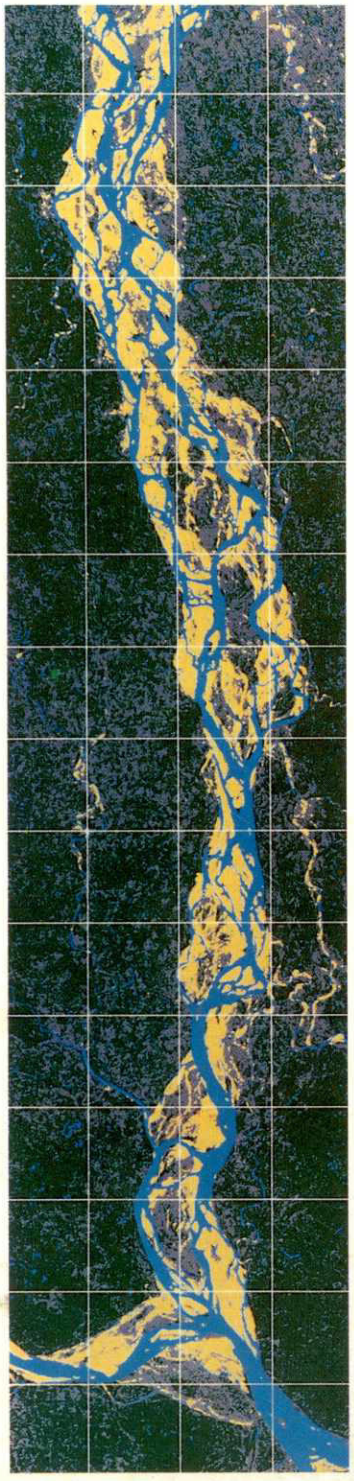
GOVERNMENT OF PEOPLE'S REPUBLIC OF BANGLADESH
MINISTRY OF WATER RESOURCES
WATER RESOURCES PLANNING ORGANIZATION

FEDERAL REPUBLIC OF GERMANY

KREDITANSTALT FÜR
WIEDERAUFBAU (KfW)

FRENCH REPUBLIC

CAISSE FRANCAISE DE
DEVELOPPEMENT (CFD)



BANK PROTECTION AND RIVER TRAINING (AFPM) PILOT PROJECT FAP 21/22

TEST AND IMPLEMENTATION PHASE

PROGRESS REPORT NO. 24

APRIL TO JUNE 1999

JAMUNA TEST WORKS CONSULTANTS, JOINT VENTURE
CONSULTING CONSORTIUM FAP 21/22

RHEIN-RUHR ING.-GES.MBH, DORTMUND/GERMANY

COMPAGNIE NATIONALE DU RHONE, LYON/FRANCE
PROF.DR. LACKNER & PARTNERS, BREMEN/GERMANY
DELFT HYDRAULICS, DELFT/NETHERLANDS

In association with:

BANGLADESH ENGINEERING &
TECHNOLOGICAL SERVICES LTD. (BETS)
DESH UPODESH LIMITED (DUL)

BANK PROTECTION AND RIVER TRAINING (AFPM) PILOT PROJECT FAP 21/22

TEST AND IMPLEMENTATION PHASE

PROGRESS REPORT NO. 24

APRIL TO JUNE 1999

BANK PROTECTION AND RIVER TRAINING/AFPM PILOT PROJECT
FAP 21/22

PROGRESS REPORT NO. 24

Table of Contents

8

List of Figures

List of Tables

List of Annexes

1 GENERAL

1.1 THE PROJECT

The Project FAP 21/22 consisting of the two components

- Bank Protection Pilot Project (FAP 21) and
- River Training and Active Flood Plain Management Pilot Project (FAP 22)

was awarded by the Flood Plan Coordination Organization (FPCO) represented by the Kreditanstalt für Wiederaufbau (KfW) to the joint venture Rhein-Ruhr Ingenieur-Gesellschaft mbH as lead partner, Compagnie Nationale du Rhône, Prof. Dr. Lackner & Partners and Delft Hydraulics in association with Bangladesh Engineering and Technological Services Ltd. (BETS) and Desh Upodesh Ltd. (DUL).

As per Terms of Reference the Consultancy Services are to be performed in two phases, a Planning Study Phase (Phase I) followed by a Test and Implementation Phase (Phase II) for the FAP 21 component.

The Consultancy Agreement was signed on October 14, 1991. The date of commencement was fixed on December 01, 1991.

The Inception Report was issued on March 21, 1992 and the Interim Report on July 16, 1992. The Draft Final Planning Study Report for the FAP 22 component was presented on December 19, 1992 and that for the FAP 21 component on January 18, 1993.

A joint mission of KfW and Caisse Française de Developpement (CFD) had carried out from January 26 to February 07, 1993 the Project appraisal of Phase II. The Mission together with FPCO agreed with the overall concept for the Test and Implementation Phase of the FAP 21 component which started on June 01, 1993 after the "Letter to Proceed" had been issued by FPCO on May 15, 1993.

After a meeting held on June 21, 1993 the FAP Review Committee of the Ministry of Irrigation, Water Development and Flood Control recommended the Draft Final Planning Study Report of both the components for approval by the Technical Committee.

The Final Planning Study Report FAP 21/22 was presented on June 30, 1993 and approved by the FAP Technical Committee of the Ministry of Irrigation, Water Development & Flood Control on August 09, 1994.

With effect of January 01, 1996 the responsibilities of the client passed to the Water Resources Planning Organization (WARPO) of the in 1995 renamed Ministry of Water Resources.

The Bank Protection Pilot Project (FAP 21) consists of the construction of a Groyne Test Structure and a Revetment Test Structure at different test sites. The subcontract for the Groyne Test Structure at Kamarjani Test Site was awarded to the Consortium: The Engineers Limited and Corolla Corporation (BD) Ltd. on September 07, 1994. The actual construction works on site started on October 01, 1994 and were substantially completed end of April 1995. The subcontract for the construction of the Revetment Test Structure at Bahadurabad Test Site was awarded to the Joint Venture The Engineers Ltd.-Corolla Corporation (BD) Ltd. and Monico Ltd.-Boskalis International on September 30, 1995. The execution of works started in December 1995 but had to be suspended in January 1996 for various reasons. The construction works were resumed in November 1996 and substantially completed end of May 1997.

With reference to the suspension of works on the Revetment Test Structure early 1996 and the incomplete adaptation / repair works at the Groyne Test Structure, the Consultant recommended in July 1996 an extension of the monitoring period of the FAP 21 component by one year up to end of 1999 which was approved by the Ministry of Water Resources in March 1997. Hence, work plan and staffing schedule were adapted accordingly up to December 31, 1999.

During the review mission of KfW and AFD (new name of the French donor agency with effect from April 1998) it was agreed between the donors, WARPO and BWDB in July 1998 to implement a third FAP 21 test site. In December 1998 the Consultant submitted a technical and financial proposal relating to this decision along with a proposal for necessary modification of Consulting Services. On the basis of this the client and the donors approved an extension of the Contract up to the end of 2000.

The River Training and Active Flood Plain Management Pilot Project (FAP 22) was formally finalized by holding an international experts discussion from November 02 to 04, 1993 on the new concepts presented in the Final Planning Study Report. Based on the recommendations of the Experts a combination of two different recurrent measures was built in the dry season 1996/97 at Katlamari Test Site and monitored during the flood season 1997. Early January 1998, however, it emerged that the investigations at Katlamari could not be continued due to the morphological development in the test site area. Therefore, a new test site had to be selected which was finally found at Kundarapara, about 5 km east of Kamarjani Test Site. However, all activities had to be stopped in March and June 1998 respectively due to permanent problems with the local population in that area. Finally, it was decided to resume the tests under FAP 22 in connection with the implementation of the third FAP 21 test site.

1.2 THE REPORT

As per Section 12.01 and Appendix 1 of the Consulting Agreement as well as according to the Work Plan of the Test and Implementation Phase (Table 1 of Attachment 1 to "Letter to Proceed") a Progress Report is due at the end of June 1999. This report is the Progress Report as indicated above and spells out the work progress of Consulting Services and Construction Works in the period from April to June 1999.

This report presents for the two components of the pilot project a description in brief of the activities performed during this period.

1.3 PERSONNEL DEPLOYMENT

After issue of the "Letter to Proceed" the expatriate Consultants and their local counterparts took up their assignment. The personnel deployment during the period under review is shown in Table 1.1-1, 1.1-2 and 1.1-3 for the FAP 21 component and in Table 2.1-1 and 2.1-2 for FAP 22.

1.4 IMPORTANT DATES AND EVENTS

15.05.1993	Letter to Proceed
01.06.1993	Start of Test and Implementation Phase
12.06.1993	Subcontract for the construction and installation of the Filter Test Rig
21.06.1993	Meeting of FAP Review Committee on Draft Final Study Report FAP 21/22
30.06.1993	Submission of Final Study Report FAP 21/22
14.07.1993	Subcontract for Physical Model Tests
23.07.1993	Collapse of Manos Regulator at Kamarjani Test Site
08. to 12.08.1993	Visit of Members of the German Parliament
18.09.1993	Submission of Final Invoice Phase I
28.09.1993	Subcontract for topographic and hydrographic survey at Kamarjani Test Site

31.10.1993	Subcontract for subsoil investigations at Kamarjani Test Site
02. to 04.11.1993	Experts Discussion FAP 22
10.02.1994	Coordination meeting for Kamarjani Test Site with FPCO and BWDB
23.02.1994	Issue of Tender Documents for Kamarjani Test Site
28.02.1994	Submission of Experts Recommendations FAP 22
20.03.1994	Pre-bid meeting for Test Site I
17.04.1994	Tender opening for Kamarjani Test Site
08. to 20.06.1994	Technical Assessment of Procurement Arrangements of the Consultant by Dr. Friedrich von Raumer on behalf of FPCO/KfW/CFD
14. to 20.06.1994	Review Mission of KfW/CFD
18.06.1994	Submission of Consultants Report on the results of the Experts Discussion FAP 22
09.08.1994	Approval of Consultants Final Study Report by the FAP Technical Committee
04.09.1994	Order to Commence construction works at Kamarjani Test Site
07.09.1994	Subcontract signed for construction works at Kamarjani Test Site
22.09.1994	Submission of Tech. Report No.1 on Physical Model Tests
22.09.1994	Submission of Tech. Report No.2 on Morphological Prediction for Test Areas
26.09.1994	Coordination meeting for Kamarjani Test Site with FPCO and BWDB
28. to 03.10.1994	KfW mission for definition of Kamarjani Test Site location and discussions on import of geotextile material
01.10.1994	Start of Construction Works at Kamarjani Test Site.
12. to 17.02.1995	Review Mission of KfW/CFD
26.02.1995	Submission of Technical Report No. 3 on Filter Stability Investigation
16.04.1995	Issue of Tender Documents for Test Site II
18.04.1995	Submission of Technical Report No. 4 on Falling Apron Investigation
15.05.1995	Pre-bid meeting for Test Site II
20. to 25.05.1995	Audit of the Project (Test Site I at Kamarjani)
30.05.1995	Completion of construction works at Kamarjani Test Site
11.06.1995	Tender opening for Test Site II
31.08.1995	Order to Commence construction works at Bahadurabad Test Site
10.09.1995	Coordination meeting for Bahadurabad Test Site with FPCO
20. to 26.09.1995	KfW mission for definition of Bahadurabad Test Site location
30.09.1995	Subcontract signed for construction works at Bahadurabad Test Site
01.12.1995	Start of construction Works at Bahadurabad Test Site
01.02.1996	Suspension of Construction Works at Bahadurabad Test Site
12.03.1996	Submission of Technical Report No. 5 on Additional Model Tests
20.03.1996	Submission of letters of FORCE MAJEURE to WARPO for both Test Sites
22.04.1996	Proposal for Final Implementation of Revetment Test Structure at Test Site II
26.06 to 03.07.96	Review Mission of KfW/CFD
18.07.1996	Proposal for Modification of Consulting Services
05.09.1996	Submission of Report on Extended Studies on Recurrent Measures (FAP 22)
30.09.1996	Submission of Report on Monitoring and Adaptation 1995 at Test Site I
29.10.1996	Proposal for location of FAP 22 Test Site (Katlamari)
13. to 17.11.1996	Technical Review Mission of KfW/CFD
26.11.1996	Resumption of construction works at Bahadurabad Test Site
24.12.1996	Start of construction works at Katlamari Test Site (FAP 22)
02.03.1997	Approval of extension of the monitoring period up to December 31, 1999
20.03.1997	Completion of construction works at Katlamari Test Site (FAP 22)
31.05.1997	Completion of construction works at Bahadurabad Test Site
20. to 29.06.1997	Technical Assessment of Procurement Arrangements of the Consultant by Dr. Friedrich von Raumer on behalf of WARPO/KfW/CFD
11. to 19.07.1997	Audit of the Project (Test Site I and II)

14. to 21.07.1997	Technical Review Mission of KfW/CFD
14.09.1997	Submission of Technical and Financial Proposal for Consultancy Services and Construction of Low Cost and Recurrent Measures (FAP 22)
06.01.1998	Approval of modified Proposal of September 1997 for Consultancy Services and Construction of Low Cost and Recurrent Measures (FAP 22)
07.02.1998	Start of construction works at Kundarapara Test Site
05.05.1998	Submission of Technical Report No. 6 on Additional Model Tests
14. to 23.07.1998	Technical Review Mission of KfW/AFD
23.12.1998	Proposal for modification of Consulting Services for Test Site III
01. to 07.03.1999	Technical Review Mission of KfW/AFD
31.05.1999	Proposal for modification of Consulting Services for Test Site III (Revision 1)
23.06.1999	Order to commence with prefabrication of cc-blocks for Third Test Site

2 BANK PROTECTION COMPONENT (FAP 21)

2.1 PRELIMINARY REMARK

The Consultant's services of the Test and Implementation Phase (Phase II) comprise all engineering and management tasks relating to the planning and execution of test structures at two test sites, their monitoring, adaptation, repair measures during subsequent years and handing over to the Client at the end of the contract period.

After submission of the Draft Final Planning Study Report a joint mission of KfW and CFD has carried out the project appraisal to proceed into Phase II of the Project. The Mission agreed to the overall concept of Phase II proposed by the Consultant the essence of which is the construction of permeable groynes and of various types of revetments at two different test sites in two successive seasons.

However, the remaining lead time of the programme as presented in the Draft Final Planning Study Report for additional studies, final design, procurement, subcontracting and preparation of construction was found to be too short in view of the administrative and technical difficulties identified by the Consultant and the Mission. There seemed to be unacceptable risks that the construction of the test works at the first test site could not be completed successfully during the dry season 1993/94 which in turn would have led to major cost increases and endangered the achievement of meaningful test results.

A mutual understanding between all parties concerned had been reached on a postponement of the start of the construction period and of the end of the Project by one year. Moreover, it was decided to reduce the magnitude of the test works on the two selected test sites in order to reserve funds for further improvement of the test structures or, if necessary and possible, for the construction of new structures. Since in July 1998 remaining funds of about DM 8.4 million were estimated taking into account costs for monitoring and maintenance of the first two test structures until the end of the Project, all parties concerned came on request of the client to an agreement to utilise the contract amount up to 100 % and to implement a third test site.

The Table 1.2-1.1 is showing the Work Plan and Table 1.2-3.1 the Staffing Schedule of the Test and Implementation Phase as per "Letter to Proceed" of May 15, 1993. Table 1.2-3.2 presents the revised Staffing Schedule submitted along with the Progress Report No. 6 and adapted to the donors' comments, whereas Table 1.2-1.2 and Table 1.2-3.3 are showing the Work Plan and the Staffing Schedule as per proposal of July 1996, approved in March 1997. Table 1.2-2 is indicating the actual progress of works and Table 1.2-4 and Table 1.2-5 the actual deployment of the expatriate and local professional staff respectively during the period under review.

2.2 TEST SITE I AT KAMARJANI

2.2.1 General

Initially, the test structure comprised of 6 groynes, each of them a combination of an impermeable and a permeable section with increasing permeability towards the river of which 3 groynes (G-1 to G-3) were partly constructed off-shore and on-shore while the other ones G-B1, G-B2 and G-A were built on the flood plain. All six structures launch from and were built against an embankment constructed under the authority of the Bangladesh Water Development Board (BWDB).

The main components of the groyne test field are the groynes G-1 to G-3, whereas G-B1, G-B2 and G-A which were built upstream and downstream respectively from the main groynes are intended to supplement the functioning and effects of the latter.

The "Order to Commence" the construction works was issued on September 04, 1994 and the works were substantially completed in April 1995.

The structure was "tested" by the river for the first time during the flood season 1995 which was marked by five flood peaks of which three represent events with more than 10 years re-occurrence and a maximum water level on July 10, 1995 corresponding to a situation of about 25 years re-occurrence.

The first four flood peaks contributed to three major damage events within the test site area:

- destruction of the impermeable groyne head of groyne G-2 and loss of piles of the permeable section;
- breach of the main embankment about 80 m downstream from groyne G-2, and
- collapsing of the impermeable part of groyne G-3 at the downstream side and destruction of the impermeable groyne head.

The initial findings of damage causes and the results of additional physical model tests performed in November/December 1995 at the River Research Institute at Faridpur had identified improvement and adaptation measures which had to fulfil mainly the following conditions:

- to substantially reduce the magnitude of return currents and vortices within the groyne field in particular along the main embankment, and
- to improve the transition between the permeable and impermeable part of the groynes with the aim to further limit the development of severe return currents, turbulences and vortices.

For the design of adaptation and repair measures, the design parameters as per original design of the groyne structure were being maintained. Only the downstream part of the impermeable groyne heads received substantially increased launching aprons.

Since the main river attack during the monsoon season 1996 was expected downstream from groyne G-A threatening the main embankment near the Manos river estuary, a new supplementary groyne G-A/2 was built 200 m downstream from G-A. However, the execution of the adaptation and repair works was hampered by the political situation in the country in 1995 and the first quarter 1996 with the result that the works could not be completed in time due to the rising water level. Especially, groyne G-2 remained incomplete because the gap between the remaining pile structure built in 1995 and the relocated main embankment could not be closed by driving further piles as per design.

During the flood season 1996 the river banks in the area of Kamarjani continued to be eroded and also the Groyne Test Structure came under attack again due to the attraction of the flow by the scour hole in front of the groynes. However, due to the adaptation of the structure and the morphological

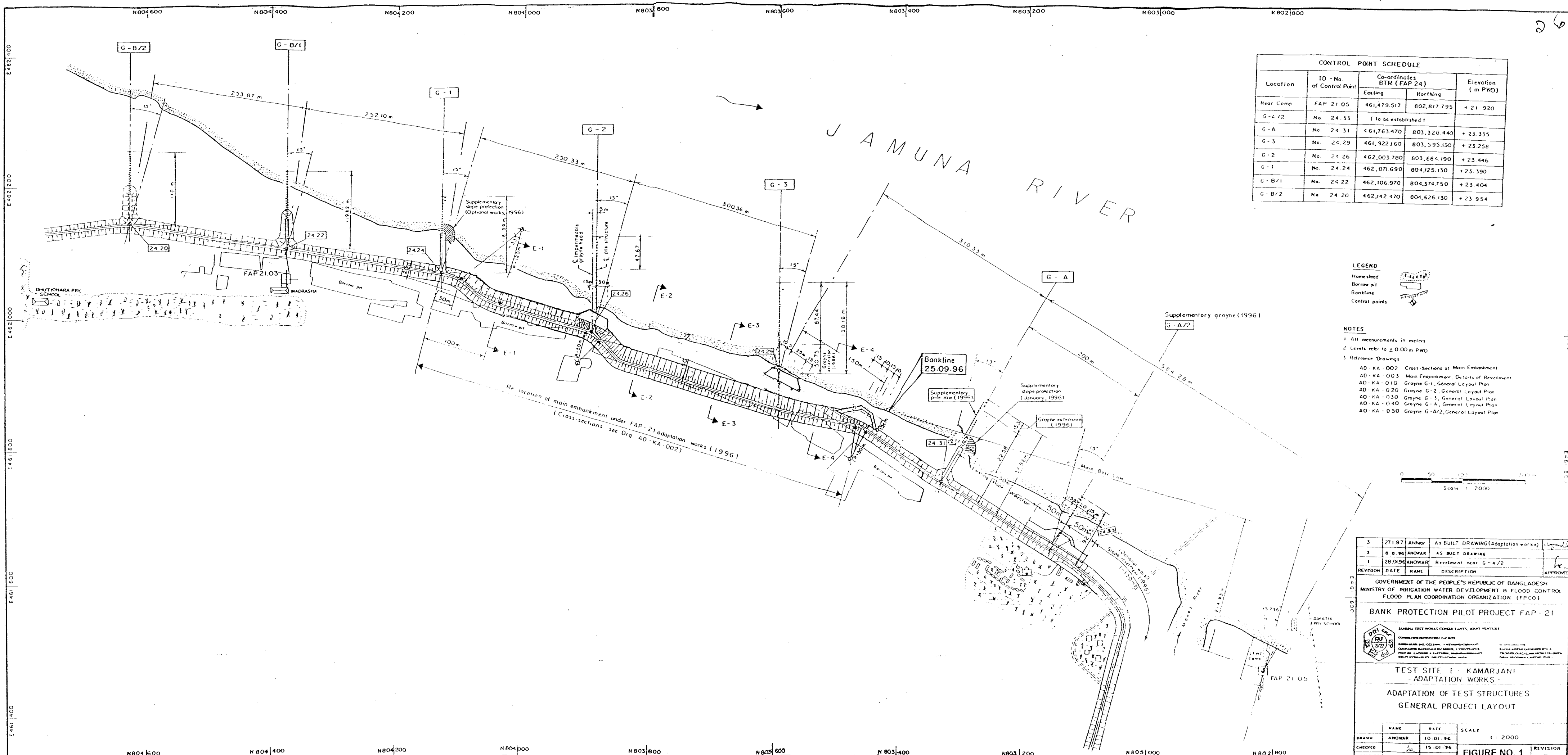
development in the test site area no damages to the structure occurred during the monsoon season 1996 except to the main embankment which was slightly damaged by wave erosion in those areas where the upper part was only protected by grass sods. Repair works were carried out in November 1996 and the grass sod protection was replaced by brick mattressing. Further repair works of the pile structure of groyne G-2 was carried out by driving 23 Nos steel piles ϕ 711 mm and 32 m length as well as by construction of 12 Nos of reinforced in-situ concrete piles between the toe of the relocated main embankment and the pile structure left over and intact after the monsoon 1995.

From September 1997 to end of January 1998 ten additional physical model tests were performed in the River Research Institute in Faridpur, the objective of which was (1) to investigate the causes of damages observed in 1995 and (2) to gain more information/knowledge of the behaviour of the groynes/groyne field in order to be in a position to formulate design rules at the end of the Project in 1999 and to work out guidelines and manuals for their application.

During the monsoon season 1998 no damages to the test structure occurred. Hence, no adaptation and repair works are necessary in the dry season 1998/99.

The general layout of the test structure after the execution of adaptation and repair works is shown in Fig. 1.

26



CONTROL POINT SCHEDULE

Location	ID - No. of Control Point	Co-ordinates BTM (FAP 24)		Elevation (m PWD)
		Easting	Northing	
Near Comp.	FAP 21.05	461,479.517	802,817.795	+ 21.920
G-B/2	No. 24.33	(To be established)		
G-A	No. 24.31	461,763.470	803,328.440	+ 23.335
G-3	No. 24.29	461,922.160	803,595.130	+ 23.258
G-2	No. 24.26	462,003.780	803,684.190	+ 23.446
G-1	No. 24.24	462,071.690	804,125.130	+ 23.390
G-B/1	No. 24.22	462,106.970	804,374.750	+ 23.404
G-B/2	No. 24.20	462,142.470	804,626.130	+ 23.954

LEGEND

- Homestead
- Borrow pit
- Bankline
- Control points

NOTES

1. All measurements in metres
2. Levels refer to ± 0.00 m PWD
3. Reference Drawings
   - AD-KA-002 Cross-Sections of Main Embankment
   - AD-KA-003 Main Embankment, Details of Revetment
   - AD-KA-010 Groyne G-1, General Layout Plan
   - AD-KA-020 Groyne G-2, General Layout Plan
   - AD-KA-030 Groyne G-3, General Layout Plan
   - AD-KA-040 Groyne G-A, General Layout Plan
   - AD-KA-050 Groyne G-A/2, General Layout Plan

Scale 1 : 2000

REVISION	DATE	NAME	DESCRIPTION	APPROVED
3	27.1.97	Anowar	As BUILT DRAWING (Adaptation works)	
2	8.8.96	ANOWAR	AS BUILT DRAWING	
1	28.04.96	ANOWAR	Revetment near G-A/2	

GOVERNMENT OF THE PEOPLE'S REPUBLIC OF BANGLADESH
MINISTRY OF IRRIGATION WATER DEVELOPMENT & FLOOD CONTROL
FLOOD PLAN COORDINATION ORGANIZATION (FPCO)

BANK PROTECTION PILOT PROJECT FAP-21

JAMUNA TEST WORKS CONSULTANTS, JOINT VENTURE

CONSULTING CONSORTIUM FAP 24/25

TEST SITE I : KAMARJANI
- ADAPTATION WORKS -

ADAPTATION OF TEST STRUCTURES
GENERAL PROJECT LAYOUT

	NAME	DATE
DRAWN	ANOWAR	10-01-96
CHECKED		15-01-96
APPROVED		

SCALE 1 : 2000

FIGURE NO. 1 | REVISION 3

2.2.2 Monitoring of the Test Structures

Since the final objective of the bank protection pilot project is to develop and optimise design criteria, cost-effective construction and maintenance methods which will serve as future standards appropriate for the prevailing conditions at the Jamuna and other rivers of Bangladesh, regular monitoring, preventive maintenance and adaptation of the works is a must after installation of the test structure. Hence, monitoring started immediately after completion of the works in 1995. The following activities have been performed during the period under review:

(1) Bathymetry

Bathymetry surveys were done to detect and record planform and riverbed changes and their influence on the stability of the test structure. The activities during the months of April to June 1999 are shown in Table 1. All the surveys were finally processed in the office in Dhaka and the results are shown in contour charts.

