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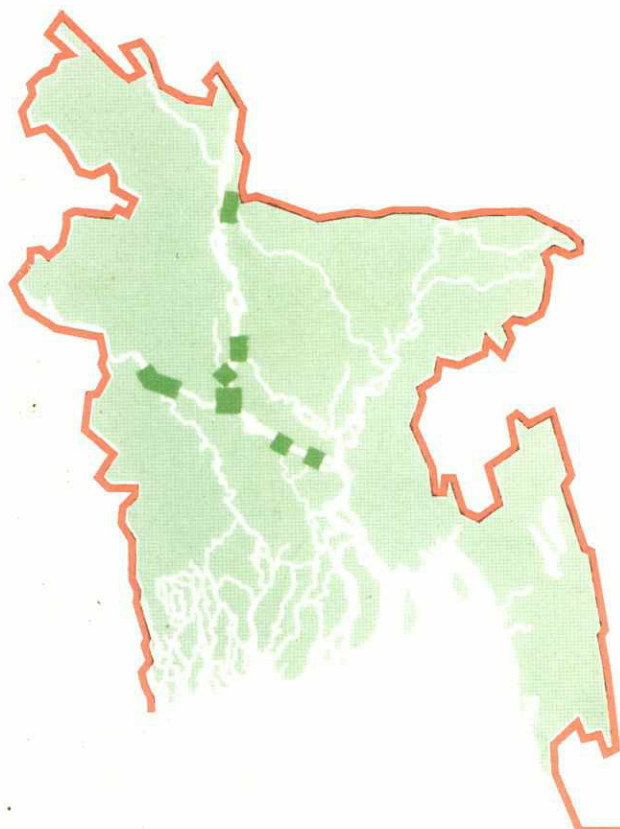
# GOVERNMENT OF BANGLADESH FLOOD PLAN COORDINATION ORGANIZATION

## FAP 24 RIVER SURVEY PROJECT

BN-724  
A-875(1)

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### Land Survey Water Level Gauging



DELFT HYDRAULICS  
DANISH HYDRAULIC INSTITUTE  
OSIRIS  
HYDROLAND  
APPROTECH

Project ALA/90/04 — Commission of the European Communities



# Land Survey Water Level Gauging



MFN-2529  
24-02  
C-2

June 1993



July 4, 1993

Chief Engineer  
Flood Plan Coordination Organization (FPCO)  
7 Green Road, Dhaka

Attention : Mr. Afzalur Rahman  
Superintending Engineer

Subject : Report on Water Level Gauging  
Our ref : RSP/9.1/455

Dear Sir,

Please find enclosed 20 (twenty) copies of the report on the checking of the BWDB water level gauges. In case you require more copies please inform us. We would like to ask you to arrange for distribution among the parties concerned.

We are awaiting the approval of the report by the FPCO and/or the BWDB.

Thanking you.

Yours sincerely,

Fred G. Koch  
Acting Team Leader

cc: Mr. A. Goodwin, Counsellor  
Delegation of CEC, Dhaka

# LAND SURVEY : WATER LEVEL GAUGING

## Contents

	Page
1 Introduction . . . . .	01
2 Bench-mark networks . . . . .	04
3 Site inspection . . . . .	06
3.1 Elevation of bench-mark . . . . .	06
3.2 Connection of bench-marks . . . . .	07
3.3 Location of bench-marks . . . . .	08
3.4 Proposed improvements . . . . .	10
4 Zero values of gauges . . . . .	11
4.1 Variation of gauge zero's . . . . .	11
4.2 Recommendations . . . . .	14

## ANNEXURES

Annexure	1	Proposal for complementary activities
Annexure	2	Inspection reports
Annexure	3	Location of gauging stations



## 1. Introduction

This report deals with the verification of zero levels of 47 BWDB water-level gauges as described in the FAP 24 1° Interim Report of February 1993 (Annexure 2, Section 2.9.4). The gauges are listed in Table 1.1, and their locations are shown in Figure 1.1. The zero level of gauges is determined by levelling the gauge to FPCO approved bench-marks. The checking consists of comparing the thus obtained zero level with the zero level as used by the gauge reader.

Three stages can be distinguished for this checking:

- 1) Site visit to check if the information of the FPCO supplied bench-marks corresponds with the situation in the field (Chapter 3).
- 2) If bench-marks are found to be in accordance with the description as supplied by FPCO and in a good condition, levelling between bench-mark and gauge is carried out (Chapter 4).
- 3) In all other cases a proposal is sent to the FPCO on how to improve the situation either by replacement, re-levelling or construction of new bench-marks (Annexure 1).

The results of the inspection of the stations are summarized in so-called inspection reports, having an agreed format. These reports are presented in Annexure 2. Location maps of the gauging stations are presented in Annexure 3.

The field work was executed in the period January to August 1993 by sub-contractor Hydroland under the guidance and supervision of an expatriate land surveyor from Osiris.

<u>Brahmaputra/Jamuna</u>			<u>Old Brahmaputra</u>		
1	45	Noonkhawa	1	225	Jamalur
2	45.5	Chilmari	2	228.5	Mymensingh
3	46	Kamarjani			
4	46.9L	Bahadurabad			
5	46.9R	Fulcharighat			
6	48	Jagannathganj			
7	49.A	Kazipur			
8	49	Serajganj			
9	50	Porabari			
10	50.3	Mathura			
11	50.6	Teota			
12	15.5	Mathurapara			
<u>Ganges</u>			<u>Arial Khan</u>		
1	88	Rampur Boalia	1	9A	Off-take of Arial Khan
2	89	Sardah			
3	90	Hardinge Bridge			
4	91	Talbaria			
5	91.1	Sengram			
6	92.1	Mahendrapur			
<u>Padma</u>			<u>Gorai</u>		
1	1.9L	Baruria	1	99	Gorai railway bridge
2	91.9R	Goalunda			
3	93.42	Bhagyakul			
4	93.5L	Mawa			
5	94	Tarpasha			
6	95	Sureshwar			
<u>Dhaleshwari</u>			<u>Upper Meghna including Kushiya</u>		
1	68	Tilly	1	266	Kanaighat
			2	267	Sylhet
			3	268	Chattak
			4	269	Sunamganj
			5	270	Markuli
			6	271	Ajmiriganj
			7	272	Madna
			8	272.1	Austagram
			9	273	Bhairab Bazar
			10	274	Narsingdi
			11	275	Baidder Bazar
			12	275.5	Meghna Ferryghat
			13	276	Satnal
			14	277	Chandpur
			15	172	Amalshid
			16	173	Sheola
			17	174	Fenchuganj
			18	175.5	Sherpur

Note: - first number is map reference (Figure 1.1)  
- second number is BWDB reference number

Table 1.1 List of BWDB gauges

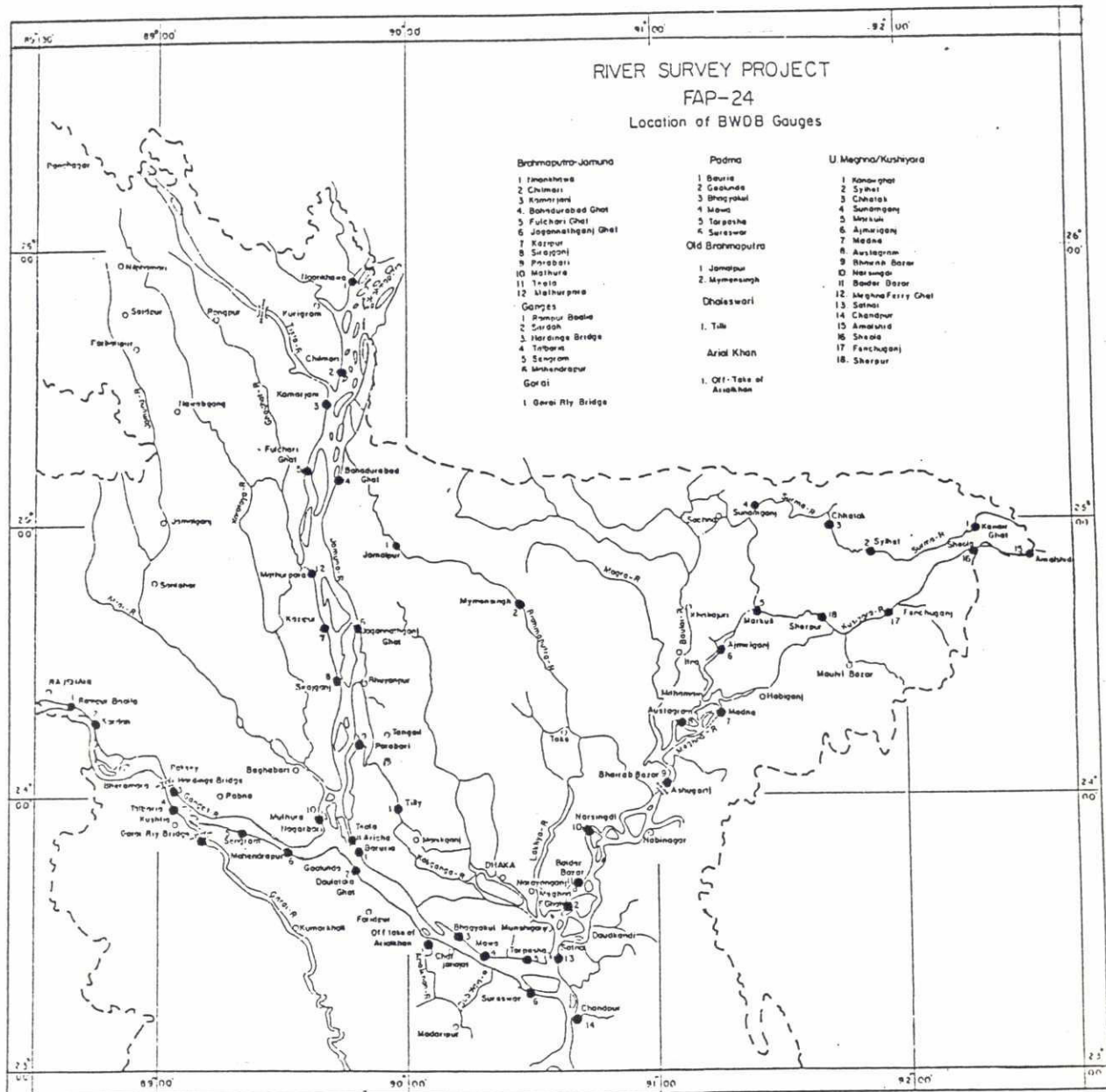


Figure 1.1 Locations of BWDB gauges



## 2. Bench-mark networks

### Survey of Bangladesh (SoB)

During site visits throughout the country SoB pillars were found which have been established under the Survey of Bangladesh project "Strengthening of Capability of Survey of Bangladesh in Geodesy" in cooperation with Japan (JICA). In many cases these bench-marks and survey marks could be useful for the FAP 24 project. Although nothing was known about the status and availability of data regarding these points when the site visits were made, survey crews were instructed to incorporate these points. This enables to make a check afterwards whenever data might become available.

### BWDB

BWDB bench-marks were officially supplied by the FPCO to the project. Distinction is made between Bench-marks (BM) and Temporary Bench-marks (TBM), the latter being of a lower order. As far as feasible the BWDB bench-marks are used for the levelling of the staff gauges. Site visits have shown that in some cases BM's are in poor condition or not anymore present. In such cases the use of a bench-mark from another network or the construction of a new bench-mark is proposed. Another problem encountered that often the officially supplied data did not correspond with the data as supplied by the gauge readers or local concerned officials.

### FINNMAP

FINNMAP established recently a network of Bench-marks (FMBM). The node of points consists of two parts: Northern part roughly around the Jamuna/Brahmaputra and a coastal part along the Padma and to the south of the Padma. The northern part was officially supplied to the project by the FPCO. For the southern part a request has been sent to the FPCO to supply the required data. All gauges connected to these BM's can be regarded as reliable. Whenever possible connection of BWDB BM's to this network was carried out.

### FAP 6

FAP 6 project is also involved in levelling water gauges in particular in the north eastern region of Bangladesh. They were consulted to avoid any duplication of work between FAP 6 and FAP 24.

Checking of water-level stations will not be carried out by FAP 6 before the establishment of a second order levelling network. The works for this network have only just started and would not be finished within one year. Consequently, checking of gauges would certainly not start within one year.

In order not to delay the works on the FAP 24 project it was decided to check the zero level values of the gauges with the nearest available existing BWDB BM's or TBM's. After connection of BM's and TBM's to the second order levelling network by FAP 6, corrections can be applied to the collected data whenever necessary.

Recommendation on the use of these networks:

- o Where possible the BWDB network should be used
- o Next to that the FINNMAP network can be used. The gauges along the Jamuna/Brahmaputra, Ganges and Padma can be connected to this network with relatively little effort. An exception to this are the gauges of Rampur Boalia and Sardah.
- o In the north eastern region along the Meghna and Kushiara the FAP 6 is executing second order levelling to connect all gauges. Once this network is finished and gauges are connected, also these gauges can be used.
- o Some isolated gauges throughout the country can easily be connected to the SoB/JICA network.
- o Question remains however how these separate networks have been or will be connected to each other (BWDB, FINNMAP north, FINNMAP south, FAP 6 network and SoB/JICA). As long as connection data between the networks are not readily available the use of more than one network should be limited as far as feasible.

For the checking of the 47 water-level gauges the BWDB network was used, and whenever possible BWDB BM's were connected to the FINNMAP network (FMBM's).



### 3 Site inspection

#### 3.1 Elevation of Bench-marks

FPCO provided the elevations of BWDB bench-marks located at each gauge station. During field survey it was observed that in some cases the elevations of BM/TBM's furnished by FPCO are not tallying with the elevations of BM/TBM's located at the gauge stations. This is caused by the shifting of the BM/TBM's from its original position to some other place by the local BWDB office. In such cases the FAP 24 field survey team had to collect the elevations of these BM/TBM's either from the local BWDB office or from the gauge reader posted at the gauge station.

The elevations of BM/TBM's which have been obtained from the gauge reader are presented in Table 3.1.

Gauge Station	Elevations of BM/TBM in m PWD	
	Provided by FPCO	Obtained from gauge reader
45 Noonkhawa	28.066	27.688
45.5 Chilmari	23.536	25.310
46 Kamarjani	21.530	24.690
15J Mathurapara	16.515	16.760
91 Talbaria	14.076	13.840
91.1 Sengram	12.741	12.550
225 Jamalpur	17.861	18.530
269 Sunamganj	8.954	8.450

Table 3.1 BM/TBM levels obtained from gauge readers



### 3.2 Connection of bench-marks

BWDB gauges were connected with the BWDB bench-marks located at the gauge stations by second order levelling. In addition, the BWDB bench-marks as well as the gauges were also connected with the FINNMAP bench-mark, wherever it was available nearest to the gauge station, to have a check of the elevations of respective BM/TBM.

After connecting of FINNMAP bench-marks with the BWDB bench-marks, the FAP 24 field survey team observed some differences in elevations. Details of these differences are presented in Table 4.1.

Gauge station & number		Reference BM & their elevations (m PWD)		Elevations of BWDB bench-mark (m PWD)	
		FMBM	Elevation	Existing BWDB	FAP 24 survey
45	Noonkhawa	7626	28.056	27.688	27.874
45.5	Chilmari	7612	23.881	25.310	24.985
46	Kamarjani	7602 GPS	21.910	24.690	24.685
46.9L	Bahadurabad	764	20.309	21.785	21.768
48	Jagannathgonj	5114	15.791	16.732	16.358
49	Sirajganj	7201	13.975	13.870	13.536
50	Porabari	6205 GPS	12.934	12.270	12.265
50.3	Mathura	709	12.757	10.912	10.906
50.6	Teota	8122	10.202	10.135	9.947
15 J	Mathurapara	7215	16.763	16.760	16.426
90	Hardinge Bridge	8236	23.140	18.950	18.868
91	Talbaria	8230	14.494	13.840	14.136
91.1	Sengram	8216	11.921	12.550	12.473
91.2	Mahendrapur	8212	11.216	11.050	10.903
99	Gorai Railway Bridge	8225	20.690	13.728	13.755
225	Jamalpur	5243	16.947	18.530	18.302
228.5	Mymensingh	6024	14.164	14.338	14.057
68	Tilli	6223	9.523	9.409	9.216

Table 3.2 Difference in bench-mark elevations

### 3.3 Location of bench-marks

Present locations of BWDB BM/TBM's and FINNMAP bench-marks (FMBM's) which have been used as a reference bench-mark are shown in sketch maps for each gauge station in Annexure 3.

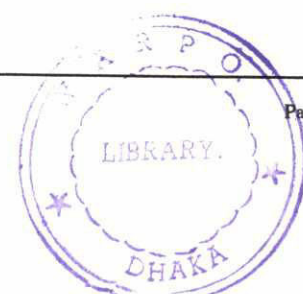
Descriptions of some of the BM's/TBM's, which have been shifted from its original location in the recent past or destroyed or found missing are presented in Table 3.3.

Gauge station & number	Description/location of BM/TBM	
	According to FPCO letter No.32/FPCO/A-024/90 dated 18.01.93/24.01.93	According to FAP 24 inspection team
45 Noonkhawa	BM fixed in front of mosque in the village Noonkhawa, Kurigram.	BM found but it was shifted from its original position.
45.5 Chilmari	BM kept over R.C.C. pillar in front of Master's house near Youth Club, Chilmari.	BM shifted from its original position. At present the BM is located on the footpath, north of Master's house at Chilmari.
46 Kamarjani	BM situated at N-E corner of primary school & 1/4th mile south from gauge.	TBM found at N-E corner of Primary school & 1/4th mile south from gauge.
48 Jagannathganj	BM located 30ft. from the N-W corner of Jagannathganj P.O and 50ft. east from the upper class waiting room.	Specified BM was reported by Gauge Reader to have been destroyed. Instead, 2nos.TBMs one on telegraph post and another in plinth of passenger shed at Jagannathganj R.S were found.
49A Kazipur	Located on the side of the N-E corner at Kazipur Hospital on the culvert distance 200ft.	B.M. destroyed. A new TBM has been established by FAP 24 with ref.to FMBM 7209



15J	Mathurapara	Near Deghulkandi village on platform of a school compound on the right bank of Jamuna river.	BM destroyed as reported by Gauge Reader. Another TBM No.M-PCLP6 was found near the gauge.
91	Talbaria	Located in the right bank back side of the house of Eman Pramanik	BM shifted from its original position to new site as reported by Gauge Reader.
91.1	Sengram	Located in front of the house of Ali Sheikh, village- Sengram, Faridpur.	BM is reported to be under 6ft. of earth, could not be recovered but found 2BMs/TBMs in the house of Rustam Sarder & another TBM located west of mosque.
94	Tarpasha	BM located in front of the Lohajang Cinema Hall.	BM destroyed as reported by Gauge Reader.
95	Sureswar	BM located near Chandipur P.O.	BM could not be ascertained which is under earth as reported by Gauge Reader.
269	Sunamganj	Located on the north side of the compound of Ansar Training Camp present Police camp in village Shologhar & just near the N-E corner of Rain Gauge station.	BM shifted and embedded in the N.W corner of Live Stock Hospital in front of shologhar Mosque and Ansar police camp.
225	Jamalpur	BM located 50ft. N.W corner of Jute office Chapatola ghat and 120ft. apart from the right bank.	BM destroyed as reported by Gauge Reader. TBM found at N-E corner of Bania Bazar High School.
228.5	Mymensingh	BM located 30ft. east from kayet khali Rly. bridge	BM could not be located as per description. TBM located 100ft. S.E of University Hospital.

Table 3.3 Description of bench-mark deviations



### 3.4 Proposed improvement

During the inspection it was observed that certain improvements, in respect of present locations and existing conditions of bench-marks are required at some gauge stations.

In this connection, a proposal was send to FPCO by FAP 24 on March, 1993 (Annexure 1) indicating the improvements to be made at a number of stations (for details see inspection reports, Annexure 2). A summary of the proposed improvements is presented in Table 3.4.

Since no approval in this respect was obtained from FPCO, FAP 24 could not make any improvements of the above mentioned gauge stations.

Nos.	Station	Proposed improvements
45	Noonkhawa	BM 45 be levelled with FMBM 7626
45.5	Chilmari	BM 45.5 be levelled with FMBM 7612
46	Kamarjani	TBM be levelled with FMBM 7602
48	Jagannathganj	TBMs be levelled with FMBM 5114
49A	Kazipur	New TBM be established and connected to FMBM 7209
91	Talbaria	BM 91 be levelled with FMBM 8230
91.1	Sengram	New BM be established and connected with FMBM 8216
93.4L	Bhagyakul	New TBM be established and connected with BM 93.4L
94	Tarapasha	New TBM be established and connected with FMBM 1716
95	Sureshwar	New BM be established and connected with GPS 79
270	Markuli	New BM be established and connected with BM 270
275.5	Meghna Ferryghat	New TBM be established and connected with FM TBM 4103
4 A	Off-take of Arial Khan	New BM be established and connected with nearby FMBM
99	Gorai Railway Bridge	New TBM be established and connected with FMBM 8225

Table 3.4 Proposed improvements



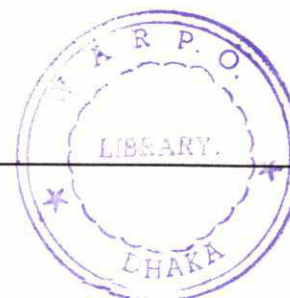
4. Zero value of gauges.

4.1 Variation of gauge zeros.

For checking of the zero values of staff gauges, FAP 24 connected the gauges with BWDB bench-marks located at the stations. It was observed that differences occurred between the existing BWDB zero values and the zero of the gauges as determined by FAP 24. Details are furnished in Table 4.1

Gauge station	BWDB BM		Zero value of gauge (m PWD)				
	BWDB Height BM No.	(m PWD)	Date and Time		BWDB	FAP 24 survey	Differ- ences
Noonkhawa	45	27.688	07.04.93	1440	19.60	19.65	+0.05
Chilmari	45.5	25.310	04.04.93	1025	17.30	17.32	+0.02
Kamarjani	46	24.690	02.04.93	1705	14.24	14.13	-0.11
Bahadurabad	46.9L	21.785	14.12.92	1620	13.00	12.98	-0.02
Fulchari	46.9R	19.330	13.12.92	1600	13.00	13.12	+0.12
Jagannathganj	48	16.732	22.02.93	1130	9.00	8.90	-0.10
Kazipur	49A	15.490	14.02.93	1045	8.00	8.00	0.00
Sirajganj	49	13.870	13.02.93	0940	6.53	6.48	-0.05
Porabari	50	12.270	12.02.93	1045	4.56	4.95	+0.39
Mathura	50.3	10.912	15.02.93	0935	2.65	2.61	-0.04
Teota	50.6	10.135	04.02.93	1340	2.17	2.24	-0.07
Mathurapara	15J	16.760	31.03.93	1550	10.30	10.35	+0.05
Hardinge Bridge	90	18.950	20.02.93	1240	3.24	3.27	+0.03
Talbaria	91	13.840	19.02.93	1200	2.51	2.59	+0.08
Sengram	91.1	12.550	20.04.93	1000	2.68	2.42	-0.26
Mahendrapur	91.2	11.050	11.02.93	1205	1.60	1.72	+0.12
Gorai Rly. Bridge	99	13.728	18.02.93	1505	3.03	3.03	0.00
Goalundo	91.9R	10.300	08.02.93	1135	2.00	1.94	-0.06
Jamalpur	225	18.530	21.02.93	1500	11.00	11.00	0.00
Mymensingh	228.5	14.338	19.02.93	1125	5.90	5.90	0.00
Tilly	68	9.409	04.02.93	1000	3.00	3.00	0.00
Rampur Boalia	88	20.086	01.02.93	0945	8.95	8.70	-0.25
Sardah	89	18.836	02.02.93	0935	8.00	7.97	-0.03
Baruria	91.9L	7.790	09.02.93	1000	0.68	0.65	-0.03
Bhagyakul	93.4L	6.931	25.01.93	1650	0.17	0.17	0.00
Mawa	93.5L	6.325	24.01.93	1135	-0.21	-0.15	+0.06
Tarpasha	94	5.575	28.01.93	1120	0.80	0.79	-0.01
Sureswar	95	5.276	15.04.93	1820	0.22	0.11	-0.11
Arial Khan off-take	4A	7.140	27.01.93	1625	-0.94	-0.83	+0.11
Kanaighat	266	14.308	03.03.93	1040	5.78	5.79	+0.01
Sylhet	267	12.090	07.03.93	1600	0.09	0.09	0.00
Chattak	268	10.300	02.03.93	0920	3.60	3.57	-0.03
Sunamganj	269	8.450	28.02.93	1135	4.00	3.93	-0.07
Markuli	270	8.162	17.03.93	1300	2.93	2.93	0.00
Ajmiriganj	271	8.085	16.03.93	1635	2.95	2.92	-0.03
Madna	272	7.698	18.03.93	0720	1.20	1.20	0.00
Austogram	272.1	8.864	19.03.93	0900	0.60	0.54	-0.06
Bhairab Bazar	273	7.371	08.02.93	1555	0.77	0.76	-0.01
Narsingdi	274	6.814	08.02.93	0920	0.55	0.52	-0.03
Baider Bazar	275	6.630	07.02.93	1455	1.46	1.42	-0.04
Meghna Ferryghat	275.5	6.985	12.04.93	1325	0.32	0.30	-0.02
Satnal	276	5.044	15.04.93	0805	-0.08	-0.08	0.00
Chandpur	277	5.410	14.04.93	0900	-0.28	-0.29	-0.01
Amalshid	172	17.590	05.03.93	1500	6.27	6.25	-0.02
Sheola	173	13.670	04.03.93	1040	6.80	6.83	+0.03
Fenchuganj	174	15.066	06.03.93	1215	5.00	5.03	+0.03
Sherpur	175.5	9.520	08.03.93	0930	3.00	3.00	0.00

Table 4.1 Zero values of gauges (BWDB BM)



Some of the BWDB bench-marks and gauges have been connected with the nearest FINNMAP bench-marks for double check.

Some differences in levels of BWDB bench-marks and gauge zero have been observed in relation to the FINNMAP bench-marks. These differences are shown in Table 4.2

Gauge station	FINNMAP BM		BWDB BM			Zero value of gauge (m PWD)			
	No.	Height (m PWD)	No.	Height (m PWD)	FAP 24 FMBM connec- tion (mPWD)	Date & Time	BWDB	FAP24 w.r.t. FMBM	Diffe- rences
Noonkhawa	7626	28.057	45	27.688	27.874	07.04.93 1440	19.60	19.83	+0.23
Chilmari	7612	23.882	45.5	25.310	24.985	04.04.93 1025	17.30	17.32	+0.02
Kamarjani	7602	21.910	46	24.690	24.685	02.04.93 1705	14.24	14.12	-0.12
Bahadurabad	GPS764	20.309	46.9L	21.785	21.768	14.12.92 1620	13.00	12.96	-0.04
Fulchari	GPS7	21.970	46.9R	19.330	19.843	13.12.92 1600	13.00	13.63	+0.63
Jagannathganj	5114	15.791	48	16.732	16.358	22.02.93 1130	9.00	8.53	-0.47
Kazipur	7209	15.155	49A	15.490	15.396	14.02.93 1045	8.00	7.90	-0.10
Sirajganj	7201	13.975	49	13.870	13.536	13.02.93 0940	6.53	6.14	-0.39
Porabari	6205	12.934	50	12.270	12.265	12.02.93 1045	4.56	4.95	+0.39
Mathura	GPS709	12.757	50.3	10.912	10.906	15.02.93 0935	2.65	2.60	-0.05
Teota	8122	10.202	50.6	10.135	9.947	04.02.93 1340	2.17	2.05	-0.12
Mathurapara	7215	16.763	15J	16.760	16.426	31.03.93 1550	10.30	10.01	-0.29
H. Bridge	8236	23.140	90	18.950	18.868	20.02.93 1240	3.24	3.18	-0.06
Talbaria	8230	14.494	91	13.840	14.136	19.02.93 1200	2.51	2.88	+0.37
Sengram	8216	11.921	91.1	12.550	12.473	20.04.93 1000	2.68	2.42	-0.26
Mahendrapur	8212	11.216	91.2	11.050	10.903	11.02.93 1205	1.60	1.58	-0.02
Gorai RWB	8225	20.690	99	13.728	13.755	18.02.93 1505	3.03	3.02	-0.01
Jamalpur	5243	16.947	225	18.530	18.302	21.02.93 1500	11.00	10.77	-0.23
Mymensingh	6024	14.164	228.5	14.338	14.057	19.02.93 1125	5.90	5.62	-0.28
Tilli	6223	9.529	68	9.409	9.216	04.02.93 1000	3.00	2.81	-0.19

Table 4.2 Zero values of gauges (FINNMAP BM)

The differences in zero value of gauges shown in the Tables 4.1 and 4.2 are to be added to the gauge zero levels obtained by the BWDB, which will give the actual zero values of the gauges.

## 4.2 Recommendations

For the 21 gauges that were connected to a FINNMAP BM it is recommended to apply the connection indicated in Table 4.2. The FINNMAP BM's being more recently established than the BWDB BM's.

Since FINNMAP has established a network of bench-marks for various projects in the country, it is recommended that the BWDB should also connect the other bench-marks at different gauge stations to this levelling net-work.

The elevations of BWDB bench-marks obtained by FAP 24 with reference to FINNMAP bench-mark may be used by the BWDB in the future.

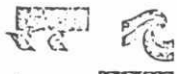
20

## Annexure 1

# **Proposal for complementary activities**



# FAP 24 RIVER SURVEY PROJECT



DELFT-DHI

Flood Plan Coordination Organization

Commission of the European Communities

House No. 96,  
Road No. 23,  
Banani, Dhaka  
Tel : 600002, 603175  
Fax: 88-02-883568

March 9, 1993

The Chief Engineer  
Flood Plan Coordination Organization (FPCO)  
7 Green Road, Dhaka

Attention : Mr. Afzalur Rahman  
Superintending Engineer

Subject : Proposal for complementary activities in relation with water level gauging  
(BoQ table 4.1.c)

Dear Sir,

Under River Survey Project FAP 24, the zero values of 47 BWDB staff gauges are required to be terminated by levelling with the BWDB bench-marks located near each gauge station. While inspecting some of these gauge stations, it was observed that certain improvements are required at the following places (for details see inspection reports, Annexure A to N):

## Brahmaputra-Jamuna

- |      |               |   |   |
|------|---------------|---|---|
| 45   | Noonkhawa     | - | BM 45 be levelled with FMBM 7626                  |
| 45.5 | Chilmari      | - | BM 45.5 be levelled with FMBM 7612                |
| 46   | Kamarjani     | - | TBM be levelled with FMBM 7602                    |
| 48   | Jagannathganj | - | TBM be levelled with FMBM 5114                    |
| 49 A | Kazipur       | - | New TBM be established and connected to FMBM 7209 |

## Ganges

- |      |          |   |  |
|------|----------|---|--|
| 91   | Talbaria | - | BM 91 be levelled with FMBM 8230                   |
| 91.1 | Sengram  | - | New BM be established and connected with FMBM 8216 |

## Padma

- |       |           |   |   |
|-------|-----------|---|---|
| 93.4L | Bhagyakul | - | New TBM be established and connected with BM 93.4L  |
| 94    | Tarpasha  | - | New TBM be established and connected with FMBM 1716 |

95 Sureshwar - New BM be established and connected with GPS 79.

Upper Meghna/Kushiyara

270 Markuli - New BM be established and connected with BM 270

275.5 Meghna Ferryghat - New TBM be established and connected with FM TBM 4103

Arial Khan

4 A Off-take of Arial Khan - New BM be established and connected with nearby FMBM

Gorai

99 Gorai Railway Bridge - New TBM be established and connected with FMBM 8225

With reference to the relevant tables of the BoQ we propose to invoice the above mentioned activities as follows:

	4.1.a Zero check Unit=No.	4.1.c.1 Establ. new BM Unit=No.	4.1.c.2 New staff gauges Unit=No.	4.1.c.3 Additional levelling Unit=km.
45 Noonkhawa	1	-	-	2.5
45.5 Chilmari	1	-	-	4
46 Kamarjani	1	-	-	4
48 Jagannathganj	1	-	-	2.5
49 A Kazipur	1	-	(1)	0.5
91 Talbaria	1	-	-	3
91.1 Sengram	1	1	-	14
93.4L Bhagyakul	1	-	(1)	1
94 Tarpasha	1	-	(1)	3
94 Sureshwar	1	1	-	1.5
270 Markuli	1	1	-	1.5
275.5 Meghna Ferryghat	1	-	(1)	0.5
4 A Off-take of Arial Khan	1	1	-	14
99 Gorai Railway Bridge	1	-	(1)	2

(1) Construction of a temporary bench-mark including 1 km levelling

22

From the above table it can be summarized that it is proposed to

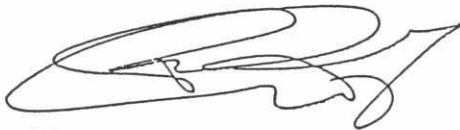
- o establish 4 new BM's
- o construct 5 new TBM's
- o execute 54 km additional levelling.

As there are no provisions in the Contract for TBM's and the provisions for new staff gauges will not be used, we propose to invoice the TBM's under BoQ table 4.1.c.2 (for new staff gauges). The cost of a TBM is assessed to be 50% of the cost of a BM.

You are requested kindly to accord the necessary approval for the above proposal

Thanking you.

Yours sincerely,



Pieter van Groen  
Team Leader

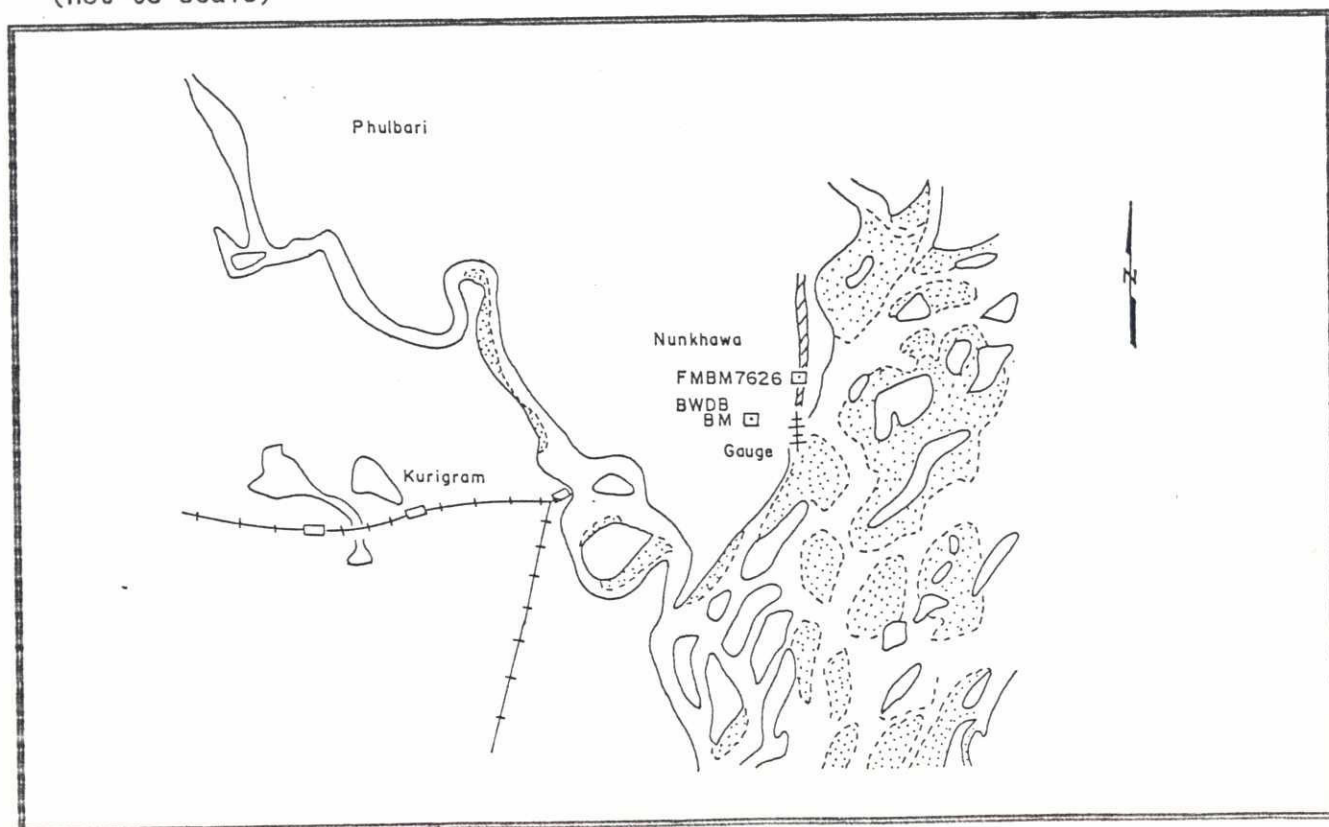
cc: CEC/PA

Annexure 2

**Inspection  
Reports**

# RIVER SURVEY PROJECT FAP-24 INSPECTION REPORT

1. Gauge.  
 Name of gauge station : 45 Noonkhawa  
 Date of visit : 02.03.93  
 Condition of gauge : Good  
 Remark : Gauge is located about 4 Km downstream from Noonkhawa which creates confusion as to the naming of gauge station.
2. Bench mark  
 Calibration benchmark present : yes/~~no~~  
 Name : 45 BM  
 Location : BM 45 located 3 m west of Mosque in Gogidaha  
  
 Height : -  
 Condition : acceptable/~~not acceptable~~
3. If, not acceptable, give reasons: -
4. Distance of gauge to BM : 1.0 Km
5. Conclusion, recommendation : yes/~~no~~  
 Improvements required, if yes, BM 45 be connected with FMBM 7626, which is located about 2.5 Km away.  
 (Give recommended steps)
6. Sketch map of the area.  
 (not to scale)





# RIVER SURVEY PROJECT FAP-24 INSPECTION REPORT

## 1. Gauge.

Name of gauge station : 45.5 Chilmari  
Date of visit : 11.01.93  
Condition of gauge : Good  
Remark : -

## 2. Bench mark

Calibration benchmark present : yes/~~no~~  
Name : BM 45.5  
Location : BM 45.5 is located on the footpath north of Master's house at Chilmari and is about 150 meters west from the river bank.

