FINAL FEASIBILITY REPORT ON
DETAILED HYDROGRAPHIC SURVEY IN CHAMBAL RIVER (NW-24)
FROM
CHAKARPURA TO AWARI
60.860 KM
CLIENT

INLAND WATERWAYS AUTHORITY OF INDIA
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SURVEY PERIOD: 05th July 2017 to 22nd August 2017

1. Acknowledgement

M/s New Horizon Surveys Pvt. Ltd., Navi Mumbai express its sincere gratitude to IWAI for awarding the work and guidance for completing this Project of detailed hydrographic survey and the feasibility report (60.860) in Region - IV (Chambal River) from Chakarpura to Awari.

We would like to use this opportunity to pen down our profound gratitude and appreciation to **Shri Amitabh Verma, IAS, Ex-Chairman and Ms. Nutan Guha Biswas, IAS, Chairperson**for spending their valuable time and guidance for completing this project of "Detailed Hydrographic and Topographic Survey in Chambal River."NHS would also like to thanks **Shri Pravir Pandey, Vice Chairman**, **IA&AS. Shri Alok Ranjan, Member (Finance) and Shri S.K. Gangwar, Member (Technical).**

NHSwishes to express their gratitude to**Cdr. P.K. Srivastava, Ex-Hydrographic Chief, IWAI and Shri SVK Reddy, Chief Engineer-I (I/c Hydrographic Chief)** for his guidance and inspiration for this project. New Horizon would also like to thank**Shri Rajiv Singhal, A.H.S, IWAI** for his invaluable support and suggestions provided throughout the survey period. New Horizon is pleased to place on record our sincere thanks to other staff and officers of IWAI for their excellent support and co-operation throughout the survey period.

CONTENTS

SALIENT FEATURES AT A GLANCE

REGION-IV					
Consultant: New Horizon Surveys (I) Pvt. Ltd					
Name	CHAMBAL RIVER			NW - 24	
Length	60.86 km from CHAKARPURA TO AWARI				
State	Uttar Pradesh				
Survey Period	05.07.2017 to 22.08.2017				
Tidal / Non-tidal	Non Tidal				
Availability of reduced Depth (mtrs)					
	0– 15 km	15– 30 km	30– 45 km	45 – 60 .860km	TOTAL
<1.2	3.900	8.800	5.800	7.000	25.500
1.2-1.4	0.950	1.200	1.200	1.000	4.350
1.5-1.7	0.350	0.400	1.400	1.200	3.350
1.8-2	9.800	1.200	1.000	0.660	12.660
>2.0	0.000	3.400	5.600	6.000	15.000
TOTAL	15.000	15.000	15.000	15.860	60.860
Average Slope (m per km)	0.038	0.018	0.043	0.027	
Width range (m)	317-75	344-73	334-111	394-84	
Average Vel (m/s)	0.399	0.435	0.490	0.535	
Discharge (Cu.m/sec.)	269.330	516.130	289.980	388.620	
Bathy Survey conducted for Length (Km)	15	15	15	15.86	60.86
Dredging Quantity (Observed) cu.m.					
	0 to 15 km	**15 to 30 km**	**30 to 45 km**	**45 to 60.68 km**	**TOTAL**
Class 1	20,701.83	1,05,645.4	1,024.88	29,895.11	1,57,267.28
Class 2	27,833.12	2.10,514.22	2943.77	56454.68	297745.79
class 3	75,419.94	3,79,589.54	7,201.47	89,610.36	5,51,821.31
Class 4	126,676.60	5,11,097.37	14,082.19	1,25,640.89	7,77,497.05
Dredging Quantity (Reduced) cu.m.					
	0 to 15 km	**15 to 30 km**	**30 to 45 km**	**45 to 60.68 km**	**TOTAL**
Class 1	145,790.40	3,40,490.4	78,305.98	1,64,238.6	7,28,825.53

Class 2	157,487.62	5,91,245.1	1,45,422.35	2,61,934.8	11,55,549.87
class 3	267,998.07	9,02,389.89	2,73,516.34	3,98,822.54	18,42,726.84
Class 4	358,644.87	11,01,971.76	3,82,731.41	5,06,398.02	23,49,746.06

No. Of Bridge					
2					
Clearances less than CLASS (no.)					
	Horizontal	**Vertical**			
Class 1	**30**	**1.8**	**One no. HT line is having VC of 3.5m whereas requ. Is 19m.**		
Class 2	**30**	**1.8**			
Class 3	**30**	**1.8**			
Class 4	**30**	**1.8**			
No. of Dams, Barrages, Weirs, Anicut etc.					
0					
NUMBER OF DAYS WATER NOT AVAILABLE					
CWC Gauge	UDI				
Chainage (km)	60				
class 1	221				
class 2	243				
class 3	263				
class 4	276				
Cargo availability					
Nil					
Passenger Movement					
Nil					
Present IWT use					
Nil					
Recommendation of the Consultant					
Full stretch of River is Wild Life Century Area. Forest area is on both Banks.					
Viable or not-viable					

(Signature)

Date:

M/s. New Horizon Surveys (I) Pvt. Ltd.

Section-1: Introductory Considerations

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

Chambal River

The **Chambal River** is a tributary of the Yamuna River in central India, and thus forms part of the greater Gangetic drainage system. The river flows north-northeast through Madhya Pradesh, running for a time through Rajasthan, then forming the boundary between Rajasthan and Madhya Pradesh before turning southeast to join the Yamuna in Uttar Pradesh state.

It is a legendary river and finds mention in ancient scriptures. The perennial Chambal originates at Janapav, south of Mhow town, near ManpurIndore, on the south slope of the Vindhya Range in Madhya Pradesh. The Chambal and its tributaries drain the Malwa region of northwestern Madhya Pradesh, while its tributary, the Banas, which rises in the Aravalli Range, drains southeastern Rajasthan. It ends a confluence of five rivers, including the Chambal, Kwari, Yamuna, Sind, Pahuj, at Pachnada near Bhareh in Uttar Pradesh state, at the border of Bhind and Etawah districts.

The Chambal River is considered pollution free,and hosts an amazing riverine faunal assemblage including 2 species of crocodilians – the mugger and gharial, 8 species of freshwater turtles, smooth-coated otters, gangetic river dolphins, skimmers, black-bellied terns, sarus cranes and black-necked storks, amongst others.

The 960 kilometers (600 mi) long Chambal River originates from the Singar Chouri peak on the northern slopes of the Vindhyan escarpment, 15 kilometers (9.3 mi) West-South-West of Mhow in Indore District, Madhya Pradesh state, at an elevation of about 843 meters (2,766 ft). The river flows first in a northerly direction through Madhya Pradesh (M.P.) for about 346 kilometers (215 mi) and then in a generally north-easterly direction for 225 kilometers (140 mi) through Rajasthan. The Chambal flows for another 217 kilometers (135 mi) between M.P. and Rajasthan and a further 145 kilometers (90 mi) between M.P. and Uttar Pradesh (U.P.). It enters U.P. and flows for about 32 kilometers (20 mi) before joining the Yamuna River in Jalaun District at an elevation of 122 meters (400 ft), to form a part of the greater Gangetic drainage system.From its source down to its junction with the Yamuna, the Chambal has a fall of about 732 meters (2,402 ft). Of this, around 305 meters (1,001 ft) is within the first 16

kilometers (9.9 mi) reach from its source. It falls for another 195 meters (640 ft) in the next 338 kilometers (210 mi), where it enters the gorge past the Chaurasigarh Fort. During the next 97 kilometers (60 mi) of its run from the Chaurasigarh Fort to Kota city, the bed falls by another 91 meters (299 ft). For the rest of its 523 kilometers (325 mi) run, the river passes through the flat terrain of the Malwa Plateau and later the Gangetic Plain with an average gradient of 0.21 m/km.

The Chambal is a rainfed catchment with a total drained area up to its confluence with the Yamuna of 143,219 square kilometers (55,297 sq mi). The drainage area resembles a rectangle up to the junction of the Parvathi and Banas Rivers with the Chambal flowing along its major axis. The Chambal Basin lies between latitudes 22° 27' N and 27° 20' N and longitudes 73° 20' E and 79° 15' E. On its south, east and west, the basin is bounded by the Vindhyan mountain ranges and on the north-west by the Aravallis. Below the confluence of the Parvathi and Banas, the catchment becomes narrower and elongated. In this reach, it is bounded by the Aravalli mountain ranges on the North and the Vindhyan hill range on the south.

The Vindhyan scarps, in the northwest, flank the left bank of the Chambal, and subsequently, are mainly drained by it. The Chambal rising within about 6 km of the Narmada river, appears as a consequent on the Mesozoic surface, superimposed on the scarps, and cuts straight through them, with subsequent tributaries on the softer shales. The River Chambal and its tributaries Kali Sindh and Parbati have formed a triangular alluvial basin, about 200–270 meters (660–890 ft) above the narrow trough of the lower Chambal in Kota. It is a typical anterior-drainage pattern river, being much older than the rivers Yamuna and Ganges, into which it eventually flows.

The tributaries of the Chambal include Shipra, ChotiKalisindh, Sivanna, Retam, Ansar, Kalisindh, Banas, Parbati, Seep, Kuwari, Kuno, Alnia, Mej, Chakan, Parwati, Chamla, Gambhir, Lakhunder, Khan, Bangeri, Kedel and Teelar.

According to Crawford (1969), the Chambal river valley is part of the Vindhyan system which consists of massive sandstone, slate and limestone, of perhaps pre-Cambrian age, resting on the surface of older rocks.[7] Hillocks and plateaus represent the major landforms of the Chambal valley. The Chambal basin is characterised by an undulating floodplain, gullies and ravines. The Hadauti plateau in Rajasthan occurs in the upper catchment of the Chambal River to the southeast of the Mewar Plains. It occurs with the Malwa

plateau in the east. Physiographically, it can be divided into Vindhyan scarp land and Deccan Lava (Malwa) plateau. According to Heron (1953), the eastern pediplain, occurring between the Vindhyan plateau and the Aravalli hill range, contains a thin veneer of Quaternary sediments, reworked soil and river channel fills. At least two erosional surfaces can be recognised within the pediplain are the Tertiary age. The Vindhyan upland, the adjoining Chambal valley and the Indo-Gangetic alluvial tract (older alluvium) are of Pleistocene to Sub-recent age. Badland topography is a characteristic feature of the Chambal valley, whereas kankar has extensively developed in the older alluvium.

The area lies within the semi-arid zone of north-western India at the border of Madhya Pradesh, Rajasthan and Uttar Pradesh States, and the vegetation consists of ravine, thorn forest. This sub-type typically occurs in less arid areas with 600–700 mm rainfall. Limited examples of Saline/Alkaline Babul Savannah (5E/8_b), a type of Northern Tropical Dry Deciduous Forest, also occur. Evergreen riparian vegetation is completely absent, with only sparse ground-cover along the severely eroded river banks and adjacent ravine lands.

The National Chambal Sanctuary lies between 24°55' to 26°50' N and 75°34' to 79°18'E in Dholpur. It consists of the large arc described by the Chambal between JawaharSagar Dam in Rajasthan and the Chambal-Yamuna confluence in Uttar Pradesh. Over this arc, two stretches of the Chambal are protected as the National Chambal Sanctuary status - the upper sector, extending from JawaharSagar Dam to Kota Barrage, and the lower sector, extending from Keshoraipatan in Rajasthan to the Chambal-Yamuna confluence in Uttar Pradesh.

The sanctuary was gazette 'in order to facilitate the restoration to "ecological health" of a major north Indian River system and provide full protection for the gravely endangered gharial.

Administrative approval of the Government of India for the establishment of the National Chambal Sanctuary was conveyed in Order No. 17-74/77-FRY (WL) dated 30 September 1978. The Sanctuary has sanctuary status declared under Section 18(1) of the Wildlife Protection Act, 1972. Since such a declaration is carried out by individual states for territory falling within their jurisdiction, there are three separate notifications covering the National Chambal Sanctuary - the Madhya Pradesh portion was gazette in the Government of Madhya Pradesh Notice No. F.15/5/77-10 (2) dated 20 December 1978, the Uttar Pradesh portion was gazette in the Government of Uttar Pradesh Notice No. 7835/XIV-3-103-78

dated 29 January 1979 and the Rajasthan portion was gazette in the Government of Rajasthan Notice No.F.11 (12) Rev.8/78 dated 7 December 1979.

In a stretch of 96 km, from km 344 to km 440 from its source, the Chambal flows through a deep gorge, while lower down, there are wide plains. The Gandhi Sagar Dam is located near the center of this reach. As there is a deep gorge immediately upstream of the dam, the reservoir has a large storage capacity despite its comparatively low height. For the next 48 km, the river flows through the Kundal Plateau, and the RanaPratapSagar Dam is constructed at the lower end of this reach, about 1.6 km upstream of Chulia Falls. Again, the topography permits fairly good storage upstream of the dam. Further down, the JawaharSagar Dam is located in the middle of the Kota gorge. The Kota Barrage is located near Kota town, where the river emerges from the gorge section into the plateau. The total area draining the Kota Barrage is 27,319 km^2.

The Chambal River is utilized for hydropower generation at Gandhi Sagar dam, RanaPratapSagar dam and JawaharSagar Dam and for annual irrigation of 5668.01 square kilometers in the commands of the right main canal and the left main canal of the Kota Barrage.

The **Gandhi Sagar dam** is the first of the four dams built on the Chambal River, located on the Rajasthan-Madhya Pradesh border. It is a 64 meter high masonry gravity dam, with a live storage capacity of 6,920 MCM (million cubic meters) and a catchment area of 22,584 km^2, of which only 1,537 km^2 is in Rajasthan. The dam was completed in the year 1960. The hydro-power station comprises five generating units of 23 MW capacity each. The water released after power generation is utilized for irrigation through Kota Barrage.

The **RanaPratapSagar dam** is a dam located 52 km downstream of Gandhi Sagar dam on across the Chambal River near Rawatbhata in Chittorgarh district in Rajasthan. It was completed in the year 1970 and it is the second in the series of Chambal Valley Projects. It is 54 meters high. The power house is located on the left side of the spillway and consists of 4 units of 43 MW each, with firm power generation of 90 MW at 60% load factor. The total catchment area of this dam is 24,864 km^2, of which only 956 km^2 are in Rajasthan. The free catchment area below Gandhi Sagar dam is 2,280 km^2. The live storage capacity is 1,566 MCM.

The **JawaharSagar Dam** is the third dam in the series of Chambal Valley Projects, located 29 km upstream of Kota city and 26 km downstream of RanaPratapSagar dam. It is a concrete gravity dam, 45 meter high and 393 m long, generating 60 MW of power with an installed capacity of 3 units of 33 MW. The work was completed in 1972. The total catchment area of the dam is 27,195 km^2, of which only 1,496 km^2 are in Rajasthan. The free catchment area below RanaPratapSagar dam is 2,331 km^2.

The **Kota Barrage** is the fourth in the series of Chambal Valley Projects, located about 0.8 km upstream of Kota City in Rajasthan. Water released after power generation at Gandhi Sagar dam, RanaPratapSagar dam and JawaharSagar Dams, is diverted by Kota Barrage for irrigation in Rajasthan and in Madhya Pradesh through canals on the left and the right sides of the river. The work on this dam was completed in 1960. The total catchment area of Kota Barrage is 27,332 km^2, of which the free catchmentarea below JawaharSagar Dam is just 137 km^2. The live storage is 99 MCM. It is an earth fill dam with a concrete spillway. The right and left main canals have a headworks discharge capacity of 188 and 42 m^3/s, respectively. The total length of the main canals, branches and distribution system is about 2,342 km, serving an area of 2,290 km^2 of CCA. The Barrage operates 18 gates to control flow of flood and canal water downstream, and serves as bridge between parts of Kota on both side of the river.

1.2 Tributaries / Network of Rivers / Basin

Chambal River is one of the most pollution free rivers of India.

It's a 960 Kilometer long river that originates at the Singar Chouri peak in the northern slopes of the Vindhyan mountains, 15 km West-South-West of Mhow in Indore District in Madhya Pradesh.

From there, it flows in a northerly direction in Madhya Pradesh(M.P.) for a length of about 346 km and then in a generally north-easterly direction for a length of 225 km through Rajasthan.

It enters U.P. and flows for about 32 km before joining the Yamuna River in Etawah District at an elevation of 122 m, to form a part of the greater Gangetic drainage system. Chambal is a rainfed river and its basin is bounded by the Vindhyan mountain ranges and on the north-west by the Aravallis.

Tributaries of Chambal

Banas River: Banasriver is a rainfed river that flows in Rajasthan. Banas means hope of forests. It originates in Khamnor Hills of the Aravalli Range, about 5 km from Kumbhalgarh in Rajsamand and flows northeast through Mewar region of Rajasthan, meets the Chambal near the village of Rameshwar in Sawai Madhopur District. The cities of Nathdwara, Jahanpur, and Tonk lie on the river.

Kali Sindh River: The Kali Sindh is a river in the Malwa region of Madhya Pradesh, that joins the Chambal River at downstream of SawaiMadhopur in Rajasthan

Parbati River: Parbati River is a river in Madhya Pradesh, India that flows into the Chambal River. It is one of the Chambal River's three main tributaries, along with the Banas River and the Kali Sindh River.

1.3 State/ District through which river passes

The Chambal is the chief tributary of the Yamuna River and rises in the Vindhya Range just south of Mhow, western Madhya Pradesh state. From its source it flows north into southeastern Rajasthan state. Turning northeast, it flows past Kota and along the Rajasthan–Madhya Pradesh border; shifting east-southeast, it forms a portion of the Uttar Pradesh–Madhya Pradesh border and flows through Uttar Pradesh to empty into the Yamuna after a 550-mile (900-km) course.

The **Chambal River** is a tributary of the Yamuna River in central India, and thus forms part of the greater Gangetic drainage system. The river flows north-northeast through Madhya Pradesh, running for a time through Rajasthan, then forming the boundary between Rajasthan and Madhya Pradesh before turning southeast to join the Yamuna in Uttar Pradesh state.