The results of the main surveys of April and May are given in Annex B. The survey of June could not be completed and the results will be presented together with those of July in the next Progress Report.

Date	Survey Area		
	April 1999	May 1999	June 1999
01			
02			
03			
04			
05			
06			
07			
08			
09			
10			
11			
12			
13			
14			
15			
16			
17			
18			
19			
20			
21	main survey		
22	main survey		
23	main survey		
24	main survey		
25	main survey		
26	main survey		
27	main survey		
28	main survey	main survey	main survey
29		main survey	
30		main survey	
31			

Table 1: Bathymetry surveys at Kamarjani Test Site from April to June 1999

(2) Topographic Measurements

The topographic measurements were done by using Electronic Distance Measurement (EDM) equipment & levelling instrument. During the period under review the following works were performed:

26/04	bankline from Syedpur to Balashi Ghat
28/05	bankline from Syedpur to Balashi Ghat
29/05	waterline at Kharjani and Batkamari chars
04/06	water level gauge at G-A shifted and zero value measured at 19.48 m + PWD
13/06	water level gauge at G-A shifted and zero value measured at 18.23 m + PWD
25/06	water level gauge at G-A shifted and zero value measured at 19.50 m + PWD
27/06	water level gauge at G-A shifted and zero value measured at 20.72 m + PWD

(3) Measurement by the Monitoring System

The monitoring system is located at groyne G-2 and recording water level information, wave heights and periods, test pile inclination and acceleration, wind speed and direction as well as other meteorological data like temperature, precipitation and relative humidity. Data are shown in the monthly reports on monitoring of the test structures.

(4) Measurement of Flow Velocity and Direction

Float track measurements were continued as well as measurements with the Valeport currentmeter in the Kamarjani main channel and Kundarapara cut-off channel. Results are presented in the monthly reports on monitoring of the test structures and in Annex B.

(5) Observations

After the exceptional low water end of March the water level started significantly to rise on April 10. A first peak was recorded on May 08 at 18.61 m + PWD. After a drop of 1.5 m within a fortnight, a sharp rise of 3.36 m within 11 days was observed with a peak at 20.47 m + PWD on June 05. The highest water level during the period under review was recorded on June 29 at 21.50 m + PWD.

During the month of April slow bank erosion was observed between Rasulpur and Balashi Ghat. With the rising water level the width and the activities of the main channels increased. The erosion downstream from the groyne field continued, but also the char in front of the groynes G-2 and GA-2 started to erode. On the other hand the connecting channels between the Kamarjani main channel and the Kundarapara channel silted up in May. The deposition with a maximum of about 3 m in May resulted in declining of the Kundarapara channel.

2.3 TEST SITE II AT BAHADURABAD

2.3.1 Introduction

The construction of the Revetment Test Structure was originally planned about 4 km south of Bahadurabad Ghat based on the investigations during the Study Phase. Since, however, no substantial erosion occurred at the pre-selected test site, this area was abandoned and a more suitable one was selected in September/October 1995 at Kulkandi-village just downstream from Bahadurabad Ghat. The decision on the final location of the test structure was taken on October 11, 1995. However, end November 1995 it emerged that the Subcontractor could not mobilise the main construction equipment for dredging and under water works in time. After he had admitted his inability to do so, the Consultant informed the Subcontractor on December 05, 1995 of his failure to comply with the contractual obligations in accordance with Sub-Clause 63.1 (b) of the Conditions of Contract. On January 20, 1996 the Subcontractor was notified in accordance with Sub-Clause 46.1 of the Conditions of Contract that the rate of progress of works was too slow to comply with the contractual Time of Completion and finally it was decided on January 31, 1996 to defer the final completion of the test structure until next dry season.

Based on the experience in 1995 and January 1996, and after identification of the main constraints preventing the completion of Works as per original schedule, a proposal for the final implementation of the Revetment Test Structure during the dry season 1996/97 was submitted in April 1996 taking into account the morphological analysis of the test area in March and May 1996 and the expected morphological development during the monsoon season 1996.

However, in August 1996 a deep channel shifted towards the bank of the selected test site and over the full length of the planned structure with severe erosion of the river bank resulting in a complete loss of the unprotected structure of 1995/96. Hence, another location of the Revetment Test Structure had to be determined and the design of the structure to be adapted accordingly. A proposal was presented to WARPO on October 19, 1996 which was discussed with the client and the donors during a review mission of the latter from November 13 to 17, 1996 with the final decision in favour of the location as shown in Fig. 2.

The start and the implementation of works was strongly affected by the land acquisition problem and the progress of works was already behind schedule at the end of 1996, because the subcontractor could only start the actual works on November 20, 1996 and concentrated till the end of the year mainly on earth works. Even after the client and the donors had decided during their meeting in November 1996 to proceed with the construction works, the concerned authorities of the Government of Bangladesh took almost another month for compensation payment to the local population after the donors had agreed to advance necessary funds.

Due to the above mentioned circumstances the delay of the actual construction works accumulated to almost 2.5 months. However, the Consultant and his Subcontractor made every effort to make up for lost time and on June 15 the Client had been informed that the Revetment Test Structure was complete in all respects on June 12, 1997.

During the construction phase the structure was protected by a natural earth dam. This was important for the completion of the falling aprons. It remained intact for a longer period than expected and was finally washed away only in the last week of June 1997. Hence, the test structure became subjected to flow and wave attack and the falling aprons started to function. During the monsoon 1997 the structure was strongly attacked by the river and severe erosion downstream from the structure was observed. In July flow velocities up to 3.9 m/s were measured and a scour hole developed in front of Section D and E the deepest level of which was at −7.0 m + PWD. The river attack continued also in August and September just as the severe erosion downstream from the test structure which was about 100 m in September in an area about 1 km downstream from the structure.

Though the flow velocity decreased considerably in September, the depth of the scour hole in front of the structure increased and shifted to Section G and H. The deepest level was recorded at −14 m + PWD. In October 1997 a mid channel char continued to grow in front of the Railway ferry ghat. This resulted in a reduction of width and depth of the channel near the bank upstream from the Revetment Test Structure, whereas the western channel developed further and attacked the river bank just downstream from the structure . Considerable erosion of some 50 m were recorded in October and this process continued till the end of the year. However, no damage to the structure was observed, the falling aprons functioned as expected and at the end of the year sedimentation in the area of the falling aprons of Section G and H and in the channel occurred.

Also during the first quarter of 1998 erosion has been observed downstream from the structure up to Ghutail Bazar. When the water level started to rise at about mid March, the test structure came under attack again, but the falling aprons continued to function as expected. In June and July sedimentation occurred in front of the structure with maximum deposition of about 17.5 m along Section H-2. In August, however, fresh erosion gave way to the sedimentation process and continued along the structure till end of the year affected in the last quarter by the formation of a new char in front of the structure. During the whole year 1998 no damages to the structure caused by the river were observed.

29

N778 800 | N778 600 | N778 400 | N778 200 | N778 000 | N777 800 | N777 600 | N777 400

E 471600 / E 471400 / E 471200 / E 471000 / E 470800 / E 470600

To Schools
(Primary, Secondary, Madrasha)

FAP 21.B

LAND ACQUISITION
PHASE I (1995-96)

EC - MB Camp

pond

FAP 21-X

A-2

Village North-south connection

Consultants camp

LAND ACQUISITION
PHASE II (Site Survey 17.10.96)

FAP 21.28

SEE DETAIL
DRG. R-A-315

±10.0

R=50m

FAP 21-Y

H-2

H-1

Market

Canteen

B

E

F

G

FAP-770

Pond

GPS FM 784

BANKLINE ON
15TH MAY' 97

BANKLINE ON
15TH.OCTOBER'96

179.40
224.40
45.0

JAMUNA RIVER

175.48
470.08
503.82

DRAWING PHOTOREDUCED BY 50%

CONTROL POINT SCHEDULE			
No. of Control Points	Co-ordinates BTM		Elevation (m PWD)
	Easting	Northing	
FAP21-B	471,548.482	778,800.937	+20.246
*) GPS FM764	471,086.185	778,478.880	—
FAP21.28	471,330.663	777,813.399	+ 20.139
FAP770	471,067.515	778,073.154	+ 20.248
FAP21-X	471,293.485	778,654.360	—
FAP21-Y	471,149.095	777,975.060	—

*) not existent anymore.

0 50 100 200 m
SCALE 1 2000

LEGEND

- Embankment
- Road Pucca, Kacha, Footpath
- High River Bank
- House Pucca, Kacha & Tinshed
- Traverse Station & Pillar
- Home stead
- Mosque

NOTES

1. The topography shown on this drawing is based on J T WC's survey of Oct '96 combined with topographical maps of Survey of Bangladesh
2. Levels refer to ± 0.00 m PWD
3. Bank line and bathymetric survey as on 09/10/96
4. Reference Drawing
   R - A - 302 Detailed Layout of Test Structure

REV.	DATE	NAME	DESCRIPTION	APPROVED
1	01.6.97	Answer	AS BUILT DRAWING	

GOVERNMENT OF THE PEOPLE'S REPUBLIC OF BANGLADESH
MINISTRY OF WATER RESOURCES
WATER RESOURCES PLANNING ORGANISATION (WARPO)

BANK PROTECTION PILOT PROJECT FAP-21

JAMUNA TEST WORKS CONSULTANTS, JOINT VENTURE

TEST SITE II - BAHADURABAD

GENERAL LAYOUT OF TEST STRUCTURE
(1996/97)

	NAME	DATE
DRAWN	ANSWAR	03-11-96
CHECKED		03-11-96
APPROVED		

SCALE : 1 : 2,000

FIGURE NO. 2

REVISION 1

REVETMENT TEST STRUCTURE
DEFINITION SKETCH

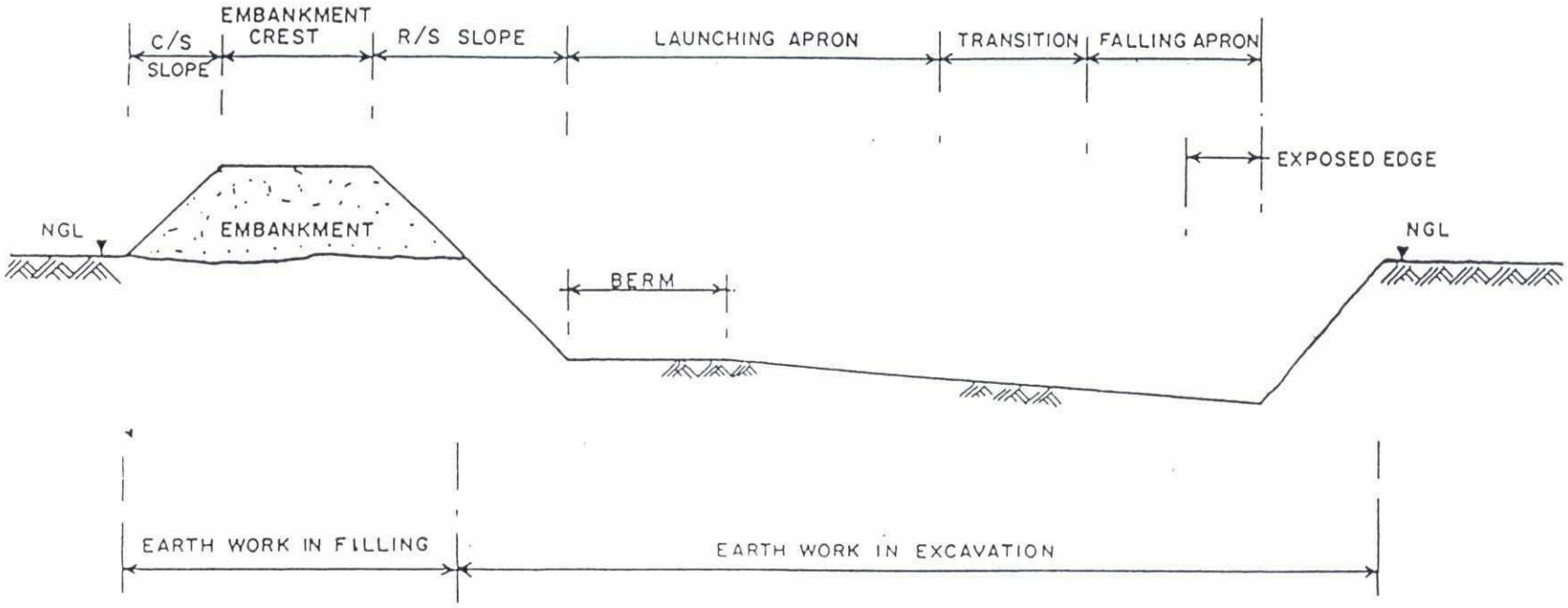


Figure 3: Definition Sketch of the Revetment Test Structure

DETAILS OF REVETMENT COMPOSITION

A. COVER LAYER

Test Structure		A-end	A-1	A-2	B	C	D	E		F	G	H-1	H-2
Land-sided slope		Brick mattress d = 15 cm	In all sections Durba grass sods laid on Geo-jute soil saver										
River side	Approximate length along toe of upper slope (at berm level)	~ 87.40	~ 74.70	~ 74.70	~ 99.10	~ 93.20	88.0	90.0		88.0	100.0	~ 82.75	~ 97.60
	Revetment above berm level (+15.3 m to +22.0 m PWD)	Brick mattress d = 15 cm	Brick mattress d = 15 cm	Wiremesh mattress d = 23/36 cm with stone fill Grade B (D_{50} = 15 cm)	Wiremesh mattress d = 23 cm with stone fill Grade B (D_{50} = 15 cm) on intermediate rubble layer (d = 25 cm)	CC-blocks D_n = 30 cm hand-laid in single, diagonal lines	CC-blocks D_n = 30 cm hand-laid in single, parallel lines	Interlocking CC-slabs (ship-lap type)		Wiremesh mattress d = 36 cm with brick fill	Interlocking CC-slabs (tongue-groove type) on intermediate layer	Rip-rap Grade C (D_{50} = 20 cm) Top 20 cm with stone pitching (d = 50 cm)	Rip-rap Grade C (D_{50} = 20 cm) Top 20 cm with stone pitching (d = 40 cm)
	Launching Apron at and below berm level (+14.5 m to +15.3 m PWD)		Dumped CC-blocks D_n = 30 cm	Dumped CC-blocks D_n = 35 cm	Dumped CC-blocks Edge us: D_n = 50 cm Center: D_n = 35 cm Edge ds: D_n = 40 cm	Articulated Rano-mattress d = 23/36 cm; stone fill grade B, C, D (D_{50} = 25 cm) with inter-connecting steel wire ropes and anchor piles at berm level	Articulated CC-block mattress with inter-connecting steel wire ropes and anchor pipes at berm level	FORESHORE-mattress (collapsible block mattress with cement grout fill)		PROFIX-mattress (tubular fabric mattress with sand and sand-bitumen fill)	INCOMAT-sandflex mattress (collapsible block mattress with sand fill)	Rip-rap Grade F (D_n = 25-35-45 cm)	CC-blocks D_n = 30 cm D_n = 35 cm (mixed)
	Transition between launching apron and falling apron		CC-blocks D_n = 30 cm	CC-blocks D_n = 30 cm	CC-blocks D_n = 35 cm			CC-blocks D_n = 40 cm	Geo-sand container D	Rip-rap Grade E CC-blocks, D_n = 30 cm *1	CC-blocks D_n = 35 cm *2		
	Falling Apron (level +14.5 m PWD)	Dumped CC-blocks D_n = 30 cm	Dumped CC-blocks D_n = 35 cm D_n = 40 cm (mixed)	Rip-rap, Grade E (D_{50} = 30 cm)	Geo-sand-container Type C (180 kg/No.)	Geo-sand-container Type E (900 kg/No.)	CC-blocks D_n = 40 cm			CC-blocks D_n = 40/45 cm (mixed)	CC-blocks D_n = 35/40 cm (mixed)		
	Exposed edge of falling apron			Rip-rap, Grade F (D_n = 25/35/45 cm)	Geo-sand-container Type D (250 kg/No.)		CC-blocks D_n = 45 cm	CC-blocks D_n = 45 cm	Geo-sand container E	Gabion sacks with stone fill Grade B (D_{50} = 15 cm) (300 kg/No.)	CC-blocks D_n = 40 cm	Selected boulders D_n = 35-45 cm	

us = upstream
ds = downstream

B. FILTER LAYER

Test Structure			A-end	A-1	A-2	B	C		D	E		F	G	H-1	H-2
Land-sided slope			GF-1	In all sections Geo-jute Soil Saver											
River Side	Approximate length along toe of upper slope (at berm level)		~ 87.40	~ 74.70	~ 74.70	~ 99.10	~ 93.20		88.0	90.0		88.0	100.0	~ 82.75	~ 97.60
	Geotextile filter mats above berm level	Spec. Type	GF-1/-5	GF-1	GF-5	GF-2	Filter III on filter II	Khoa on filter II	GF-2	GF-1	GF-5	GF-1	GF-1	GF-4	GF-4/-2
		Brand Name	BIDIM b7 HaTe 02214	BIDIM b 7	HaTe O 2214	BIDIM S 550			BIDIM S 550	DATEX AD1300	Hate J 9014	BIDIM S 390	DATEX AD1300	BIDIM S 700	HaTe E650/K251
	Geotextile filter mats at and below berm level	Spec. Type	GF-1/-5	GF-2	GF-2	GF-4	GF-2		GF-4	FORESHORE-mattres (collapsible fabric block mattress with cement grout fill)		PROFIX-mattress (tubular fabric mattress with sand and sand-bitumen fill)	GF-1 (sub-layer to INCOMAT-sand flex mattress)	GF-1	GF-1
		Brand Name	BIDIM b7 HaTe 02214	BIDIM S 550	BIDIM S 550	HaTe K 251	DATEX AD 1600		BIDIM S 700				BIDIM b 7	BIDIM S 390	BIDIM S 390

Table 2: Details of Revetment Composition

2.3.2 Monitoring of the Test Structures

Monitoring of the Revetment Test Structure started already during the construction phase in January 1997. During the period under report the following activities have been performed:

(1) Bathymetry

Bathymetry surveys are mainly done to record riverbed changes in front of the test structure and to detect their influence on the stability of the structure, in particular to find out the behaviour / functioning of the falling aprons and launching aprons, since this is decisive for the overall stability of the test structure.

The activities during the months of April to June 1999 are shown in Table 3. All the surveys were finally processed in the office in Dhaka and the results are shown in contour charts as well as differential models (see Annex G and H).

Date	Survey Area		
	April 1999	May 1999	June 1999
01			
02			
03			
04			
05		site survey	
06			
07			
08			
09			
10			
11			
12			
13			
14			
15	main survey		
16	main and site survey		main survey
17	main survey		main survey
18	main survey		main and site survey
19			
20			
21			
22			
23			
24		site survey	
25		main and site survey	
26			
27			
28			site survey
29			
30			
31			

Table 3: Bathymetry surveys at Bahadurabad Test Site from April to June 1999

Moreover, measurements have been carried out regularly in the individual sections of the structure. The aim of these activities is to get more information on erosion and sedimentation in the channel in front of the structure, in the area of the falling aprons and on the functioning of the falling/launching aprons. The results of these measurements are given as cross-sections in Annex I.

(2) Topographic Measurements

During the period under review the following works were performed:

22/04	bankline from Harindhara to the test structure and from Belgacha to Ghutail Bazar
22/04	water line of the char in front of the test structure
01/05	bankline from Harindhara to the test structure
17/06 to 18/06	bankline from Harindhara to Ghutail Bazar
27/06 to 28/06	survey of boundaries of roads and homesteads upstream from the test structure
29/06	survey of boundaries of roads and homesteads downstream from the test structure

(3) Measurement of Flow Velocity and Direction

Float track measurements were continued as well as measurements with the Valeport currentmeter. Results of flow measurements are presented in the monthly reports on monitoring and in Annex G.

(4) Observations

Also at the Revetment Test Structure the usual seasonal rise of the water level were delayed and started on April 11 only. Peaks during the second quarter of 1999 were recorded at 16.51 m+PWD on May 08 and at 18.21 m+PWD on June 05. At the end of the period under report the water level was recorded at 19.06 m+PWD.

No damage of the test structure has been reported. In April no significant change of the bed level in front of the structure was observed except in Section C where about 4 m deposition approximately 130 m away from the crest of the embankment were measured. In May the flow velocities in front of the structure increased and maximum values of 1.7 m/s were recorded. At the same time another erosion process started. In Section E-1 about 5 m erosion occurred and in the following month erosion was also observed in the other sections except Section B and C. The deepest part of the river bed was found just downstream from Section H where 12 m erosion and flow velocities of more than 1.9 m/s were measured. At the end of June also strong return currents were observed just downstream from Section H.

2.4 TEST SITE III

2.4.1 Introduction

During the monsoon season 1997 and the following dry season severe erosion occurred further downstream from the Revetment Test Structure at Bahadurabad. Following the demand of the local population for suitable protection of their land and homesteads, WARPO requested the donors KfW and AFD during their review mission in July 1998 to agree to the implementation of a third test site at Ghutail, about 4 km downstream from the Revetment Test Structure. Since the test structures at Kamarjani and Bahadurabad had been implemented within the available budget and taking into account a cost estimate for their monitoring and maintenance until the completion of the Project by the end of December 1999, remaining funds of about DM 8.4 million were estimated. Taking further into account the intention to utilise the contract amount up to 100 %, it was agreed between the donors, WARPO and BWDB in July 1998 to implement a third FAP 21 test site at Ghutail.

Immediately after the decision had been taken in favour of a third test site, the Consultant started necessary investigations and surveys and arrived finally at the conviction that any test structure at any suitable test site on the Jamuna could not be completed before the monsoon season 1999. It was therefore suggested in letter No. CC/F21-22/WARPO-KfW/L/98-332 of November 01, 1998 to start the actual construction of the third test structure after the monsoon season 1999 only.

In December 1998 a technical and financial proposal for the implementation of a third test structure along with a proposal for necessary modification of consulting services was submitted by the Consultant because the existing Contract was scheduled up to the end of 1999 only. The client and the donors approved the extension of the Contract up to end of 2000, but asked for some modifications of the financial proposal taking into account also the discussions and findings of the donors' review mission of March 1999. A revised proposal was submitted in May 1999.

The technical proposal of December 1998 was based on the morphological situation during and immediately after the monsoon 1998 in that area. Since this location was proposed by the client during the flood season, it was stressed by the Consultant in his proposal in accordance with the conditions mentioned in the Minutes of Meeting of the donors' review mission of July 1998 that its suitability as a test site could only be estimated after a detailed investigation of the effects of the tremendous flood 1998 on the river morphology. Site visits, morphological investigations on site in February/March 1999 and the study of a satellite image of January 23, 1999 which became available only in the second half of February 1999, revealed considerable morphological changes in the area of Ghutail and further upstream. Based on the results of all investigations including the morphological development to be expected during the monsoon season 1999, the proposed location seemed to be only partly suitable for the construction of another test structure, especially of a groyne field. Hence, the Consultant concentrated on the investigation of alternative locations suitable for the construction of groynes and revetments as well.

The offer for the works for the Third Test Site from the Consortium: Engineers Ltd. and Corolla Corporation (BD) Ltd. was accepted with letter No. CC/F21/CONS/L/99-132 dated June 22, 1999.

The order to commence the works, limited to the prefabrication of cc-blocks was issued on June 23, 1999.

2.4.2 Selection of Test Sites

Within the feasible reach of the present test sites, namely Kamarjani and Bahadurabad, six locations have been investigated and assessed with regard to their suitability for a third test structure. Basis of the analysis of the pre-selected sites were the site selection criteria already defined in the Final Planning Study Report FAP 21. Finally, Ghutail and the consolidation of the Revetment Test Structure at Test Site II were assessed to be most suitable for the implementation of a third test structure. Details of the assessment were presented in a revision of the "Proposal for Modification of Consulting Services for Test Site III" in May 1999. The final decision on the exact location of the third test structure can only be taken after the monsoon season 1999.

2.4.3 Type of Structure

Based on the investigations after the monsoon season 1998 the Consultant suggested in his proposal of December 1998 to build another groyne test structure of permeable groynes only during the dry season 1999/2000. Since, however, the investigations of February and March 1999 revealed that the changed conditions at Ghutail may prohibit the construction of a groyne field within the available budget, it was recommended in the revised proposal of May 1999 to prepare for the implementation of a revetment test structure at Ghutail if found suitable after the monsoon 1999. If not, the material which has to be ordered now can be used for the consolidation of the Revetment Test Structure at Bahadurabad, because according to the results of the investigations of February/March 1999 at least the upstream part of the structure is expected to be seriously attacked during the coming years.

As to details of layout and design principles reference is made to Progress Report No. 23.

2.4.4 Work Plan

A suitable work plan for planning and implementation of the third test structure was already developed and presented in the proposal of December 1998. This program which is practicable for both optioned sites has been slightly adapted taking into account the donors' comments of January 1999 on the proposal of December 1998 and the discussions held during the donors' review mission of March 1999. However it is stressed again that the Government of Bangladesh has to make sure that the Consultant and the Contractors will have access to the finally selected site on November 01, 1999 at the latest. This was discussed with BWDB and WARPO during the donors' review missions in July 1998 and March 1999, and is mentioned in the relevant minutes of meeting.

Other important, dates which have to be observed, are:

July 31, 1999	contract awards and work orders;
mid October 1999:	final decision on the location of the test site;
November 01, 1999:	access to the site for Consultant and Contractors;
mid November 1999:	order to commence and mobilisation;
December 01, 1999:	start of actual construction works, and
May 31, 2000:	termination of construction works.

The Consultant would appreciate very much the active participation of BWDB and WARPO in the site selection process.

2.5 REPORTING

In accordance with the Terms of Reference and the Consulting Agreement the Consultant will critically assess the results of the test programme at the end of the Project for the Final Evaluation Report. In addition to this report the Consultant has to submit on the basis of all available know-how and experience gained during the Project guidelines and manuals for the design and implementation of river training works for more or less standard solutions for the rivers in Bangladesh, in particular the Jamuna River.