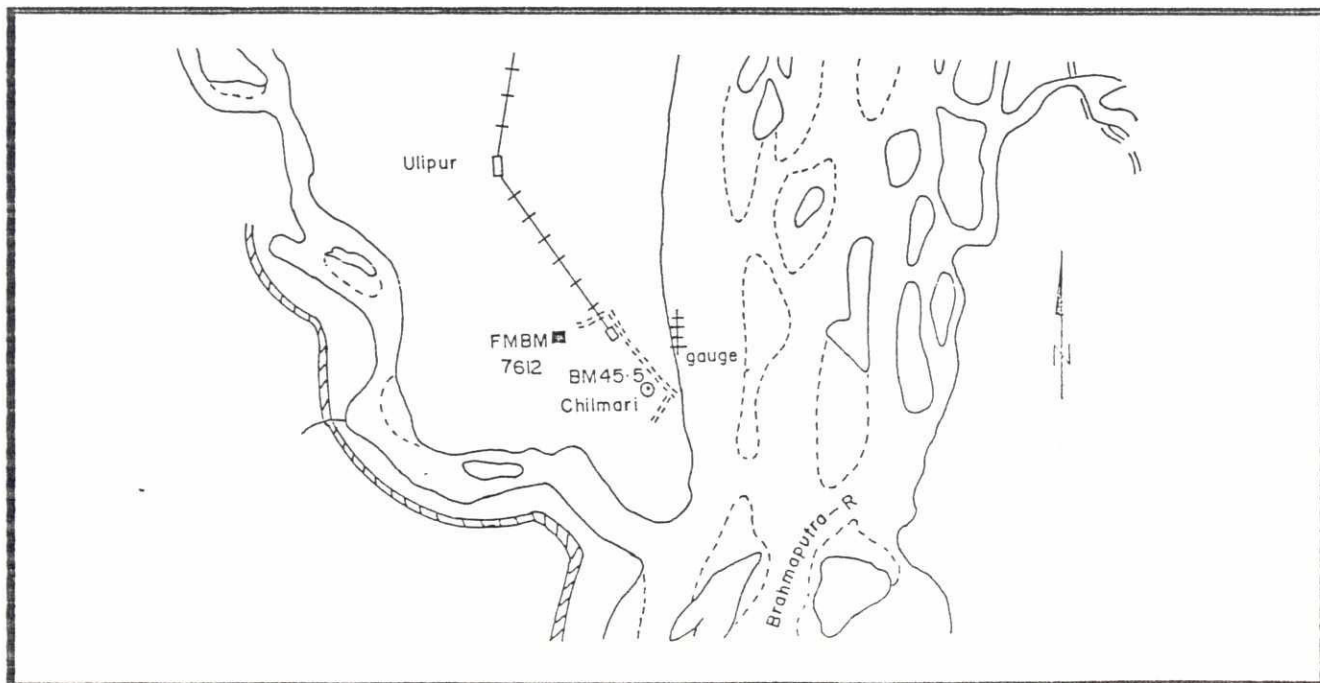
Height : -  
Condition : acceptable/~~not acceptable~~

3. If, not acceptable, give reasons: —

4. Distance of gauge to BM : 0.5 Km

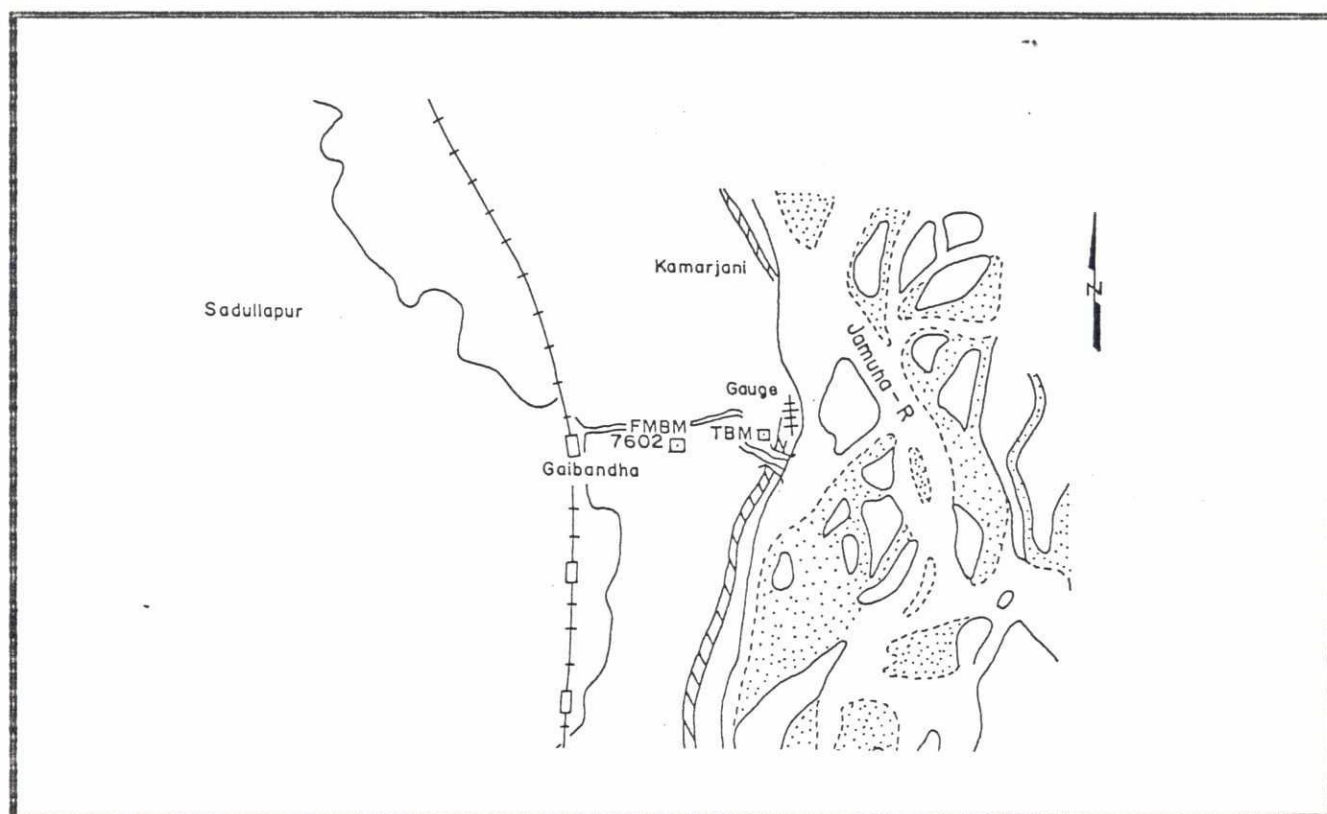
5. Conclusion, recommendation : yes/~~no~~  
Improvements required, if yes, describe. BM 45.5 at Chilmari was shifted from its original position due to erosion of river bank. Height of BM 45.5 at new position be determined by levelling with FMBM 7612 located at a distance of about 4Km from Chilmari.  
(Give recommended steps)

6. Sketch map of the area.  
(not to scale)



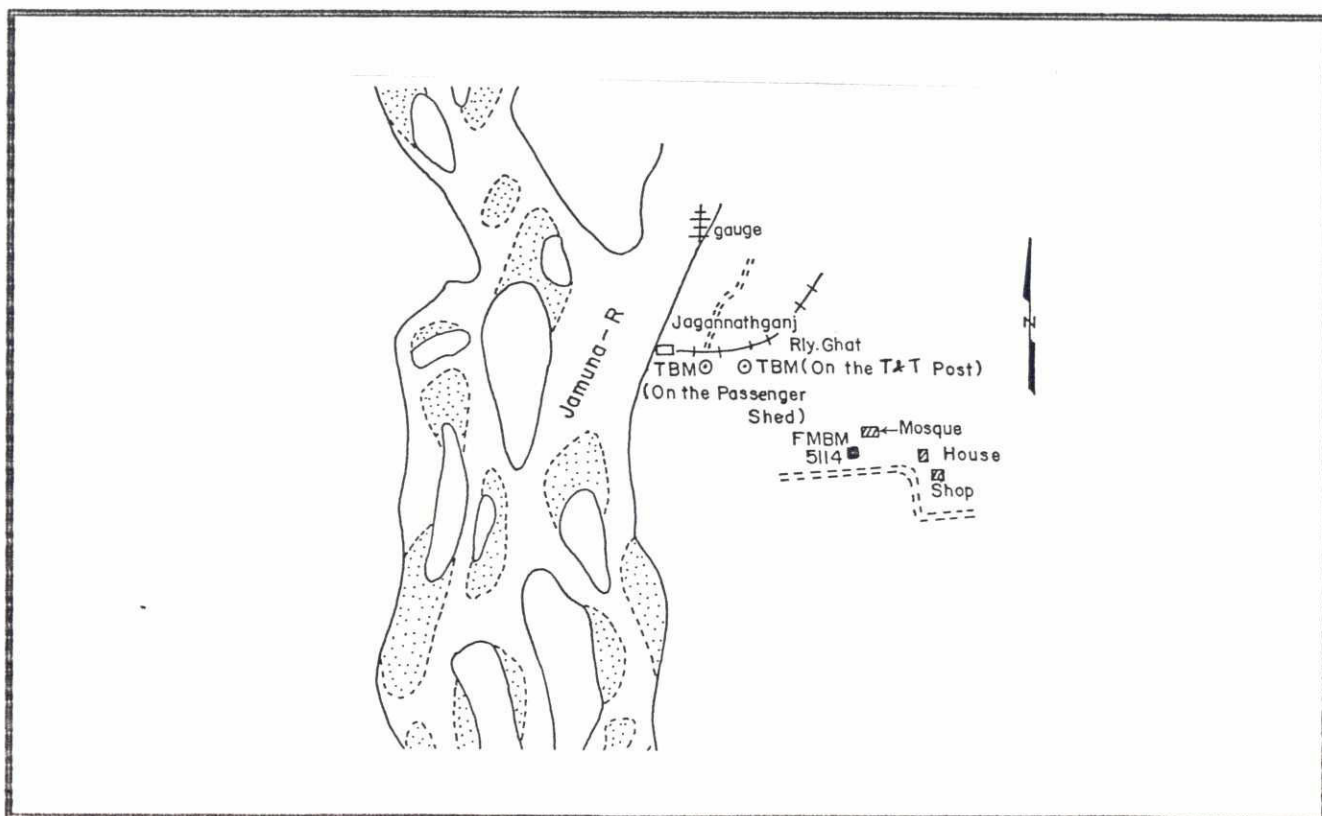
# RIVER SURVEY PROJECT FAP-24 INSPECTION REPORT

1. Gauge.  
 Name of gauge station : 46 Kamarjani  
 Date of visit : 03.03.93  
 Condition of gauge : Good  
 Remark : Gauge is located about 5 Km downstream from Kamarjani, which creates confusion as to the naming of gauge station.
2. Bench mark  
 Calibration benchmark present : ~~yes~~/no  
 Name : TBM  
 Location : TBM located on the NE corner of primary school at Satarkandi  
  
 Height : 21.530 m PWD  
 Condition : acceptable/~~not acceptable~~
3. If, not acceptable, give reasons: -
4. Distance of gauge to BM : 0.2 Km
5. Conclusion, recommendation : ~~yes~~/no  
 Improvements required, if yes, TBM be connected with FM BM 7602, which is about 4 Km from the TBM.  
 (Give recommended steps)
6. Sketch map of the area.  
 (not to scale)



# RIVER SURVEY PROJECT FAP-24 INSPECTION REPORT

1. Gauge.  
 Name of gauge station : 48 Jagannathganj  
 Date of visit : 13.02.93  
 Condition of gauge : Good  
 Remark : -
2. Bench mark  
 Calibration benchmark present : ~~yes~~/no  
 Name : TBMs  
 Location : One TBM located on passenger shed and the other on T & T post at Jagannathganj ghat  
  
 Height : -  
 Condition : acceptable/~~not acceptable~~
3. If, not acceptable, give reasons: -
4. Distance of gauge to BM : 0.2 Km
5. Conclusion, recommendation : yes/~~no~~  
 Improvements required, if yes, TBMs at Jagannathganj ghat be levelled with FM BM 5114 located at a distance of about 2.5 Km from the Jagannathganj ghat.  
 (Give recommended steps)
6. Sketch map of the area.  
 (not to scale)



24

RIVER SURVEY PROJECT FAP-24  
INSPECTION REPORT

1. Gauge.

Name of gauge station : 49A Kazipur  
Date of visit : 8-2-93  
Condition of gauge : Good  
Remark : -

2. Bench mark

Calibration benchmark present : ~~yes~~/no  
Name : TBM  
Location : Kazipur

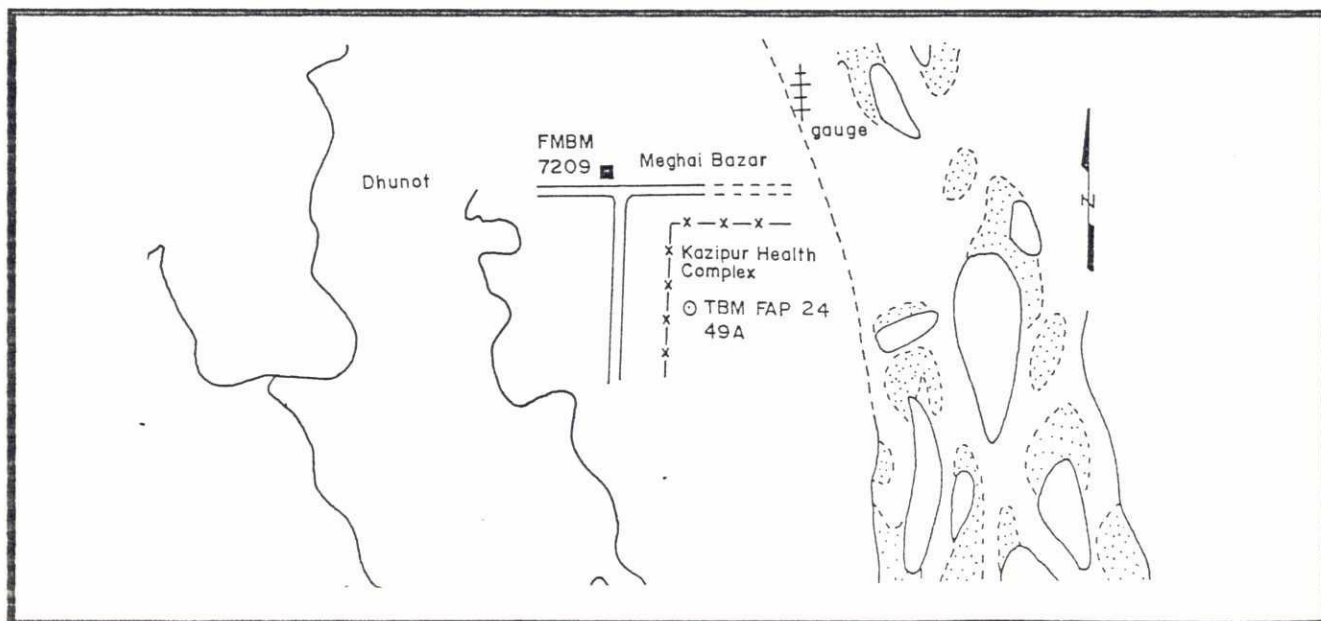
Height : -  
Condition : ~~Acceptable~~/not acceptable

3. If, not acceptable, give reasons: Since BM 49A at Kazipur has been eroded by bank erosion, there should be one TBM located in a suitable position.

4. Distance of gauge to BM : 0.2 Km

5. Conclusion, recommendation : ~~yes~~/no  
Improvements required, if yes, describe. One new TBM FAP 24 49A be established within the compound of Kazipur Health Complex and its height be determined by levelling with FBM 7209 located at Meghai Bazar (1.5 Km from river bank)  
(Give recommended steps)

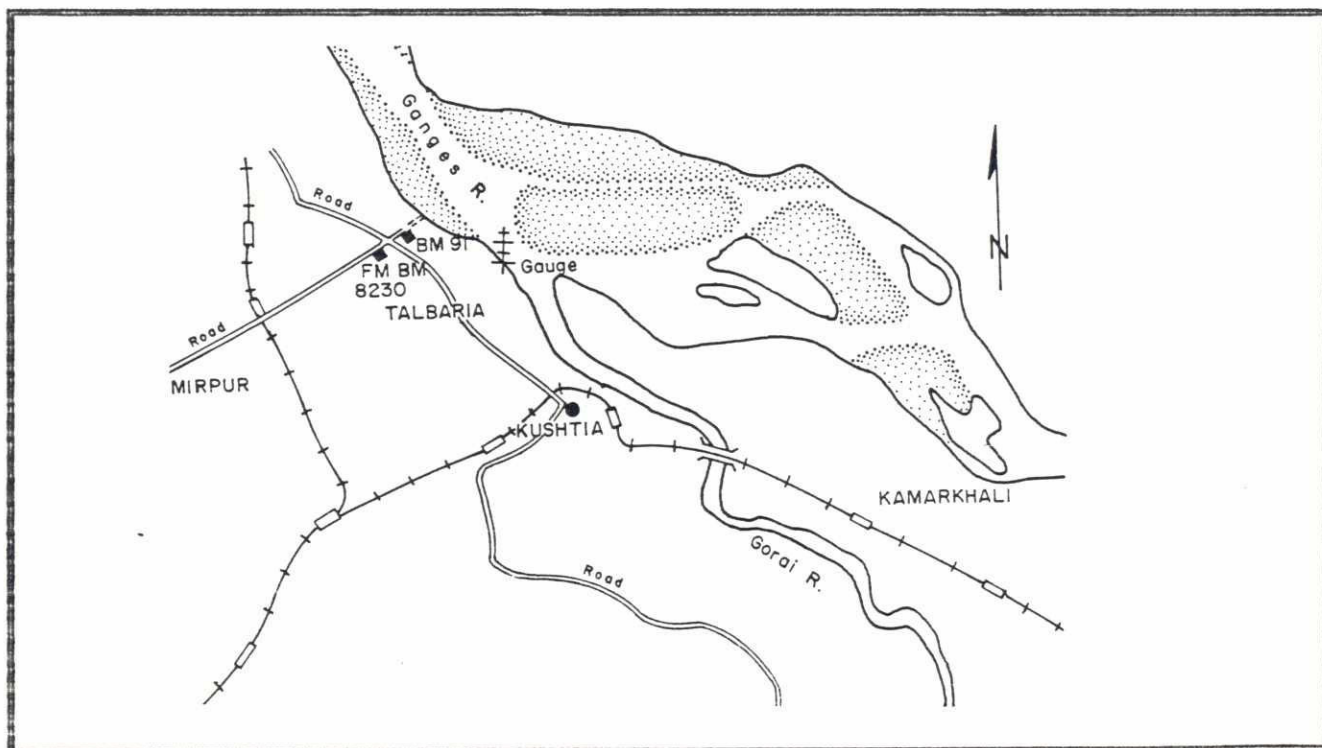
6. Sketch map of the area.  
(not to scale)





# RIVER SURVEY PROJECT FAP-24 INSPECTION REPORT

1. Gauge.  
 Name of gauge station : 91 Talbaria  
 Date of visit : 9.2.93  
 Condition of gauge : Good  
 Remark : -
2. Bench mark  
 Calibration benchmark present : yes/~~no~~  
 Name : BM 91  
 Location : BM 91 is located on the eastside of the road leading to Mirpur from Talbaria.  
  
 Height : -  
 Condition : acceptable/~~not acceptable~~
3. If, not acceptable, give reasons: -
4. Distance of gauge to BM : 0.5 Km
5. Conclusion, recommendation : yes/~~no~~  
 Improvements required, if yes, describe.  
 (Give recommended steps)  
 BM 91 Talbaria was shifted from its original position and placed at a new position. Height of BM 91 at new position be determined by levelling with FMBM 8230 located at a distance of about 3 Km from the gauge.
6. Sketch map of the area.  
 (not to scale)



# RIVER SURVEY PROJECT FAP-24 INSPECTION REPORT

## 1. Gauge.

Name of gauge station : 91.1 Sengram  
Date of visit : 31.01.93  
Condition of gauge : Good  
Remark : -

## 2. Bench mark

Calibration benchmark present : ~~yes~~/no  
Name : TBM  
Location : Sengram

Height : -  
Condition : ~~acceptable~~/not acceptable

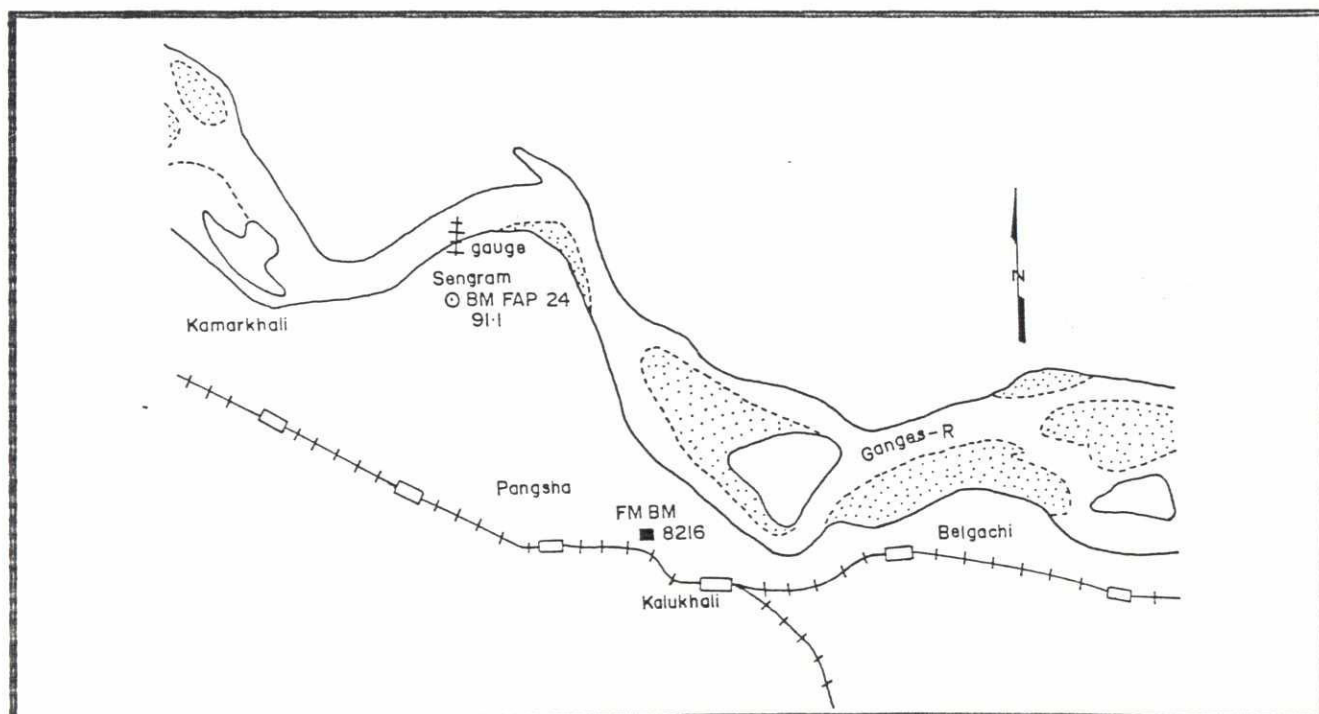
3. If, not acceptable, give reasons: TBMs at Sengram considered to be not acceptable as their locations and heights are doubtful.

4. Distance of gauge to BM : 0.5 Km

5. Conclusion, recommendation : yes/~~no~~

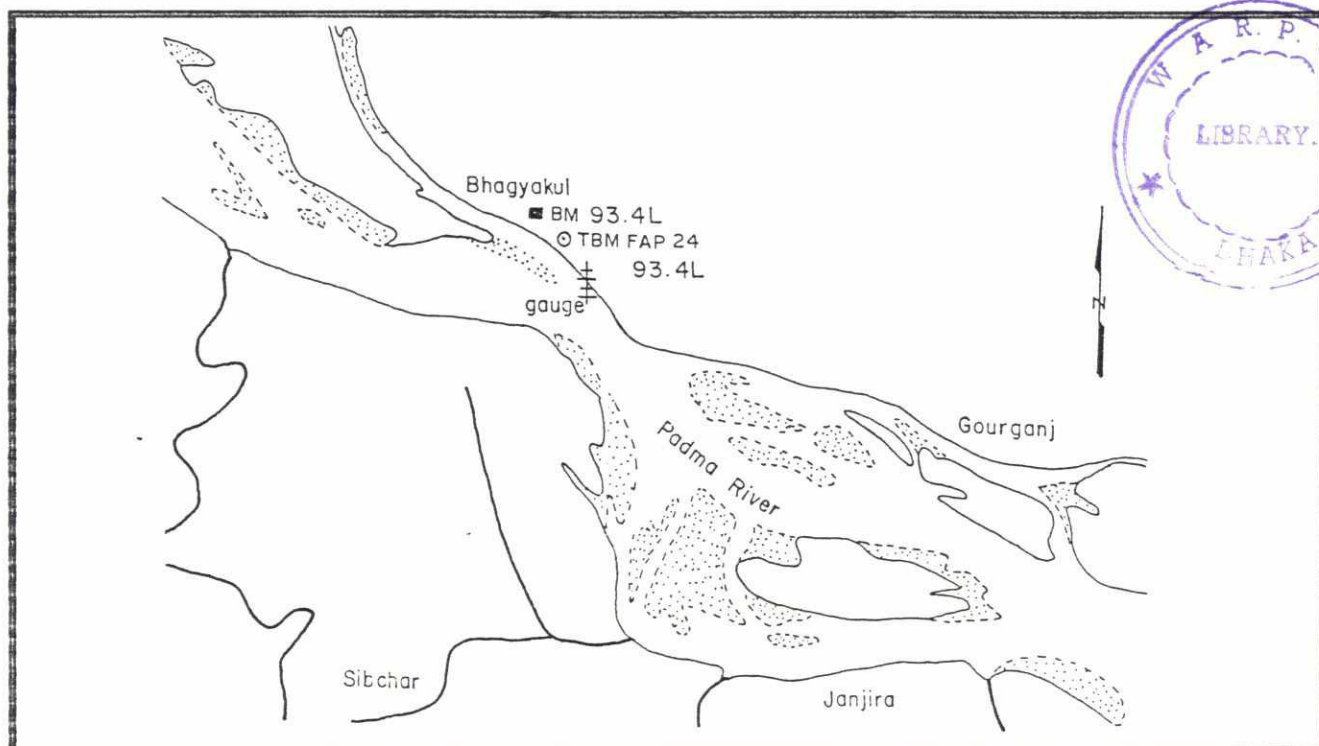
Improvements required, if yes, One B M FAP 24 91.1 be established at Sengram and its height be determined by levelling with nearest FMBM 8216, located at about 15 Km from Sengram.  
(Give recommended steps)

6. Sketch map of the area.  
(not to scale)



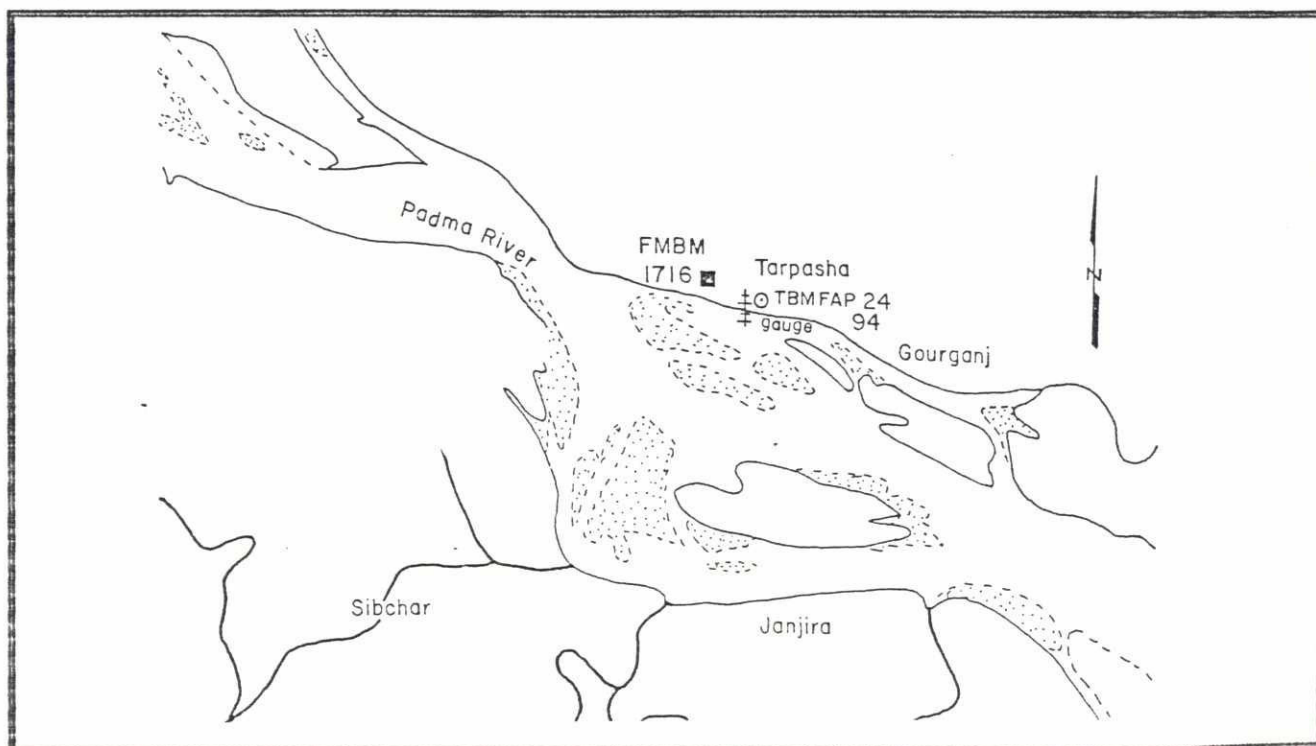
# RIVER SURVEY PROJECT FAP-24 INSPECTION REPORT

1. Gauge.  
 Name of gauge station : 93.4L Bhagyakul  
 Date of visit : 23.01.93  
 Condition of gauge : Good  
 Remark : Gauge should be shifted near to Bhagyakul Bazar during flood period.
2. Bench mark  
 Calibration benchmark present : yes/~~no~~  
 Name : BM 93.4L  
 Location : Located within Bhagyakul meteorological station compound.  
  
 Height : 6.931 meters PWD  
 Condition : acceptable/~~not acceptable~~
3. If, not acceptable, give reasons: -
4. Distance of gauge to BM : 3 Km
5. Conclusion, recommendation : yes/~~no~~  
 Improvements required, if yes, describe. Inter distance between BM 93.4L and gauge being about 3 Km, one new TBM FAP 24 93.4L be established at Bhagyakul Bazar. New TBM be levelled with BM 93.4L, which will involve about 2 Km of levelling.  
 (Give recommended steps)
6. Sketch map of the area.  
 (not to scale)



# RIVER SURVEY PROJECT FAP-24 INSPECTION REPORT

1. Gauge.  
 Name of gauge station : 94 Tarpasha  
 Date of visit : 23.01.93  
 Condition of gauge : Good  
 Remark : -
2. Bench mark  
 Calibration benchmark present : ~~yes~~/no  
 Name : TBM  
 Location : Located on the I.D. pillar near the house of Golam Hasan, retired Gauge Reader.  
  
 Height : 5.575 meters PWD  
 Condition : ~~acceptable~~/not acceptable
3. If, not acceptable, give reasons: Top position of TBM pillar was found to be broken down.
4. Distance of gauge to BM : 0.2 Km
5. Conclusion, recommendation : ~~yes~~/no  
 Improvements required, if yes, describe. One TBM FAP 24 94 be established at Tarpasha Bazar and its height be determined by levelling with nearest FMBM 1716, located at about 4 Km from Tarpasha Bazar.  
 (Give recommended steps)
6. Sketch map of the area.  
 (not to scale)





# RIVER SURVEY PROJECT FAP-24 INSPECTION REPORT

## 1. Gauge.

Name of gauge station : 95 Sureswar  
Date of visit : 27.01.93  
Condition of gauge : Good  
Remark : -

## 2. Bench mark

Calibration benchmark present : ~~yes~~/no  
Name : TBM  
Location : Located at Sureswar Bazar

Height : 5.276 meters PWD  
Condition : ~~acceptable~~/not acceptable

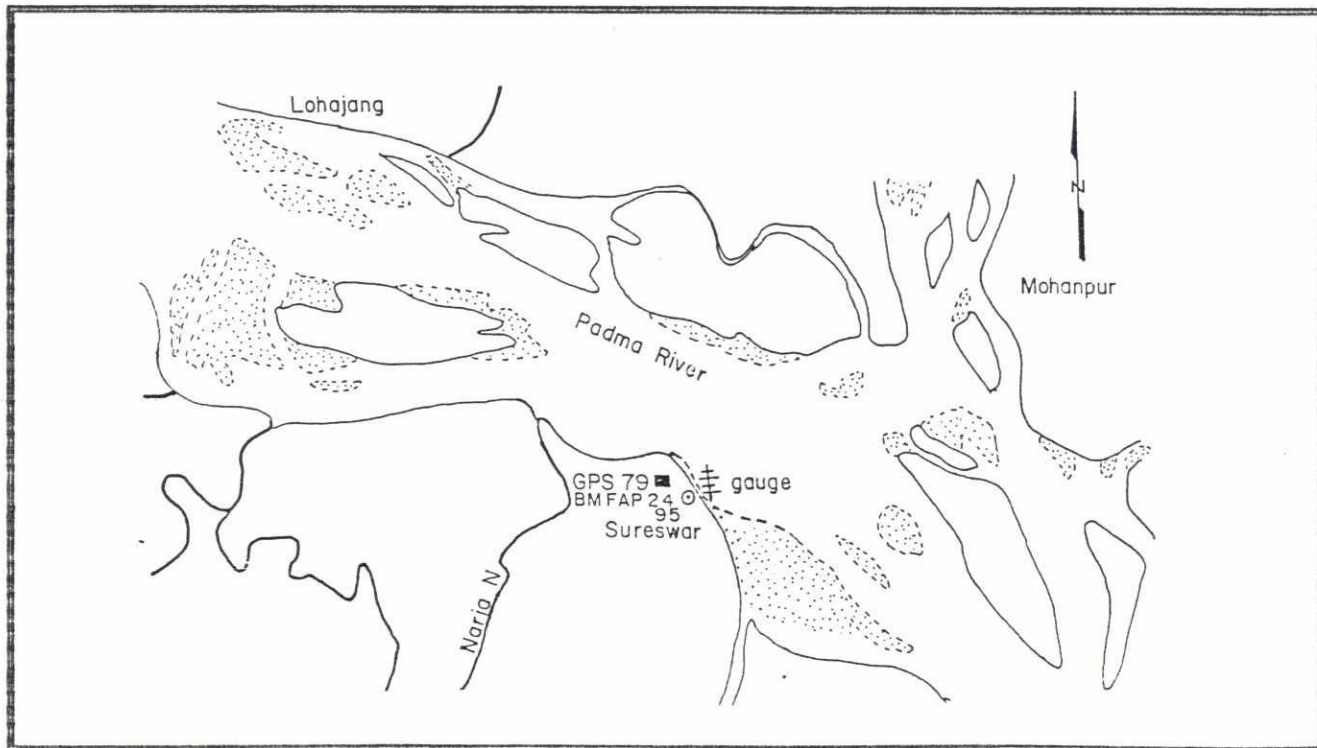
3. If, not acceptable, give reasons: TBM kept on top of wooden peg was found to be in bad shape.

4. Distance of gauge to BM : 0.1 Km

5. Conclusion, recommendation : ~~yes~~/no

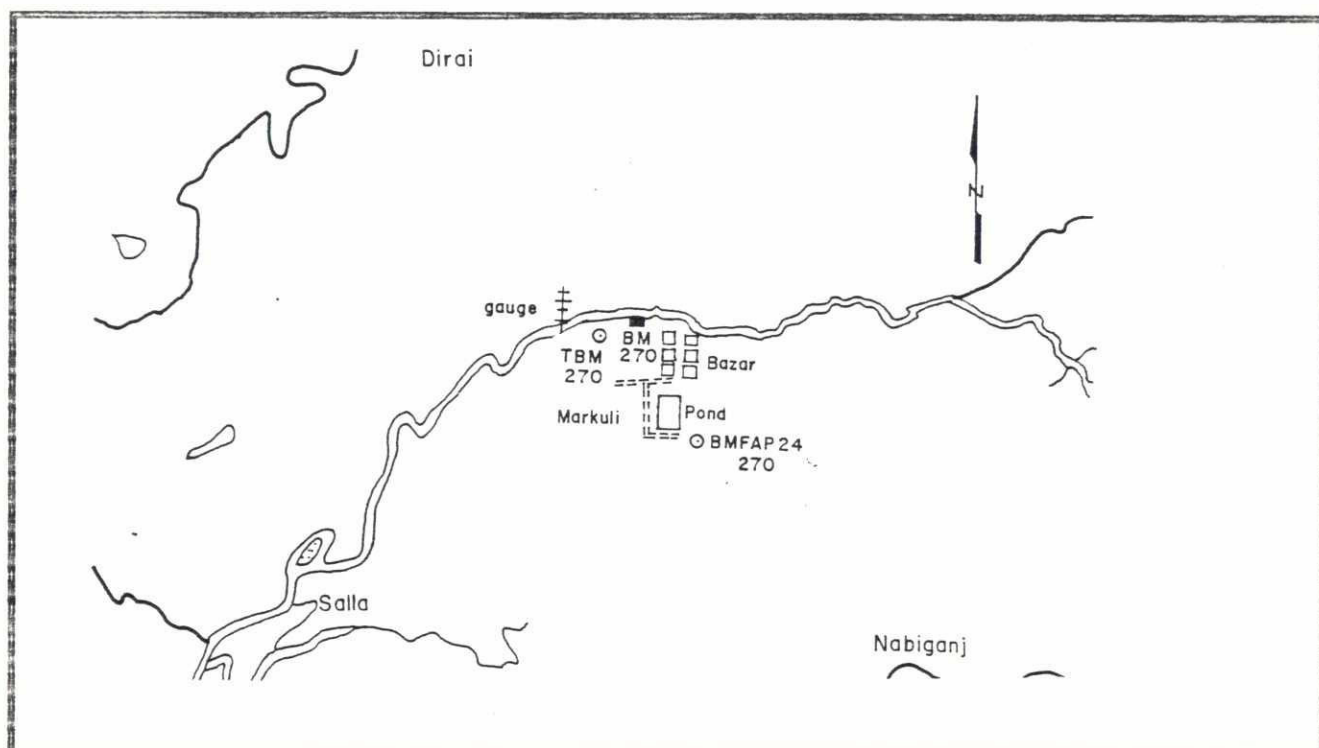
Improvements required, if yes, describe.  
(Give recommended steps) One BM FAP 24 95 be established at Sureswar Bazar and its height be determined by levelling with GPS pillar No. 79 located about 2.5 Km from Sureswar Bazar.

6. Sketch map of the area.  
(not to scale)



# RIVER SURVEY PROJECT FAP-24 INSPECTION REPORT

1. Gauge.  
 Name of gauge station : 270 Markuli  
 Date of visit : 18.02.93  
 Condition of gauge : Good  
 Remark : -
2. Bench mark  
 Calibration benchmark present : yes/~~no~~  
 Name : BM 270  
 Location : BM located just on the bank of river Kushiyara at Markuli Bazar. TBM is only about 15 m from bank.  
  
 Height : 8.162 meters PWD  
 Condition : ~~acceptable~~/not acceptable
3. If, not acceptable, give reasons: BM 270 will no doubt be eroded during next flood period.
4. Distance of gauge to BM : 0.5 Km
5. Conclusion, recommendation : yes/~~no~~  
 Improvements required, if yes, describe. One BM FAP 24 270 be established at a suitable location at Markuli and be levelled with the BM/TBM at Markuli. Levelling length will approx. be 2.5 Km.  
 (Give recommended steps)
6. Sketch map of the area.  
 (not to scale)



# RIVER SURVEY PROJECT FAP-24 INSPECTION REPORT

## 1. Gauge.

Name of gauge station : 275.5 Meghna Ferry ghat  
Date of visit : 04.02.93  
Condition of gauge : Good  
Remark : -

## 2. Bench mark

Calibration benchmark present : ~~yes~~/no  
Name : TBM  
Location : Located on the SE corner of Pucca bridge (Culvert) at old Ferryghat Bazar.

