0.1	7.3	6100	0.388	130300.3	320338	-0.3	7.5	6000	0.766	252973.1	647048.7
Uttarmora Village	Paschim Ratiadaha Pt III	30.00	40.00	0.1	9.02	8000	0.397	175089.6	495427.6	-0.1	9	8000	0.240	145301.1	792349.8
Paschim Ratiadaha Pt III	Salundanga Village	40.00	50.00	0.9	7.1	8000	0.270	118976.2	614403.8	0.3	7.1	3900	0.076	16339.3	808689.1
Bakshirhat village	Pakriguri Village	50.00	62.00	0.3	5.9	11000	0.415	251250.16	865653.96	0.2	5.9	7400	0.259	105796.07	914485.17
Total						44200		8656553.96		Total		42000		914485.17	

Table 16- Dredging quantity in class-III

Class-IV: - (Channel design: - Bottom width- 50 meter, Top width- 70 meter)



Location		Chainage (km)				As per Observed Soundings				As per Reduced Soundings					
From	To	From	To	Min. depth (m)	Max depth (m)	Length of Shoal (m)	Avg Depth of cut (m)	Dredging Qty. (cubic meter)	Cumulative Dredging Qty (cubic meter)	Min. Depth (m)	Max Depth (m)	Length of Shoal (m)	Avg Depth of cut (m)	Dredging Qty. (cubic meter)	Cumulative Dredging Qty (cubic meter)
Brahmaputra Confluence	Nalia Village	0.00	10.00	0.2	8.5	3900	0.409	87944.87	87944.87	-0.3	7.7	9000	0.454	224990.59	224990.59
Nayachara village	Belguri Pt II village	10.00	20.00	0.1	15.4	9000	0.359	178140.43	266085.3	-0.3	15.1	9000	0.628	311307.46	536298.05
Paschim Maisha village	Lohajani Village	20.00	30.00	0.01	7.5	6900	0.506	192283.05	458368.35	-0.3	7.7	7200	0.831	329485.07	865783.12
Uttarmora Village	Paschim Ratiadaha Pt III	30.00	40.00	0.1	9.33	8000	0.462	203718.22	662086.57	-0.3	9.2	7500	0.305	125987.32	991770.44
Paschim Ratiadaha Pt III	Salundanga Village	40.00	50.00	0.01	7.1	9100	0.526	263662.46	925749.03	0.01	7.1	8000	0.134	59277.66	1051048.1
Bakshirhat village	Pakrigur i Village	50.00	62.00	0.1	5.9	11000	0.488	295334.77	1221083.8	0.1	6.1	8200	0.384	173419.6	1224467.7
Total						47900		1221083.8		Total		48900		1224467.7	

Table 17- Dredging quantity in class- IV

Section 6: Conclusion

The surveyed stretch of Gangadhar River is 62.000 km in length and was not explored for any navigational possibility in earlier time. As much as 03 minor ferry services were being operated along the survey stretch by private concerns. The right bank of the river is moderately connected with roads and Railways and other infrastructures than the left bank. The settlements are thickly populated on the right bank where as the left bank is sparsely distributed. However, there is a good scope for developing tourism along the entire stretch of Gangadhar. The river bed of Gangadhar River is mainly sandy in nature with isolated incident of small scale and conventional sand/Gravel mining by the local peoples. The river banks of entire stretch are covered with vegetation and beyond that cultivation is prominent. Encroachment was observed in many parts of the river banks. The water flow of the river is not obstructed from top to bottom of the entire stretch. The average water velocity during the survey period is around 0.80 m/s.

The waterway of the Gangadhar River includes with many villages, Rail and Road, Ferry Ghat, Jetty etc. Two Railway Bridges (West Bengal-Assam) are crossing over the river which is very communicative for the native villagers and the foreigners. Another rail Bridge is also linked with Balajan Railway Station. Two RCC bridges are situated in this zone of river which are communicated with Siliguri to Assam. The waterway of the river Gangadhar is originated from the Himalayan region but we start the works from the Pakriguri RCC Bridge towards the Brahamaputra confluence. In some places for lacking of water the river is affected by the sand char in the way of the river. For this reason, the water is flown by some channels and get narrower in some places.

6.1 Dredging Quantity:

Class	As per Observed Soundings (cubic meter)	As per Reduced Soundings (cubic meter)
Class-I	214964.20	272688.79
Class-II	404516.72	456256.17
Class-III	865653.96	914485.17
Class-IV	1221083.80	1224467.70

Annexure:-

Annexure-1 Source and type of data collected from various agencies:-

The Chart Datum value and HFL values of Sankosh, Golokganj and Confluence of Brahmaputra River have been provided by IWAI office.

Annexure-2 Min. / max. Depth, length of shoal per km-wise for different classification in the designed dredged channel:-

Class-I:-

Class-I											
Chainage (km)		As per Observed Soundings					As per Reduced Soundings				
From	To	Min. depth (m)	Max. depth (m)	Length of Shoal (m)	Dredging Qty. (cubic meter)	Cumulative Dredging Quantity (cubic meter)	Min. Depth (m)	Max. Depth (m)	Length of Shoal (m)	Dredging Qty. (cubic meter)	Cumulative Dredging Quantity (cubic meter)
0	1	2.4	5.1	0	0.00	0	1.5	4.1	0	0.00	0
1	2	1	5.2	0	0.00	0.00	0.2	3.7	500	518.26	518.26
2	3	0.5	3.2	1000	17144.32	17144.32	-0.3	2.2	1000	38788.68	39306.94
3	4	1.8	6.2	0	0.00	17144.32	0.9	5.1	1000	2500.91	41807.85
4	5	2	4.1	0	0.00	17144.32	1.1	4.4	200	406.14	42213.99
5	6	3.7	6.4	0	0.00	17144.32	2.7	5.5	0	0.00	42213.99
6	7	1.8	8	0	0.00	17144.32	1.4	7.2	0	0.00	42213.99
7	8	1.3	3.8	0	0.00	17144.32	0.5	2.9	1000	10377.40	52591.39
8	9	3.3	7.2	0	0.00	17144.32	2.3	6.4	0	0.00	52591.39
9	10	2.2	7.9	0	0.00	17144.32	0.9	7.1	100	23.14	52614.53
10	11	2.8	7	0	0.00	17144.32	2	6	0	0.00	52614.53
11	12	1	6.8	0	0.00	17144.32	0.9	6	200	382.95	52997.48
12	13	1	3.1	100	126.24	17270.56	0.9	4.5	1000	1880.41	54877.89
13	14	2.5	15.1	0	0.00	17270.56	1.1	14.8	200	509.25	55387.14
14	15	0.5	10.1	1000	5149.24	22419.80	-0.3	9.2	1000	15312.63	70699.77
15	16	0.5	4.8	1000	6667.78	29087.58	-0.3	4.2	1000	15217.14	85916.91
16	17	0.2	7.7	1000	27114.66	56202.24	-0.3	6.9	1000	36613.08	122530.00
17	18	0.5	7.9	1000	4055.68	60257.92	1.1	7.5	1000	5238.63	127768.60
18	19	0.5	6.1	1000	1184.92	61442.84	0.2	4.4	1000	8398.04	136166.70
19	20	1.1	6.1	500	662.01	62104.85	0.9	5.3	1000	2850.32	139017.00
20	21	1.2	6.8	0	0.00	62104.85	1.8	6.2	0	0.00	139017.00
21	22	0.5	3	1000	7018.82	69123.67	-0.1	2.4	1000	26286.07	165303.10
22	23	0.5	3	500	928.96	70052.63	-0.1	2.2	1000	9568.95	174872.00
23	24	0.5	3.1	1000	13716.05	83768.68	-0.1	2.4	1000	34899.20	209771.20
24	25	0.7	6.4	1000	10907.29	94675.97	0.1	7.9	1000	21184.64	230955.80
25	26	1.8	6.1	0	0.00	94675.97	1.3	7.9	0	0.00	230955.80
26	27	1.8	5.7	0	0.00	94675.97	2	5.8	0	0.00	230955.80

Class-I											
Chainage (km)		As per Observed Soundings					As per Reduced Soundings				
From	To	Min. depth (m)	Max. depth (m)	Length of Shoal (m)	Dredging Qty. (cubic meter)	Cumulative Dredging Quantity (cubic meter)	Min. Depth (m)	Max. Depth (m)	Length of Shoal (m)	Dredging Qty. (cubic meter)	Cumulative Dredging Quantity (cubic meter)
27	28	1.7	6.9	0	0.00	94675.97	1.8	7.1	0	0.00	230955.80
28	29	1.1	3.6	200	451.48	95127.45	1.1	3.9	100	148.99	231104.80
29	30	1.4	6.7	0	0.00	95127.45	1.5	6.8	0	0.00	231104.80
30	31	0.5	3.9	1000	4453.41	99580.86	0.3	3.3	1000	3767.19	234872.00
31	32	0.5	3.9	1000	2136.01	101716.90	0.5	3.3	1000	1806.59	236678.60
32	33	0.5	3.2	1000	9470.91	111187.80	0.7	3.2	1000	9110.23	245788.80
33	34	0.5	1.9	1000	5794.96	116982.70	0.6	2	1000	5865.75	251654.60
34	35	1.3	6.8	0	0.00	116982.70	1.3	7.2	0	0.00	251654.60
35	36	2	7	0	0.00	116982.70	2	7.2	0	0.00	251654.60
36	37	1.1	9.3	1000	4362.84	121345.60	1.1	9.2	200	344.83	251999.40
37	38	1.1	6	1000	1765.83	123111.40	1.1	7	100	33.66	252033.10
38	39	0.5	7.9	1000	5085.17	128196.60	1.2	8.8	100	33.69	252066.80
39	40	0.5	5.7	500	741.48	128938.10	1.2	6.5	0	0.00	252066.80
40	41	0.9	3.4	100	124.81	129062.90	1.7	5.2	0	0.00	252066.80
41	42	1.2	4.7	0	0.00	129062.90	1.8	4.2	0	0.00	252066.80
42	43	1.1	5	1000	3336.35	132399.20	2.8	5.2	0	0.00	252066.80
43	44	0.5	3.4	1000	4448.89	136848.10	1.5	4.8	0	0.00	252066.80
44	45	0.5	4.5	1000	2819.57	139667.70	1.5	5.7	0	0.00	252066.80
45	46	0.5	5.4	1000	4231.89	143899.60	0.3	5.9	500	646.67	252713.40
46	47	1.1	6.1	1000	4954.82	148854.40	1.1	6.1	1000	1025.96	253739.40
47	48	1.2	4.4	0	0.00	148854.40	1.5	4.4	0	0.00	253739.40
48	49	1.3	6.7	0	0.00	148854.40	2.4	6.7	0	0.00	253739.40
49	50	2.2	4.7	1000	8443.66	157298.10	3.1	5.8	0	0.00	253739.40
50	51	0.5	4.1	1000	7997.99	165296.00	1.3	5.1	0	0.00	253739.40
51	52	0.5	3.2	500	697.30	165993.30	1.3	2.9	0	0.00	253739.40
52	53	0.7	4.8	1000	4944.03	170937.40	1.5	5.5	0	0.00	253739.40
53	54	1.3	5.5	0	0.00	170937.40	1.1	5.5	1000	1954.00	255693.40
54	55	1.1	5.8	500	753.29	171690.70	2	5.8	0	0.00	255693.40
55	56	1.3	5.4	0	0.00	171690.70	1.5	5.3	0	0.00	255693.40
56	57	0.5	4.2	1000	10579.11	182269.80	1.1	5.3	100	8.60	255702.00
57	58	1.3	2.9	0	0.00	182269.80	1.3	3.8	0	0.00	255702.00
58	59	1.1	5.2	1000	16088.37	198358.10	1.1	5.1	1000	3035.27	258737.30
59	60	0.5	5.2	1000	3455.34	201813.50	1.1	5.1	100	20.19	258757.50
60	61	0.5	3.8	1000	7355.79	209169.30	1.1	3.6	1000	8065.58	266823.00
61	62	0.5	3.4	1000	5794.96	214964.20	0.4	3.4	1000	5865.75	272688.79
Total				31900	214964.20		Total		25400	272688.79	

Table 18 Minimum & Maximum depth per km wise(Class-I)

Class-II:-

Class-II											
Chainage (km)		As per Observed Soundigs					As per Reduced Soundigs				
From	To	Min. depth (m)	Max. depth (m)	Length of Shoal (m)	Dredging Qty. (Cubic meter)	Cumulative Dredging Quantity (Cubic meter)	Min. Depth (m)	Max. Depth (m)	Length of Shoal (m)	Dredging Qty. (cubic meter)	Cumulative Dredging Quantity (Cubic meter)
0	1	2.2	5.2	0	0	0	1.2	4.2	100	12.54	12.54
1	2	1.7	5.3	0	0	0	0.1	3.8	1000	1815.8	1828.34
2	3	0.4	3.4	1000	28539.08	28539.08	-0.5	2.4	1000	59228.68	61057.02
3	4	1.7	6.3	0	0	28539.08	0.8	5.2	1000	5226.01	66283.03
4	5	1.9	4.3	0	0	28539.08	1	4.6	1000	2048.8	68331.83
5	6	3.5	6.41	0	0	28539.08	2.5	5.51	0	0	68331.83
6	7	1.6	8.1	0	0	28539.08	1.4	7.3	0	0	68331.83
7	8	1.59	4	0	0	28539.08	0.3	3.1	1000	21173.2	89505.03
8	9	3.1	7.3	0	0	28539.08	2.1	6.5	100	12	89517.03
9	10	2	8.1	0	0	28539.08	0.7	7.3	500	830.33	90347.36
10	11	2.7	7.1	0	0	28539.08	1.9	6.01	0	0	90347.36
11	12	1.6	6.81	0	0	28539.08	0.7	6.01	1000	1794.64	92142
12	13	1.3	3.2	500	758.71	29297.79	0.7	4.7	1000	5065.57	97207.57
13	14	1.3	15.2	200	244.51	29542.3	0.9	14.9	1000	1742.72	98950.29
14	15	0.4	10.3	1000	11000.07	40542.37	-0.4	9.4	1000	25328.83	124279.1
15	16	0.4	5	1000	11390.88	51933.25	-0.4	4.21	1000	23402	147681.1
16	17	0.1	7.9	1000	41361.67	93294.92	-0.5	7.1	1000	54592.09	202273.2
17	18	1.1	8	1000	6177.48	99472.4	1	7.6	1000	7699.23	209972.4
18	19	0.4	6.4	1000	3498.73	102971.1	0.1	4.5	1000	13996.08	223968.5
19	20	0.9	6.11	1000	1618.5	104589.6	0.7	5.31	1000	4741.19	228709.7
20	21	1.4	5.1	0	0	104589.6	1.1	6.3	100	4.18	228713.9
21	22	0.3	3.2	1000	16361.47	120951.1	-0.3	2.5	1000	43193.37	271907.3
22	23	0.3	3.2	1000	3342.91	124294	-0.3	2.4	1000	20039.1	291946.4
23	24	0.3	3.11	1000	25492.36	149786.4	-0.3	2.4	1000	54055.12	346001.5
24	25	0.5	6.41	1000	18585.32	168371.7	-0.1	6.4	1000	32977.99	378979.5
25	26	1.7	6.2	0	0	168371.7	1.4	6.2	0	0	378979.5
26	27	1.79	5.9	0	0	168371.7	1.69	5.9	0	0	378979.5
27	28	1.8	7.1	0	0	168371.7	1.7	7.1	0	0	378979.5
28	29	1.09	3.8	1000	2059.93	170431.6	1.09	3.6	1000	1273.53	380253
29	30	1.4	6.71	0	0	170431.6	1.4	6.7	0	0	380253
30	31	0.3	4	1000	10371.18	180802.8	0.1	3.4	1000	8840.15	389093.2
31	32	0.4	4	1000	4898.77	185701.6	0.4	3.4	1000	4300.9	393394.1
32	33	0.3	3.3	1000	17106.72	202808.3	0.6	3.3	1000	16226.69	409620.7
33	34	1.4	2	0	0	202808.3	1.4	2.1	0	0	409620.7
34	35	1.1	6.9	1000	7285.78	210094.1	1.1	6.8	1000	1858.5	411479.2

Class-II											
Chainage (km)		As per Observed Soundigs					As per Reduced Soundigs				
From	To	Min. depth (m)	Max. depth (m)	Length of Shoal (m)	Dredging Qty. (Cubic meter)	Cumulative Dredging Quantity (Cubic meter)	Min. Depth (m)	Max. Depth (m)	Length of Shoal (m)	Dredging Qty. (cubic meter)	Cumulative Dredging Quantity (Cubic meter)
35	36	1.3	7.3	1000	3167.3	213261.4	1.2	7.2	200	490.84	411970.1
36	37	1	9.31	1000	10884.56	224145.9	1.09	9.21	500	619.87	412590
37	38	1	6.01	1000	3037.44	227183.4	2	7.01	0	0	412590
38	39	0.3	8	1000	2243.72	229427.1	1.4	7.6	0	0	412590
39	40	1.79	5.9	0	0	229427.1	1.5	6.7	0	0	412590
40	41	0.8	3.5	1000	5909.8	235336.9	1.6	5.3	0	0	412590
41	42	0.79	4.8	1000	9889.12	245226	1.79	4.3	0	0	412590
42	43	1.3	5.1	1000	9476.99	254703	1.3	4.9	100	102.43	412692.4
43	44	1.3	3.5	1000	7458.52	262161.5	1.3	4.9	1000	2282.31	414974.7
44	45	1.3	4.7	1000	10396.66	272558.2	1.3	4.5	1000	2932.79	417907.5
45	46	1.1	5.6	100	85.17	272643.4	1.4	5.5	0	0	417907.5
46	47	1.4	6.3	0	0	272643.4	1.4	6.2	0	0	417907.5
47	48	1.1	4.21	1000	15411.45	288054.8	1	4.2	100	135.87	418043.4
48	49	1.1	4.5	1000	16878.56	304933.4	1	4.3	100	150.47	418193.8
49	50	1.3	4.9	1000	2924.3	307857.7	2.1	6	0	0	418193.8
50	51	1.2	5.3	1000	8897.81	316755.5	1.1	5.2	1000	4164.7	422358.5
51	52	0.4	2.3	200	254.92	317010.4	1.4	3.1	0	0	422358.5
52	53	0.6	4.81	1000	3106.68	320117.1	1.4	5.2	0	0	422358.5
53	54	1.7	4.81	0	0	320117.1	1.7	4.7	0	0	422358.5
54	55	0.9	4.9	1000	19057.79	339174.9	0.7	4.7	1000	2333.42	424691.9
55	56	1.2	4.2	100	3.01	339177.9	1.4	5.5	0	0	424691.9
56	57	0.49	4.21	1000	28384.86	367562.7	1	5.5	1000	9255.08	433947
57	58	1.2	3.1	1000	7908.83	375471.6	1	3.2	500	834.2	434781.2
58	59	1.09	4.5	1000	18592.08	394063.6	1	4.4	1000	19125.61	453906.8
59	60	1.4	4.5	0	0	394063.6	1.4	4.3	0	0	453906.8
60	61	0.4	4	1000	7285.78	401349.4	0.4	3.7	1000	1858.5	455765.3
61	62	0.3	3.3	1000	3167.3	404516.72	0.3	3.5	200	490.84	456256.17
Total				37100	404516.72		Total		32500	456256.17	