On the occasion of the donors' review mission in July 19998 the Consultant presented in a work shop on July 20, 1998 his concept for the Final Report, Guidelines and Manuals. Tables of Content (see Annex N) were elaborated and discussed with the donors and engineers of BWDB and WARPO. Finally, a time schedule was agreed upon in the work shop for the presentation of the guidelines and manuals for planning, design and implementation of river training and bank protection works.

Since the project period was extended until end of 2000 due to the implementation of a third test site, the schedule for elaborating the guidelines and manuals needed to be modified. After a discussion of all parties concerned during the donors' review mission of March 1999, the programme of July 1998 was reviewed and the following updated programme was jointly agreed upon:

Date	Task	Action
December 1998	Determination of participants and composition of BWDB/WARPO working group; Definition of general concept and degree of Detailing	Finalized
December 1998	Determination of Table of Contents	Approved
December 1999	Submission and presentation of draft Guidelines and Manuals	Consultant
May 2000	Submission of consolidated comments and suggestions of modification to draft Guidelines and Manual	BWDB / WARPO
October 2000	Inclusion of additional experiences from the monsoon 2000 season, if any	Consultant
December 2000	Submission of Final Document	Consultant

In the meantime, the Consultant's experts have started to review and assess the test results available so far and to draft the Final Evaluation Report. In August a group of engineers which are involved in the test programme will meet in Dhaka for the elaboration of the draft guidelines and manuals, which will be submitted end of this year.

3 RIVER TRAINING (AFPM) COMPONENT (FAP 22)

3.1 PRELIMINARY REMARK

After the activities under FAP 22 had been suspended in 1995, the Consultant was requested by WARPO on March 06, 1996 to take up recurrent measure activities. Therefore, the project works were resumed at the beginning of April 1996 and concentrated mainly on the completion of the desk study and a report on the activities in 1995/96 which was submitted on September 05, 1996 along with a proposal and work plan for the project continuation for the implementation of recurrent measures during the lean season 1996/97. The work plan covered the selection of suitable test sites as well as the design, implementation and testing of appropriate recurrent measures as Low Water Bandals, Improved Bandals and Sills.

Immediately after the positive comments of KfW on the Consultants programme of investigations in 1996/97 were received in September 1996, a suitable test site had been selected in the outflanking Katlamari channel just upstream from Fulchari where a combination of two measures viz. a 210 m long bandal structure and an earth dam about 600 m downstream from the bandals was built. Design and construction works started in the last quarter of 1996 and were completed mid March 1997. These measures were tested by the Jamuna river and monitored by the Consultants during the monsoon season 1997. It was intended to supplement/modify the test structures based on the experience of the first test season and to continue the investigations during the monsoon season 1998. A technical and financial proposal for further investigations was submitted to the client and the donors in the last quarter of 1997, but at the end of the flood season 1997 it emerged that the overall morphological development in the test site area and the Fulchari channel did not allow the continuation of the tests at Katlamari Test Site. Therefore, at the beginning of January 1998 a new test site was selected for testing of recurrent

measures during the monsoon season 1998 which is located about 5 km east of the Groyne Test Structure of FAP 21 at Kamarjani.

Table 2.2-1 and Table 2.2-3 are showing the Work Plan as per proposal of August 1996 and December 1997 respectively whereas Table 2.2-5 the Staffing Schedule for the study period 1996 till 1998 including that one of the modified proposal of December 1997. Table 2.2-2 and 2.2-4 are showing the actual activities up to the end of the period under report and Table 2.2-6 and 2.2-7 the actual input of the expatriate and the local professional staff fielded up to end of June 1999.

3.2 TEST SITE I AT KATLAMARI

3.2.1 The Test Structures

Two different structures were built at Katlamari:
(a) improved bandals with a total length of 210 m and consisting of 4 main components at the off-take of the Katlamari channel with the aim to deflect the flow and to encourage siltation behind the structure;
(b) an earth dam 600 meters downstream from the bandal structure with the aim to close the Katlamari channel at the beginning of the flood season.

The idea behind these measures was to deflect the flow into the Fulchari channel, to decrease the size of the Katlamari channel and thus concentrate more flow in the Fulchari channel, to deepen the latter and to improve the ferry operations to Fulchari Ghat. In parallel it was expected that the size of the Katlamari channel would decrease, that bank erosion would diminish and agradable land could be won.

Both the structures were designed to support the effectiveness of each other and thus to increase their overall efficiency.

3.2.2 Monitoring of the Test Structures

After the Fulchari channel started to move westwards and finally washed away Section E of the bandal structure, it was decided to abandon this test site. In January/February 1998 dismantling of the remaining sections of the structure except Section A was started and the dismantled material of the bandal structure was transported to the new test site at Kundarapara and partly used for the construction of low water bandals. After the monsoon season also Section A was given up.

Hence, no monitoring activities are to be reported from the period under review.

3.3 TEST SITE II AT KUNDARAPARA

3.3.1 The Test Structures

In order to reduce the severe erosion in the outer bend of the Kamarjani channel between Syedpur and Balashi Ghat it was planned to promote the development of the Kundarapara cut-off channel. The following recurrent measures were planned to be constructed and investigated:

(a) Low Water Bandals
Low water bamboo bandals were installed in February / March 1998 at the entrance of the Kamarjani bypass channel in order to increase the inflow into the Kundarapara channel and at the same time to reduce the inflow into the Kamarjani bypass channel. The bandals were removed end of March when the water level started to rise.

(b) Improved Bandals with adjustable Screens

After permanent problems with the local population, it was decided on March 10, 1998 to stop the construction of the improved bandals when it became obvious that they could not be completed in time before the flood season 1998

(c) Floating Screens

In the course of positioning and anchoring of the elements, local people sabotaged the activities so that the Consultant had no choice but to stop the investigations with floating screens for the flood season 1998.

In the course of the donors' review mission of March 1999 it was agreed upon by all parties involved to execute the next phase of the investigations with floating elements in connection with and at the location of the third test site at Ghutail or, alternatively, at Bahadurabad.

3.3.2 Monitoring of the Test Structures

During the period under report bathymetric surveys and flow measurements were continued in the Kundarapara channel the results of which are presented in Annex B and C (FAP 21, Test Site I). However, testing of the floating elements remained suspended.

3.4 REPORTING

Valuable results of the tests with recurrent measures gained at Katlamari and Kundarapara Test Sites will be included in the guidelines and manuals detailed in Section 2.5 of this Progress Report and Annex N.

Table 1.1-1

BANK PROTECTION TEST STRUCTURES - FAP 21

EXPATRIATE PROFESSIONAL STAFF

Activities during the period of 04/99 to 06/99

VERSION : 12.07.99

Sl. No.	Function	Person	Code	Company	Period		Remarks
					From	To	
1.1	Project Director	Dr. D. Neuhaus / Dr. H. Kramer	DN / HK	RRI	01/04	30/06	Part time in Europe
1.2	Home Office Support						
1.3.1	Project Manager	C. Netzeband	CN	RRI	01/04	30/06	
					01/05	31/05	Holiday & home office work
1.4	Chief Hydraulic Design Engineer	Dr. H. Kramer	HK	L&P	01/04	30/06	Part time in Europe
2.1.1	Hydraulic Design Engineer	M. Schwarz	MS	L&P	11/02	23/02	
2.2	Structural Engineer	-	-	-	-	-	
2.3	Mechanical Engineer	-	-	-	-	-	
2.4	Procurement Expert	-	-	-	-	-	
2.5.1	Subsoil Expert	H. Wessling	HW	L&P	-	-	
3.1.	Chief Supervising Engineer	-	-	-	-	-	
3.2.1	Supervising Engineer	-	-	-	-	-	
3.4.1	Surveyor	J. Heise	JH	RRI	-	-	
3.5.1	Administrator	B. Thomas	BT	CNR	-	-	
3.6.1	Monitoring Expert	T. Döscher	TD	RRI	23/06	30/06	
4.1.1	Morphologist	Dr. E. Mosselman	EM	DELFT	01/06	30/06	Part time in Europe
4.2.1	Modelling Expert	M. v. d. Wal	MvdW	DELFT	01/06	30/06	Part time in Europe
		D. Carrion	DC	CNR	-	-	
		E. Divet	ED	CNR	-	-	
4.3.1	Environmental Expert	C. Bertrand	CB	CNR	-	-	
4.5.1	Economist	--	-	-	-	-	
4.6.1	Unallocated	--	-	-	-	-	

Table 1.1-2

BANK PROTECTION TEST STRUCTURES - FAP 21
LOCAL PROFESSIONAL STAFF
Activities during the period of 04/99 to 06/99

VERSION : 12.07.99

Sl. No.	Function	Person	Code	Company	Period		Remarks
					From	To	
1.2	Home Office Support	NN					
1.3.2	Deputy Project Manager	S. M. Mansur	SM	BETS	01/04	30/06	
2.1.2	Hydraulic Design Engineer 2	A. Q. Mohammed Ali	MA	BETS	-	-	
2.3.2	Mechanical Engineer 2	Masih-ur-Rahman	MR	DUL	-	-	
2.4.2	Procurement Expert 2	Masih-ur-Rahman	MR	DUL	-	-	
2.5.2	Subsoil Expert 2	-	-	-	-	-	
3.2.2	Supervising Engineer 2	Fazlur Rahman /	FR	BETS	-	-	
		Sk. Golam Kader	SGK	BETS	01/04	30/06	
3.3	Quantity Surveyor	Faizur Rahman Khan	FRK	DUL	-	-	
3.4.2	Surveyor 2	-	-	-	-	-	
3.6.2/3/4	Monitoring Expert 2	A.B.M. Anwar Haider	AH	BETS	01/04	30/06	
	Jr. Monitoring Expert	Pankaj K. Maitra	PKM	BETS	01/04	30/06	
	Monitoring Data Processor	Yasmin Khayer	YK	FL	01/04	30/06	
4.1.2	Morphologist 2	M. H. Sarker	MHS	FL	-	-	
4.2.2	Modelling Expert 2	Monjur Kader	MoK	BETS	-	-	
4.3.2	Environmental Expert 2	Dr. A.K.M. Nazrul Islam	NI	BETS	-	-	
4.4	Socio-Economist	Tauhidun Nabi	TN	BETS	07/04	30/06	
4.5.2	Economist 2	NN	-	-	-	-	
4.6.2	Unallocated 2		-	-	-	-	

Table 1.1-3

BANK PROTECTION TEST STRUCTURES - FAP 21

LOCAL SUPPORT STAFF

Activities during the period of 04/99 to 06/99

VERSION : 12.07.99

Sl. No.	Function	Person	Company	Period		Remarks
				From	To	
1	Bilingual Secretary	Sk. Zakirul Islam	BETS	01/04	30/06	
2	Receptionist	Md. Razaul Karim	BETS	01/04	30/06	
3	Operator / Data Input	Md. Khorshed Alam	BETS	01/04	30/06	
4	Senior Draftsman	Anowarul Alam	BETS	01/04	30/06	
5	Draftsman	Md. Fazle Hossain Bhuiyan	BETS	01/04	30/06	
6	Photocopy Operator	Md. Q M Hussain (Babu)	BETS	01/04	30/06	
7	Accountant	A.B.M Bazlur Rashid	BETS	01/04	30/06	
8	Asstt. Acct. Purchase	Md. Shafiuddin	BETS	01/04	30/06	
9	Messenger	Md. Aziz	BETS	01/04	30/06	
10	Peon	Md. Habibur Rahman Hawladar	BETS	01/04	30/06	
11	Guards (8 hours shift)	Md. Farid Sikder /	BETS	01/04	30/06	
		Md. Moqbul Hossain /	BETS	01/04	30/06	
		Md. Shakawat Hossain	BETS	01/04	30/06	
12-19	Drivers	Eight Drivers	L&S	01/04	30/06	

TABLE 1.2-1.1

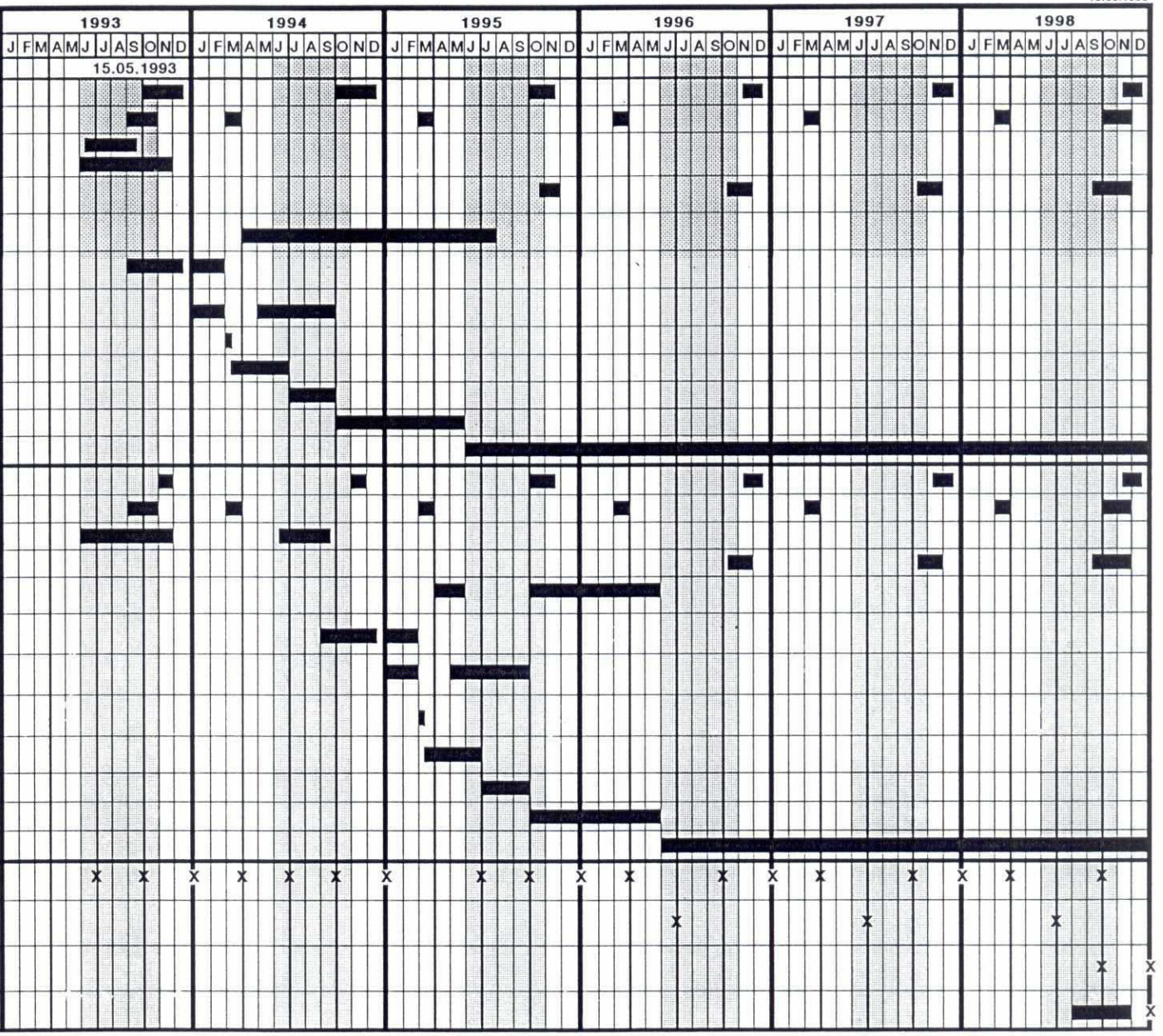
BANK PROTECTION TEST STRUCTURES FAP 21

WORK PLAN *)

VERSION NO. 1

15.03.1995

		ACTIVITY
		ORDER TO PROCEED (15.05.1993)
TEST SITE 1	1.1	TOPOGRAPHIC SURVEYS / SUBSOIL INVESTIGATIONS
	1.2	MORPHOLOGICAL INVESTIGATIONS
	1.3	MODEL TESTS
	1.4	ENVIRONMENTAL INVESTIGATIONS
	1.5	SOCIO-ECONOMIC MITIGATION MEASURES
	1.6	DETAILED DESIGN, SPECIFICATIONS, TENDER
	1.7	WORKING DRAWINGS
	1.8	PRESELECTION OF CONTRACTORS
	1.9	PREPARATION / EVALUATION OF PROPOSALS
	1.10	ORDER TO COMMENCE / MOBILIZATION
	1.11	CONSTRUCTION OF TEST WORKS
	1.12	MONITORING, ADAPTATION
TEST SITE 2	2.1	TOPOGRAPHIC SURVEYS / SUBSOIL INVESTIGATIONS
	2.2	MORPHOLOGICAL INVESTIGATIONS
	2.3	MODEL TESTS
	2.4	ENVIRONMENTAL INVESTIGATIONS
	2.5	SOCIO-ECONOMIC MITIGATION MEASURES
	2.6	DETAILED DESIGN, SPECIFICATIONS, TENDER
	2.7	WORKING DRAWINGS
	2.8	PRESLECTION OF CONTRACTORS
	2.9	PREPARATION / EVALUATION OF PROPOSALS
	2.10	ORDER TO COMMENCE / MOBILIZATION
	2.11	CONSTRUCTION OF TEST WORKS
	2.12	MONITORING, ADAPTATION
REPORTING		QUARTERLY REPORTS
		YEARLY REPORTS ON MONITORING / ADAPTATION
		EVALUATION REPORT
		MANUALS + GUIDELINES

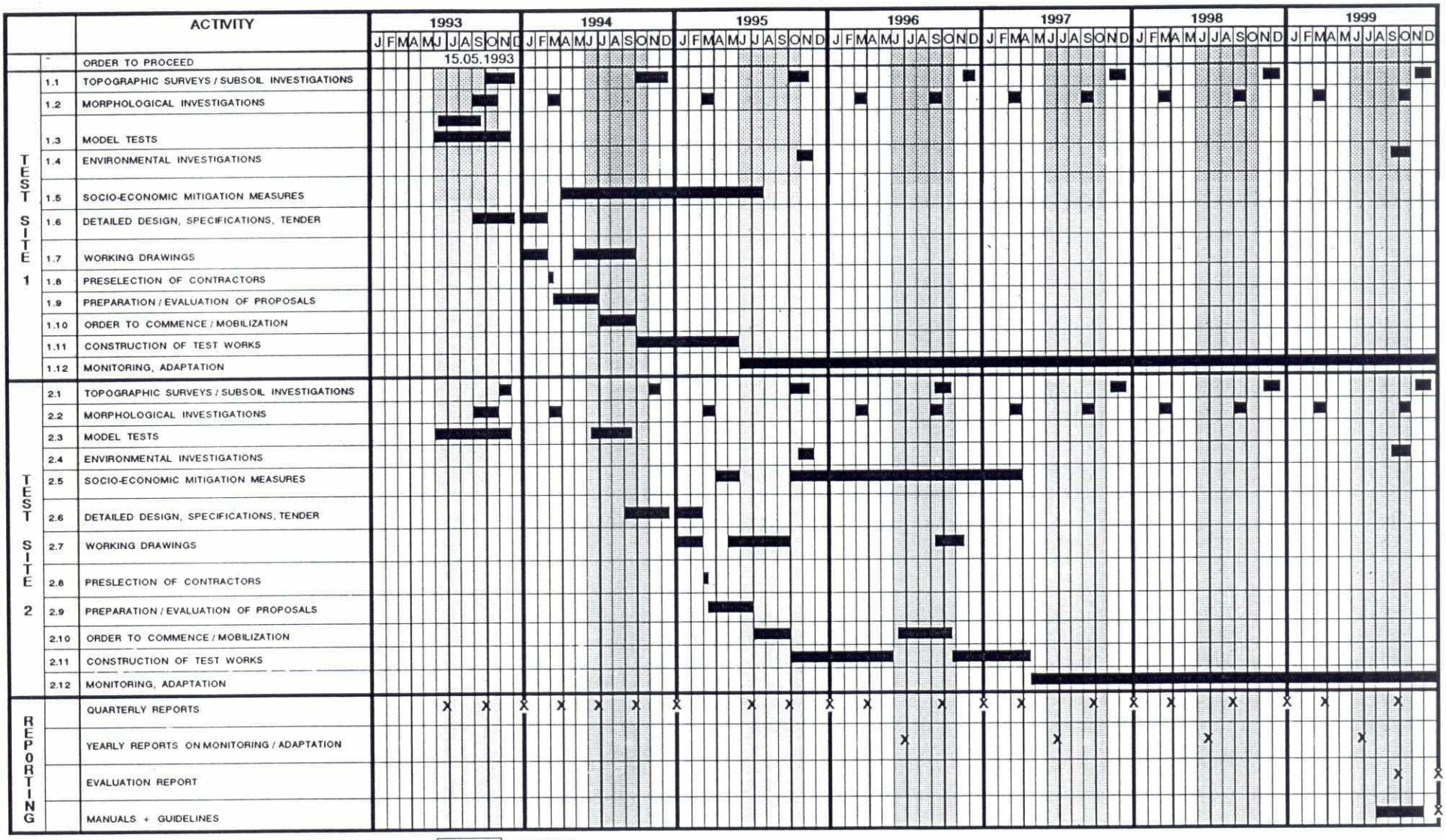


*) AS PER LETTER TO PROCEED OF MAY 1993

MONSOON

TABLE 1.2-1.2

BANK PROTECTION TEST STRUCTURES FAP 21
WORK PLAN
REVISION NO. 1 *)



*) AS PER PROPOSAL OF SEPTEMBER 1996

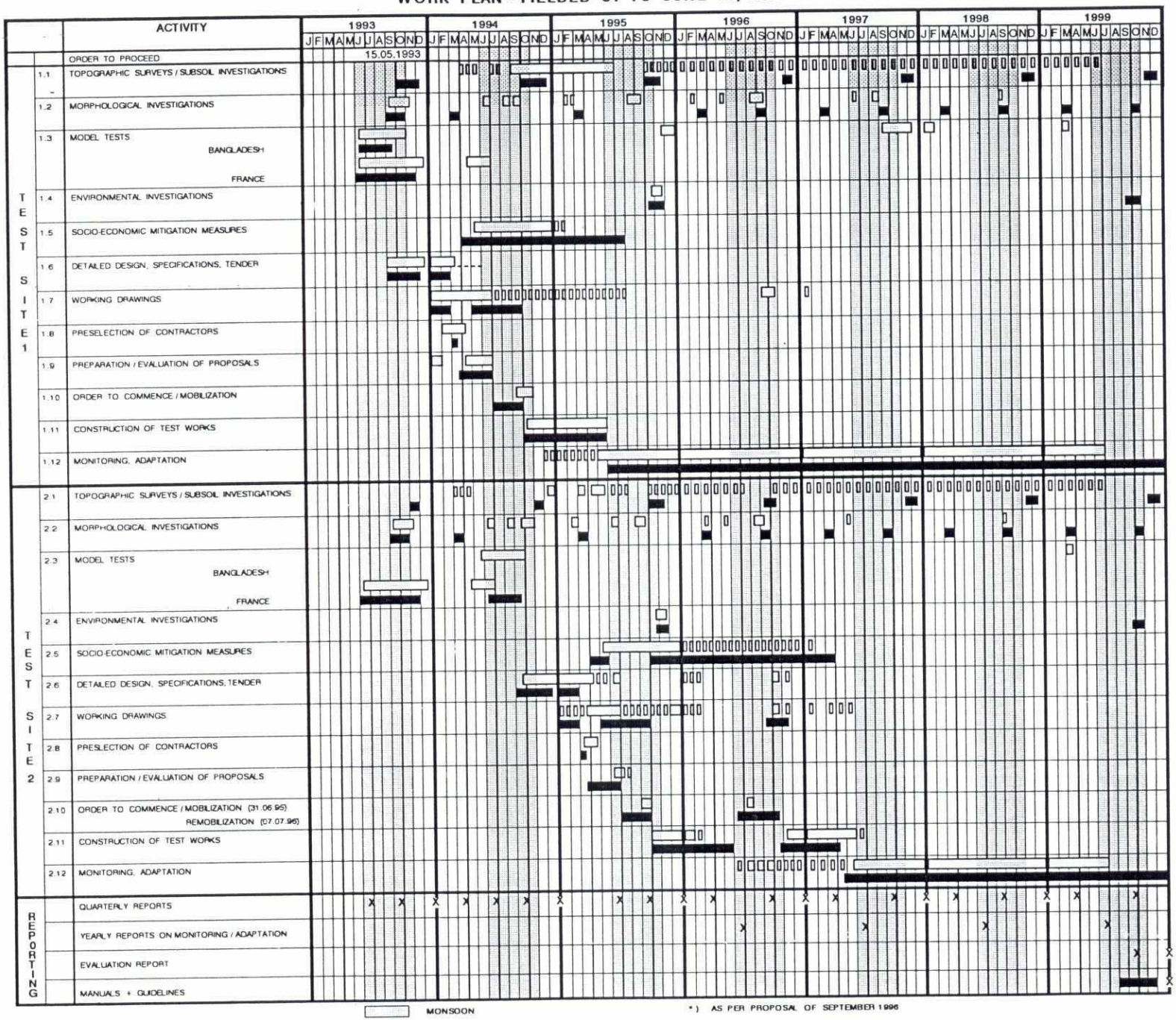
MONSOON

TABLE 1.2-2

BANK PROTECTION TEST STRUCTURES FAP 21

REVISION NO. 1 *)

WORK PLAN - FIELDED UP TO JUNE 30, 1999



*) AS PER PROPOSAL OF SEPTEMBER 1996

TABLE 1.2-3.1

BANK PROTECTION TEST STRUCTURES - FAP 21

STAFFING SCHEDULE *)