Height : 6.985 meters PWD  
Condition : ~~acceptable~~/not acceptable

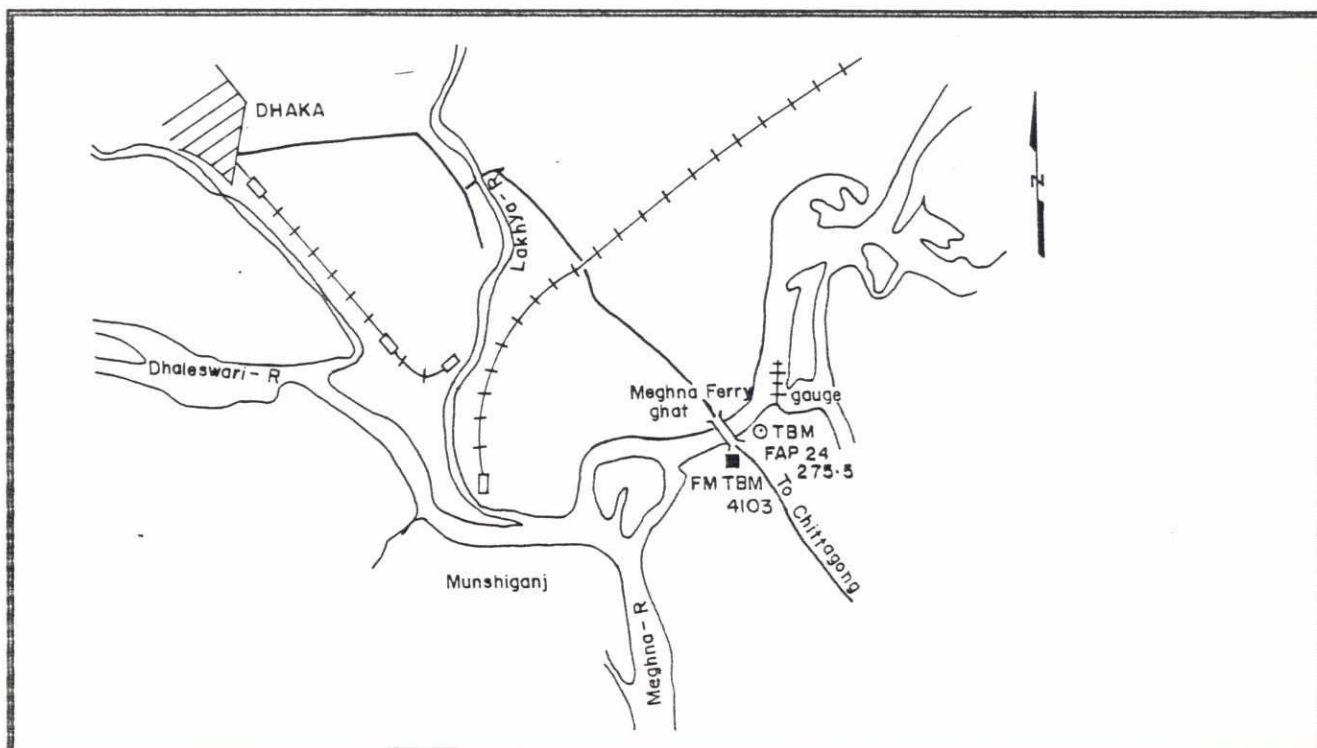
## 3. If, not acceptable, give reasons: -

4. Distance of gauge to BM : 0.25 Km

5. Conclusion, recommendation : yes/~~no~~

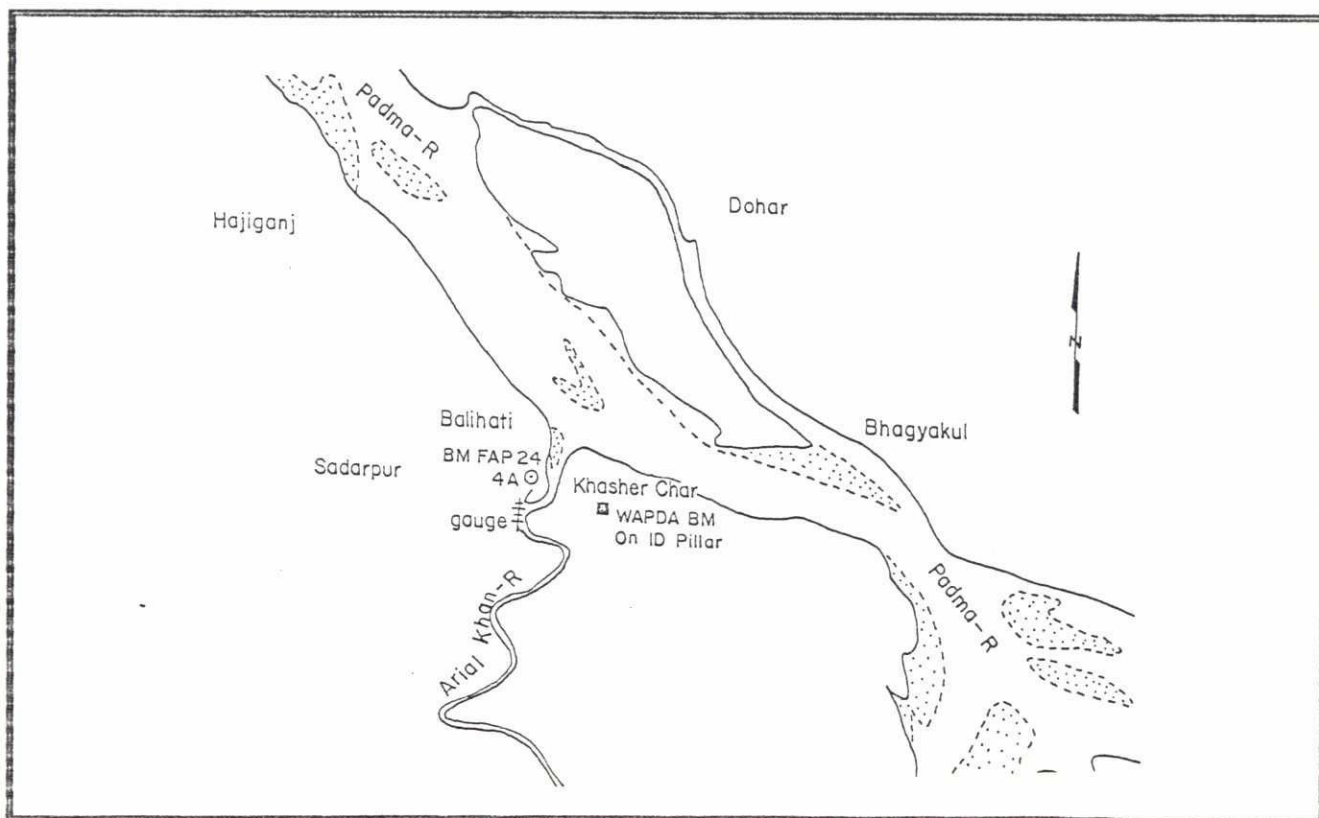
Improvements required, if yes, describe. One new TBM FAP 24 275.5 be established on the left bank at Meghna Ferry ghat in suitable place and its height be determined by levelling with FM TBM 4103 (length of levelling likely to be approx. 2 Km)

(Give recommended steps)

6. Sketch map of the area.  
(not to scale)

# RIVER SURVEY PROJECT FAP-24 INSPECTION REPORT

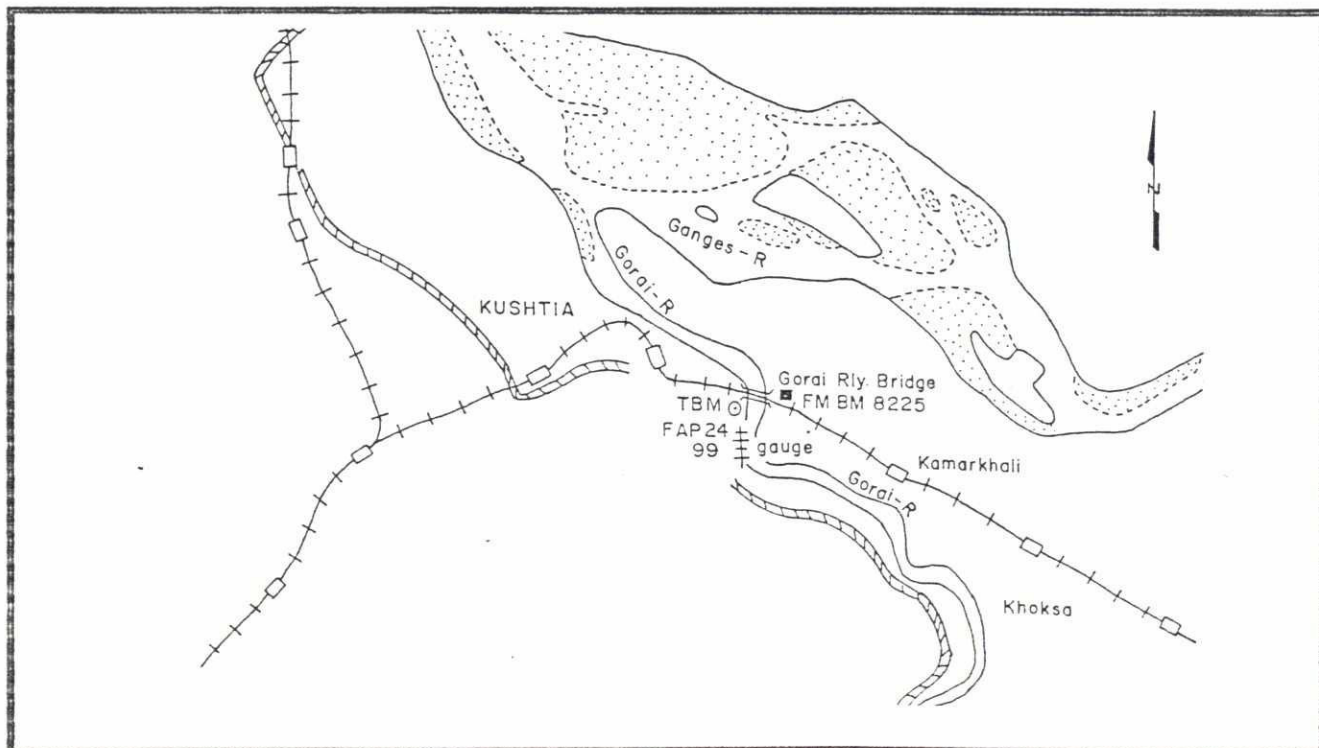
1. Gauge.  
 Name of gauge station : 4 A Offtake of Arial Khan  
 Date of visit : 24.01.93  
 Condition of gauge : Good  
 Remark : -
2. Bench mark  
 Calibration benchmark present : ~~yes~~/no  
 Name : TBM  
 Location : TBM is located on the north east corner  
 (of godown) plinth of Balihati Bazar.  
 Height : 7.14 m PWD  
 Condition : ~~acceptable~~/not acceptable
3. If, not acceptable, give reasons: Location of TBM not found suitable
4. Distance of gauge to BM : 1.5 Km
5. Conclusion, recommendation : ~~yes~~/no  
 Improvements required, if yes, One new BM FAP 24 4 A be established at Balihati Bazar and its height be determined by levelling with nearby FMBM (15 Km of levelling likely to be involved).  
 (Give recommended steps)
6. Sketch map of the area.  
 (not to scale)





RIVER SURVEY PROJECT FAP-24  
INSPECTION REPORT

1. Gauge.  
Name of gauge station : 99 Gorai Rly. Bridge  
Date of visit : 31.12.92  
Condition of gauge : Good  
Remark : -
2. Bench mark  
Calibration benchmark present : ~~yes~~/no  
Name : TBM  
Location : Situated on the right bank of the Gorai river and 120ft. away from South-West abutment of Rly. Bridge.  
  
Height : 13.728 meters PWD  
Condition : ~~acceptable~~/not acceptable
3. If, not acceptable, give reasons: Existing TBM on the abutment of Gorai Rly. Bridge considered to be not acceptable in view of its location.
4. Distance of gauge to BM : 0.5 Km
5. Conclusion, recommendation : yes/~~no~~  
Improvements required, if yes, describe.  
(Give recommended steps) One TBM FAP 24 99 be established on the right bank near the Gorai Rly. bridge and its height be determined by levelling with FM BM 8225 (length of levelling likely to be involved approx. 3 Km)
6. Sketch map of the area.  
(not to scale)