1.4 Google Maps showing State through which it is passing with road and rail networks and map showing full course of the waterway

Fig 01- Full course of the waterway

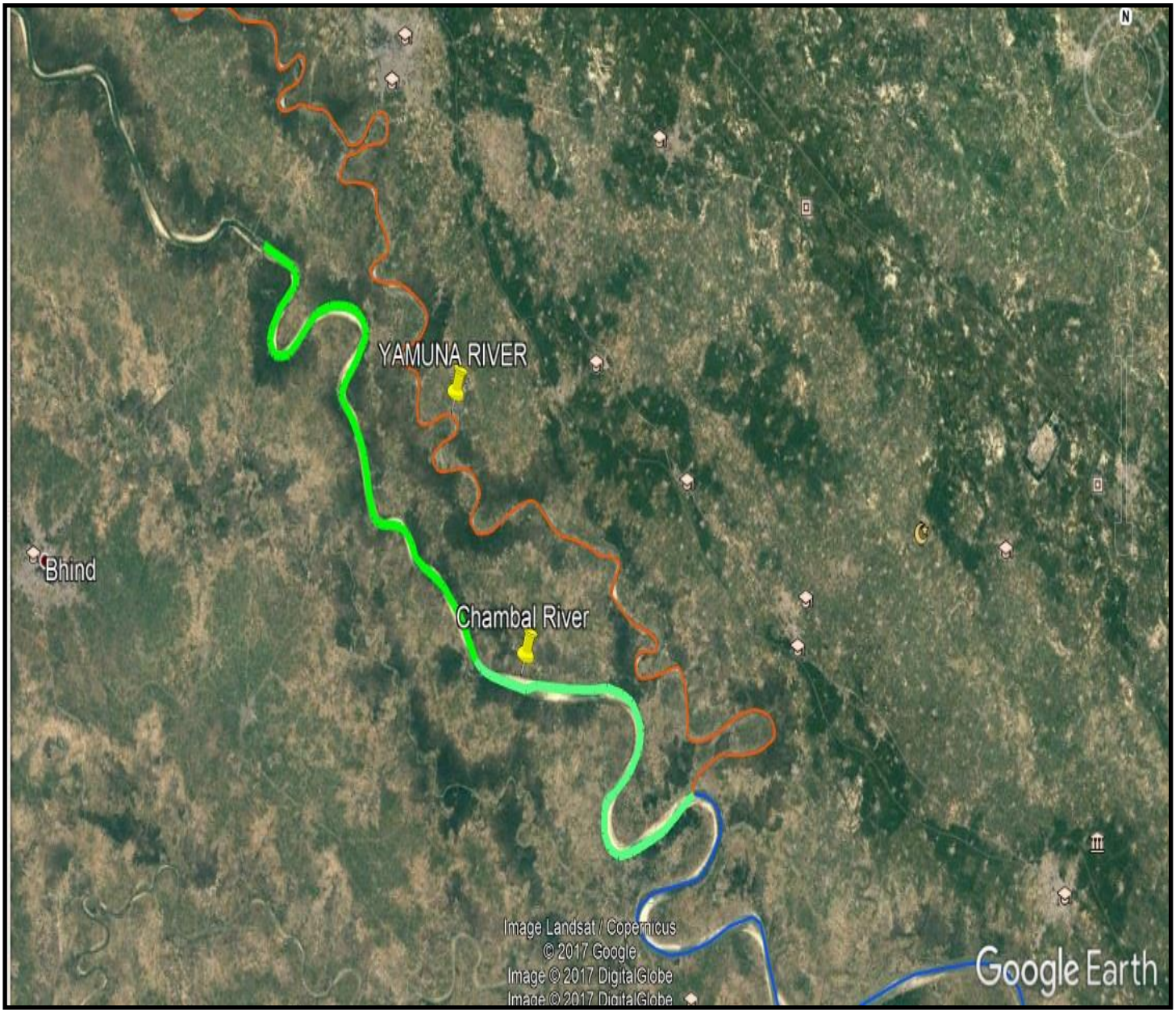


Fig 02- Map Showing Course of the waterway under study

1.5 Scope of work

a) The detailed Hydrographic Survey to assess the Navigability of the River.
b) Estimate the Dredging Quantity for developing a Navigational Channelfor Depths less than 2.0m, 1.7m, 1.4m and 1.2m (Class-wise).
c) Topographical Survey to locate the permanent structure within the River corridor.
d) Construction of BMs at every 10 km and connecting the same with nearest GTS.
e) Measurement of Speed and Direction of River Water.
f) Collection and analysis of the Water and bottom samples at every 10-km interval along the River.
g) To carry out tidal observation during the survey period.
h) To prepare feasibility report

Section-2: Methodology Adopted to undertake Study

2.1 Methodology Adopted in brief including resources and equipment used.

The Hydrographic survey of Chambal River from Chakarpura to Awari commenced on 05thJuly 2017 and completed on 22ndAugust 2017. The area intended to be surveyed has been sounded completely, for the depths available for movement of inflatable boat, as per the required specifications. The shallow patches were observed in river stretch and area above the water levels was surveyed by the Trimble R3 system. The bathymetric survey was carried out using a small Rafting boat. The sounding of the river was carried out at a line spacing grid of 200 meter. There were no interruptions during the survey period.

The survey was carried out on WGS 84 Datum. The projection used was Transverse Mercator and the grid used was Universe Transverse Mercator Grid (Zone 44). Differential signal corrections for the DGPS system were automatically obtained by establishing high precision DGPS. HYPACK Ver. 6.2b Hydrographic Survey Software developed by Coastal Oceanographical INC., USA was used for the data logging during the survey and for data processing thereafter.

The data logging during the survey was achieved by interfacing both Echo sounder and DGPS Receiver to the HYPACK software on a laptop/PC carried on board sounding boat. The entire system was supported by battery power and backed by an onboard small Honda generator. The position and depth data were logged in continuously during the survey, once every 500 millisecond. All digitally logged data were automatically stored in the assigned files. No significant difficulties were experienced in the operation of the digital surveying system during the survey.

2.2 Description of Bench Marks (B.M.) / authentic Reference Level used, with photographs.

The transfer of Bench Marks was carried out from Tatarpur to Awari

The Bench Marks of the survey area for Hydrographic survey is based on the datum level erected on gauge of Yamuna River. The Bench mark of CWC (R46) was recovered at Yamuna River Bank at Hamirpur and was used to transfer of datum (MSL) to the BMs. The BM position for YR 64 near the confluence of Chambal River thus derived is:

Latitude:	**26° 26' 27.3463"N**
Longitude:	**079° 13' 21.0868" E**
RL Hgt:	**123.597m**

TBM was connected from (R-46) CWC Bench Mark at Yamuna River Bank Hamirpur.

Latitude:	**25° 57' 32.9327"N**
Longitude:	**080° 09' 11.6881"E**
RL Hgt:	**109.153m**

BM YR-64

CWC BM AT HAMIRPUR

2.3 Tidal Influence Zone and tidal variation in different stretches

The Chambal River is non tidal river.

2.4 Methodology to fix Chart Datum / Sounding Datum's in Tidal and Non-Tidal area

IWAI had provided Sounding datum at gauges on river stretch. The gauge value was used for calculation of sounding datum at every tide pole. The distance and slope between the twogauges was used to interpolate the datum at tide pole. If the tide pole is close to the gauge then the value of gauge is used as sounding datum. The Data provided by IWAI was used to arrive the sounding datum values at BM Pillars and at tide pole.

Sl.no	Place	Chain age (km)	Sounding datum w.r.t M.S.L (m) (provided by IWAI)
0	Bhareh	0.000	103.325
1	Bhareh	0.235	103.332
2	Birori	8.000	103.583
3	Gopalpur	18.208	103.913
4	Hanumantpur	26.910	104.194
5	Barecha	37.819	104.546
6	Gaati	47.136	104.847
7	Awari	60.620	105.283

2.5 Yearly minimum and maximum Water Levels. Average of 06 years minimum Water Levels to be used to arrive at Chart Datum (CD) / Sounding Datum (SD). FSL in case of Canals

Sounding Datum was provided by IWAI.

2.6 Transfer of Sounding Datum table for Tidal rivers/canals

Chambal River is a non-tidal river.

2.7 Table indicating tidal variation at different observation points.

Non Tidal River.

2.8 Salient features of Dam, Barrages, Weirs, Anicut, Locks, and Aqueducts etc.

No dam, Barrages, weirs, Anicut, Locks, and Aqueducts found in this Stretch.

2.9 Description of erected Bench mark Pillars:-

Bench Mark No.	Location	Chainage (km)	Latitude (N)	Longitude (E)	Easting (m)	Northing (m)	BM Height above MSL (m)	BM Height above SD (m)
CR 01	Bhareh	0.155	26°29'47.5126"N	073°1'50.5100"E	325327.675	2931865.574	117.492	14.160
CR 02	Birori	8.040	26°28'29.7144"N	073°11'05.4702"E	319062.58	2929558.03	137.217	33.634
CR 03	Gopalpur	18.190	26°32'01.7407"N	073°10'17.5728"E	317829.012	2936101.691	129.282	25.369
CR 04	Hanumantpur	26.985	26°32'22.4931"N	073°05'16.5394"E	309505.5	2936861.9	121.927	17.733
CR 05	Barecha	37.828	26°36'11.9379"N	073°01'04.6036"E	302641.029	2944029.157	124.937	20.391
CR 06	Gaati	47.298	26°40'35.8461"N	073°00'16.7790"E	301444.8	2952171.8	137.172	32.325
CR 07	Awari	60.620	26°41'57.4845"N	072°56'23.7474"E	295042.4	2954786.8	125.994	20.711

2.10 Description of erected Tide Gauges:-

Tide Gauge No.	Location	Chainage (km)	Latitude (N)	Longitude (E)	Easting (m)	Northing (m)	Zero of Tide Gauge w.r.t. MSL (m)	Period of Observation
TP 01	**Bhareh**	0.235	26° 29' 33.472" N	073° 14' 55.7336" E	325466.42	2931431.53	102.987	01 Day
TP 02	**Birori**	8.00	26° 28' 29.4619" N	073° 11' 13.3983" E	319282.04	2929547.16	104.022	02 Days
TP 03	**Gopalpur**	18.208	26° 31' 51.6635" N	073° 10' 19.7924" E	317886.03	2935790.70	104.477	01 Day
TP 04	**Hanumantpur**	26.910	26° 32" 25.6817" N	073° 05' 25.2097" E	309746.96	2936956.45	105.291	02 Days
TP 05	**Barecha**	37.819	26° 36' 10.6738" N	073° 01' 0.6714" E	302531.64	2943991.94	105.687	02 Days
TP 06	**Gaati**	47.136	26° 40' 27.3272" N	073° 00' 16.4756" E	301432.31	2951909.75	106.417	01 Day
TP 07	**Awari**	60.620	26° 41' 52.3509" N	072° 56' 21.1112" E	294966.97	2954629.98	106.514	01 Day

2.11 Chart Datum / Sounding Datum and Reductions:-

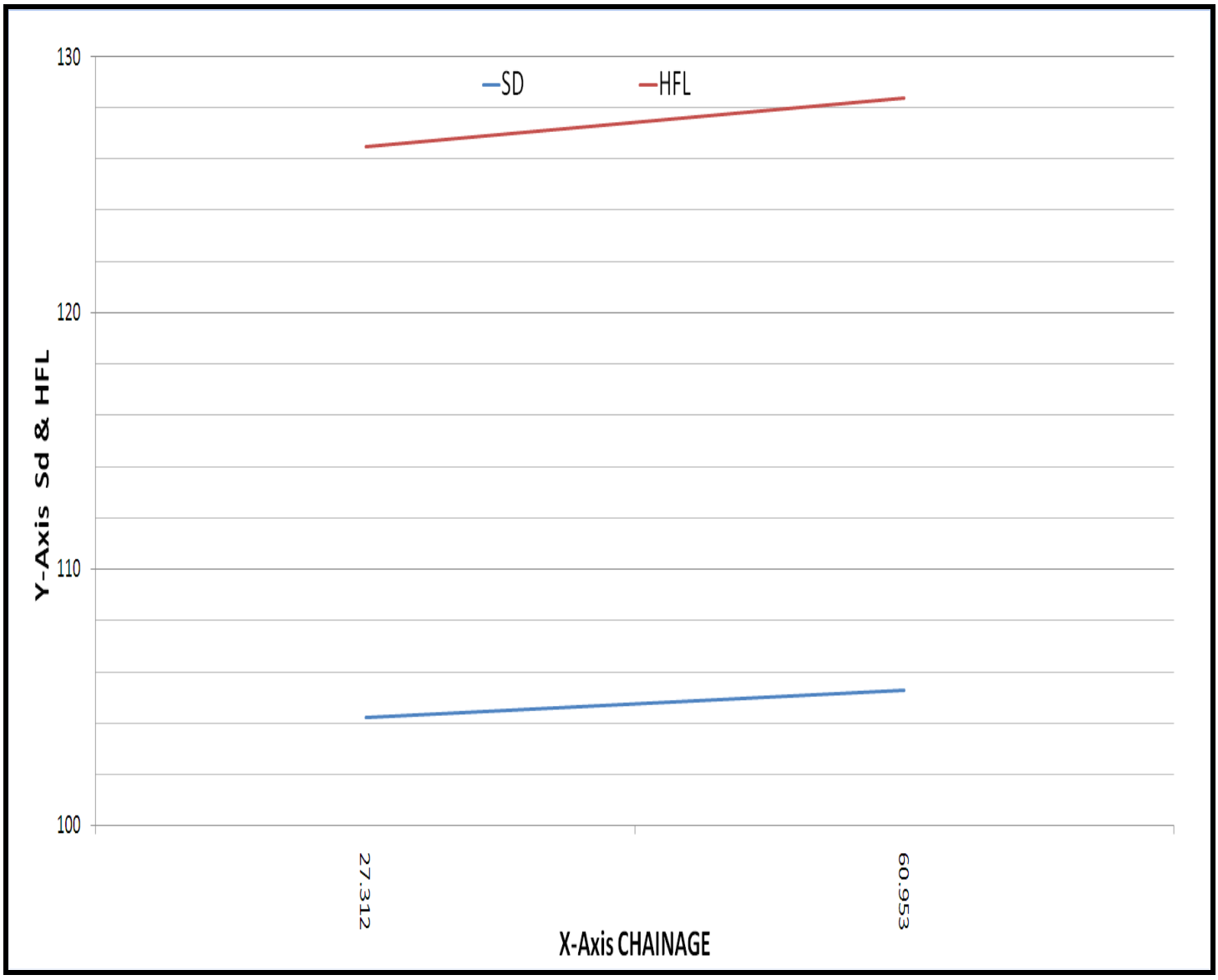
Sl.No	Location of CWC gauge / Dam / Barrage / Weir / Anicut / Bench Mark / tide gauges	Chainage (km)	Stretch for corrected soundings and topo levels (km)	Established Sounding Datum w.r.t. MSL (m) at col. A.	Sounding Datum of Tide Gauge wrt MSL (m)	Correction in WL data for Bathymetric survey (m)	Topo level data to be converted as depth for volume calculation wrt 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)
						Details at Annexure-4.	A separate xyz file is to be created (not to plot).
1	TP-1 Bhareh	0.235	0.000 to 5.000	-	103.332	DATA Provided in Annexure.	Data provided in Soft copy.
2	TP-2 Birori	8.00	5.000 to 13.000	-	103.583		
3	TP- Gopalpur	18.208	13.000 to 23.000	-	103.913		
4	TP-4 Hanumantpur	26.910	23.000 to 32.500	-	104.194		
5	TP-5 Barecha	37.819	32.500 to 42.800	-	104.546		
6	TP-6 Gaati	47.136	42.800 to 53.800	-	104.847		
7	CWC (Udi)	60.000	-	105.273			
8	TP-7 Awari	60.620	53.800 to 60.860	-	105.283		

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

Sl. No	Location and description of CWC gauge / Dam / Barrage / Weir / Anicut / Locks/Aqueducts / BM	Cross – structure details	Chainage (km)	Established HFL/MHWS/FSL/MWL/FRL w.r.t. MSL (m)	Computed HFL at Cross – Structures w.r.t. MSL (m)	Invert level of Cross-Structure w.r.t. MSL (m)	Vertical clearance w.r.t. HFL / MHWS (m)
01	HANUMANTPURA	HANUMANTPURACHAKKARNAGAR BRIDGE	27.312	------	126.463	128.363	1.90
02	Awari	BHIND-ETAWA BRIDGE	60.953	128.400	128.400	130.200	1.80

2.13 Graph Sounding Datum and HFL vs.Chainage

CHAINAGE (km)	SOUNDING DATUM (m)	HFL (m)
27.312	104.194	126.463
60.953	105.283	128.400



2.14 Average Bed Slope

Reach		River / Canal Bed Level RL (m)	Length (km)	Slope
From	To			
0	60.860	103.332-105.283	60.860	1:0.032
0	15	103.332-103.913	15	1:0.038
15	30	103.913-104.194	15	1:0.018
30	45	104.194-104.847	15	1:0.043
45	60.860	104.847-105.283	15.860	1:0.027

2.15 Details of Dam, Barrages, Weirs, Anicut, etc. w.r.t. MSL:-

No Dam, Barrages, Weirs & Anicut were found in whole stretch.

2.16 Details of Locks: -

No Locks found in whole stretch.

2.17 Details of Aqueducts: -

No Aqueducts found in whole stretch.

2.18 Details of existing Bridges and Crossings over waterway:-

SL. NO.	Structure Name and for road / rail	Chainage (km)	Type of Structure (RCC / Iron / Wooden)	Location	Position (Lat Long)		Position (UTM) (m)		Length (m)	Width (m)	No of Piers	Horizontal clearance (clear distance Between piers) (m)	Vertical clearance w.r.t. HFL / MHWS (m)	Remarks (complete / under - construction), in use or not, condition
					Left Bank	Right Bank	Left Bank	Right Bank						
1	HANUMAN TPURA CHAKKARN AGAR BRIDGE	**27.312**	RCC	SAHSO GHAT	26°32'30.2546"N 079°05'10.8687"E	26°32'45.3529"N 079°05'27.2192"E	309352.112 2937103.100	309811.600 2937561.000	648	7.5	21	30	**1.90**	**Complete & Useable**
2	BHIND-ETAWA BRIDGE	**60.953**	RCC	BARHI VILLAGE	26°41'43.0646"N 078°56'01.0943"E	26°41'59.8932"N 078°56'11.4478"E	294408.9952 2954353.133	294703.595 2954866.433	591	7.5	21	50	**1.80**	**Complete & Useable**
3	RAWANI BRIDGE	**14.650**	RCC	RAWANI VILLAGE	26°31'2.26"N 079°12'23.89"E	26°31'9.05"N 079°12'44.86"E	321300.77 2934222.95	321882.86 2934430.59	--	--	--	--	--	**Under construction**

2.19 Details of other Cross structure, pipe-lines, and underwater cables.

No other Cross structure, pipe-lines, underwater cables.