VERSION NO.1 — 15.03.1993

		FUNCTION	MAN-MONTHS EXPATRIATES BD	EU	LOCAL	
	1.1	PROJECT DIRECTOR	3	8		8
	1.2	HOME OFFICE SUPPORT		10	7	
	1.3.1/2	PROJECT MANAGER / DEPUTY PROJECT MANAGER	58	3	67	17
	1.4	CHIEF HYDRAULIC DESIGN ENGINEER	16	2		8
		SUB-TOTAL	77	23	74	33
	2.1.1/2	HYDRAULIC DESIGN ENGINEER 1 + 2	13		35	5
	2.2	STRUCTURAL ENGINEER	2			1
	2.3.1/2	MECHANICAL ENGINEER 1 + 2	2	1	3	2
	2.4.1/2	PROCUREMENT EXPERT 1 + 2	1	3	1	1
	2.5.1/2	SUBSOIL ENGINEER 1 + 2	2	2	6	2
		SUB-TOTAL	20	6	45	11
	3.1	CHIEF SUPERVISING ENGINEER	20			2
	3.2.1/2	SUPERVISING ENGINEER 1 + 2	20		53	2
	3.3	QUANTITY SURVEYORS			90	
	3.4.1/2	SURVEYOR 1 + 2	8		62	6
	3.5	ADMINISTRATOR	26			4
		SUB-TOTAL	74	0	205	14
	4.1.1/2	MORPHOLOGIST 1 + 2	8		9	7
	4.2.1/2	MODELLING EXPERT 1 + 2 + 3	7		16	2
	4.3.1/2	ENVIRONMENTAL EXPERT 1 + 2	4		7	4
	4.4	SOCIO-ECONOMIST			25	
	4.5.1/2	ECONOMIST 1 + 2	3		4	2
	4.6.1/2	UNALLOCATED 1 + 2	10		10	12
		SUB-TOTAL	32	0	71	27
		QUARTERLY REPORTS				
		YEARLY REPORTS ON MONITORING / ADAPTATION				
		EVALUATION REPORT				
		MANUALS + GUIDELINES				
		TOTAL	203	29	395	85

*) AS PER LETTER TO PROCEED OF MAY 1993

MONSOON — IN BANGLADESH — OUTSIDE BANGLADESH — LOCAL

TABLE 1.2-3.2

BANK PROTECTION TEST STRUCTURES - FAP 21

STAFFING SCHEDULE

REVISION NO. 1 *)

01.06.1995

	FUNCTION	1993	1994	1995	1996	1997	1998	MAN-MONTHS EXPATRIATES BD	EU	LOCAL	FLIGHTS
		J F M A M J J A S O N D	J F M A M J J A S O N D	J F M A M J J A S O N D	J F M A M J J A S O N D	J F M A M J J A S O N D	J F M A M J J A S O N D				
1.1	PROJECT DIRECTOR							3	8		8
1.2	HOME OFFICE SUPPORT								10	7	
1.3.1/2	PROJECT MANAGER / DEPUTY PROJECT MANAGER							58	3	67	17
1.4	CHIEF HYDRAULIC DESIGN ENGINEER							17	3		10
							SUB-TOTAL	78	24	74	35
2.1.1/2	HYDRAULIC DESIGN ENGINEER 1 + 2							18		35	6
2.2	STRUCTURAL ENGINEER							2			1
2.3.1/2	MECHANICAL ENGINEER 1 + 2							2	1	3	2
2.4.1/2	PROCUREMENT EXPERT 1 + 2							1	3	1	1
2.5.1/2	SUBSOIL ENGINEER 1 + 2							2	2	6	2
							SUB-TOTAL	25	6	45	12
3.1	CHIEF SUPERVISING ENGINEER							20			2
3.2.1/2	SUPERVISING ENGINEER 1 + 2							20		53	2
3.3	QUANTITY SURVEYORS									90	
3.4.1/2	SURVERYOR 1 + 2							8		62	6
3.5	ADMINISTRATOR							26			4
3.6.1/2/3	MONITORING EXPERT 1 + 2 + 3							6		61	2
							SUB-TOTAL	80	0	266	16
4.1.1/2	MORPHOLOGIST 1 + 2							9		9	10
4.2.1/2/3	MODELLING EXPERT 1 + 2 + 3							9		18	4
4.3.1/2	ENVIRONMENTAL EXPERT 1 + 2							4		7	4
4.4	SOCIO-ECONOMIST									25	
4.5.1/2	ECONOMIST 1 + 2							3		4	2
4.6.1/2	UNALLOCATED 1 + 2							2		2	3
							SUB-TOTAL	27	0	65	23
	QUARTERLY REPORTS	X X X X X X X X X X X X X X X X X X X X X X X X									
	YEARLY REPORTS ON MONITORING / ADAPTATION	X X X									
	EVALUATION REPORT	X									
	MANUALS + GUIDELINES	X									
							TOTAL	210	30	450	86

*) AS PER PROPOSAL OF 1995

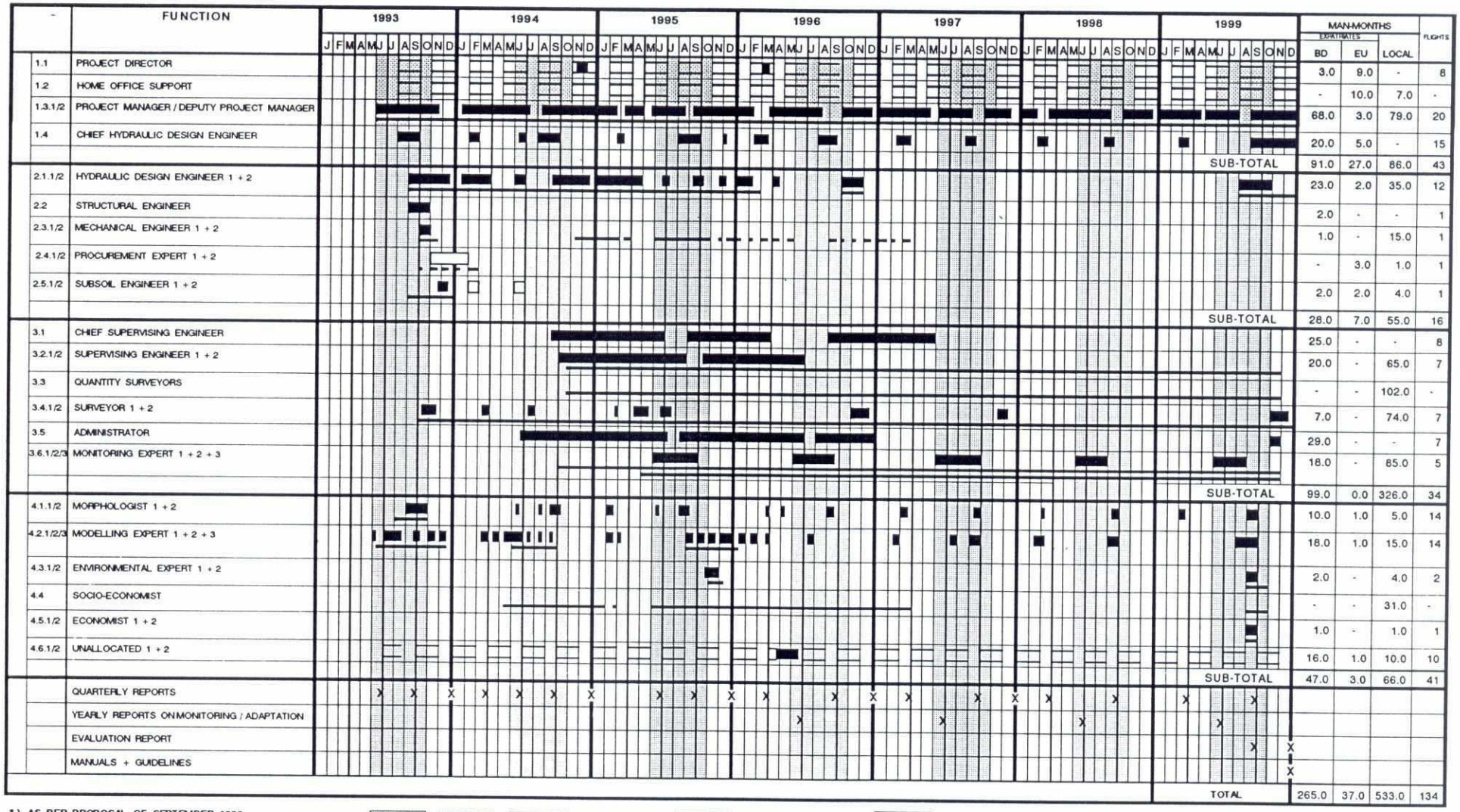
MONSOON | IN BANGLADESH | OUTSIDE BANGLADESH | LOCAL

TABLE 1.2-3.3

BANK PROTECTION TEST STRUCTURES - FAP 21

STAFFING SCHEDULE

REVISION NO. 2 *)



	FUNCTION	MAN-MONTHS EXPATRIATES BD	EU	LOCAL	FLIGHTS
1.1	PROJECT DIRECTOR	3.0	9.0	-	8
1.2	HOME OFFICE SUPPORT	-	10.0	7.0	-
1.3.1/2	PROJECT MANAGER / DEPUTY PROJECT MANAGER	68.0	3.0	79.0	20
1.4	CHIEF HYDRAULIC DESIGN ENGINEER	20.0	5.0	-	15
	SUB-TOTAL	91.0	27.0	86.0	43
2.1.1/2	HYDRAULIC DESIGN ENGINEER 1 + 2	23.0	2.0	35.0	12
2.2	STRUCTURAL ENGINEER	2.0	-	-	1
2.3.1/2	MECHANICAL ENGINEER 1 + 2	1.0	-	15.0	1
2.4.1/2	PROCUREMENT EXPERT 1 + 2	-	3.0	1.0	1
2.5.1/2	SUBSOIL ENGINEER 1 + 2	2.0	2.0	4.0	1
	SUB-TOTAL	28.0	7.0	55.0	16
3.1	CHIEF SUPERVISING ENGINEER	25.0	-	-	8
3.2.1/2	SUPERVISING ENGINEER 1 + 2	20.0	-	65.0	7
3.3	QUANTITY SURVEYORS	-	-	102.0	-
3.4.1/2	SURVEYOR 1 + 2	7.0	-	74.0	7
3.5	ADMINISTRATOR	29.0	-	-	7
3.6.1/2/3	MONITORING EXPERT 1 + 2 + 3	18.0	-	85.0	5
	SUB-TOTAL	99.0	0.0	326.0	34
4.1.1/2	MORPHOLOGIST 1 + 2	10.0	1.0	5.0	14
4.2.1/2/3	MODELLING EXPERT 1 + 2 + 3	18.0	1.0	15.0	14
4.3.1/2	ENVIRONMENTAL EXPERT 1 + 2	2.0	-	4.0	2
4.4	SOCIO-ECONOMIST	-	-	31.0	-
4.5.1/2	ECONOMIST 1 + 2	1.0	-	1.0	1
4.6.1/2	UNALLOCATED 1 + 2	16.0	1.0	10.0	10
	SUB-TOTAL	47.0	3.0	66.0	41
	QUARTERLY REPORTS				
	YEARLY REPORTS ON MONITORING / ADAPTATION				
	EVALUATION REPORT				
	MANUALS + GUIDELINES				
	TOTAL	265.0	37.0	533.0	134

*) AS PER PROPOSAL OF SEPTEMBER 1996

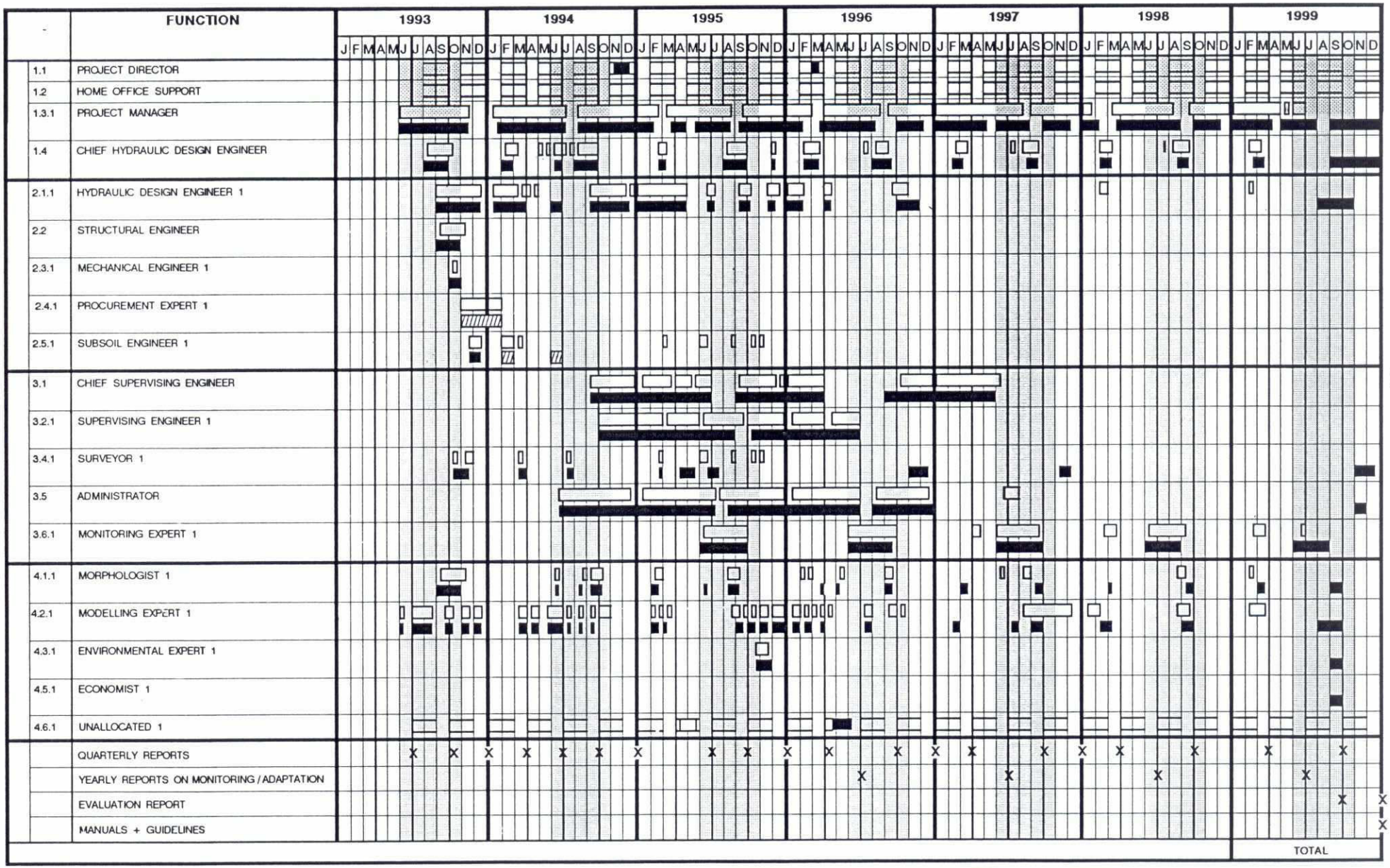
MONSOON IN BANGLADESH OUTSIDE BANGLADESH LOCAL

TABLE 1.2-4

BANK PROTECTION TEST STRUCTURES - FAP 21

REVISION NO. 2 *)

STAFFING SCHEDULE - EXPATRIATE PROFESSIONAL STAFF; FIELDED UP TO JUNE 30, 1999



*) AS PER PROPOSAL OF SEPTEMBER 1996

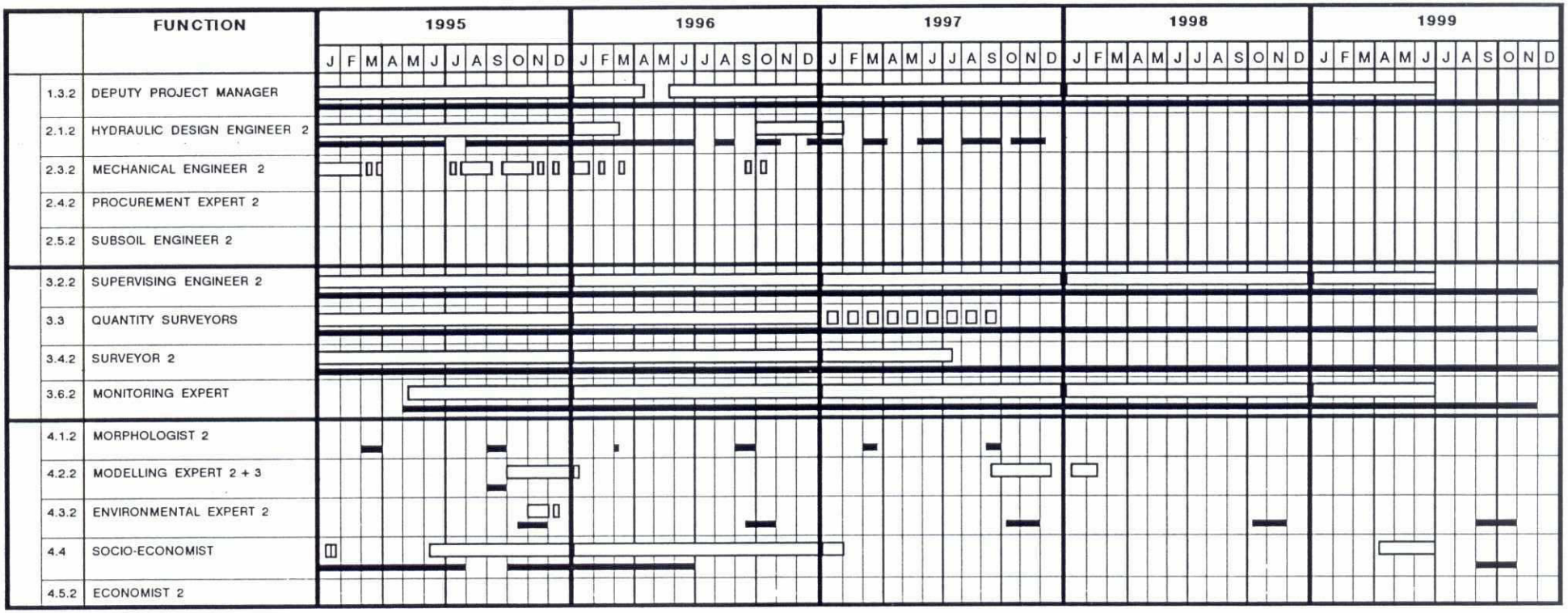
MONSOON | IN BANGLADESH | OUTSIDE BANGLADESH | LOCAL | PART TIME

TABLE 1.2-5

BANK PROTECTION TEST STRUCTURES - FAP 21

REVISION NO. 2 *)

STAFFING SCHEDULE - LOCAL PROFESSIONAL STAFF - FIELDED UP TO JUNE 30, 1999



*) AS PER PROPOSAL OF SEPTEMBER 1996

SCHEDULE

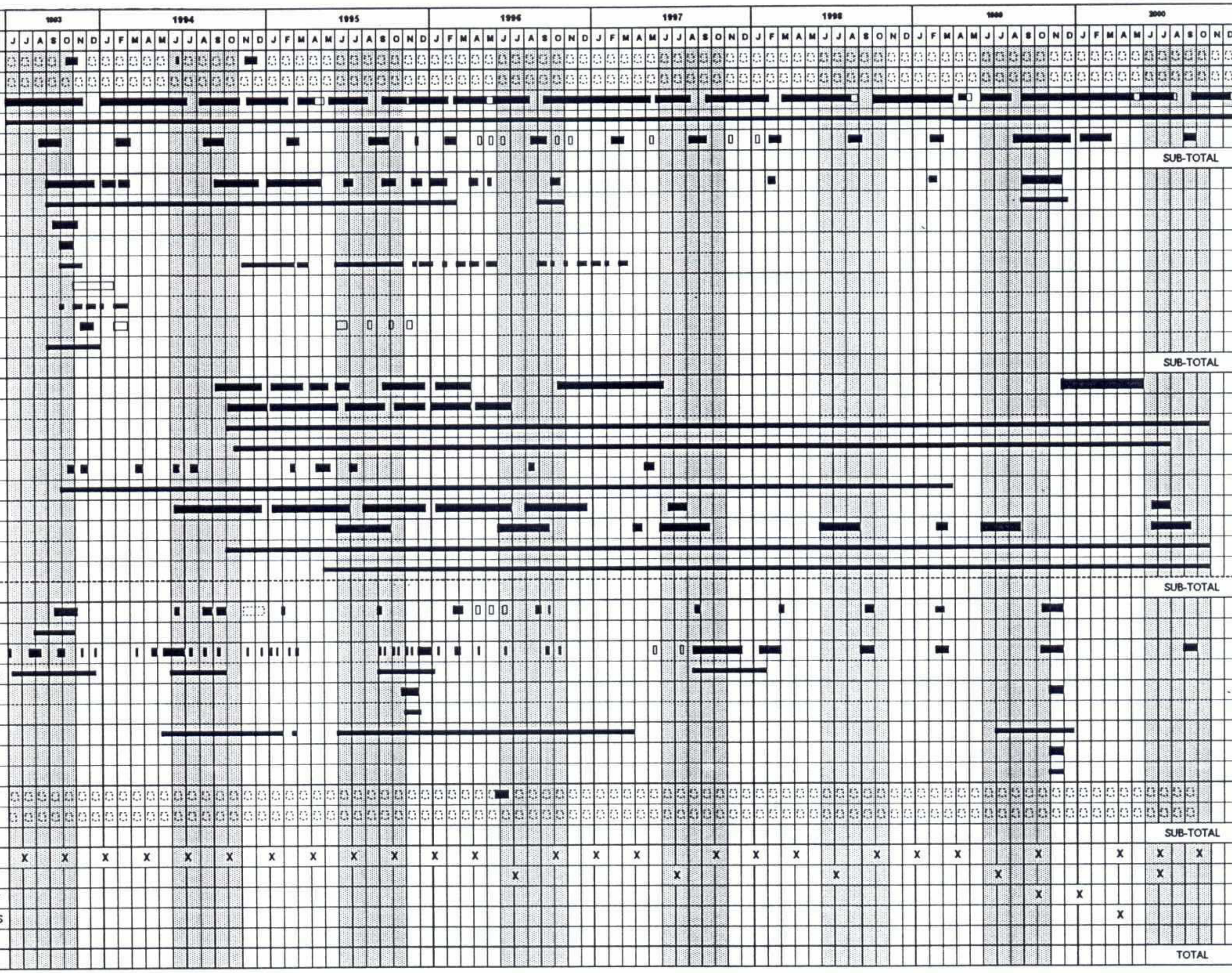
REALIZATION

TABLE 1.2-4

BANK PROTECTION TEST STRUCTURES - FAP 21

STAFFING SCHEDULE

REVISION NO. 3



	FUNCTION	EXPATRIATE BD	EXPATRIATE EU	LOCAL	FLIGHT
1.1	PROJECT DIRECTOR	3.00	9.00	0.00	5
1.2	HOME OFF. SUPPORT	0.00	10.00	7.00	0
1.3.1	PROJECT MANAGER	76.50	2.50	0.00	22
1.3.2	Dy. PROJ. MANAGER	0.00	0.00	89.00	0
1.4	CHIEF HYD. DES. ENG.	24.00	6.00	0.00	17
	SUB-TOTAL	103.50	27.50	96.00	44
2.1.1	HYD. DES. ENG.	23.00	3.00	0.00	14
2.1.2	HYD. DES. ENG.	0.00	0.00	35.00	0
2.2	STRUCTURAL ENG.	2.13	0.00	0.00	1
2.3.1	MECH. ENG. 1	1.00	0.00	0.00	1
2.3.2	MECH. ENG. 2	0.00	0.00	12.21	0
2.4.1	PROC. EXP. 1	0.00	3.00	0.00	0
2.4.2	PROC. EXP. 2	0.00	0.00	1.00	0
2.5.1	SUBSOIL ENG. 1	1.20	2.06	0.00	1
2.5.2	SUBSOIL ENG. 2	0.00	0.00	3.11	0
	SUB-TOTAL	27.33	8.06	51.32	17
3.1	CHIEF SUP. ENG.	29.27	0.00	0.00	8
3.2.1	SUP. ENG. 1	18.96	0.00	0.00	7
3.2.2	SUP. ENG. 2	0.00	0.00	71.00	0
3.3	QUANT. SURVEYOR	0.00	0.00	95.00	0
3.4.1	SURVEYOR 1	4.44	0.00	0.00	6
3.4.2	SURVEYOR 2	0.00	0.00	44.00	0
3.5	ADMINISTRATOR	30.00	0.00	0.00	7
3.8.1	MONIT. EXP. 1	23.00	0.00	0.00	9
3.8.2	MONIT. EXP. 2	0.00	0.00	54.00	0
3.8.3	MONIT. EXP. 3	0.00	0.00	44.00	0
	SUB-TOTAL	105.67	0.00	308.00	37
4.1.1	MORPHOLOGIST 1	9.00	2.00	0.00	14
4.1.2	MORPHOLOGIST 2	0.00	0.00	5.08	0
4.2.1	MODELLING EXP. 1	23.50	2.00	0.00	13
4.2.2	MODELLING EXP. 2+3	0.00	0.00	20.00	0
4.3.2	ENVIRONM. EXP. 1	2.00	0.00	0.00	2
4.3.2	ENVIRONM. EXP. 2	0.00	0.00	2.50	0
4.4	SOCIO-ECONOMIST	0.00	0.00	33.00	0
4.5.1	ECONOMIST 1	1.00	0.00	0.00	1
4.5.2	ECONOMIST 2	0.00	0.00	1.00	0
4.8.1	UNALLOCATED 1	7.00	1.44	0.00	6
4.8.2	UNALLOCATED 2			3.10	0
	SUB-TOTAL	42.50	5.44	64.68	36
	QUART. REPORTS				
	Monitoring/Adaptation				
	EVALUATION REPORT				
	MANUALS/GUIDELINES				
	TOTAL	279.00	41.00	520.00	134