of

Annexure 3

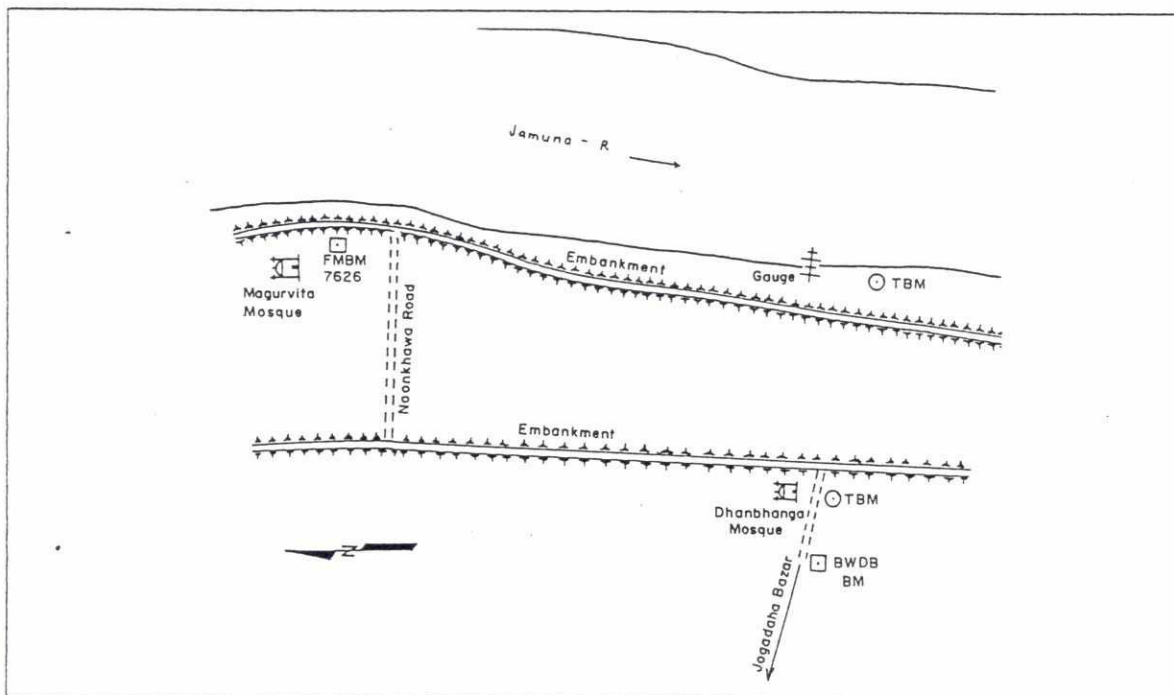
**Location of  
Gauging Stations**

# PROJECT : FAP 24 RIVER SURVEY PROJECT

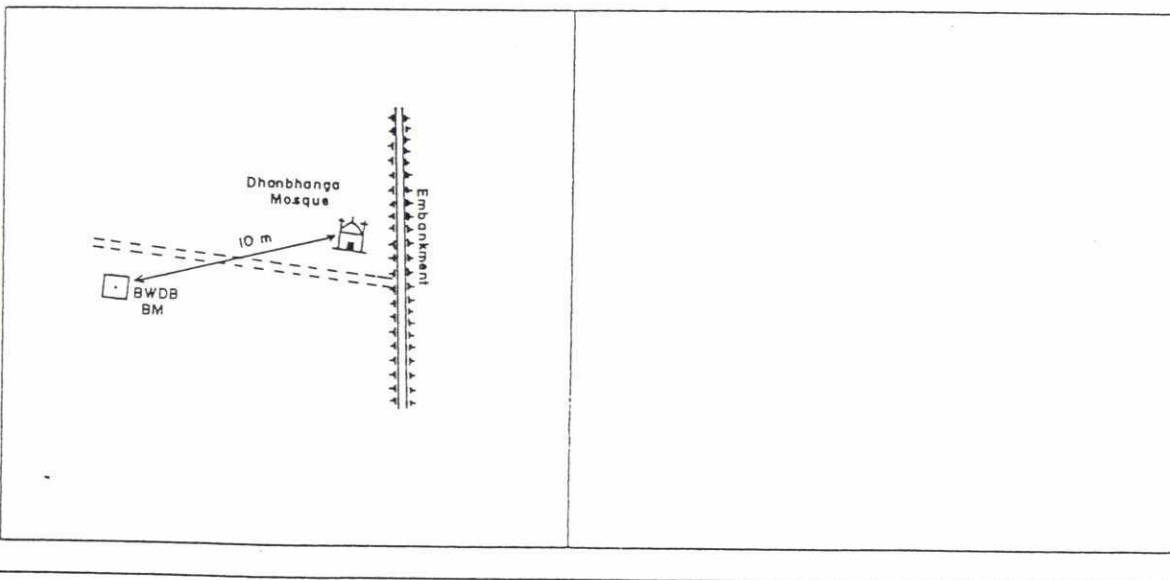
RIVER : Brahmaputra-Jamuna

GAUGE STATION : 45 Noonkhawa

## LOCATION SKETCH



## LOCATION OF BM & TBM

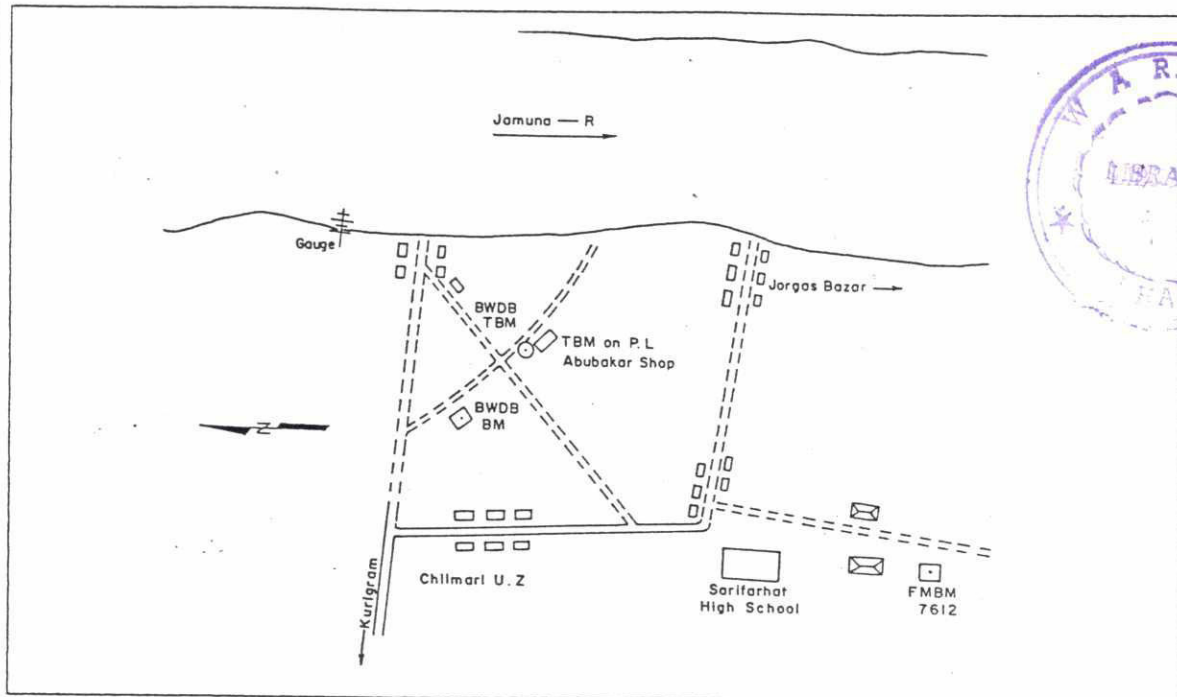


# PROJECT : FAP 24 RIVER SURVEY PROJECT

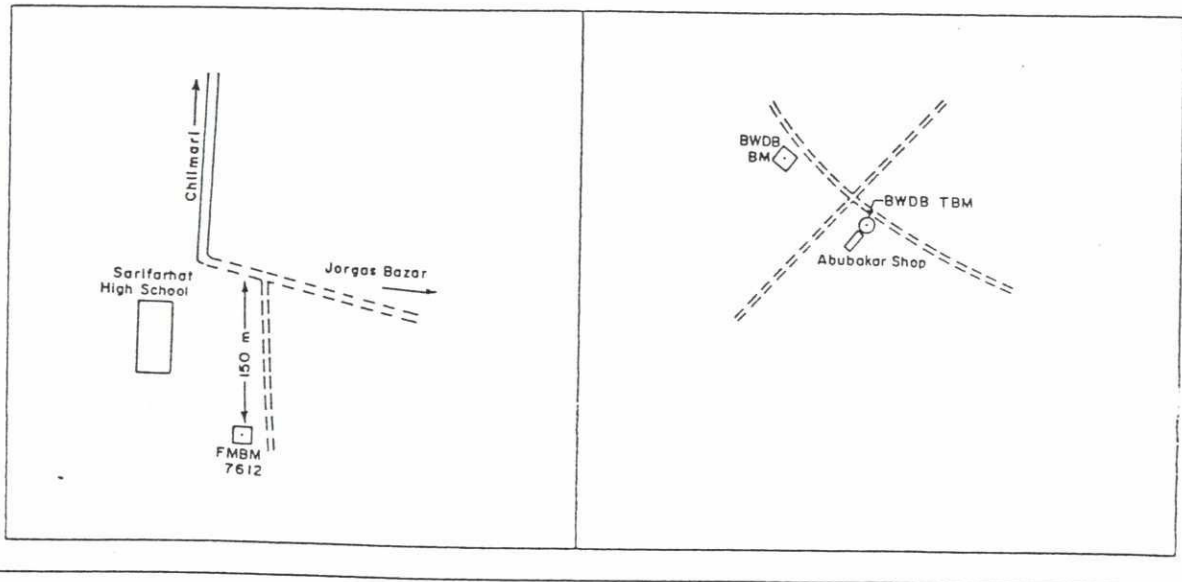
RIVER : Brahmaputra-Jamuna

GAUGE STATION : 45.5 Chilmari

## LOCATION SKETCH



## LOCATION OF BM & TBM



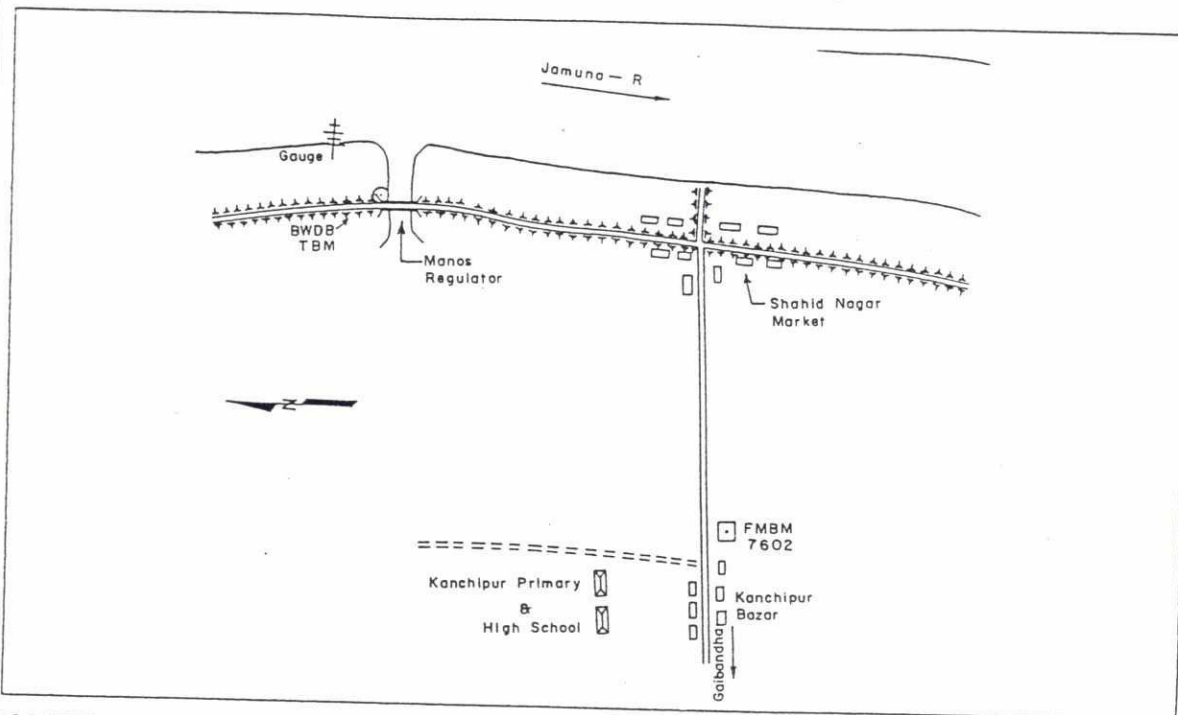


# PROJECT : FAP 24 RIVER SURVEY PROJECT

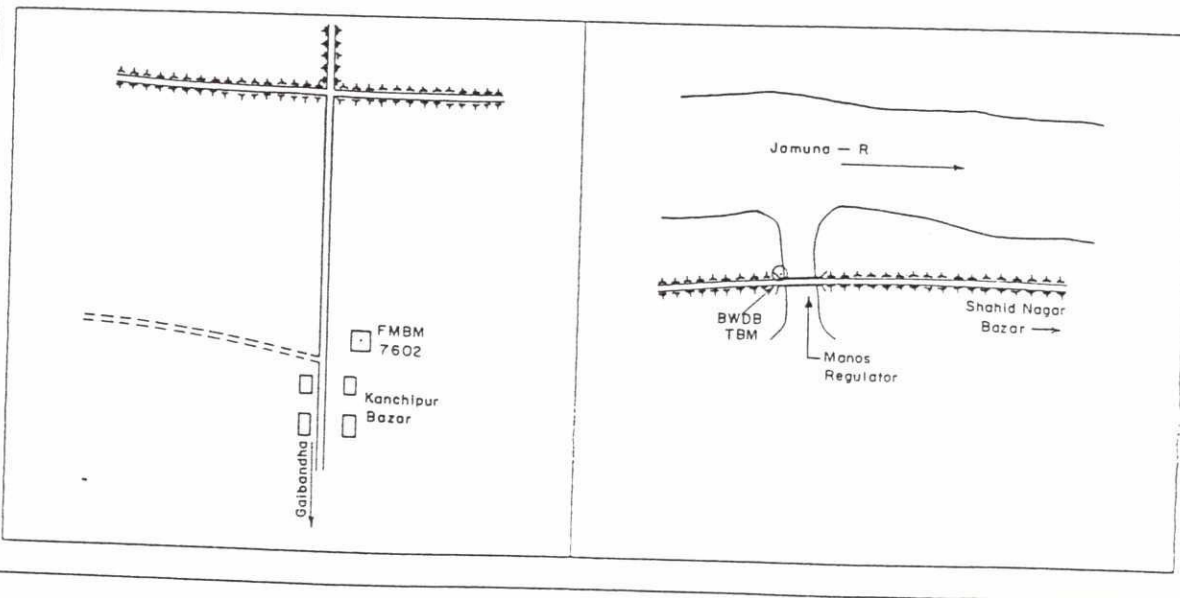
RIVER : Old Brahmaputra

GAUGE STATION : 46 Kamarjani

## LOCATION SKETCH



## LOCATION OF BM & TBM

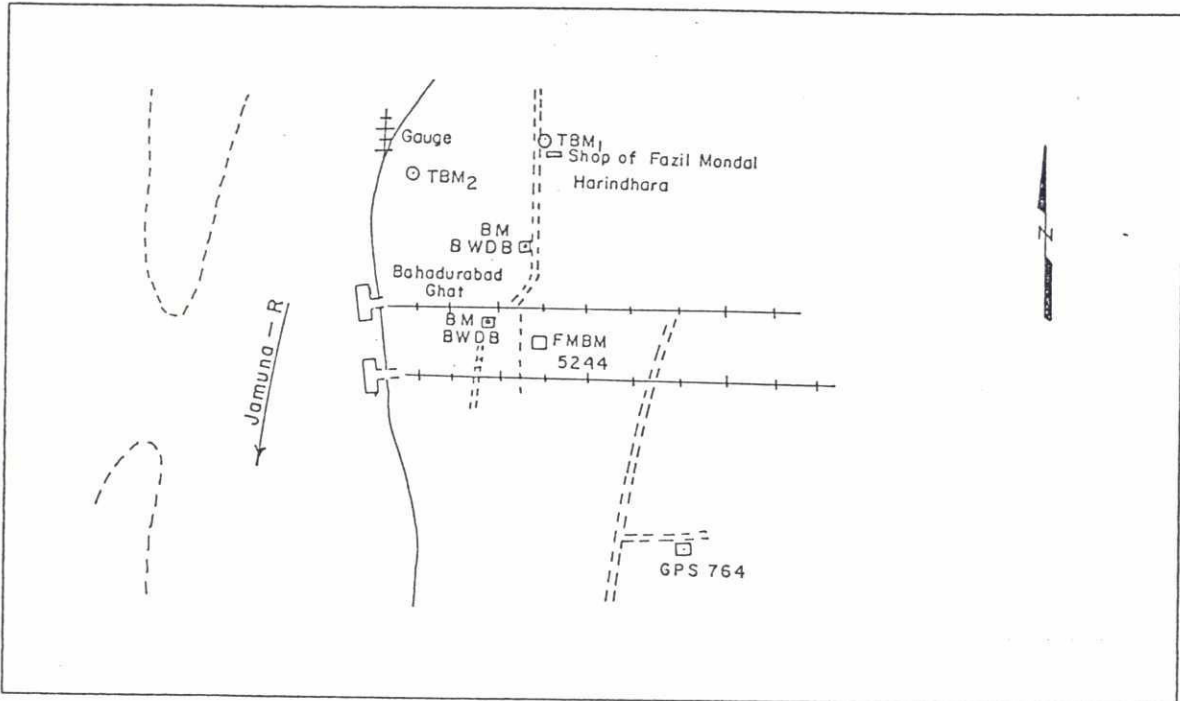


PROJECT : FAP 24 RIVER SURVEY PROJECT

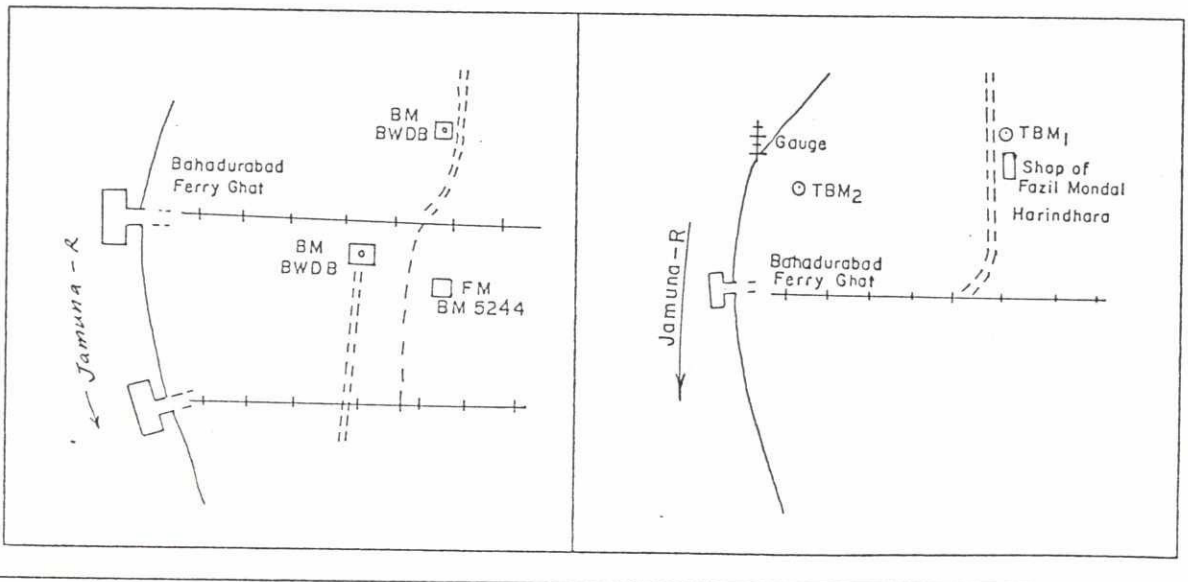
RIVER : Brahmaputra-Jamuna

GAUGE STATION : 46.9L Bahadurabad transit

LOCATION SKETCH



LOCATION OF BM & TBM

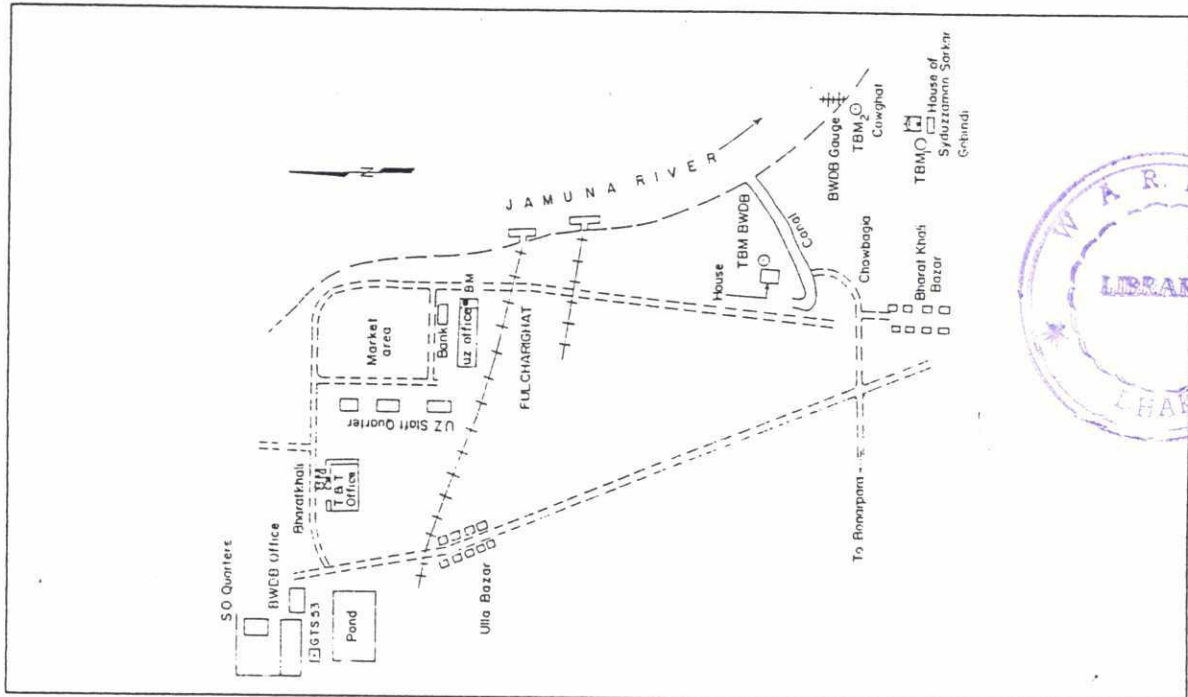


# PROJECT : FAP 24 RIVER SURVEY PROJECT

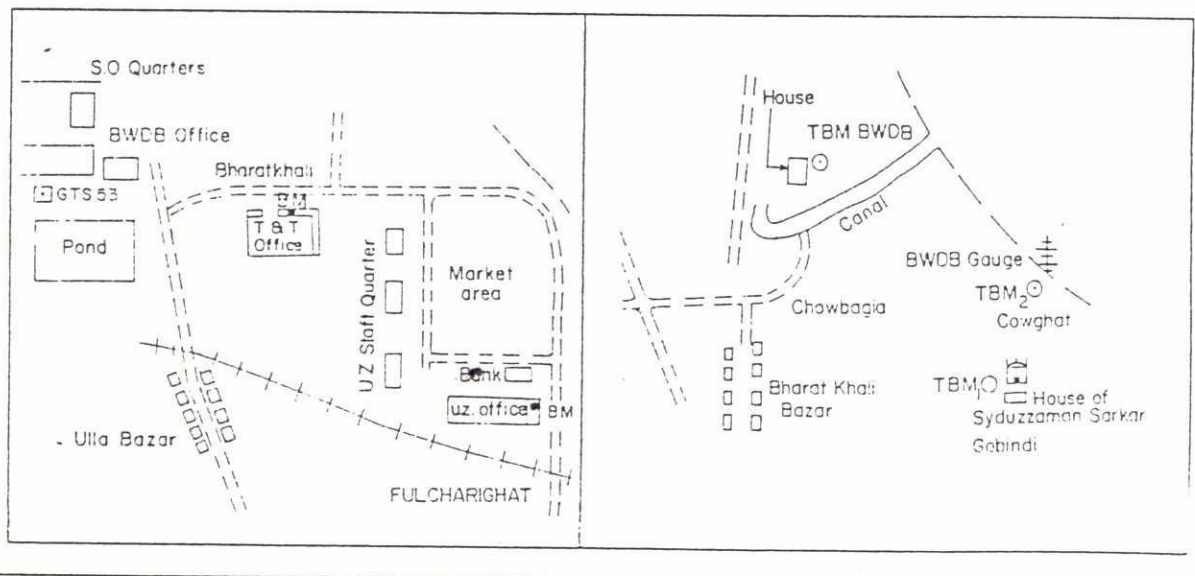
RIVER : Brahmaputra-Jamuna

GAUGE STATION : 46.9R Fulchari transit

## LOCATION SKETCH



## LOCATION OF BM & TBM

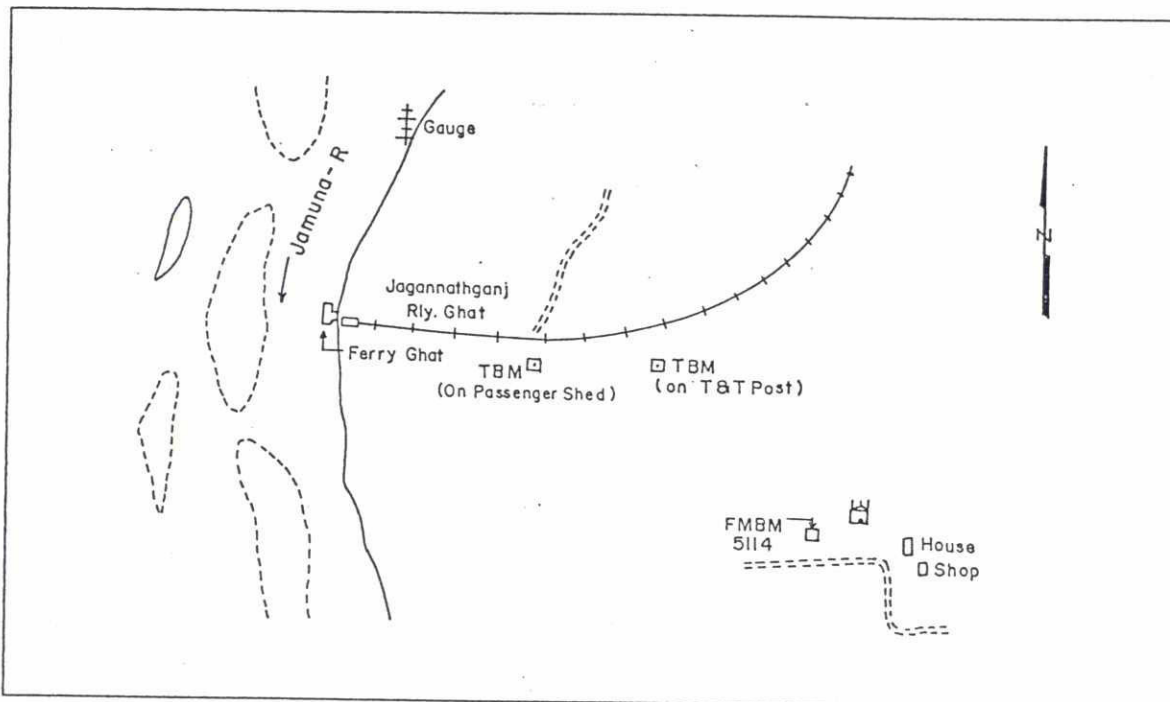


# PROJECT : FAP 24 RIVER SURVEY PROJECT

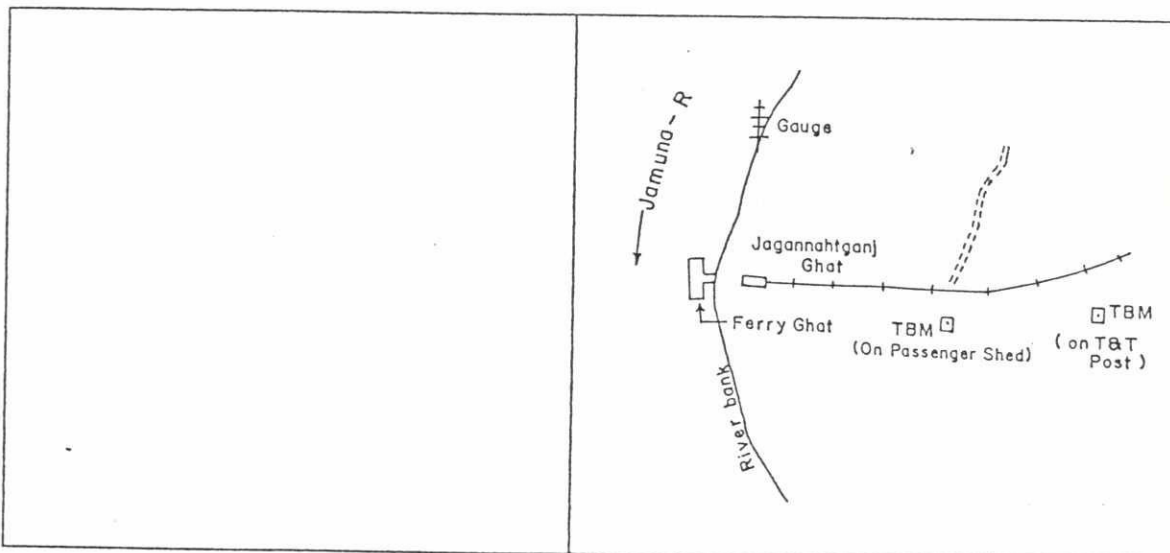
RIVER : Brahmaputra-Jamuna

GAUGE STATION : 48 Jagannathganj

## LOCATION SKETCH



## LOCATION OF BM & TBM



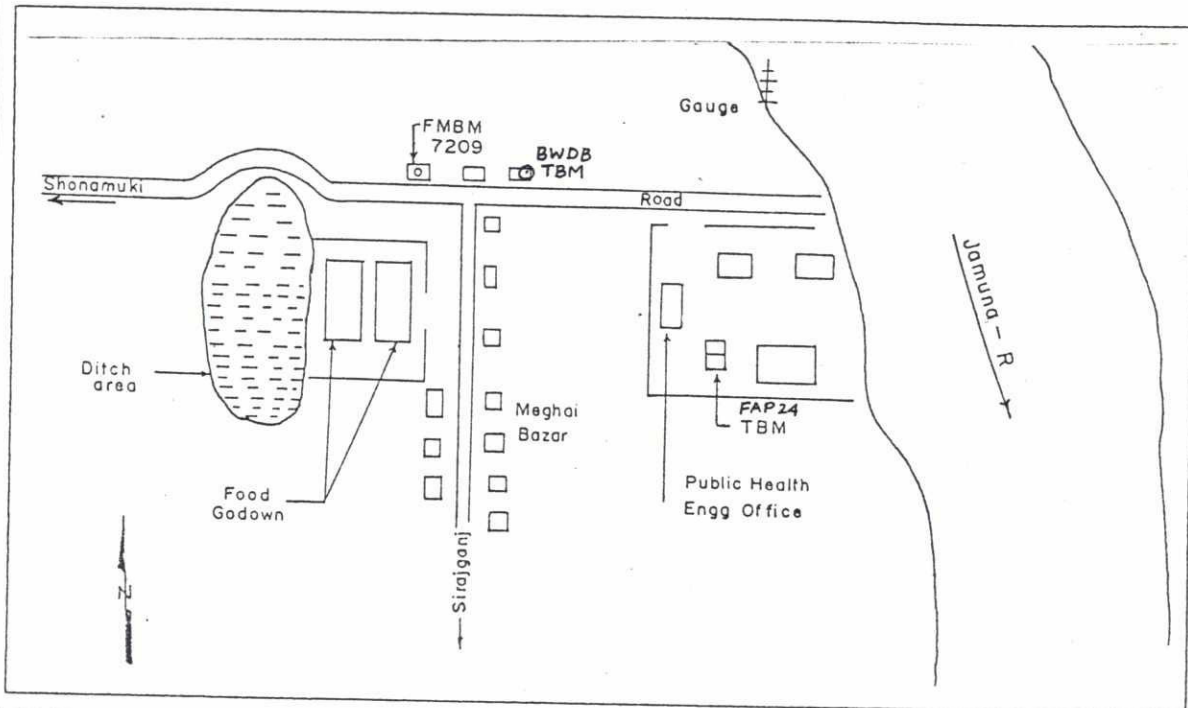


PROJECT : FAP 24 RIVER SURVEY PROJECT

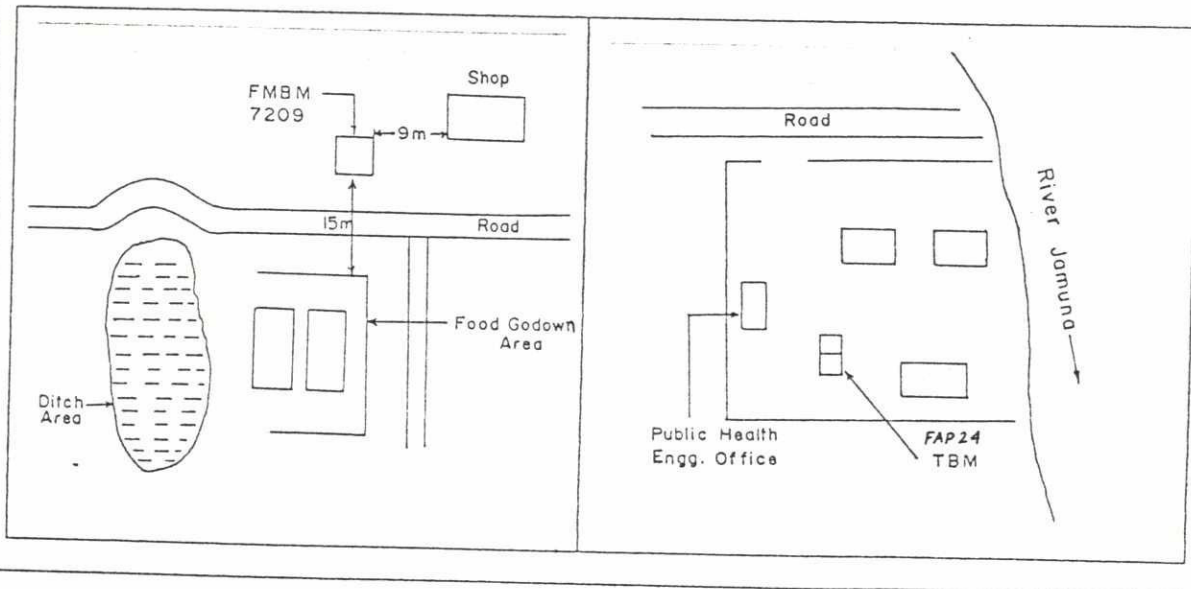
RIVER : Brahmaputra-Jamuna

GAUGE STATION : 49A Kazipur

LOCATION SKETCH



LOCATION OF BM & TBM

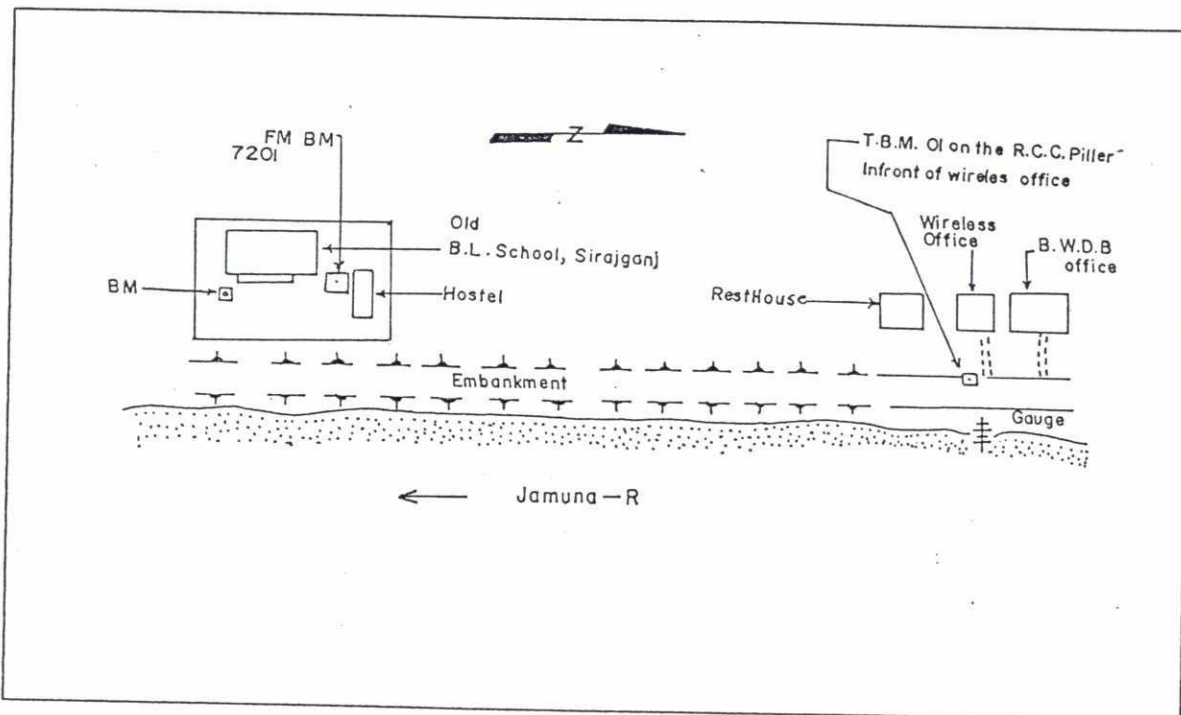


# PROJECT : FAP 24 RIVER SURVEY PROJECT

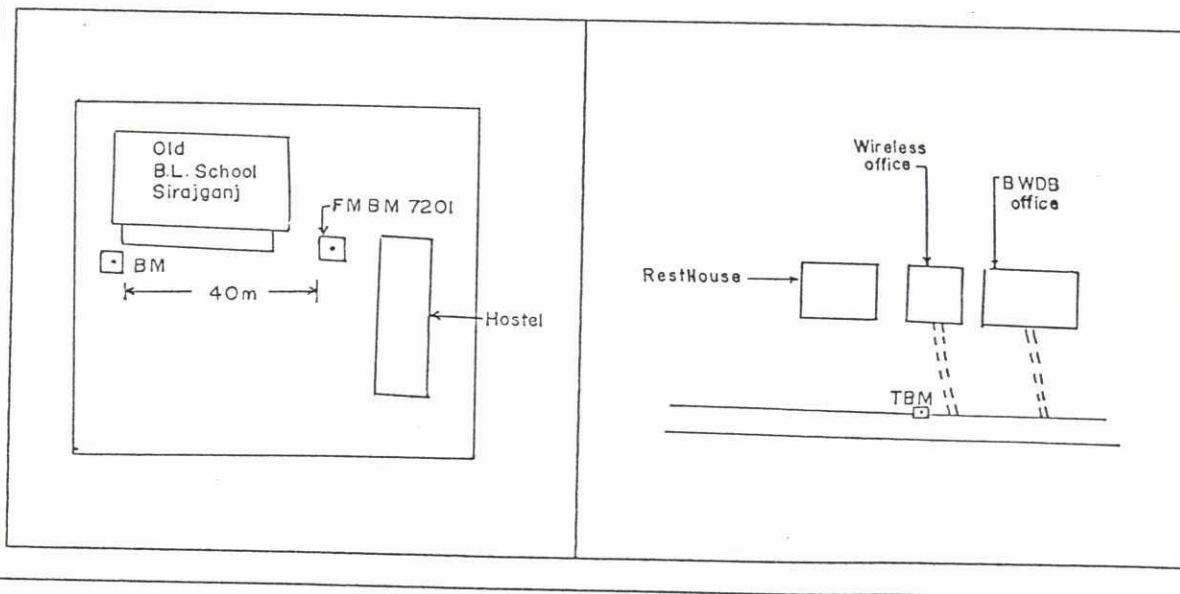
RIVER : Brahmaputra-Jamuna

GAUGE STATION : 49 Serajganj

## LOCATION SKETCH



## LOCATION OF BM & TBM



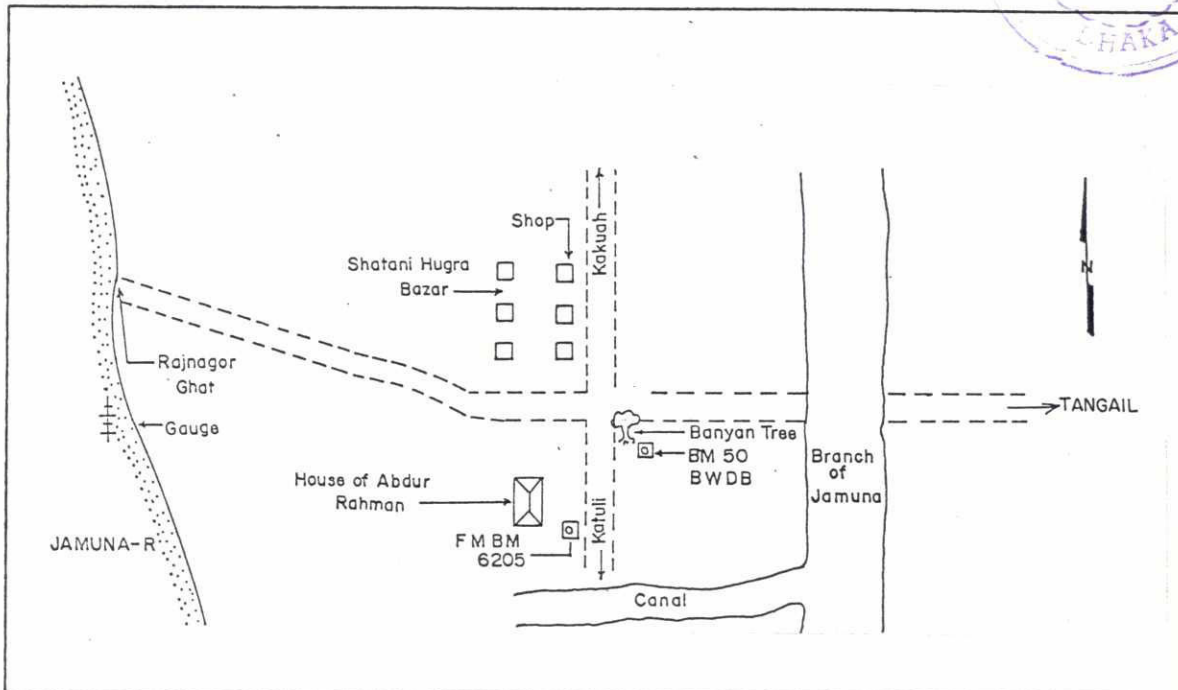
# PROJECT : FAP 24 RIVER SURVEY PROJECT

RIVER : Brahmaputra-Jamuna

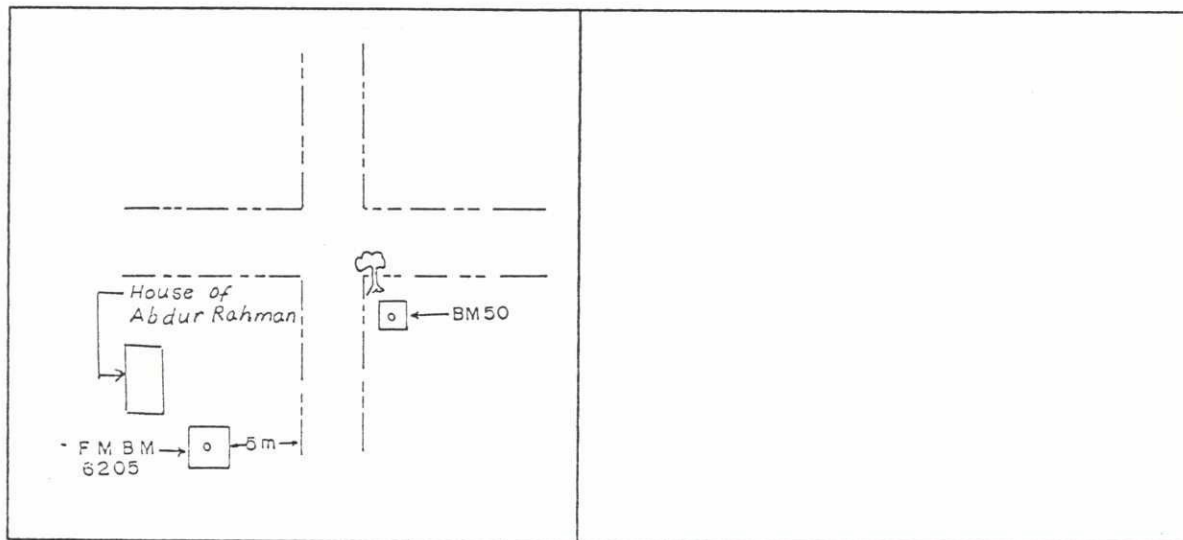
GAUGE STATION : 50 Porabari