Table 19- Minimum & Maximum Depth per km wise (Class-II)

Class-III:-

Class-III											
Chainage (km)		As per Observed Soundings					As per Reduced Soundings				
From	To	Min. depth (m)	Max. depth (m)	Length of Shoal (m)	Dredging Qty. (Cubic meter)	Cumulative Dredging Quantity (Cubic meter)	Min. Depth (m)	Max. Depth (m)	Length of Shoal (m)	Dredging Qty. (Cubic meter)	Cumulative Dredging Quantity (Cubic meter)
0	1	2	5.3	0	0	0	0.9	4.3	1000	1056.54	1056.54
1	2	1.7	5.4	0	0.79	0.79	-0.2	3.9	1000	5341.72	6398.26
2	3	0.3	3.6	1000	49657.29	49658.08	-0.7	2.6	1000	89951.93	96350.19
3	4	1.6	6.4	500	978.02	50636.1	0.6	5.3	1000	11093.04	107443.2
4	5	1.8	4.5	500	978.02	51614.12	0.9	4.8	1000	6285.02	113728.3
5	6	3.3	6.5	0	0	51614.12	2.3	5.6	0	0	113728.3
6	7	1.7	8.2	0	0	51614.12	1	7.4	200	323.01	114051.3
7	8	1	4.2	1000	5225.1	56839.22	0.1	3.3	1000	41120.27	155171.5
8	9	2.9	7.4	0	0	56839.22	1.6	6.6	500	832.08	156003.6
9	10	1.8	8.3	0	0	56839.22	0.5	7.5	1000	4885.15	160888.8
10	11	2.6	7.2	0	0	56839.22	1.8	6.02	0	0	160888.8
11	12	1.3	6.82	100	187.87	57027.09	0.5	6.02	1000	5001.6	165890.4
12	13	1.3	3.3	1000	2263.13	59290.22	0.5	4.9	1000	12737.79	178628.2
13	14	1.3	15.3	1000	1273.56	60563.78	0.7	15	1000	4782.92	183411.1
14	15	0.3	10.5	1000	22202.21	82765.99	-0.3	9.6	1000	40559.77	223970.8
15	16	0.3	5.2	1000	20433.8	103199.8	-0.3	4.4	1000	38624.57	262595.4
16	17	0.1	8.1	1000	63952.1	167151.9	-0.7	7.3	1000	83975.42	346570.8
17	18	0.3	8.2	1000	9685.03	176836.9	0.9	7.7	1000	12689.35	359260.2
18	19	0.3	6.7	1000	9754.23	186591.2	0.2	4.7	1000	24770.48	384030.7
19	20	0.7	6.12	1000	3446.52	190037.7	0.5	5.32	1000	10044.95	394075.6
20	21	1.7	7	0	0	190037.7	1.1	6.4	500	934.13	395009.7
21	22	0.3	2.42	1000	34430.2	224467.9	-0.3	2.4	1000	69739.11	464748.9
22	23	0.1	3.4	1000	11837.33	236305.2	-0.3	2.3	1000	41609.5	506358.4
23	24	0.1	3.12	1000	45805.25	282110.5	-0.3	2.42	1000	84066.74	590425.1
24	25	0.3	6.42	1000	31080.17	313190.6	-0.3	6.3	1000	51317.65	641742.7
25	26	1.6	6.3	100	51.22	313241.8	1.8	6.2	0	0	641742.7
26	27	1.78	6.1	0	0	313241.8	1.7	6.2	0	0	641742.7
27	28	1.7	7.3	0	0	313241.8	1.7	7.5	0	0	641742.7
28	29	1.08	4.4	1000	5810.53	319052.4	1.08	4.3	1000	4610.7	646353.4
29	30	1.38	6.72	1000	1285.62	320338	1.3	6.52	500	695.27	647048.7
30	31	0.1	4.1	1000	24256.56	344594.6	-0.1	3.5	1000	21783.37	668832.1
31	32	0.3	4.1	1000	12325.96	356920.5	0.2	3.5	1000	10948.58	679780.7
32	33	0.3	3.4	1000	31991.09	388911.6	0.4	3.4	1000	30551.66	710332.3

Class-III											
Chainage (km)		As per Observed Soundings					As per Reduced Soundings				
From	To	Min. depth (m)	Max. depth (m)	Length of Shoal (m)	Dredging Qty. (Cubic meter)	Cumulative Dredging Quantity (Cubic meter)	Min. Depth (m)	Max. Depth (m)	Length of Shoal (m)	Dredging Qty. (Cubic meter)	Cumulative Dredging Quantity (Cubic meter)
33	34	1.1	2.2	1000	49858.64	438770.2	0.2	2.2	1000	52739.74	763072.1
34	35	1.3	7	1000	17506.32	456276.6	0.9	7.22	1000	17571.96	780644
35	36	1.7	7.2	0	0	456276.6	1.7	7.5	0	0	780644
36	37	2.08	9.02	0	0	456276.6	2	9	0	0	780644
37	38	0.9	6.02	1000	11978.34	468254.9	0.7	6.1	1000	5028.95	785673
38	39	0.8	8.1	1000	5539.88	473794.8	0.8	9	1000	1842.29	787515.3
39	40	1.5	6.1	1000	21632.84	495427.6	0.8	6.9	1000	4834.55	792349.8
40	41	1.5	3.6	1000	10206.42	505634	1.3	3.5	100	199.35	792549.2
41	42	1.6	4.9	1000	11640.07	517274.1	1.5	4.4	100	185.97	792735.1
42	43	2.88	5.2	0	0	517274.1	2.78	5.5	0	0	792735.1
43	44	1.2	3.6	1000	12525.73	529799.8	1.1	5	200	207.28	792942.4
44	45	1.1	4.9	1000	21117.72	550917.6	1.1	4.6	500	641.63	793584
45	46	1	5.8	1000	22985.04	573902.6	0.9	6.3	1000	2213.71	795797.8
46	47	1.1	6.5	1000	15404.82	589307.4	0.9	7.1	1000	5992.04	801789.8
47	48	1.5	4.22	1000	23127.42	612434.8	1.48	4.2	1000	6899.27	808689.1
48	49	0.9	7.1	1000	1968.98	614403.8	2	6.9	0	0	808689.1
49	50	2	5.1	0	0	614403.8	2	5.2	0	0	808689.1
50	51	0.9	4.3	1000	27928.75	642332.6	0.8	4.2	1000	4872.24	813561.3
51	52	1.2	2.5	1000	35315.79	677648.4	1.1	2.3	1000	3661.19	817222.5
52	53	1.3	4.82	1000	8772.5	686420.9	1.2	4.6	100	51.38	817273.9
53	54	0.7	4.82	1000	17250.29	703671.2	0.7	4.6	1000	8337.76	825611.6
54	55	0.7	5	1000	2833.78	706504.9	1.8	3.5	0	0	825611.6
55	56	1.3	4.3	1000	11210.05	717715	1.2	4.3	200	239.68	825851.3
56	57	0.9	4.22	500	610.71	718325.7	0.8	4.1	0	0	825851.3
57	58	1.1	3.3	1000	34435.88	752761.6	0.9	3.2	1000	12181.11	838032.4
58	59	1.08	4.7	500	586.8	753348.4	0.9	4.5	100	35.29	838067.7
59	60	0.9	4.7	1000	49115.55	802463.9	0.7	4.3	1000	23904.52	861972.2
60	61	0.7	4.2	1000	16859.56	819323.5	0.5	4.1	1000	6378.13	868350.4
61	62	0.3	3.4	1000	46330.48	865653.96	0.2	3.3	1000	46134.81	914485.17
Total				44200	865653.96		Total		42000	914485.17	

Table 20-Minimum & Maximum Depth per km wise (Class-III)

Class - IV:-

Class-IV											
Chainage (km)		As per Observed Soundings					As per Reduced Soundings				
From	To	Min. depth (m)	Max. depth (m)	Length of Shoal (m)	Dredging Qty. (Cubic meter)	Cumulative Dredging Quantity (Cubic meter)	Min. Depth (m)	Max. Depth (m)	Length of Shoal (m)	Dredging Qty. (Cubic meter)	Cumulative Dredging Quantity (Cubic meter)
0	1	2.1	5.4	0	0	0	0.6	4.4	1000	4318.56	4318.56
1	2	1.5	5.5	500	652.5	652.5	-0.3	4	1000	8652.89	12971.45
2	3	0.2	3.8	1000	65968.31	66620.81	-0.3	2.8	1000	109282.3	122253.75
3	4	1.3	6.5	1000	2807.69	69428.5	0.3	5.4	1000	18031.43	140285.18
4	5	1.7	4.7	200	205.75	69634.25	0.8	4.3	1000	11260.91	151546.09
5	6	3.1	6.6	0	0	69634.25	2.1	5.7	0	0	151546.09
6	7	2.1	8.3	0	0	69634.25	0.8	7.5	1000	2750.23	154296.32
7	8	0.8	4.4	1000	17923	87557.25	-0.1	3.5	1000	57580.33	211876.65
8	9	2.7	7.5	0	0	87557.25	1.7	6.7	1000	2457.34	214333.99
9	10	1.6	8.5	200	387.62	87944.87	0.3	7.7	1000	10656.6	224990.59
10	11	2.5	7.3	0	0	87944.87	2	6.03	0	0	224990.59
11	12	1.2	6.83	1000	1489.78	89434.65	0.3	6.03	1000	7899.32	232889.91
12	13	1.2	3.4	1000	4254.77	93689.42	0.3	5.1	1000	23757.35	256647.26
13	14	1.3	15.4	1000	2491.4	96180.82	0.5	15.1	1000	10123.66	266770.92
14	15	0.2	10.7	1000	30772.68	126953.5	-0.3	9.8	1000	50310.76	317081.68
15	16	0.2	5.4	1000	27532.59	154486.09	-0.3	4.6	1000	50404.91	367486.59
16	17	0.1	8.3	1000	78562.38	233048.47	-0.3	7.5	1000	102774.6	470261.19
17	18	0.2	8.4	1000	12194.79	245243.26	0.2	7.8	1000	15838.08	486099.27
18	19	0.2	7	1000	15858.66	261101.92	-0.1	4.9	1000	34227.76	520327.03
19	20	0.5	6.13	1000	4983.38	266085.3	0.3	5.33	1000	15971.02	536298.05
20	21	1.1	7.1	100	32.25	266117.55	1.1	6.5	1000	3775.35	540073.4
21	22	0.01	3.6	1000	49369.74	315487.29	-0.3	2.8	1000	87093.26	627166.66
22	23	0.01	3.6	1000	22633.59	338120.88	-0.3	2.8	1000	58864.68	686031.34
23	24	0.1	3.13	1000	61920.43	400041.31	-0.3	2.43	1000	103642	789673.34
24	25	0.1	6.43	1000	41023.42	441064.73	-0.3	6.3	1000	63482.34	853155.68
25	26	1.5	6.4	500	630.75	441695.48	1.27	6.2	100	196.87	853352.55
26	27	1.6	6.3	200	440.28	442135.76	2	6.3	0	0	853352.55
27	28	1.4	7.5	100	46.05	442181.81	1.5	7.7	100	7.36	853359.91
28	29	1.07	4.2	1000	11047.32	453229.13	1.07	4.1	1000	8236	861595.91
29	30	1.37	6.73	1000	5139.22	458368.35	1.3	6.3	1000	4187.21	865783.12
30	31	0.1	4.2	1000	37619.81	495988.16	-0.3	3.7	1000	34890.54	900673.66
31	32	0.2	4.2	1000	21385.84	517374	-0.1	3.6	1000	19335.81	920009.47
32	33	0.2	3.5	1000	48016.46	565390.46	0.2	3.5	1000	45573	965582.47
33	34	2	3.5	0	0	565390.46	2	3.4	0	0	965582.47

Class-IV											
Chainage (km)		As per Observed Soundings					As per Reduced Soundings				
From	To	Min. depth (m)	Max. depth (m)	Length of Shoal (m)	Dredging Qty. (Cubic meter)	Cumulative Dredging Quantity (Cubic meter)	Min. Depth (m)	Max. Depth (m)	Length of Shoal (m)	Dredging Qty. (Cubic meter)	Cumulative Dredging Quantity (Cubic meter)
34	35	0.7	7.1	1000	15590.17	580980.63	0.7	7.1	1000	7924.37	973506.84
35	36	1.4	7.3	1000	7342.83	588323.46	1.1	7.2	1000	3477.82	976984.66
36	37	0.8	9.33	1000	30091.72	618415.18	0.7	9.2	1000	11204.7	988189.36
37	38	0.8	6.03	1000	18794.24	637209.42	0.5	5.03	1000	2988.47	991177.83
38	39	0.1	8.2	1000	24877.15	662086.57	0.1	8.1	500	592.61	991770.44
39	40	2	6.3	0	0	662086.57	2	6.1	0	0	991770.44
40	41	0.6	3.7	1000	21339.51	683426.08	0.5	5.5	1000	2739.94	994510.38
41	42	0.7	5	1000	31589.56	715015.64	0.6	4.5	1000	3971.62	998482
42	43	1.07	5.3	1000	35291.87	750307.51	1	5.2	1000	6526.56	1005008.6
43	44	0.01	3.7	1000	23938.99	774246.5	0.01	3.5	1000	9511.35	1014519.9
44	45	0.1	5.1	1000	36323.7	810570.2	0.1	4.5	1000	11489.91	1026009.8
45	46	0.47	6	1000	6792.47	817362.67	2	5.6	0	0	1026009.8
46	47	1	6.7	100	13.13	817375.8	2	6.3	0	0	1026009.8
47	48	0.6	4.23	1000	38971.91	856347.71	0.6	4.1	1000	11664.56	1037674.4
48	49	0.7	4.7	1000	52331.9	908679.61	0.5	4.5	1000	11955.1	1049629.5
49	50	1.9	5.3	1000	17069.42	925749.03	1.6	5.2	1000	1418.57	1051048.1
50	51	0.1	4.4	1000	24810.06	950559.09	0.1	4.2	1000	11827.11	1062875.2
51	52	0.2	2.7	1000	7189.98	957749.07	2	2.6	0	0	1062875.2
52	53	0.4	4.83	1000	20766.05	978515.12	0.3	4.6	1000	2373.27	1065248.4
53	54	0.5	4.83	1000	4875.63	983390.75	2	4.6	0	0	1065248.4
54	55	0.5	5.1	1000	47300.93	1030691.7	0.4	5	1000	22101.87	1087350.3
55	56	0.8	4.4	1000	2716.92	1033408.6	0.6	4.3	200	462.32	1087812.6
56	57	0.47	4.23	1000	64424.35	1097833	0.3	4.1	1000	37310.2	1125122.8
57	58	1	3.5	1000	24687.62	1122520.6	0.8	3.3	1000	13493.11	1138615.9
58	59	1.07	4.9	1000	75630.22	1198150.8	0.8	4.6	1000	74449.57	1213065.5
59	60	2	4.9	0	0	1198150.8	2	4.6	0	0	1213065.5
60	61	0.2	4.4	1000	15590.17	1213741	0.2	4.1	1000	7924.37	1220989.9
61	62	0.1	3.5	1000	7342.83	1221083.8	0.1	3.3	1000	3477.82	1224467.7
Total				47900	1221083.8				48900	1224467.7	

Table 21-Minimum & Maximum Depth per km wise (Class-IV)

Annexure-3 Observed Depth in 200 m. Interval:-

Chainage (in meter)	Class-I		Class-II		Class-III		Class-IV	
	Observed		Observed		Observed		Observed	
	Min	Max	Min	Max	Min	Max	Min	Max
0	3	3.3	2.9	3.4	2.8	3.5	2.7	3.6
200	2.4	3.3	2.2	3.5	2	3.7	1.8	3.9
400	3	4	2.7	4.3	2.4	4.6	2.1	4.9
600	4	5.1	3.9	5.2	3.8	5.3	3.7	5.4
800	3.2	3.9	3.19	3.91	3.18	3.92	3.17	3.93
1000	3	3.5	2.8	3.7	2.6	3.9	2.4	4.1
1200	3.7	5.2	3.6	5.3	3.5	5.4	3.4	5.5
1400	2.9	4.1	2.8	4.2	2.7	4.3	2.6	4.4
1600	3.2	3.5	3.1	3.6	3	3.7	2.9	3.8
1800	2.9	3.1	2.89	3.11	2.88	3.12	2.87	3.13
2000	1.8	3.2	1.7	3.4	1.7	3.6	1.5	3.8
2200	0.5	0.8	0.4	0.9	0.3	1	0.2	1.1
2400	0.5	0.8	0.49	0.81	0.48	0.82	0.47	0.83
2600	1	2	0.9	2.1	0.8	2.2	0.7	2.3
2800	1.5	1.9	1.3	2.1	1.1	2.3	0.9	2.5
3000	2.2	2.5	1.9	2.8	1.6	3.1	1.3	3.4
3200	3.3	4.4	3.2	4.5	3.1	4.6	3	4.7
3400	3	6.2	2.9	6.3	2.8	6.4	2.7	6.5
3600	2	4.2	1.8	4.4	1.6	4.6	1.4	4.8
3800	1.8	2.9	1.7	3	1.6	3.1	1.5	3.2
4000	2	3	1.9	3.1	1.8	3.2	1.7	3.3
4200	2.9	3.1	2.8	3.2	2.7	3.3	2.6	3.4
4400	3.5	3.8	3.3	4	3.1	4.2	2.9	4.4
4600	3.5	3.8	3.49	3.81	3.48	3.82	3.47	3.83
4800	3.8	4.1	3.7	4.2	3.6	4.3	3.5	4.4
5000	3.7	4.1	3.5	4.3	3.3	4.5	3.1	4.7
5200	5	5.4	4.8	5.6	4.6	5.8	4.4	6
5400	5.1	5.7	4.9	5.9	4.7	6.1	4.5	6.3
5600	5.5	6	5.4	6.1	5.3	6.2	5.2	6.3
5800	6	6.4	5.99	6.41	5.98	6.42	5.97	6.43
6000	5.4	6.3	5.3	6.4	5.2	6.5	5.1	6.6
6200	5.5	8	5.4	8.1	5.3	8.2	5.2	8.3
6400	5.9	7.9	5.89	7.91	5.88	7.92	5.87	7.93
6600	2.2	2.6	2	2.8	1.8	3	1.6	3.2
6800	2.9	3.1	2.8	3.2	2.7	3.3	2.6	3.4
7000	1.8	2.8	1.6	3	1.4	3.2	1.2	3.4
7200	1.4	1.8	1.3	1.9	1.2	2	1.1	2.1