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

Sl No	Type of line	Chainage (km)	Location	Position (Lat Long)		Position (UTM) (m)		No of Piers	Horizontal clearance (clear distance Between piers) (m)	Vertical clearance w.r.t. HFL/MHWS (m)	Remarks (complete / under - construction)
				Left Bank	Right Bank	Left Bank	Right Bank				
1	HT	27.255	SAHSO GHAT	26°32'29.4411"N 079°05'12.0985"E	26°32'44.9955"N 079°05'30.2738"E	309385.764 2937077.559	309895.986 2937548.742	-	694.504	3.5	Complete

2.21 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)
		Latitude (N)	Longitude (E)	Easting (m)	Northing (m)		0.5 D			
1	0.351	26° 29′ 26.0177″ N	073° 14′ 55.5418″ E	325457.980	2931202.210	1.2	0.509	0.304	120.40	36.60
2	8.075	26° 28′ 32.1804″ N	073° 11′ 16.817″ E	319377.900	2929629.480	5.0	0.608	0.399	675.00	269.33
3	18.084	26° 31′ 49.3956″ N	073° 10′ 24.958″ E	318028.030	2935718.870	1.2	1.228	0.477	227.50	108.52
4	26.899	26° 32′ 28.7108″ N	073° 05′ 29.8661″ E	309877.240	2937047.750	4.4	1.051	0.435	1186.50	516.13
5	37.802	26° 36′ 8.9361″ N,	073° 00′ 55.7285″ E	302394.060	2943940.580	3.4	1.097	0.490	591.80	289.98
6	47.215	26° 40′ 27.0323″ N	073° 00′ 12.4871″ E	301321.890	2951902.400	5.8	1.066	0.535	726.40	388.62
7	60.090	26° 41′ 43.6924″ N	072° 56′ 37.6823″ E	295420.760	2954356.100	1.4	0.994	0.386	68.25	26.34

2.22 (a) Soil Sample Locations

Sample No.	Chainage (km)	Latitude (N)	Longitude (E)	Easting (m)	Northing (m)	Depth (m)
CR 01	0.351	26° 29′ 26.0177″ N	073° 14′ 55.5418″ E	325457.980	2931202.210	1.2
CR 02	8.075	26° 28′ 32.1804″ N	073° 11′ 16.817″ E	319377.900	2929629.480	5.0
CR 03	18.084	26° 31′ 49.3956″ N	073° 10′ 24.958″ E	318028.030	2935718.870	1.2
CR 04	26.899	26° 32′ 28.7108″ N	073° 05′ 29.8661″ E	309877.240	2937047.750	4.4
CR 05	37.802	26° 36′ 8.9361″ N,	073° 00′ 55.7285″ E	302394.060	2943940.580	3.4
CR 06	47.215	26° 40′ 27.0323″ N	073° 00′ 12.4871″ E	301321.890	2951902.400	5.8
CR 07	60.090	26° 41′ 43.6924″ N	072° 56′ 37.6823″ E	295420.760	2954356.100	1.4

(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)
CR 01	0.351	26° 29′ 26.0177″ N	073° 14′ 55.5418″ E	325457.980	2931202.210	1.2	0.6
CR 02	8.075	26° 28′ 32.1804″ N	073° 11′ 16.817″ E	319377.900	2929629.480	5.0	2.5
CR 03	18.084	26° 31′ 49.3956″ N	073° 10′ 24.958″ E	318028.030	2935718.870	1.2	0.6
CR 04	26.899	26° 32′ 28.7108″ N	073° 05′ 29.8661″ E	309877.240	2937047.750	4.4	2.2
CR 05	37.802	26° 36′ 8.9361″ N,	073° 00′ 55.7285″ E	302394.060	2943940.580	3.4	1.7
CR 06	47.215	26° 40′ 27.0323″ N	073° 00′ 12.4871″ E	301321.890	2951902.400	5.8	2.9
CR 07	60.090	26° 41′ 43.6924″ N	072° 56′ 37.6823″ E	295420.760	2954356.100	1.4	0.7

Section-3: Description of waterway

3.1 Stretch – 01 Chakarpur to Rawari -00.00km to 15.00km

Google map showing chainage 00.00km to 15.00km

Stretch	Stretch with less than < 1.2m depth	Stretch with depths between 1.2 to 1.4m(km)	Stretch with depths between 1.5 to 1.7m	Stretch with depths between 1.8m to 2m depth	Stretch with more than 2m depth
Chakarpur to Rawari	3.900 km	0.950 km	0.350 km	9.800 km	0.000 km

This stretch starts from confluence of Yamuna and Chambal River. Width of this stretch varies from 317.0mr to 75.0mr. Minimum and maximum depth observed is 0.2mtr and 11.1mtr.

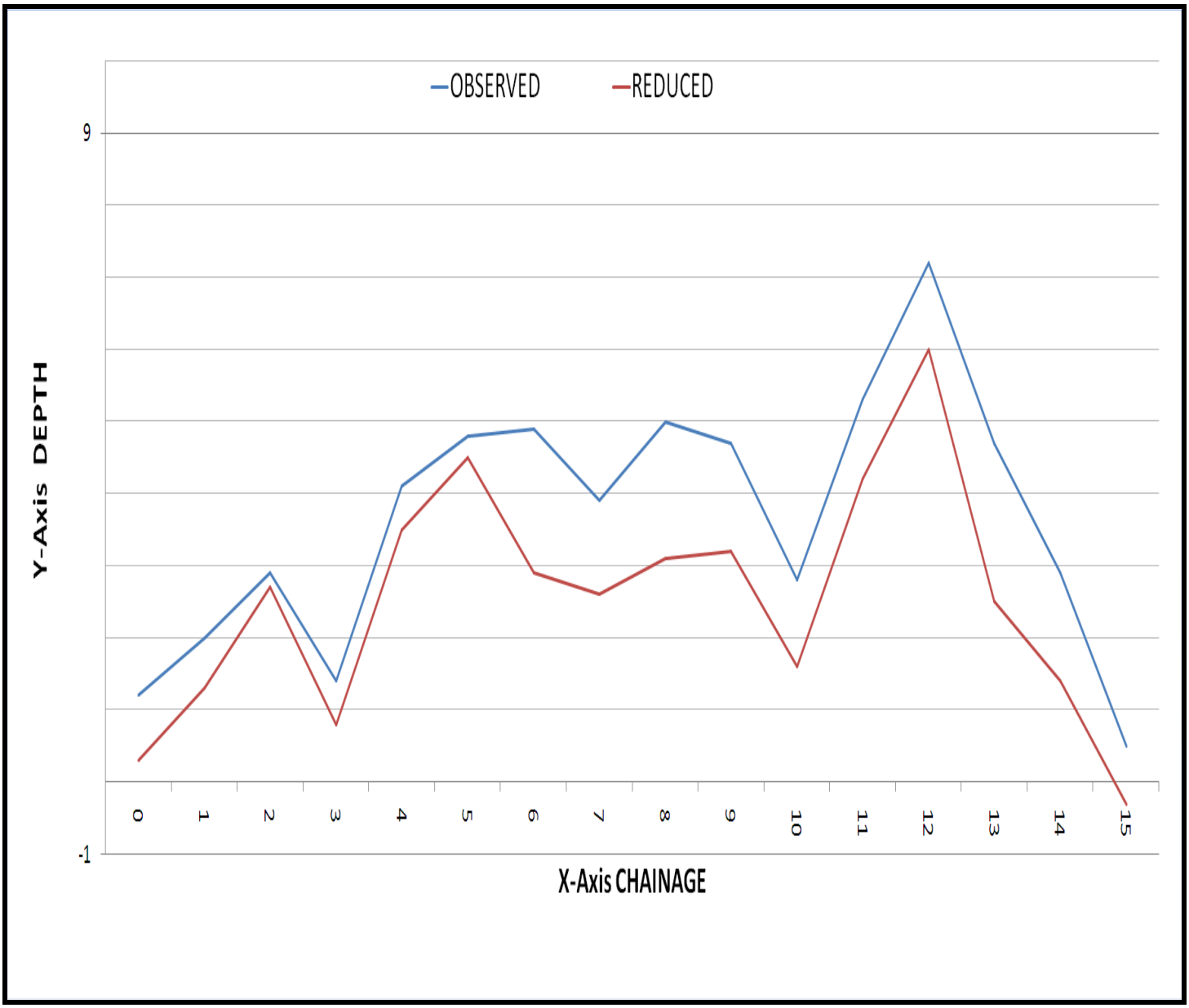
BM pillar CR- 01 established in North Bank of River near mouth at chainage 00.00km. Bhareh Temple situated near the BM Pillar. It is a very old Shiva Temple and Built by Pandav's. Sufficient depth is available in this stretch except River Mouth due to depositing of sand. Current is very less as water is stopped in Rajasthan Dam. Water quality is very good. Mining is not seen. Both the Banks of river are unprotected. Crocodiles are in the whole river. This is a Wild Life Century area. Fishing is not allowed. Chakarpura village is on SE bank near the mouth at 0.600kmchainage. A Charauli Village is at 2.500km, Patara village is at 4.20km Chainage on North Bank.

BM Pillar CR 02 is established at Chainage 8.00km on west Bank. Bihar village is at 8.30km on East Bank Katrauli Village is at chainage 10.4km on SE Bank

No hindrance found in this stretch. Water way may not be possible due to Wild Life Century area.

Observed and reduced Bed Profile of the stretch-01 CH 00 to Ch 15 km

CHAINAGE (km)	OBSERVED (m)	REDUCED (m)
0	1.2	0.3
1	2	1.3
2	2.9	2.7
3	1.4	0.8
4	4.1	3.5
5	4.8	4.5
6	4.9	2.9
7	3.9	2.6
8	5	3.1
9	4.7	3.2
10	2.8	1.6
11	5.3	4.2
12	7.2	6
13	4.7	2.5
14	2.9	1.4
15	0.5	-0.3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X-Axis CHAINAGE

3.2 Stretch – 02 Rawari to Boncholi - 15.00km to 30.00km

Google map showing chainage 15.00km to 30.00km

Stretch	Stretch with less than < 1.2m depth	Stretch with depths between 1.2 to 1.4m(km)	Stretch with depths between 1.5 to 1.7m	Stretch with depths between 1.8m to 2m depth	Stretch with more than 2m depth
Rawari to Boncholi	8.800 km	1.200 km	0.400 km	1.200 km	3.400 km

Width of channel in this stretch varies from 344mtr to 73.0mtr. Minimum and maximum depth observed in this stretch is 0.2mtr and 18.6mtr.

Rawari Village is at chainage 15.2km on south Bank, Chhibroli village is at chainage 17.0km on North Bank.

BM Pillar CR 03 is established at chainage 18.00km on North Bank of river. Gopalpur village is at chainage 18.8km on North Bank, Palighar village is at chainage 20.2km on North Bank, Piproli Gadhiya village is at 20.8km chainage on South Bank

BM Pillar CR 04 is established at Chainage 27.00km on SW Bank near forest dept. Guest House. A Bridge is crossing at chainage 27.400km and connecting from Chakar Nagar to shanson. Dhakra village is at Chainage 27.2km on NE Bank. Dadara village is at chainage 29.00km on NE Bank. Depth is less than 02 mtrFromchainage 15.00km to 23.00km and more than 2.0mtr from chainage 23.00km to 30.00km chainage. Water quality is good. Current is very less as water is stopped in Rajasthan. Both the Bank is unprotected. Maximum land alongside the bank is forest area. No mining seen in the whole stretch. Fishing is not allowed due to Wild Life Century area. Crocodiles are in the river in full stretch. One approach is available in this stretch near Shashon. Water way may not be allowed due to Wild Life Century area.

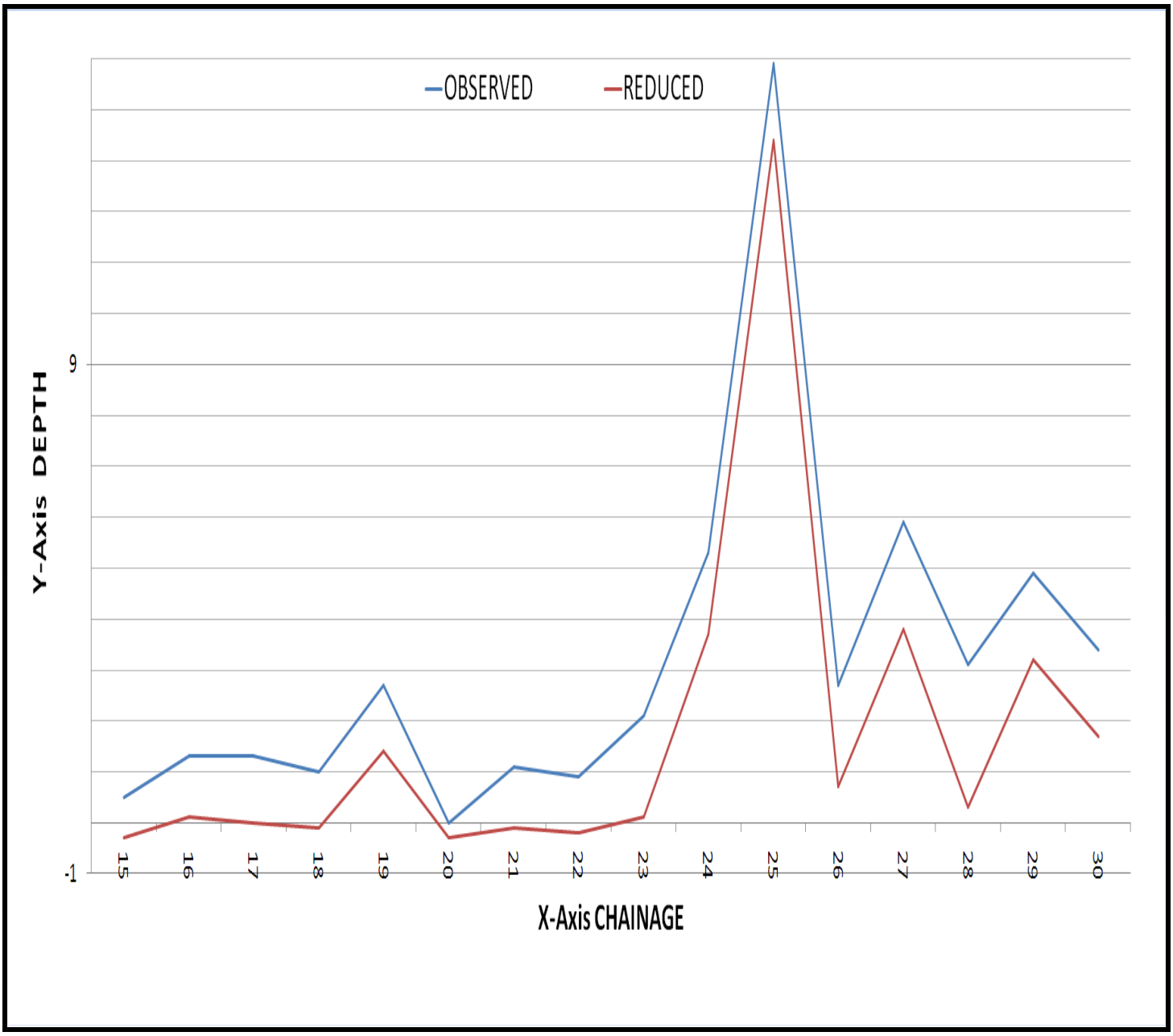
Bridge at chainage 27.312km

Length (m)	Width (m)	Height w.r.t. -(msl) (m)	Present condition	H Clearance (m)	V Clearance(HFL) (m)
648	7.5	130.363	Good	30	1.90

Chainage (km)	Horizontal clearance (clear distance Between piers) (m)	Vertical clearance w.r.t. HFL (m) For non tidal river
27.255	694.504	3.5

Observed and reduced Bed Profile of the stretch-02 CH 15 to Ch 30 km

CHAINAGE (km)	OBSERVED (m)	REDUCED (m)
15	0.5	-0.3
16	1.3	0.1
17	1.3	0
18	1	-0.1
19	2.7	1.4
20	0	-0.3
21	1.1	-0.1
22	0.9	-0.2
23	2.1	0.1
24	5.3	3.7
25	14.9	13.4
26	2.7	0.7
27	5.9	3.8
28	3.1	0.3
29	4.9	3.2
30	3.4	1.7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X-Axis CHAINAGE

3.3 Stretch – 03 Barchli to Chikani - 30.00km to 45.00km

Google map showing chainage 30.00km to 45.00km

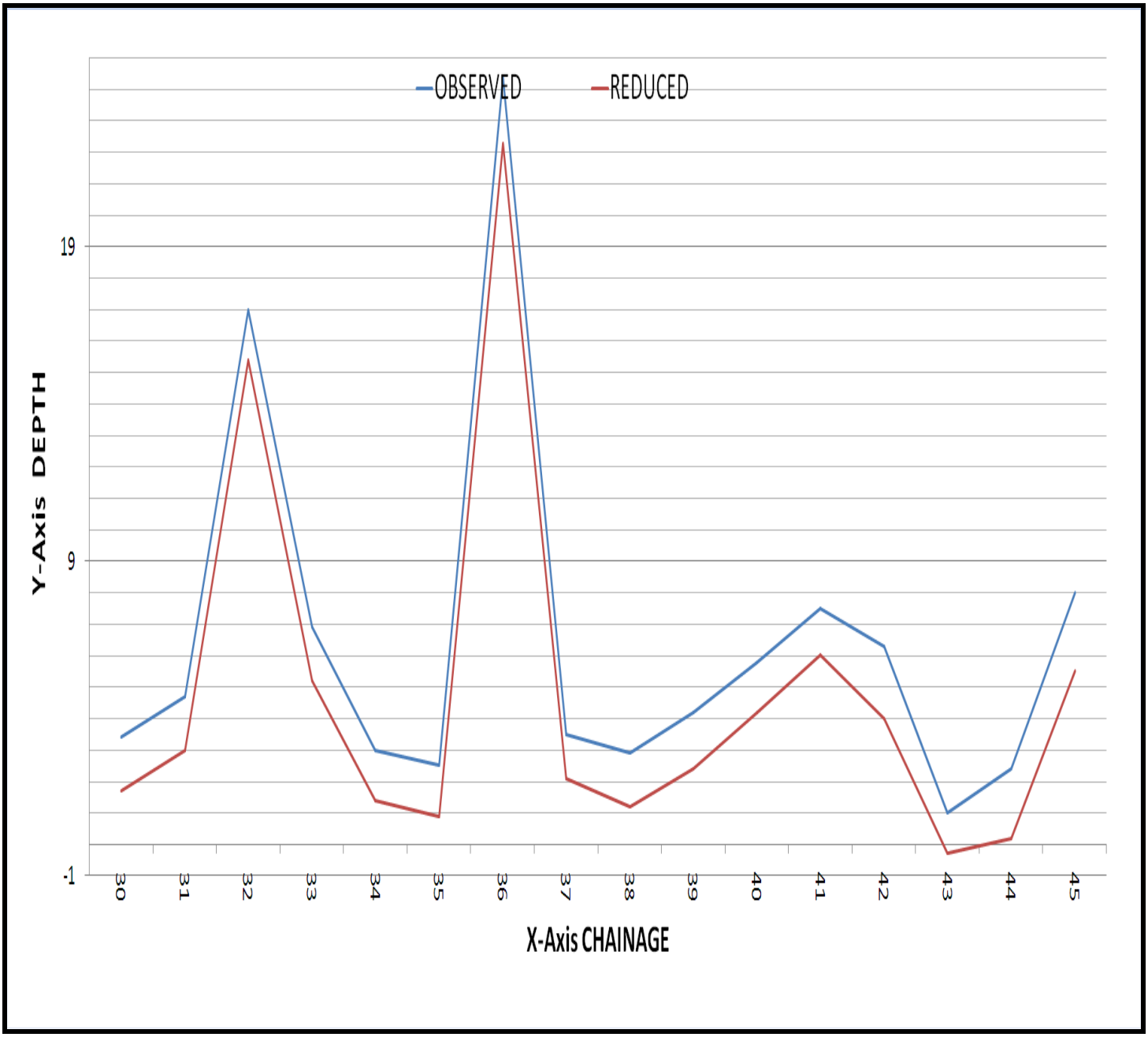
Stretch	Stretch with less than < 1.2m depth	Stretch with depths between 1.2 to 1.4m(km)	Stretch with depths between 1.5 to 1.7m	Stretch with depths between 1.8m to 2m depth	Stretch with more than 2m depth
Barchli to Chikani	5.800 km	1.200 km	1.400 km	1.000 km	5.600 km

Width of channel varies from 334.0mtr to 111.0mtrin this stretch. Minimum and maximum depth observed 0.7mtr and 21.5mtr. Barchauli village is at 31.00km chainage on NE Bank, Jagtoli village is at 33.80km on NE Bank, Barecha Village is at 37.6km chainage on East Bank.