## LOCATION SKETCH



## LOCATION OF BM & TBM

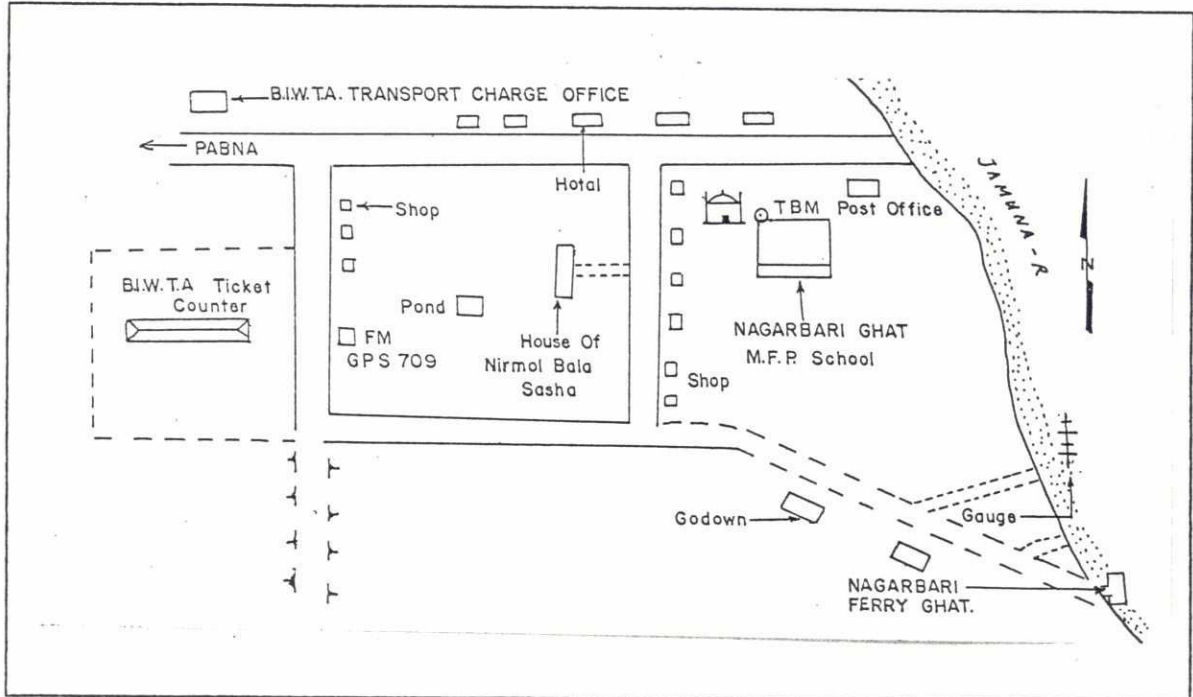


# PROJECT : FAP 24 RIVER SURVEY PROJECT

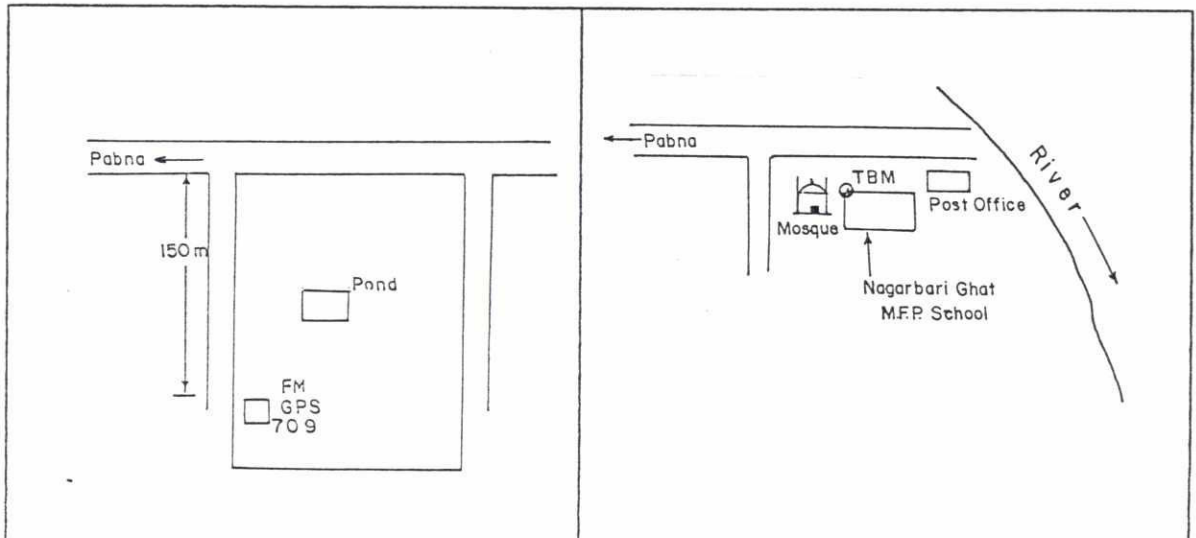
RIVER : Brahmaputra-Jamuna

GAUGE STATION : 50.3 Mathura

## LOCATION SKETCH



## LOCATION OF BM & TBM





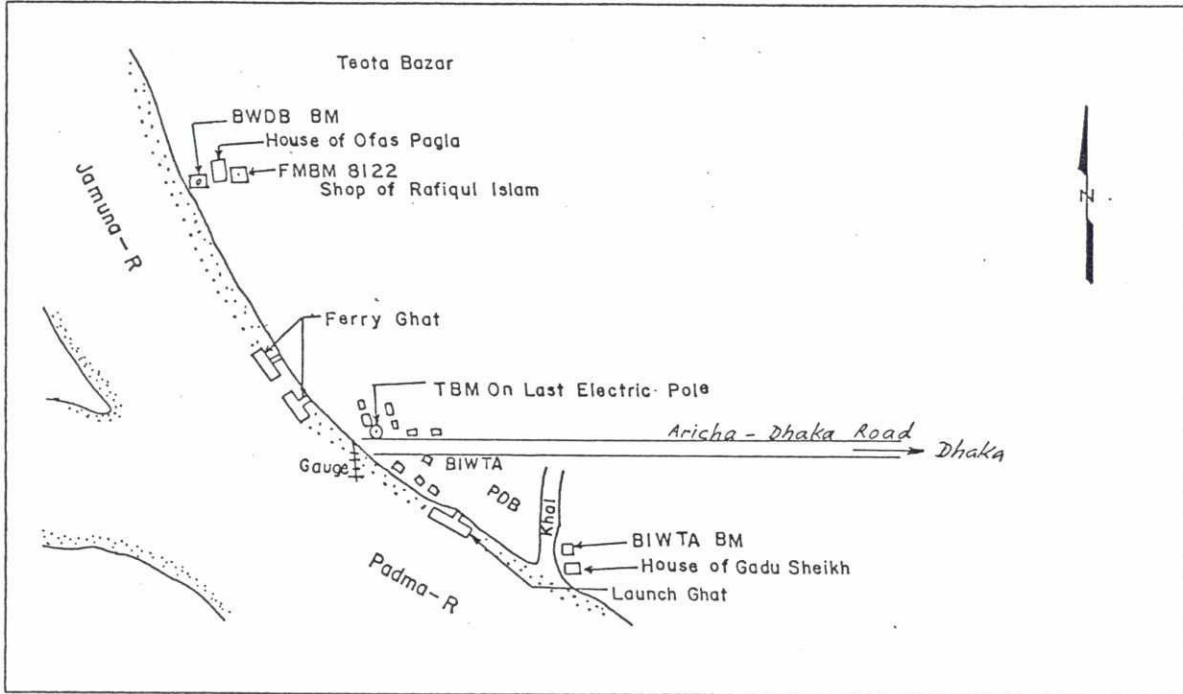
82

# PROJECT : FAP 24 RIVER SURVEY PROJECT

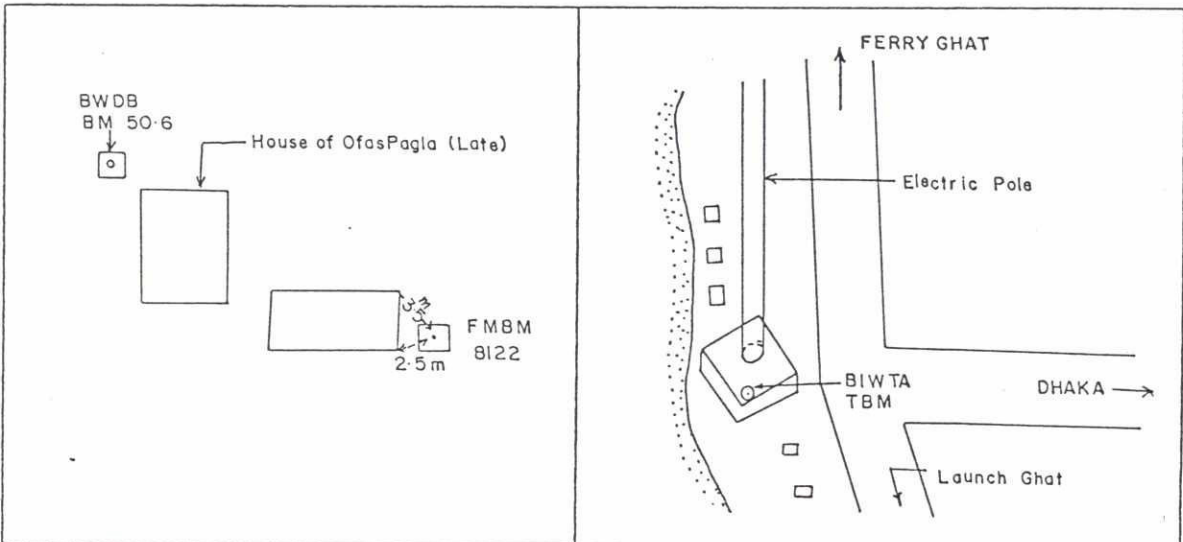
RIVER : Brahmaputra-Jamuna

GAUGE STATION : 50.6 Teota

## LOCATION SKETCH



## LOCATION OF BM & TBM



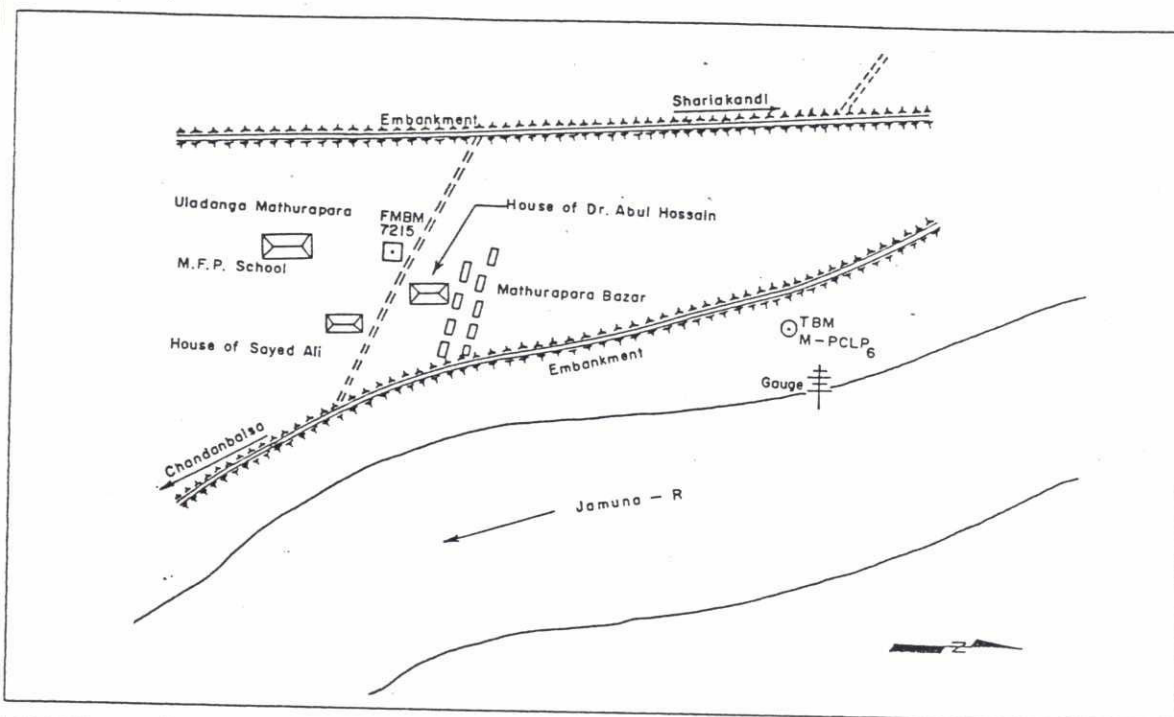
CD

# PROJECT : FAP 24 RIVER SURVEY PROJECT

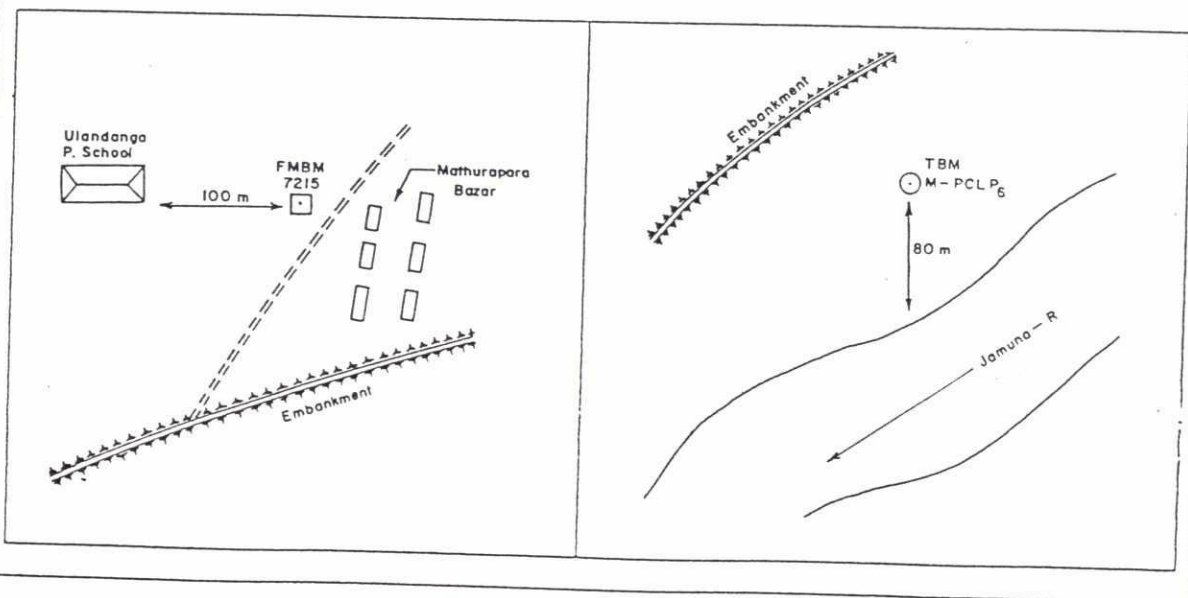
RIVER : Brahmaputra-Jamuna

GAUGE STATION : 15.J Mathurapara

## LOCATION SKETCH



## LOCATION OF BM & TBM

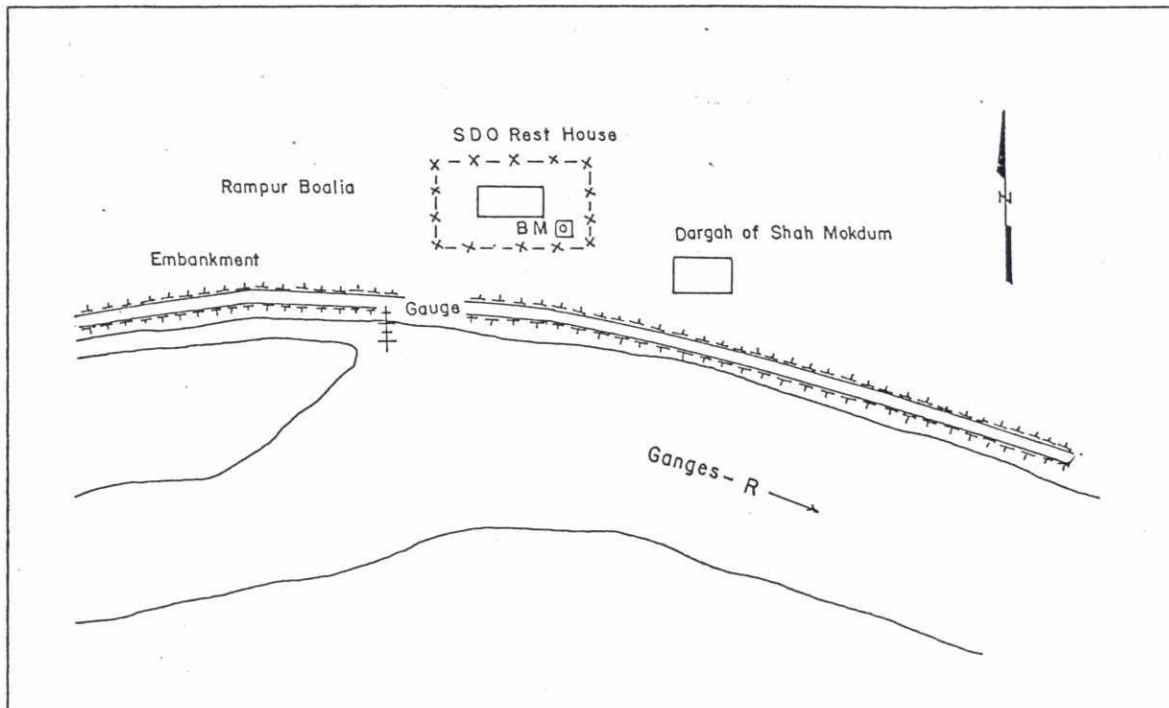


# PROJECT : FAP 24 RIVER SURVEY PROJECT

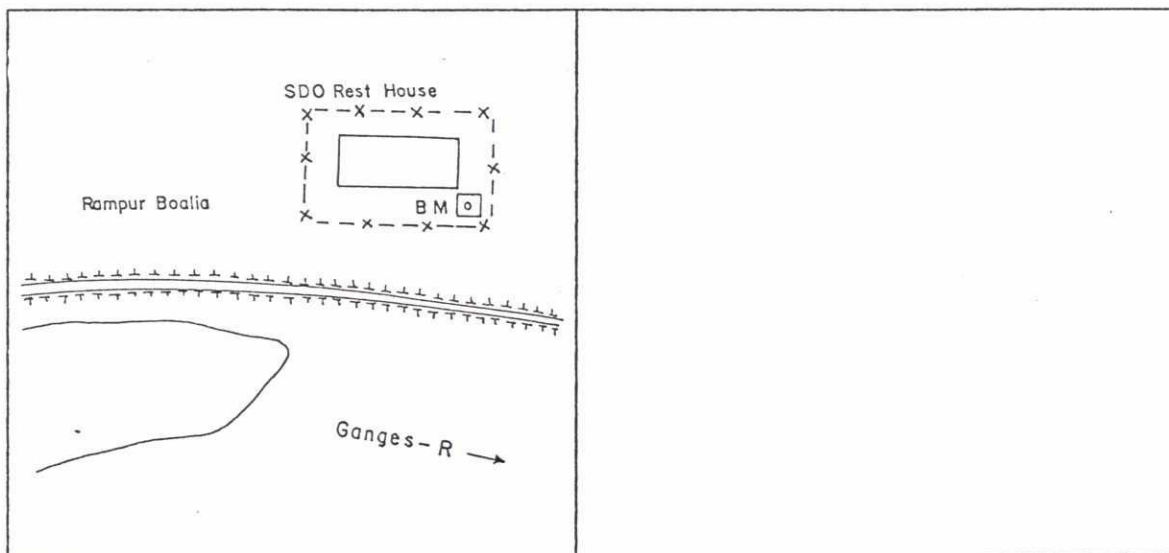
RIVER : Ganges

GAUGE STATION : 88 Rampur Boalia

## LOCATION SKETCH



## LOCATION OF BM & TBM

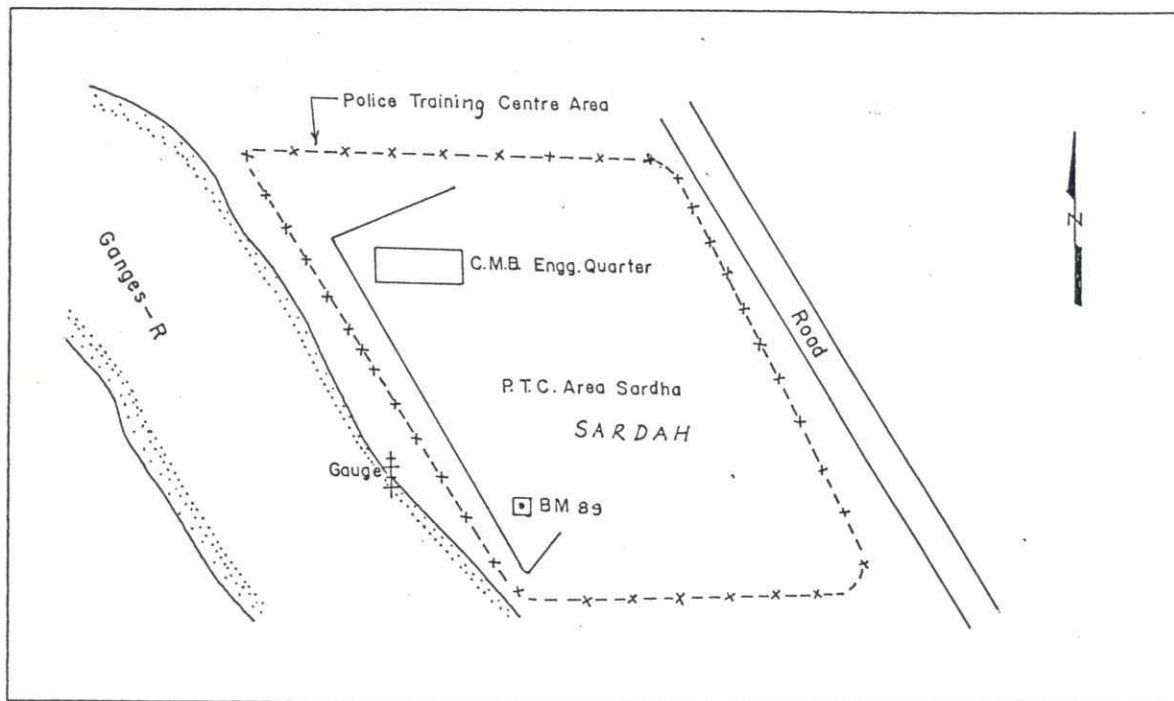


PROJECT : FAP 24 RIVER SURVEY PROJECT

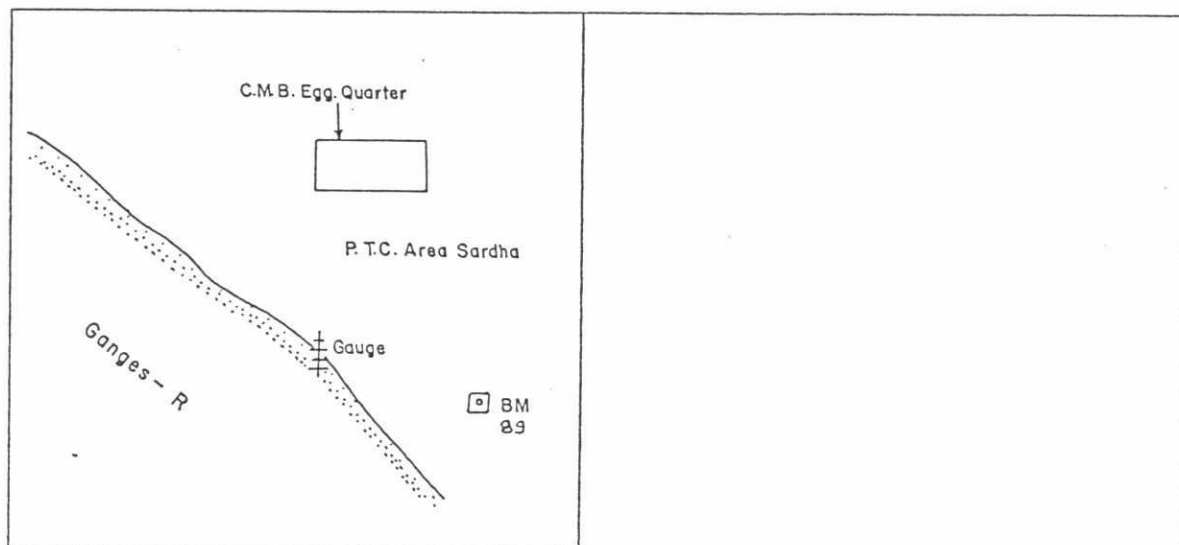
RIVER : Ganges

GAUGE STATION : 89 Sardah

LOCATION SKETCH



LOCATION OF BM & TBM



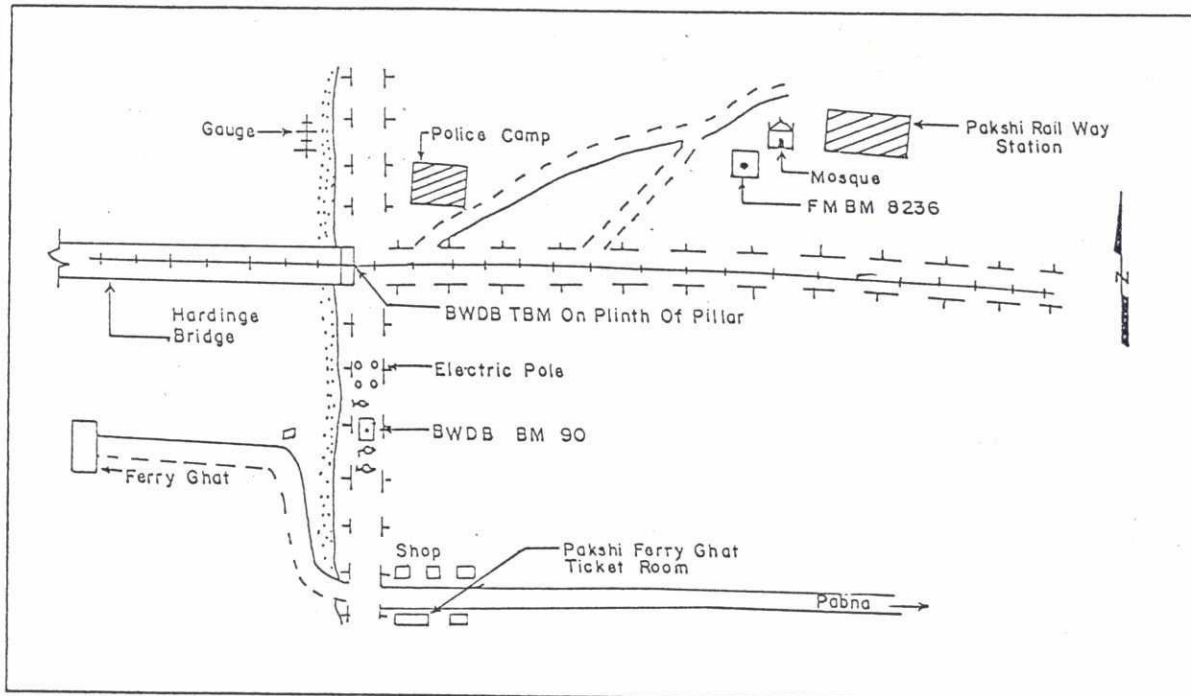


PROJECT : FAP 24 RIVER SURVEY PROJECT

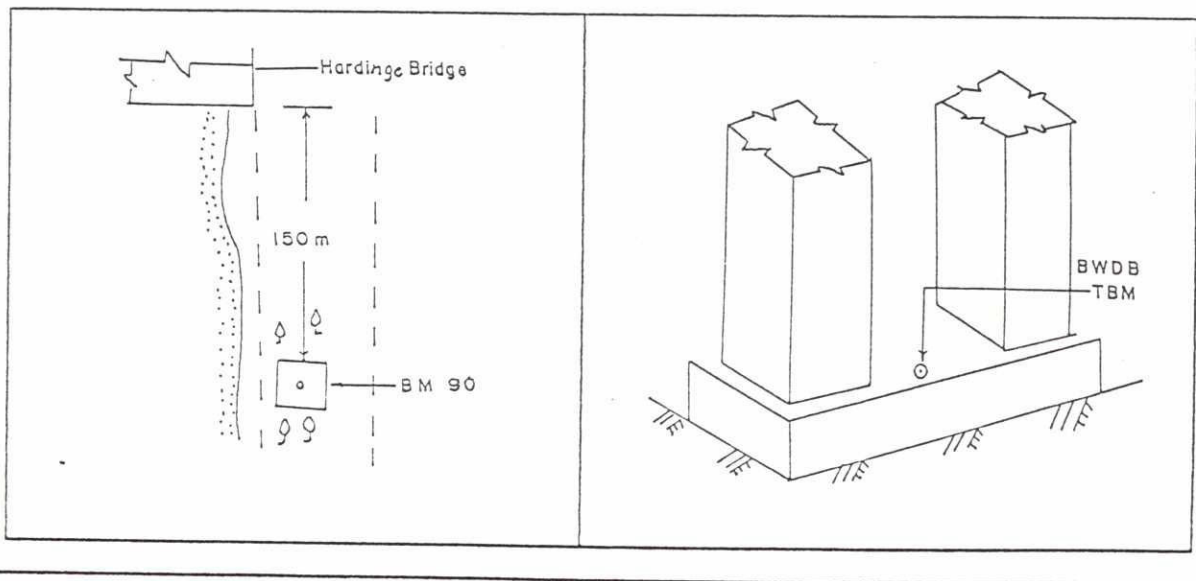
RIVER : Ganges

GAUGE STATION : 90 Hardinge Bridge

LOCATION SKETCH



LOCATION OF BM & TBM

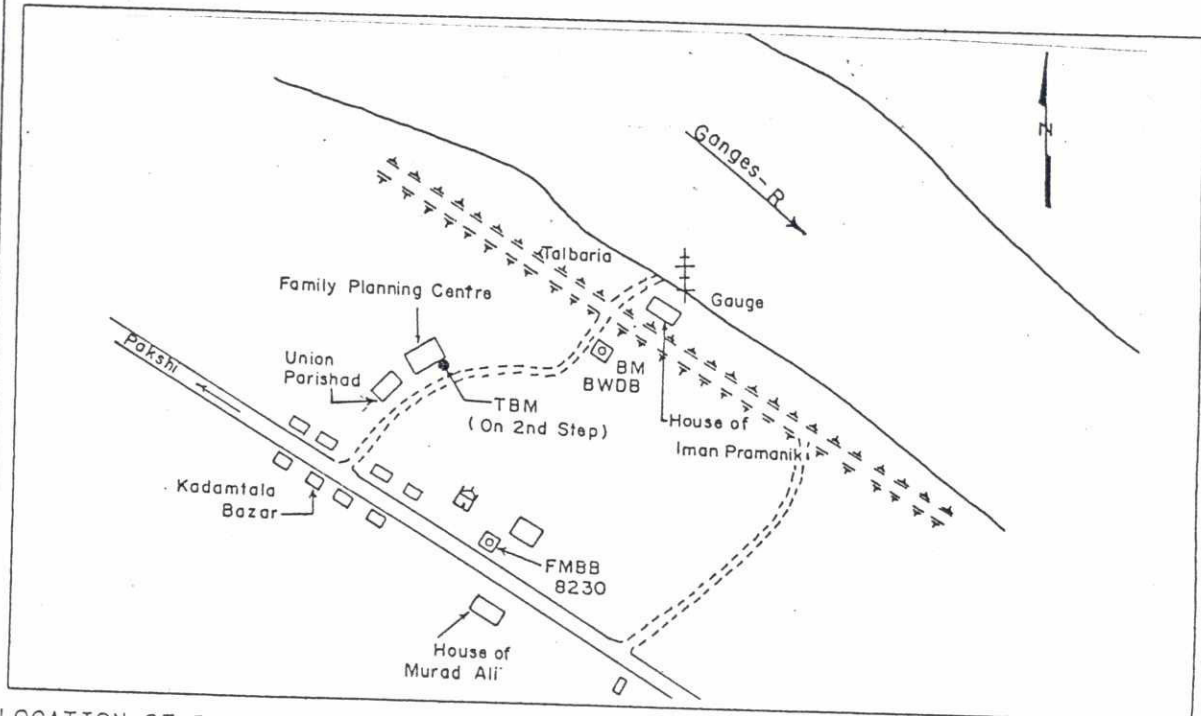


PROJECT : FAP 24 RIVER SURVEY PROJECT

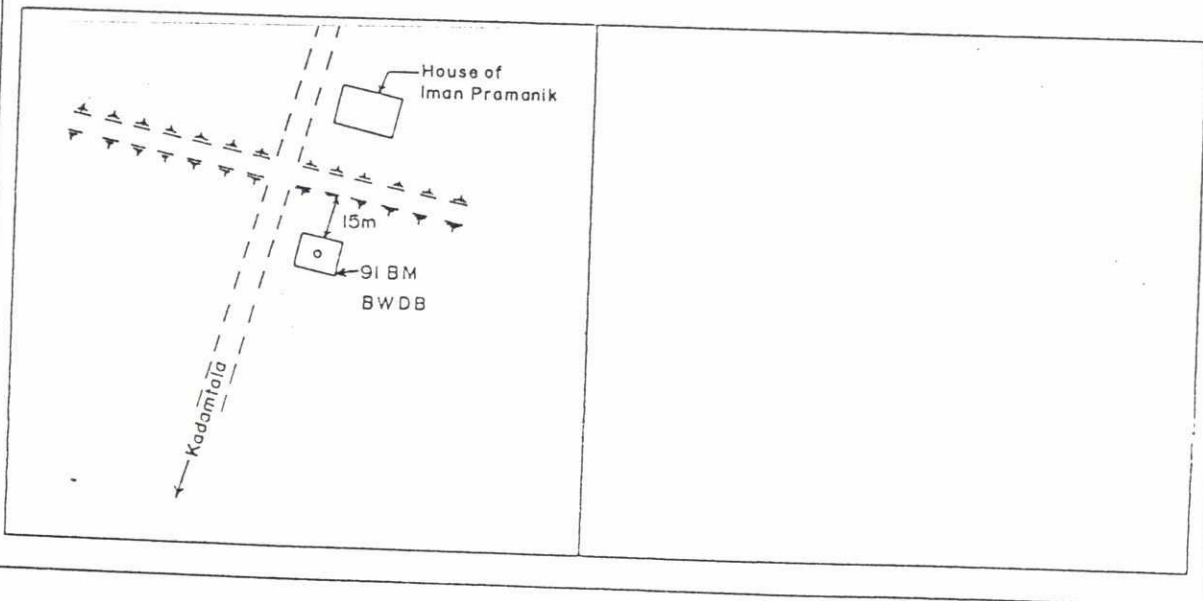
RIVER : Ganges

GAUGE STATION : 91 Talbaria

LOCATION SKETCH



LOCATION OF BM & TBM

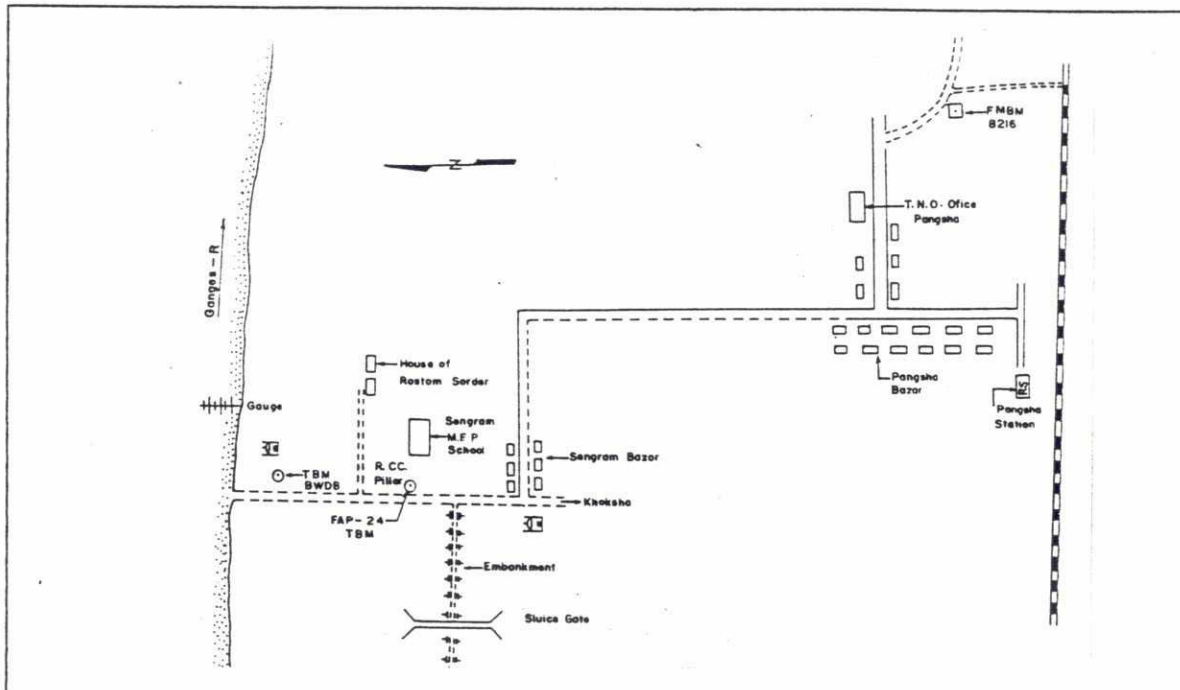


# PROJECT : FAP 24 RIVER SURVEY PROJECT

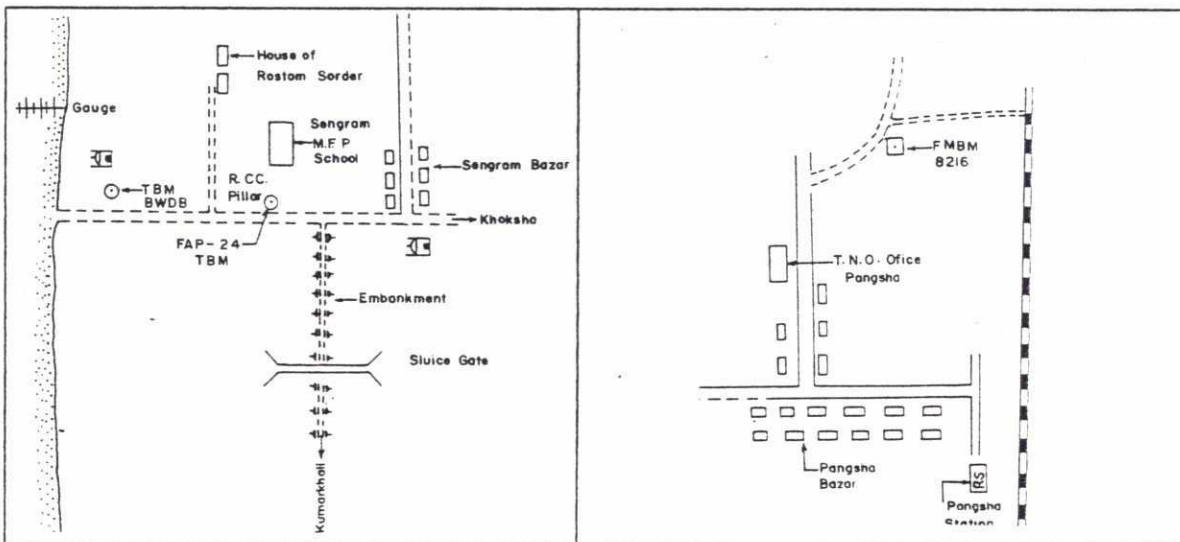
RIVER : Ganges

GAUGE STATION : 91.1 Sengram

## LOCATION SKETCH



## LOCATION OF BM & TBM



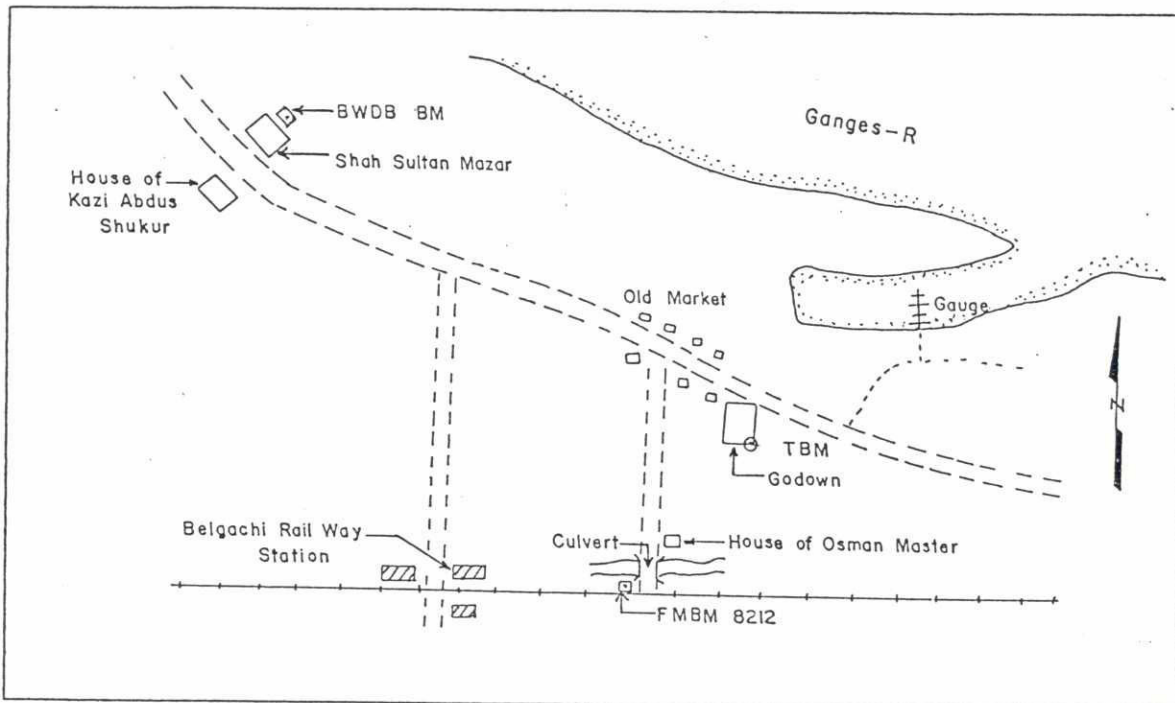
73

# PROJECT : FAP 24 RIVER SURVEY PROJECT

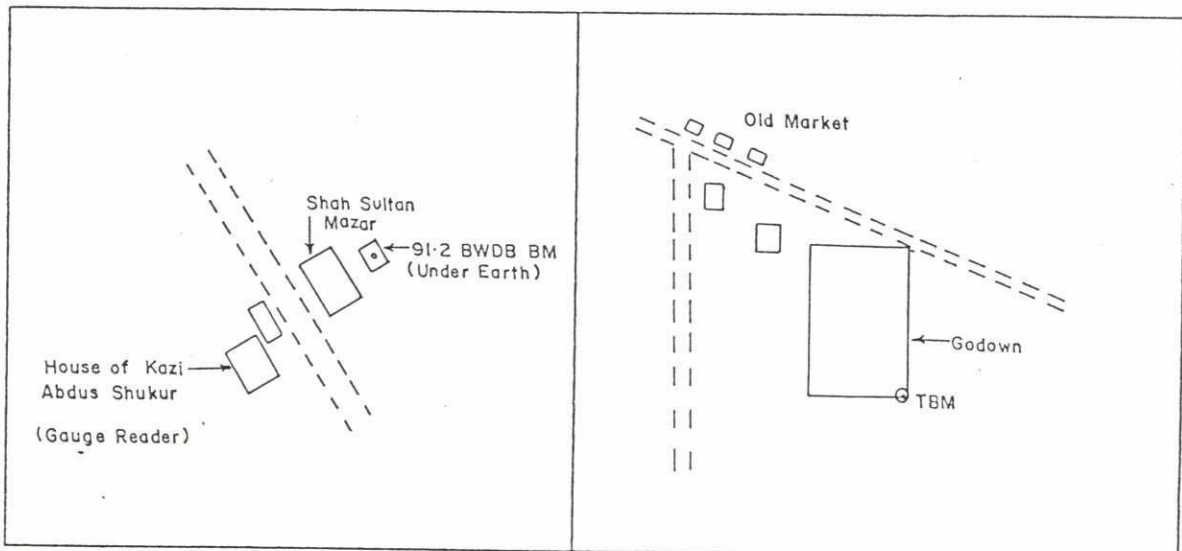
RIVER : Ganges

GAUGE STATION : 91.2 Mahendrapur

## LOCATION SKETCH



## LOCATION OF BM & TBM



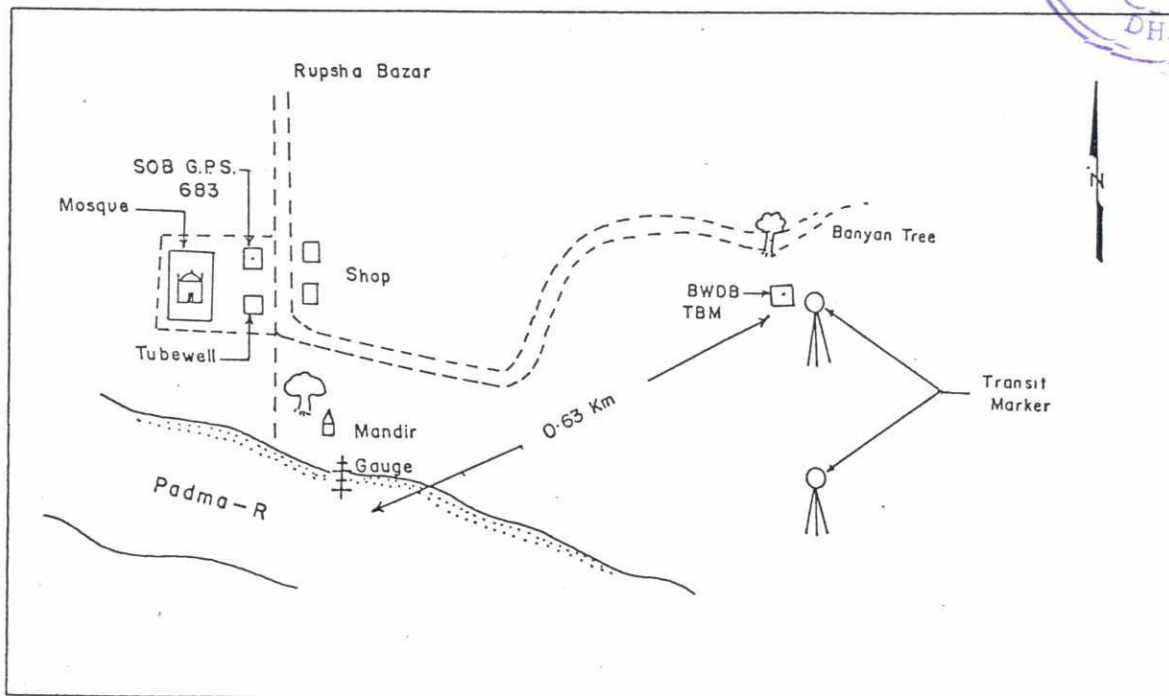