Chainage (in meter)	Class-I		Class-II		Class-III		Class-IV	
	Observed		Observed		Observed		Observed	
	Min	Max	Min	Max	Min	Max	Min	Max
7400	1.4	1.8	1.2	2	1	2.2	0.8	2.4
7600	1.6	2.1	1.59	2.11	1.58	2.12	1.57	2.13
7800	2.3	2.8	2.29	2.81	2.28	2.82	2.27	2.83
8000	3.3	3.8	3.1	4	2.9	4.2	2.7	4.4
8200	3.9	5.2	3.89	5.21	3.88	5.22	3.87	5.23
8400	4.8	5.2	4.6	5.4	4.4	5.6	4.2	5.8
8600	3.8	4.9	3.79	4.91	3.78	4.92	3.77	4.93
8800	4.8	5.4	4.5	5.7	4.2	6	3.9	6.3
9000	5.9	7.2	5.8	7.3	5.7	7.4	5.6	7.5
9200	2.5	7.9	2.3	8.1	2.1	8.3	1.9	8.5
9400	3.8	5.2	3.7	5.3	3.6	5.4	3.5	5.5
9600	2.2	4.2	2	4.4	1.8	4.6	1.6	4.8
9800	2.5	3.1	2.49	3.11	2.48	3.12	2.47	3.13
10000	4.4	5.3	4.3	5.4	4.2	5.5	4.1	5.6
10200	3.8	4.4	3.6	4.6	3.4	4.8	3.2	5
10400	2.9	5.9	2.8	6	2.7	6.1	2.6	6.2
10600	2.8	7	2.7	7.1	2.6	7.2	2.5	7.3
10800	3	3.9	2.9	4	2.8	4.1	2.7	4.2
11000	3.9	6.8	3.89	6.81	3.88	6.82	3.87	6.83
11200	2.8	3.4	2.6	3.6	2.4	3.8	2.2	4
11400	2.5	3.6	2.4	3.7	2.3	3.8	2.2	3.9
11600	3.5	5.8	3.49	5.81	3.48	5.82	3.47	5.83
11800	3.7	6.1	3.6	6.2	3.5	6.3	3.4	6.4
12000	1.8	1.4	1.3	1.6	1.3	1.8	1.2	2
12200	1.9	2.3	1.89	2.31	1.88	2.32	1.87	2.33
12400	2.1	2.5	2	2.6	1.9	2.7	1.8	2.8
12600	2.5	2.8	2.3	3	2.1	3.2	1.9	3.4
12800	2.4	2.8	2.3	2.9	2.2	3	2.1	3.1
13000	2.8	3.1	1.3	3.2	1.3	3.3	1.3	3.4
13200	2.5	3.4	2.3	3.6	2.1	3.8	1.9	4
13400	3.6	5.1	3.5	5.2	3.4	5.3	3.3	5.4
13600	5.9	6.7	5.7	6.9	5.5	7.1	5.3	7.3
13800	7.7	15.1	7.6	15.2	7.5	15.3	7.4	15.4
14000	4.3	10.1	4.1	10.3	3.9	10.5	3.7	10.7
14200	3.8	5.8	3.79	5.81	3.78	5.82	3.77	5.83
14400	2.4	7.1	2.3	7.2	2.2	7.3	2.1	7.4
14600	1	1.9	0.8	2.1	0.6	2.3	0.4	2.5
14800	0.5	3.2	0.4	3.3	0.3	3.4	0.2	3.5
15000	0.5	0.8	0.4	0.9	0.3	1	0.2	1.1
15200	2	2.6	1.9	2.7	1.8	2.8	1.7	2.9

Chainage (in meter)	Class-I		Class-II		Class-III		Class-IV	
	Observed		Observed		Observed		Observed	
	Min	Max	Min	Max	Min	Max	Min	Max
15400	2.7	3.1	2.69	3.11	2.68	3.12	2.67	3.13
15600	2	4.8	1.8	5	1.6	5.2	1.4	5.4
15800	0.8	1	0.7	1.1	0.6	1.2	0.5	1.3
16000	1.8	2.3	1.79	2.31	1.78	2.32	1.77	2.33
16200	0.5	0.8	0.4	0.9	0.3	1	0.2	1.1
16400	0.3	0.6	0.1	0.8	0.1	1	0.1	1.2
16600	0.2	0.5	0.19	0.51	0.18	0.52	0.17	0.53
16800	0.5	1.2	0.4	1.3	0.3	1.4	0.2	1.5
17000	4.9	7.7	4.7	7.9	4.5	8.1	4.3	8.3
17200	5.8	6.2	5.7	6.3	5.6	6.4	5.5	6.5
17400	4.8	6.7	4.7	6.8	4.6	6.9	4.5	7
17600	4.9	7.8	4.7	8	4.5	8.2	4.3	8.4
17800	2.5	7.9	2.4	8	2.3	8.1	2.2	8.2
18000	0.5	5.2	0.4	5.3	0.3	5.4	0.2	5.5
18200	3	5	2.8	5.2	2.6	5.4	2.4	5.6
18400	1.7	6.1	1.4	6.4	1.1	6.7	0.8	7
18600	1	1.3	0.9	1.4	0.8	1.5	0.7	1.6
18800	0.9	1.2	0.8	1.3	0.7	1.4	0.6	1.5
19000	1.1	2.2	0.9	2.4	0.7	2.6	0.5	2.8
19200	2	2.5	1.9	2.6	1.8	2.7	1.7	2.8
19400	2	3.2	1.9	3.3	1.8	3.4	1.7	3.5
19600	3.4	4.3	3.3	4.4	3.2	4.5	3.1	4.6
19800	3.9	5	3.7	5.2	3.5	5.4	3.3	5.6
20000	4.4	6.1	4.39	6.11	4.38	6.12	4.37	6.13
20200	5.2	6.8	5.1	6.9	5	7	4.9	7.1
20400	1.9	3.1	1.7	3.3	1.5	3.5	1.3	3.7
20600	2.5	4.3	2.3	4.5	2.1	4.7	1.9	4.9
20800	1.7	5.6	1.5	5.8	1.3	6	1.1	6.2
21000	1.5	1.4	1.4	1.5	1.4	1.6	1.4	1.7
21200	0.5	0.8	0.49	0.81	0.48	0.82	0.47	0.83
21400	1	1.3	0.9	1.4	0.8	1.5	0.7	1.6
21600	0.5	0.7	0.4	0.8	0.3	0.9	0.2	1
21800	1.4	2.4	1.39	2.41	1.38	2.42	1.37	2.43
22000	0.5	3	0.3	3.2	0.1	3.4	0.01	3.6
22200	0.7	1.6	0.6	1.7	0.5	1.8	0.4	1.9
22400	0.5	1.8	0.3	2	0.1	2.2	0.1	2.4
22600	1.9	2.7	1.8	2.8	1.7	2.9	1.6	3
22800	1	2.2	0.8	2.4	0.6	2.6	0.4	2.8
23000	0.9	1.8	0.89	1.81	0.88	1.82	0.87	1.83
23200	1.9	3.1	1.89	3.11	1.88	3.12	1.87	3.13

Chainage (in meter)	Class-I		Class-II		Class-III		Class-IV	
	Observed		Observed		Observed		Observed	
	Min	Max	Min	Max	Min	Max	Min	Max
23400	0.5	0.8	0.3	1	0.1	1.2	0.1	1.4
23600	0.7	1.5	0.69	1.51	0.68	1.52	0.67	1.53
23800	0.7	1.2	0.6	1.3	0.5	1.4	0.4	1.5
24000	0.8	1.8	0.6	2	0.4	2.2	0.2	2.4
24200	0.7	1.9	0.5	2.1	0.3	2.3	0.1	2.5
24400	1.7	2.4	1.5	2.6	1.3	2.8	1.1	3
24600	3	4	2.9	4.1	2.8	4.2	2.7	4.3
24800	4.4	6.4	4.39	6.41	4.38	6.42	4.37	6.43
25000	4	6.1	3.9	6.2	3.8	6.3	3.7	6.4
25200	3.4	5	3.3	5.1	3.2	5.2	3.1	5.3
25400	1.8	2.7	1.79	2.71	1.78	2.72	1.77	2.73
25600	2.1	2.8	1.9	3	1.7	3.2	1.5	3.4
25800	1.8	2.2	1.7	2.3	1.6	2.4	1.5	2.5
26000	2.4	3.1	2.2	3.3	2	3.5	1.8	3.7
26200	2.2	3.4	2.1	3.5	2	3.6	1.9	3.7
26400	2.2	3	2	3.2	1.8	3.4	1.6	3.6
26600	1.8	2.2	1.79	2.21	1.78	2.22	1.77	2.23
26800	3.1	4.1	3.09	4.11	3.08	4.12	3.07	4.13
27000	3	5.7	2.8	5.9	2.6	6.1	2.4	6.3
27200	3.7	6.9	3.5	7.1	3.3	7.3	3.1	7.5
27400	3.5	4.7	3.49	4.71	3.48	4.72	3.47	4.73
27600	1.8	4	1.7	4.1	1.6	4.2	1.5	4.3
27800	2	2.8	1.8	3	1.6	3.2	1.4	3.4
28000	1.7	2.1	1.6	2.2	1.5	2.3	1.4	2.4
28200	2.4	2.9	2.3	3	2.2	3.1	2.1	3.2
28400	1.5	2.5	1.4	2.6	1.3	2.7	1.2	2.8
28600	1.1	1.8	1.09	1.81	1.08	1.82	1.07	1.83
28800	2.5	3.6	2.3	3.8	2.1	4	1.9	4.2
29000	1.7	2.1	1.6	2.2	1.5	2.3	1.4	2.4
29200	1.5	1.8	1.4	1.81	1.38	1.82	1.37	1.83
29400	2.2	2.6	2.1	2.7	2	2.8	1.9	2.9
29600	3	3.9	2.8	4.1	2.6	4.3	2.4	4.5
29800	3.2	6.7	3.19	6.71	3.18	6.72	3.17	6.73
30000	2.1	2.9	2	3	1.9	3.1	1.8	3.2
30200	0.5	0.8	0.3	1	0.1	1.2	0.1	1.4
30400	0.7	1.8	0.6	1.9	0.5	2	0.4	2.1
30600	1	2.2	0.9	2.3	0.8	2.4	0.7	2.5
30800	2.4	3	2.2	3.2	2	3.4	1.8	3.6
31000	3.2	3.9	3.1	4	3	4.1	2.9	4.2
31200	1.8	2.9	1.7	3	1.6	3.1	1.5	3.2

Chainage (in meter)	Class-I		Class-II		Class-III		Class-IV	
	Observed		Observed		Observed		Observed	
	Min	Max	Min	Max	Min	Max	Min	Max
31400	1.5	2.1	1.3	2.3	1.1	2.5	0.9	2.7
31600	1.3	1.8	1	2.1	0.7	2.4	0.4	2.7
31800	0.5	0.8	0.4	0.9	0.3	1	0.2	1.1
32000	0.5	1.4	0.4	1.5	0.3	1.6	0.2	1.7
32200	1	1.2	0.8	1.4	0.6	1.6	0.4	1.8
32400	1.3	1.5	1.2	1.6	1.1	1.7	1	1.8
32600	1.8	2.5	1.7	2.6	1.6	2.7	1.5	2.8
32800	1.7	3.2	1.6	3.3	1.5	3.4	1.4	3.5
33000	1.1	1	1.1	1.2	1.1	1.4	1.1	1.6
33200	1.4	1.5	1.4	1.51	1.3	1.52	0.97	1.53
33400	1.5	1.9	1.5	2	1.4	2.1	0.2	2.2
33600	1.4	1.8	1.4	2	1.3	2.2	0.1	2.4
33800	1.5	1.2	1.4	1.4	1.3	1.6	0.1	1.8
34000	1.4	0.9	1.4	1.1	1.4	1.3	0.7	1.5
34200	2.9	3.2	2.8	3.3	2.7	3.4	2.6	3.5
34400	4	4.2	3.99	4.21	3.98	4.22	3.97	4.23
34600	5.2	6.5	5.1	6.6	5	6.7	4.9	6.8
34800	5	6.8	4.9	6.9	4.8	7	4.7	7.1
35000	3.4	6.4	3.39	6.41	3.38	6.42	3.37	6.43
35200	2	2.8	1.8	3	1.6	3.2	1.4	3.4
35400	2.2	7	2.1	7.1	2	7.2	1.9	7.3
35600	2.9	3.9	2.7	4.1	2.5	4.3	2.3	4.5
35800	4	5	3.9	5.1	3.8	5.2	3.7	5.3
36000	4.2	6.2	4	6.4	3.8	6.6	3.6	6.8
36200	7.1	9.3	7.09	9.31	7.08	9.32	7.07	9.33
36400	2.6	8.9	2.59	8.91	2.58	8.92	2.57	8.93
36600	5.4	7.7	5.2	7.9	5	8.1	4.8	8.3
36800	2.1	6	2.09	6.01	2.08	6.02	2.07	6.03
37000	1.1	2.8	1	2.9	0.9	3	0.8	3.1
37200	1.5	2.5	1.3	2.7	1.1	2.9	0.9	3.1
37400	1.5	2.2	1.3	2.4	1.1	2.6	0.9	2.8
37600	2.1	2.5	1.9	2.7	1.7	2.9	1.5	3.1
37800	3	3.8	2.9	3.9	2.8	4	2.7	4.1
38000	5	6	4.99	6.01	4.98	6.02	4.97	6.03
38200	4.2	7.9	4.1	8	4	8.1	3.9	8.2
38400	1.4	5.8	1.3	5.9	1.2	6	1.1	6.1
38600	2	2.5	1.99	2.51	1.98	2.52	1.97	2.53
38800	0.5	1.3	0.3	1.5	0.1	1.7	0.1	1.9
39000	1.5	2.9	1.4	3	1.3	3.1	1.2	3.2
39200	0.5	0.8	0.3	1	0.1	1.2	0.1	1.4

Chainage (in meter)	Class-I		Class-II		Class-III		Class-IV	
	Observed		Observed		Observed		Observed	
	Min	Max	Min	Max	Min	Max	Min	Max
39400	2	3.8	1.9	3.9	1.8	4	1.7	4.1
39600	4.8	5.7	4.6	5.9	4.4	6.1	4.2	6.3
39800	2.8	4.7	2.79	4.71	2.78	4.72	2.77	4.73
40000	1.8	2.9	1.79	2.91	1.78	2.92	1.77	2.93
40200	1.7	2.8	1.5	3	1.3	3.2	1.1	3.4
40400	0.9	1.9	0.8	2	0.7	2.1	0.6	2.2
40600	1.3	2.1	1.1	2.3	0.9	2.5	0.7	2.7
40800	1.5	3.4	1.4	3.5	1.3	3.6	1.2	3.7
41000	1.7	2.1	1.5	2.3	1.3	2.5	1.1	2.7
41200	0.8	1.8	0.79	1.81	0.78	1.82	0.77	1.83
41400	1	1.3	0.9	1.4	0.8	1.5	0.7	1.6
41600	1.5	2.1	1.3	2.3	1.1	2.5	0.9	2.7
41800	2.5	3.1	2.4	3.2	2.3	3.3	2.2	3.4
42000	3.7	4.7	3.6	4.8	3.5	4.9	3.4	5
42200	3.2	5	3.1	5.1	3	5.2	2.9	5.3
42400	2.9	3.6	2.89	3.61	2.88	3.62	2.87	3.63
42600	3.8	4.1	3.6	4.3	3.4	4.5	3.2	4.7
42800	3.1	4	3	4.1	2.9	4.2	2.8	4.3
43000	1.1	2.6	1.09	2.61	1.08	2.62	1.07	2.63
43200	1.4	3.4	1.3	3.5	1.2	3.6	1.1	3.7
43400	0.5	1.2	0.3	1.4	0.1	1.6	0.01	1.8
43600	0.7	1	0.69	1.01	0.68	1.02	0.67	1.03
43800	1.9	2.5	1.8	2.6	1.7	2.7	1.6	2.8
44000	0.5	0.8	0.3	1	0.1	1.2	0.1	1.4
44200	0.7	1.2	0.6	1.3	0.5	1.4	0.4	1.5
44400	2.2	3.4	2.1	3.5	2	3.6	1.9	3.7
44600	3.5	4.5	3.3	4.7	3.1	4.9	2.9	5.1
44800	1.2	2.1	1.1	2.2	1	2.3	0.9	2.4
45000	0.5	1	0.49	1.01	0.48	1.02	0.47	1.03
45200	1.2	1.5	1.1	1.6	1	1.7	0.9	1.8
45400	3	4.4	2.9	4.5	2.8	4.6	2.7	4.7
45600	1.7	2.1	1.69	2.11	1.68	2.12	1.67	2.13
45800	3.2	5.4	3	5.6	2.8	5.8	2.6	6
46000	1.9	3.9	1.8	4	1.7	4.1	1.6	4.2
46200	1.1	1.2	1.1	1.4	1.1	1.6	1	1.8
46400	1.4	1.4	1.4	1.5	1.3	1.6	1.2	1.7
46600	4.8	6.1	4.6	6.3	4.4	6.5	4.2	6.7
46800	1.2	4.5	1.2	4.51	1.18	4.52	1.17	4.53
47000	1.3	4.2	1.3	4.21	1.28	4.22	1.27	4.23
47200	1.3	2.1	1.3	2.3	1.2	2.5	1	2.7

Chainage (in meter)	Class-I		Class-II		Class-III		Class-IV	
	Observed		Observed		Observed		Observed	
	Min	Max	Min	Max	Min	Max	Min	Max
47400	1.7	2.1	1.69	2.11	1.68	2.12	1.67	2.13
47600	1.5	3.2	1.4	3.3	1.3	3.4	1.2	3.5
47800	1.2	2.1	1	2.3	0.8	2.5	0.6	2.7
48000	1.4	2	1.2	2.2	1	2.4	0.8	2.6
48200	1.3	1.5	1.1	1.7	0.9	1.9	0.7	2.1
48400	1.3	4.4	1.2	4.5	1.1	4.6	1	4.7
48600	1.8	2.5	1.79	2.51	1.78	2.52	1.77	2.53
48800	1.9	2.4	1.8	2.5	1.7	2.6	1.6	2.7
49000	2.4	3.3	2.3	3.4	2.2	3.5	2.1	3.6
49200	3.3	4.4	3.29	4.41	3.28	4.42	3.27	4.43
49400	3.2	4.1	3	4.3	2.8	4.5	2.6	4.7
49600	3.9	4.7	3.8	4.8	3.7	4.9	3.6	5
49800	3	4.7	2.8	4.9	2.6	5.1	2.4	5.3
50000	2.2	4.1	2.1	4.2	2	4.3	1.9	4.4
50200	0.8	1	0.6	1.2	0.4	1.4	0.2	1.6
50400	0.5	2.6	0.49	2.61	0.48	2.62	0.47	2.63
50600	0.8	1.3	0.79	1.31	0.78	1.32	0.77	1.33
50800	0.5	0.8	0.3	1	0.1	1.2	0.1	1.4
51000	0.7	1.2	0.6	1.3	0.5	1.4	0.4	1.5
51200	0.9	2.1	0.7	2.3	0.5	2.5	0.3	2.7
51400	0.5	0.8	0.4	0.9	0.3	1	0.2	1.1
51600	0.9	1.5	0.7	1.7	0.5	1.9	0.3	2.1
51800	0.8	1.8	0.79	1.81	0.78	1.82	0.77	1.83
52000	0.7	1.8	0.6	1.9	0.5	2	0.4	2.1
52200	1.7	2.1	1.5	2.3	1.3	2.5	1.1	2.7
52400	1.8	2.6	1.7	2.7	1.6	2.8	1.5	2.9
52600	1.7	2.1	1.6	2.2	1.5	2.3	1.4	2.4
52800	2.5	3.1	2.4	3.2	2.3	3.3	2.2	3.4
53000	3.2	4.8	3.19	4.81	3.18	4.82	3.17	4.83
53200	1.3	2.8	1.3	3	1.3	3.2	0.7	3.4
53400	1.9	2.8	1.8	2.9	1.7	3	1.6	3.1
53600	1.9	2.9	1.89	2.91	1.88	2.92	1.87	2.93
53800	1.4	1.8	1.3	1.9	1.2	2	1.1	2.1
54000	1.1	1.6	0.9	1.8	0.7	2	0.5	2.2
54200	1.5	1.8	1.49	1.81	1.48	1.82	1.47	1.83
54400	2.6	3.4	2.5	3.5	2.4	3.6	2.3	3.7
54600	3.2	4.2	3	4.4	2.8	4.6	2.6	4.8
54800	4.2	4.8	4.1	4.9	4	5	3.9	5.1
55000	3	4.1	2.9	4.2	2.8	4.3	2.7	4.4
55200	1.4	1.9	1.2	2.1	1	2.3	0.8	2.5