A BM Pillar CR -05 is established at chainage 37.8km on. East Bank of River.Bindwa village at 38.00km chainage on West Bank. Kuroli Village is at 42.8km on West Bank,Chikani village is at Chainage 44.2km on East Bank. Water quality is good. Current is very less. Both the banks are unprotected. Mining is not seen in the stretch. Fishing is not allowed due to wild life century area. Depth is available more than 02mtr except between chainage 43.0km to 43.4km. Water way may not be possible due to forest and Wild Life Century Area. Maximum land along side Both the Banks is forest area.

Observed and reduced Bed Profile of the stretch-03 CH 30 to Ch 45 km

CHAINAGE (km)	OBSERVED (m)	REDUCED (m)
30	3.4	1.7
31	4.7	3
32	17	15.4
33	6.9	5.2
34	3	1.4
35	2.5	0.9
36	24.4	22.3
37	3.5	2.1
38	2.9	1.2
39	4.2	2.4
40	5.8	4.2
41	7.5	6
42	6.3	4
43	1	-0.3
44	2.4	0.2
45	8	5.5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Y-Axis DEPTH
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45
X-Axis CHAINAGE

3.4 Stretch – 04 Chikani to Awari - 45.00km to 60.86km

Google map showing chainage 45.00km to 60.86km

Stretch	Stretch with less than < 1.2m depth	Stretch with depths between 1.2 to 1.4m(km)	Stretch with depths between 1.5 to 1.7m	Stretch with depths between 1.8m to 2m depth	Stretch with more than 2m depth
Chikani to Awari	7.000 km	1.000 km	1.200 km	0.660 km	6.000 km

Width of channel varies from 394mr to 84.0mr in this stretch. Minimum and maximum depth observed is 0.2mtrand 20.7mtr.

Bm Pillar CR 06 is established at Chainage 47.2km on North Bank. Gyanpura Village is at 48.0km chainageon South Bank of River.

BM Pillar CR 07 is established at Chainage 60.6km on North Bank.

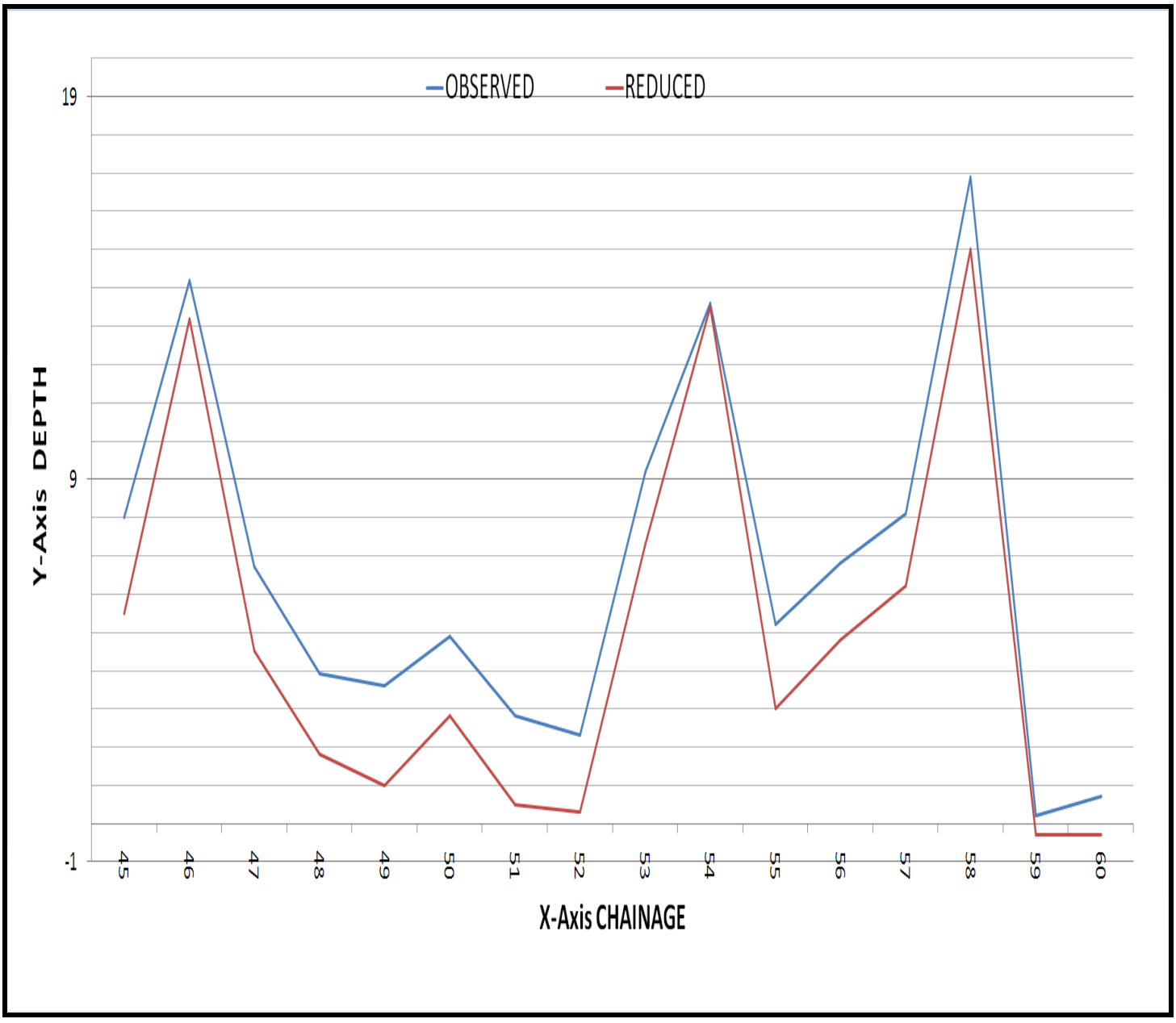
Both the banks are unprotected. Water quality is good. Current is very less. Mining is not seen in the stretch. Fishing is not allowed due to wild life century area. A Bridge is crossing at chainage 60.9km and connecting Udi to Bhind Crocodiles are in the full stretch. Maximum area along side Both the Bank is forest area. Depth is available more than 2.0mtrfrom 45.0km to 60.8km except 50.4km to 51km and 58.8km to 60.9kmchainage. Waterway may not be possible due to wild life century and Forest area.

Bridge at chainage 60.954 km

Length (m)	Width (m)	Height w.r.t. -(msl) (m)	Present condition	H Clearance (m)	V Clearance(HFL) (m)
591	7.5	132.200	Good	50	1.80

Observed and reduced Bed Profile of the stretch-03 CH 45 to Ch 60 km

CHAINAGE (km)	OBSERVED (m)	REDUCED (m)
45	8	5.5
46	14.2	13.2
47	6.7	4.5
48	3.9	1.8
49	3.6	1
50	4.9	2.8
51	2.8	0.5
52	2.3	0.3
53	9.2	7.3
54	13.6	13.5
55	5.2	3
56	6.8	4.8
57	8.1	6.2
58	16.9	15
59	0.2	-0.3
60	0.7	-0.3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X-Axis CHAINAGE

Bathymetry Survey

Stretch No	Chainage (km)	From	To	Bathymetric Survey	Total Length (km)
Stretch -01	0 to 15 Km	Chakarpura	Rawani	Carried Out	15
Stretch -02	15 to 30 Km	Rawani	Barcholi	Carried Out	15
Stretch -03	30 to 45 Km	Barcholi	Chikani	Carried Out	15
Stretch -04	45 to 60.860 Km	Chikani	Awari	Carried Out	15.86

Topographic Survey was carried out only on banks.

Stretch No	Chainage (km)	From	To	Topographic Survey	Total Length (km)
Stretch -01	0 to 15 Km	Chakarpura	Rawani	Carried Out	15
Stretch -02	15 to 30 Km	Rawani	Barcholi	Carried Out	15
Stretch -03	30 to 45 Km	Barcholi	Chikani	Carried Out	15
Stretch -04	45 to 60.860 Km	Chikani	Awari	Carried Out	15.86

Minimum and Maximum Width

Stretch -01 0 to 15 Km		Stretch -02 15 to 30 Km		Stretch -03 30 to 45 Km		Stretch -04 45 to 60.860 Km	
Minimum width (m)	Maximum width (m)	Minimum width (m)	Maximum width (m)	Minimum width (m)	Maximum width (m)	Minimum width (m)	Maximum width (m)
75.000	317.000	73.000	344.000	111.000	334.000	84.000	394.000

Average Width

Stretch -01 0 to 15 Km	Stretch -02 15 to 30 Km	Stretch -03 30 to 45 Km	Stretch -04 45 to 60.860 Km
Average width (m)	Average width (m)	Average width (m)	Average width (m)
196	208.5	222.5	239

Section 4: Terminals

4.1 Terminal is proposed at

Udi, Chakar Nagar and Chambal Yamuna confluence.

4.2 Details of Land use, owner etc.

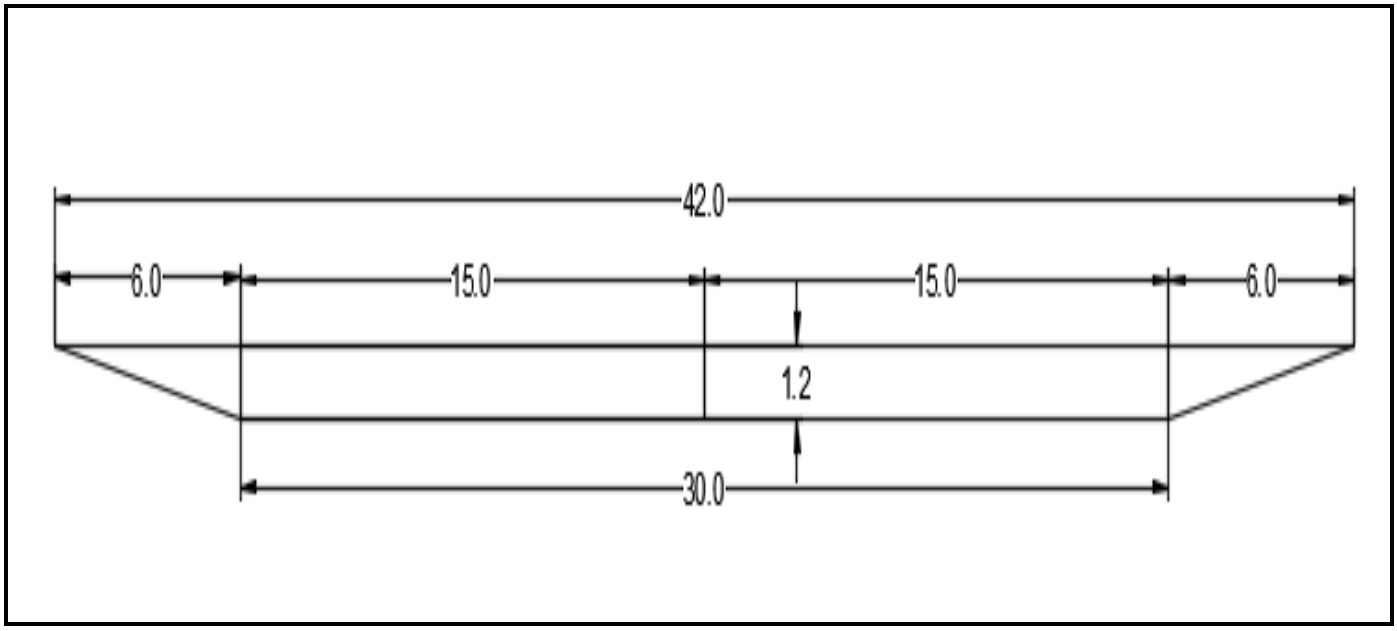
The Land use is mostly forest area along the banks.

Section 5: Fairway development

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

Chambal River from Chakarpura to Awari (Chain age 0.0 km –60.860 km)

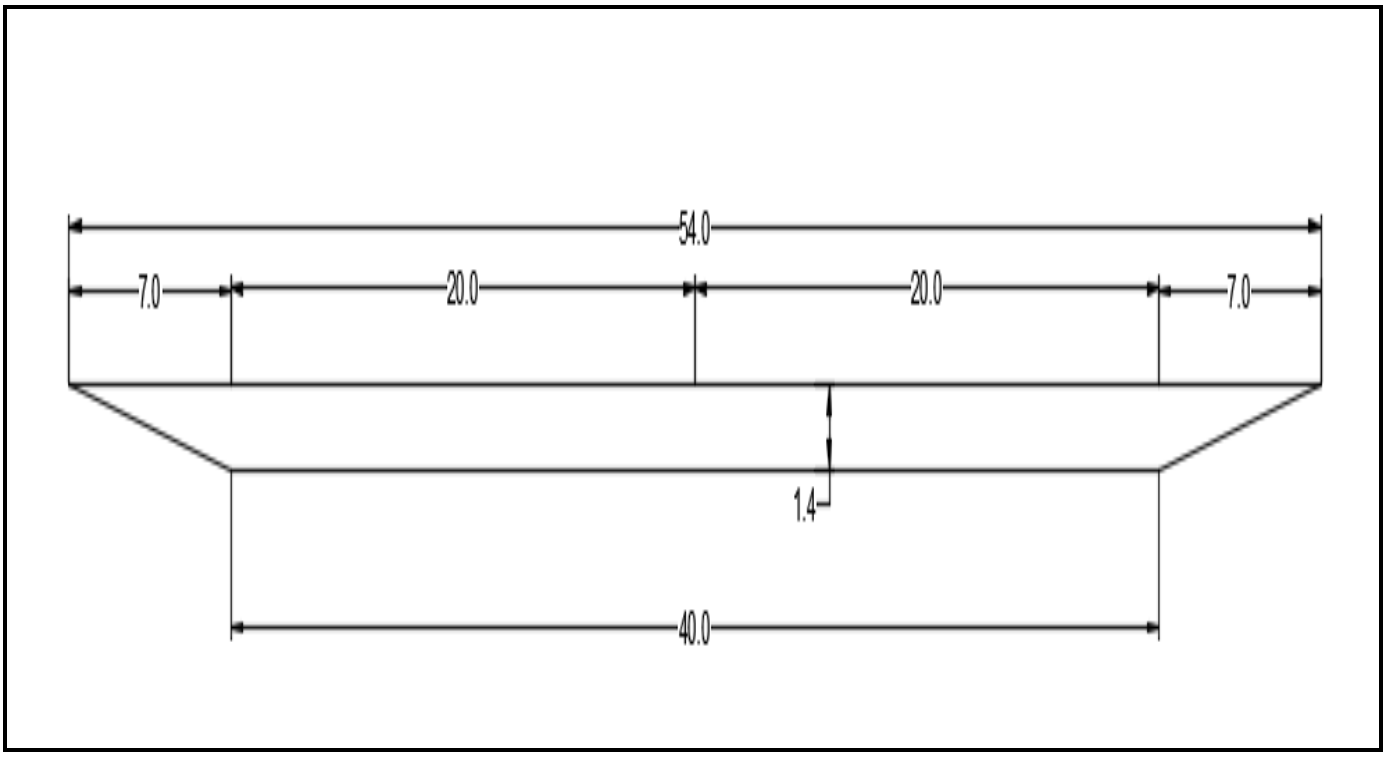
Class- I 1.2m



Chainage (km)		Observed					Reduced w.r.t. Sounding Datum				
From	To	Min. depth (m)	Max. depth (m)	Length of Shoal (m)	Dredging Qty. (cu.m.)	Accumulated Quantity	Min. Depth (m)	Max. Depth (m)	Length of Shoal (m)	Dredging Qty. (cu.m.)	Accumulated Quantity
0	15	0.1	13.6	1900	20,701.83	20,701.83	-0.3	7.2	5000	1,45,790.4	1,45,790.48
15	30	0	17.1	4800	1,05,645.4	1,26,347.29	-0.3	15.4	9000	3,40,490.4	4,86,280.95
30	45	0.9	28.2	400	1,024.88	1,27,372.17	-0.3	25.4	4800	78,305.98	5,64,586.93
45	60.86	0	19.8	2200	29,895.11	1,57,267.28	-0.3	-0.3	6400	1,64,238.6	7,28,825.53

Chambal River from Chakarpura to Awari (Chain age 0.0 km –60.860 km)

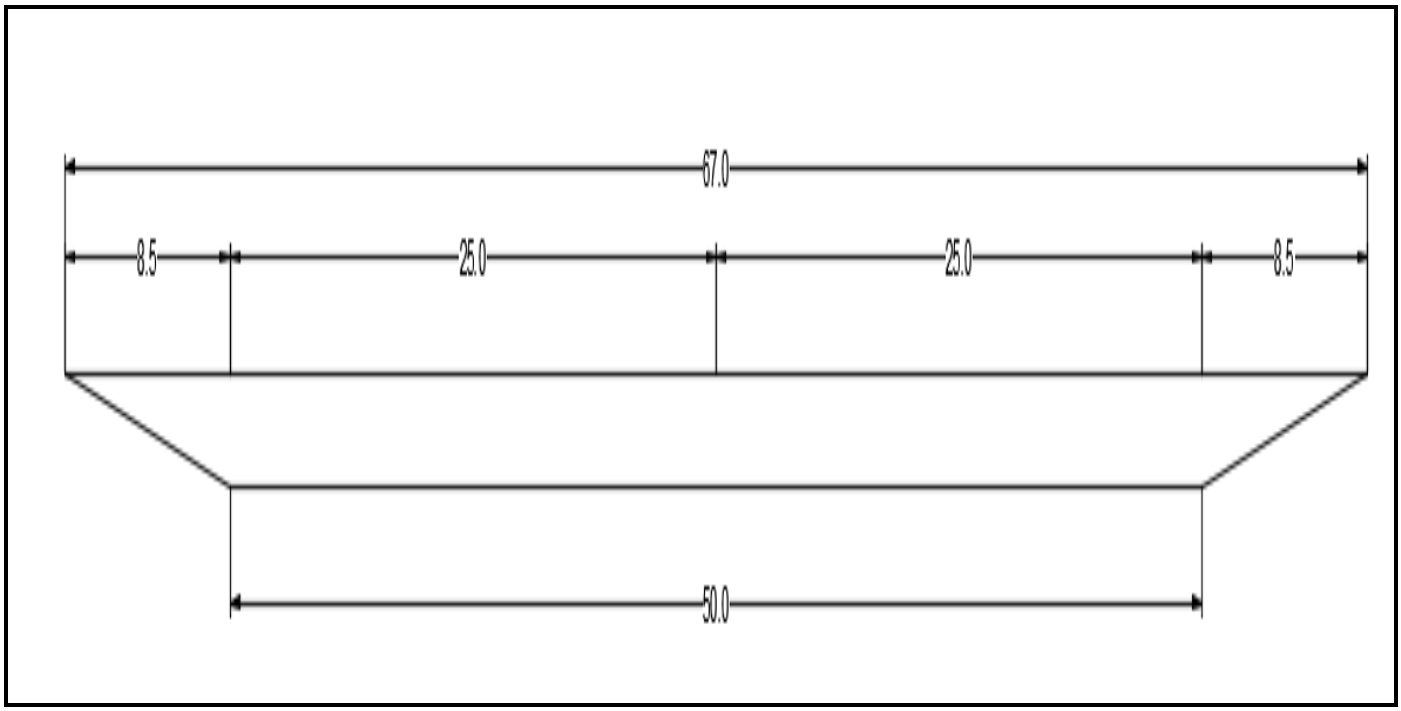
Class- II 1.4m



Chainage (km)		Observed					Reduced w.r.t. Sounding Datum				
From	To	Min. depth (m)	Max. depth (m)	Length of Shoal (m)	Dredging Qty. (cu.m.)	Accumulated Quantity	Min. Depth (m)	Max. Depth (m)	Length of Shoal (m)	Dredging Qty. (cu.m.)	Accumulated Quantity
0	15	0.1	13.6	2400	27,833.12	27,833.12	-0.3	7.2	5200	1,57,487.62	1,57,487.62
15	30	0	17.1	7000	2,10,514.22	2,38,347.34	-0.3	15.4	1060	5,91,245.1	7,48,732.72
30	45	0.9	28.2	800	2,943.77	2,41,291.11	-0.3	25.4	5400	1,45,422.35	8,94,155.07
45	60.680	0	19.8	2800	56,454.68	2,97,745.79	-0.3	-0.3	7000	2,61,394.8	11,55,549.87