# PROJECT : FAP 24 RIVER SURVEY PROJECT

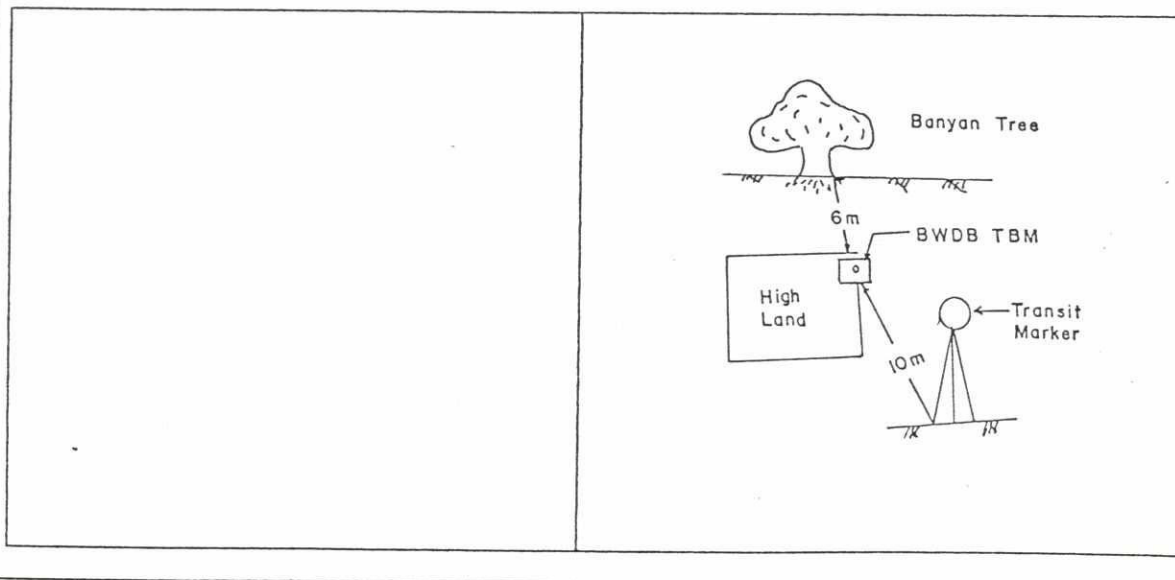
RIVER : Padma

GAUGE STATION : 91.9L Baruria

## LOCATION SKETCH



## LOCATION OF BM & TBM



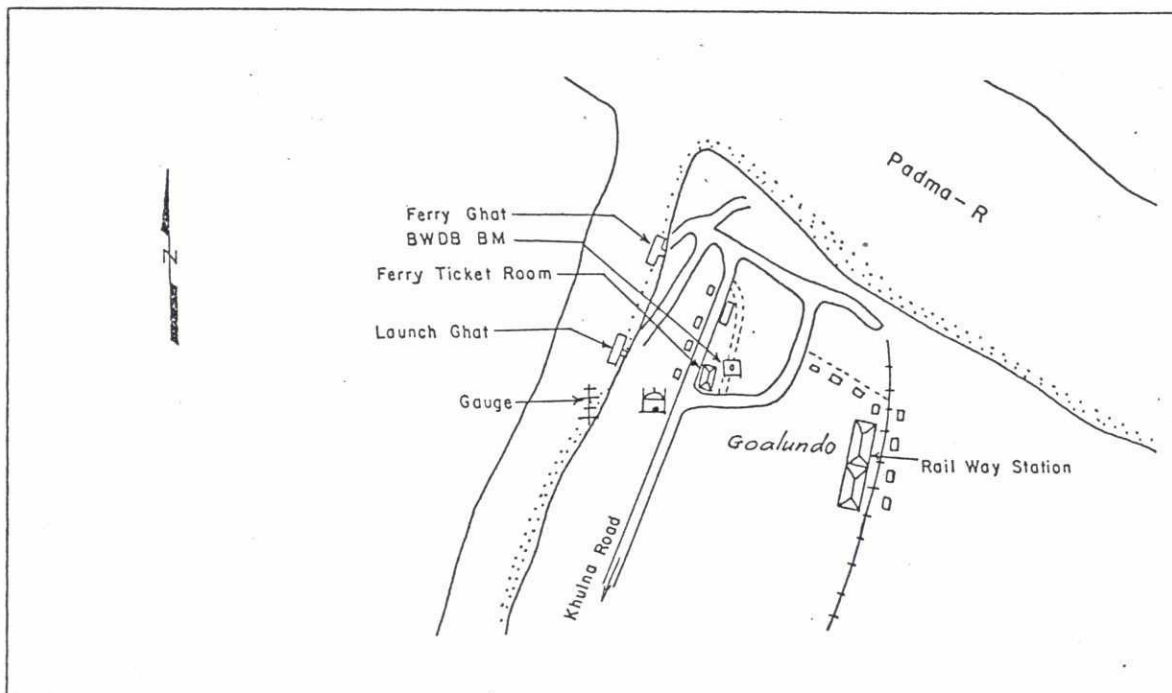
CF

# PROJECT : FAP 24 RIVER SURVEY PROJECT

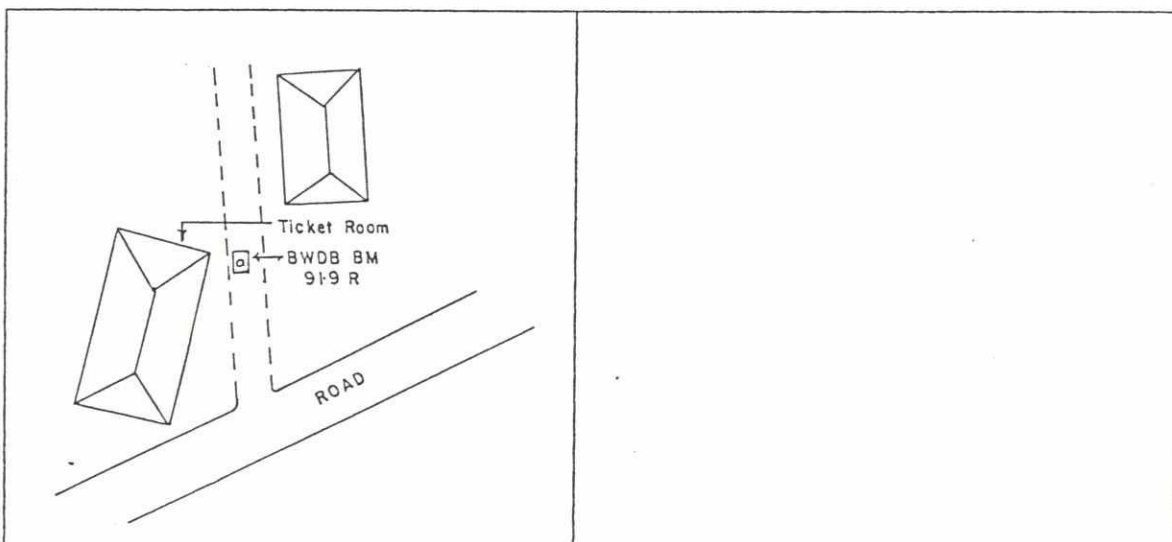
RIVER : Padma

GAUGE STATION : 91.9R Goalunda

## LOCATION SKETCH



## LOCATION OF BM & TBM



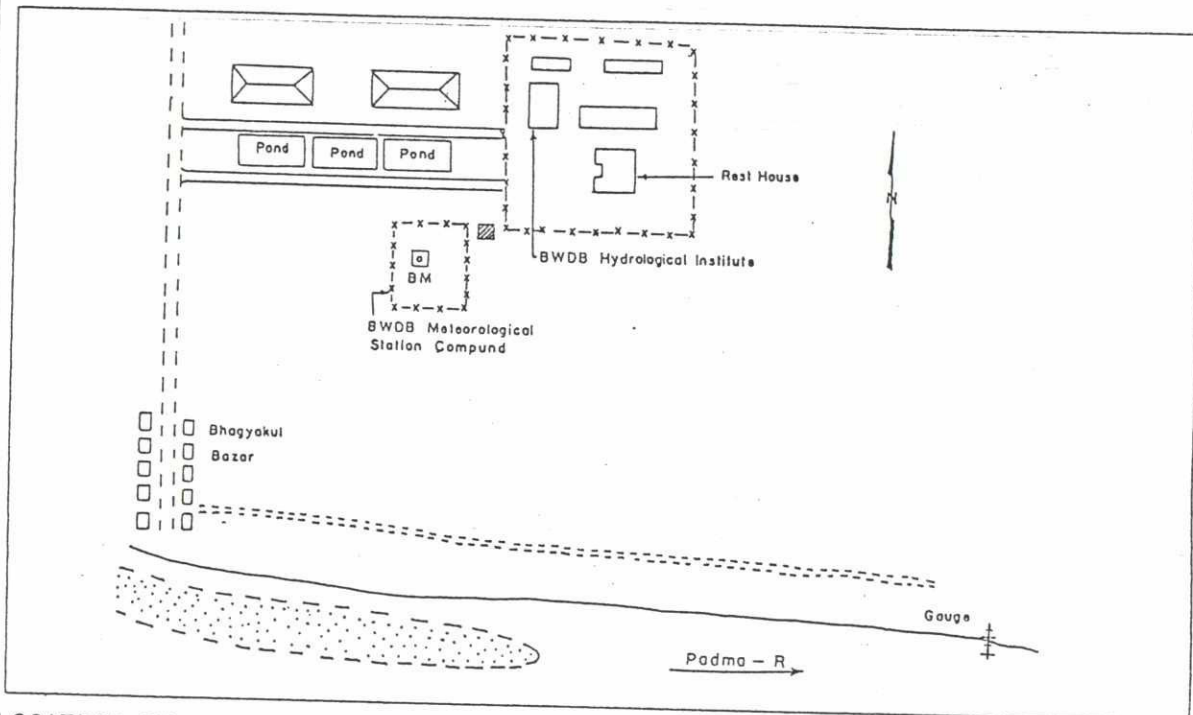
72

# PROJECT : FAP 24 RIVER SURVEY PROJECT

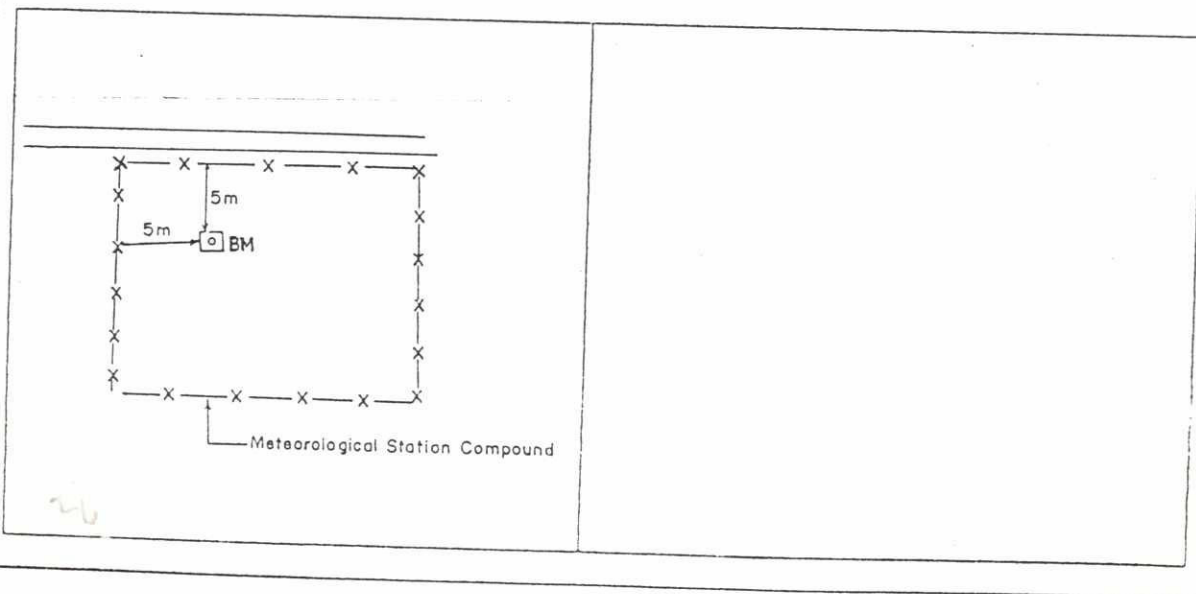
RIVER : Padma

GAUGE STATION : 93.4L Bhagyakul

## LOCATION SKETCH



## LOCATION OF BM & TBM

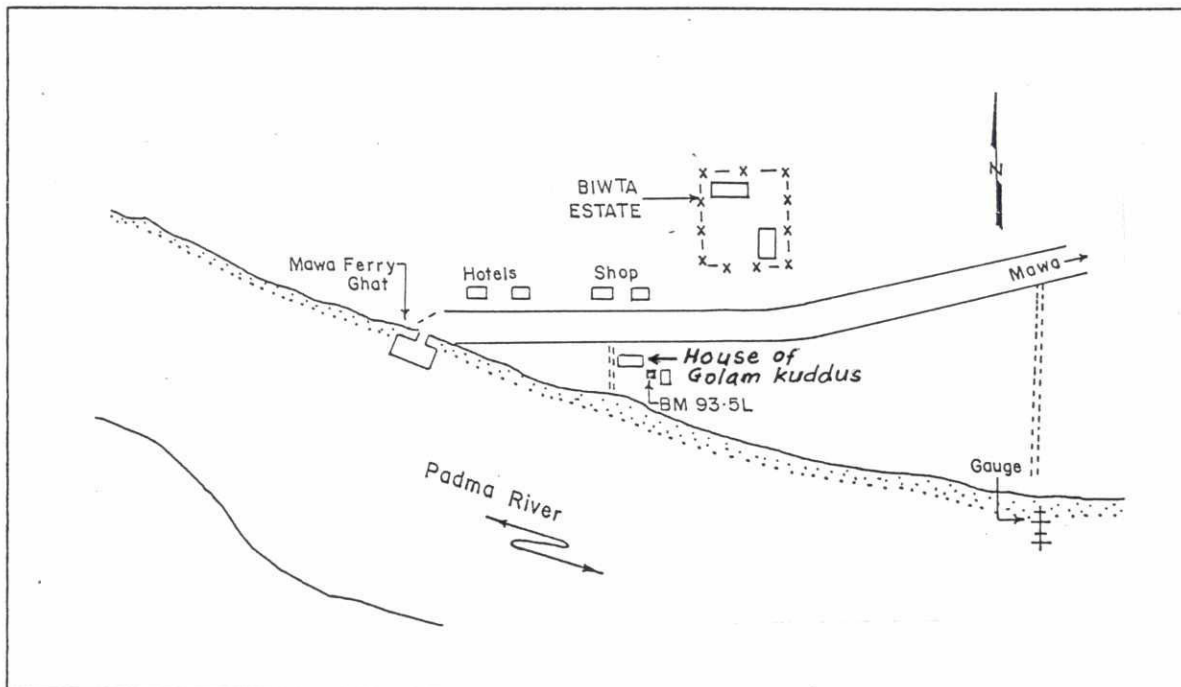


# PROJECT : FAP 24 RIVER SURVEY PROJECT

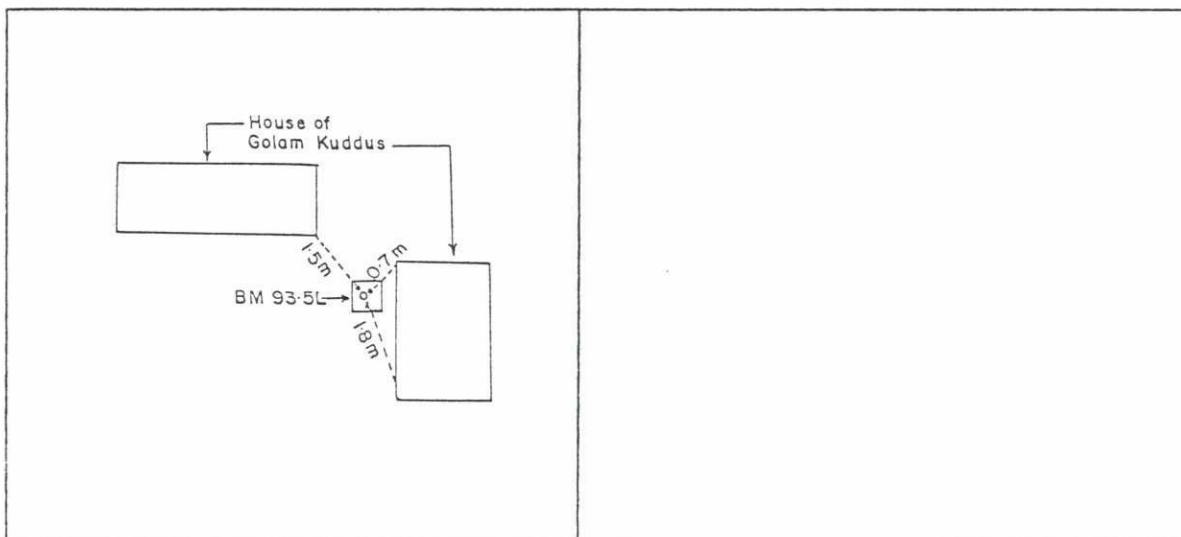
RIVER : Padma

GAUGE STATION : 93.5L Mawa

## LOCATION SKETCH



## LOCATION OF BM & TBM



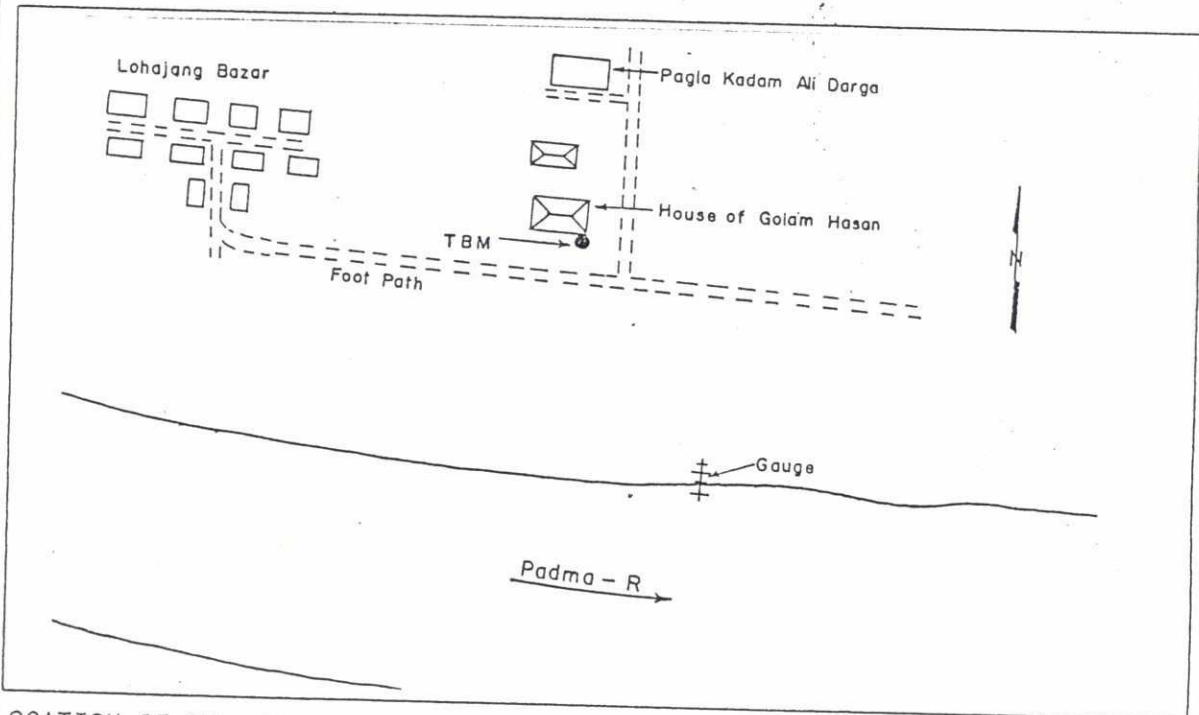


PROJECT : FAP 24 RIVER SURVEY PROJECT

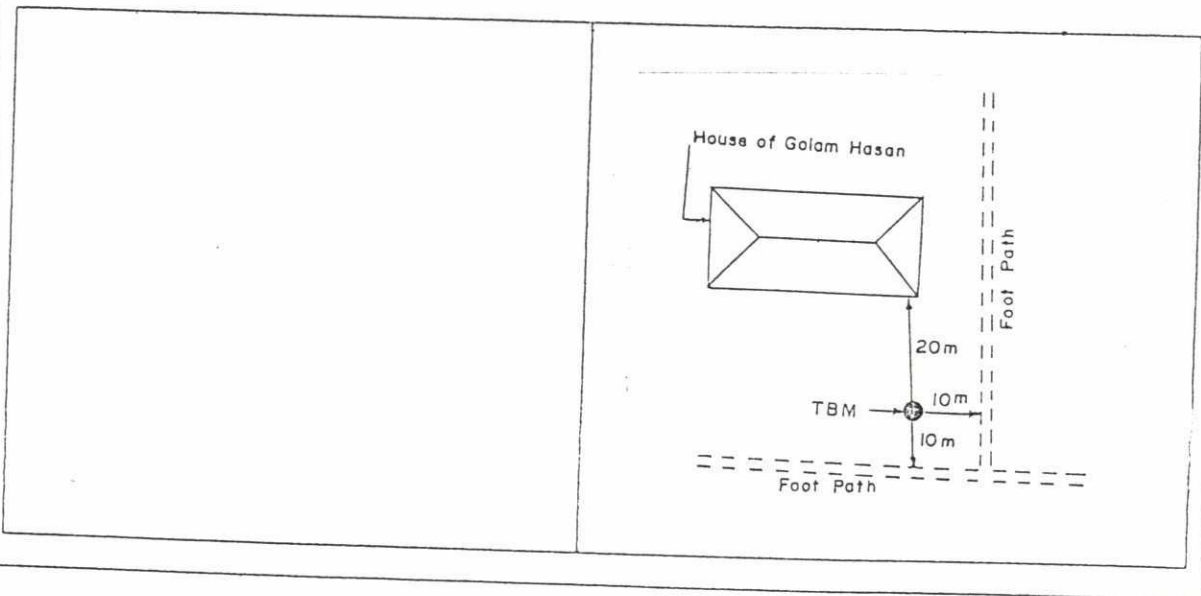
RIVER : Padma

GAUGE STATION : 94 Tarpasha

LOCATION SKETCH



LOCATION OF BM & TBM

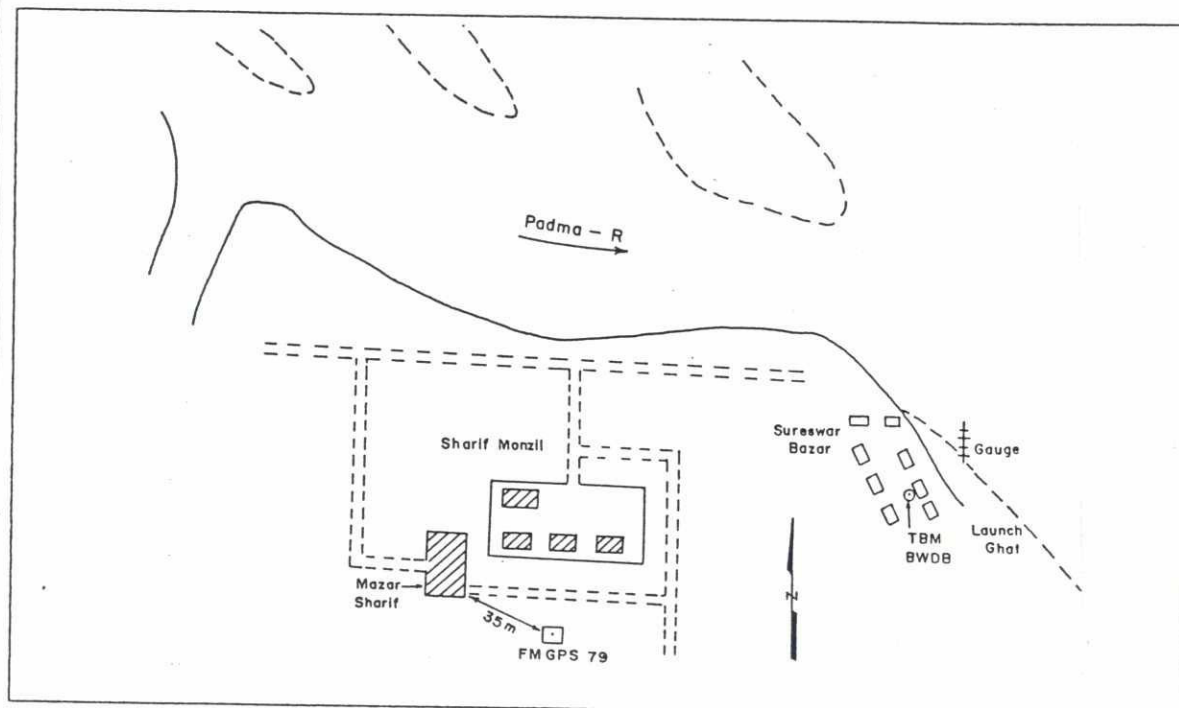


PROJECT : FAP 24 RIVER SURVEY PROJECT

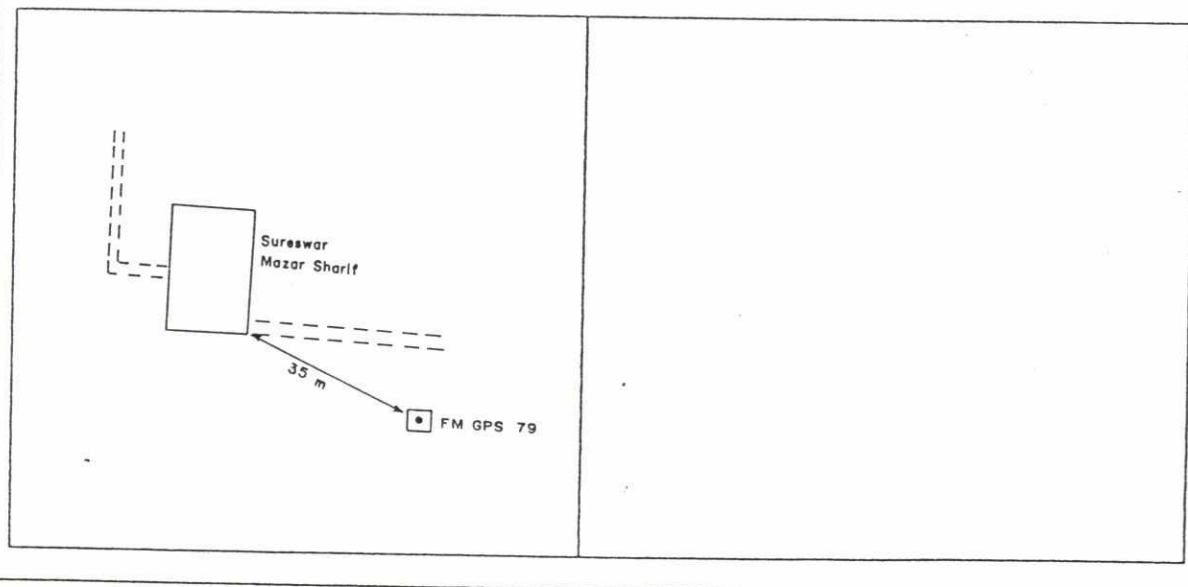
RIVER : Padma

GAUGE STATION : 95 Sureswar

LOCATION SKETCH



LOCATION OF BM & TBM



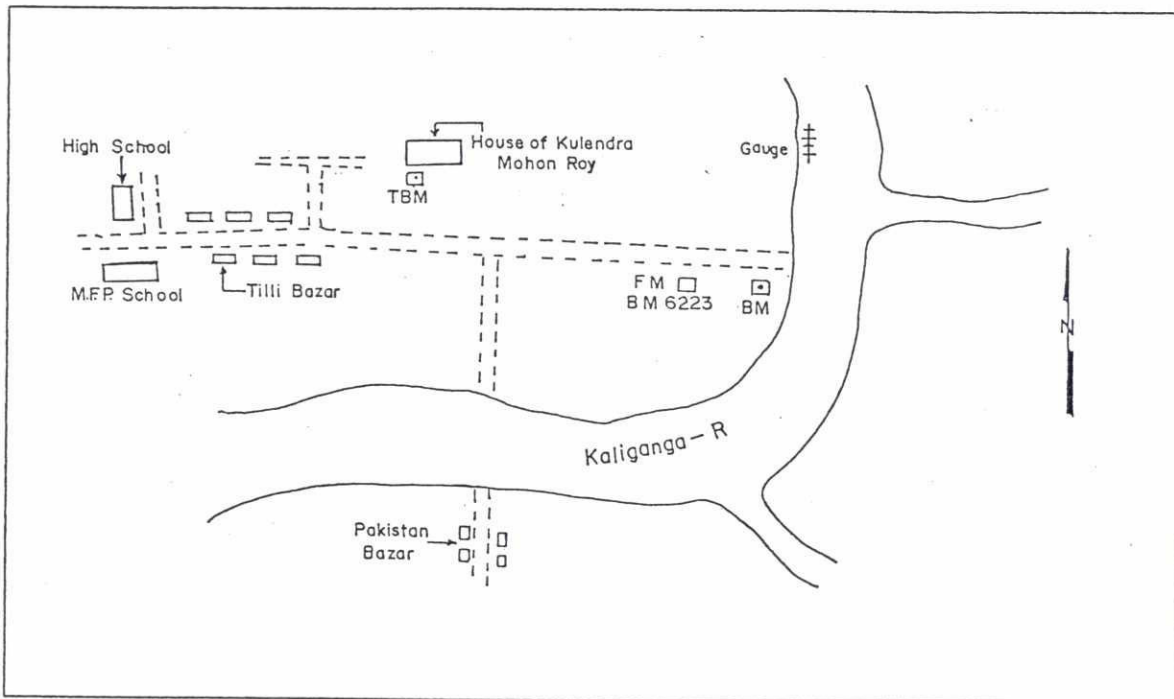
56

# PROJECT : FAP 24 RIVER SURVEY PROJECT

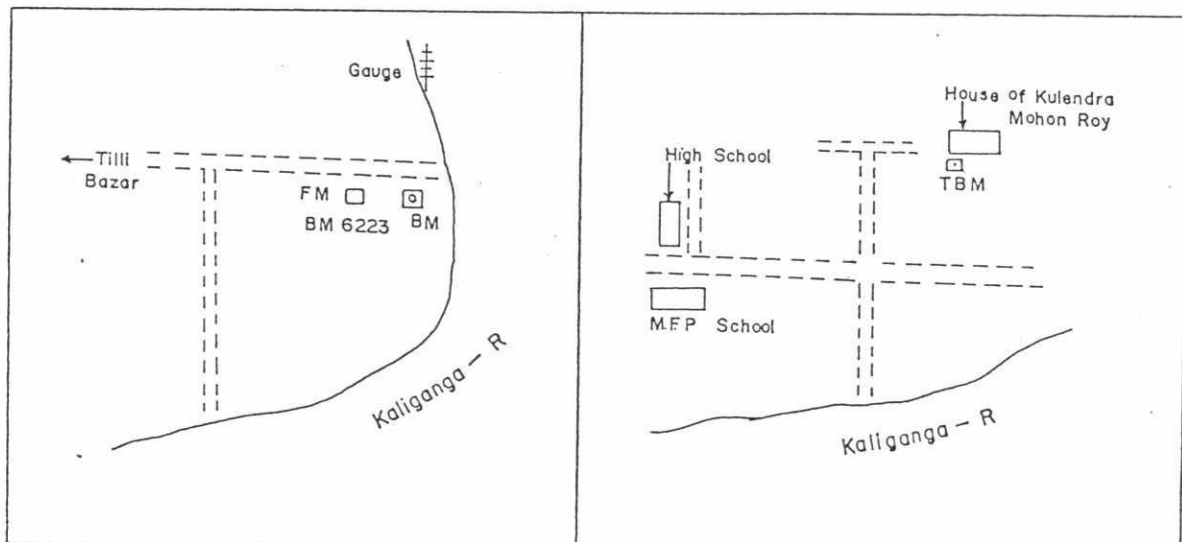
RIVER : Dhaleswari

GAUGE STATION : 68 Tilli

## LOCATION SKETCH



## LOCATION OF BM & TBM

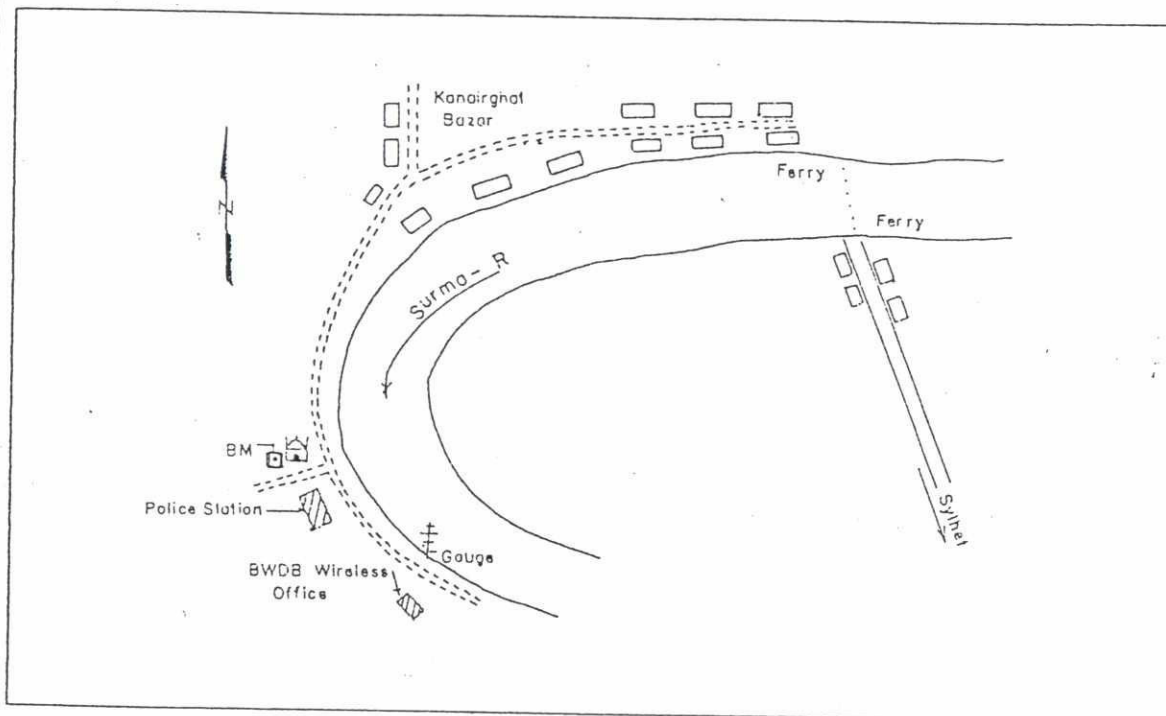


# PROJECT : FAP 24 RIVER SURVEY PROJECT

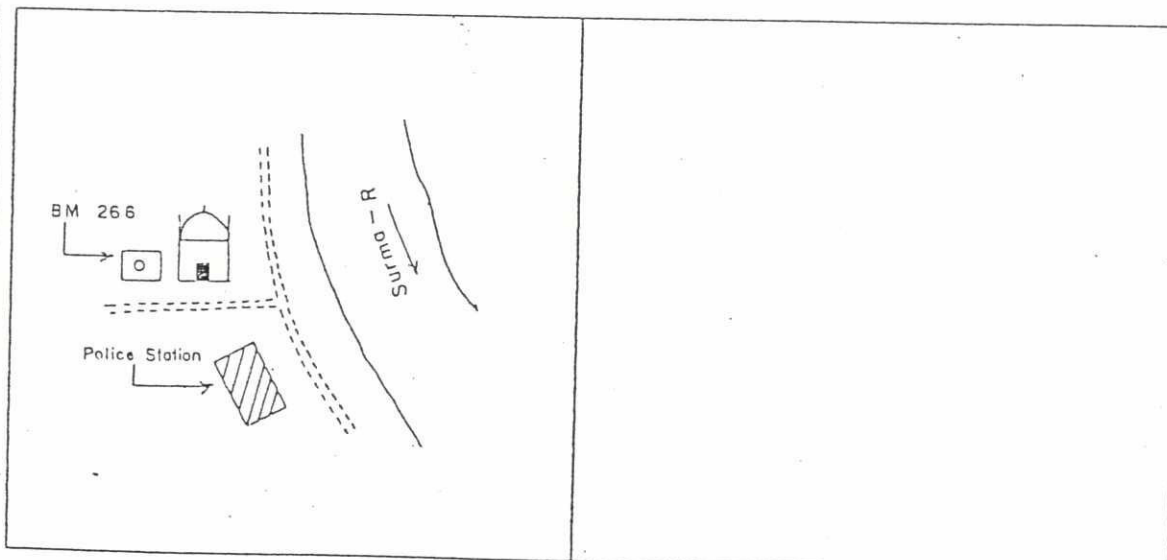
RIVER : Surma

GAUGE STATION : 266 Kanairghat

## LOCATION SKETCH



## LOCATION OF BM & TBM



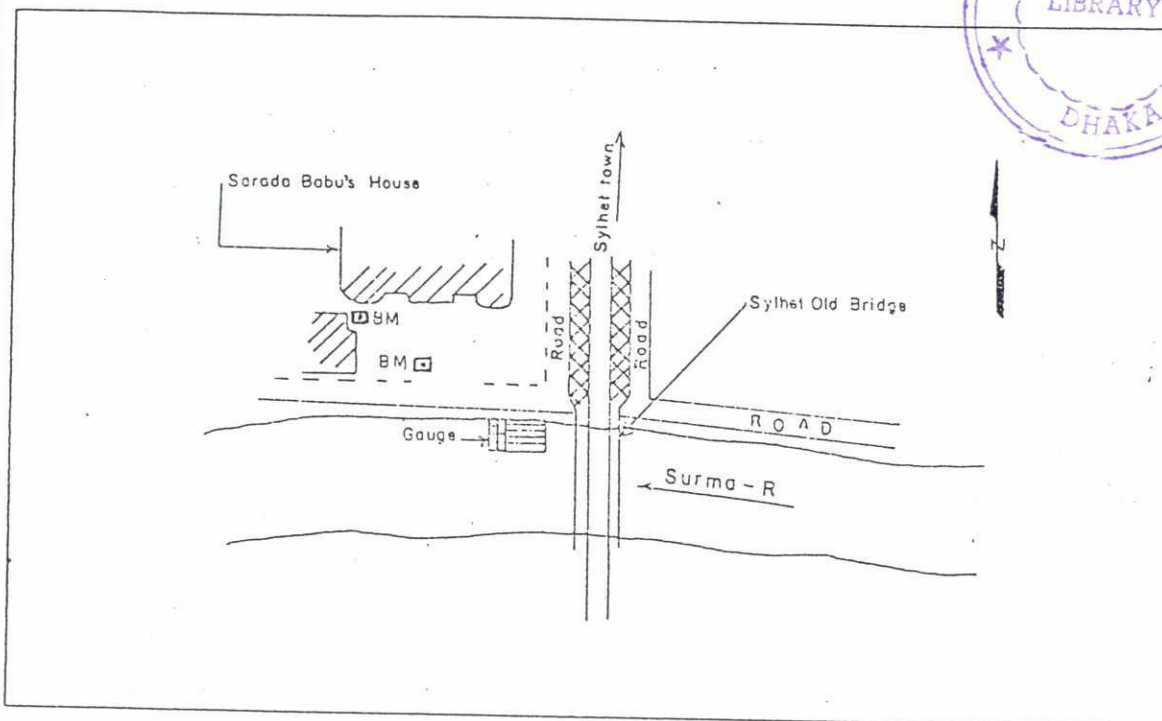


PROJECT : FAP 24 RIVER SURVEY PROJECT

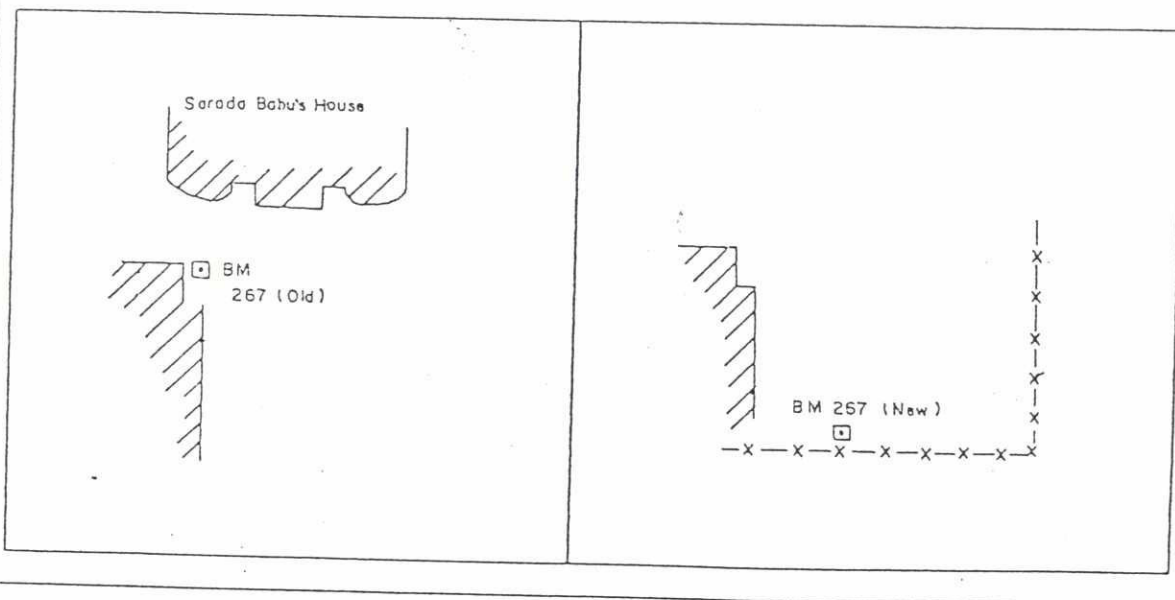
RIVER : Surma

GAUGE STATION : 267 Sylhet

LOCATION SKETCH



LOCATION OF BM & TBM

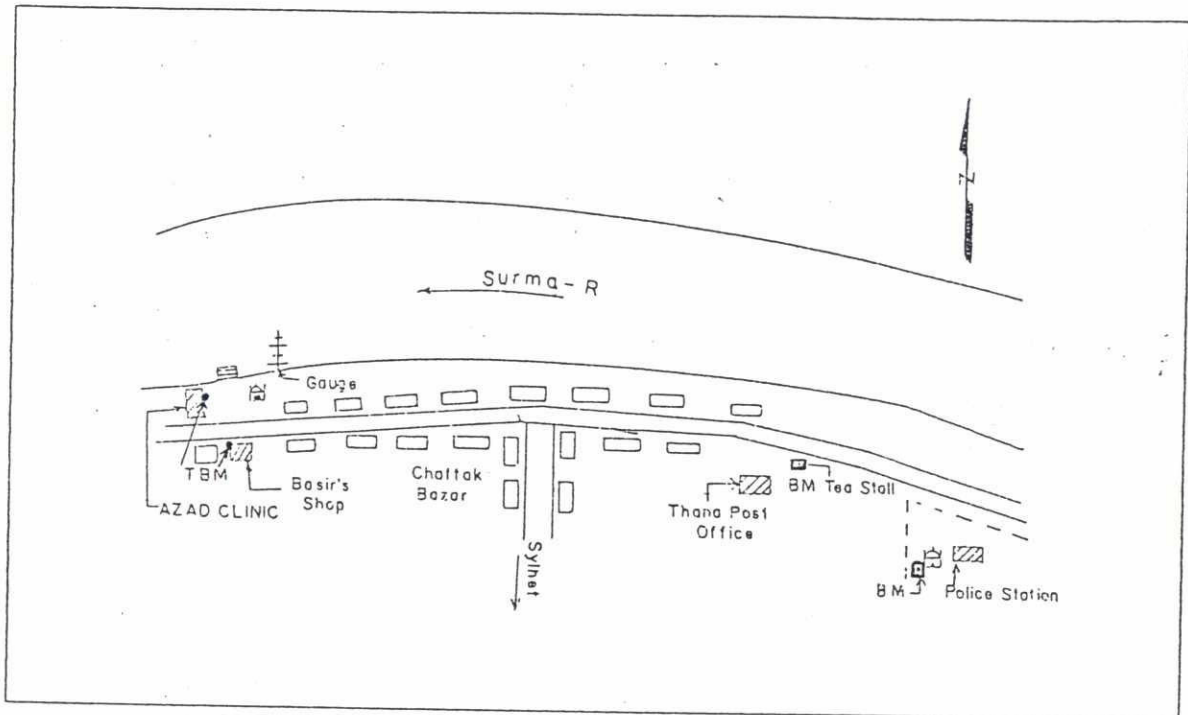


PROJECT : FAP 24 RIVER SURVEY PROJECT

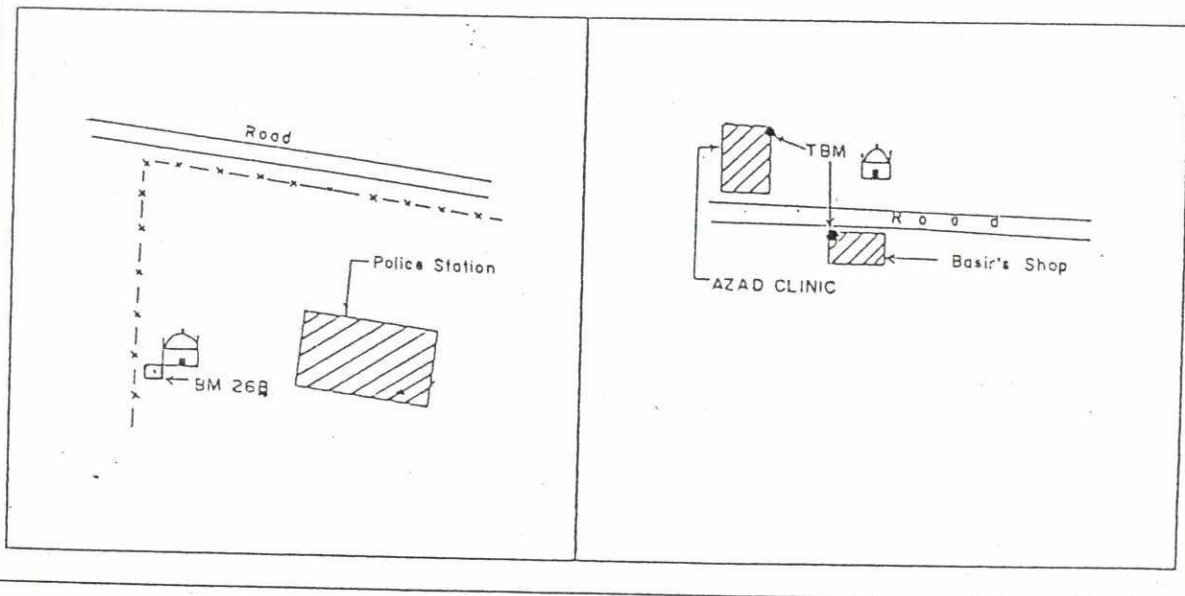
RIVER : Surma

GAUGE STATION : 268 Chattak

LOCATION SKETCH



LOCATION OF BM & TBM