Chainage (in meter)	Class-I		Class-II		Class-III		Class-IV	
	Observed		Observed		Observed		Observed	
	Min	Max	Min	Max	Min	Max	Min	Max
55400	1.3	2.7	1.2	2.8	1.1	2.9	1	3
55600	2.4	2.9	2.39	2.91	2.38	2.92	2.37	2.93
55800	1.9	2.3	1.8	2.4	1.7	2.5	1.6	2.6
56000	1.7	2.2	1.5	2.4	1.3	2.6	1.1	2.8
56200	1.8	2.8	1.6	3	1.4	3.2	1.2	3.4
56400	2.3	3.6	2.1	3.8	1.9	4	1.7	4.2
56600	2.7	3.4	2.6	3.5	2.5	3.6	2.4	3.7
56800	0.5	4.2	0.49	4.21	0.48	4.22	0.47	4.23
57000	1.3	2.5	1.2	2.6	1.1	2.7	1	2.8
57200	1.4	2.3	1.3	2.4	1.2	2.5	1.1	2.6
57400	1.5	1.8	1.49	1.81	1.48	1.82	1.47	1.83
57600	2.1	2.8	1.9	3	1.7	3.2	1.5	3.4
57800	1.5	2.1	1.4	2.2	1.3	2.3	1.2	2.4
58000	2.4	2.9	2.2	3.1	2	3.3	1.8	3.5
58200	2.6	3.1	2.5	3.2	2.4	3.3	2.3	3.4
58400	2.7	3.1	2.5	3.3	2.3	3.5	2.1	3.7
58600	1.1	2.4	1.09	2.41	1.08	2.42	1.07	2.43
58800	2.1	3.2	2.09	3.21	2.08	3.22	2.07	3.23
59000	2	4.3	1.8	4.5	1.6	4.7	1.4	4.9
59200	1.5	2.8	1.3	3	1.1	3.2	0.9	3.4
59400	0.5	0.8	0.49	0.81	0.48	0.82	0.47	0.83
59600	0.5	0.8	0.4	0.9	0.3	1	0.2	1.1
59800	2.7	3.2	2.5	3.4	2.3	3.6	2.1	3.8
60000	0.5	0.8	0.4	0.9	0.3	1	0.2	1.1
60200	0.8	1.4	0.7	1.5	0.6	1.6	0.5	1.7
60400	1.8	2.8	1.7	2.9	1.6	3	1.5	3.1
60600	3	3.8	2.8	4	2.6	4.2	2.4	4.4
60800	2.5	3.2	2.49	3.21	2.48	3.22	2.47	3.23
61000	2.1	3.1	2	3.2	1.9	3.3	1.8	3.4
61200	2.2	3.1	2.1	3.2	2	3.3	1.9	3.4
61400	0.5	2.1	0.3	2.3	0.1	2.5	0.1	2.7
61600	0.5	3.2	0.4	3.3	0.3	3.4	0.2	3.5
61800	0.7	2.6	0.5	2.8	0.3	3	0.1	3.2
62000	1.5	2.1	1.5	2.1	1.5	2.1	1.5	2.1

Table 22- 200 meter interval observed depth

Annexure-4 Reduced Depth in 200 m Interval:-

Chainage (in meter)	Class-I		Class-II		Class-III		Class-IV	
	Reduced		Reduced		Reduced		Reduced	
	Min	Max	Min	Max	Min	Max	Min	Max
0	2.1	2.4	2	2.5	1.9	2.6	1.8	2.7
200	1.5	2.3	1.3	2.5	1.1	2.7	0.9	2.9
400	1.5	2.3	1.2	2.6	0.9	2.9	0.6	3.2
600	3.1	4.1	3	4.2	2.9	4.3	2.8	4.4
800	2.2	3	2.19	3.01	2.18	3.02	2.17	3.03
1000	2.1	3	1.9	3.2	1.7	3.4	1.5	3.6
1200	2.8	3.7	2.7	3.8	2.6	3.9	2.5	4
1400	2	3.1	1.9	3.2	1.8	3.3	1.7	3.4
1600	1.8	2.8	1.7	2.9	1.6	3	1.5	3.1
1800	1.8	2.2	1.79	2.21	1.78	2.22	1.77	2.23
2000	0.2	2.2	0.1	2.4	-0.2	2.6	-0.4	2.8
2200	-0.3	0.1	-0.4	0.2	-0.5	0.3	-0.6	0.4
2400	-0.3	0.2	-0.31	0.21	-0.32	0.22	-0.33	0.23
2600	-0.3	0.1	-0.4	0.2	-0.5	0.3	-0.6	0.4
2800	-0.3	0.2	-0.5	0.4	-0.7	0.6	-0.9	0.8
3000	1.2	1.8	0.9	2.1	0.6	2.4	0.3	2.7
3200	2.4	3.5	2.3	3.6	2.2	3.7	2.1	3.8
3400	3.3	5.1	3.2	5.2	3.1	5.3	3	5.4
3600	1	2.1	0.8	2.3	0.6	2.5	0.4	2.7
3800	0.9	1.8	0.8	1.9	0.7	2	0.6	2.1
4000	1.1	2	1	2.1	0.9	2.2	0.8	2.3
4200	1.9	2.2	1.8	2.3	1.7	2.4	1.6	2.5
4400	2	4.4	1.8	4.6	1.6	4.8	1.4	5
4600	2.6	2.9	2.59	2.91	2.58	2.92	2.57	2.93
4800	2.9	3.1	2.8	3.2	2.7	3.3	2.6	3.4
5000	2.7	3	2.5	3.2	2.3	3.4	2.1	3.6
5200	3.9	4.1	3.7	4.3	3.5	4.5	3.3	4.7
5400	4.4	4.8	4.2	5	4	5.2	3.8	5.4
5600	5.1	5.4	5	5.5	4.9	5.6	4.8	5.7
5800	5	5.5	4.99	5.51	4.98	5.52	4.97	5.53
6000	4.5	5.2	4.4	5.3	4.3	5.4	4.2	5.5
6200	5.4	7.2	5.3	7.3	5.2	7.4	5.1	7.5
6400	5.1	7.1	5.09	7.11	5.08	7.12	5.07	7.13
6600	1.4	1.8	1.2	2	1	2.2	0.8	2.4
6800	1.9	2.3	1.8	2.4	1.7	2.5	1.6	2.6
7000	1.8	2.1	1.6	2.3	1.4	2.5	1.2	2.7

Chainage (in meter)	Class-I		Class-II		Class-III		Class-IV	
	Reduced		Reduced		Reduced		Reduced	
	Min	Max	Min	Max	Min	Max	Min	Max
7200	0.8	1.2	0.7	1.3	0.6	1.4	0.5	1.5
7400	0.5	0.8	0.3	1	0.1	1.2	-0.1	1.4
7600	0.5	0.8	0.49	0.81	0.48	0.82	0.47	0.83
7800	1.1	1.9	1.09	1.91	1.08	1.92	1.07	1.93
8000	2.3	2.9	2.1	3.1	1.9	3.3	1.7	3.5
8200	3.1	4.8	3.09	4.81	3.08	4.82	3.07	4.83
8400	4	4.8	3.8	5	3.6	5.2	3.4	5.4
8600	3.1	3.9	3.09	3.91	3.08	3.92	3.07	3.93
8800	4	4.8	3.7	5.1	3.4	5.4	3.1	5.7
9000	5.1	6.4	5	6.5	4.9	6.6	4.8	6.7
9200	0.9	7.1	0.7	7.3	0.5	7.5	0.3	7.7
9400	2.1	4.3	2	4.4	1.9	4.5	1.8	4.6
9600	1.3	3.4	1.1	3.6	0.9	3.8	0.7	4
9800	1.7	2.3	1.69	2.31	1.68	2.32	1.67	2.33
10000	2.9	4.4	2.8	4.5	2.7	4.6	2.6	4.7
10200	2.8	3.6	2.6	3.8	2.4	4	2.2	4.2
10400	3.3	5.1	3.2	5.2	3.1	5.3	3	5.4
10600	2.2	4.2	2.1	4.3	2	4.4	1.9	4.5
10800	2	3.1	1.9	3.2	1.8	3.3	1.7	3.4
11000	2.8	6	2.79	6.01	2.78	6.02	2.77	6.03
11200	2	2.8	1.8	3	1.6	3.2	1.4	3.4
11400	2.1	2.9	2	3	1.9	3.1	1.8	3.2
11600	2.7	4.8	2.69	4.81	2.68	4.82	2.67	4.83
11800	2	5.3	1.9	5.4	1.8	5.5	1.7	5.6
12000	0.9	4.5	0.7	4.7	0.5	4.9	0.3	5.1
12200	0.9	1.5	0.89	1.51	0.88	1.52	0.87	1.53
12400	1.5	1.8	1.4	1.9	1.3	2	1.2	2.1
12600	1.4	1.9	1.2	2.1	1	2.3	0.8	2.5
12800	1.8	2.1	1.7	2.2	1.6	2.3	1.5	2.4
13000	2	2.2	1.9	2.3	1.8	2.4	1.7	2.5
13200	1.1	2.6	0.9	2.8	0.7	3	0.5	3.2
13400	2.2	4.2	2.1	4.3	2	4.4	1.9	4.5
13600	5	5.8	4.8	6	4.6	6.2	4.4	6.4
13800	7.5	14.8	7.4	14.9	7.3	15	7.2	15.1
14000	2.8	9.2	2.6	9.4	2.4	9.6	2.2	9.8
14200	3	5.2	2.99	5.21	2.98	5.22	2.97	5.23
14400	0.9	6.3	0.8	6.4	0.7	6.5	0.6	6.6
14600	-0.2	2	-0.4	2.2	-0.6	2.4	-0.8	2.6
14800	-0.2	2.4	-0.3	2.5	-0.4	2.6	-0.5	2.7
15000	-0.3	2	-0.4	2.1	-0.5	2.2	-0.6	2.3

Chainage (in meter)	Class-I		Class-II		Class-III		Class-IV	
	Reduced		Reduced		Reduced		Reduced	
	Min	Max	Min	Max	Min	Max	Min	Max
15200	0.9	1.8	0.8	1.9	0.7	2	0.6	2.1
15400	2.7	4.2	2.69	4.21	2.68	4.22	2.67	4.23
15600	2.2	4	2	4.2	1.8	4.4	1.6	4.6
15800	-0.1	0.2	-0.2	0.3	-0.3	0.4	-0.4	0.5
16000	1.1	1.5	1.09	1.51	1.08	1.52	1.07	1.53
16200	1.4	2.4	1.3	2.5	1.2	2.6	1.1	2.7
16400	-0.3	0.2	-0.5	0.4	-0.7	0.6	-0.9	0.8
16600	-0.3	0.1	-0.31	0.11	-0.32	0.12	-0.33	0.13
16800	-0.3	0.3	-0.4	0.4	-0.5	0.5	-0.6	0.6
17000	3.8	6.9	3.6	7.1	3.4	7.3	3.2	7.5
17200	2.7	7.5	2.6	7.6	2.5	7.7	2.4	7.8
17400	3.3	6.2	3.2	6.3	3.1	6.4	3	6.5
17600	3.8	7.2	3.6	7.4	3.4	7.6	3.2	7.8
17800	1.1	7.2	1	7.3	0.9	7.4	0.8	7.5
18000	3	4.4	2.9	4.5	2.8	4.6	2.7	4.7
18200	2.5	4.3	2.3	4.5	2.1	4.7	1.9	4.9
18400	1.4	3.7	1.1	4	0.8	4.3	0.5	4.6
18600	0.4	0.8	0.3	0.9	0.2	1	0.1	1.1
18800	0.2	0.4	0.1	0.5	0	0.6	-0.1	0.7
19000	0.9	1.4	0.7	1.6	0.5	1.8	0.3	2
19200	1.3	2	1.2	2.1	1.1	2.2	1	2.3
19400	2	3.1	1.9	3.2	1.8	3.3	1.7	3.4
19600	3	3.8	2.9	3.9	2.8	4	2.7	4.1
19800	3.2	4.2	3	4.4	2.8	4.6	2.6	4.8
20000	3.6	5.3	3.59	5.31	3.58	5.32	3.57	5.33
20200	4.8	6.2	4.7	6.3	4.6	6.4	4.5	6.5
20400	1.8	3.4	1.1	3.6	1.1	3.8	1.1	4
20600	2.1	3.8	1.9	4	1.7	4.2	1.5	4.4
20800	2	4.2	1.8	4.4	1.6	4.6	1.4	4.8
21000	1.8	2.4	1.7	2.5	1.6	2.6	1.5	2.7
21200	0.1	0.2	0.09	0.21	0.08	0.22	0.07	0.23
21400	0.7	0.8	0.6	0.9	0.5	1	0.4	1.1
21600	-0.1	0.2	-0.2	0.3	-0.3	0.4	-0.4	0.5
21800	0.9	1.2	0.89	1.21	0.88	1.22	0.87	1.23
22000	-0.1	2.2	-0.3	2.4	-0.5	2.6	-0.7	2.8
22200	0.2	0.8	0.1	0.9	0	1	-0.1	1.1
22400	-0.1	0.9	-0.3	1.1	-0.5	1.3	-0.7	1.5
22600	0.8	2	0.7	2.1	0.6	2.2	0.5	2.3
22800	0.2	1.8	0	2	-0.2	2.2	-0.4	2.4
23000	0.1	0.7	0.09	0.71	0.08	0.72	0.07	0.73

Chainage (in meter)	Class-I		Class-II		Class-III		Class-IV	
	Reduced		Reduced		Reduced		Reduced	
	Min	Max	Min	Max	Min	Max	Min	Max
23200	1.2	2.4	1.19	2.41	1.18	2.42	1.17	2.43
23400	-0.1	0.2	-0.3	0.4	-0.5	0.6	-0.7	0.8
23600	-0.1	0.5	-0.11	0.51	-0.12	0.52	-0.13	0.53
23800	0.2	1.2	0.1	1.3	0	1.4	-0.1	1.5
24000	0.1	1	-0.1	1.2	-0.3	1.4	-0.5	1.6
24200	0.1	1.2	-0.1	1.4	-0.3	1.6	-0.5	1.8
24400	1	1.7	0.8	1.9	0.6	2.1	0.4	2.3
24600	2	3.3	1.9	3.4	1.8	3.5	1.7	3.6
24800	4.5	6.8	4.49	6.81	4.48	6.82	4.47	6.83
25000	5	7.9	4.9	8	4.8	8.1	4.7	8.2
25200	3	5.1	2.9	5.2	2.8	5.3	2.7	5.4
25400	1.4	2.9	1.4	2.91	1.28	2.92	1.27	2.93
25600	2.3	2.7	2.1	2.9	1.9	3.1	1.7	3.3
25800	1.9	2.3	1.8	2.4	1.7	2.5	1.6	2.6
26000	2.2	3.2	2	3.4	1.8	3.6	1.6	3.8
26200	2.1	3.5	2	3.6	1.9	3.7	1.8	3.8
26400	2.3	3.2	2.1	3.4	1.9	3.6	1.7	3.8
26600	2	2.4	1.99	2.41	1.98	2.42	1.97	2.43
26800	3	4.3	2.99	4.31	2.98	4.32	2.97	4.33
27000	3.1	5.8	2.9	6	2.7	6.2	2.5	6.4
27200	4.1	7.1	3.9	7.3	3.7	7.5	3.5	7.7
27400	3.9	4.9	3.89	4.91	3.88	4.92	3.87	4.93
27600	2.4	4.2	2.3	4.3	2.2	4.4	2.1	4.5
27800	2.1	2.9	1.9	3.1	1.7	3.3	1.5	3.5
28000	1.8	2.8	1.7	2.9	1.6	3	1.5	3.1
28200	2.3	3	2.2	3.1	2.1	3.2	2	3.3
28400	1.7	2.7	1.6	2.8	1.5	2.9	1.4	3
28600	1.1	2.2	1.09	2.21	1.08	2.22	1.07	2.23
28800	2.7	3.9	2.5	4.1	2.3	4.3	2.1	4.5
29000	2	2.3	1.9	2.4	1.8	2.5	1.7	2.6
29200	1.5	1.8	1.49	1.81	1.48	1.82	1.47	1.83
29400	2.2	2.8	2.1	2.9	2	3	1.9	3.1
29600	3.1	4.1	2.9	4.3	2.7	4.5	2.5	4.7
29800	2.2	6.8	2.19	6.81	2.18	6.82	2.17	6.83
30000	2.1	2.8	2	2.9	1.9	3	1.8	3.1
30200	0.3	0.8	0.1	1	-0.1	1.2	-0.3	1.4
30400	0.7	1.9	0.6	2	0.5	2.1	0.4	2.2
30600	0.8	2.2	0.7	2.3	0.6	2.4	0.5	2.5
30800	1.8	3.1	1.6	3.3	1.4	3.5	1.2	3.7
31000	2.1	3.3	2	3.4	1.9	3.5	1.8	3.6