Chambal River from Chakarpura to Awari (Chain age 0.0 km –60.860 km)

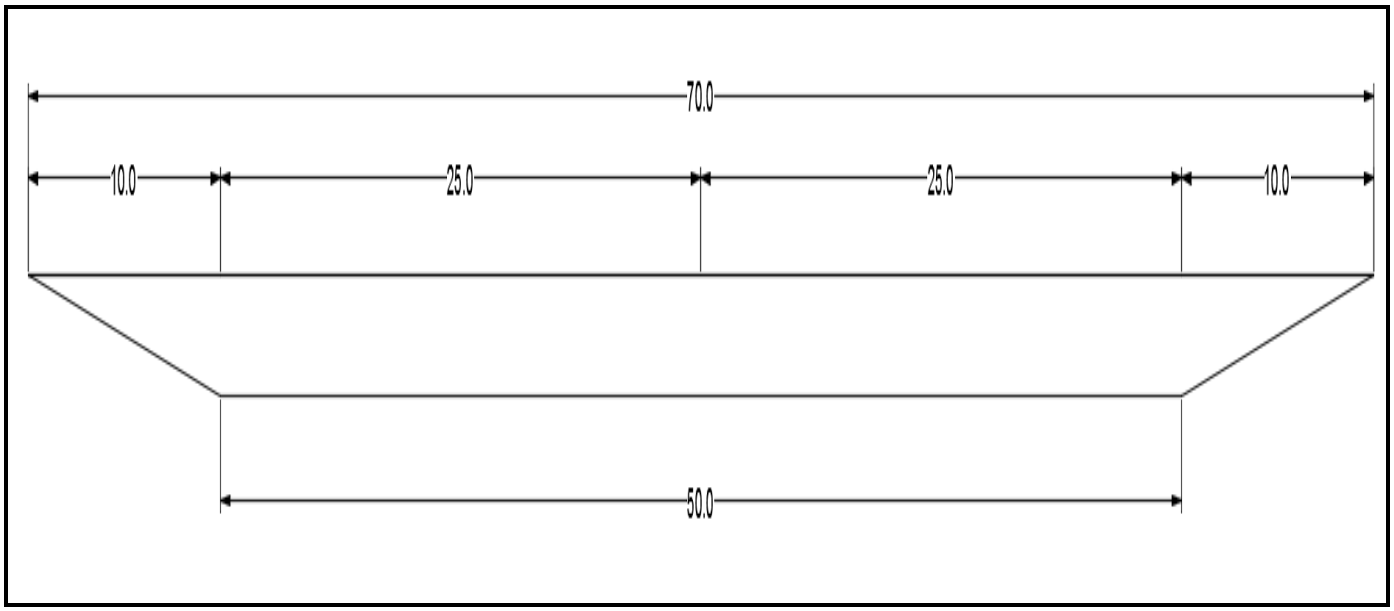
Class- III 1.7m



Chainage (km)		Observed					Reduced w.r.t. Sounding Datum				
From	To	Min. depth (m)	Max. depth (m)	Length of Shoal (m)	Dredging Qty. (cu.m.)	Accumulated Quantity	Min. Depth (m)	Max. Depth (m)	Length of Shoal (m)	Dredging Qty. (cu.m.)	Accumulated Quantity
0	15	0.1	13.6	3400	75,419.94	75,419.94	-0.3	7.2	7200	2,67,998.07	2,67,998.07
15	30	0	17.1	8000	3,79,589.54	4,55,009.48	-0.3	15.4	12000	9,02,389.89	11,70,387.96
30	45	0.9	28.2	800	7,201.47	4,62,210.95	-0.3	25.4	8200	2,73,516.34	14,43,904.3
45	60.860	0	19.8	2400	89,610.36	5,51,821.31	-0.3	-0.3	9000	3,98,822.54	18,42,726.84

Chambal River from Chakarpura to Awari (Chain age 0.0 km –60.860 km)

Class- IV2.0m



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.)	Accumalated Quantity	Min. Depth (m)	Max. Depth (m)	Length of Shoal (m)	Dredging Qty. (cu.m.)	Accumalated Quantity
0	15	0.1	13.6	4600	1,26,676.6	1,26,676.6	-0.3	7.2	7600	3,58,644.87	3,58,644.87
15	30	0	17.1	8000	5,11,097.37	6,37,773.97	-0.3	15.4	12600	11,01,971.76	14,60,616.63
30	45	0.9	28.2	1200	14,082.19	6,51,856.16	-0.3	25.4	9400	3,82,731.41	18,43,348.04
45	60.860	0	19.8	3200	1,25,640.89	7,77,497.05	-0.3	-0.3	9600	5,06,398.02	23,49,746.06

Section 6: Conclusion

The Chambal river is tributary of the Yamuna river in central India. The Detailed hydrographic survey was carried out forthe length of 60.860 from Chakarpura to Awari. The survey was conducted during the period fromJuly 2017 to August 2017.

Following are the observations:-

- Average width of the river is 216.50m
- Average slope of the river is 1:0.032
- Average discharge of the river is 233.645 Cu.m/s.
- Total 02 numbers of bridges were found and 02no's of bridges required to be modified for development of declared waterway in Class III.
- There is no jetty, cargo or tourism facilities are available in entire river stretch.
- There is no Major Industries along the river.
- Cross river ferry service is available at Chainage 5.0 & Chainage 12.5
- The Probable water availability in the river is for 250 no's of days.
- The dredging required for different classes are as follow.

Class	Reduced (Cu.m)
Class I	7,28,825.53
Class II	11,55,549.87
Class II	18,42,726.84
Class IV	23,49,746.06

The wildlife sanctuary full stretch is there which can be developed for tourism purpose. Waterways may be developed for class I.

Annexure - 1

Min. / max.depth, length of shoal per km-wise for different classification in the designed dredged channel Class-I for maintaining 1.2 m. Depth.

Chambal River Dredging Quantity for 1.2 M												
Observed							Reduced Depth (m) w.r.t. Sounding Datum (Avg. LWL)					
Chainage (km)		Min	Max	Length of Shoal (m)	Dredging Qty. (cu.m.) w.r.t. SD (Avg. LWL)	Accumulated Dredging Qty. (Cu. M.) w.r.t. SD	Min	Max	Length of Shoal (m)	Dredging Qty. (cu.m.) w.r.t. SD (Avg. LWL)	Accumulated Dredging Qty. (Cu. M.) w.r.t. SD
0	1	1	1.8	200	18.95	18.95	0	1.1	800	13,811.06	13,811.06
1	2	2	3.3	0	0	18.95	1.2	2.7	0	0	13,811.06
2	3	0.8	3.1	300	1,545.05	1564	0.1	2.7	800	12,399.39	26,210.45
3	4	1.2	3.4	0	0	1564	0.4	2.7	400	4,054.49	30,264.94
4	5	3.8	7.3	0	0	1564	3.2	6.1	0	0	30,264.94
5	6	5.2	8.2	0	0	1564	3.3	6.2	0	0	30,264.94
6	7	3.2	5.8	0	0	1564	1.7	4.7	0	0	30,264.94
7	8	3.4	7	0	0	1564	2	5	0	0	30,264.94
8	9	3	7.4	0	0	1564	1.5	5.4	0	0	30,264.94
9	10	0.9	5	200	468.75	2,032.75	-0.2	3.6	800	18,698.11	48,963.05
10	11	2.1	8.5	0	0	2,032.75	0.8	7.2	200	1,116.46	50,079.51
11	12	3.2	7.3	0	0	2,032.75	1.8	6.2	0	0	50,079.51
12	13	5.8	13.6	0	0	2,032.75	4.2	12	0	0	50,079.51
13	14	3.1	7.2	0	0	2,032.75	1.4	5.7	0	0	50,079.51
14	15	0.1	3.1	600	8,768.93	10,801.68	-0.3	1.7	1000	44,959.64	95,039.15
15	16	0.2	1.9	600	9,900.15	20,701.83	-0.3	0.5	1000	50,751.33	1,45,790.48
16	17	0.4	1.7	400	5,550.51	26,252.34	-0.3	0.4	1000	51,072.61	1,96,863.09
17	18	0.1	1.6	1000	13,855.38	40,107.72	-0.3	0.5	1000	52,422.76	2,49,285.85
18	19	0.7	3.3	200	1,648.44	41,756.16	-0.3	2.1	1000	27,722.52	2,77,008.37
19	20	0	2.8	1000	25,787	67,543.16	-0.3	1.5	1000	48,804.73	3,25,813.1
20	21	0	1.3	1000	27,514.68	95,057.84	-0.3	0.4	1000	52,738.2	3,78,551.3
21	22	0	1.2	1000	28,014.13	1,23,071.97	-0.3	-0.1	1000	54,772.88	4,33,324.18
22	23	0.7	2	400	3,275.32	1,26,347.29	-0.3	0.6	1000	33,503.19	4,66,827.37
23	24	2	5.6	0	0	1,26,347.29	0.1	3.9	600	7,505.58	4,74,332.95
24	25	4.9	13.7	0	0	1,26,347.29	1.5	11.8	0	0	4,74,332.95
25	26	4.7	17.1	0	0	1,26,347.29	3.1	15.4	200	1,401.23	4,75,734.18
26	27	2.3	4.5	0	0	1,26,347.29	0.6	2.6	400	4,649.34	4,80,383.52
27	28	2.4	7.8	0	0	1,26,347.29	0.8	4	200	1,497.03	4,81,880.55
28	29	2.3	5.6	0	0	1,26,347.29	0.2	3.7	400	2,986.06	4,84,866.61
29	30	3.6	6	0	0	1,26,347.29	1.8	4.3	0	0	4,84,866.61
30	31	2.7	4.9	0	0	1,26,347.29	0.6	2.9	200	1,414.34	4,86,280.95

Chambal River Dredging Quantity for 1.2 M											
Observed						Reduced Depth (m) w.r.t. Sounding Datum (Avg. LWL)					
Chainage (km)		Min	Max	Length of Shoal (m)	Dredging Qty. (cu.m.) w.r.t. SD (Avg. LWL)	Accumulated Dredging Qty. (Cu. M.) w.r.t. SD	Min	Max	Length of Shoal (m)	Dredging Qty. (cu.m.) w.r.t. SD (Avg. LWL)	Accumulated Dredging Qty. (Cu. M.) w.r.t. SD
31	32	4.4	16.1	0	0	1,26,347.29	2.5	14.3	0	0	4,86,280.95
32	33	5.5	19.4	0	0	1,26,347.29	3.7	17.2	0	0	4,86,280.95
33	34	2	8.3	0	0	1,26,347.29	0	6.4	400	3,751.83	4,90,032.78
34	35	1.9	4.1	0	0	1,26,347.29	0.1	2.8	800	12,593.37	5,02,626.15
35	36	2.2	28.2	0	0	1,26,347.29	0.6	25.4	200	765.48	5,03,391.63
36	37	3.3	25.4	0	0	1,26,347.29	1.6	23.6	0	0	5,03,391.63
37	38	2.5	3.7	0	0	1,26,347.29	0.5	2.1	400	2,320.68	5,05,712.31
38	39	2.5	3.8	0	0	1,26,347.29	0.6	2.2	400	3,093.86	5,08,806.17
39	40	3.4	5.9	0	0	1,26,347.29	1.5	3.9	0	0	5,08,806.17
40	41	2.2	6.5	0	0	1,26,347.29	0.5	4.6	400	2,172.86	5,10,979.03
41	42	3.8	9.5	0	0	1,26,347.29	2.3	8	0	0	5,10,979.03
42	43	1.1	14.6	200	528.6	1,26,875.89	0.8	11.9	400	6,209.96	5,17,188.99
43	44	0.9	3.3	200	496.28	1,27,372.17	-0.3	1.1	1000	38,364.95	5,55,553.94
44	45	2.1	4.2	0	0	1,27,372.17	0	2.3	800	9,032.99	5,64,586.93
45	46	6.5	16.3	0	0	1,27,372.17	4.4	13.8	0	0	5,64,586.93
46	47	6.5	15	0	0	1,27,372.17	4.3	13.5	0	0	5,64,586.93
47	48	2.4	6.9	0	0	1,27,372.17	0.3	4.5	800	7,497.12	5,72,084.05
48	49	3.3	8.5	0	0	1,27,372.17	1.1	5.7	200	707.51	5,72,791.56
49	50	2.6	8	0	0	1,27,372.17	0.5	5.9	200	702.66	5,73,494.22
50	51	1.1	7	200	16.27	1,27,388.44	-0.3	4.7	1000	35,280.38	6,08,774.6
51	52	2.1	6.7	0	0	1,27,388.44	0	4.3	800	12,051.04	6,20,825.64
52	53	2.3	9.2	0	0	1,27,388.44	0	7.1	400	3,544.38	6,24,370.02
53	54	8.7	17.8	0	0	1,27,388.44	5.9	14.9	0	0	6,24,370.02
54	55	6.7	18.6	0	0	1,27,388.44	4.8	15.2	0	0	6,24,370.02
55	56	3.4	10.1	0	0	1,27,388.44	1.4	8.2	0	0	6,24,370.02
56	57	2.4	7.8	0	0	1,27,388.44	0.6	5.4	600	4,461.78	6,28,831.8
57	58	6.6	18.3	0	0	1,27,388.44	4.2	15.8	0	0	6,28,831.8
58	59	1.7	19.8	400	3,299.27	1,30,687.71	0.3	17.8	600	10,717.09	6,39,548.89
59	60	0	1.6	800	1,4480.62	1,45,168.33	-0.3	0.0	1000	55,797.22	6,95,346.11
60	61	0	1.2	800	1,2098.95	1,57,267.28	-0.3	0.0	800	33,479.42	7,28,825.53
			Total			**1,57,267.28**		**Total**			**7,28,825.53**

Chambal River Dredging Quantity for 1.4 M											
Observed							Reduced Depth (m) w.r.t. Sounding Datum (Avg. LWL)				
Chainage (km)		Min	Max	Length of Shoal (m)	Dredging Qty. (cu.m.) w.r.t. SD (Avg. LWL)	Accumulated Dredging Qty. (Cu. M.) w.r.t. SD	Min	Max	Length of Shoal (m)	Dredging Qty. (cu.m.) w.r.t. SD (Avg. LWL)	Accumulated Dredging Qty. (Cu. M.) w.r.t. SD
0	1	1	1.8	400	1,865.43	1,865.43	0	1.1	1000	25,363.75	25,363.75
1	2	1.9	3.3	0	0	1,865.43	1.1	2.7	200	259.2	25,622.95
2	3	0.8	3.2	600	4,639.63	6,505.06	0.1	2.7	1000	22,299.14	47,922.09
3	4	1	3.4	200	630.68	7,135.74	0.3	2.8	600	9,776.01	57,698.1
4	5	3.6	7.5	0	0	7,135.74	3.1	6.3	0	0	57,698.1
5	6	4.9	8.1	0	0	7,135.74	3.3	6.3	0	0	57,698.1
6	7	3.2	5.9	0	0	7,135.74	1.6	4.6	0	0	57,698.1
7	8	3.4	6.9	0	0	7,135.74	2	5.2	0	0	57,698.1
8	9	2.7	7.3	0	0	7,135.74	1.4	5.3	0	0	57,698.1
9	10	0.9	5.1	400	2,900.56	10,036.3	-0.2	3.9	1000	29,080.47	86,778.57
10	11	2	8.7	0	0	10,036.3	0.8	7.2	400	3,474.17	90,252.74
11	12	3	8.3	0	0	10,036.3	1.6	7	0	0	90,252.74
12	13	5.4	13.6	0	0	10,036.3	3.6	12	0	0	90,252.74
13	14	3	7.3	0	0	10,036.3	1.4	5.8	0	0	90,252.74
14	15	0.1	3	800	17,796.82	27,833.12	-0.3	1.8	1000	67,234.88	1,57,487.62
15	16	0.1	1.9	1000	21,305.77	49,138.89	-0.3	0.5	1000	75,404.96	2,32,892.58
16	17	0.2	1.7	800	14,837.01	63,975.9	-0.3	0.3	1000	76,034.98	3,08,927.56
17	18	0.1	1.7	1000	26,329.88	90,305.78	-0.3	0.5	1000	77,629.8	3,86,557.36
18	19	0.7	3.3	600	7,122.6	97,428.38	-0.3	2.1	1000	43,000.75	4,29,558.11
19	20	0	2.9	1000	41,820.85	1,39,249.23	-0.3	1.6	1000	72,004.53	5,01,562.64
20	21	0	1.4	1000	45,092.23	1,84,341.46	-0.3	0.5	1000	77,886.32	5,79,448.96
21	22	0	1.2	1000	46,903.26	2,31,244.72	-0.3	-0.1	1000	80,736.77	6,60,185.73
22	23	0.7	2	600	7,102.62	2,38,347.34	-0.3	0.6	1000	53,478.14	7,13,663.87
23	24	2	5.8	0	0	2,38,347.34	0.1	3.9	800	13,207.58	7,26,871.45
24	25	4.7	13.8	0	0	2,38,347.34	1.5	11.9	0	0	7,26,871.45
25	26	4.3	17.1	0	0	2,38,347.34	2.6	15.4	400	2,611.41	7,29,482.86
26	27	2	4.5	0	0	2,38,347.34	0.4	2.6	600	10,186.17	7,39,669.03
27	28	2.4	7.8	0	0	2,38,347.34	0.6	4	400	3,057.31	7,42,726.34
28	29	2.2	5.6	0	0	2,38,347.34	0.2	3.6	400	6,006.38	7,48,732.72
29	30	3.4	6.3	0	0	2,38,347.34	1.6	4.3	0	0	7,48,732.72
30	31	2.5	4.8	0	0	2,38,347.34	0.6	3	400	5,159.65	7,53,892.37
31	32	4.2	16.8	0	0	2,38,347.34	2.4	15.2	0	0	7,53,892.37
32	33	5.2	19.4	0	0	2,38,347.34	3.7	17.1	0	0	7,53,892.37
33	34	2.1	8.2	0	0	2,38,347.34	-0.2	6.4	600	7,413.4	7,61,305.77