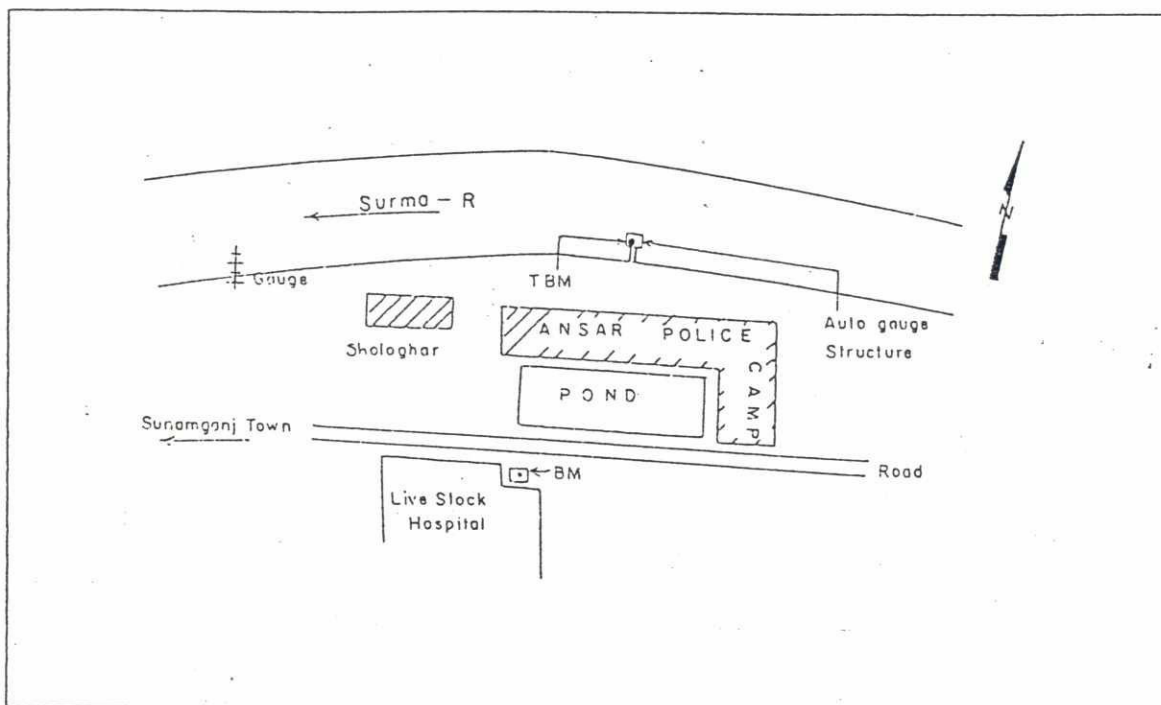


# PROJECT : FAP 24 RIVER SURVEY PROJECT

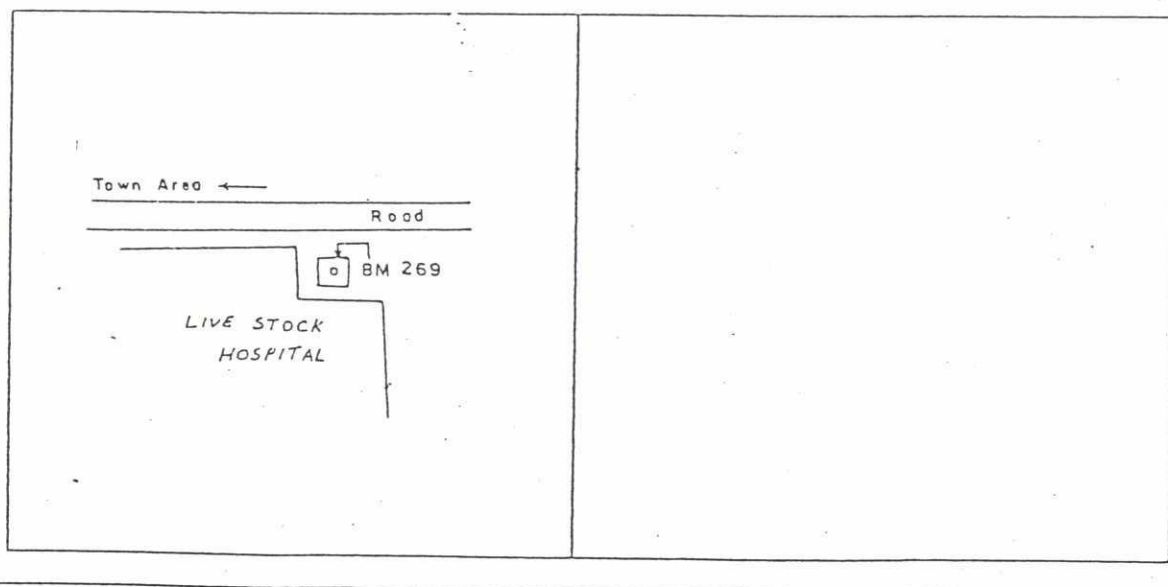
RIVER : Surma

GAUGE STATION : 269 Sunamganj

## LOCATION SKETCH



## LOCATION OF BM & TBM



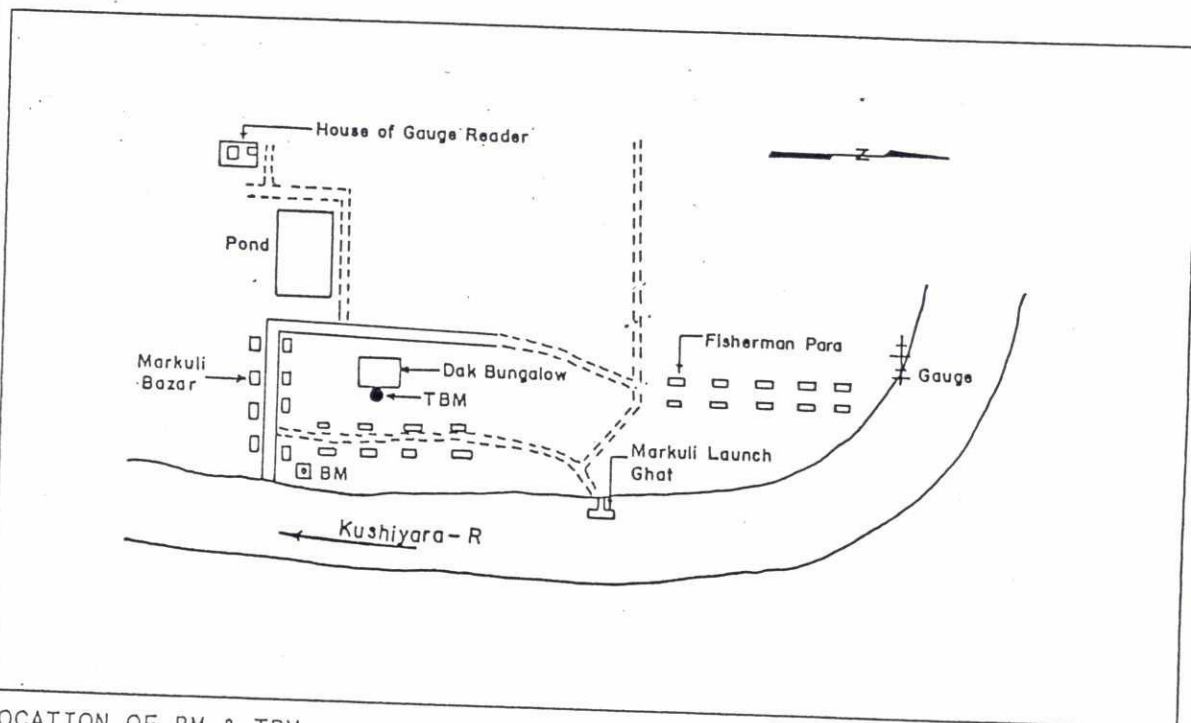
21

# PROJECT : FAP 24 RIVER SURVEY PROJECT

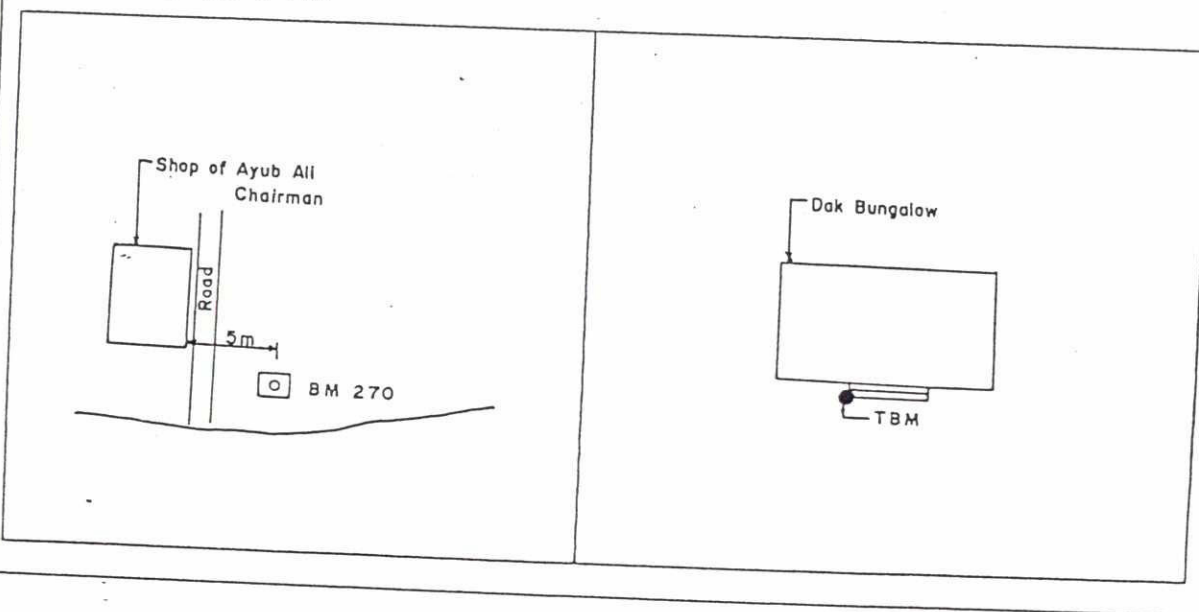
RIVER : Kushiyara

GAUGE STATION : 270 Markuli

## LOCATION SKETCH



## LOCATION OF BM & TBM



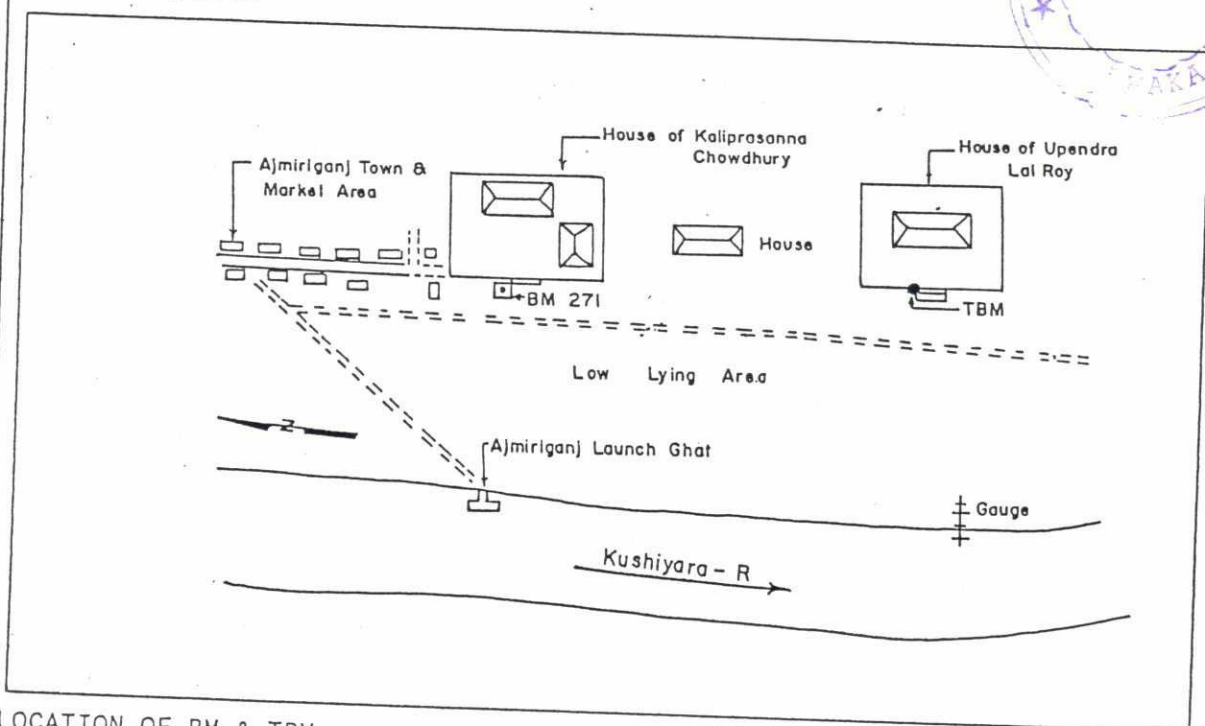
PROJECT : FAP 24 RIVER SURVEY PROJECT

RIVER : Kushiyara

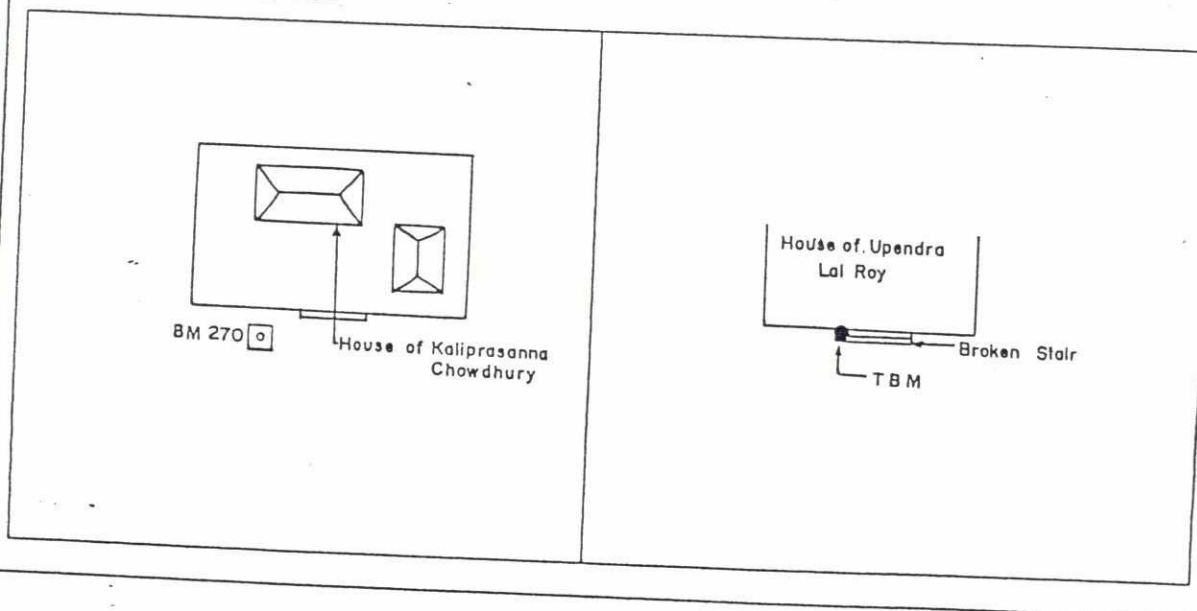
GAUGE STATION : 271 Ajmiriganj



LOCATION SKETCH



LOCATION OF BM & TBM



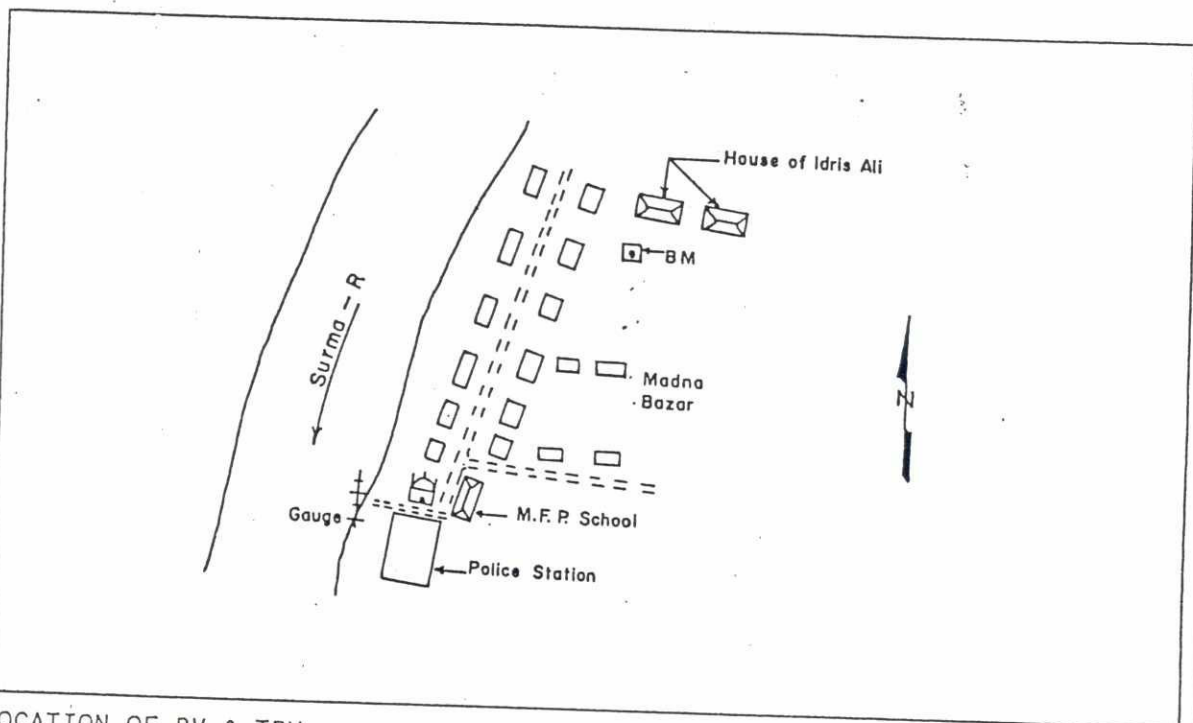


# PROJECT : FAP 24 RIVER SURVEY PROJECT

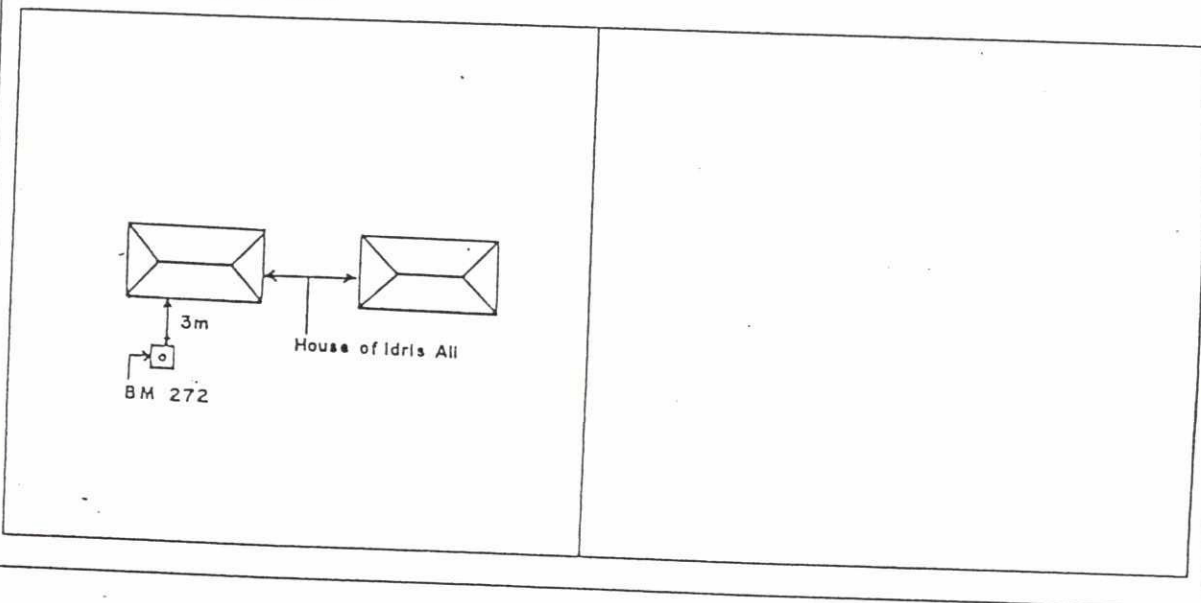
RIVER : Upper Meghna

GAUGE STATION : 272 Madna

## LOCATION SKETCH



## LOCATION OF BM & TBM

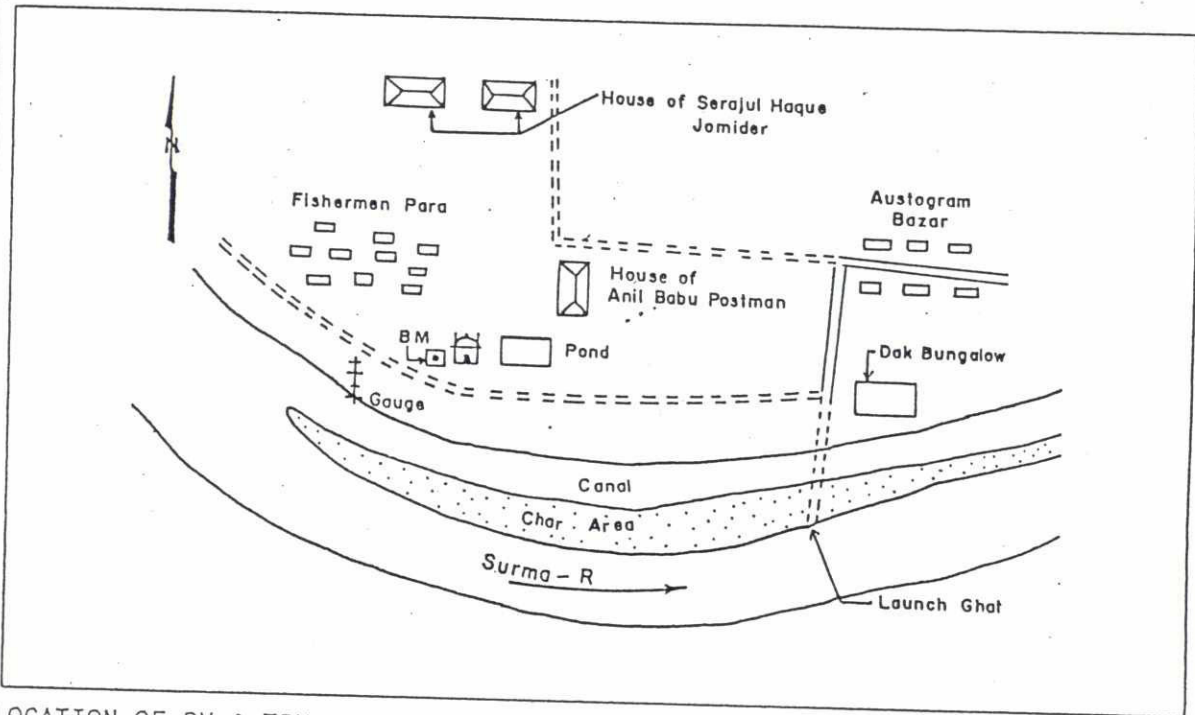


# PROJECT : FAP 24 RIVER SURVEY PROJECT

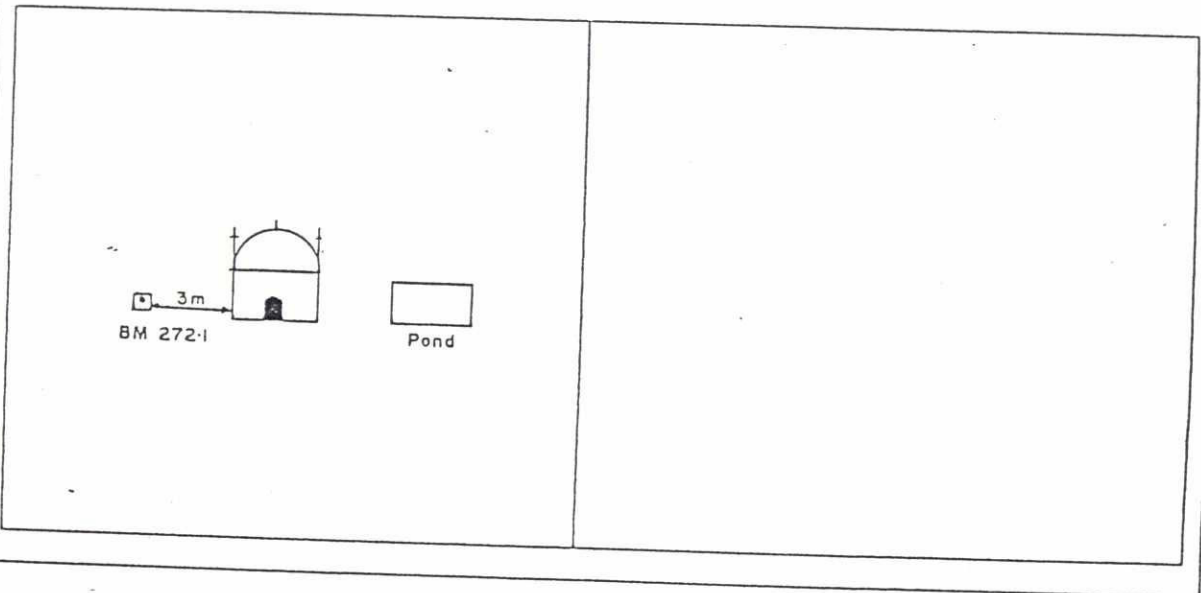
RIVER : Upper Meghna

GAUGE STATION : 272.1 Austagram

## LOCATION SKETCH



## LOCATION OF BM & TBM

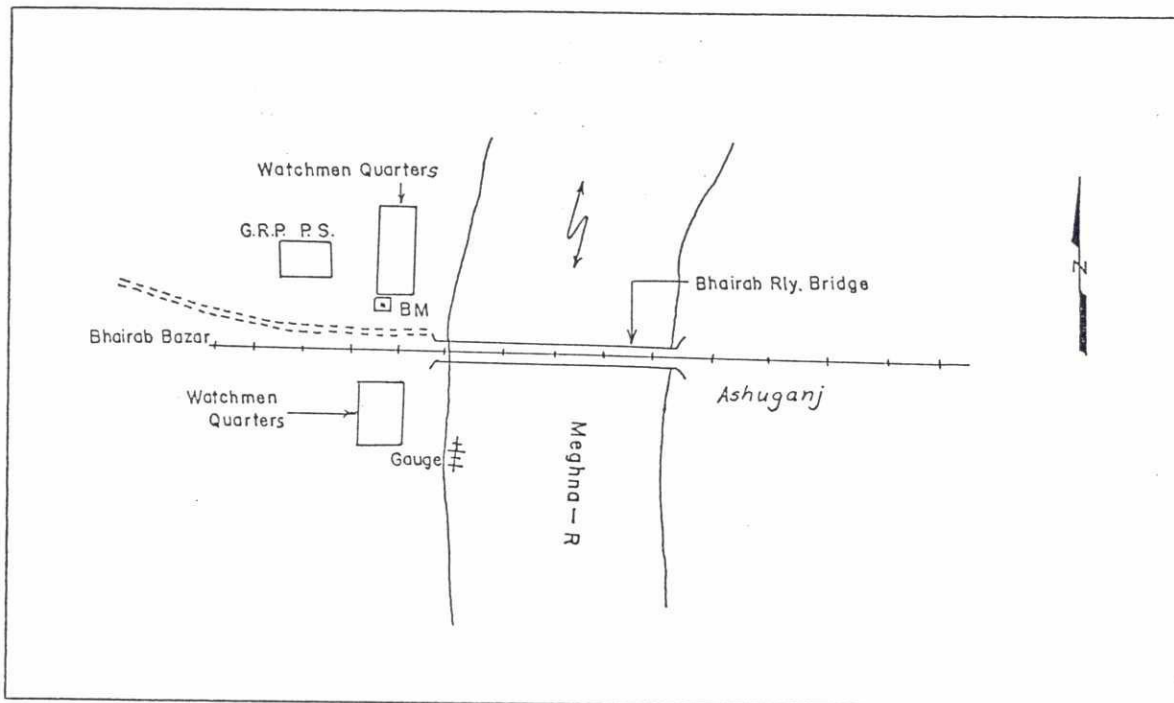


# PROJECT : FAP 24 RIVER SURVEY PROJECT

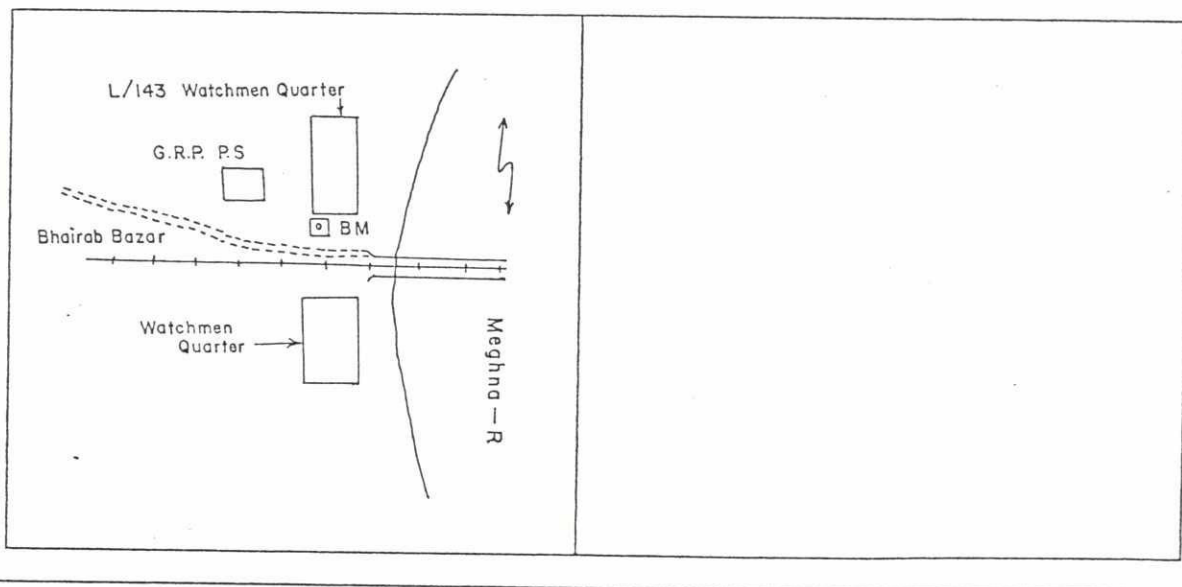
RIVER : Upper Meghna

GAUGE STATION : 273 Bhairab Bazar

## LOCATION SKETCH



## LOCATION OF BM & TBM

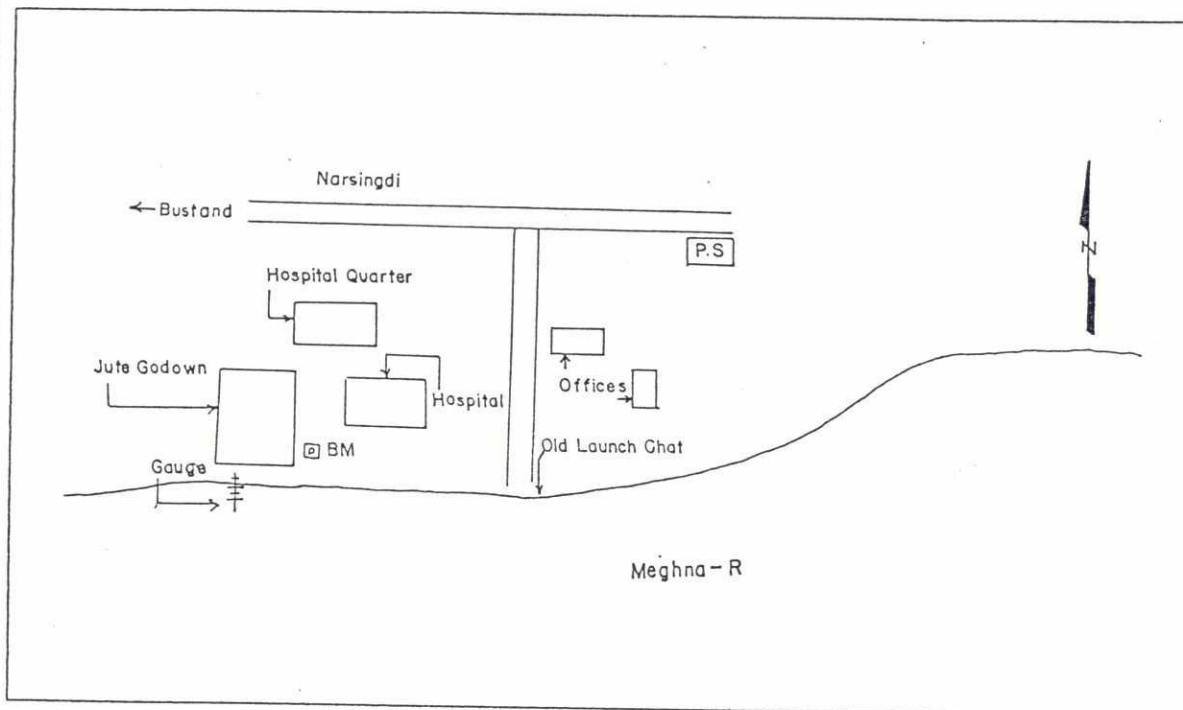


# PROJECT : FAP 24 RIVER SURVEY PROJECT

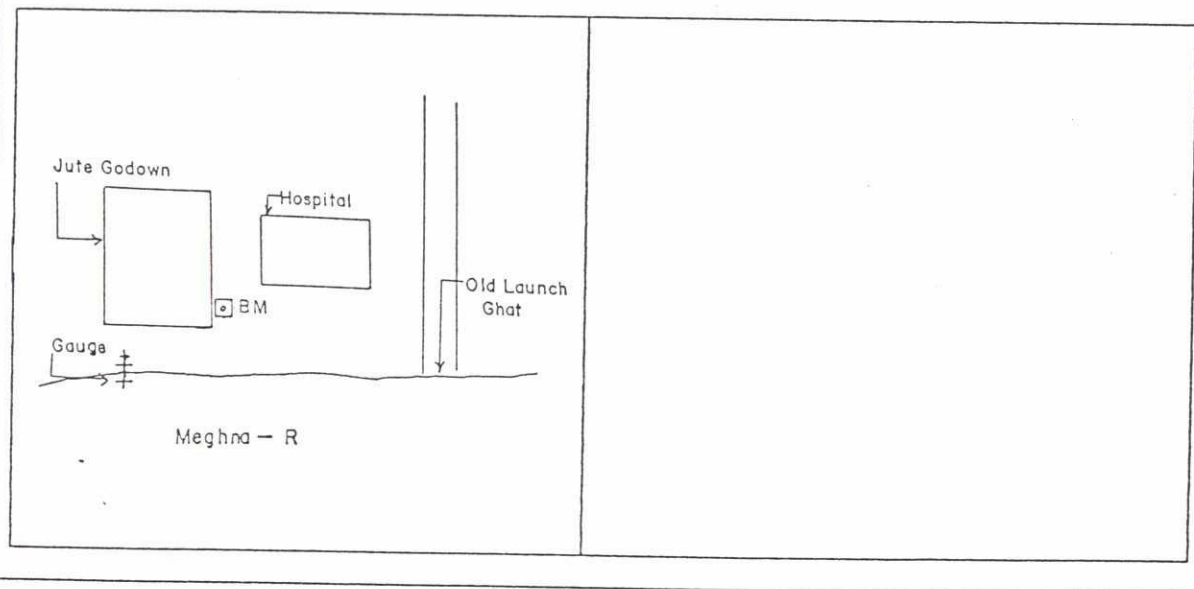
RIVER : Upper Meghna

GAUGE STATION : 274 Narsingdi

## LOCATION SKETCH



## LOCATION OF BM & TBM



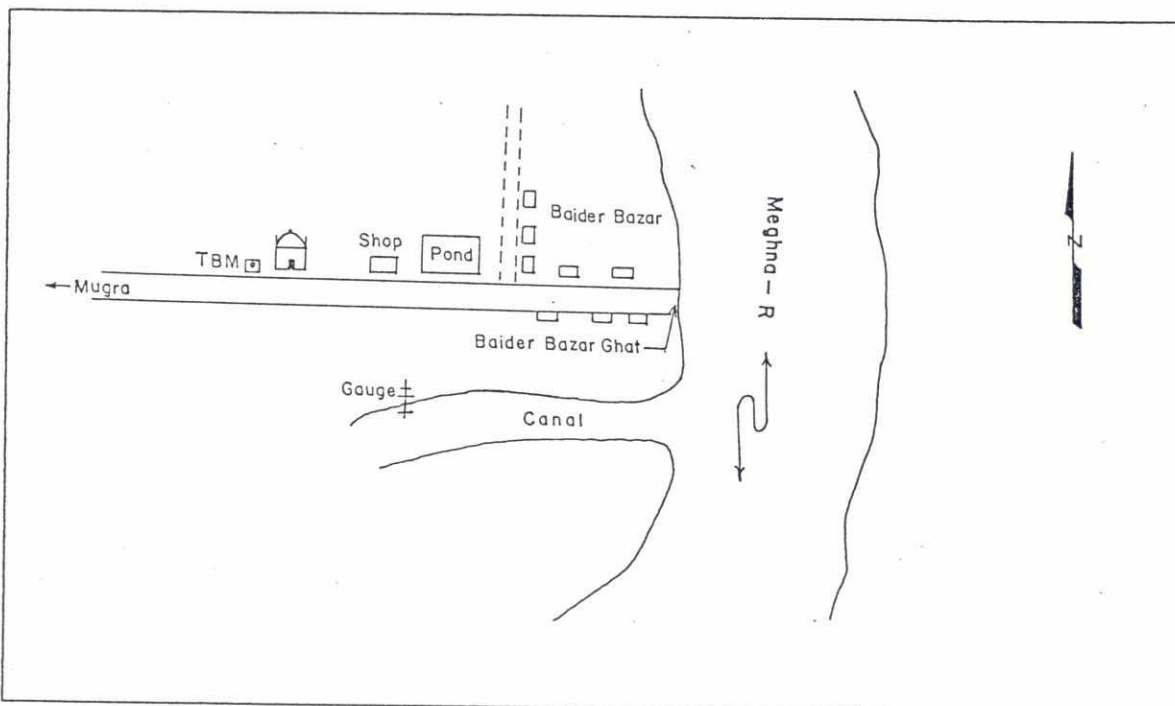
98

# PROJECT : FAP 24 RIVER SURVEY PROJECT

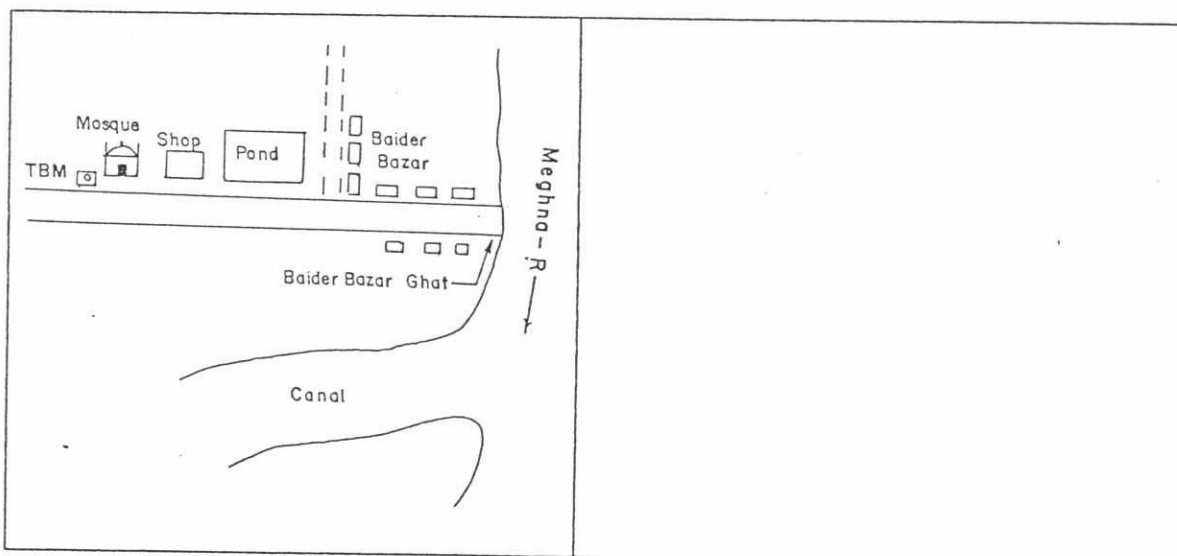
RIVER : Upper Meghna

GAUGE STATION : 275 Baider Bazar

## LOCATION SKETCH



## LOCATION OF BM & TBM



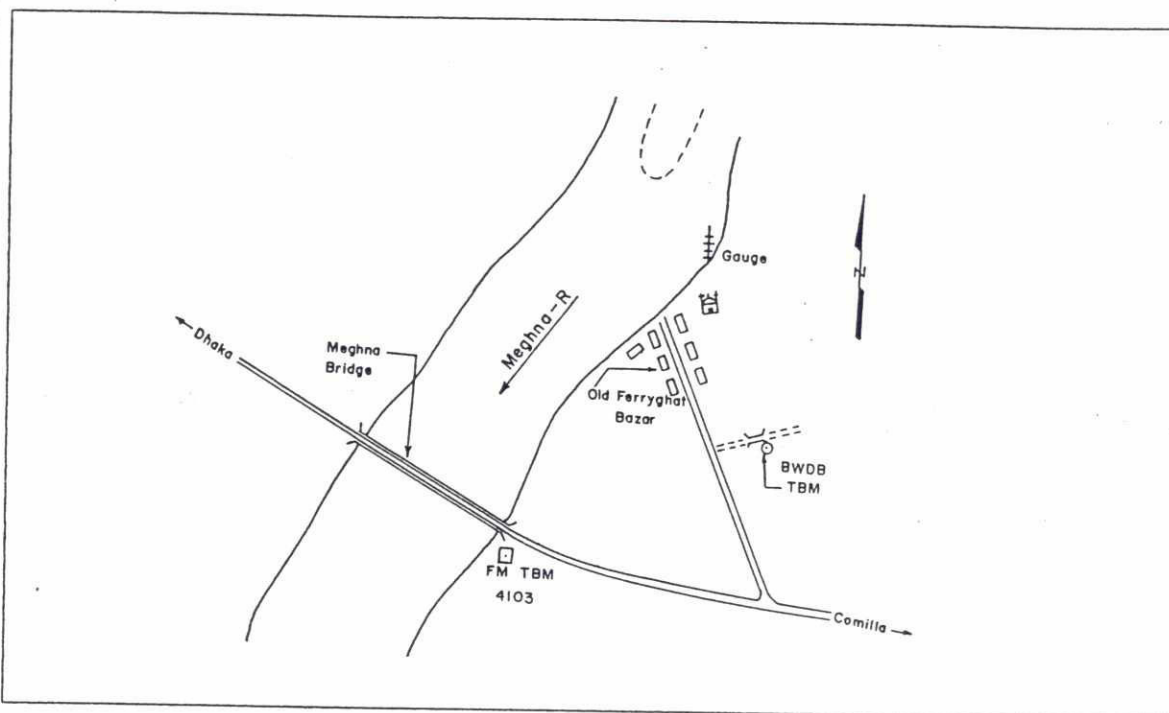


# PROJECT : FAP 24 RIVER SURVEY PROJECT

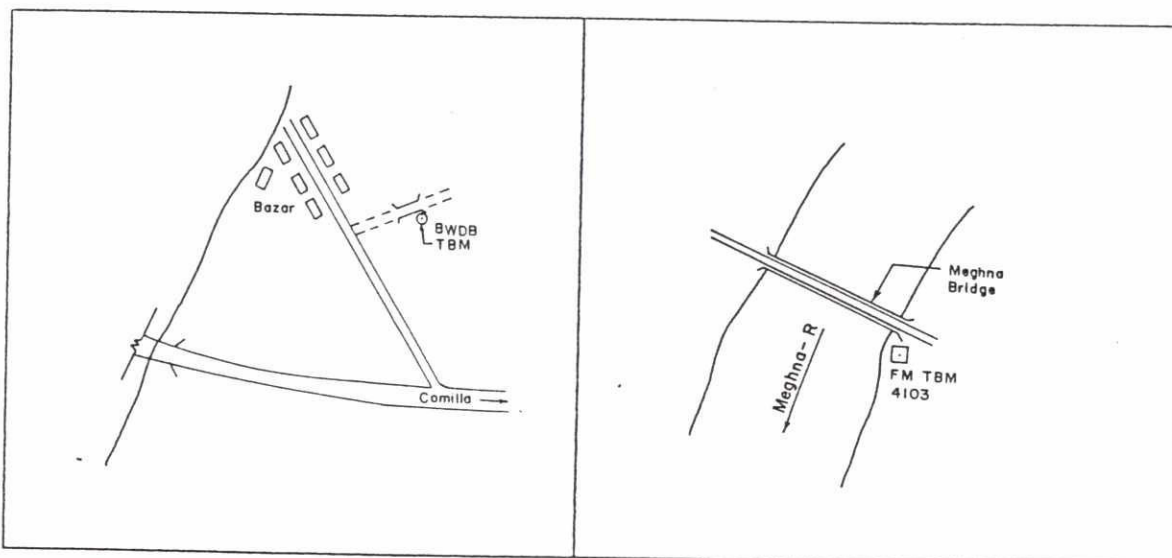
RIVER : Upper Meghna

GAUGE STATION : 275.5 Meghna ferry ghat

## LOCATION SKETCH



## LOCATION OF BM & TBM



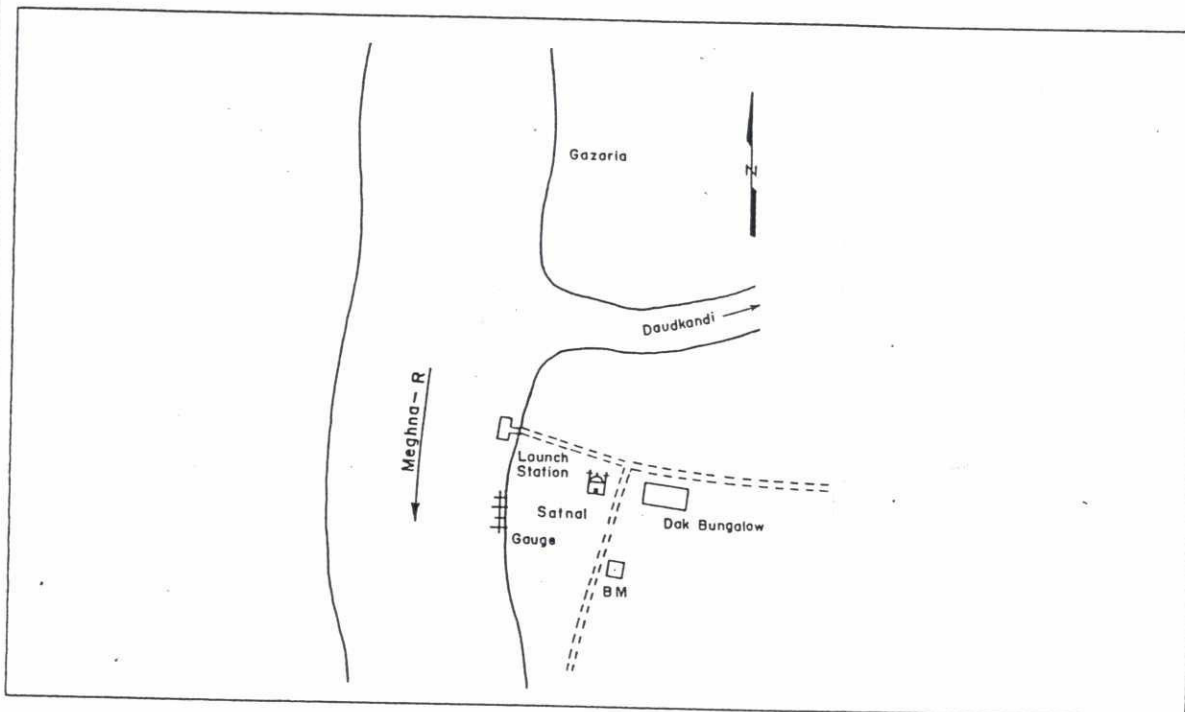
92

PROJECT : FAP 24 RIVER SURVEY PROJECT