Chainage (in meter)	Class-I		Class-II		Class-III		Class-IV	
	Reduced		Reduced		Reduced		Reduced	
	Min	Max	Min	Max	Min	Max	Min	Max
31200	1.8	2.5	1.7	2.6	1.6	2.7	1.5	2.8
31400	1.5	2.2	1.3	2.4	1.1	2.6	0.9	2.8
31600	0.8	1.8	0.5	2.1	0.2	2.4	-0.1	2.7
31800	0.5	1.1	0.4	1.2	0.3	1.3	0.2	1.4
32000	0.7	1.5	0.6	1.6	0.5	1.7	0.4	1.8
32200	0.9	1.3	0.7	1.5	0.5	1.7	0.3	1.9
32400	1.4	1.8	1.3	1.9	1.2	2	1.1	2.1
32600	1.2	2.8	1.1	2.9	1	3	0.9	3.1
32800	1.3	3.2	1.2	3.3	1.1	3.4	1	3.5
33000	0.8	1.4	0.6	1.6	0.4	1.8	0.2	2
33200	0.7	1.8	0.69	1.81	0.68	1.82	0.67	1.83
33400	0.8	2	0.7	2.1	0.6	2.2	0.5	2.3
33600	0.7	1.8	0.5	2	0.3	2.2	0.1	2.4
33800	0.6	0.8	0.4	1	0.2	1.2	0.2	1.4
34000	1.3	1.3	1.1	1.5	0.9	1.7	0.7	1.9
34200	2.9	3.2	2.8	3.3	2.7	3.4	2.6	3.5
34400	4	4.2	3.99	4.21	3.98	4.22	3.97	4.23
34600	5.5	6.2	5.4	6.3	5.3	6.4	5.2	6.5
34800	6.3	7	6.2	7.1	6.1	7.2	6	7.3
35000	5.5	7.2	5.49	7.21	5.48	7.22	5.47	7.23
35200	2.1	2.8	1.9	3	1.7	3.2	1.5	3.4
35400	2	2.4	1.9	2.5	1.8	2.6	1.7	2.7
35600	2.9	4	2.7	4.2	2.5	4.4	2.3	4.6
35800	4.7	5.9	4.6	6	4.5	6.1	4.4	6.2
36000	4.9	7.1	4.7	7.3	4.5	7.5	4.3	7.7
36200	5.7	10.2	5.69	10.21	5.68	10.22	5.67	10.23
36400	4.3	9.8	4.29	9.81	4.28	9.82	4.27	9.83
36600	6.1	8.4	5.9	8.6	5.7	8.8	5.5	9
36800	1.1	6.2	1.09	6.21	1.08	6.22	1.07	6.23
37000	2.7	4.4	2.6	4.5	2.5	4.6	2.4	4.7
37200	1.1	2.2	0.9	2.4	0.7	2.6	0.5	2.8
37400	2.2	2.8	2	3	1.8	3.2	1.6	3.4
37600	2.8	3.2	2.6	3.4	2.4	3.6	2.2	3.8
37800	3.9	4.8	3.8	4.9	3.7	5	3.6	5.1
38000	5.1	7	5.09	7.01	5.08	7.02	5.07	7.03
38200	1.2	8.8	1.1	8.9	1	9	0.9	9.1
38400	2.1	6.5	2	6.6	1.9	6.7	1.8	6.8
38600	2.7	3.1	2.69	3.11	2.68	3.12	2.67	3.13
38800	1.2	2.1	1	2.3	0.8	2.5	0.6	2.7
39000	2.7	3.6	2.6	3.7	2.5	3.8	2.4	3.9

Chainage (in meter)	Class-I		Class-II		Class-III		Class-IV	
	Reduced		Reduced		Reduced		Reduced	
	Min	Max	Min	Max	Min	Max	Min	Max
39200	1.2	1.7	1	1.9	0.8	2.1	0.6	2.3
39400	3.7	4.3	3.6	4.4	3.5	4.5	3.4	4.6
39600	5.3	6.5	5.1	6.7	4.9	6.9	4.7	7.1
39800	3.5	5.4	3.49	5.41	3.48	5.42	3.47	5.43
40000	3	3.7	2.99	3.71	2.98	3.72	2.97	3.73
40200	2.1	3.3	1.9	3.5	1.7	3.7	1.5	3.9
40400	1.7	2.6	1.6	2.7	1.5	2.8	1.4	2.9
40600	2.1	2.8	1.9	3	1.7	3.2	1.5	3.4
40800	2.8	5.2	2.7	5.3	2.6	5.4	2.5	5.5
41000	2.6	3	2.4	3.2	2.2	3.4	2	3.6
41200	1.8	2.7	1.79	2.71	1.78	2.72	1.77	2.73
41400	2.3	2.8	2.2	2.9	2.1	3	2	3.1
41600	2	2.3	1.8	2.5	1.6	2.7	1.4	2.9
41800	2.3	3.1	2.2	3.2	2.1	3.3	2	3.4
42000	3.6	4.2	3.5	4.3	3.4	4.4	3.3	4.5
42200	4.4	5.2	4.3	5.3	4.2	5.4	4.1	5.5
42400	4.1	4.8	4.09	4.81	4.08	4.82	4.07	4.83
42600	4.4	5.1	4.2	5.3	4	5.5	3.8	5.7
42800	4.2	4.9	4.1	5	4	5.1	3.9	5.2
43000	2.8	4.1	2.79	4.11	2.78	4.12	2.77	4.13
43200	2.4	4.8	2.3	4.9	2.2	5	2.1	5.1
43400	1.5	1.8	1.3	2	1.1	2.2	0.9	2.4
43600	1.7	2	1.69	2.01	1.68	2.02	1.67	2.03
43800	3.2	3.9	3.1	4	3	4.1	2.9	4.2
44000	1.5	1.8	1.3	2	1.1	2.2	0.9	2.4
44200	1.7	1.9	1.6	2	1.5	2.1	1.4	2.2
44400	3.5	4.4	3.4	4.5	3.3	4.6	3.2	4.7
44600	3.4	5.7	3.2	5.9	3	6.1	2.8	6.3
44800	2.4	4.7	2.3	4.8	2.2	4.9	2.1	5
45000	1.5	2.1	1.49	2.11	1.48	2.12	1.47	2.13
45200	1.1	2.5	1	2.6	0.9	2.7	0.8	2.8
45400	4	5.2	3.9	5.3	3.8	5.4	3.7	5.5
45600	2.8	3.3	2.79	3.31	2.78	3.32	2.77	3.33
45800	5	5.9	4.8	6.1	4.6	6.3	4.4	6.5
46000	2.7	3.1	2.6	3.2	2.5	3.3	2.4	3.4
46200	4.3	5.2	4.1	5.4	3.9	5.6	3.7	5.8
46400	1.1	2.8	1	2.9	0.9	3	0.8	3.1
46600	5.8	7.1	5.6	7.3	5.4	7.5	5.2	7.7
46800	4.4	8.8	4.39	8.81	4.38	8.82	4.37	8.83
47000	1.5	1.8	1.49	1.81	1.48	1.82	1.47	1.83

Chainage (in meter)	Class-I		Class-II		Class-III		Class-IV	
	Reduced		Reduced		Reduced		Reduced	
	Min	Max	Min	Max	Min	Max	Min	Max
47200	2.1	3.1	1.9	3.3	1.7	3.5	1.5	3.7
47400	2.2	3.3	2.19	3.31	2.18	3.32	2.17	3.33
47600	1.9	4.4	1.8	4.5	1.7	4.6	1.6	4.7
47800	2	4	1.8	4.2	1.6	4.4	1.4	4.6
48000	2.4	3	2.2	3.2	2	3.4	1.8	3.6
48200	2.5	2.8	2.3	3	2.1	3.2	1.9	3.4
48400	5.4	6.7	5.3	6.8	5.2	6.9	5.1	7
48600	3.1	4.8	3.09	4.81	3.08	4.82	3.07	4.83
48800	3.1	4.3	3	4.4	2.9	4.5	2.8	4.6
49000	3.3	4.3	3.2	4.4	3.1	4.5	3	4.6
49200	4.2	5.3	4.19	5.31	4.18	5.32	4.17	5.33
49400	3.9	4.9	3.7	5.1	3.5	5.3	3.3	5.5
49600	4.8	5.8	4.7	5.9	4.6	6	4.5	6.1
49800	4.2	5.8	4	6	3.8	6.2	3.6	6.4
50000	3.1	5.1	3	5.2	2.9	5.3	2.8	5.4
50200	1.4	1.9	1.2	2.1	1	2.3	0.8	2.5
50400	1.9	3.5	1.89	3.51	1.88	3.52	1.87	3.53
50600	1.6	2.2	1.59	2.21	1.58	2.22	1.57	2.23
50800	1.3	2.1	1.1	2.3	0.9	2.5	0.7	2.7
51000	1.4	2.2	1.3	2.3	1.2	2.4	1.1	2.5
51200	1.7	2.9	1.5	3.1	1.3	3.3	1.1	3.5
51400	1.3	2.3	1.2	2.4	1.1	2.5	1	2.6
51600	1.7	2.1	1.5	2.3	1.3	2.5	1.1	2.7
51800	1.4	2.1	1.39	2.11	1.38	2.12	1.37	2.13
52000	1.5	2.6	1.4	2.7	1.3	2.8	1.2	2.9
52200	1.9	2.9	1.7	3.1	1.5	3.3	1.3	3.5
52400	2.7	3.5	2.6	3.6	2.5	3.7	2.4	3.8
52600	2.7	3.2	2.6	3.3	2.5	3.4	2.4	3.5
52800	3.3	4.2	3.2	4.3	3.1	4.4	3	4.5
53000	3.3	5.5	3.29	5.51	3.28	5.52	3.27	5.53
53200	1.1	1.5	0.9	1.7	0.7	1.9	0.5	2.1
53400	2	3.7	1.9	3.8	1.8	3.9	1.7	4
53600	1.8	3.8	1.79	3.81	1.78	3.82	1.77	3.83
53800	2.1	2.8	2	2.9	1.9	3	1.8	3.1
54000	2	2.6	1.8	2.8	1.6	3	1.4	3.2
54200	3.5	4.2	3.49	4.21	3.48	4.22	3.47	4.23
54400	4.5	5.1	4.4	5.2	4.3	5.3	4.2	5.4
54600	5	5.4	4.8	5.6	4.6	5.8	4.4	6
54800	5	5.8	4.9	5.9	4.8	6	4.7	6.1
55000	3.8	5	3.7	5.1	3.6	5.2	3.5	5.3

Chainage (in meter)	Class-I		Class-II		Class-III		Class-IV	
	Reduced		Reduced		Reduced		Reduced	
	Min	Max	Min	Max	Min	Max	Min	Max
55200	1.8	3.4	1.6	3.6	1.4	3.8	1.2	4
55400	1.5	2.1	1.4	2.2	1.3	2.3	1.2	2.4
55600	2	2.2	1.99	2.21	1.98	2.22	1.97	2.23
55800	2.6	3.3	2.5	3.4	2.4	3.5	2.3	3.6
56000	3	5.3	2.8	5.5	2.6	5.7	2.4	5.9
56200	2.5	3.5	2.3	3.7	2.1	3.9	1.9	4.1
56400	3.9	4.3	3.7	4.5	3.5	4.7	3.3	4.9
56600	3.3	4.3	3.2	4.4	3.1	4.5	3	4.6
56800	1.9	2.5	1.89	2.51	1.88	2.52	1.87	2.53
57000	1.1	1.7	1	1.8	0.9	1.9	0.8	2
57200	1.3	1.4	1.2	1.5	1.1	1.6	1	1.7
57400	1.6	1.9	1.59	1.91	1.58	1.92	1.57	1.93
57600	1.7	2.5	1.5	2.7	1.3	2.9	1.1	3.1
57800	2	2.8	1.9	2.9	1.8	3	1.7	3.1
58000	3	3.8	2.8	4	2.6	4.2	2.4	4.4
58200	1.1	3.7	1	3.8	0.9	3.9	0.8	4
58400	3.4	3.8	3.2	4	3	4.2	2.8	4.4
58600	3.4	3.8	3.39	3.81	3.38	3.82	3.37	3.83
58800	2.9	3.7	2.89	3.71	2.88	3.72	2.87	3.73
59000	2.8	5.1	2.6	5.3	2.4	5.5	2.2	5.7
59200	2.3	3.4	2.1	3.6	1.9	3.8	1.7	4
59400	1.3	2	1.29	2.01	1.28	2.02	1.27	2.03
59600	1.1	1.5	1	1.6	0.9	1.7	0.8	1.8
59800	3	4.2	2.8	4.4	2.6	4.6	2.4	4.8
60000	2.1	3.2	2	3.3	1.9	3.4	1.8	3.5
60200	1.6	2.2	1.5	2.3	1.4	2.4	1.3	2.5
60400	2.7	3.6	2.6	3.7	2.5	3.8	2.4	3.9
60600	1.1	2.5	0.9	2.7	0.7	2.9	0.5	3.1
60800	2.1	3.4	2.09	3.41	2.08	3.42	2.07	3.43
61000	2	2.7	1.9	2.8	1.8	2.9	1.7	3
61200	2.3	3.1	2.2	3.2	2.1	3.3	2	3.4
61400	1.1	2.8	0.9	3	0.7	3.2	0.5	3.4
61600	1.1	3.4	1	3.5	0.9	3.6	0.8	3.7
61800	1.5	2.9	1.3	3.1	1.1	3.3	0.9	3.5
62000	1.9	2.8	1.9	2.8	1.9	2.8	1.9	2.8

Table 23-200 meter interval Reduced depth

Annexure-5 Details of collected Water level of different gauge stations w.r.t. MSL (CWC, Irrigation, Ports, Maritime Boards, Observed stations during survey etc.) – Table indicating Chainage (zero at downstream) and following:-

Date	Tide Pole name	Chainage (km)	Time	T. Reading (m)	Zero of TP w.r.t. MSL (m)	W.L w.r.t. MSL (m)	SD value w.r.t. MSL (m)	Corrected Tide (m)
				A	B	C = A+B	D	E = D-C
22.09.15	GS 3	56.654	24hrs	0.27	46.18	46.450	43.579	-2.871
26.09.15	GS 4	48.035	24hrs	0.31	39.19	39.500	40.261	0.761
				0.30	39.10	39.400		
28.09.15	GS 7	34.895	24hrs	0.51	33.69	34.200	35.202	1.002
				0.50	34.0	34.500		
29.09.15	GS 5	24.652	24hrs	0.35	30.85	31.200	31.259	0.059
				0.33	30.77	31.100		
30.09.15	GS 6	16.673	24hrs	0.46	28.44	28.900	28.187	-0.713
01.10.15	GS 1	11.794	24hrs	0.49	26.61	27.100	26.308	-0.792
02.10.15	GS 2	0.617	24hrs	0.56	25.64	26.200	23.252	-2.948

Table 24- Details of Collected water level at different gauge stations

Annexure-6 Details of Bathymetric surveys carried out:-

Date of Survey	Type of survey	Chainage	
		From (km)	To (km)
02.10.15	Bathymetry Survey	0.00	6.00
01.10.15	Bathymetry Survey	6.00	14.00
30.09.15	Bathymetry Survey	14.00	24.500
29.09.15	Bathymetry Survey	24.500	34.800
28.09.15	Bathymetry Survey	34.800	42.135
27.09.15	Bathymetry Survey	42.135	48.300
26.09.15	Bathymetry Survey	48.300	56.205
22.09.15	Bathymetry Survey	56.205	62.00

Table 25- Details of Bathymetry survey

Annexure-7 Bank Protection along the Bank:-

The River had a tendency to break its boundary. So for this reason some short and as well as long embankments and Bolder pitching are needed in the both banks of the river. From chainage 55.00km to 56.600km, The Boulder pitching are noticed very well. From chainage 29.500km to 32.500km are highly protected by Bituminus Roadside. Two RCC bridges are situated near at chainage of 56.660 and 56.680km which are highly protected area. Though in the Rainy season the water level becomes very high and the both side river bank are flooded in some places.

Annexure-8 Details of Features across the Bank:-

The bank of the river includes villages, Ferry ghat, Irrigation canals and outlets, Rail Bridges, RCC Bridges and Forest etc. The both side river bank are highly protected by embankment and bolder pitching due to flood, erosion etc. The villagers are also situated near the bank side of the river. Recently different kinds of industries are also located near the bank side of the river.

Annexure-9 detailed methodology adopted for carrying out survey. Horizontal Control and Vertical Details Control:-

- **Establishment of Horizontal Control:-**

The Horizontal control for Topography survey: - High precision RTK DGPS in fix mode is using UHF Radio Modem with IHO accuracy standards, with minimum 24 hours observations at some permanent platform/base.

The Horizontal control for Bathy surveys: - DGPS is receiving corrections from Beacons.

Establishment of Vertical Control:-

Vertical control from G.T.S level, situated near at the Pakriguri RCC Bridge (NH-31C) is used for the entire Survey work. It's value is 51.230m w.r.t. MSL has been considered for calculating the vertical levels. Total 7 no. of BM was established along the 62kms stretch of the Gangadhar River with the reference of G.T.S Level, which was fixed near at Pakriguri RCC Bridge (NH-31C). The vertical control is to be established with respect to the chart datum / sounding datum from the following methods:-

i. Standard method shall be adopted for transfer of datum in rivers/canals. For tidal reaches standard transfer of datum as per Admiralty Manual shall be adopted.
ii. Chart datum/ sounding datum already established by Port Authorities (Chart Datum), Central Water Commission (Average of last six years minimum Water Level) / State Irrigation Department (Full Supply Level (FSL) and at their gauge stations along the river/canal.

- **Topography Survey:-**

The survey was commenced on 14th September 2015 and completed on 06th October 2015. Then The days become Autumn season and the climate become normal which reached about 20◦ C. Mostly day weather was sunny and was very favorable 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 40 m interval. The plotting of the chart was done on UTM Projection at Zone 45R as directed in the contract specifications. The spot levels along the river were obtained by using Trimble DGPS. The data was post processed using Trimble Business Center to get the precise position and MSL height values of the rover locations. The topographic survey for the entire survey stretch was conducted to collect the following data:-

- Spot levels
-Delineation of Islands
-Fixing of bridges and marks
-Assess the type of river bank
-Extending the vertical and horizontal control throughout the survey area
-Collection of local information along the river Banks

Topographic survey Equipments: South (S86T) GNSS RTK, Total Station was used for conducting the topographic survey.

South RTK (S86T) satellite navigation is a technique used in land survey and in hydrographic survey based on the use of carrier phase measurements of the GPS, GLONASS and / or Galileo signals where a single reference station provides the real-time corrections, providing up to centimeter-level accuracy. When referring to GPS in particular, the system is also commonly referred to as Carrier-Phase Enhancement, CPGPS. RTK systems use a single base station receiver and a number of mobile units. The base station re-broadcasts the phase of the carrier that it measured, and the mobile units compare their own phase measurements with the ones received from the base station. There are several ways to transmit a correction signal from base station to mobile station. The most popular way to achieve real-time, low-cost signal transmission is to use a radio modem, typically in the UHF band. This allows the units to calculate their relative position to millimeters, although their absolute position is accurate only to the same accuracy as the position of the base station.

RTK systems are available in dual-frequency and single-frequency versions. Dual-frequency systems deliver greater precision, faster and over longer baselines than single-frequency systems. Leica GS09 & GS12 GNSS RTK that used for the survey contains dual-frequency requires antenna and controller to suit any surveying task with a wide range of functionality. Leica GS09 & GS12 GNSS RTK Rover is extremely light-weight and cable free rover is comfortable to use and withstand even for rough use and topple over. It uses a single base station receiver and a number of mobile units. The base station re-broadcasts the phase of the carrier that it measured, and the mobile units compare their own phase measurements with the ones received from the base station. So, that centimeter level accuracy can be achieved from latitude, longitude and altitude. RTK technique in terms of general navigation, it is perfectly suited to roles like surveying. In this case, the base station is located at a known surveyed location, often a benchmark, and the mobile units can then produce a highly accurate map by taking fixes relative to that point. RTK has also found uses in auto drive/autopilot systems, precision farming and similar roles.

Figure 18- Topography Survey Instrument

○ Bathymetry Survey:-

The bathymetry survey was carried out using Bathy 500 portable shallow water Echosounder supported by DGPS Beacon Receiver and HYPACK Data collection and processing software. The survey equipment was installed as per the standard procedure the survey vessel equipped with safety gears.