Chambal River Dredging Quantity for 1.4 M											
Observed							Reduced Depth (m) w.r.t. Sounding Datum (Avg. LWL)				
Chainage (km)		Min	Max	Length of Shoal (m)	Dredging Qty. (cu.m.) w.r.t. SD (Avg. LWL)	Accumulated Dredging Qty. (Cu. M.) w.r.t. SD	Min	Max	Length of Shoal (m)	Dredging Qty. (cu.m.) w.r.t. SD (Avg. LWL)	Accumulated Dredging Qty. (Cu. M.) w.r.t. SD
34	35	1.8	4.3	0	0	2,38,347.34	0	3.2	800	23,315.9	7,84,621.67
35	36	2.2	28.2	0	0	2,38,347.34	0.5	25.4	400	1,862.51	7,86,484.18
36	37	3.3	25.4	0	0	2,38,347.34	1.6	23.8	0	0	7,86,484.18
37	38	2.4	3.7	0	0	2,38,347.34	0.4	2.1	400	7,962.4	7,94,446.58
38	39	2.5	4	0	0	2,38,347.34	0.6	2.3	400	7,968.38	8,02,414.96
39	40	3.2	5.9	0	0	2,38,347.34	1.4	4	0	0	8,02,414.96
40	41	2.2	6.5	0	0	2,38,347.34	0.5	4.7	400	4,028.72	8,06,443.68
41	42	3.8	9.7	0	0	2,38,347.34	2.2	8.2	0	0	8,06,443.68
42	43	1.1	14.6	400	1,517.75	2,39,865.09	0.8	12	600	9,845.31	8,16,288.99
43	44	0.9	3.4	400	1,426.02	2,41,291.11	-0.3	1.2	1000	59,153.64	8,75,442.63
44	45	2	4.1	0	0	2,41,291.11	0	2.2	800	18,712.44	8,94,155.07
45	46	5.9	17.3	0	0	2,41,291.11	4.2	14.2	0	0	8,94,155.07
46	47	6.1	14.9	0	0	2,41,291.11	3.8	13.4	0	0	8,94,155.07
47	48	2.4	6.9	0	0	2,41,291.11	0.3	4.6	800	13,537.66	9,07,692.73
48	49	3.2	8.7	0	0	2,41,291.11	1.1	5.5	400	2,262.52	9,09,955.25
49	50	2.2	8.8	0	0	2,41,291.11	0.2	6.1	400	2,875.05	9,12,830.3
50	51	0.9	7.7	400	1,276.01	2,42,567.12	-0.3	4.7	1000	54,464.75	9,67,295.05
51	52	1.7	7.1	0	0	2,42,567.12	0	4.8	1000	22,713.97	9,90,009.02
52	53	2.3	9.9	0	0	2,42,567.12	0	7.1	400	7,261.08	9,97,270.1
53	54	7.9	17.9	0	0	2,42,567.12	5.9	15	0	0	9,97,270.1
54	55	5.7	18.7	0	0	2,42,567.12	4.2	15.2	0	0	9,97,270.1
55	56	3	10.8	0	0	2,42,567.12	1.4	8.3	0	0	9,97,270.1
56	57	2.4	7.9	0	0	2,42,567.12	0.5	5.8	600	10,514.38	10,07,784.48
57	58	6.1	18.4	0	0	2,42,567.12	3.7	15.6	0	0	10,07,784.48
58	59	1.2	19.8	600	5,102.14	2,47,669.26	0.3	17.8	600	16,569.1	10,24,353.58
59	60	0	1.5	1000	28,428.36	2,76,097.62	-0.3	0.0	1000	81,996.55	11,06,350.13
60	61	0	1.2	800	21,648.17	2,97,745.79	-0.3	0.0	800	49,199.74	11,55,549.87
			Total			**2,97,745.79**		**Total**			**11,55,549.87**

Chambal River Dredging Quantity for 1.7 M												
Observed							Reduced Depth (m) w.r.t. Sounding Datum (Avg. LWL)					
Chainage (km)		Min	Max	Length of Shoal (m)	Dredging Qty. (cu.m.) w.r.t. SD (Avg. LWL)	Accumulated Dredging Qty. (Cu. M.) w.r.t. SD	Min	Max	Length of Shoal (m)	Dredging Qty. (cu.m.) w.r.t. SD (Avg. LWL)	Accumulated Dredging Qty. (Cu. M.) w.r.t. SD
0	1	0.9	1.8	600	9,057.08	9,057.08	-0.1	1.1	1000	46,223.78	46,223.78
1	2	1.8	3.3	0	0	9,057.08	0.9	2.7	400	2,183.18	48,406.96
2	3	0.8	3.1	800	13,603.33	22,660.41	0.1	2.7	1000	39,694.76	88,101.72
3	4	1	3.4	400	4,759.42	27,419.83	0.3	2.7	1000	22,150.71	1,10,252.43
4	5	3.4	7.6	0	0	27,419.83	2.9	6.3	0	0	1,10,252.43
5	6	4.7	8.1	0	0	27,419.83	3.3	6.3	0	0	1,10,252.43
6	7	3.1	5.9	0	0	27,419.83	1.6	4.7	200	17.97	1,10,270.4
7	8	3.4	7	0	0	27,419.83	2	5.1	0	0	1,10,270.4
8	9	2.3	7.3	0	0	27,419.83	0.5	5.4	200	676.51	1,10,946.91
9	10	0.9	5.6	600	9,032.39	36,452.22	-0.2	4.5	1000	4,6297.46	1,57,244.37
10	11	1.8	8.8	0	0	36,452.22	0.6	7.2	600	8,970.3	1,66,214.67
11	12	2.8	9.6	0	0	36,452.22	1.4	8.5	200	0.22	1,66,214.89
12	13	4.1	13.6	0	0	36,452.22	1.5	12	200	303.9	1,66,518.79
13	14	2.8	7.4	0	0	36,452.22	1.1	5.9	400	950.64	1,67,469.43
14	15	0.1	3.1	1000	38,967.72	75,419.94	-0.3	1.9	1000	1,00528.6	2,67,998.07
15	16	0	1.8	1000	43,980.5	1,19,400.44	-0.3	0.5	1000	1,11,780.7	3,79,778.76
16	17	0.1	1.7	1000	35,946.12	1,55,346.56	-0.3	0.3	1000	1,12,631.5	4,92,410.23
17	18	0.1	1.6	1000	48,890.01	2,04,236.57	-0.3	0.5	1000	1,14,325.6	6,06,735.87
18	19	0.7	3.3	1000	17,623.43	2,21,860	-0.3	2.1	1000	68,869.22	6,75,605.09
19	20	0	2.9	1000	66,902.56	2,88,762.56	-0.3	1.6	1000	1,06,536	7,82,141.08
20	21	0	2.1	1000	73,025.08	3,61,787.64	-0.3	0.6	1000	1,14,124.3	8,96,265.4
21	22	0	1.2	1000	77,193.94	4,38,981.58	-0.3	-0.1	1000	1,18,015.9	10,14,281.34
22	23	0.6	2	1000	16,027.9	4,55,009.48	-0.3	0.6	1000	85,068.93	10,99,350.27
23	24	2	5.9	0	0	4,55,009.48	0.1	3.9	1000	24,705.81	11,24,056.08
24	25	4.5	13.8	0	0	4,55,009.48	1.5	12	200	222.25	11,24,278.33
25	26	3.7	17.1	0	0	4,55,009.48	1.1	15.4	400	4,771.69	11,29,050.02
26	27	1.7	4.5	0	0	4,55,009.48	0.1	2.6	1000	21,365.66	11,50,415.68
27	28	2.4	7.8	0	0	4,55,009.48	0.6	4	600	7,449.93	11,57,865.61
28	29	2.1	5.5	0	0	4,55,009.48	0.3	3.7	600	12,167.71	11,70,033.32
29	30	3.1	6.8	0	0	4,55,009.48	0.6	4.2	200	354.64	11,70,387.96
30	31	1.9	4.8	0	0	4,55,009.48	0.3	3	800	14,841.86	11,85,229.82
31	32	4	18.1	0	0	4,55,009.48	2.3	16.2	0	0	11,85,229.82
32	33	4.8	19.4	0	0	4,55,009.48	3.2	17.2	0	0	11,85,229.82

Chambal River Dredging Quantity for 1.7 M												
Observed							Reduced Depth (m) w.r.t. Sounding Datum (Avg. LWL)					
Chainage (km)		Min	Max	Length of Shoal (m)	Dredging Qty. (cu.m.) w.r.t. SD (Avg. LWL)	Accumulated Dredging Qty. (Cu. M.) w.r.t. SD	Min	Max	Length of Shoal (m)	Dredging Qty. (cu.m.) w.r.t. SD (Avg. LWL)	Accumulated Dredging Qty. (Cu. M.) w.r.t. SD
33	34	2	8.2	0	0	4,55,009.48	-0.3	6.5	800	14,499.33	11,99,729.15
34	35	1.7	4.6	0	0	4,55,009.48	0	3.4	1000	42,095.81	12,41,824.96
35	36	2.1	28.2	0	0	4,55,009.48	0.5	25.4	600	3,953.46	12,45,778.42
36	37	3.3	25.3	0	0	4,55,009.48	1.6	23.5	200	38.01	12,45,816.43
37	38	2.2	3.7	0	0	4,55,009.48	0.4	2.1	1000	22,112.52	12,67,928.95
38	39	2.5	4.3	0	0	4,55,009.48	0.6	2.5	1000	19,765.71	12,87,694.66
39	40	2.8	5.9	0	0	4,55,009.48	1	3.9	200	232.21	12,87,926.87
40	41	2.2	6.5	0	0	4,55,009.48	0.5	4.7	600	8,631.13	12,96,558.00
41	42	3.4	10.2	0	0	4,55,009.48	2	8.5	0	0	12,96,558.00
42	43	1.1	14.6	400	3,511.92	4,58,521.4	0.8	12	800	16,461.22	13,13,019.22
43	44	0.9	3.4	400	3,689.55	4,62,210.95	-0.3	1.1	1000	91,641.32	14,04,660.54
44	45	1.8	4.2	0	0	4,62,210.95	-0.1	2.3	1000	39,243.76	14,43,904.3
45	46	5.5	17.4	0	0	4,62,210.95	3.7	14.2	0	0	14,43,904.3
46	47	5.5	15.2	0	0	4,62,210.95	3.2	13.6	0	0	14,43,904.3
47	48	2.4	6.9	0	0	4,62,210.95	0.3	4.5	1000	23,910.25	14,67,814.55
48	49	3	8.7	0	0	4,62,210.95	1	5.8	600	5,670.72	14,73,485.27
49	50	1.8	9.3	0	0	4,62,210.95	0	6.1	600	11,187.39	14,84,672.66
50	51	0.4	7.9	400	6,745.00	4,68,955.95	-0.3	4.8	1000	83,467.72	15,68,140.38
51	52	1.7	7.6	0	0	4,68,955.95	-0.1	5.3	1000	42,986.41	16,11,126.79
52	53	1.8	10.2	0	0	4,68,955.95	0	7.2	800	16,243.39	16,27,370.18
53	54	7.3	17.8	0	0	4,68,955.95	5.2	14.9	0	0	16,27,370.18
54	55	4.4	18.6	0	0	4,68,955.95	2.7	15.2	0	0	16,27,370.18
55	56	2.7	10.9	0	0	4,68,955.95	0.8	8.3	200	574.24	16,27,944.42
56	57	2.4	8.1	0	0	4,68,955.95	0.5	6.3	1000	22,004.99	16,49,949.41
57	58	5.4	18.5	0	0	4,68,955.95	1.7	15.6	0	0	16,49,949.41
58	59	1.5	19.8	600	7,910.49	4,76,866.44	0.3	17.8	1000	25,413.5	16,75,362.91
59	60	0	1.5	1000	54,003.48	5,30,869.92	-0.3	0.0	1000	1,19,544.7	17,94,907.61
60	61	0	1.2	800	20,951.39	5,51,821.31	-0.3	0.0	800	47,819.23	18,42,726.84
			Total			**5,51,821.31**		**Total**			**18,42,726.84**

Chambal River Dredging Quantity for 2.0 M											
Observed							Reduced Depth (m) w.r.t. Sounding Datum (Avg. LWL)				
Chainage (km)		Min	Max	Length of Shoal (m)	Dredging Qty. (cu.m.) w.r.t. SD (Avg. LWL)	Accumulated Dredging Qty. (Cu. M.) w.r.t. SD	Min	Max	Length of Shoal (m)	Dredging Qty. (cu.m.) w.r.t. SD (Avg. LWL)	Accumulated Dredging Qty. (Cu. M.) w.r.t. SD
0	1	0.9	1.8	1000	19,839.94	19,839.94	-0.1	1.1	1000	61,416.64	61,416.64
1	2	1.8	3.3	200	12.33	19,852.27	0.9	2.7	400	6,117.84	67,534.48
2	3	0.8	3.1	1000	23,744.11	43,596.38	0.1	2.7	1000	55,501.14	1,23,035.62
3	4	1	3.4	600	11,880.93	55,477.31	0.3	2.7	1000	34,332.26	1,57,367.88
4	5	3.4	7.6	0	0	55,477.31	2.9	6.3	0	0	1,57,367.88
5	6	4.7	8.1	0	0	55,477.31	3.3	6.3	0	0	1,57,367.88
6	7	3.1	5.9	0	0	55,477.31	1.6	4.7	400	1,448.96	1,58,816.84
7	8	3.4	7	0	0	55,477.31	2	5.1	0	0	1,58,816.84
8	9	2.3	7.3	0	0	55,477.31	0.5	5.4	400	1,553.41	1,60,370.25
9	10	0.9	5.6	800	15,585.67	71,062.98	-0.2	4.5	1000	58,999.41	2,19,369.66
10	11	2.0	8.8	0	0	71,062.98	0.6	7.2	600	14,197.82	2,33,567.48
11	12	2.8	9.6	0	0	71,062.98	1.4	8.5	200	264.68	2,33,832.16
12	13	4.1	13.6	0	0	71,062.98	2.7	12	200	830.6	2,34,662.76
13	14	2.8	7.4	0	0	71,062.98	1.1	5.9	400	2,982.51	2,37,645.27
14	15	0.1	3.1	1000	55,613.62	1,26,676.6	-0.3	1.9	1000	1,20,999.6	3,58,644.87
15	16	0	1.8	1000	62,170.87	1,88,847.47	-0.3	0.5	1000	1,33,025.4	4,91,670.31
16	17	0.1	1.7	1000	54,323.44	2,43,170.91	-0.3	0.3	1000	1,33,934.4	6,25,604.66
17	18	0.1	1.6	1000	67,113.99	3,10,284.9	-0.3	0.5	1000	1,35,585.4	7,61,190.02
18	19	0.7	3.3	1000	26,777.43	3,37,062.33	-0.3	2.1	1000	86,848.15	8,48,038.17
19	20	0	2.9	1000	84,125.85	4,21,188.18	-0.3	1.6	1000	1,27,232.9	9,75,271.08
20	21	0	2.1	1000	92,117.92	5,13,306.1	-0.3	0.6	1000	1,35,216.6	11,10,487.65
21	22	0	1.2	1000	96,934.9	6,10,241.00	-0.3	0.0	1000	1,39,348.2	12,49,835.81
22	23	0.6	2	1000	27,532.97	6,37,773.97	-0.3	0.6	1000	1,05,340.9	13,55,176.69
23	24	2	5.9	0	0	6,37,773.97	0.1	3.9	1000	34,473.93	13,89,650.62
24	25	4.5	13.8	0	0	6,37,773.97	1.5	12	200	856.41	13,90,507.03
25	26	3.7	17.1	0	0	6,37,773.97	2.0	15.4	400	6,518.86	13,97,025.89
26	27	2.1	4.5	0	0	6,37,773.97	0.1	2.6	1000	30,390.75	14,27,416.64
27	28	2.4	7.8	0	0	6,37,773.97	0.6	4	800	13,794.57	14,41,211.21
28	29	2.1	5.5	0	0	6,37,773.97	0.3	3.7	800	17,934.83	14,59,146.04
29	30	3.1	6.8	0	0	6,37,773.97	0.6	4.2	400	1,470.59	14,60,616.63
30	31	2.0	4.8	0	0	6,37,773.97	0.3	3	1000	24,414.77	14,85,031.4