MONSOON — IN BANGLADESH — OUTSIDE BANGLADESH — LOCAL

TABLE 1.2-7

BANK PROTECTION TEST STRUCTURES - FAP 21

TEST SITE - III

WORK PLAN

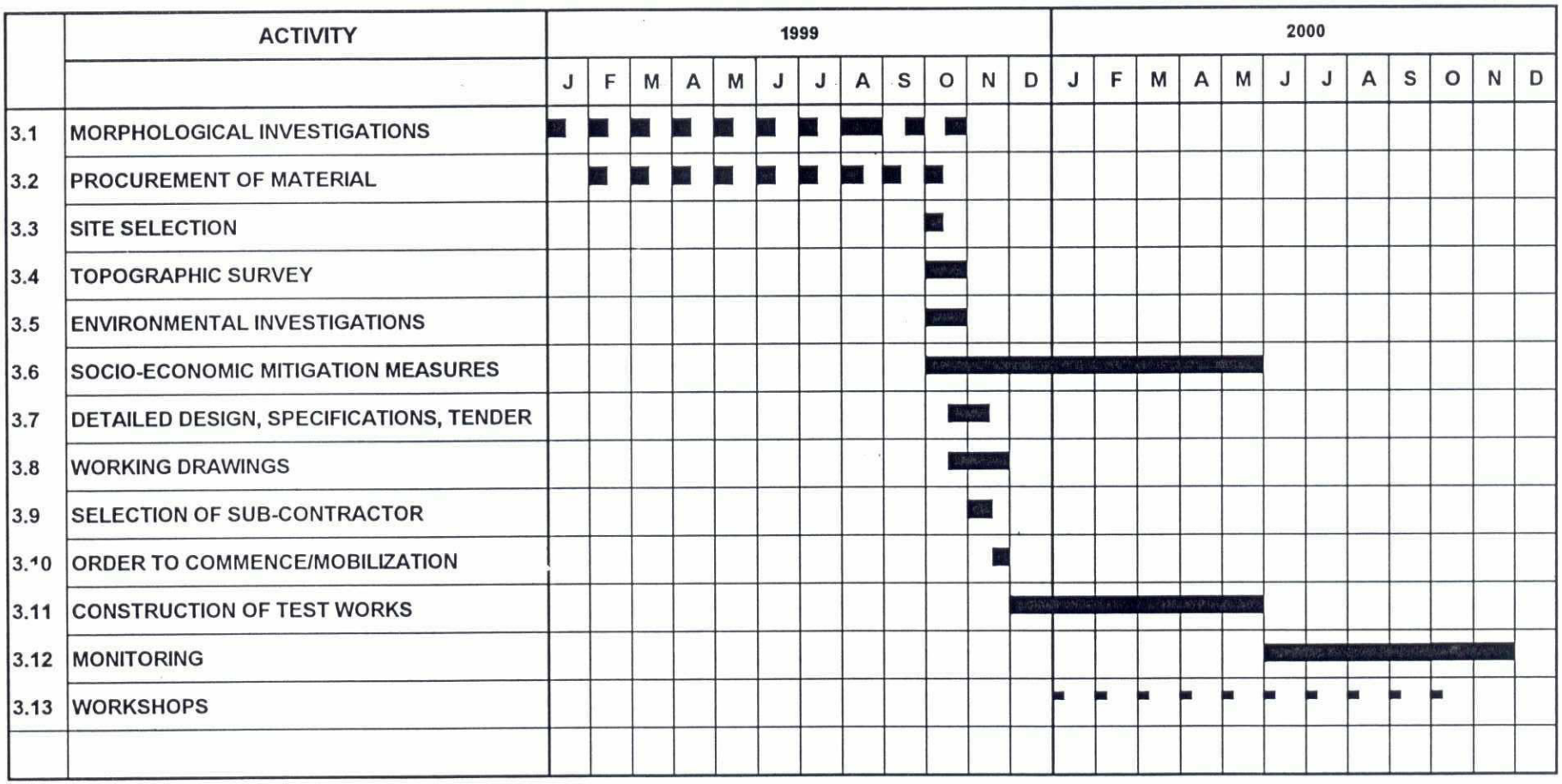


TABLE 2.1-1

STUDIES ON RECURRENT MEASURES - FAP 22
EXPATRIATE PROFESSIONAL STAFF
Activities during the period of 04/99 to 06/99

VERSION: 22.07.99

Sl. No.	Function	Person	Code	Company	Period		Remarks
					From	To	
1.1	Project Director	Dr. D. Neuhaus	DN	RRI	-	-	
		Dr. H. Kramer	HK		-	-	
1.2	Home Office Support						
1.3.1	Project Manager	C. Netzeband	CN	RRI	-	-	
1.4	Chief Hydraulic Design Engineer	Dr. H. Kramer	HK	L&P	-	-	
5.1.1	River Engineer	P. van Groen	PvG	DELFT	-	-	
5.2	Hydraulic Design Engineer	M. Schwarz	MS	L&P	-	-	
5.3.1	Surveyor	-	-	-	-	-	
5.4.1	Morphologist	Dr. E. Mosselman	EM	DELFT	-	-	
5.5	System Anaiyst	R. H. Buijsrogge	RHB	DELFT	-	-	
5.6	Programmer	M. Witteveen	MW	DELFT	-	-	
5.6.A	Programmer / Modeller	J. I. Crebas	JIC	DELFT	-	-	
5.7	GIS Specialist	G.K.F.M.Hesselmans	GMH	DELFT	-	-	
5.8.1	Supervising Engineer	K. Oberhagemann	KO	RRI	-	-	
5.9.1	Monitoring Expert	T. Döscher	TD	L&P	-	-	
5.10	Economist	-	-	-	-	-	

TABLE 2.1-2

STUDIES ON RECURRENT MEASURES - FAP 22

LOCAL PROFESSIONAL STAFF

Activities during the period of 04/99 to 06/99

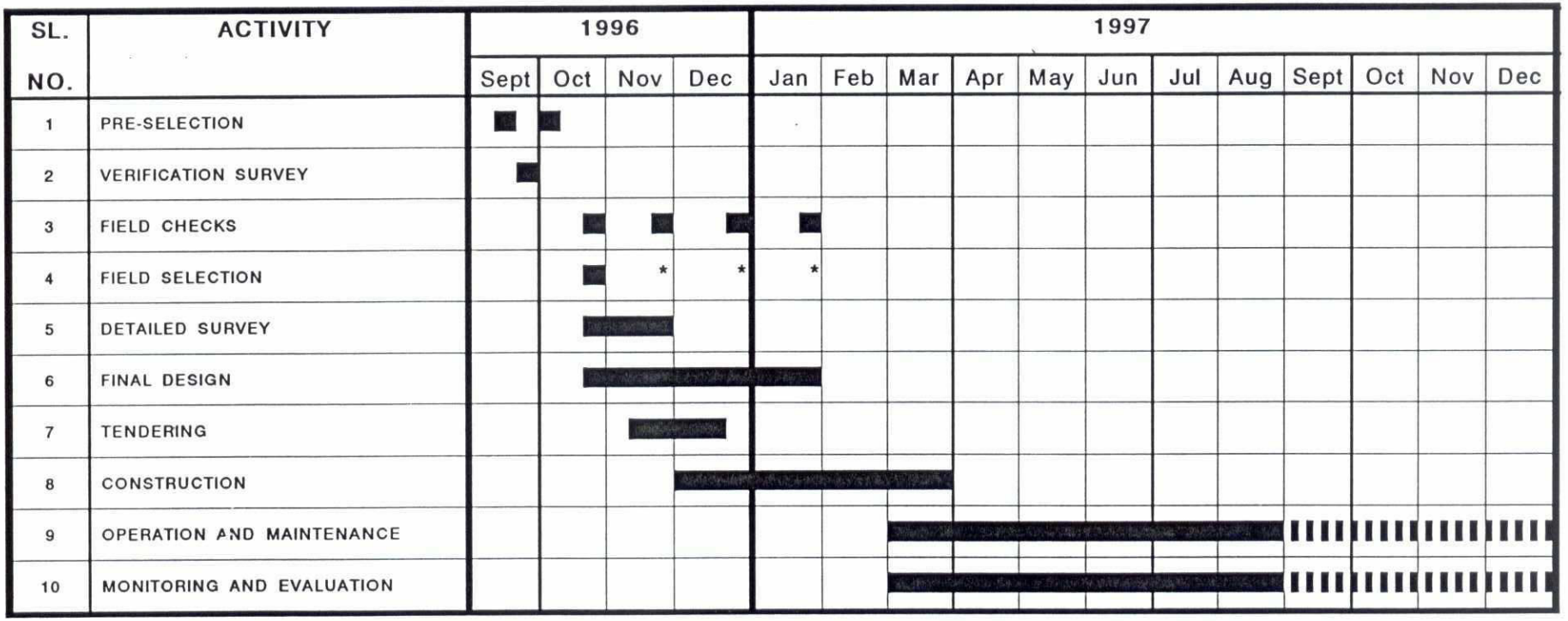
VERSION: 22.07.99

Sl. No.	Function	Person	Code	Company	Period		Remarks
					From	To	
1.2	Home Office Support	NN	-	-	-	-	
1.3.2	Deputy Project Manager	S. M. Mansur	SM	BETS	-	-	
5.1.2	River Engineer 2	S. R. Khan	SRK	BETS	-	-	
5.3.2	Surveyor 2	--	-	-	-	-	
5.4.2	Morphologist 2	Salahuddin Khan	SK	BETS	-	-	
5.8.2	Supervising Engineer 2	F. R. Khan	FRK	DUL	-	-	
5.9.2/3/4	Monitoring Expert 2	A.B.M. Anwar Haider	AH	BETS	-	-	
	Jr. Monitoring Expert	Pankaj K. Maitra	PKM	BETS	-	-	
	Monitoring Data Processor	Yasmin Khayer	YK	FL	-	-	
5.10.2	Economist 2	--	-	-	-	-	

TABLE 2.2-1

STUDIES ON RECURRENT MEASURES - FAP 22

WORK PLAN AS PER PROPOSAL OF AUGUST 1996



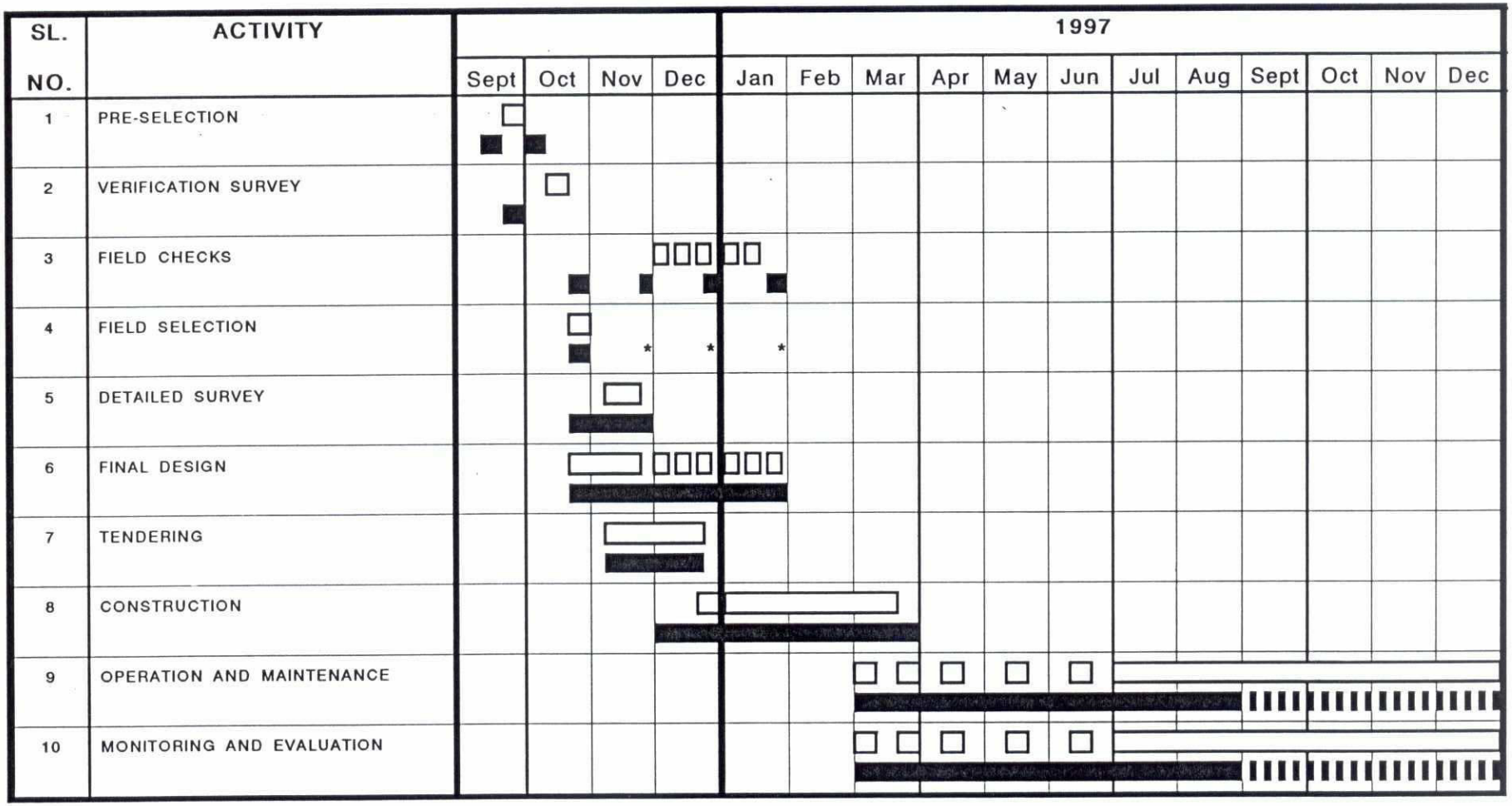
NOTE: * DENOTES REVIEW OF FINAL SELECTION

TABLE 2.2-2

STUDIES ON RECURRENT MEASURES - FAP 22

WORK PLAN AS PER PROPOSAL OF AUGUST 1996

ACTIVITIES FIELDED UP TO DECEMBER 31, 1997



NOTE: * DENOTES REVIEW OF FINAL SELECTION

TABLE 2.2-3

STUDIES ON RECURRENT MEASURES - FAP 22

WORK PLAN AS PER PROPOSAL OF DECEMBER 1997

SL. NO.	ACTIVITY	1997				1998											
		Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
1	PRE-SELECTION OF SITE																
2	VERIFICATION SURVEY / FIELD CHECK																
3	MAINTENANCE/ADAPTATION OF EXISTING BANDALS																
4	ELONGATION OF IMPROVED BANDALS																
5	DESIGN OF FLOATING SCREEN ELEMENTS																
6	CONSTRUCTION OF FLOATING SCREEN ELEMENTS																
7	FINAL SITE SELECTION																
8	DETAILED SURVEY																
9	POSITIONING AT TEST SITE																
10	OPERATION AND MAINTENANCE																
11	MONITORING																
12	EVALUATION																

TABLE 2.2-4

STUDIES ON RECURRENT MEASURES - FAP 22

WORK PLAN AS PER PROPOSAL OF DECEMBER 1997

FIELDED UP TO JUNE 30, 1999

SL. NO.	ACTIVITY	1997				1998											
		Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
1	PRE-SELECTION OF SITE																
2	VERIFICATION SURVEY / FIELD CHECK																
3	MAINTENANCE/ADAPTATION OF EXISTING BANDALS																
4	ELONGATION OF IMPROVED BANDALS																
5	DESIGN OF FLOATING SCREEN ELEMENTS																
6	CONSTRUCTION OF FLOATING SCREEN ELEMENTS																
7	FINAL SITE SELECTION																
8	DETAILED SURVEY																
9	POSITIONING AT TEST SITE																
10	OPERATION AND MAINTENANCE																
11	MONITORING																
12	EVALUATION																

TABLE 2.2-5

STUDIES ON RECURRENT MEASURES - FAP 22

STAFFING SCHEDULE *)

	FUNCTION	NAME	Man-Months EXPATRIATES BD	EU	LOCAL	FLIGHTS
1.1	PROJECT DIRECTOR	Dr. D. Neuhaus / Dr. H. Kramer				
1.2	HOME OFFICE SUPPORT			1.5		
1.3.1	PROJECT MANAGER *	C. Netzeband				
1.3.2	DEPUTY PROJECT MANAGER *	S. M. Mansur				
1.4	CHIEF HYDRAULIC DESIGN ENGINEER	Dr. H. Kramer	1.5	1.0		2
			SUB-TOTAL 1.5	2.5		2
5.1.1	RIVER ENGINEER 1	Pieter van Groen	5.5		12.0	6
5.1.2	RIVER ENGINEER 2	S. R. Khan				
5.2	HYDRAULIC DESIGN ENGINEER	M. Schwarz	1.0	0.75		1
5.4.1	MORPHOLOGIST 1 *	Dr. E. Mosselman	2.0		17.0	1
5.4.2	MORPHOLOGIST 2	M. H. Sarker / NN				
5.6.1	PROGRAMMER / MODELLING ENGINEER 1	J. Crebas	1.0			
5.8.1	SUPERVISING ENGINEER 1	K. Oberhagemann	8.0	0.5	14.0	3
5.8.2	SUPERVISING ENGINEER 2	F. R. Khan				
5.9.1	MONITORING EXPERT 1	T. Döscher	2.0		14.0	2
5.9.2	MONITORING EXPERT 2	A. Haider / P.K. Maitra				
5.11.1	UNALLOCATED 1		3.0		2.0	3
5.11.2	UNALLOCATED 2					
			SUB-TOTAL 22.5	1.25	59.0	16
	QUARTERLY REPORTS					
	DRAFT EVALUATION REPORT					
	FINAL EVALUATION REPORT					
			TOTAL 24.0	3.75	59.0	18

NOTE : * Some of the working time of the Professionals will be charged to FAP 21 project

*) AS PER PROPOSAL OF AUGUST 1996 AND DECEMBER 1997

MONSOON EXPATRIATE LOCAL FAP 21

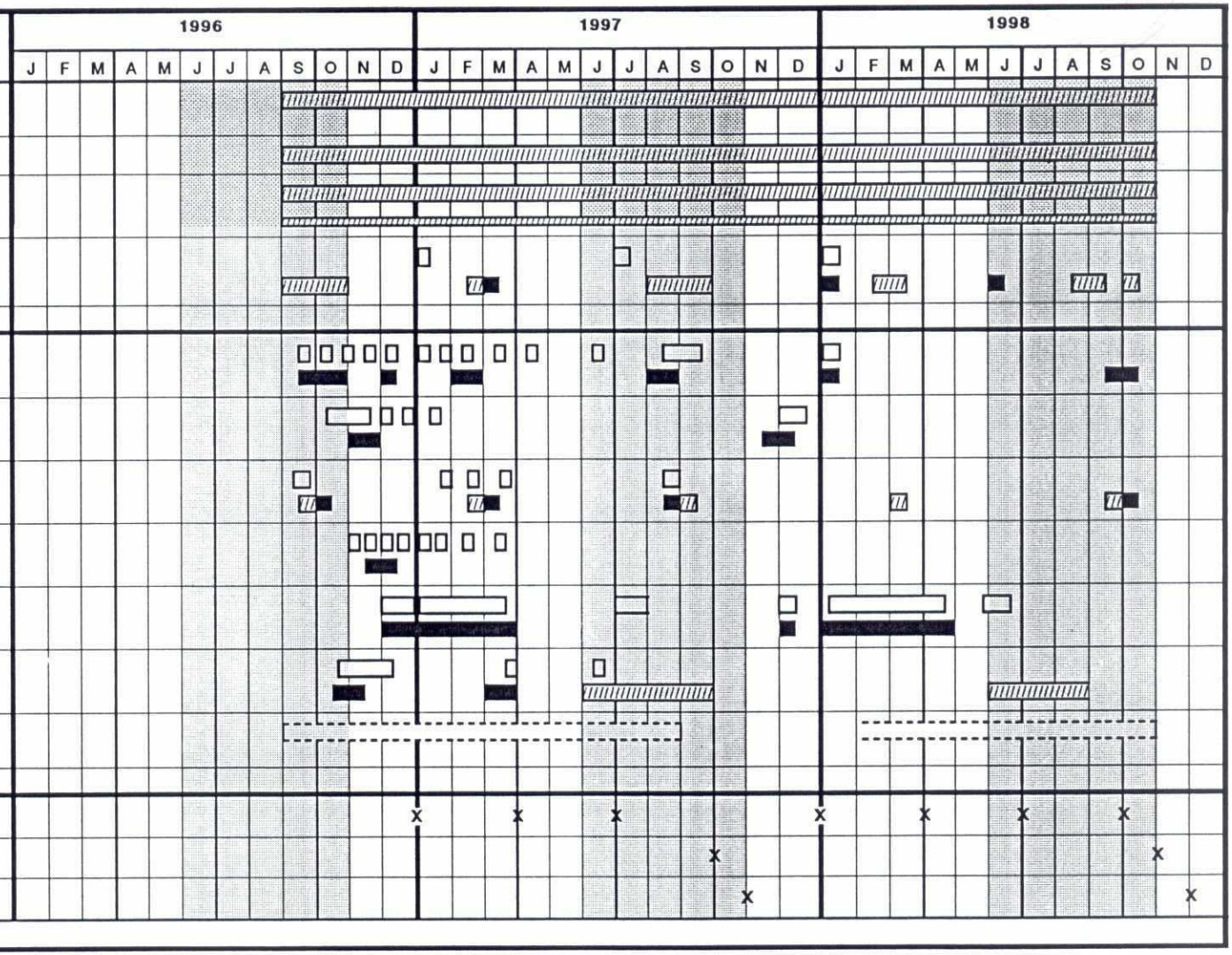
TABLE 2.2-6

STUDIES ON RECURRENT MEASURES - FAP 22

STAFFING SCHEDULE *)

EXPATRIATE PROFESSIONAL STAFF - FIELDED UP TO JUNE 30, 1999

	FUNCTION	NAME
1.1	PROJECT DIRECTOR	Dr. D. Neuhaus / Dr. H. Kramer
1.2	HOME OFFICE SUPPORT	
1.3.1	PROJECT MANAGER *	C. Netzeband
1.4	CHIEF HYDRAULIC DESIGN ENGINEER *	Dr. H. Kramer
5.1.1	RIVER ENGINEER 1	Pieter van Groen
5.2	HYDRAULIC DESIGN ENGINEER	M. Schwarz
5.4.1	MORPHOLOGIST 1 *	Dr. E. Mosselman
5.6.1	PROGRAMMER / MODELLING ENGINEER 1	J. Crebas
5.8.1	SUPERVISING ENGINEER 1	K. Oberhagemann
5.9.1	MONITORING EXPERT 1	T. Döscher
5.11.1	UNALLOCATED 1	
	QUARTERLY REPORTS	
	DRAFT EVALUATION REPORT	
	FINAL EVALUATION REPORT	



NOTE : * Some of the working time of the Professionals will be charged to FAP 21 project

*) AS PER PROPOSAL OF AUGUST 1996 AND DECEMBER 1997

MONSOON EXPATRIATE FAP 21 RELIAZATION

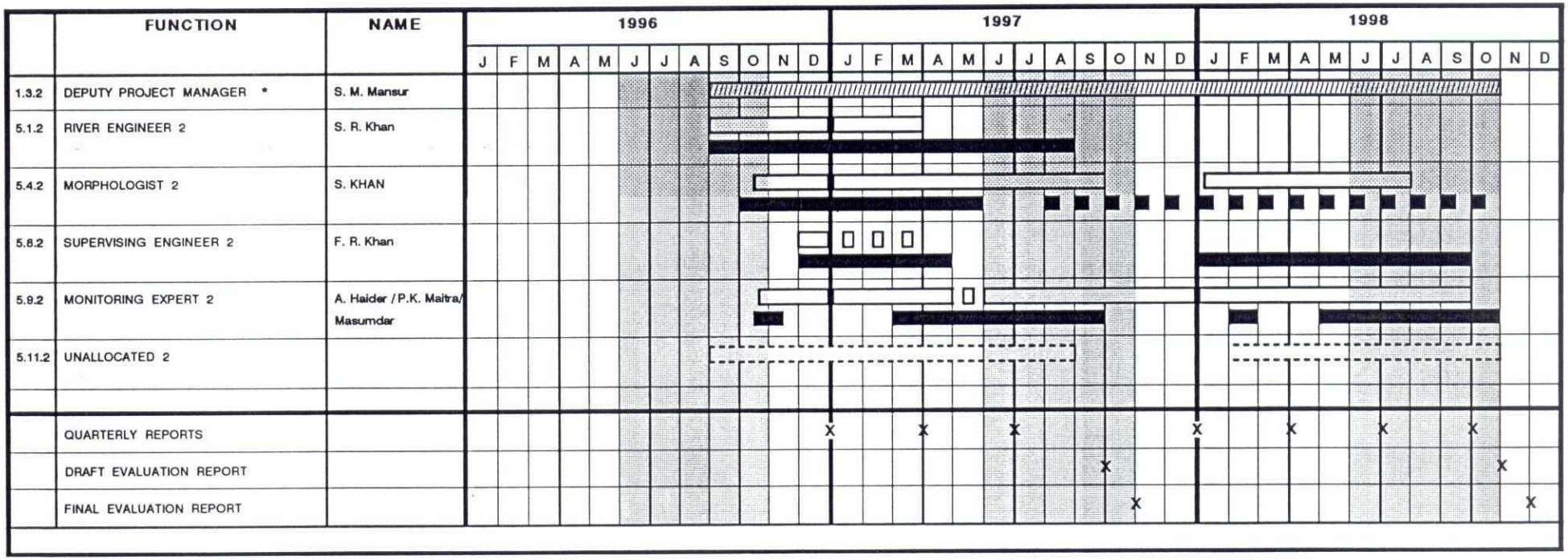
TABLE 2.2-7

STUDIES ON RECURRENT MEASURES - FAP 22

STAFFING SCHEDULE *)

LOCAL PROFESSIONAL STAFF - FIELDED UP TO JUNE 30, 1999

	FUNCTION	NAME
1.3.2	DEPUTY PROJECT MANAGER *	S. M. Mansur
5.1.2	RIVER ENGINEER 2	S. R. Khan
5.4.2	MORPHOLOGIST 2	S. KHAN
5.8.2	SUPERVISING ENGINEER 2	F. R. Khan
5.9.2	MONITORING EXPERT 2	A. Haider / P.K. Maitra/ Masumdar
5.11.2	UNALLOCATED 2	
	QUARTERLY REPORTS	
	DRAFT EVALUATION REPORT	
	FINAL EVALUATION REPORT	



NOTE : * Some of the working time of the Professionals will be charged to FAP 21 project