Bathy- 500MF Echosounder: The Bathy- 500MF echosounder is an electronic hydrographic survey instrument used for measuring depths with precision chart recordings and digital data output manufactured by Syqwest Incorporated, USA. The Bathy-500 echo sounding systems are based on the principle that when a sound signal is sent into the water it will be reflected back when it strikes an object. The Bathy-500 is technologically sophisticated, utilizing modern, micro processor based electronics and a thermal chart recorder mechanism. Digital processing enables the instrument to offer fully automatic digitizing capabilities. When interfaced to a NMEA 0183 compatible position sensor, it provides user with a complete, integrated hydrographic survey environment. The instrument front panel consists of a high contrast, backlit four line LCD displays and a fully sealed input keypad. The front panel encompassing system data, status and setup parameters with RS232/RS422 output format. All operating functions are set via the front panel interface. Setup selections are stored within internal, non-volatile memory for instant availability upon power-up. The instrument decodes and processes the NMEA 0183 formatted sentence GGA or GLL from GPS/DGPS using variable Baud rates for communication.

Figure 19- Bathymetry Data Collection

Annexure-10 Photographs of equipment:-

- Positioning System:-
  - 1 no Trimble DGPS system (SPS361)

Figure 20- DGPS Survey Instrument

- **Navigation & Data Logging System:-**
  - To provide on-line route guidance, log navigation data, provide QC of navigation data, etc. The system comprises the following equipment:
  - 1 no. DELL Laptop
  - 1 no. Hypack version 2014 Navigation & Data Logging Software
  - 1 no. Positioning & sensor interfaces
  - Sufficient Paper Rolls

- **Single Beam Echo Sounder System:-**
  - 1 no. Bathy 500MF multi frequency Echo sounder
  - 1 no. transducer 210 kHz + mounting bracket & base plate

Figure 21- Echo Sounder Instrument

- **Current Meter:-**
  - 1 no. current meter (AEM 213-D) was used during water velocity
  - observation

Figure 22- Current Meter

- **South RTK:-**

Figure 23- Topographical survey Instrument

- **Survey Boat**

Figure 24-Survey vessel

Annexure-11 Bench Mark Forms:-

BM Name	Northing(m)	Easting(m)	Latitude(N)	Longitude(E)	RL (m)
BM1	2880204.25	782521.334	26° 0'47.67"N	89°49'21.46"	29.500
Pillar Established by: - Precision Survey Consultancy. Surveyor – Debasis Mondal ; Date of Establishment – 30-09-2015					
Station Description :-					
Benchmark is located near Binnyachara Pt.II The BM is denoted by a "." mark engraved on a plate. The plate is fixed on a 5cm diameter GI pipe. The GI pipe is cemented with construction pillar of 30cmX30cmX150cm. The pillar extends 60.cms above ground level. Inscription "IWAI", "PSC" and BM number can be seen on the face of the pillar. The measurements of the bench mark pillar from notable locations / edges as follows: West From Bhurungmari-Kachakata Road–6.5m					
Life of Station : 15Yrs	**Datum:** - WGS 84		**ZONE :** 45 N		

Table 26-Bench Mark Form & Google image view of BM-1

BM Name	Northing(m)	Easting(m)	Latitude(N)	Longitude(E)	RL (m)
BM 2	2890744.22	781655.305	26° 6'30.49"	89°48'58.52"	34.513

Pillar Established by: - Precision Survey Consultancy. Surveyor – Mr. Debasis Mondal;
Date of Establishment – 30-09-2015

Station Description :-

Benchmark is located near Golokgung village.

The BM is denoted by a "." mark engraved on a plate. The plate is fixed on a 5cm diameter GI pipe. The GI pipe is cemented with construction pillar of 30cmX30cmX150cm.

The pillar extends 60.cms above ground level. Inscription "IWAI", "PSC" and BM number can be seen on the face of the pillar.

The measurements of the bench mark pillar from notable locations / edges as follows:

West from Road - 12.7 m

South-East From Ferry Ghat Road–227m

Life of Station : 15Yrs	**Datum:** - WGS 84	**ZONE :** 45 N

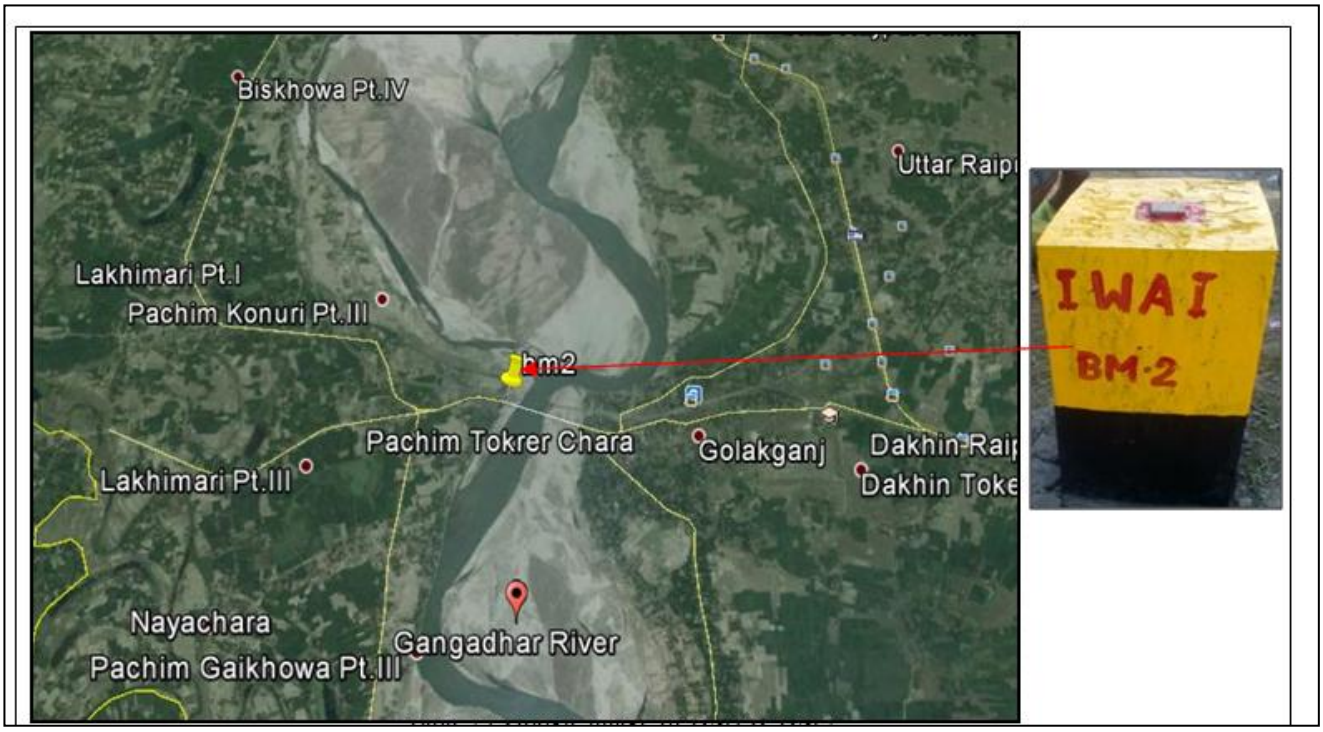


Table 27-Bench Mark Form & Google image view of BM 2

BM Name	Northing(m)	Easting(m)	Latitude(N)	Longitude(E)	RL(m)
BM3	2895205.554	780589.239	26° 8'56.07"	` 89°48'23.65"	35.079
Pillar Established by: - Precision Survey Consultancy. Surveyor – Mr. Debasis Mondal; Date of Establishment – 29/09/2015					
Station Description :-					
Benchmark is located at near NH31c. The BM is denoted by a "." mark engraved on a plate. The plate is fixed on a 5cm diameter GI pipe. The GI pipe is cemented with construction pillar of 30cmX30cmX150cm. The pillar extends 60.cms above ground level. Inscription "IWAI", "PSC" and BM number can be seen on the face of the pillar. The measurements of the bench mark pillar from notable locations / edges as follows: East From NH31c bridge -7.98m.					
Life of Station : 15Yrs	**Datum**: - WGS 84		**ZONE :** 45 N		

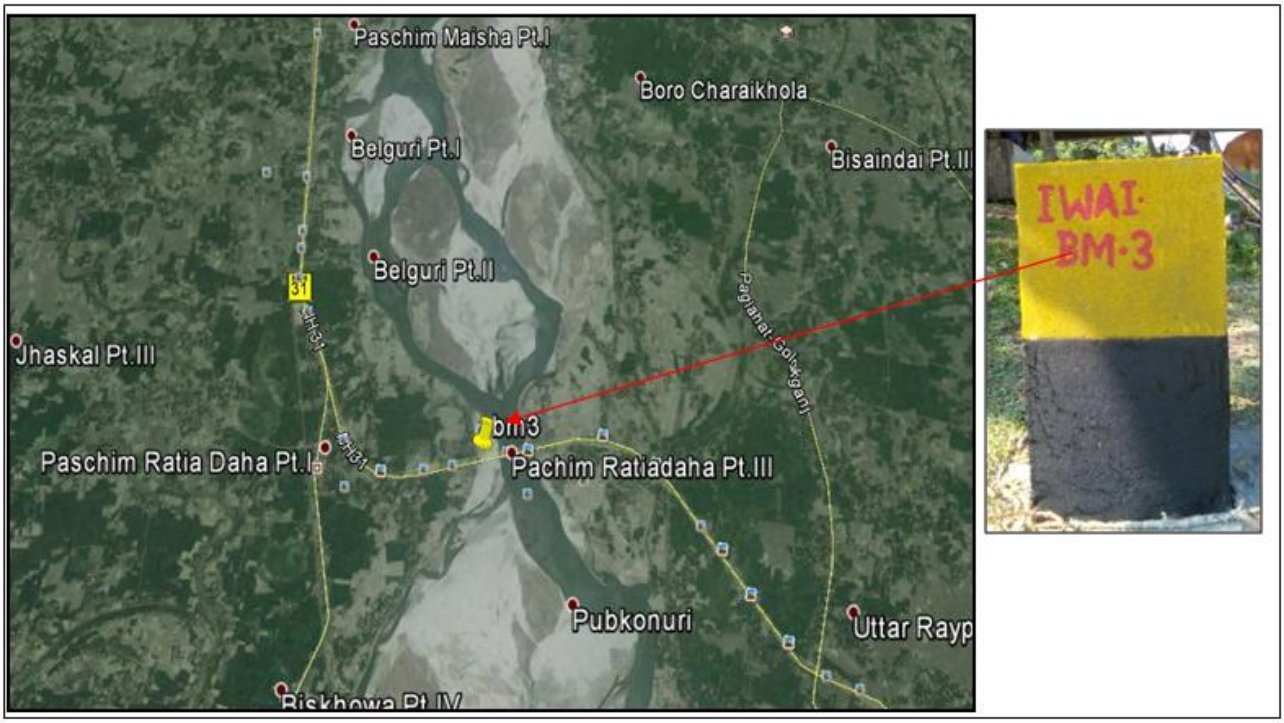


Table 28- Bench Mark Form &Google image view of BM-3

BM Name	Northing(m)	Easting(m)	Latitude(N)	Longitude(E)	RL(m)
BM4	2903000.307	780504.263	26°13'9.22"	89°48'26.66"	34.286

Pillar Established by: - Precision Survey Consultancy. Surveyor – Mr. Debasis Mondal ;
Date of Establishment – 28/09/2015

Station Description :-

Benchmark is located near Kaldoba Pt.I village.

The BM is denoted by a "." mark engraved on a plate. The plate is fixed on a 5cm diameter GI pipe. The GI pipe is cemented with construction pillar of 30cmX30cmX150cm.

The pillar extends 60.cms above ground level. Inscription "IWAI", "PSC" and BM number can be seen on the face of the pillar.

The measurements of the bench mark pillarfrom notable locations / edges as follows:

North West corner from National Highway31 –1.77 m.

Life of Station : 15Yrs	**Datum**: - WGS 84	**ZONE :** 45 N

Table 29- Bench Mark Form & Google image view of BM-4

BM Name	Northing(m)	Easting(m)	Latitude(N)	Longitude(E)	RL (m)
BM 5	2911249.825	783123.142	26°17'35.18"	89°50'7.44"	36.363

Pillar Established by: - Precision Survey Consultancy. Surveyor – Mr. Debasis Mondal ;
Date of Establishment – 27/09/2015

Station Description :-

Benchmark is located near Bhangaduli village.

The BM is denoted by a "." mark engraved on a plate. The plate is fixed on a 5cm diameter GI pipe. The GI pipe is cemented with construction pillar of 30cmX30cmX150cm.

The pillar extends 60.cms above ground level. Inscription "IWAI", "PSC" and BM number can be seen on the face of the pillar.

The measurements of the bench mark pillar from notable locations / edges as follows:

North East –1.78m.

Life of Station : 15Yrs	**Datum:** - WGS 84	**ZONE :** 45 N

Table 30- Bench Mark Form & Google image view of BM-5

BM Name	Northing(m)	Easting(m)	Latitude(N)	Longitude(N)	RL (m)
BM 6	2922780.536	782148.459	26°23'50.24"	89°49'41.43"	42.731
Pillar Established by: - Precision Survey Consultancy. Surveyor – Mr. Debasis Mondal; Date of Establishment – 26/09/2015					
Station Description :-					
Benchmark is located end of Falimari Village The BM is denoted by a "." mark engraved on a plate. The plate is fixed on a 5cm diameter GI pipe. The GI pipe is cemented with construction pillar of 30cmX30cmX150cm. The pillar extends 60.cms above ground level. Inscription "IWAI", "PSC" and BM number can be seen on the face of the pillar. The measurements of the bench mark pillarfrom notable locations / edges as follows: West from NH31C road – 4.94 m.					
Life of Station : 15Yrs	**Datum:** - WGS 84		**ZONE :** 45 N		

Table 31- Bench Mark Form & Google image view of BM-6

BM Name	Northing(m)	Easting(m)	Latitude(N)	Longitude(E)	RL (m)
BM 7	2929609.4259	784667.4979	26°27'30.14"	89°51'17.70"	51.230
Pillar Established by: - Precision Survey Consultancy. Surveyor – Mr. Debasis Mondal ; Date of Establishment – 22.09.15					
Station Description :-					
Benchmark is located NH31C The BM is denoted by a "." mark engraved on a plate. The plate is fixed on a 5cm diameter GI pipe. The GI pipe is cemented with construction pillar of 30cmX30cmX150cm. The pillar extends 60.cms above ground level. Inscription "IWAI", "PSC" and BM number can be seen on the face of the pillar. The measurements of the bench mark pillar from notable locations / edges as follows: West corner from NH31c Bridge - m.					
Life of Station : 15Yrs	**Datum:** - WGS 84		**ZONE :** 45 N		

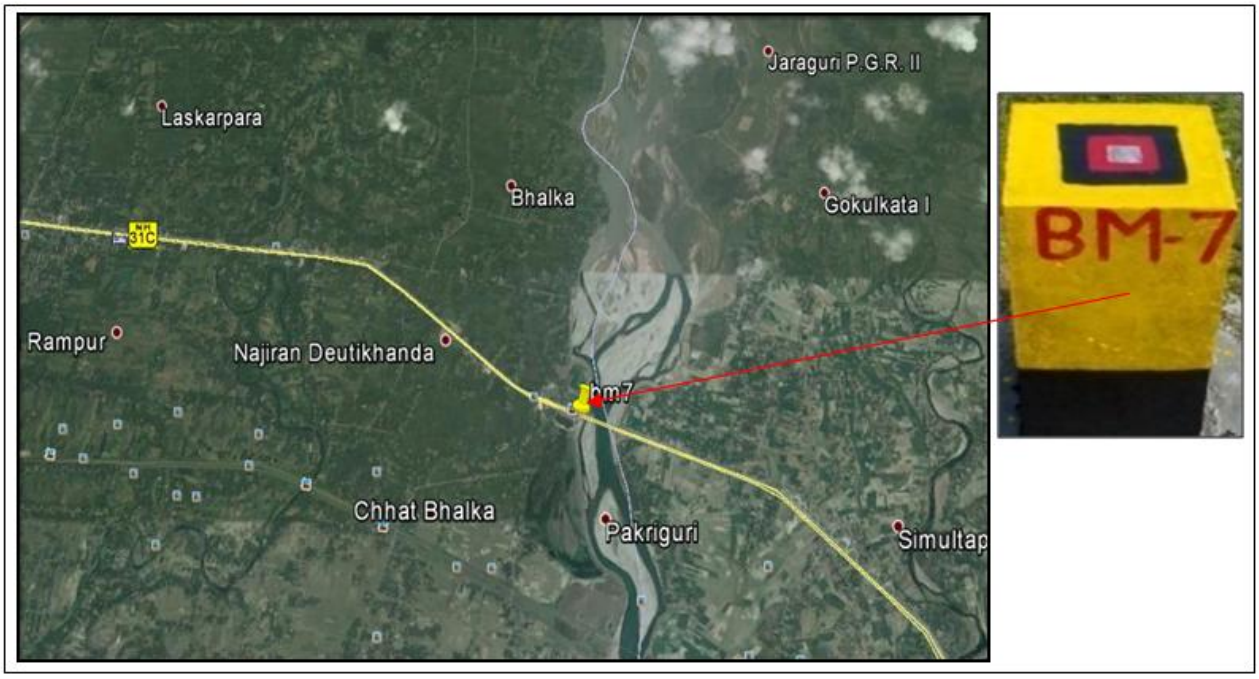


Table 32- Bench Mark Form & Google image view of BM-7

Annexure-12- Leveling Calculation:-

Levelling from GS-2 to BM-1

BS	IS	FS	RISE(+)	FALL(-)	RL(m)	REMARKS
0.682					29.500	BM -1
0.734		1.885		1.203	28.302	
0.374		1.385		0.651	27.651	
		1.825		1.451	26.200	Gauge Station-2

Levelling from GS-1 to BM-2

BS	IS	FS	RISE(+)	FALL(-)	RL(m)	REMARKS
0.865					34.513	BM -2
1.725		1.893		1.028	33.485	
1.875		1.885		0.160	33.325	
1.745		1.996		0.121	33.204	
0.695		2.985		1.240	31.964	
0.358		2.157		1.462	30.502	
0.835		2.920		2.562	27.940	
		1.675		0.840	27.100	Gauge Station-1

Levelling from GS-6 to BM-3

BS	IS	FS	RISE(+)	FALL(-)	RL(m)	REMARKS
0.367					35.079	BM -3
0.488		2.872		2.505	32.574	
0.689		2.164		1.676	30.898	
0.268		1.395		0.706	30.192	
		1.56		1.292	28.900	Gauge Station-6

Levelling from GS-5 to BM-4

BS	IS	FS	RISE(+)	FALL(-)	RL(m)	REMARKS
0.536					34.286	BM - 4
0.345		1.958		1.422	32.864	
0.832		1.691		1.346	31.518	
		1.150		0.318	31.200	Gauge Station-5

Levelling from GS-7 to BM-5

BS	IS	FS	RISE(+)	FALL(-)	RL(m)	REMARKS
0.720					36.363	BM -5
0.645		1.826		1.106	35.257	
		1.702		1.057	34.200	Gauge Station-7

Levelling from GS-4 to BM-6

BS	IS	FS	RISE(+)	FALL(-)	RL(m)	REMARKS
0.335					42.731	BM -6
0.687		1.645		1.310	41.421	
0.990		1.883		1.196	40.225	Gauge Station-4
		1.715		0.725	39.500	