Chambal River Dredging Quantity for 2.0 M												
Observed							Reduced Depth (m) w.r.t. Sounding Datum (Avg. LWL)					
Chainage (km)		Min	Max	Length of Shoal (m)	Dredging Qty. (cu.m.) w.r.t. SD (Avg. LWL)	Accumulated Dredging Qty. (Cu. M.) w.r.t. SD	Min	Max	Length of Shoal (m)	Dredging Qty. (cu.m.) w.r.t. SD (Avg. LWL)	Accumulated Dredging Qty. (Cu. M.) w.r.t. SD
31	32	4	18.1	0	0	6,37,773.97	2.3	16.2	0	0	14,85,031.4
32	33	4.8	19.4	0	0	6,37,773.97	3.2	17.2	0	0	14,85,031.4
33	34	2	8.2	0	0	6,37,773.97	-0.3	6.5	1000	21,075.48	15,06,106.88
34	35	1.2	4.6	200	226.77	6,38,000.74	0	3.4	1000	56,273.4	15,62,380.28
35	36	2.1	28.2	0	0	6,38,000.74	0.5	25.4	600	5,704.64	15,68,084.92
36	37	3.3	25.3	0	0	6,38,000.74	1.6	23.5	600	2,366.91	15,70,451.83
37	38	2.2	3.7	0	0	6,38,000.74	0.4	2.1	1000	37,782.44	16,08,234.27
38	39	2.5	4.3	0	0	6,38,000.74	0.6	2.5	1000	32,641.8	16,40,876.07
39	40	2.8	5.9	0	0	6,38,000.74	1	3.9	400	1,401.95	16,42,278.02
40	41	2.2	6.5	0	0	6,38,000.74	0.5	4.7	800	13,225.42	16,55,503.44
41	42	3.4	10.2	0	0	6,38,000.74	2	8.5	0	0	16,55,503.44
42	43	1.1	14.6	400	5,217.72	6,43,218.46	0.8	12	1000	21,377.55	16,76,880.99
43	44	0.9	3.4	600	8,637.7	6,51,856.16	-0.3	1.1	1000	1,11,863.00	17,88,743.97
44	45	2.0	4.2	0	0	6,51,856.16	-0.1	2.3	1000	54,604.07	18,43,348.04
45	46	5.5	17.4	0	0	6,51,856.16	3.7	14.2	0	0	18,43,348.04
46	47	5.5	15.2	0	0	6,51,856.16	3.2	13.6	0	0	18,43,348.04
47	48	2.4	6.9	0	0	6,51,856.16	0.3	4.5	1000	32,963.34	18,76,311.38
48	49	3	8.7	0	0	6,51,856.16	1	5.8	600	9,164.61	18,85,475.99
49	50	2.0	9.3	0	0	6,51,856.16	0	6.1	800	18,509.39	19,03,985.38
50	51	0.4	7.9	600	13,843.35	6,65,699.51	-0.3	4.8	1000	1,01,773.3	20,05,758.71
51	52	1.2	7.6	200	19.26	6,65,718.77	-0.1	5.3	1000	56,926.83	20,62,685.54
52	53	2.0	10.2	0	0	6,65,718.77	0	7.2	1000	23,358.52	20,86,044.06
53	54	7.3	17.8	0	0	6,65,718.77	5.2	14.9	0	0	20,86,044.06
54	55	4.4	18.6	0	0	6,65,718.77	2.7	15.2	0	0	20,86,044.06
55	56	2.7	10.9	0	0	6,65,718.77	0.8	8.3	400	2,871.96	20,88,916.02
56	57	2.4	8.1	0	0	6,65,718.77	0.5	6.3	1000	32,168.79	21,21,084.81
57	58	5.4	18.5	0	0	6,65,718.77	2.1	15.6	0	0	21,21,084.81
58	59	1.5	19.8	600	10,412.16	6,76,130.93	0.3	17.8	1000	31,266.31	21,52,351.12
59	60	0	1.5	1000	72,954.65	7,49,085.58	-0.3	0.0	1000	1,40,994.8	22,93,345.9
60	61	0	1.2	800	28,411.47	7,77,497.05	-0.3	0.0	800	56,400.16	23,49,746.06
			Total			**7,77,497.05**		**Total**			**2349746.06**

Annexure - 2

Details of collected Water level of different gauge stations w.r.t. MSL:-

DATE	Tide Pole name	Chainage (km)	TIME	Tide Reading (m)	Zero of TP w.r.t. MSL (m)	Tide reading w.r.t. MSL (m)	SD value w.r.t. MSL (m)	CORRECTED TIDE (m)
				A	B	C = A+B	D	E = D-C
14.07.2017	CR TP 4	26.91	10:00	0.6	105.291	105.891	104.194	-1.697
			11:00	0.6	105.291	105.891	104.194	-1.697
			12:00	0.6	105.291	105.891	104.194	-1.697
			13:00	0.6	105.291	105.891	104.194	-1.697
			14:00	0.6	105.291	105.891	104.194	-1.697
			15:00	0.6	105.291	105.891	104.194	-1.697
			16:00	0.6	105.291	105.891	104.194	-1.697
			17:00	0.6	105.291	105.891	104.194	-1.697

DATE	Tide Pole name	Chainage (km)	TIME	Tide Reading (m)	Zero of TP w.r.t. MSL (m)	Tide reading w.r.t. MSL (m)	SD value w.r.t. MSL (m)	CORRECTED TIDE (m)
				A	B	C = A+B	D	E = D-C
14.07.2017	CR TP 5	37.819	10:00	0.37	105.687	106.057	104.546	-1.511
			11:00	0.37	105.687	106.057	104.546	-1.511
			12:00	0.37	105.687	106.057	104.546	-1.511
			13:00	0.37	105.687	106.057	104.546	-1.511
			14:00	0.37	105.687	106.057	104.546	-1.511
			15:00	0.37	105.687	106.057	104.546	-1.511
			16:00	0.36	105.687	106.047	104.546	-1.501
			17:00	0.36	105.687	106.047	104.546	-1.501

DATE	Tide Pole name	Chainage (km)	TIME	Tide Reading (m)	Zero of TP w.r.t. MSL (m)	Tide reading w.r.t. MSL (m)	SD value w.r.t. MSL (m)	CORRECTED TIDE (m)
				A	B	C = A+B	D	E = D-C
15.07.2017	CR TP 5	37.819	7:00	0.35	105.687	106.037	104.546	-1.491
			8:00	0.35	105.687	106.037	104.546	-1.491
			9:00	0.35	105.687	106.037	104.546	-1.491
			10:00	0.35	105.687	106.037	104.546	-1.491
			11:00	0.35	105.687	106.037	104.546	-1.491
			12:00	0.35	105.687	106.037	104.546	-1.491
			13:00	0.35	105.687	106.037	104.546	-1.491
			14:00	0.35	105.687	106.037	104.546	-1.491
			15:00	0.35	105.687	106.037	104.546	-1.491
			16:00	0.34	105.687	106.027	104.546	-1.481
			17:00	0.34	105.687	106.027	104.546	-1.481

DATE	Tide Pole name	Chainage (km)	TIME	Tide Reading (m)	Zero of TP w.r.t. MSL (m)	Tide reading w.r.t. MSL (m)	SD value w.r.t. MSL (m)	CORRECTED TIDE (m)
				A	B	C = A+B	D	E = D-C
15.07.2017	CR TP 6	47.136	8:00	0.46	106.417	106.877	104.847	-2.03
			9:00	0.46	106.417	106.877	104.847	-2.03
			10:00	0.46	106.417	106.877	104.847	-2.03
			11:00	0.46	106.417	106.877	104.847	-2.03
			12:00	0.46	106.417	106.877	104.847	-2.03
			13:00	0.46	106.417	106.877	104.847	-2.03
			14:00	0.46	106.417	106.877	104.847	-2.03
			15:00	0.46	106.417	106.877	104.847	-2.03
			16:00	0.45	106.417	106.867	104.847	-2.02
			17:00	0.45	106.417	106.867	104.847	-2.02

DATE	Tide Pole name	Chainage (km)	TIME	Tide Reading (m)	Zero of TP w.r.t. MSL (m)	Tide reading w.r.t. MSL (m)	SD value w.r.t. MSL (m)	CORRECTED TIDE (m)
				A	B	C = A+B	D	E = D-C
15.07.2017	CR TP 7	60.62	10:00	0.5	106.514	107.014	105.283	-1.731
			11:00	0.5	106.514	107.014	105.283	-1.731
			12:00	0.5	106.514	107.014	105.283	-1.731
			13:00	0.5	106.514	107.014	105.283	-1.731
			14:00	0.5	106.514	107.014	105.283	-1.731
			15:00	0.49	106.514	107.004	105.283	-1.721
			16:00	0.49	106.514	107.004	105.283	-1.721
			17:00	0.49	106.514	107.004	105.283	-1.721

DATE	Tide Pole name	Chainage (km)	TIME	Tide Reading (m)	Zero of TP w.r.t. MSL (m)	Tide reading w.r.t. MSL (m)	SD value w.r.t. MSL (m)	CORRECTED TIDE (m)
				A	B	C = A+B	D	E = D-C
17.07.2017	CR TP 2	8	10:00	0.7	104.022	104.722	103.583	-1.139
			11:00	0.7	104.022	104.722	103.583	-1.139
			12:00	0.7	104.022	104.722	103.583	-1.139
			13:00	0.7	104.022	104.722	103.583	-1.139
			14:00	0.7	104.022	104.722	103.583	-1.139
			15:00	0.7	104.022	104.722	103.583	-1.139
			16:00	0.7	104.022	104.722	103.583	-1.139
			17:00	0.7	104.022	104.722	103.583	-1.139

DATE	Tide Pole name	Chainage (km)	TIME	Tide Reading (m)	Zero of TP w.r.t. MSL (m)	Tide reading w.r.t. MSL (m)	SD value w.r.t. MSL (m)	CORRECTED TIDE (m)
				A	B	C = A+B	D	E = D-C
17.07.2017	CR TP 3	18.208	10:00	0.6	104.477	105.077	103.913	-1.164
			11:00	0.6	104.477	105.077	103.913	-1.164
			12:00	0.6	104.477	105.077	103.913	-1.164
			13:00	0.6	104.477	105.077	103.913	-1.164
			14:00	0.6	104.477	105.077	103.913	-1.164
			15:00	0.6	104.477	105.077	103.913	-1.164
			16:00	0.6	104.477	105.077	103.913	-1.164
			17:00	0.6	104.477	105.077	103.913	-1.164

DATE	Tide Pole name	Chainage (km)	TIME	Tide Reading (m)	Zero of TP w.r.t. MSL (m)	Tide reading w.r.t. MSL (m)	SD value w.r.t. MSL (m)	CORRECTED TIDE (m)
				A	B	C = A+B	D	E = D-C
17.07.2017	CR TP 4	26.91	10:00	0.58	105.291	105.871	104.194	-1.677
			11:00	0.58	105.291	105.871	104.194	-1.677
			12:00	0.58	105.291	105.871	104.194	-1.677
			13:00	0.58	105.291	105.871	104.194	-1.677
			14:00	0.58	105.291	105.871	104.194	-1.677
			15:00	0.58	105.291	105.871	104.194	-1.677
			16:00	0.58	105.291	105.871	104.194	-1.677
			17:00	0.58	105.291	105.871	104.194	-1.677

DATE	Tide Pole name	Chainage (km)	TIME	Tide Reading (m)	Zero of TP w.r.t. MSL (m)	Tide reading w.r.t. MSL (m)	SD value w.r.t. MSL (m)	CORRECTED TIDE (m)
				A	B	C = A+B	D	E = D-C
18.07.2017	CR TP 2	8	6:00	0.76	104.022	104.782	103.583	-1.199
			7:00	0.76	104.022	104.782	103.583	-1.199
			8:00	0.76	104.022	104.782	103.583	-1.199
			9:00	0.76	104.022	104.782	103.583	-1.199
			10:00	0.76	104.022	104.782	103.583	-1.199
			11:00	0.76	104.022	104.782	103.583	-1.199
			12:00	0.76	104.022	104.782	103.583	-1.199
			13:00	0.76	104.022	104.782	103.583	-1.199
			14:00	0.76	104.022	104.782	103.583	-1.199
			15:00	0.76	104.022	104.782	103.583	-1.199

DATE	Tide Pole name	Chainage (km)	TIME	Tide Reading (m)	Zero of TP w.r.t. MSL (m)	Tide reading w.r.t. MSL (m)	SD value w.r.t. MSL (m)	CORRECTED TIDE (m)
				A	B	C = A+B	D	E = D-C
18.07.2017	CR TP 1	0.235	6:00	0.85	102.987	103.837	103.332	-0.505
			7:00	0.85	102.987	103.837	103.332	-0.505
			8:00	0.85	102.987	103.837	103.332	-0.505
			9:00	0.85	102.987	103.837	103.332	-0.505
			10:00	0.85	102.987	103.837	103.332	-0.505
			11:00	0.85	102.987	103.837	103.332	-0.505
			12:00	0.85	102.987	103.837	103.332	-0.505
			13:00	0.85	102.987	103.837	103.332	-0.505
			14:00	0.85	102.987	103.837	103.332	-0.505
			15:00	0.85	102.987	103.837	103.332	-0.505

Annexure - 3

Details of bathymetric/topographic surveys carried out: -

Date of Survey	Type of Survey	Chainage	
		From (km)	To (km)
14-07-2017	Bathymetric	27.000	38.000
15-07-2017	Bathymetric	38.000	60.620
17-07-2017	Bathymetric	10.700	27.000
18-07-2017	Bathymetric	0.000	10.700
20-07-2017	Topographic	0.000	5.000
21-07-2017	Topographic	5.000	10.000
24-07-2017	Topographic	10.000	15.000
26-07-2017	Topographic	15.000	20.000
28-07-2017	Topographic	20.000	26.000
01-08-2017	Topographic	26.000	32.000
04-08-2017	Topographic	32.000	38.000
07-07-2017	Topographic	38.000	43.500
11-08-2017	Topographic	43.500	50.000
15-08-2017	Topographic	50.000	55.500
21-08-2017	Topographic	55.000	60.860

Annexure - 4

Details of bank Protection along the Bank

Both the banks are unprotected.

Annexure - 5

Details of Features across the Bank

Hanuman Tpura Chakkarnagar Bridge at 27.295km, Bhind Etawa Bridge at 60.910 km. High Tension Lines is atchainage27.255km,

Annexure - 6

Detailed methodology adopted for carrying out survey. Horizontal Control and Vertical Control

Horizontal Control

The survey boat used for the survey operations throughout the project was positioned by the Differential Global Positioning System (DGPS). Differential signal corrections for the DGPS system were automatically obtained by establishing high precision DGPS.

The Trimble DGPS Receiver was used for positioning of the depths. Thepositioncorrectiondetails were receivedfromthehigh precision DGPSandposition datawerefoundtobeindifferentialmodeand inorder.

For topographic survey horizontal control was carried out from Bench Mark situated at Yamuna River Bank Tatarpur. The Trimble base station was set up at same station and 24 hours observation was carried out. Raw data was collected and converted to Trimble RTX format for on line processing system. The BM position of YR 64, at Chambal confluence thus derived is:

Latitude:	**26° 26' 27.3463"N**
Longitude:	**079° 13' 21.0868" E**
RL Hgt:	**123.597m**

TBM was connected from the CWC Bench Mark at Yamuna River Bank Hamirpur value is 109.153 w.r.t. MSL.

Vertical Control

Vertical control was started from CWC Bench Mark at Yamuna River Bank Hamirpur value is 109.153m w.r.t. MSL.Graduated Tide Pole was installed at 10 Kilometre interval along the River as per specifications.

Water levels were measured at 60-minute interval during entire survey period.
At site, reference marks were also made and checked regularly during the survey period to ensure that the tide pole was not disturbed / dis-levelled.

Instrument used

Positioning System

1 X Trimble DGPS system

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 X HP Laptop
1 X Hypack Max version 6.2b Navigation & Data Logging Software
1 X Positioning & sensor interfaces Sufficient Paper Rolls

The survey was conducted in WGS-84 spheroid with no datum transformation.

Spheroid	WGS-84
Datum Transformation	None
Semi-major axis (a)	6378137.0000 m
Semi-minor axis (b)	6356752.3142 m
Eccentricity	0.0818 191909 28906
Inverse flattening (1/f)	298.257223563
Projection Parameters	
Grid Projection	Universal Transverse Mercator
Central Meridian (CM)	81 º East (Zone 44)
Origin Latitude (False Lat)	0.0º
Hemisphere	North
False Easting (FE)	500000.0 m
False Northing (FN)	0.0 m
Scale Factor on CM	0.999600
Units	International Meters

Single Beam Echo Sounder System

1 X Bathy 500 dual frequency Echo Sounder.
1 X Dual frequency transducer 33 kHz
& 210 kHz + mounting bracket & base plate.

Current Meter

1 X 2D Falmouth current meter.

Water Sampler & Bottom Sampler

1 X Water Sampler

1 X Van veen Grab

Topographic Survey

3 X Trimble PPK Controllers.

1 X Trimble PPK base.

1 X Nikon Auto level with tacky stave.

2 X Tide station

Methodology of Trimble *R3*

The Trimble® R3 GPS system is a complete L1 GPS post processed solution from the industry leader in GPS surveying technology. Combining an L1 GPS receiver and antenna, rugged handheld controller, and easy-to-use field and office software, the Trimble R3 system brings precise sub centimeter control to our site, establishes new localized control, and collects topographic data.

The base station is located at the known point which transmits the signals for handheld controllers. The controller observes the points for default 1 Hour time Period which is manually operated and stores that points.

Survey Vessel

A small Gemini boat made of inflatable rubber with draught 0.4 meter was used for collecting bathymetry data.

Annexure - 7

Photographs of equipment

Figure No.-01 Trimble DGPS

Figure No.-02 Bathy Echo Sounder

Figure No.-03 2D Falmouth current meter

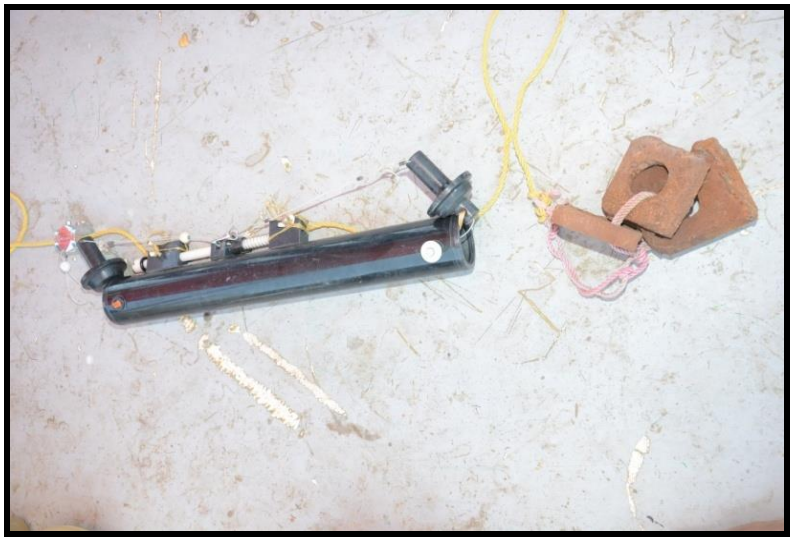


Figure No.-04 Water Sampler

Figure No.-05 Van veen Grab

Figure No.–06 Trimble R3

Figure No. -07 Sokkia Automatic Level

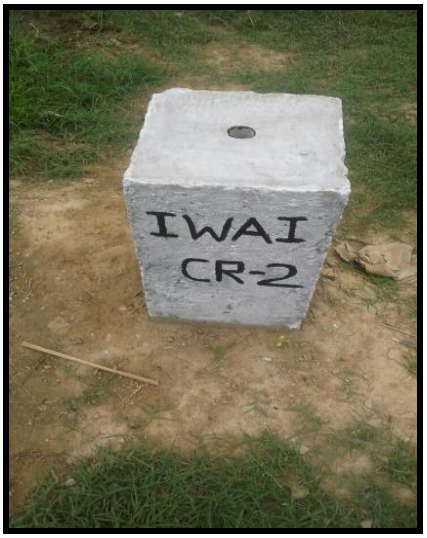
Annexure – 8

Bench Mark Forms

Bench Mark CR-01 at Chain age 0.155

BM Name	Easting(m)	Northing(m)	Latitude(N)	Longitude(E)	RL w.r.t. MSL(m)	Value w.r.t of SD (m)
CR-01	325327.675	2931865.574	26°29'47.5126"N	073°1'50.5100"E	117.492	14.16
	Pillar Established by : - New horizon surveys Date of Establishment – 05July 2017					
	Station Description :-					
	Benchmark is located near **Bhareh**. 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", "CR 01" and BM No. can be seen on the face of the pillar. 					
Life of Station :15Yrs		Datum: - WGS 84			**ZONE :44**	