*) AS PER PROPOSAL OF AUGUST 1996 AND DECEMBER 1997

MONSOON FAP 21 LOCAL RELIAZATION

ANNEX A

FAP 21 / Test Site I

- Water Level

BANK PROTECTION TEST STRUCTURES - FAP 21
WATER LEVEL AT KAMARJANI TEST SITE
MONTH : APRIL 1999

DAYS	TIME			REMARKS
	8.00	13.00	17.00	
1	14.780	14.790	14.790	
2	14.750	14.740	14.740	
3	14.730	14.730	14.730	
4	14.730	14.730	14.740	
5	14.770	14.780	14.780	
6	14.820	14.830	14.840	
7	14.880	14.900	14.920	
8	14.960	14.970	14.970	
9	14.920	14.910	14.900	
10	14.900	14.900	14.900	
11	14.980	15.040	15.090	
12	15.380	15.490	15.540	
13	15.700	15.720	15.730	
14	15.760	15.770	15.770	
15	15.780	15.770	15.760	
16	15.720	15.700	15.680	
17	15.660	15.640	15.630	
18	15.600	15.600	15.600	
19	15.600	15.600	15.600	
20	15.600	15.590	15.580	
21	15.540	15.540	15.540	
22	15.530	15.530	15.530	
23	15.530	15.550	15.600	
24	15.750	15.800	15.850	
25	15.940	15.940	15.940	
26	15.940	15.940	15.940	
27	15.930	15.930	15.930	
28	15.920	15.920	15.930	
29	15.960	15.960	15.970	
30	16.010	16.060	16.060	

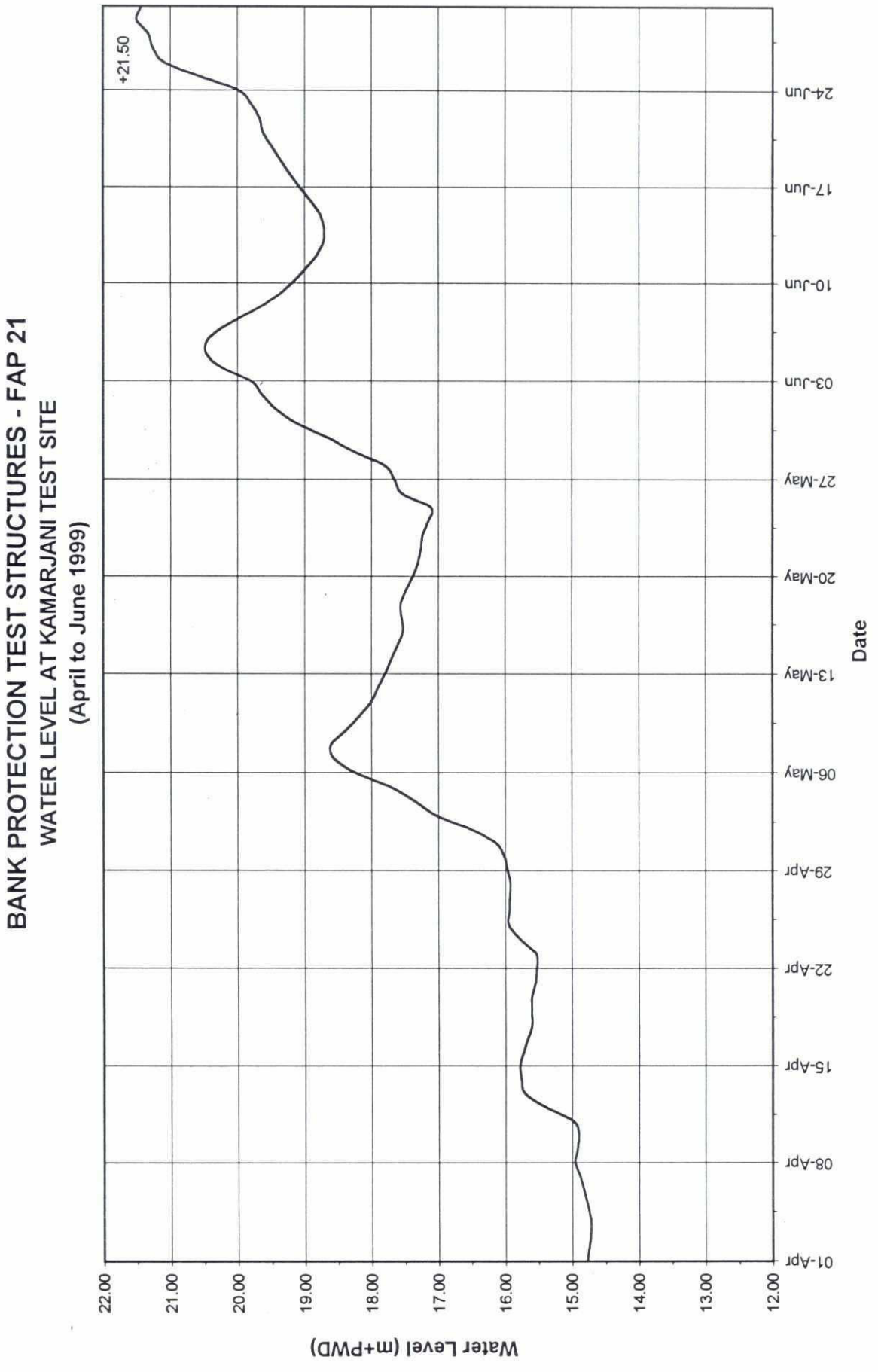
BANK PROTECTION TEST STRUCTURES - FAP 21
WATER LEVEL AT KAMARJANI TEST SITE
MONTH : MAY 1999

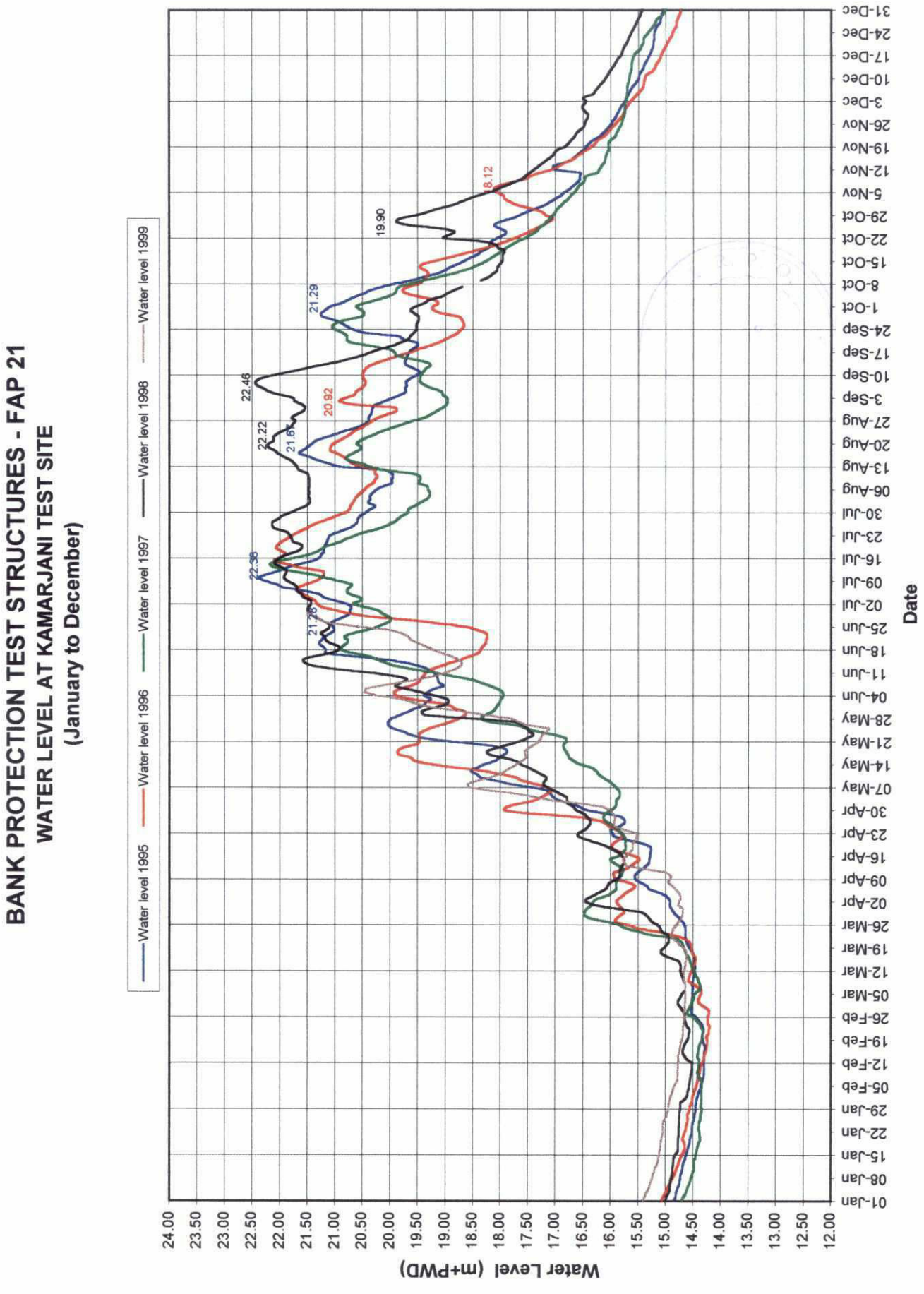
DAYS	TIME			REMARKS
	8.00	13.00	17.00	
1	16.140	16.160	16.180	
2	16.530	16.680	16.780	
3	17.050	17.140	17.220	
4	17.350	17.390	17.410	
5	17.710	17.770	17.840	
6	18.240	18.290	18.340	
7	18.560	18.570	18.600	
8	18.610	18.600	18.590	
9	18.390	18.370	18.350	
10	18.190	18.170	18.150	
11	18.010	18.000	17.990	
12	17.910	17.890	17.880	
13	17.800	17.800	17.790	
14	17.710	17.700	17.690	
15	17.610	17.600	17.590	
16	17.530	17.520	17.520	
17	17.550	17.570	17.570	
18	17.560	17.560	17.550	
19	17.480	17.460	17.440	
20	17.380	17.360	17.340	
21	17.300	17.290	17.280	
22	17.260	17.260	17.260	
23	17.240	17.220	17.200	
24	17.150	17.130	17.120	
25	17.110	17.360	17.440	
26	17.540	17.570	17.600	
27	17.660	17.670	17.690	
28	17.800	17.850	17.910	
29	18.260	1.360	18.420	
30	18.650	18.730	18.810	
31	19.110	19.210	19.200	

BANK PROTECTION TEST STRUCTURES - FAP 21
WATER LEVEL AT KAMARJANI TEST SITE
MONTH : JUNE 1999

DAYS	TIME			REMARKS
	8.00	13.00	17.00	
1	19.430	19.490	19.530	
2	19.630	19.660	19.680	
3	19.800	19.910	19.990	
4	20.250	20.310	20.370	
5	20.470	20.510	20.510	
6	20.440	20.410	20.360	
7	20.160	20.080	20.020	
8	19.780	19.710	19.650	
9	19.440	19.410	19.370	
10	19.190	19.140	19.010	
11	19.000	18.970	18.950	
12	18.820	18.790	19.760	
13	18.720	18.700	18.700	
14	18.700	18.720	18.740	
15	18.760	18.770	18.800	
16	18.900	18.920	18.950	
17	19.070	19.100	19.130	
18	19.220	19.240	19.270	
19	19.360	19.380	19.400	
20	19.490	19.520	19.540	
21	19.620	19.630	19.650	
22	19.670	19.680	19.650	
23	19.790	19.820	19.840	
24	19.980	20.030	20.110	
25	20.560	20.730	20.830	
26	21.090	21.150	21.180	
27	21.260	21.290	21.300	
28	21.330	21.360	21.390	
29	21.500	21.500	21.500	
30	21.430	21.410	21.390	

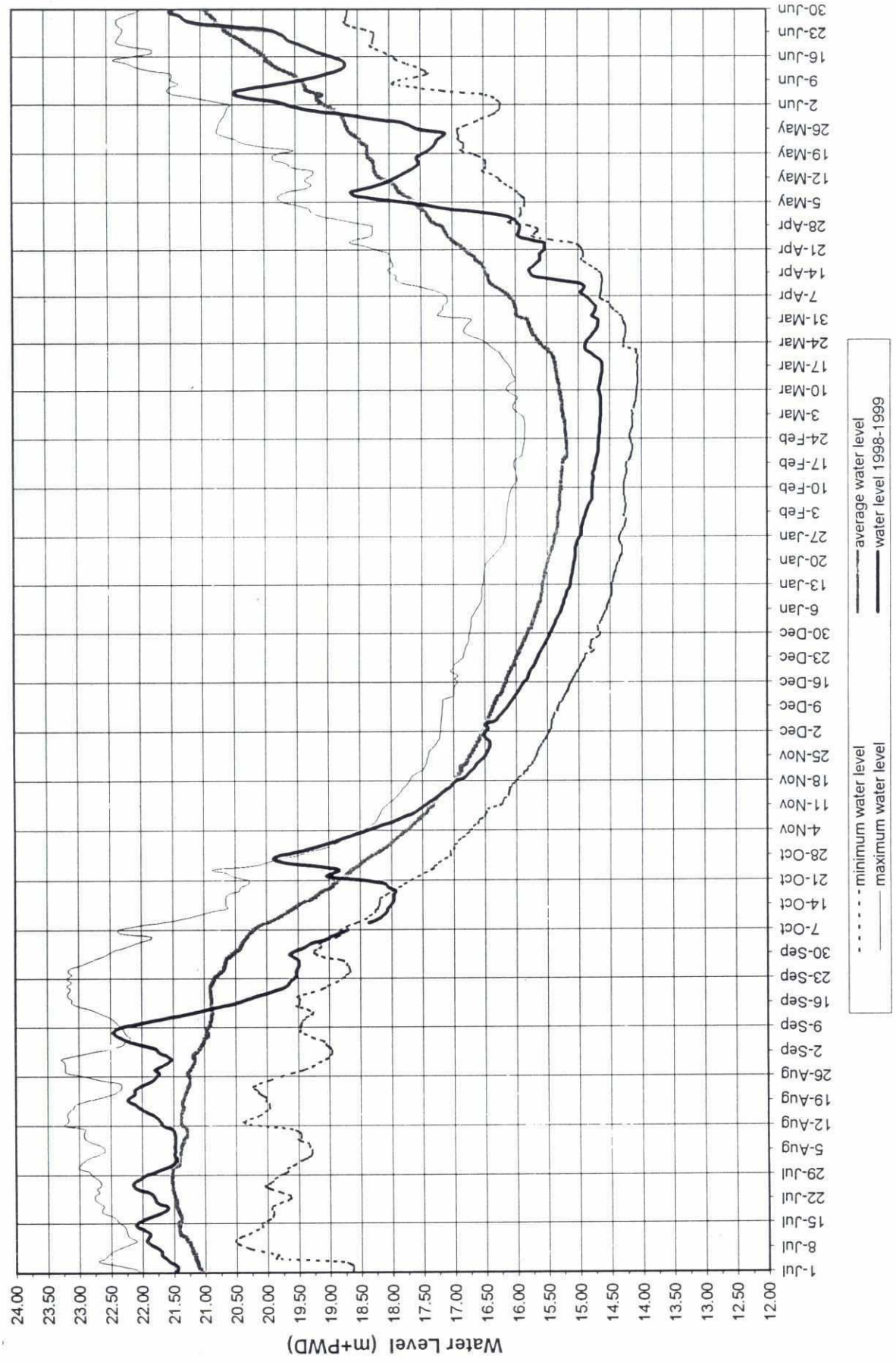
46


BANK PROTECTION TEST STRUCTURES - FAP 21
WATER LEVEL AT KAMARJANI TEST SITE
(April to June 1999)
+21.50
Water Level (m+PWD)
22.00
21.00
20.00
19.00
18.00
17.00
16.00
15.00
14.00
13.00
12.00
01-Apr
08-Apr
15-Apr
22-Apr
29-Apr
06-May
13-May
20-May
27-May
03-Jun
10-Jun
17-Jun
24-Jun
Date


BANK PROTECTION TEST STRUCTURES - FAP 21
WATER LEVEL AT KAMARJANI TEST SITE
(January to December)
Water level 1995
Water level 1996
Water level 1997
Water level 1998
Water level 1999
Water Level (m+PWD)
Date
22.46
22.22
21.61
21.29
20.92
19.90
18.12
22.38
21.26

BANK PROTECTION TEST STRUCTURES - FAP 21

BWDB WATER LEVEL FREQUENCY CURVES VERSUS ACTUAL FAP 21 WATER LEVEL AT KAMARJANI TEST SITE UP TO JUNE '99

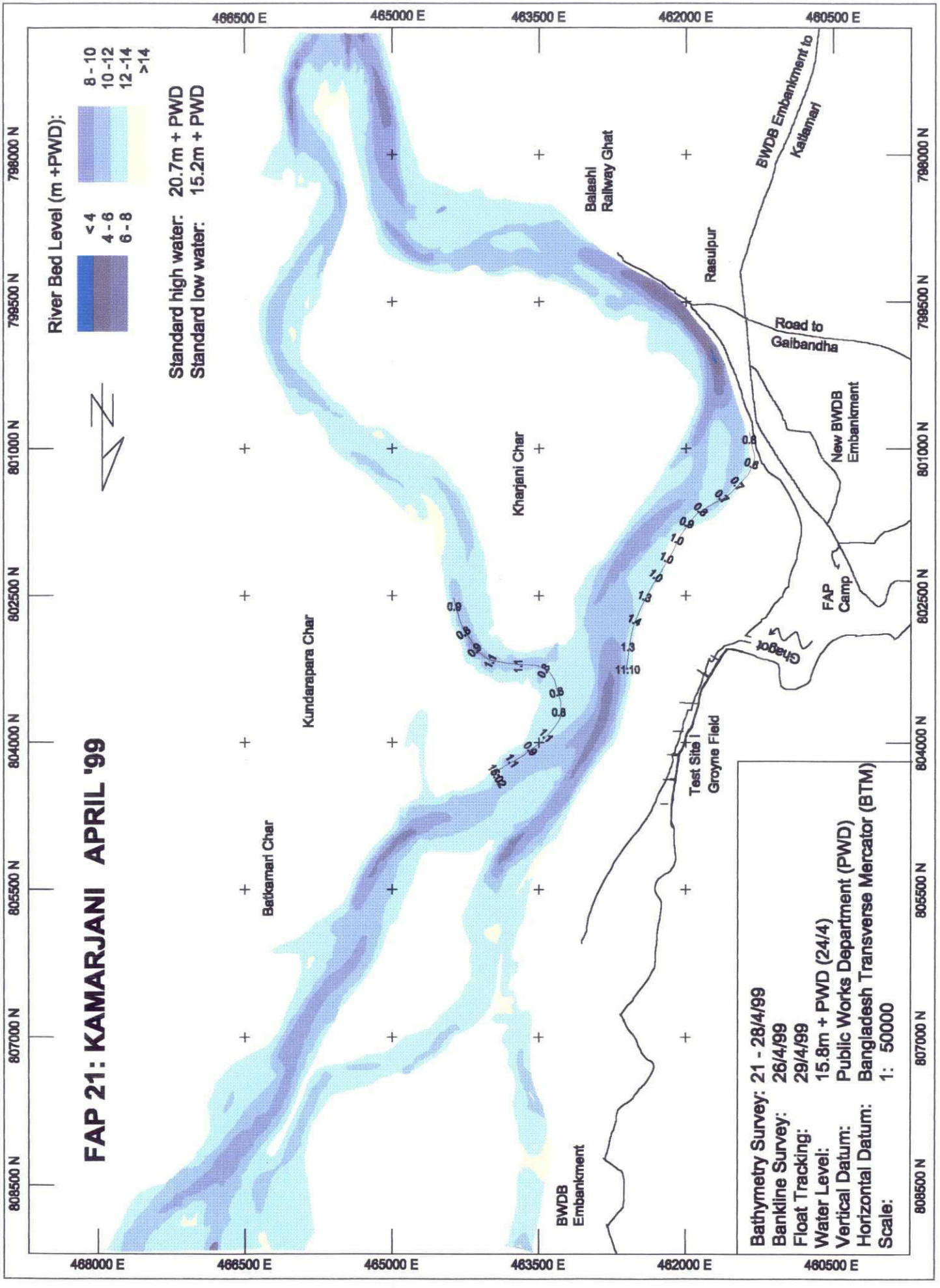


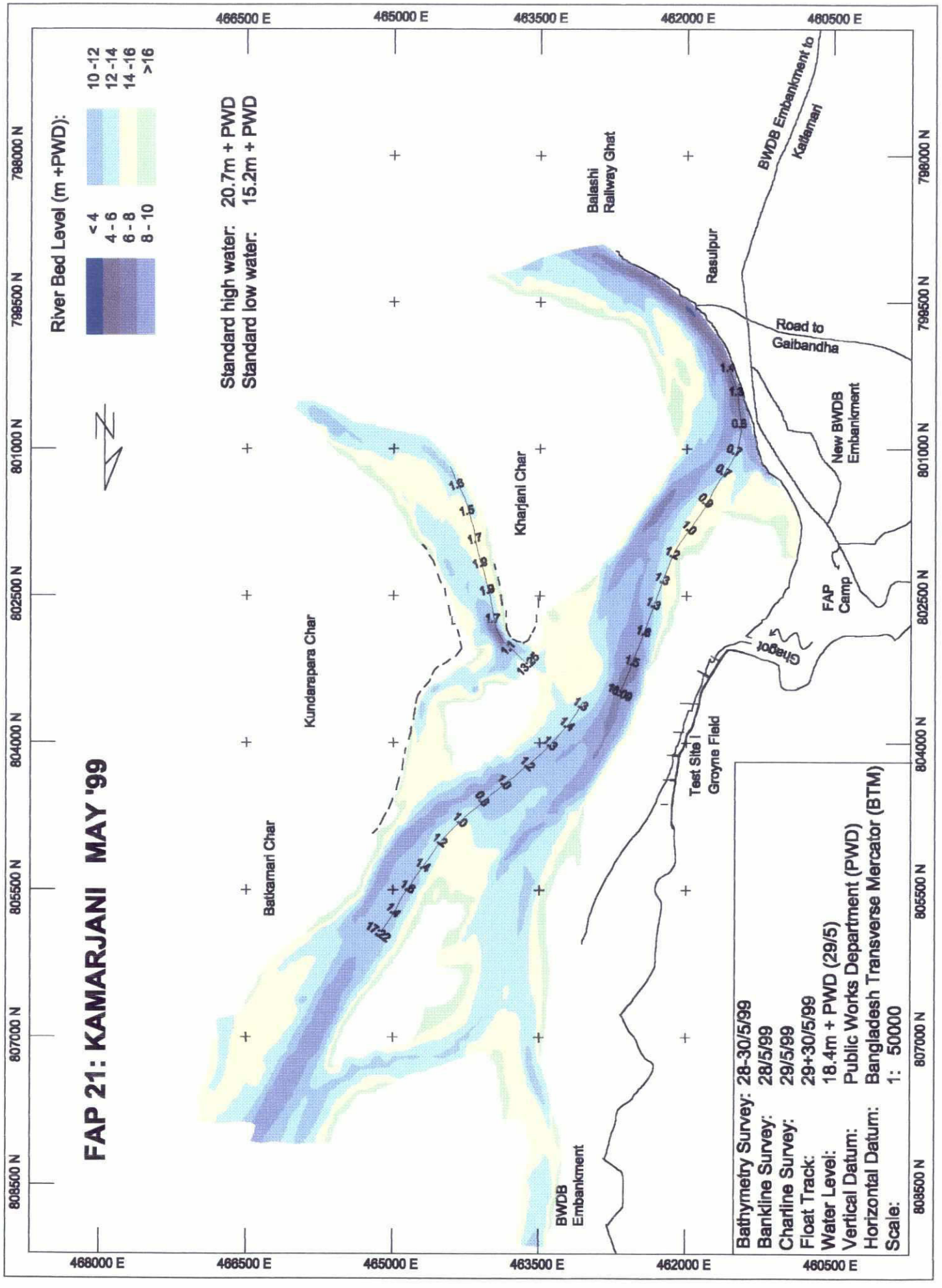
BWDB Data: Period of Record 1957 ~ 1997

ANNEX B

FAP 21 / Test Site I

- Bathymetric Survey and Flow Velocities

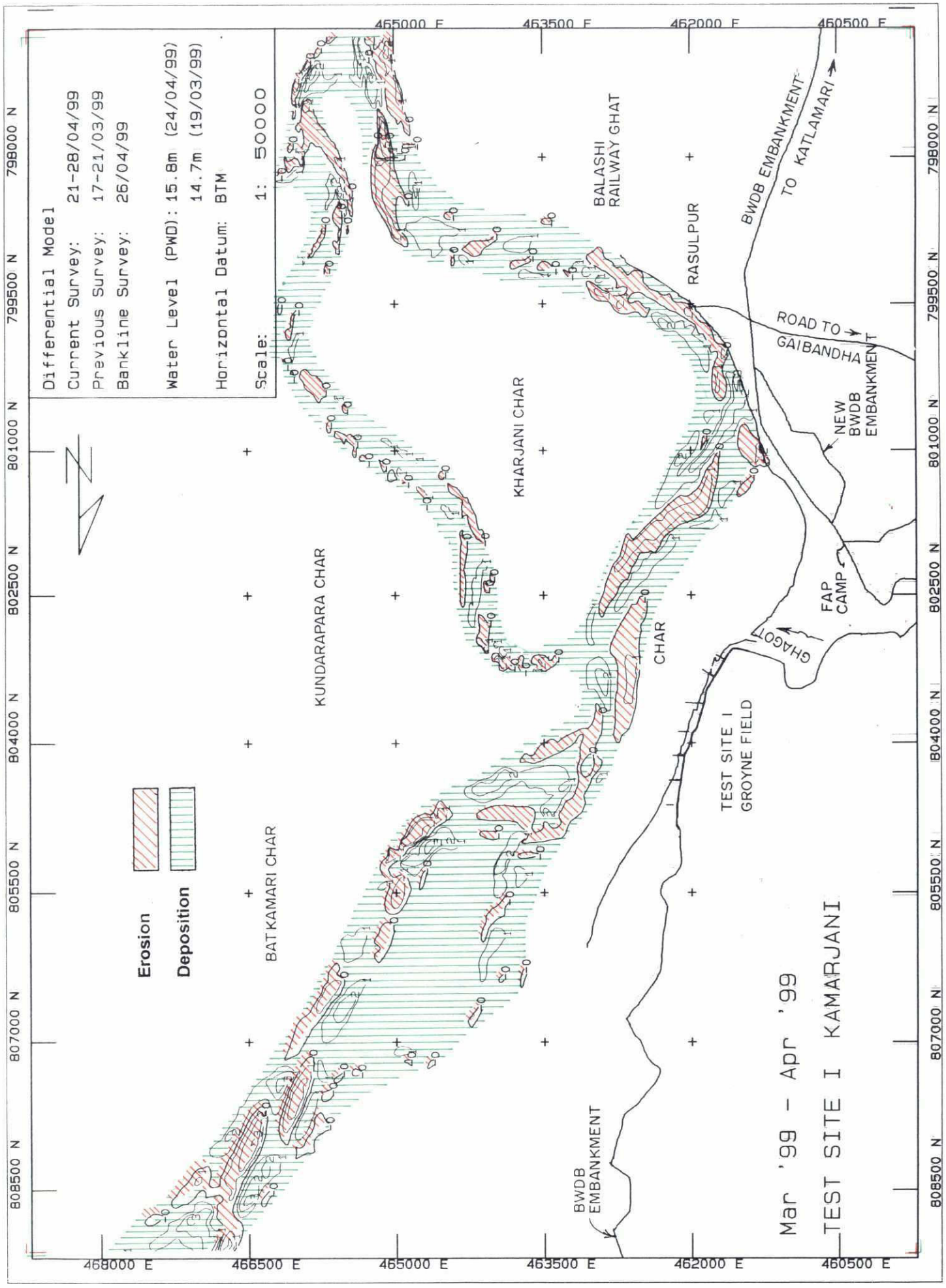

FAP 21: KAMARJANI APRIL '99
River Bed Level (m +PWD):
< 4
4 - 6
6 - 8
8 - 10
10 -12
12 -14
>14
Standard high water: 20.7m + PWD
Standard low water: 15.2m + PWD
Bathymetry Survey: 21 - 28/4/99
Bankline Survey: 26/4/99
Float Tracking: 29/4/99
Water Level: 15.8m + PWD (24/4)
Vertical Datum: Public Works Department (PWD)
Horizontal Datum: Bangladesh Transverse Mercator (BTM)
Scale: 1: 50000
Batkamari Char
Kundarapara Char
Kharjani Char
Balashi Railway Ghat
Rasulpur
BWDB Embankment to Katlamari
Road to Gaibandha
New BWDB Embankment
FAP Camp
Ghegok
Test Site I
Groyne Field
BWDB Embankment
466500 E
465000 E
463500 E
462000 E
460500 E
808500 N
807000 N
805500 N
804000 N
802500 N
801000 N
799500 N
798000 N