Levelling from GS-3 to BM-7

BS	IS	FS	RISE(+)	FALL(-)	RL(m)	REMARKS
0.455					51.230	BM -7
0.923		2.972		2.517	48.713	
0.352		1.682		0.759	47.954	
		1.856		1.504	46.450	Gauge Station-3

Table 33- Leveling calculation of Gangadhar River

Annexure-13-Soil Sample Report:-

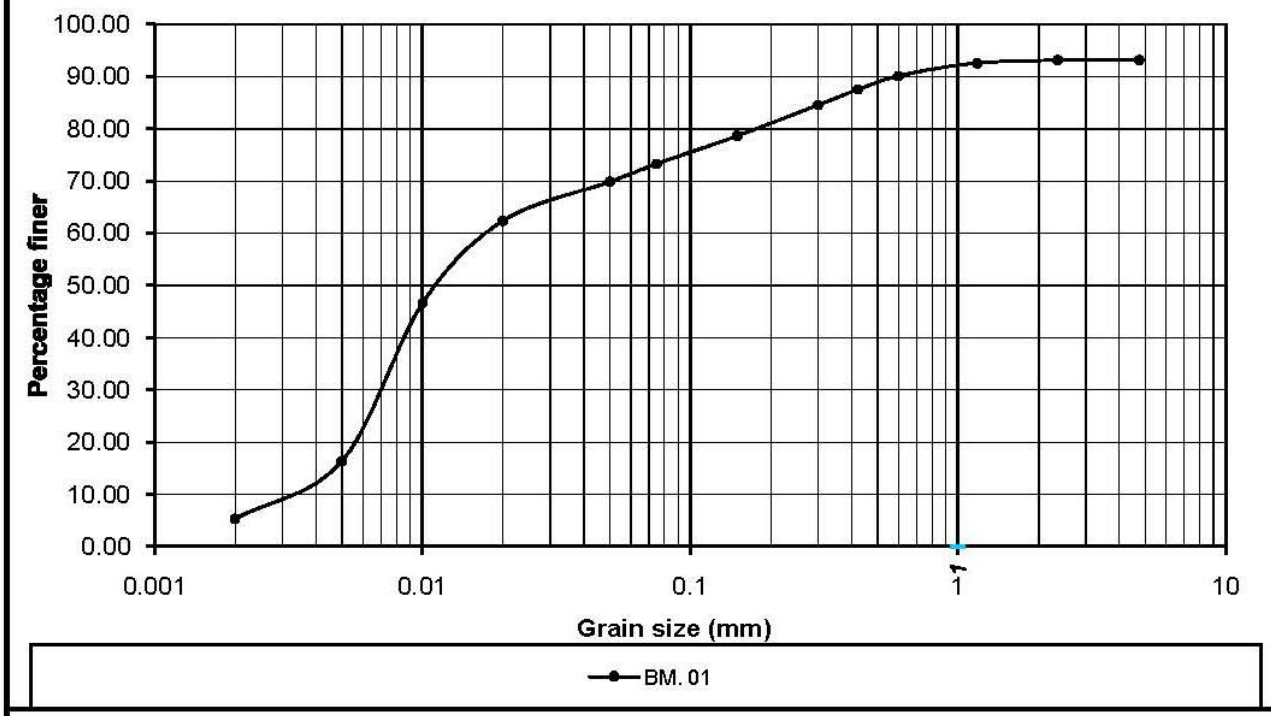
RESULTS OF TEST OF SOIL SAMPLES

SITE – GANGADHAR RIVER

PHYSICAL ANALYSIS OF SOIL

Sl.No.	BM.	GRAVEL (%)	SAND (%)	SILT+CLAY (%)	SPECIFIC GRAVITY	pH VALUE	SILT (%)	CLAY (%)	Cu	Cc
1	1.00	6.87	19.60	73.53	2.64	7.50	68.20	5.33	5.07	0.91
2	2.00	2.45	24.00	73.55	2.64	7.40	65.50	8.05	7.19	1.13
3	3.00	11.25	9.50	79.25	2.61	7.20	72.14	7.11	11.51	0.76
4	4.00	6.07	15.00	78.93	2.62	7.30	70.65	8.28	12.26	2.13
5	5.00	2.65	26.20	71.15	2.63	7.40	62.00	9.15	5.56	2.72
6	6.00	21.87	43.20	34.93	2.65	7.50	26.20	8.73	15.29	1.81
7	7.00	25.35	39.30	35.35	2.67	7.50	26.20	9.15	11.70	0.68

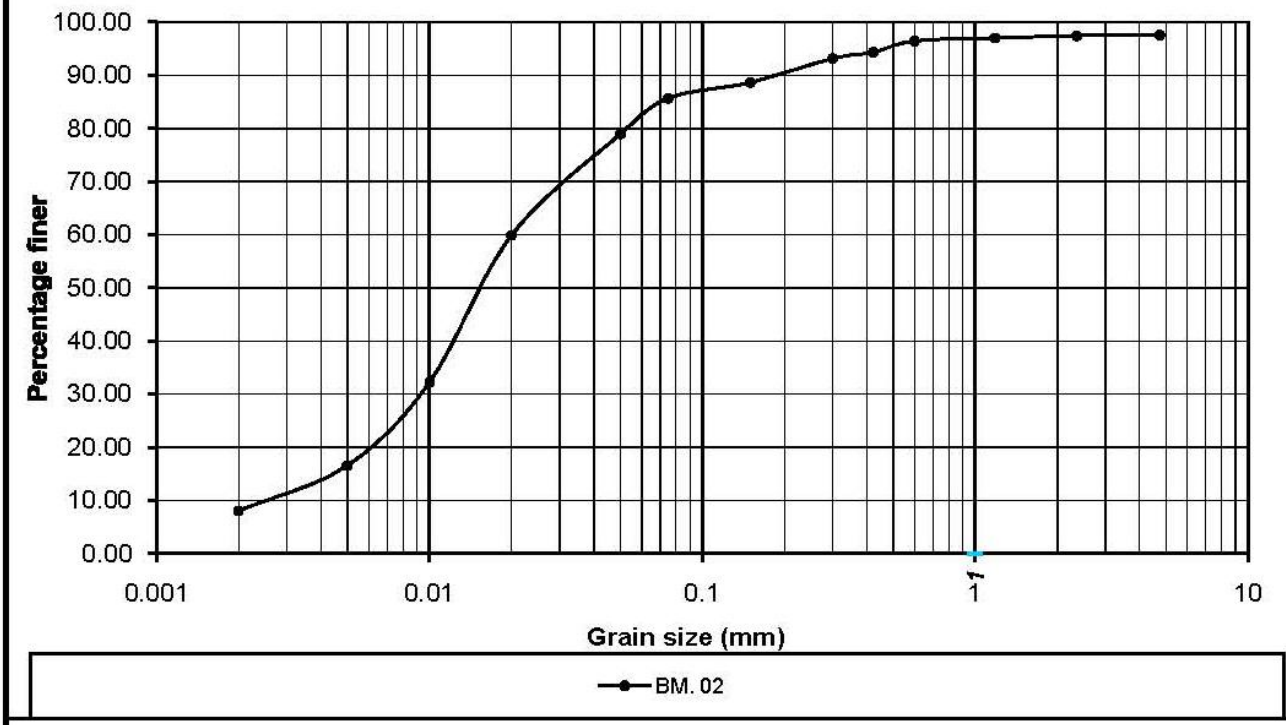
GRAIN SIZE DISTRIBUTION CURVES



Grain size (mm)	*<0.002*	*0.002-0.075*	*0.075-4.75*	*>4.75*
Sample No.	**Clay (%)**	**Silt (%)**	**Sand (%)**	**Gravel (%)**
BM. 01	5.33	68.20	19.60	6.87

*Silt & Clay

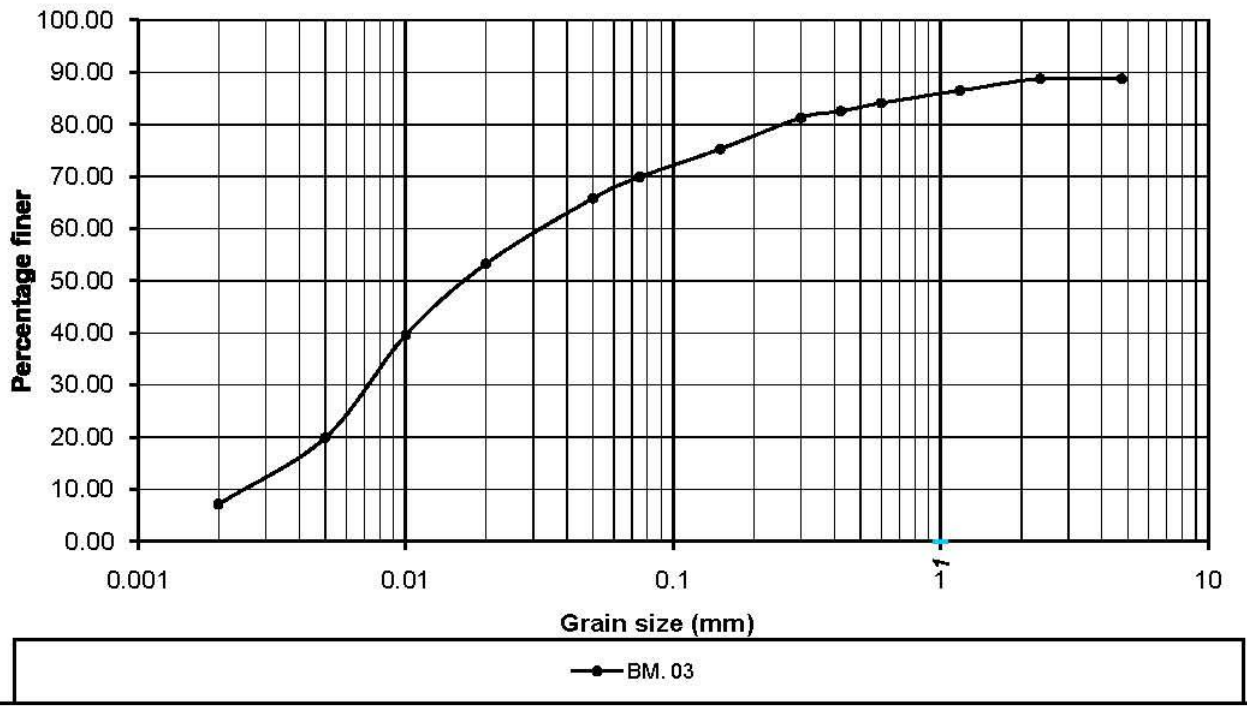
GRAIN SIZE DISTRIBUTION CURVES



Grain size (mm)	*<0.002*	*0.002-0.075*	*0.075-4.75*	*>4.75*
Sample No.	**Clay (%)**	**Silt (%)**	**Sand (%)**	**Gravel (%)**
BM. 02	8.05	65.50	24.00	2.45

*Silt & Clay

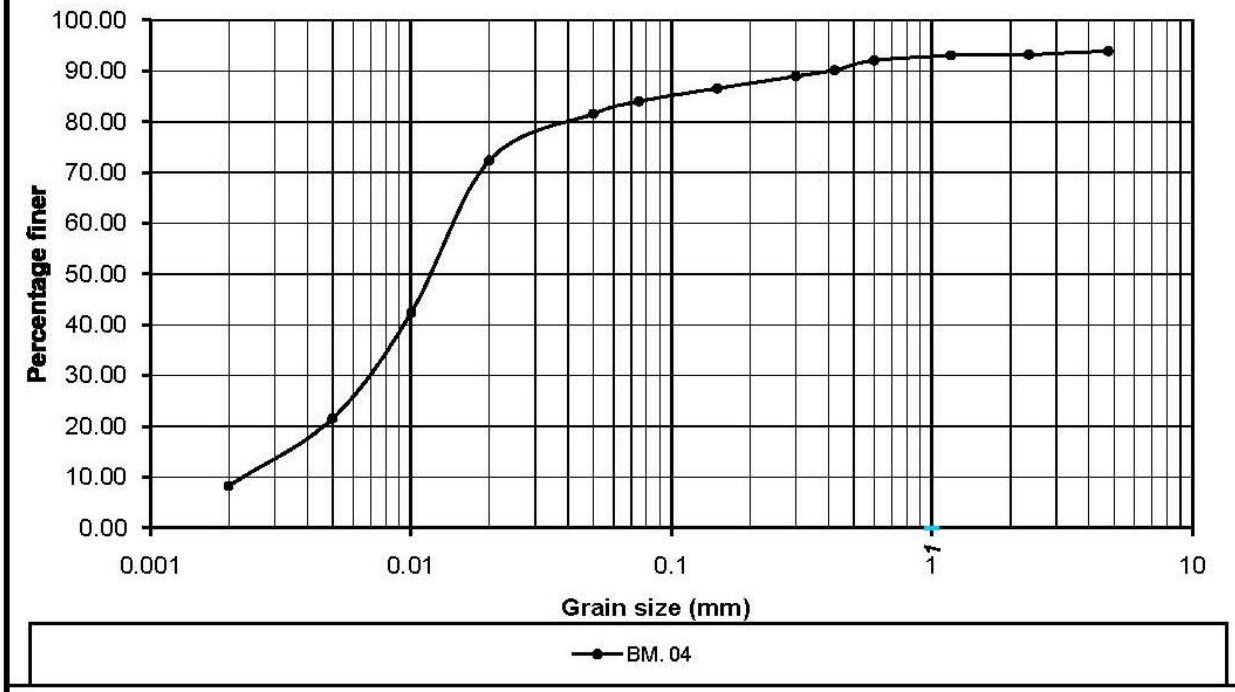
GRAIN SIZE DISTRIBUTION CURVES



Grain size (mm)	*<0.002*	*0.002-0.075*	*0.075-4.75*	*>4.75*
Sample No.	**Clay (%)**	**Silt (%)**	**Sand (%)**	**Gravel (%)**
BM. 03	7.11	72.14	9.50	11.25

*Silt & Clay

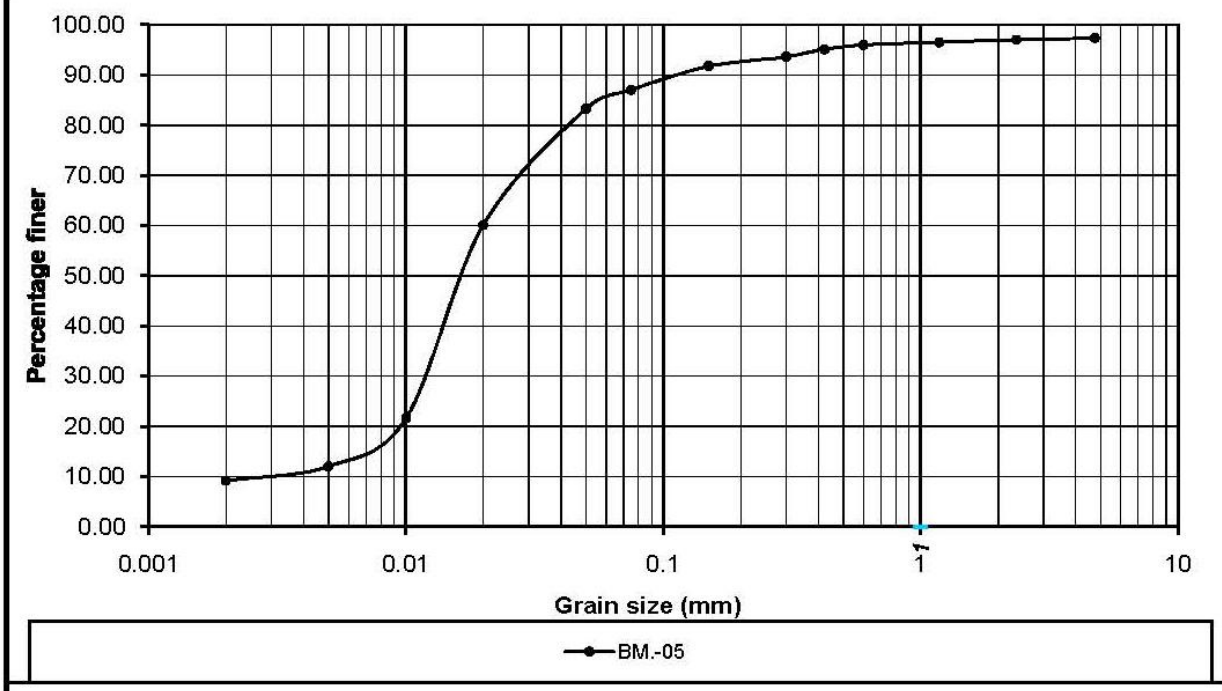
GRAIN SIZE DISTRIBUTION CURVES



Grain size (mm)	*<0.002*	*0.002-0.075*	*0.075-4.75*	*>4.75*
Sample No.	**Clay (%)**	**Silt (%)**	**Sand (%)**	**Gravel (%)**
BM. 04	8.28	70.65	15.00	6.07

*Silt & Clay

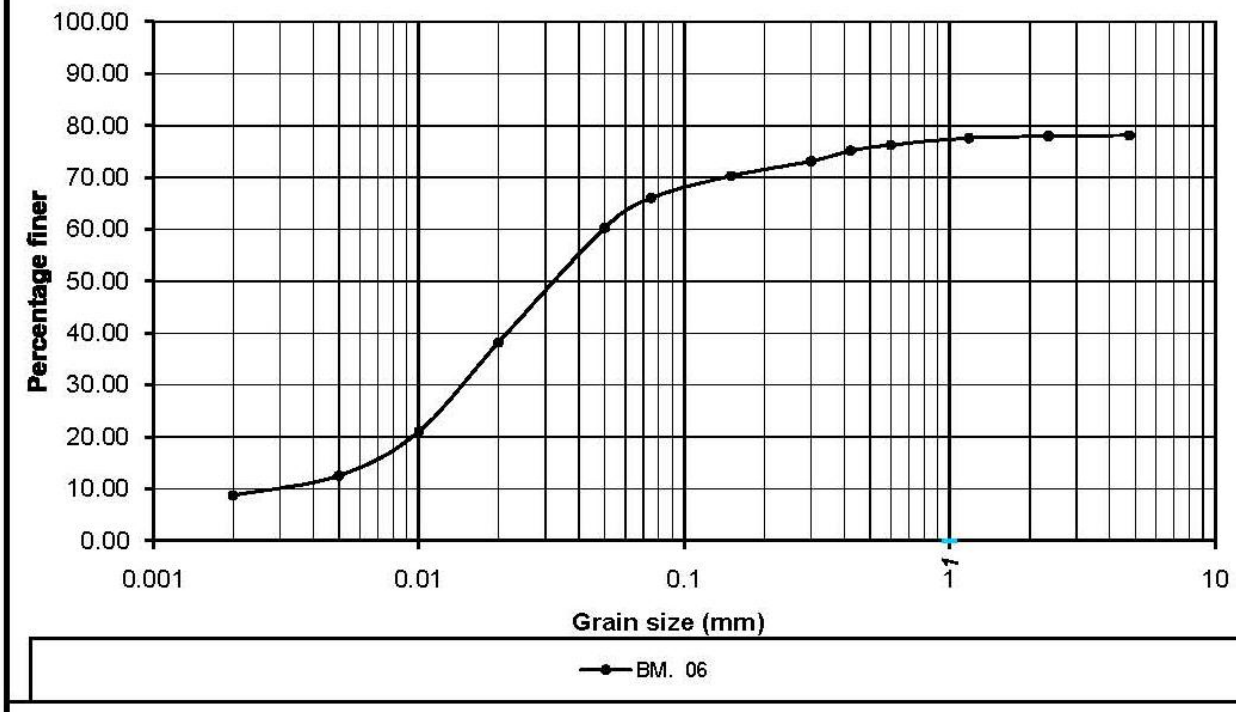
GRAIN SIZE DISTRIBUTION CURVES



Grain size (mm)	*<0.002*	*0.002-0.075*	*0.075-4.75*	*>4.75*
Sample No.	**Clay (%)**	**Silt (%)**	**Sand (%)**	**Gravel (%)**
BM.-05	9.15	62.00	26.20	2.65