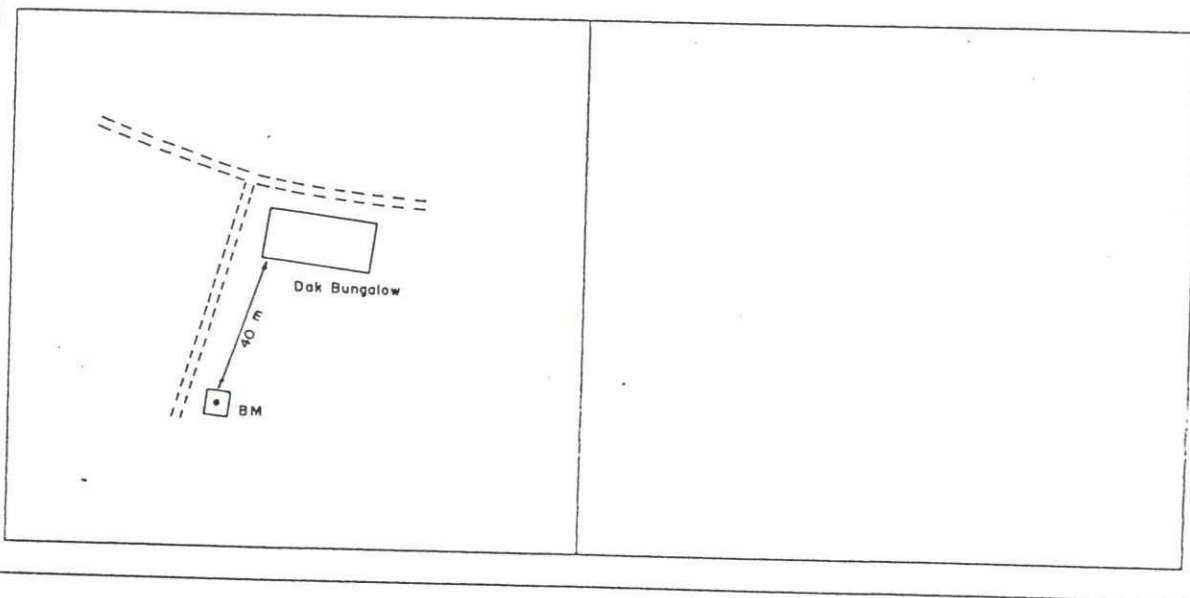
RIVER : Upper Meghna

GAUGE STATION : 276 Satnal

LOCATION SKETCH



LOCATION OF BM & TBM

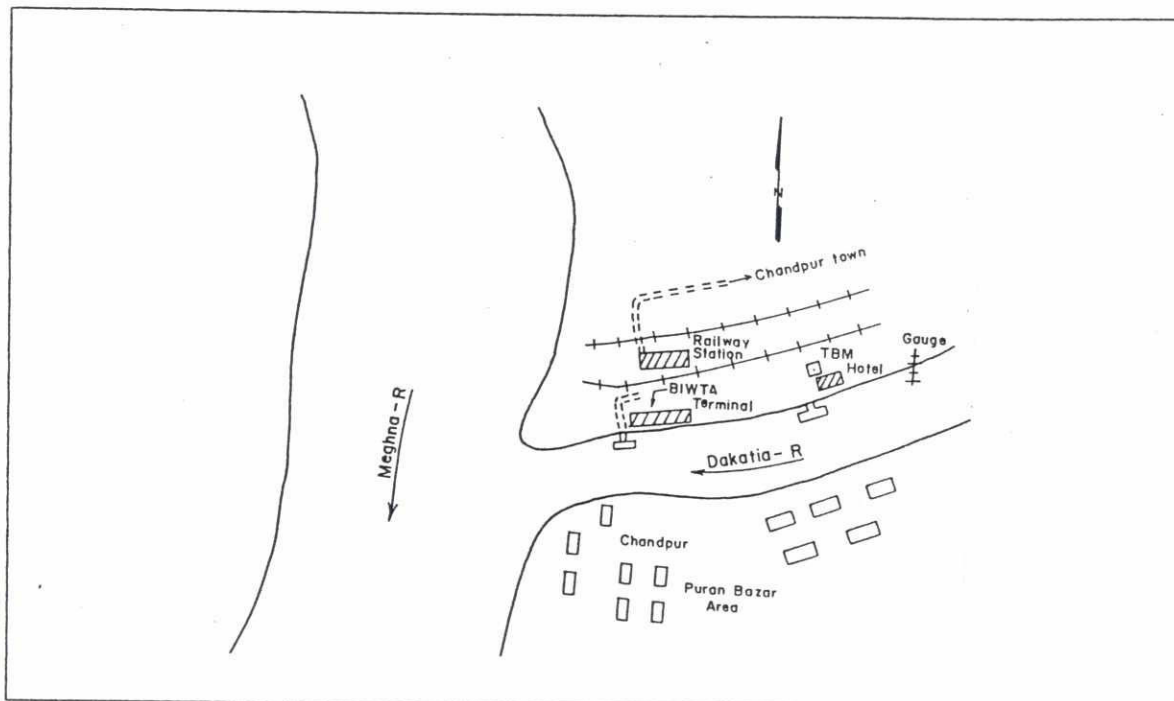


# PROJECT : FAP 24 RIVER SURVEY PROJECT

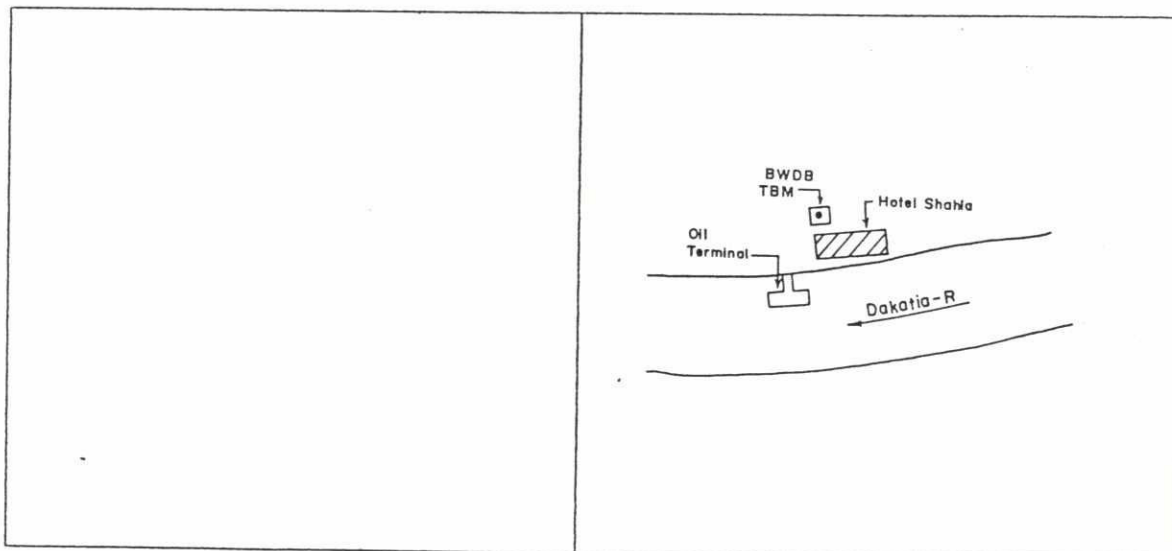
RIVER : Upper Meghna

GAUGE STATION : 277 Chandpur

## LOCATION SKETCH



## LOCATION OF BM & TBM



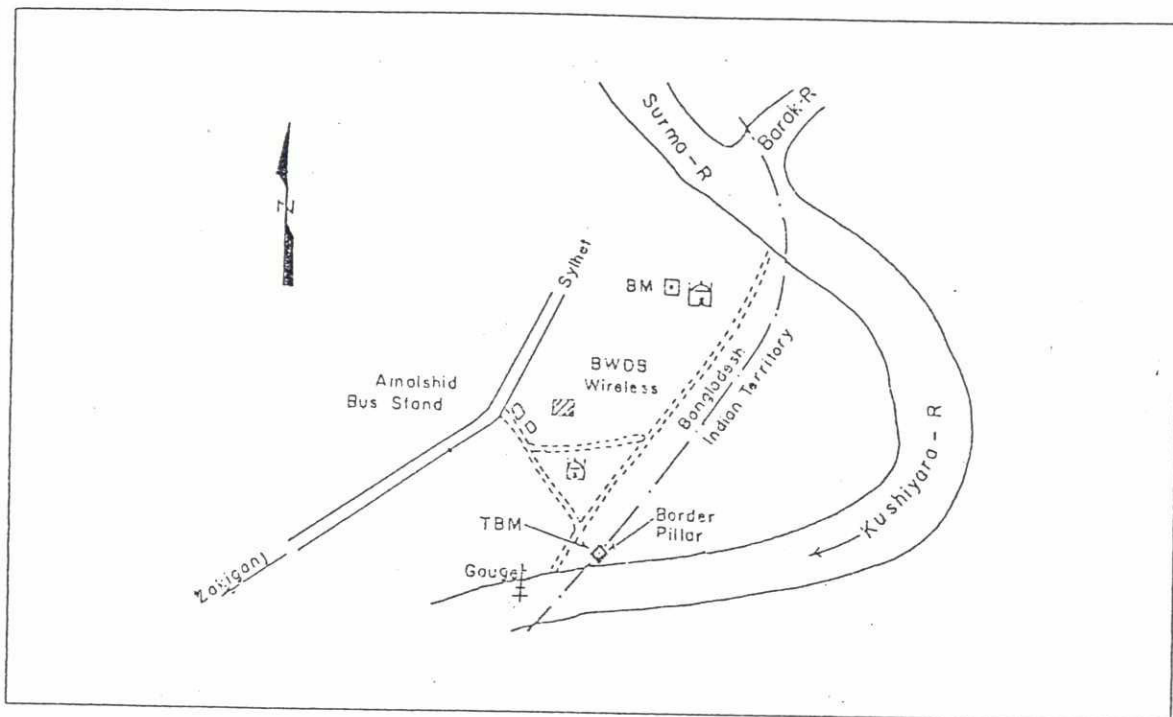
98

# PROJECT : FAP 24 RIVER SURVEY PROJECT

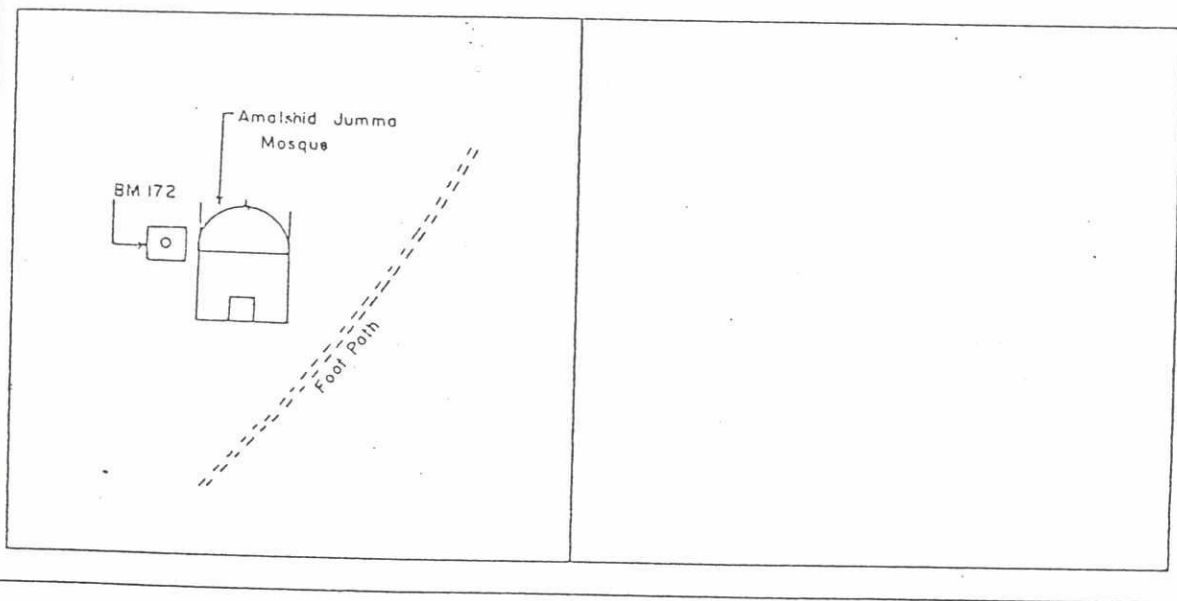
RIVER : Kushiya

GAUGE STATION : 172 Amalshid

## LOCATION SKETCH



## LOCATION OF BM & TBM

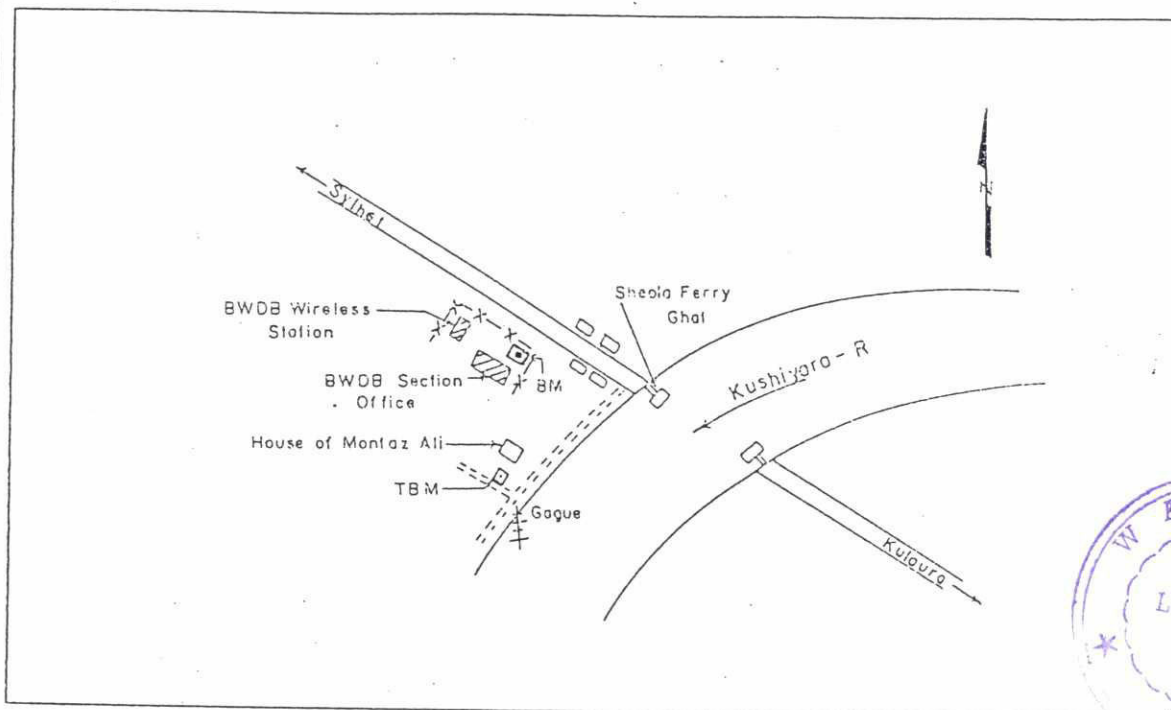


# PROJECT : FAP 24 RIVER SURVEY PROJECT

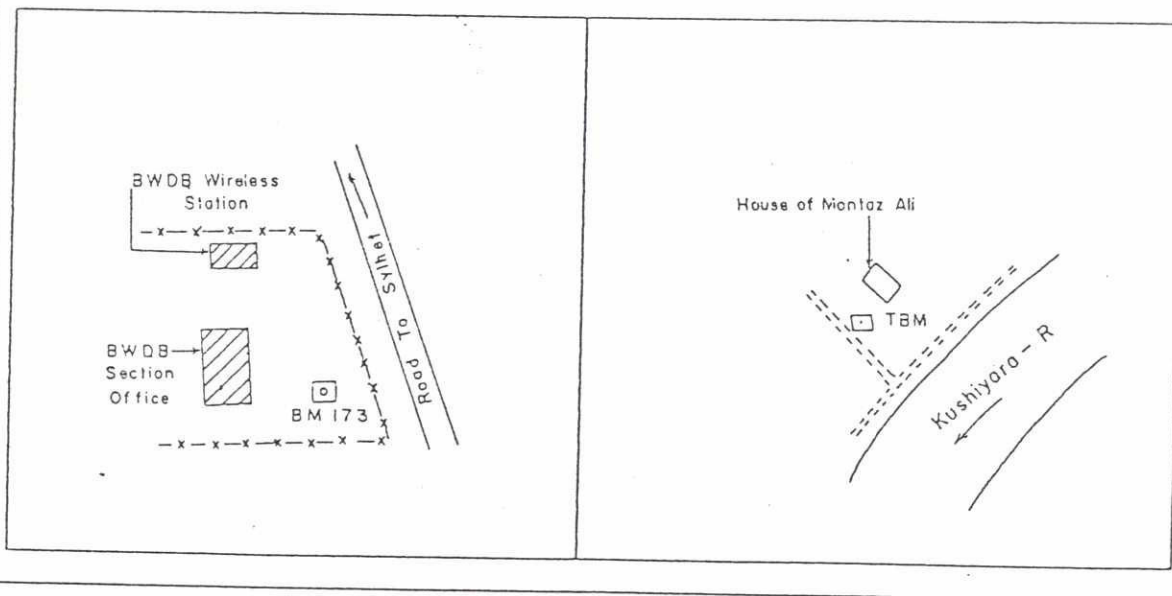
RIVER : Kushiyara

GAUGE STATION : 173 Sheola

## LOCATION SKETCH



## LOCATION OF BM & TBM



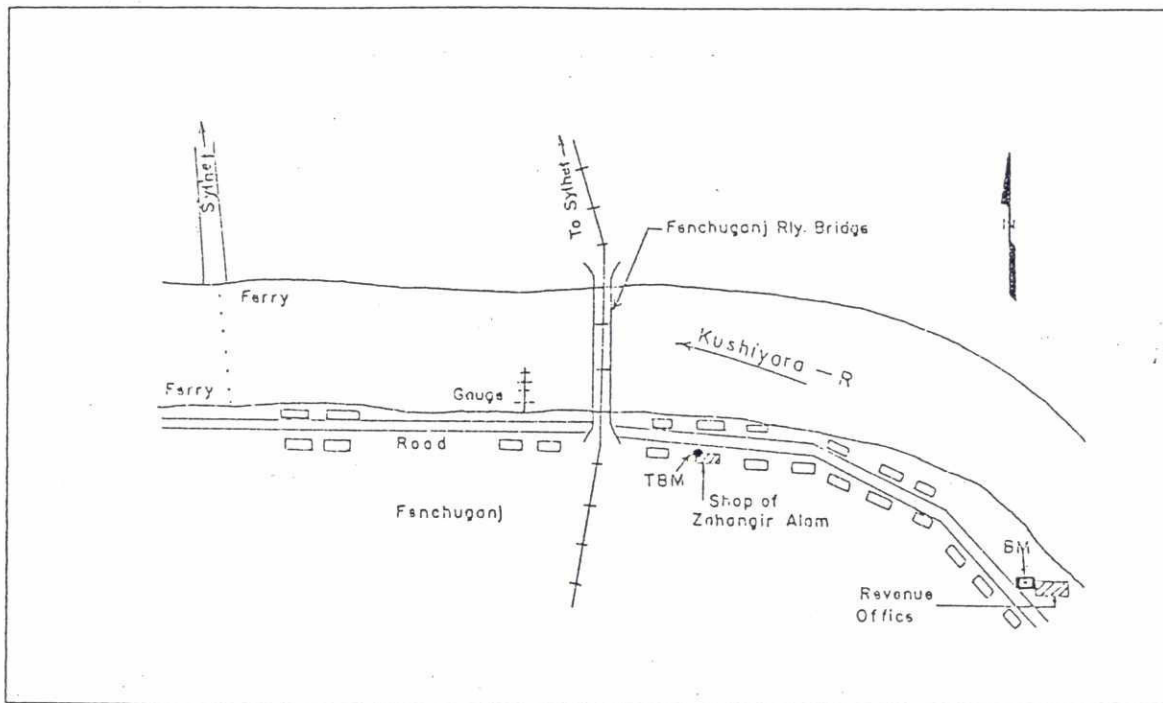


# PROJECT : FAP 24 RIVER SURVEY PROJECT

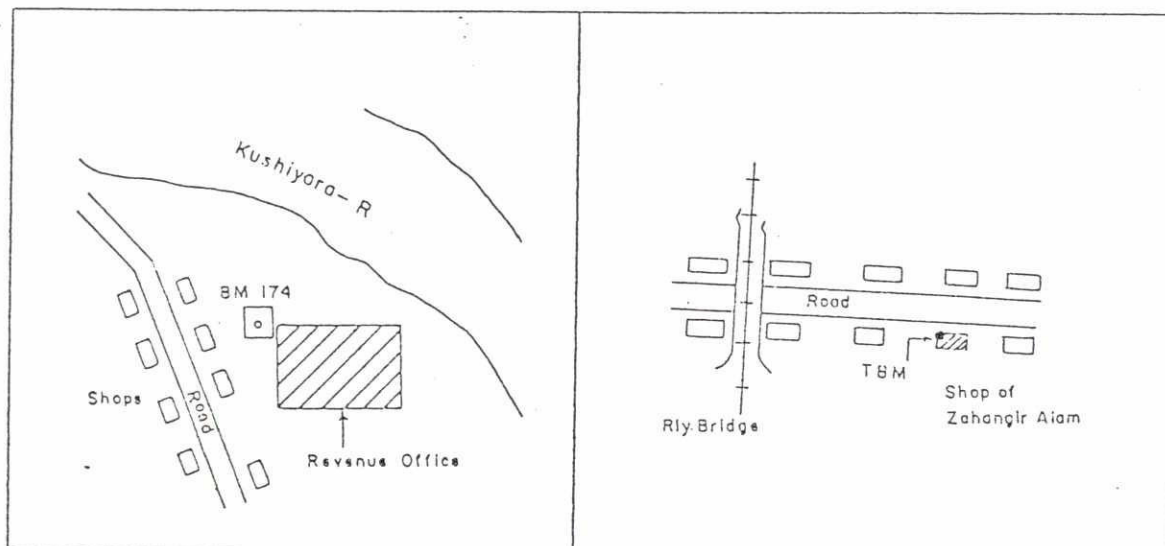
RIVER : Kushiya

GAUGE STATION : 174 Fenchuganj

## LOCATION SKETCH



## LOCATION OF BM & TBM

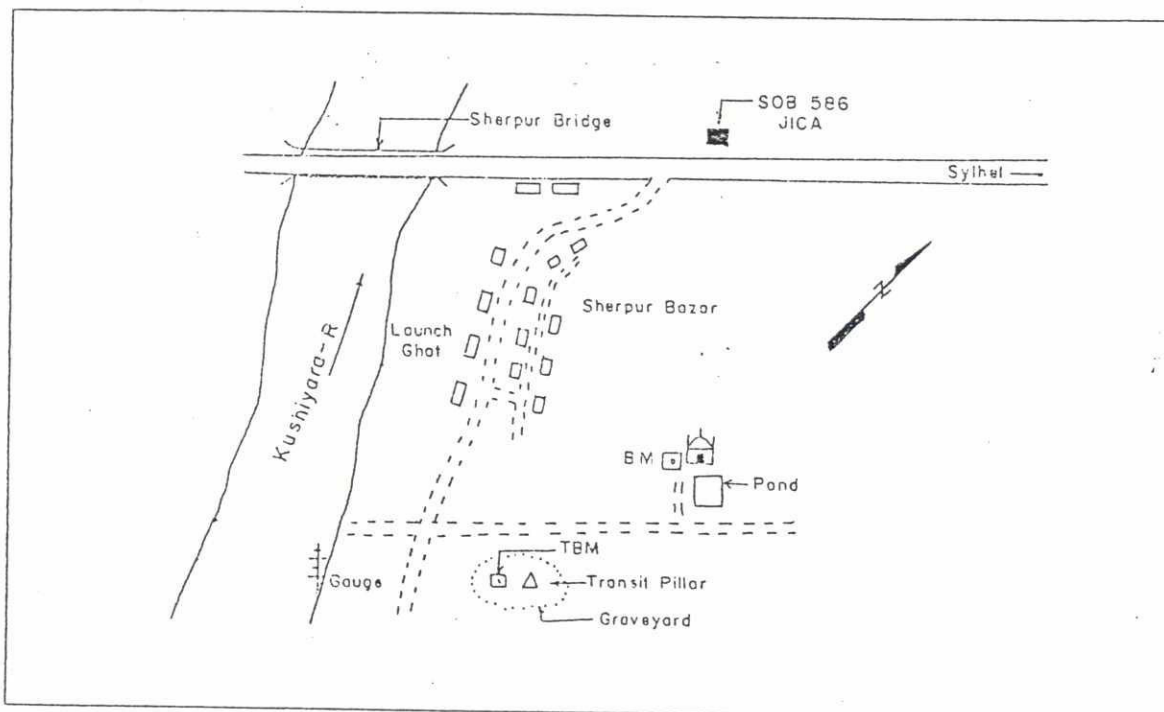


PROJECT : FAP 24 RIVER SURVEY PROJECT

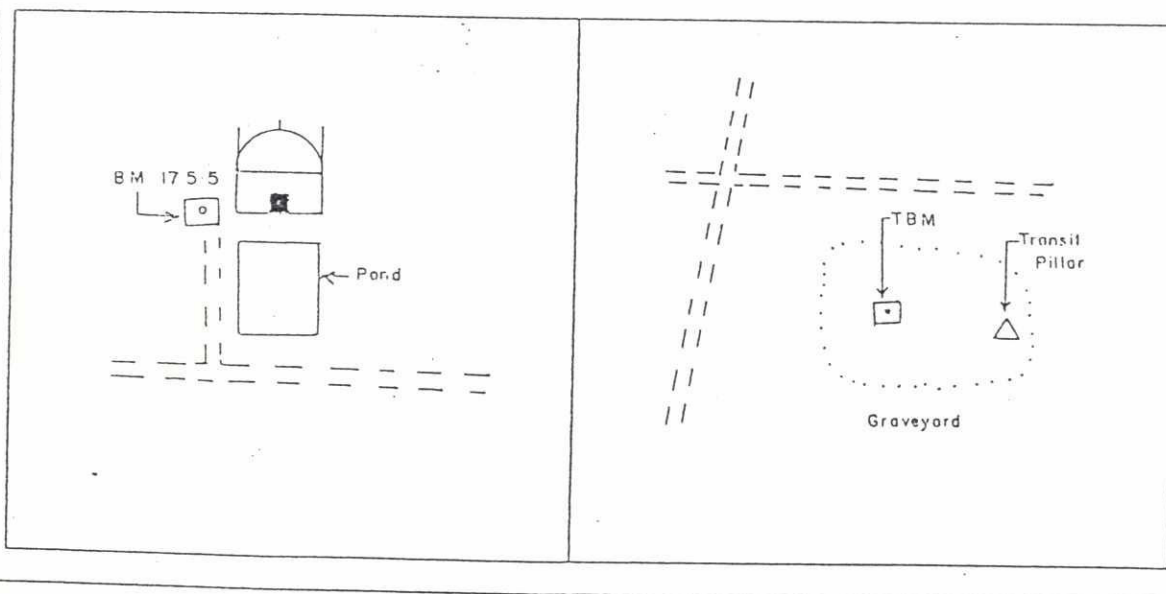
RIVER : Kushiya

GAUGE STATION : 175.5 Sherpur

LOCATION SKETCH



LOCATION OF BM & TBM



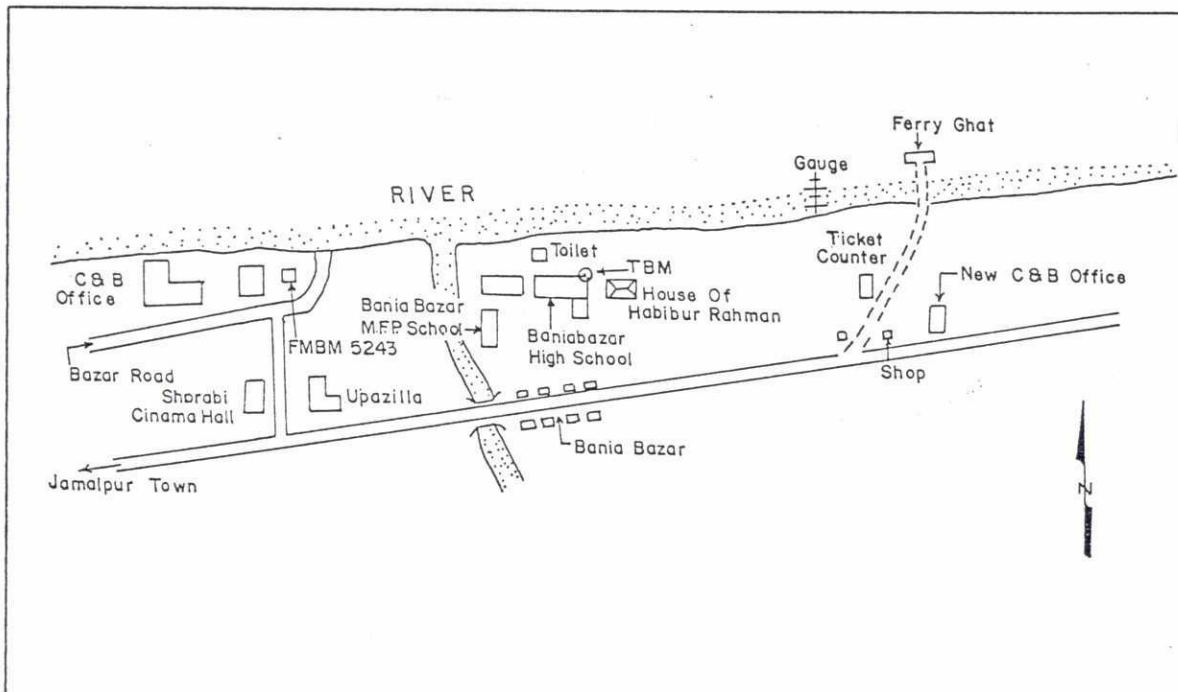
62

## PROJECT : FAP 24 RIVER SURVEY PROJECT

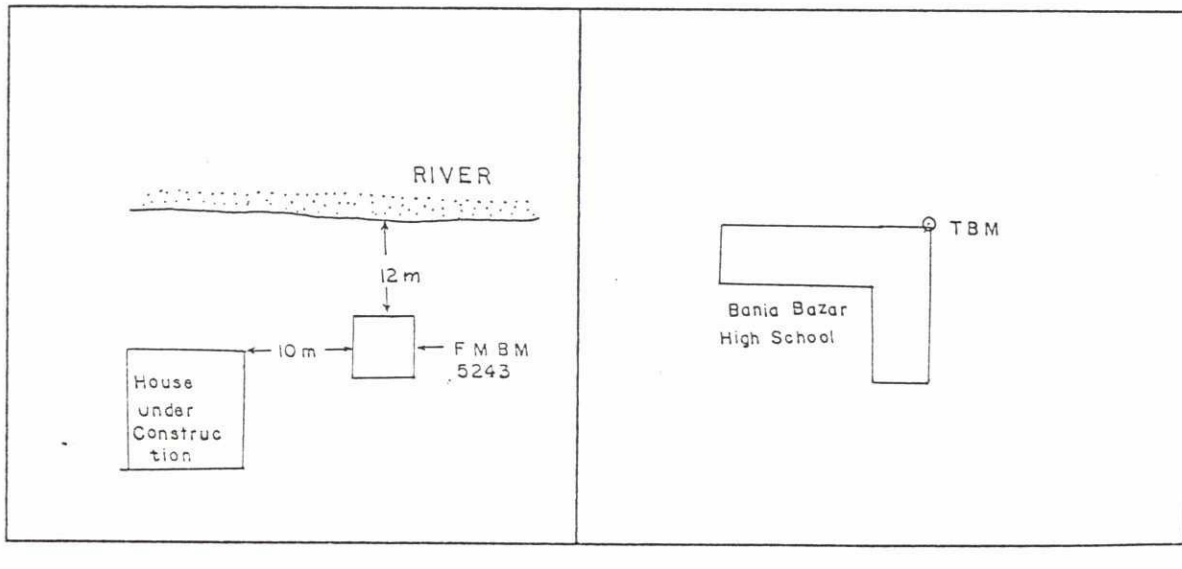
RIVER : Old Brahmaputra

GAUGE STATION : 225 Jamalpur

### LOCATION SKETCH



### LOCATION OF BM & TBM

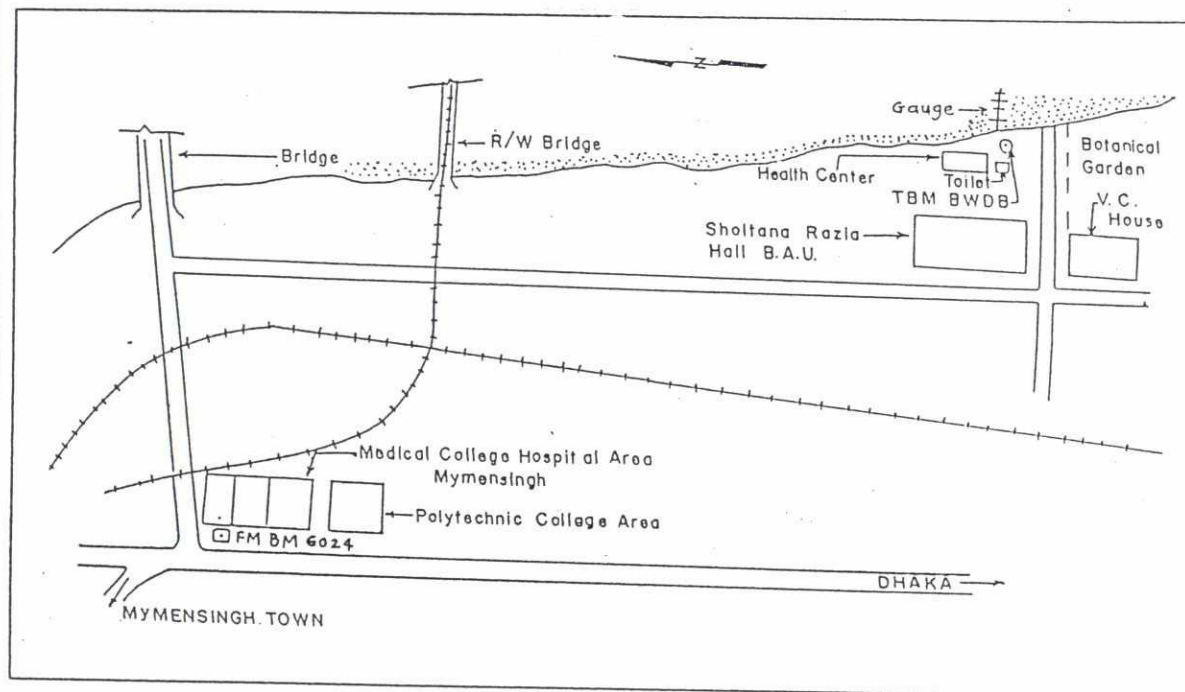


PROJECT : FAP 24 RIVER SURVEY PROJECT

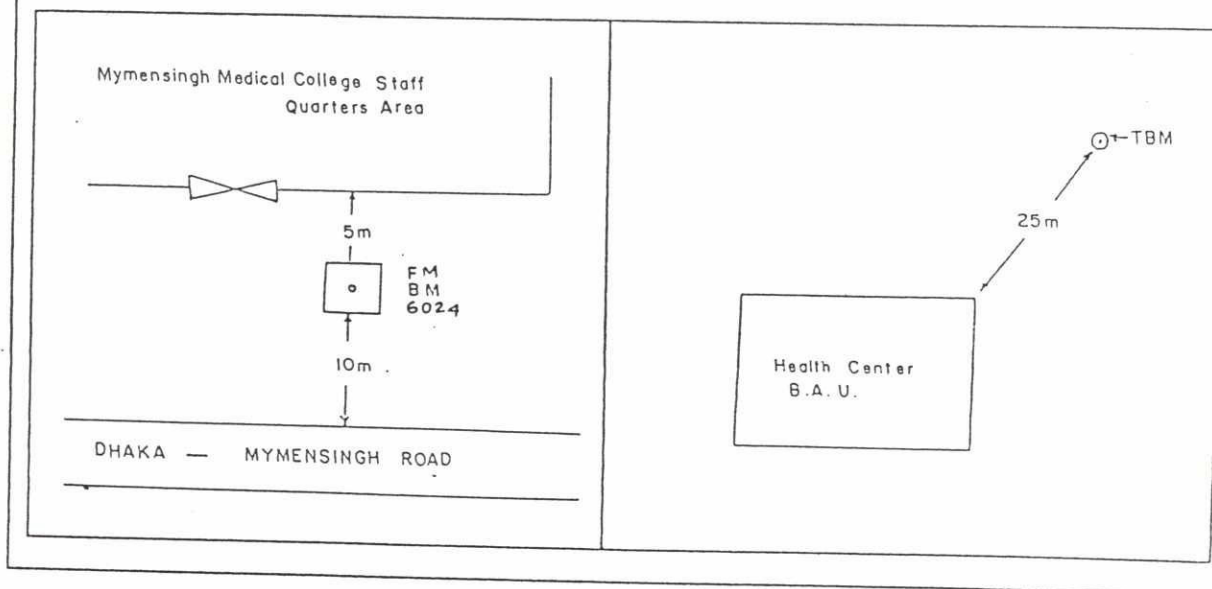
RIVER : Old Brahmaputra

GAUGE STATION : 228.5 Mymensingh

LOCATION SKETCH



LOCATION OF BM & TBM

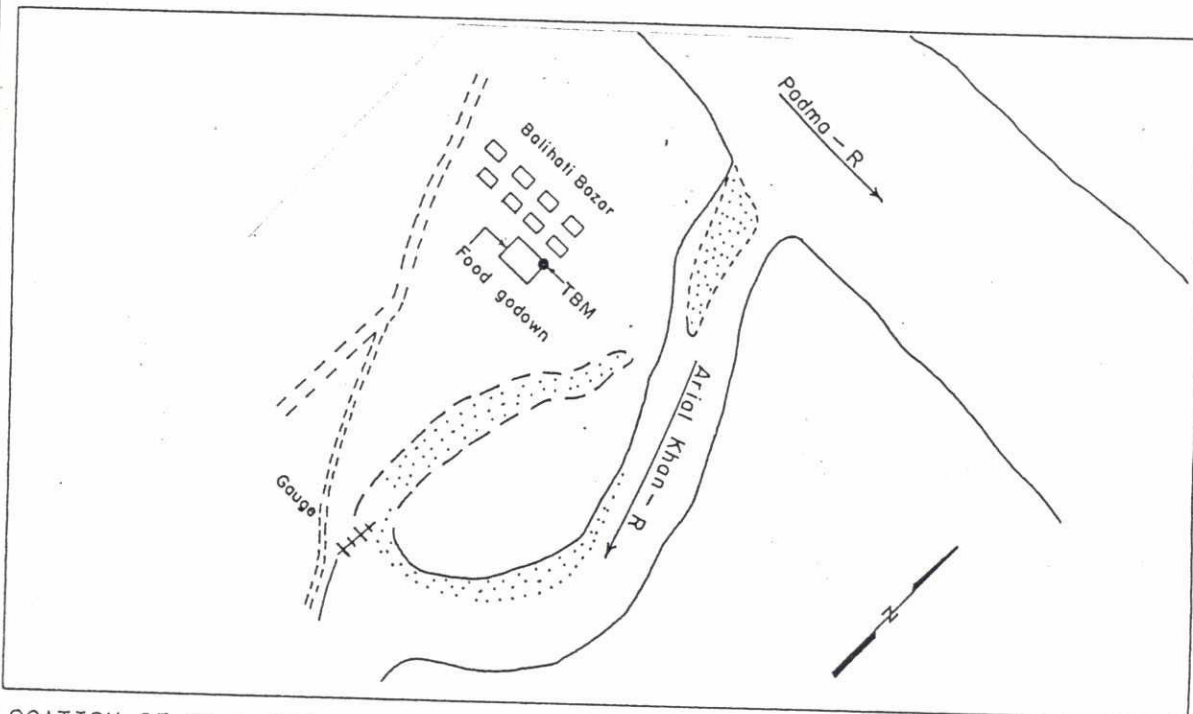


# PROJECT : FAP 24 RIVER SURVEY PROJECT

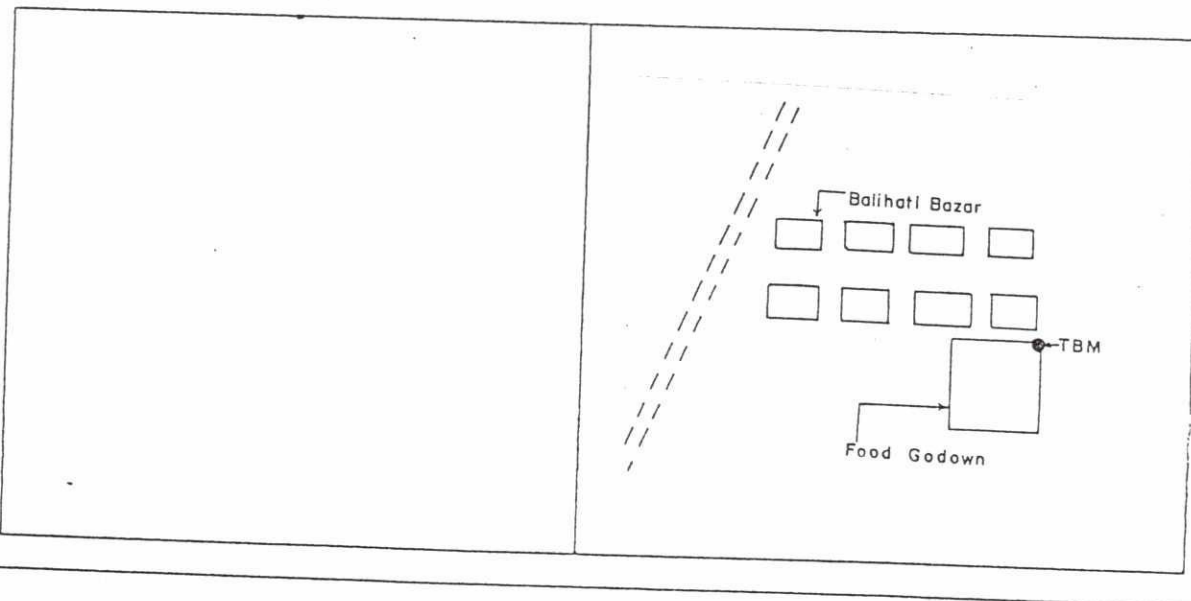
RIVER : Arial Khan

GAUGE STATION : 4A Off-take of Arial Khan

## LOCATION SKETCH



## LOCATION OF BM & TBM



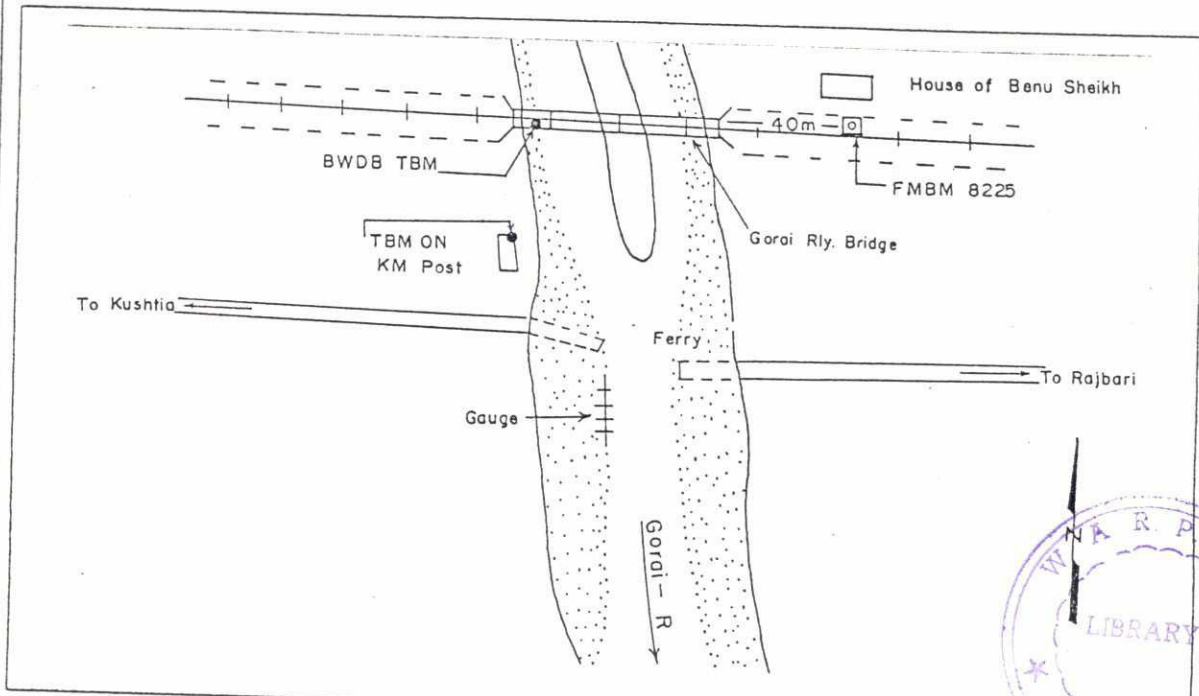


PROJECT : FAP 24 RIVER SURVEY PROJECT

RIVER : Gorai

GAUGE STATION : 99 Gorai railway bridge

LOCATION SKETCH



LOCATION OF BM & TBM