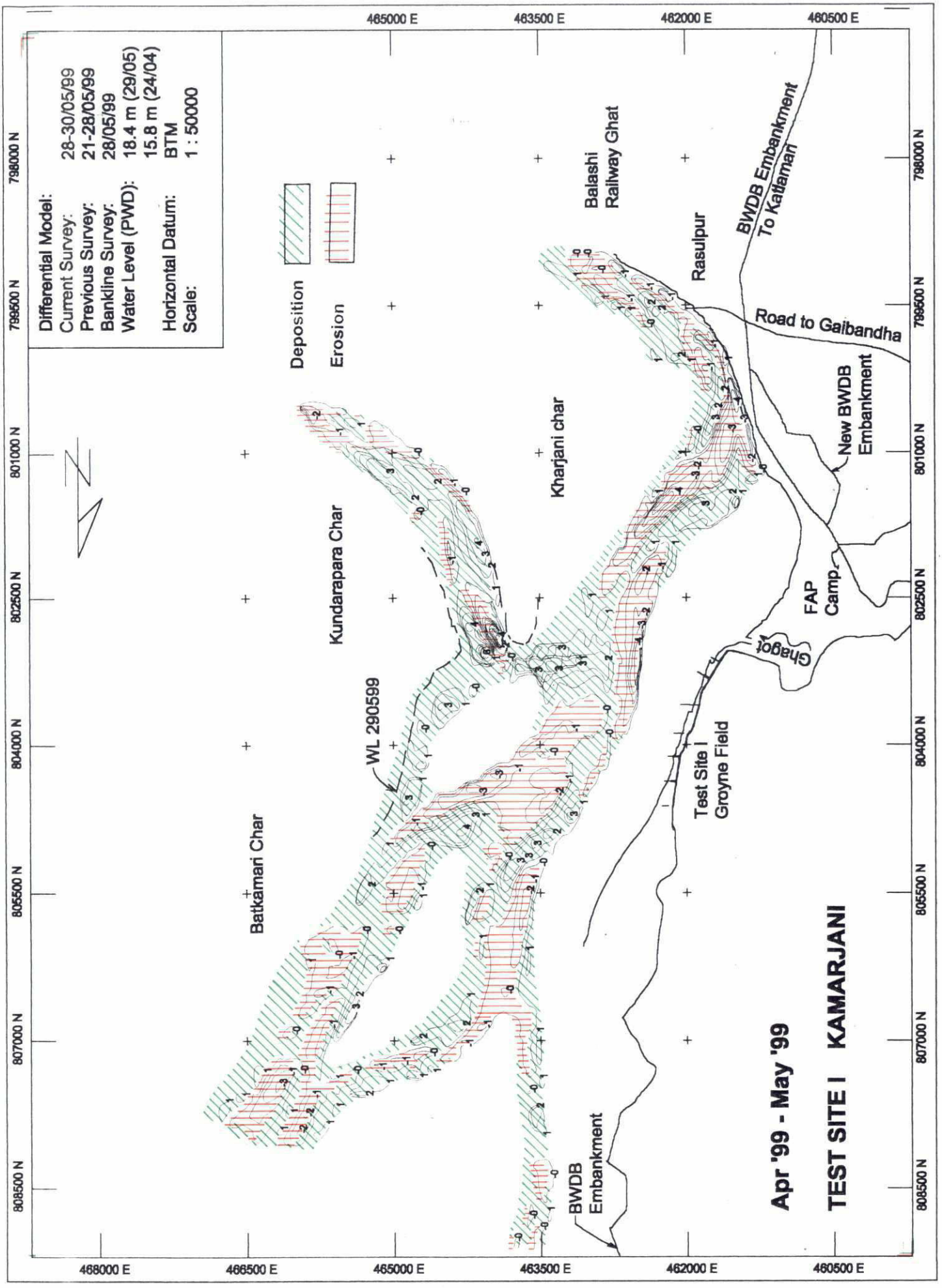

FAP 21: KAMARJANI MAY '99
River Bed Level (m +PWD):
< 4
4 - 6
6 - 8
8 - 10
10 -12
12 -14
14 -16
>16
Standard high water: 20.7m + PWD
Standard low water: 15.2m + PWD
Balashi Railway Ghat
BWDB Embankment to Kattamari
Rasulpur
Road to Gaibandha
New BWDB Embankment
FAP Camp
Ghagot
Test Site I
Groyne Field
Kharjani Char
Kundarapara Char
Batkamari Char
BWDB Embankment
Bathymetry Survey: 28-30/5/99
Bankline Survey: 28/5/99
Charline Survey: 29/5/99
Float Track: 29+30/5/99
Water Level: 18.4m + PWD (29/5)
Vertical Datum: Public Works Department (PWD)
Horizontal Datum: Bangladesh Transverse Mercator (BTM)
Scale: 1: 50000
466500 E
465000 E
463500 E
462000 E
460500 E
808500 N
807000 N
805500 N
804000 N
802500 N
801000 N
799500 N
798000 N

ANNEX C

FAP 21 / Test Site I

- Differential Models

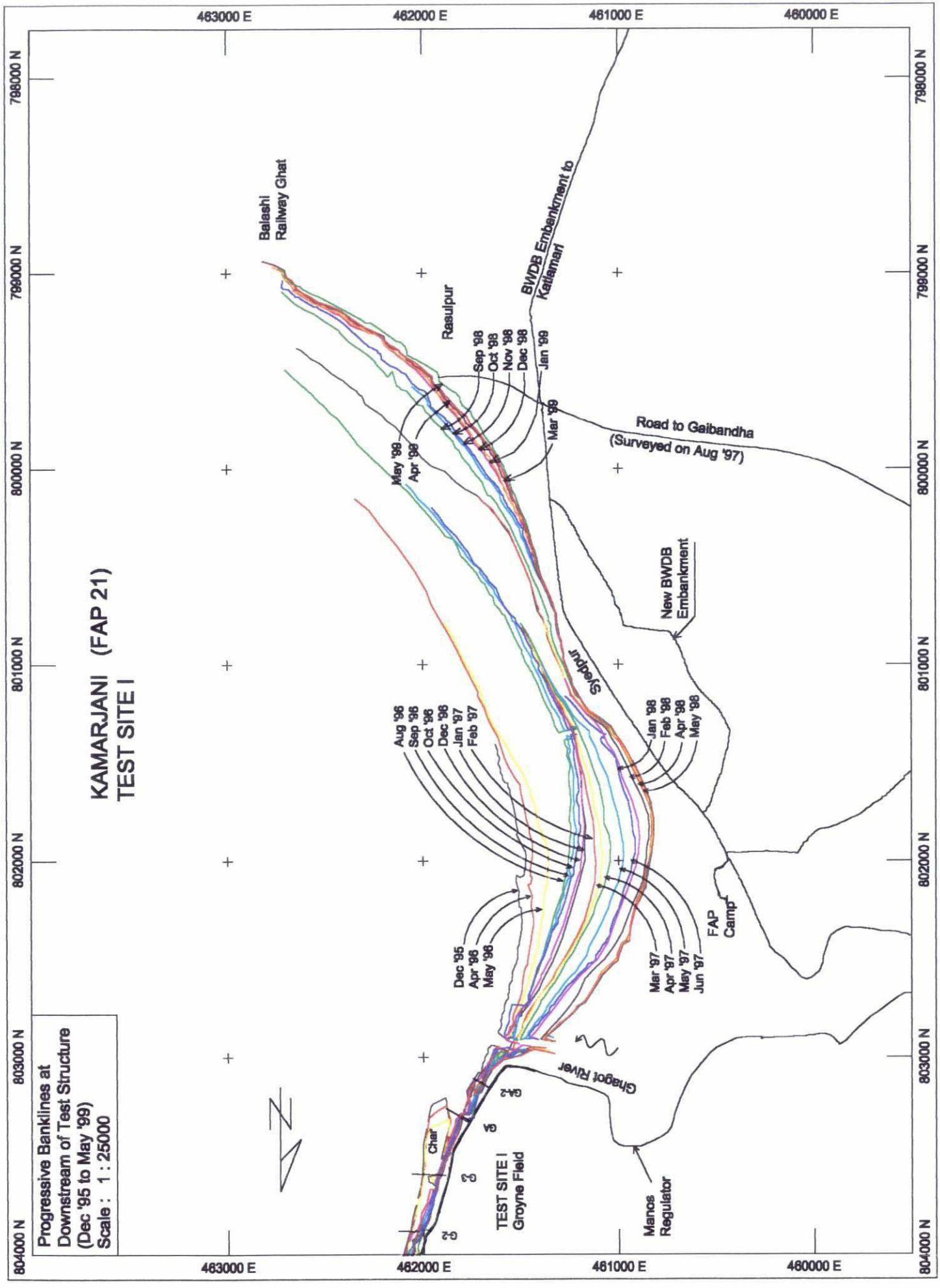

Differential Model
Current Survey: 21-28/04/99
Previous Survey: 17-21/03/99
Bankline Survey: 26/04/99
Water Level (PWD): 15.8m (24/04/99)
14.7m (19/03/99)
Horizontal Datum: BTM
Scale: 1: 50000
Erosion
Deposition
KUNDARAPARA CHAR
KHARJANI CHAR
BATKAMARI CHAR
CHAR
BALASHI RAILWAY GHAT
RASULPUR
BWDB EMBANKMENT TO KATLAMARI
ROAD TO GAIBANDHA
NEW BWDB EMBANKMENT
FAP CAMP
GHAGOT
TEST SITE I GROYNE FIELD
BWDB EMBANKMENT
Mar '99 - Apr '99
TEST SITE I KAMARJANI
468000 E
466500 E
465000 E
463500 E
462000 E
460500 E
808500 N
807000 N
805500 N
804000 N
802500 N
801000 N
799500 N
798000 N


Differential Model:
Current Survey: 28-30/05/99
Previous Survey: 21-28/05/99
Bankline Survey: 28/05/99
Water Level (PWD): 18.4 m (29/05)
15.8 m (24/04)
Horizontal Datum: BTM
Scale: 1 : 50000
Deposition
Erosion
Balashi Railway Ghat
Rasulpur
BWDB Embankment To Katamari
Road to Gaibandha
New BWDB Embankment
Kharjani char
Kundarapara Char
WL 290599
Batkamari Char
FAP Camp
Ghagot
Test Site I Groyne Field
BWDB Embankment
Apr '99 - May '99
TEST SITE I KAMARJANI
465000 E
463500 E
462000 E
460500 E
468000 E
466500 E
798000 N
799500 N
801000 N
802500 N
804000 N
805500 N
807000 N
808500 N

ANNEX D

FAP 21 / Test Site I

- Change of Bankline


463000 E
462000 E
461000 E
460000 E
798000 N
799000 N
800000 N
801000 N
802000 N
803000 N
804000 N
KAMARJANI (FAP 21)
TEST SITE I
Progressive Banklines at Downstream of Test Structure (Dec '95 to May '99)
Scale : 1 : 25000
Balashi Railway Ghat
Rasulpur
BWDB Embankment to Kallamari
Sep '98
Oct '98
Nov '98
Dec '98
Jan '99
Mar '99
May '99
Apr '98
Road to Gaibandha (Surveyed on Aug '97)
New BWDB Embankment
Sylaidpur
Aug '96
Sep '96
Oct '96
Dec '96
Jan '97
Feb '97
Jan '98
Feb '98
Apr '98
May '98
Dec '95
Apr '96
May '96
Mar '97
Apr '97
May '97
Jun '97
FAP Camp
Ghagot River
Char
G4-2
G4
G3
G2
TEST SITE I
Groyne Field
Manos Regulator

ANNEX E

FAP 21 / Test Site I

- Photographs

There was no further development at the test site during the period under review.

Therefore, there are no photographs.

ANNEX F

FAP 21 / Test Site II

- Water Level

BANK PROTECTION TEST STRUCTURES - FAP 21
WATER LEVEL AT BAHADURABAD TEST SITE
MONTH : APRIL 1999

DAYS	TIME			REMARKS
	8.00	13.00	17.00	
1	13.220	13.240	13.260	
2	13.240	13.240	13.210	
3	13.210	13.210	13.210	
4	13.200	13.200	13.200	
5	13.210	13.230	13.250	
6	13.280	13.290	13.290	
7	13.340	13.330	13.330	
8	13.390	13.390	13.390	
9	13.400	13.390	13.390	
10	13.340	13.340	13.340	
11	13.370	13.400	13.450	
12	13.640	13.700	13.760	
13	13.930	13.950	13.980	
14	14.040	14.050	14.050	
15	14.050	14.050	14.050	
16	13.990	13.970	13.970	
17	13.920	13.910	13.910	
18	13.870	13.860	13.850	
19	13.870	13.860	13.850	
20	13.830	13.850	13.840	
21	13.840	13.820	13.820	
22	13.800	13.800	13.800	
23	13.830	13.850	13.860	
24	13.950	14.000	14.050	
25	14.130	14.140	14.150	
26	14.160	14.160	14.160	
27	14.160	14.160	14.170	
28	14.160	14.150	14.150	
29	14.170	14.180	14.180	
30	14.220	14.230	14.240	

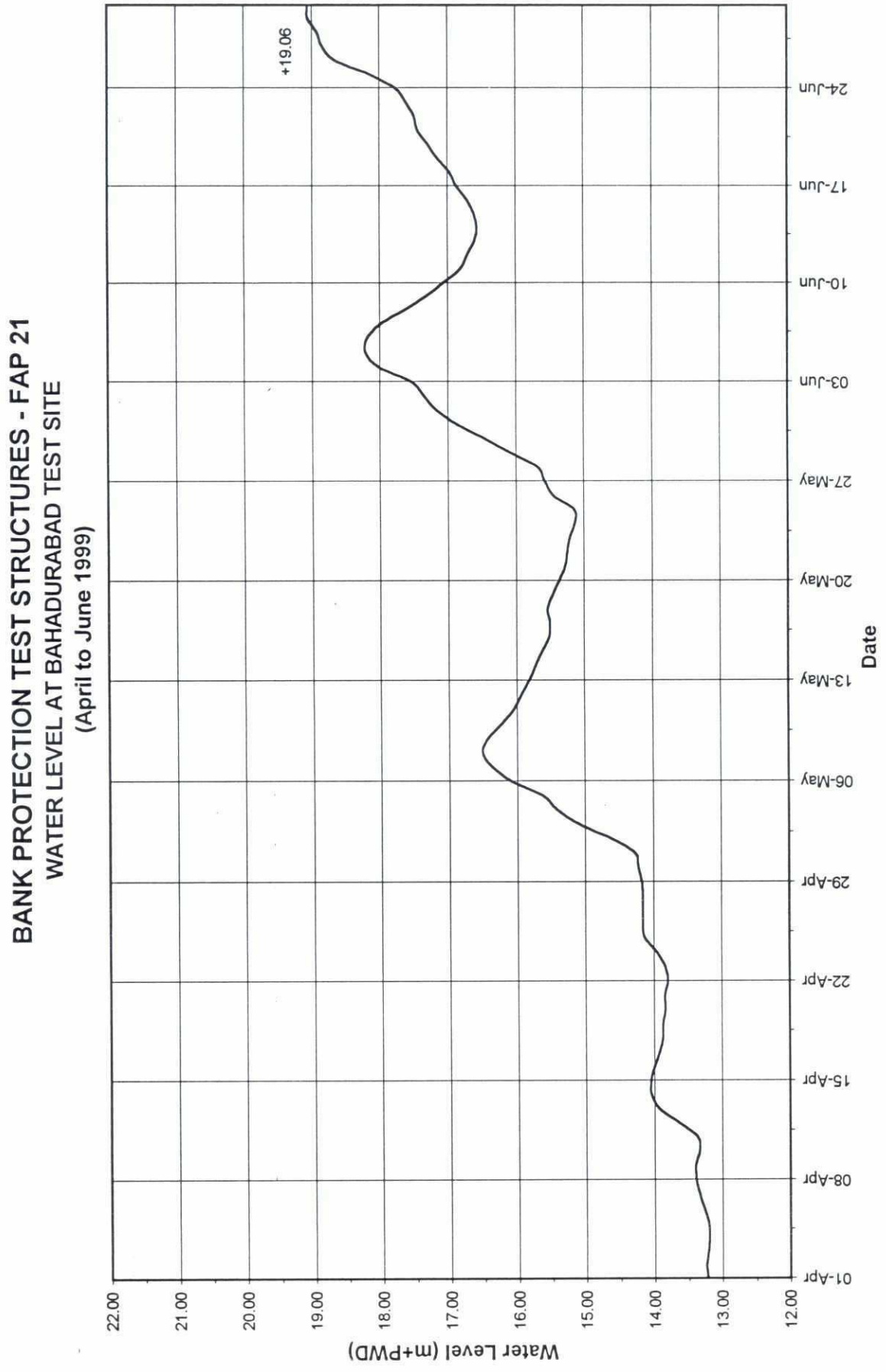
BANK PROTECTION TEST STRUCTURES - FAP 21
WATER LEVEL AT BAHADURABAD TEST SITE
MONTH : MAY 1999

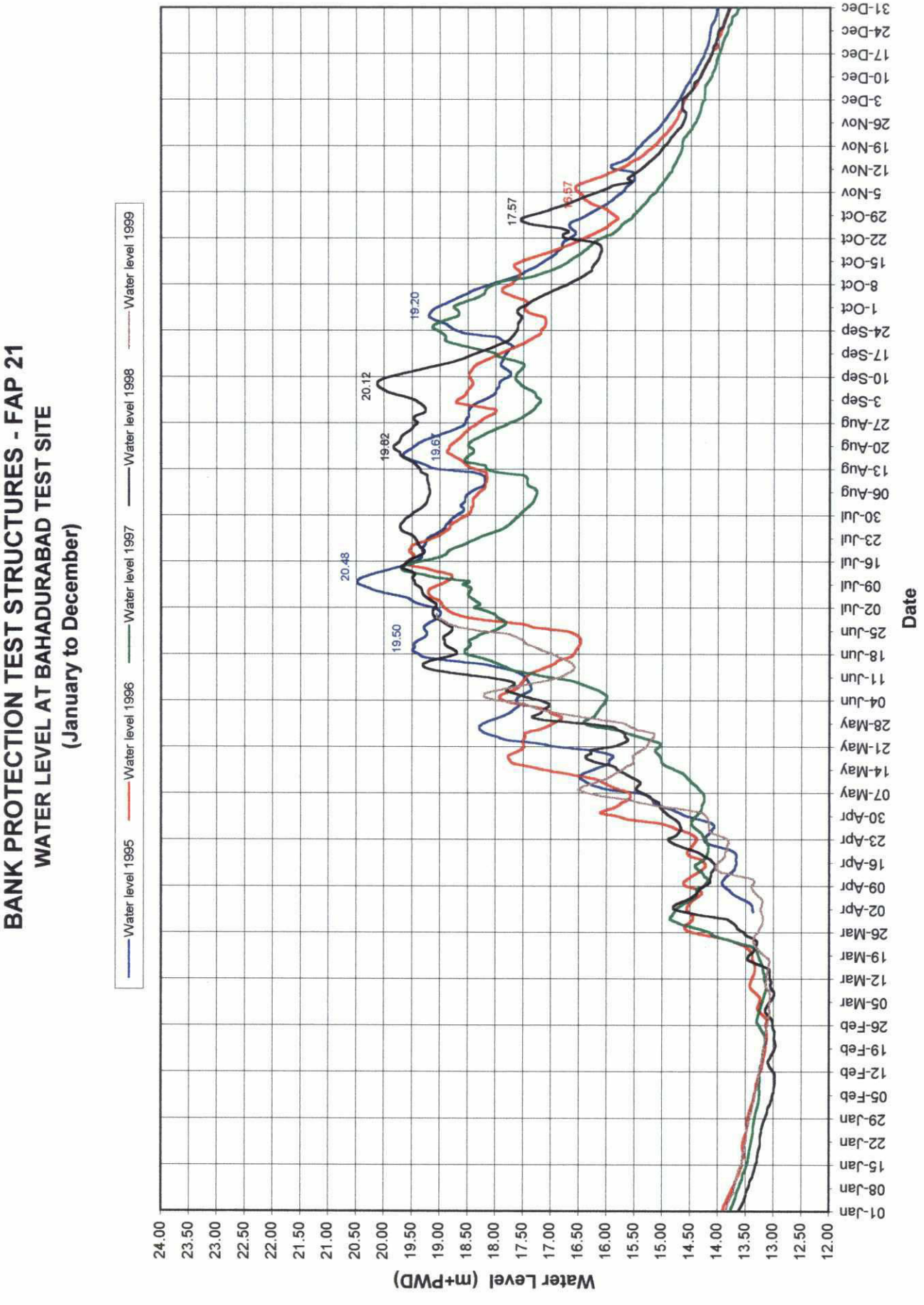
DAYS	TIME			REMARKS
	8.00	13.00	17.00	
1	14.270	14.310	14.350	
2	14.610	14.720	14.810	
3	15.080	15.210	15.270	
4	15.410	15.450	15.480	
5	15.620	15.690	15.720	
6	16.090	16.160	16.220	
7	16.370	16.420	16.440	
8	16.510	16.510	16.510	
9	16.420	16.400	16.340	
10	16.220	16.190	16.160	
11	16.040	16.020	15.990	
12	15.930	15.910	15.900	
13	15.820	15.810	15.810	
14	15.720	15.700	15.690	
15	15.630	15.600	15.580	
16	15.520	15.510	15.580	
17	15.510	15.530	15.540	
18	15.540	15.530	15.530	
19	15.460	15.440	15.430	
20	15.370	15.350	15.330	
21	15.280	15.280	15.270	
22	15.250	15.240	15.230	
23	15.210	15.210	15.180	
24	15.140	15.110	15.090	
25	15.140	15.280	15.350	
26	15.450	15.490	15.520	
27	15.580	15.600	15.620	
28	15.680	15.730	15.810	
29	16.080	16.180	16.260	
30	16.460	16.530	16.600	
31	16.860	16.940	17.020	

BANK PROTECTION TEST STRUCTURES - FAP 21
WATER LEVEL AT BAHADURABAD TEST SITE
MONTH : JUNE 1999

DAYS	TIME			REMARKS
	8.00	13.00	17.00	
1	17.170	17.230	17.230	
2	17.350	17.380	17.410	
3	17.500	17.590	17.640	
4	18.020	18.050	18.100	
5	18.210	18.230	18.250	
6	18.200	18.160	18.160	
7	17.960	17.900	17.860	
8	17.650	17.570	17.520	
9	17.330	17.260	17.250	
10	17.070	17.020	16.970	
11	16.820	16.780	16.780	
12	16.710	16.700	16.680	
13	16.600	16.590	16.580	
14	16.570	16.580	16.600	
15	16.610	16.620	16.640	
16	16.710	16.750	16.770	
17	16.870	16.900	16.930	
18	16.970	17.000	17.050	
19	17.150	17.180	17.210	
20	17.290	17.330	17.350	
21	17.440	17.460	17.470	
22	17.490	17.490	17.500	
23	17.610	17.640	17.670	
24	17.770	17.800	17.860	
25	18.280	18.440	18.520	
26	18.670	18.710	18.750	
27	18.850	18.900	18.910	
28	18.930	18.960	18.970	
29	19.060	19.070	19.100	
30	19.060	19.030	19.000	