*Silt & Clay

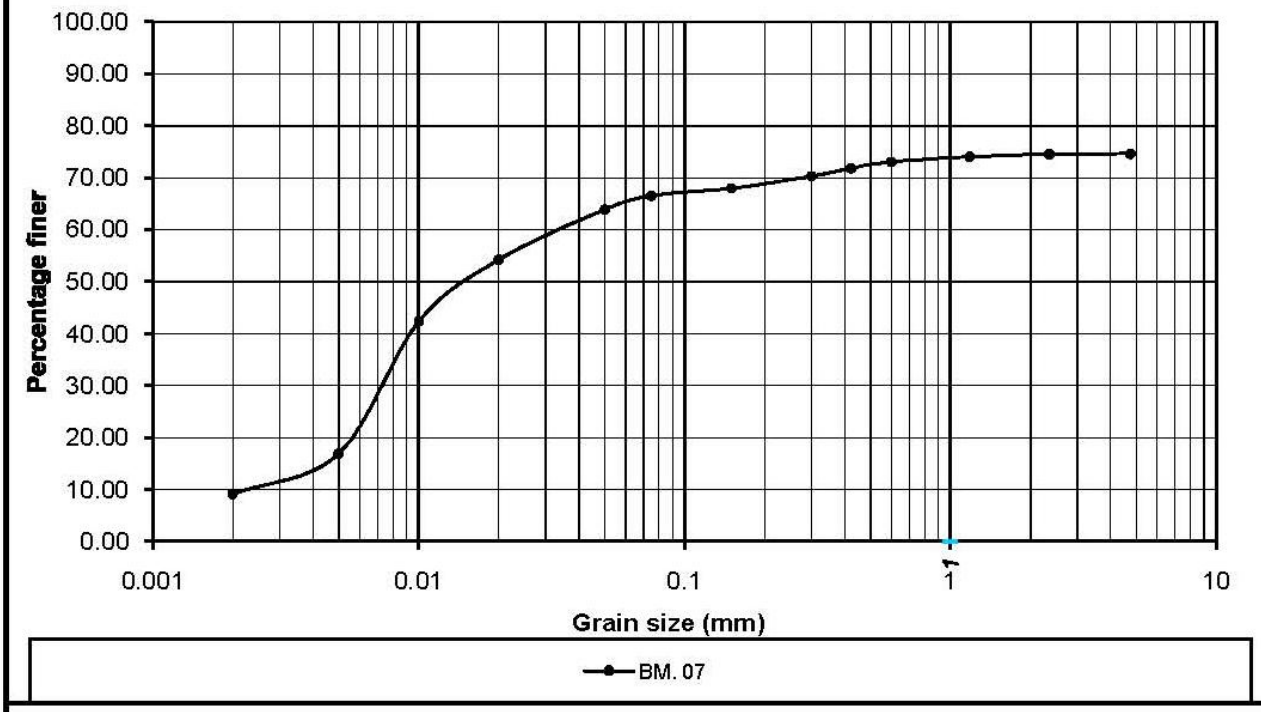
GRAIN SIZE DISTRIBUTION CURVES



Grain size (mm)	*<0.002*	*0.002-0.075*	*0.075-4.75*	*>4.75*
Sample No.	**Clay (%)**	**Silt (%)**	**Sand (%)**	**Gravel (%)**
BM. 06	8.73	26.20	43.20	21.87

*Silt & Clay

GRAIN SIZE DISTRIBUTION CURVES



Grain size (mm)	*<0.002*	*0.002-0.075*	*0.075-4.75*	*>4.75*
Sample No.	**Clay (%)**	**Silt (%)**	**Sand (%)**	**Gravel (%)**
BM. 07	9.15	26.20	39.30	25.35

*Silt & Clay

Annexure-14-Water Sample Report:-

RESULTS OF EXAMINATION OF SAMPLES OF WATER

SITE- RIVER GANGADHAR

PARAMETER – pH Value at 25° C

SL.NO;	B.M	LOCATION	PARAMETER	WATER SAMPLE RESULTS	PERMISSIBLE LIMIT IS:456-2000
1	1	1		7.3	
		2		7.0	
		3		6.5	
2	2	1		7.0	
		2		6.9	
		3		6.7	
3	3	1	pH Value at 25° C	7.2	6.5 – 8.5
		2		7.0	
		3		6.9	
4	4	1		72	
		2		7.0	
		3		6.8	
5	5	1		7.3	
		2		6.8	
		3		7.0	
6	6	1		7.3	
		2		7.0	
		3		6.9	
7	7	1		6.7	
		2		6.8	
		3		6.5	

PARAMETER –Chloride as Cl (mg/l)					
SL.NO;	B.M	LOCATION	PARAMETER	WATER SAMPLE RESULTS	PERMISSIBLE LIMIT IS:456-2000
1	1	1	Chloride as Cl (mg/l)	6	2000 mg/l for concrete not containing embedded steel and 500 mg/l for reinforced concrete work.
		2		6	
		3		4	
2	2	1		8	
		2		10	
		3		12	
3	3	1		5	
		2		6	
		3		9	
4	4	1		8	
		2		10	
		3		11	
5	5	1		6	
		2		4	
		3		9	
6	6	1		5	
		2		4	
		3		6	
7	7	1		6	
		2		4	
		3		7	

PARAMETER –Sulphates as SO_4 (mg/l)					
SL.NO;	B.M	LOCATION	PARAMETER	WATER SAMPLE RESULTS	PERMISSIBLE LIMIT IS:456-2000
1	1	1	Sulphates as SO_4 (mg/l)	20	400 (mg/l)
		2		25	
		3		20	
2	2	1		20	
		2		25	
		3		20	
3	3	1		23	
		2		20	
		3		22	
4	4	1		21	
		2		22	
		3		23	
5	5	1		20	
		2		25	
		3		20	
6	6	1		21	
		2		23	
		3		20	
7	7	1		20	
		2		23	
		3		20	

PARAMETER –Sediment Concentration (mg/l)					
SL.NO;	B.M	LOCATION	PARAMETER	WATER SAMPLE RESULTS	PERMISSIBLE LIMIT IS:456-2000
1	1	1		20	
		2		30	
		3		3	
2	2	1		10	
		2		30	
		3		20	
3	3	1	Sediment Concentration (mg/l)	20	2000 (mg/l)
		2		30	
		3		20	
4	4	1		30	
		2		20	
		3		10	
5	5	1		30	
		2		10	
		3		20	
6	6	1		20	
		2		30	
		3		20	
7	7	1		30	
		2		20	
		3		20	

Annexure-15 Calibration Certificate:-

PAN INDIA CONSULTANTS PVT. LTD.

SALES DEPARTMENT

CORPORATE ADDRESS : 105, PHASE IV, UDYOG VIHAR, GURGAON-122015, HARYANA, INDIA
PHONES : +91 124 4300950, 4013954, FAX : +91 124 2346646, 2342880, CIN - U74899DL1985PTC021177
e-mail : paie@panindiagroup.com, paie@vsnl.com, www.panindiagroup.com

CALIBRATION CERTIFICATE

CUSTOMER NAME	:	PRECISION SURVEY CONSULTANCY
ADDRESS	:	Po: Salap (Jatin Xerox Center) Dist: Howrah Pin: 711409
INSTRUMENT	:	DGPS EQUIPMENTS
SERIES	:	SPS 855
SERIAL NUMBER	:	5431R03128, 5340K46115
CALIBRATION DATE	:	15/12/2014
VALIDITY	:	14/12/2015

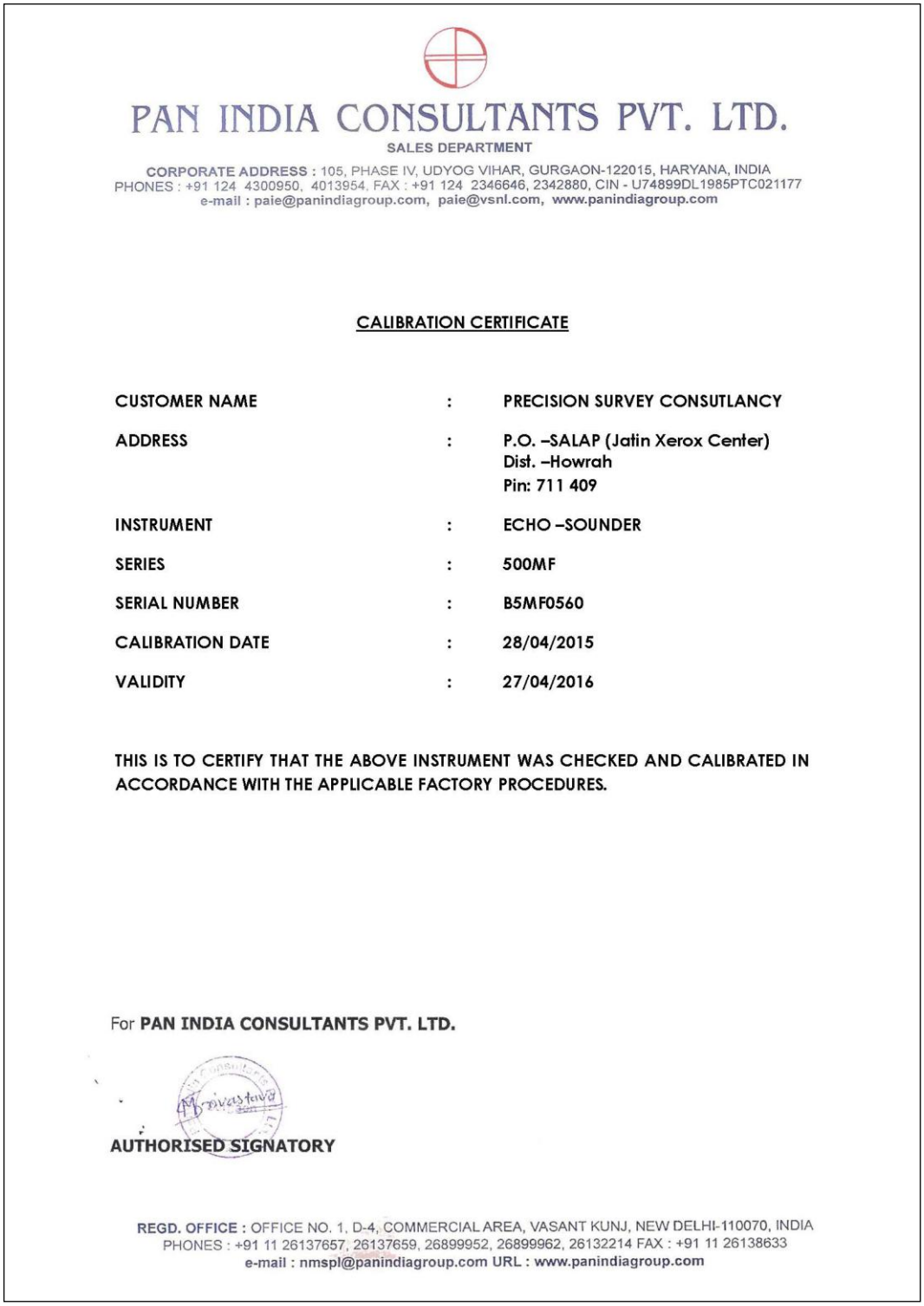
THIS IS TO CERTIFY THAT THE ABOVE INSTRUMENT WAS CHECKED AND CALIBRATED IN ACCORDANCE WITH THE APPLICABLE FACTORY PROCEDURES.

For PAN INDIA CONSULTANTS PVT. LTD.

AUTHORISED SIGNATORY

REGD. OFFICE : OFFICE NO. 1, D-4, COMMERCIAL AREA, VASANT KUNJ, NEW DELHI-110070, INDIA
PHONES : +91 11 26137657, 26137659, 26899952, 26899962, 26132214 FAX : +91 11 26138633
e-mail : nmspl@panindiagroup.com URL : www.panindiagroup.com

Table 34- Calibration Certificate of DGPS



PAN INDIA CONSULTANTS PVT. LTD.

SALES DEPARTMENT

CORPORATE ADDRESS : 105, PHASE IV, UDYOG VIHAR, GURGAON-122015, HARYANA, INDIA
PHONES : +91 124 4300950, 4013954, FAX : +91 124 2346646, 2342880, CIN - U74899DL1985PTC021177
e-mail : paie@panindiagroup.com, paie@vsnl.com, www.panindiagroup.com

CALIBRATION CERTIFICATE

CUSTOMER NAME	:	PRECISION SURVEY CONSUTLANCY
ADDRESS	:	P.O. –SALAP (Jatin Xerox Center) Dist. –Howrah Pin: 711 409
INSTRUMENT	:	ECHO –SOUNDER
SERIES	:	500MF
SERIAL NUMBER	:	B5MF0560
CALIBRATION DATE	:	28/04/2015
VALIDITY	:	27/04/2016

THIS IS TO CERTIFY THAT THE ABOVE INSTRUMENT WAS CHECKED AND CALIBRATED IN ACCORDANCE WITH THE APPLICABLE FACTORY PROCEDURES.

For PAN INDIA CONSULTANTS PVT. LTD.

AUTHORISED SIGNATORY

REGD. OFFICE : OFFICE NO. 1, D-4, COMMERCIAL AREA, VASANT KUNJ, NEW DELHI-110070, INDIA
PHONES : +91 11 26137657, 26137659, 26899952, 26899962, 26132214 FAX : +91 11 26138633
e-mail : nmspl@panindiagroup.com URL : www.panindiagroup.com

Table 35- Calibration certificate of Echo- Sounder

SOUTH

SOUTH PRECISION INSTRUMENT PVT. LTD.
FA - 229 B, Ground Floor, Mansarover Garden, New Delhi-110015
Ph. : 011- 45544114, 65568870 Fax: 011- 45530854 Mob.: 9999999255

Calibration Certificate

SOUTH Precision Instrument Pvt. Ltd. Calibration laboratory certifies that the instrument has been inspected, tested and calibrated in accordance with the documented procedures using measuring and test equipment, which are traceable to national standards and of the international accepted standard.

We hereby certify that the instrument mentioned below meet the specification and result of the traceability is carried out in accordance to our company's standard.

INSTRUMENT TYPE	:	GPS RTK
MODEL	:	S-86T
MAKE	:	SOUTH
INSTRUMENT SR. NO.	:	S86951117129438GEM W1286752342GM
CALIBRATION DATE	:	10/02/2015
VALID UPTO	:	09/02/2016
ISSUED TO	:	PRECISION SURVEY CONSULTANCY

For SOUTH PRECISION INSTRUMENT PVT. LTD.

For SOUTH PRECISION INSTRUMENT PVT. LTD.

Authorised Signatory

Authorised Signatory

Table 36- Calibration Certificate of GPS- RTK

Annexure-16Site Pictures:-

Figure 25- B.M pillar Establishment & Bathymetry Survey Instrument

Figure 26-Topography Survey Instrument

Annexure-17 Survey Chart Scheming Index and chart details:-

LIST OF SURVEY CHARTS OF GANGADHAR RIVER FINAL DWG (NW-38)								
Sl. No.	Chart No.	Location (from .... to .....)	Chainage (Form…….km. To…...km.)	Chart Datum And Water Level w.r.t. MSL			Value of Reduction	Remarks
				Chainage (km.)	CD (m.)	WL (m.)		
1	P_01	Binnyachara pt.III to Baladuba pt.II	0.00 km to 2.395 km	0.617	23.252	26.200	-2.948	GS-2
2	P_02	Baladuba pt.II to Nalia pt.III	2.395 km to 6.107 km	0.617	23.252	26.200	-2.948	GS-2
3	P_03	Nalia pt.III to Pachim Gaikhowa pt.III	6.107 km to 8.365 km	11.794	26.308	27.100	-0.792	GS-1
4	P_04	Pachim Gaikhowa pt.III to Pachim Tokrer Chara	8.365 km to 11.404 km	11.794	26.308	27.100	-0.792	GS-1
5	P_05	Pachim Tokrer Chara to Uttar Tokererchara pt.I	11.404 km to 13.776 km	11.794	26.308	27.100	-0.792	GS-1
6	P_06	Uttar Tokererchara pt.I to Pachim Ratiadaha pt.III	13.776 km to 16.936 km	16.673	28.187	28.900	-0.713	GS-6
7	P_07	Pachim Ratiadaha pt.III to Belguri pt.I	16.936 km to 19.524 km	16.673	28.187	28.900	-0.713	GS-6
8	P_08	Belguri pt.I to Paschim Maisha pt.II	19.524 km to 22.285 km	24.652	31.259	31.200	0.059	GS-5
9	P_09	Paschim Maisha pt.II to Bhangaduli	22.652 km to 25.88 km	24.652	31.259	31.200	0.059	GS-5
10	P_10	Bhangaduli to Lohajani	25.88 km to 27.71 km	24.652	31.259	31.200	0.059	GS-5
11	P_11	Lohajani to kumar Ganj	27.71 km to 31.226 km	24.652	31.259	31.200	0.059	GS-5
				34.895	35.202	34.200	1.002	GS-7
12	P_12	kumar Ganj to kaimari pt.II	31.226 km to 35.189 km	34.895	35.202	34.200	1.002	GS-7
13	P_13	kaimari pt.II to Bholarkhas	35.189 km to 38.216 km	34.895	35.202	34.200	1.002	GS-7

LIST OF SURVEY CHARTS OF GANGADHAR RIVER FINAL DWG (NW-38)								
Sl. No.	**Chart No.**	**Location (from .... to .....)**	**Chainage (Form…….km. To…...km.)**	**Chart Datum And Water Level w.r.t. MSL**			**Value of Reduction**	**Remarks**
				Chainage (km.)	**CD (m.)**	**WL (m.)**		
14	P_14	Bholarkhas to Binyaguri II	38.216 km to 41.562 km	34.895	35.202	34.200	1.002	GS-7
15	P_15	Binyaguri II to Falimari	41.562 km to 45.502 km	48.035	40.261	39.500	0.761	GS-4
16	P_ 16	Falimari to Garumarachar	45.502 km to 49.553 km	48.035	40.261	39.500	0.761	GS-4
17	P_17	Garumarachar to simultapu no II	49.553 km to 52.342 km	48.035	40.261	39.500	0.761	GS-4
				56.654	43.579	46.450	-2.871	GS-3
18	P_18	simultapu no II to Pakriguri	52.342 km to 62.000 km	56.654	43.579	46.450	-2.871	GS-3

Table 37 Survey Charts

Note: Scale: - 1:5000 in each survey Chart
Survey period: - 14th September, 2015 to 06th October, 2015

G.S:- Gauge Station