Bench Mark CR-02 at Chain age 8.040

BM Name	Easting(m)	Northing(m)	Latitude(N)	Longitude(E)	RL w.r.t. MSL(m)	Value w.r.t of SD (m)
CR-02	319062.58	2929558.03	26°28'29.7144"N	073°11'05.4702"E	137.217	33.634
	Pillar Established by : - New horizon surveys Date of Establishment – 06 July 2017					
	Station Description :-					
	Benchmark is located near**Birori**. 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", "CR 02" and BM No. can be seen on the face of the pillar. 					
Life of Station :15Yrs		Datum: - WGS 84		**ZONE :44**		

Bench Mark CR-03 at Chain age 18.190

BM Name	Easting(m)	Northing(m)	Latitude(N)	Longitude(E)	RL w.r.t. MSL(m)	Value w.r.t of SD (m)
CR-03	317829.012	2936101.691	26°32'01.7407"N	073°10'17.5728"E	129.282	25.369
	Pillar Established by : - New horizon surveys Date of Establishment – 07 July 2017					
	Station Description :-					
	Benchmark is located near **Gopalpur**. 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", "CR 03" and BM No. can be seen on the face of the pillar. 					
Life of Station :15Yrs		Datum: - WGS 84		**ZONE :44**		

Bench Mark CR-04 at Chain age 26.985

BM Name	Easting(m)	Northing(m)	Latitude(N)	Longitude(E)	RL w.r.t. MSL(m)	Value w.r.t of SD (m)
CR-04	309505.5	2936861.9	26°32'22.4931"N	073°05'16.5394"E	121.927	17.733
	Pillar Established by : - New horizon surveys Date of Establishment – 07 July 2017					
	Station Description :-					
	Benchmark is located near **Hanumantpur**. 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", "CR 04" and BM No. can be seen on the face of the pillar. 					
Life of Station :15Yrs		Datum: - WGS 84		**ZONE :44**		

Bench Mark YR-05 at Chain age 37.828

BM Name	Easting(m)	Northing(m)	Latitude(N)	Longitude(E)	RL w.r.t. MSL(m)	Value w.r.t of SD (m)
CR-05	302641.029	2944029.157	26°36'11.9379"N	073°01'04.6036"E	124.937	20.391
	Pillar Established by : - New horizon surveys Date of Establishment – 08 July 2017					
	Station Description :-					
	Benchmark is located near **Barecha**. 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", "CR 05" and BM No. can be seen on the face of the pillar. 					
Life of Station :15Yrs		Datum: - WGS 84		**ZONE :44**		

Bench Mark CR-06 at Chain age 47.298

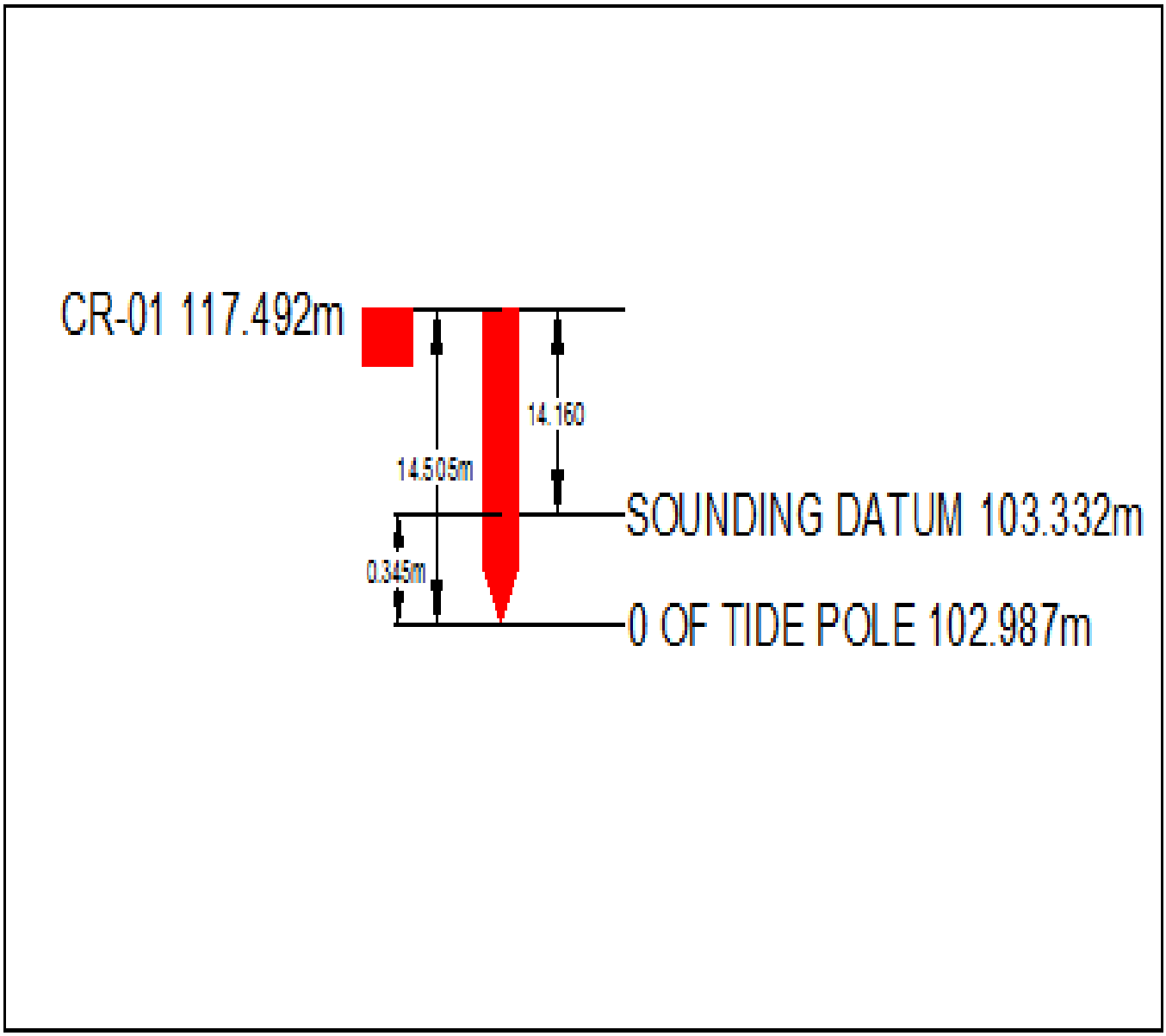
BM Name	Easting(m)	Northing(m)	Latitude(N)	Longitude(E)	RL w.r.t. MSL(m)	Value w.r.t of SD (m)
CR-06	301444.8	2952171.8	26°40'35.8461"N	073°00'16.7790"E	137.172	32.325
	Pillar Established by : - New horizon surveys Date of Establishment – 08 July 2017					
	Station Description :-					
	Benchmark is located near **Gaati**. 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", "CR 06" and BM No. can be seen on the face of the pillar. 					
Life of Station :15Yrs		Datum: - WGS 84		**ZONE :44**		

Bench Mark YR-07 at Chain age 60.620

BM Name	Easting(m)	Northing(m)	Latitude(N)	Longitude(E)	RL w.r.t. MSL(m)	Value w.r.t of SD (m)
YR-07	295042.4	2954786.8	26°41'57.4845"N	072°56'23.7474"E	125.994	20.711
	Pillar Established by : - New horizon surveys Date of Establishment – 09 July 2017					
	Station Description :-					
	Benchmark is located near **Awari**. 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", "CR 07" and BM No. can be seen on the face of the pillar. 					
Life of Station :15Yrs		Datum: - WGS 84			**ZONE :44**	

Annexure – 9

Levelling calculations and Levelling Diagram



Leveling From B.M. 01 to Tide Pole

Date:- 18.07.2017			**Location:-Bhareh**		
	Back Site			**Forward Site**	
1	C	0.255		C	3.290
2	C	2.295		C	1.530
3	C	1.300		C	1.900
4	C	0.395		C	3.525
5	C	0.515		C	3.860
6	C	0.725		C	3.285
7	C	1.770		C	3.345
	Back Site Total	**7.255**		**Forward Site Total**	**20.735**

Bench Mark Value	**117.492**	**Tachystave kept at 1.025m at Tide Pole**	**1.025**
add : Back Site Total	**7.255**	**add : Forward Site Total**	**20.735**
	124.747		**21.760**

zero of the Tide Pole	**124.747**	**-**	**21.76**
	102.987		
Water Level	**102.987**	**+**	**0.85**
	103.837		

Leveling From B.M. 02 to Tide Pole					
Date:- 17.07.2017			**Location:-Birori**		
	Back Site			**Forward Site**	
1	C	1.430		C	0.250
2	C	1.950		C	2.510
3	C	0.130		C	3.660
4	C	0.130		C	3.650
5	C	0.115		C	3.935
6	C	0.120		C	3.875
7	C	0.250		C	3.785
8	C	0.125		C	2.990
9	C	0.135		C	3.950
10	C	0.460		C	3.185
11	C	0.245		C	3.210
12	C	0.755		C	3.240
	Back Site Total	**5.845**		**Forward Site Total**	**38.240**
Bench Mark Value		**137.217**	**Tachystave kept at 0.8m at Tide Pole**		**0.800**
add : Back Site Total		**5.845**	**add : Forward Site Total**		**38.240**
		143.062			**39.040**
zero of the Tide Pole		**143.062**	**-**	**39.04**	
		104.022			
Water Level		**104.022**	**+**	**0.7**	
		104.722			

Leveling From B.M. 03 to Tide Pole					
Date:- 17.07.2017			Location:- Gopalpur		
	Back Site			Forward Site	
1	C	0.455		C	3.360
2	C	0.890		C	2.138
3	C	1.260		C	1.310
4	C	0.380		C	4.930
5	C	0.210		C	2.337
6	C	0.480		C	3.550
7	C	0.350		C	3.615
8	C	0.360		C	3.845
9	C	0.185		C	3.590
	Back Site Total	**4.570**		**Forward Site Total**	**28.675**
Bench Mark Value		**129.282**	**Tachystave kept at 0.7m at Tide Pole**		**0.700**
add : Back Site Total		**4.570**	**add : Forward Site Total**		**28.675**
		133.852			**29.375**
zero of the Tide Pole		**133.852**	**-**	**29.375**	
		104.477			
Water Level		**104.477**	**+**	**0.6**	
		105.077			

Leveling From B.M. 04 to Tide Pole					
Date:- 17.07.2017			**Location:-Hanumantpur**		
	Back Site			**Forward Site**	
1	C	0.449		C	2.569
2	C	0.442		C	2.691
3	C	0.393		C	2.912
4	C	0.246		C	3.764
5	C	0.450		C	2.942
6	C	0.425		C	2.053
7	C	0.645		C	2.055
	Back Site Total	**3.050**		**Forward Site Total**	**18.986**
Bench Mark Value		**121.927**	**Tachystave kept at 0.7m at Tide Pole**		**0.700**
add : Back Site Total		**3.050**	**add : Forward Site Total**		**18.986**
		124.977			**19.686**
zero of the Tide Pole		**124.977**	**-**	**19.686**	
		105.291			
Water Level		**105.291**	**+**	**0.6**	
		105.891			

Leveling From B.M. 05 to Tide Pole					
Date:- 15.07.2017			**Location:-Barecha**		
	Back Site			**Forward Site**	
1	C	0.515		C	3.825
2	C	0.210		C	3.980
3	C	0.260		C	4.385
4	C	0.100		C	4.220
5	C	0.400		C	3.525
	Back Site Total	**1.485**		**Forward Site Total**	**19.935**
Bench Mark Value		**124.937**	**Tachystave kept at 0.8m at Tide Pole**		**0.800**
add : Back Site Total		**1.485**	**add : Forward Site Total**		**19.935**
		126.422			**20.735**
zero of the Tide Pole		**126.422**	**-**	**20.735**	
		105.687			
Water Level		**105.687**	**+**	**0.37**	
		106.057			

Leveling From B.M. 06 to Tide Pole					
Date:- 15.07.2017			**Location:-Gaati**		
	Back Site			**Forward Site**	
1	C	0.235		C	3.810
2	C	0.040		C	3.760
3	C	0.060		C	4.490
4	C	0.095		C	3.265
5	C	0.235		C	3.220
6	C	0.200		C	4.130
7	C	0.375		C	4.270
8	C	0.675		C	4.300
9	C	1.265		C	1.990
	Back Site Total	**3.180**		**Forward Site Total**	**33.235**
Bench Mark Value		**137.172**	**Tachystave kept at 0.7m at Tide Pole**		**0.700**
add : Back Site Total		**3.180**	**add : Forward Site Total**		**33.235**
		140.352			**33.935**
zero of the Tide Pole		**140.352**	**-**	**33.935**	
		106.417			
Water Level		**106.417**	**+**	**0.46**	
		106.877			

Leveling From B.M. 07 to Tide Pole					
Date:- 15.07.2017			**Location:-Awari**		
	Back Site			**Forward Site**	
1	C	0.315		C	2.810
2	C	0.220		C	2.820
3	C	0.465		C	2.805
4	C	0.320		C	3.955
5	C	0.160		C	4.170
6	C	0.235		C	4.035
	Back Site Total	**1.715**		**Forward Site Total**	**20.595**
Bench Mark Value		**125.994**	**Tachystave kept at 0.6m at Tide Pole**		**0.600**
add : Back Site Total		**1.715**	**add : Forward Site Total**		**20.595**
		127.709			**21.195**
zero of the Tide Pole		**127.709**	**-**	**21.195**	
		106.514			
Water Level		**106.514**	**+**	**0.5**	
		107.014			

Annexure - 10

Soil Sample

Sl No.	Specific Gravity	Fine Gravel In % (20 mm to 4.75 mm)	Coarse Sand In % (4.75 mm to 2.00 mm)	Cu	Cc	Silt Size In % (0.075 mm to 0.002 mm)	Clay Size In % (<0.002 mm)
CR 01	2.65	0	95	2.095	1.251	5	5
CR 02	2.63	3	37	7.400	2.055	54	6
CR 03	2.58	0	22	27.857	0.847	65	13
CR 04	2.65	0	96	2.071	0.985	4	4
CR 05	2.62	0	3	11.786	2.061	84	13
CR 06	2.67	0	2	11.042	2.908	90	8
CR 07	2.61	10	22	10.000	2.875	62	6

Annexure – 11

Water Samples

S.NO	pH	UNITS	TOTAL DEPTH (m)	SEDIMENT CONCENTRATION (ppm) AT MID-DEPTH
CR 01	7.39	1	1.2	63
CR 02	7.48	1	5.0	54
CR 03	7.56	1	1.2	39
CR 04	7.69	1	4.4	178
CR 05	7.40	1	3.4	629
CR 06	6.84	1	5.8	54
CR 07	7.27	1	1.4	456

Annexure 12

Calibration Certificate

N.K.TRADING CO.

Scientific & survey instrument repairers & suppliers

Automatic Level, Dumpy Level, Tilting Level, Transite Theodolite; Micro; Optic Theodolite

Impoted Instrument Sokkia, Wild, Kern, Zeiss & Civil Lab Equipment

A-1, Om Shivsai C.H.S.,Near Fish Market,Vasantrao Naik Highway,Sion(E),Mumbai No.-400 022

Tel.:24013926 Mob.9821341462 E-mail: nkt1975@gmail.com

Ref: NKT/1215 DATE:01.03.2016

TEST REPORT

= AUTO LEVEL =

CLIENT	M/S NEW HORIZON SURVEYS
EQUIPMENT DETAILS	AUTO LEVEL
MAKE	TOPCON
TYPE	ATG6
SR NO	8F3898
DATE OF CALIBRATION	01.03.2016
VALIDITY	06 month's time
DUE DATE OF CALIBRATION	01.08.2016

THIS IS TO CERTIFY THAT NIL WAS CHECKED BY AS ORDER

1) AUTO LEVEL WAS KEPT ON ADJUSTABALE STAND.

2) READING CHECKED BY FOCUSSING TELESCOPE ON COLLIMATOR "A" SIDE.

3) INSTRUMENT ROTATED 180 DEGREES.

4) READING CHECKED BY FOCUSSING ON COLLIMATOR "B" SIDE.

5) ERROR FOUND NIL –HENCE INSTRUMENT IN PERFECT WORKING CONDITION.

N.K. TRADING CO.

PROPRIETOR

Standard Product Certificate Report

S/N: 1992

1400 RT. 28A, CATAUMET, MA 02534-0315

Date : 11.12.2015

CERTIFICATE OF COMPLIANCE

This is to certify that the subject system has been electrically and mechanically tested and inspected in compliance to applicable drawings.

Subject system was produced in accordance with Quality procedures and practices at FSI.

PART #	Description
2ACM-CBP-S	2DACM 200DBAR

- ☒ Final Acceptance Test
- ☒ Compass Calibration
- ☒ Tilt Calibration
- ☒ Velocity Calibration
- ☒ Sea Temperature Calibration
- ☒ Certification of Instrument Functioning

FALMOUTH SCIENTIFIC INC.

QUALITY ASSURANCE — 11.12.2015 DATE

Annexure - 13

Field Photographs

BRIDGE CH 27.312 km

CARRY OUT BATHYMETRIC SURVEY

BRIDGE CH 60.953 km

LEVELLING OF TIDE POLE

LEVELLING OF TIDE POLE

RIVER BANK

RIVER BANK

RIVER BANK

STEEP CUT

RIVER BANK

CROCODILE

CROCODILE

CROCODILE

Annexure – 14

Survey Chart Scheming Index and chart details:-

Sl. No.	Chart No.	Chainage (from ..... km to .... km)	Location (from .... to .....)	Scale	Size of the Chart
1	NHS/IWAI/CR/DS/CA/2017-18/01	0.000 to 6.400	Chakarpura to Bihar	1:5000	A0
2	NHS/IWAI/CR/DS/CA/2017-18/01	6.400 to 12.400	Bihar to Bansari	1:5000	A0
3	NHS/IWAI/CR/DS/CA/2017-18/01	12.400 to 18.400	Bansari to PiproliGadhiya	1:5000	A0
4	NHS/IWAI/CR/DS/CA/2017-18/01	18.400 to 23.700	PiproliGadhiya toHanumantpur	1:5000	A0
5	NHS/IWAI/CR/DS/CA/2017-18/01	23.700 to 28.100	Hanumantpur to Chakarnagar	1:5000	A0
6	NHS/IWAI/CR/DS/CA/2017-18/01	28.100 to 33.400	Chakarnagar to BindwanKalan	1:5000	A0
7	NHS/IWAI/CR/DS/CA/2017-18/01	33.400 to 39.000	BindwanKalan to KandhesiDhar	1:5000	A0
8	NHS/IWAI/CR/DS/CA/2017-18/01	39.000 to 45.200	KandhesiDhar to Gaati	1:5000	A0
9	NHS/IWAI/CR/DS/CA/2017-18/01	45.200 to 51.200	Gaati to Saraya	1:5000	A0
10	NHS/IWAI/CR/DS/CA/2017-18/01	51.200 to 60.860	Saraya to Awari	1:5000	A0