90

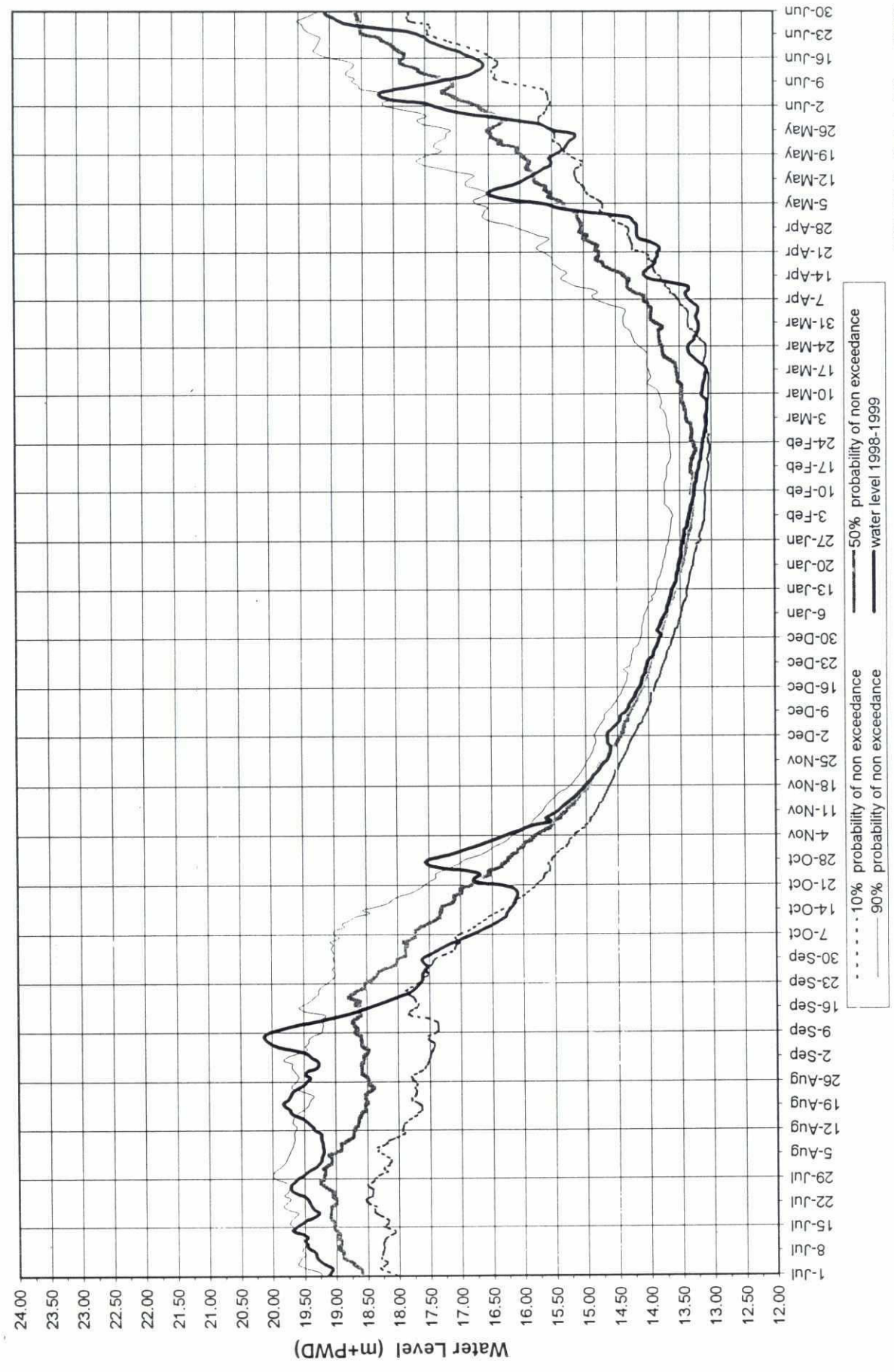

BANK PROTECTION TEST STRUCTURES - FAP 21
WATER LEVEL AT BAHADURABAD TEST SITE
(April to June 1999)
+19.06
Water Level (m+PWD)
22.00
21.00
20.00
19.00
18.00
17.00
16.00
15.00
14.00
13.00
12.00
01-Apr
08-Apr
15-Apr
22-Apr
29-Apr
06-May
13-May
20-May
27-May
03-Jun
10-Jun
17-Jun
24-Jun
Date


BANK PROTECTION TEST STRUCTURES - FAP 21
WATER LEVEL AT BAHADURABAD TEST SITE
(January to December)
Water level 1995
Water level 1996
Water level 1997
Water level 1998
Water level 1999
Water Level (m+PWD)
Date
20.48
19.50
20.12
19.82
19.61
19.20
17.57
16.57

92

BANK PROTECTION TEST STRUCTURES - FAP 21

BWDB WATER LEVEL FREQUENCY CURVES VERSUS ACTUAL FAP 21 WATER LEVEL AT BAHADURABAD TEST SITE UP TO JUNE '99



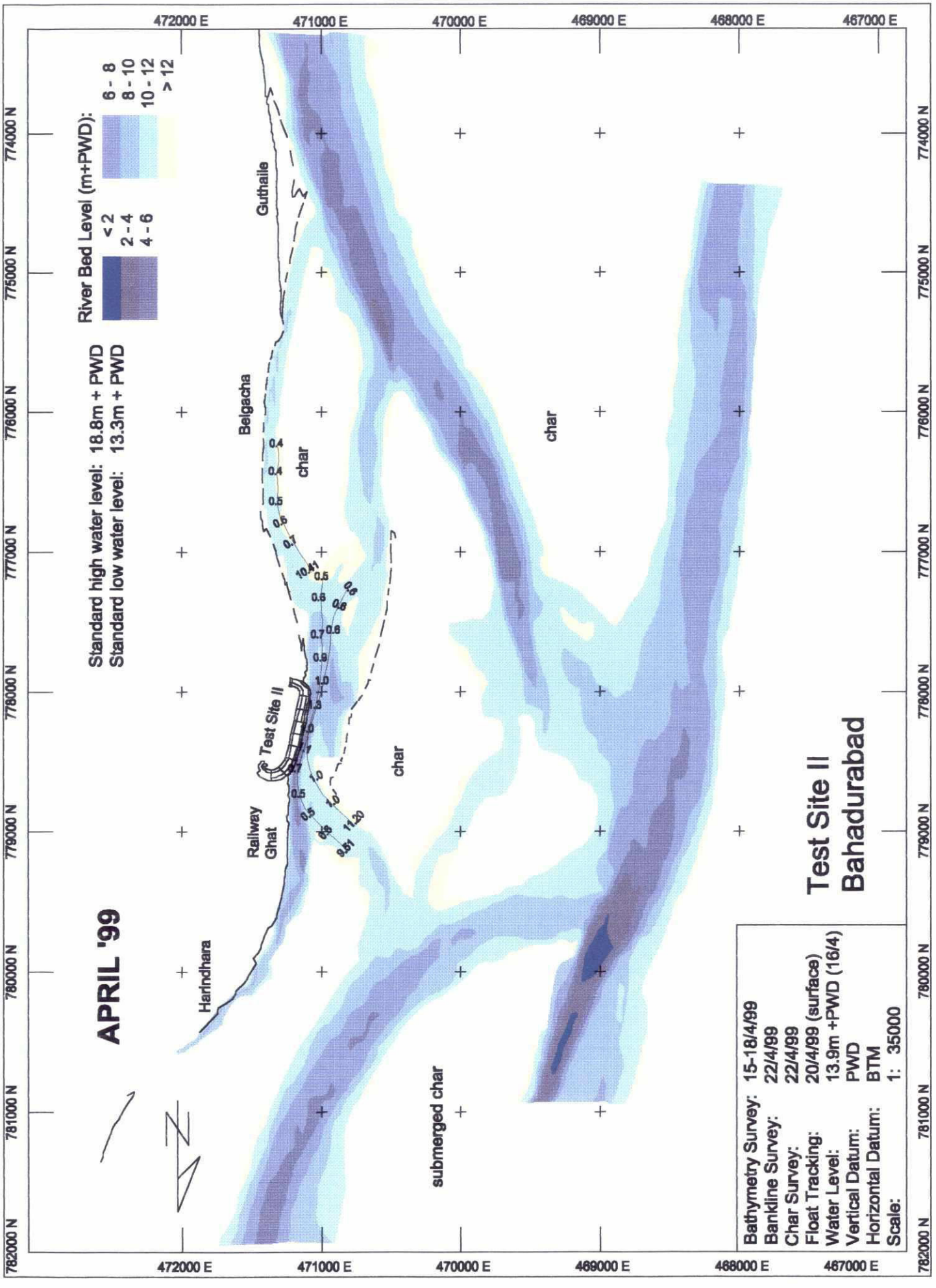
BWDB Data: Period of Record 1962 ~ 1994

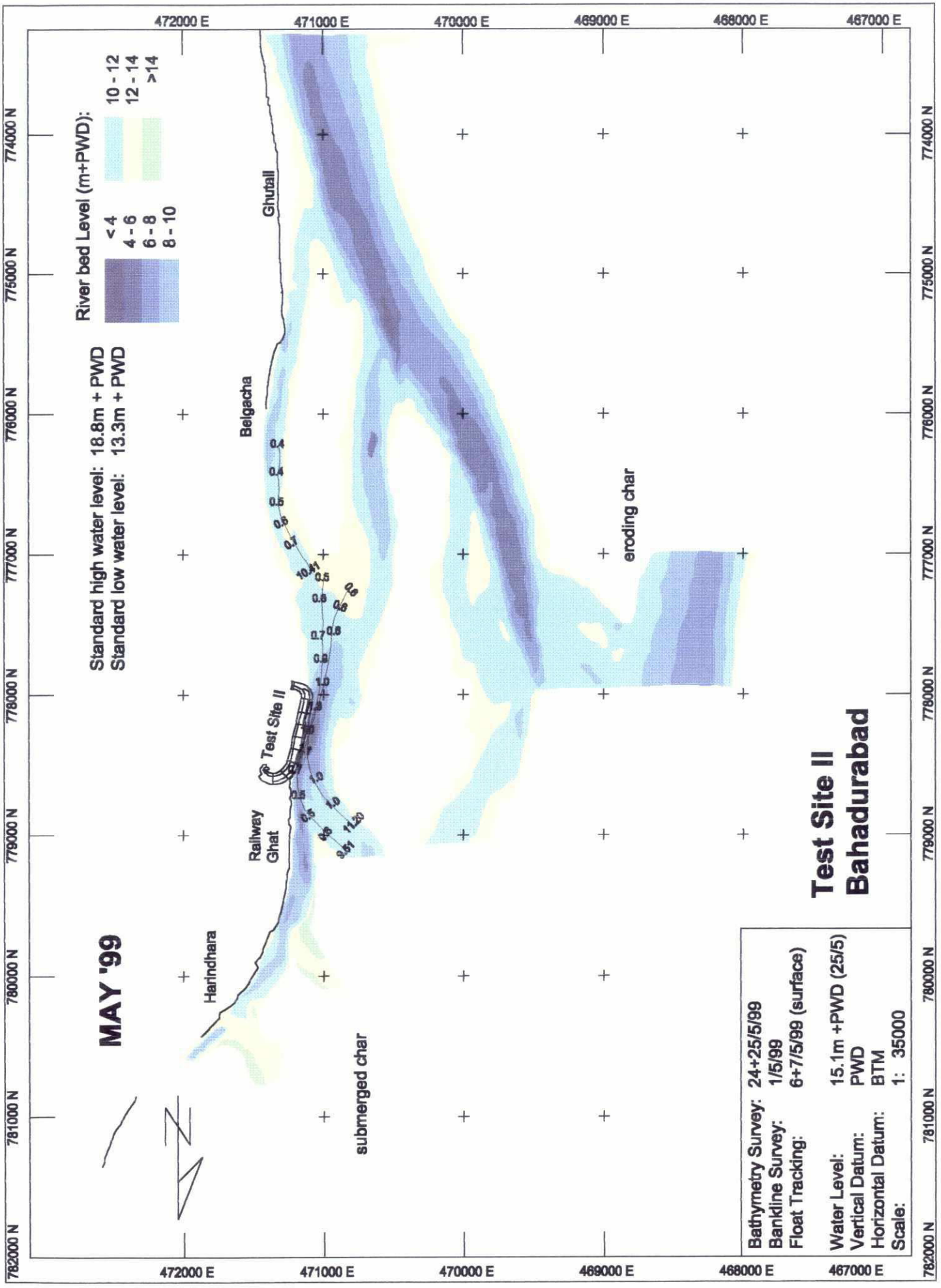
ANNEX G

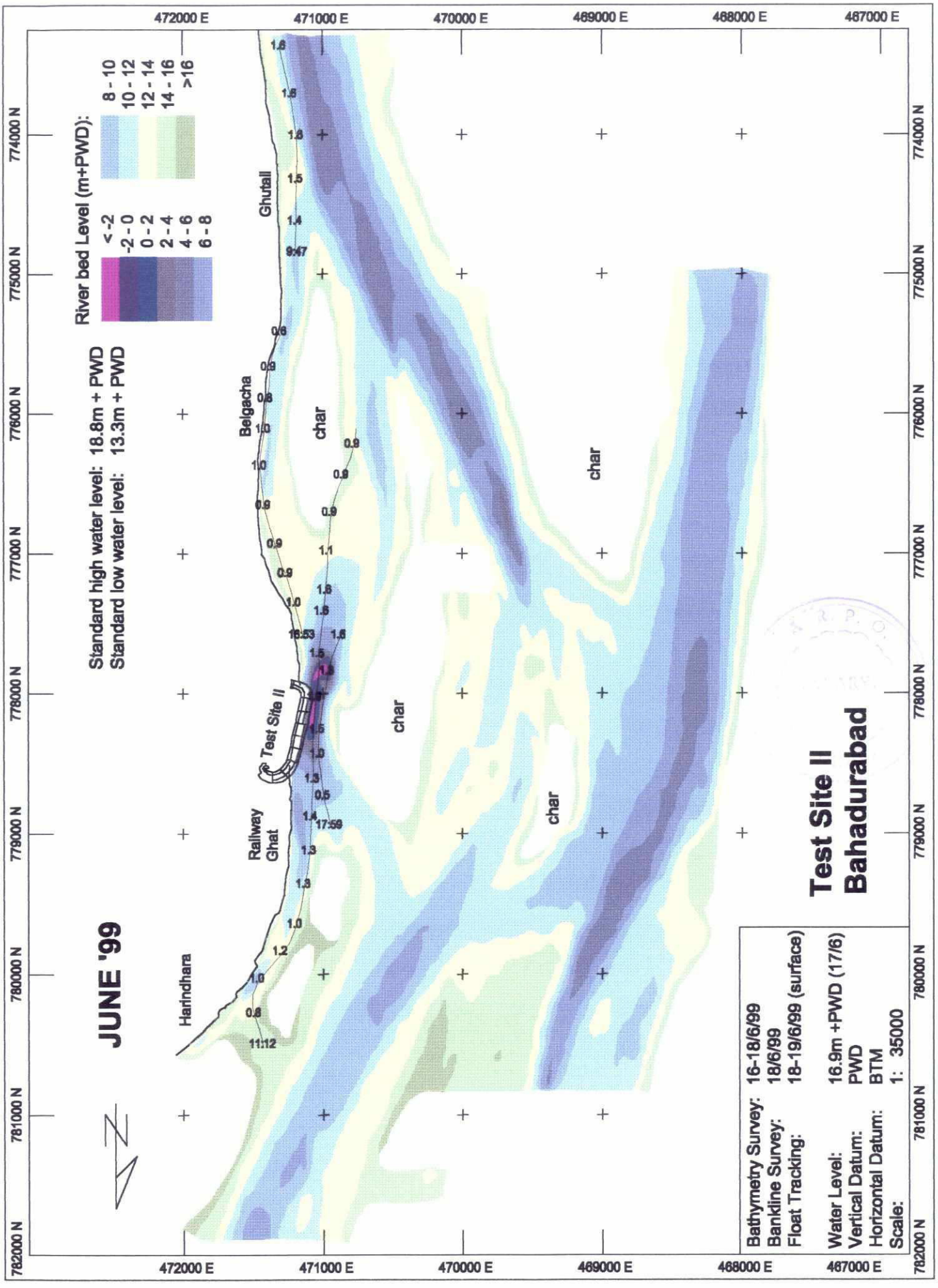
FAP 21 / Test Site II

- Bathymetric Survey and Flow Velocities

98


APRIL '99
Test Site II
Bahadurabad
Standard high water level: 18.8m + PWD
Standard low water level: 13.3m + PWD
River Bed Level (m+PWD):
< 2
2 - 4
4 - 6
6 - 8
8 - 10
10 - 12
> 12
Guthaile
Belgacha
char
Test Site II
Railway Ghat
Harindhara
submerged char
Bathymetry Survey: 15-18/4/99
Bankline Survey: 22/4/99
Char Survey: 22/4/99
Float Tracking: 20/4/99 (surface)
Water Level: 13.9m +PWD (16/4)
Vertical Datum: PWD
Horizontal Datum: BTM
Scale: 1: 35000
472000 E
471000 E
470000 E
469000 E
468000 E
467000 E
782000 N
781000 N
780000 N
779000 N
778000 N
777000 N
776000 N
775000 N
774000 N

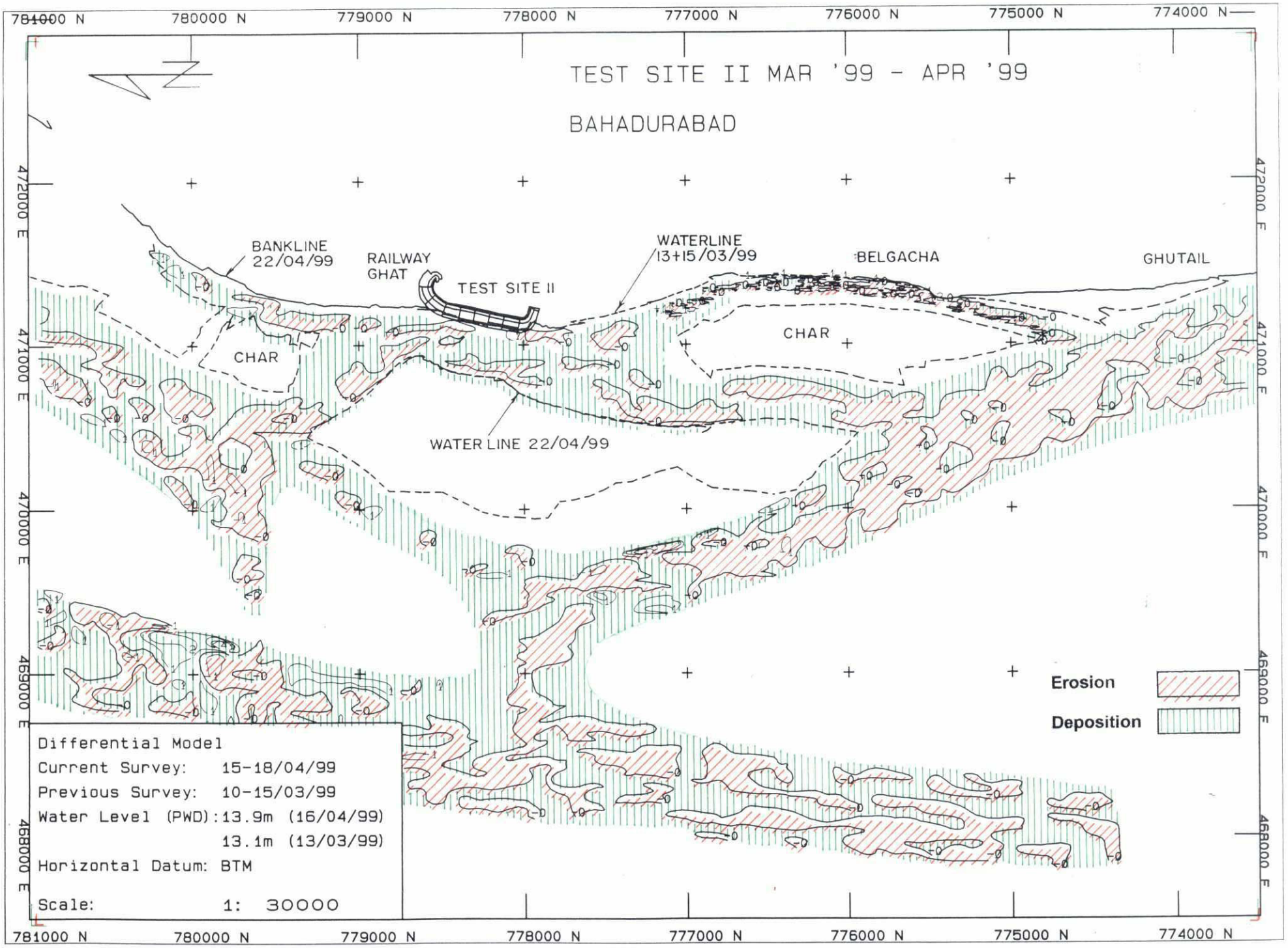

MAY '99
Test Site II
Bahadurabad
River bed Level (m+PWD):
< 4
4 - 6
6 - 8
8 - 10
10 - 12
12 - 14
>14
Standard high water level: 18.8m + PWD
Standard low water level: 13.3m + PWD
Ghutail
Belgacha
Test Site II
Railway Ghat
Harindhara
submerged char
eroding char
Bathymetry Survey: 24+25/5/99
Bankline Survey: 1/5/99
Float Tracking: 6+7/5/99 (surface)
Water Level: 15.1m +PWD (25/5)
Vertical Datum: PWD
Horizontal Datum: BTM
Scale: 1: 35000
472000 E
471000 E
470000 E
469000 E
468000 E
467000 E
782000 N
781000 N
780000 N
779000 N
778000 N
777000 N
776000 N
775000 N
774000 N

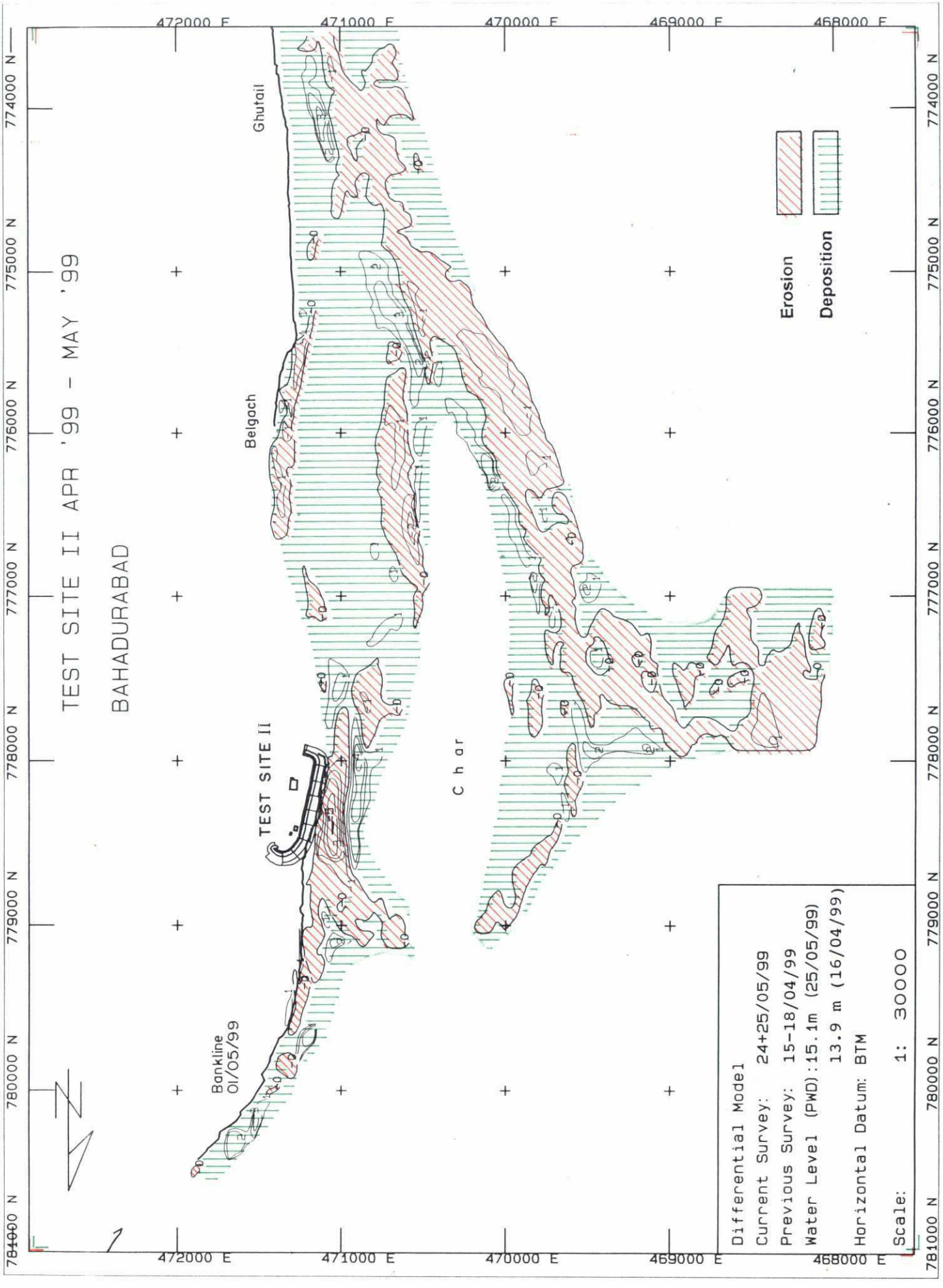

JUNE '99
Test Site II
Bahadurabad
River bed Level (m+PWD):
< -2
-2 - 0
0 - 2
2 - 4
4 - 6
6 - 8
8 - 10
10 - 12
12 - 14
14 - 16
>16
Standard high water level: 18.8m + PWD
Standard low water level: 13.3m + PWD
Ghutail
Belgacha
Test Site II
Railway Ghat
Harindhara
char
char
char
char
Bathymetry Survey: 16-18/6/99
Bankline Survey: 18/6/99
Float Tracking: 18-19/6/99 (surface)
Water Level: 16.9m +PWD (17/6)
Vertical Datum: PWD
Horizontal Datum: BTM
Scale: 1: 35000
472000 E
471000 E
470000 E
469000 E
468000 E
467000 E
782000 N
781000 N
780000 N
779000 N
778000 N
777000 N
776000 N
775000 N
774000 N

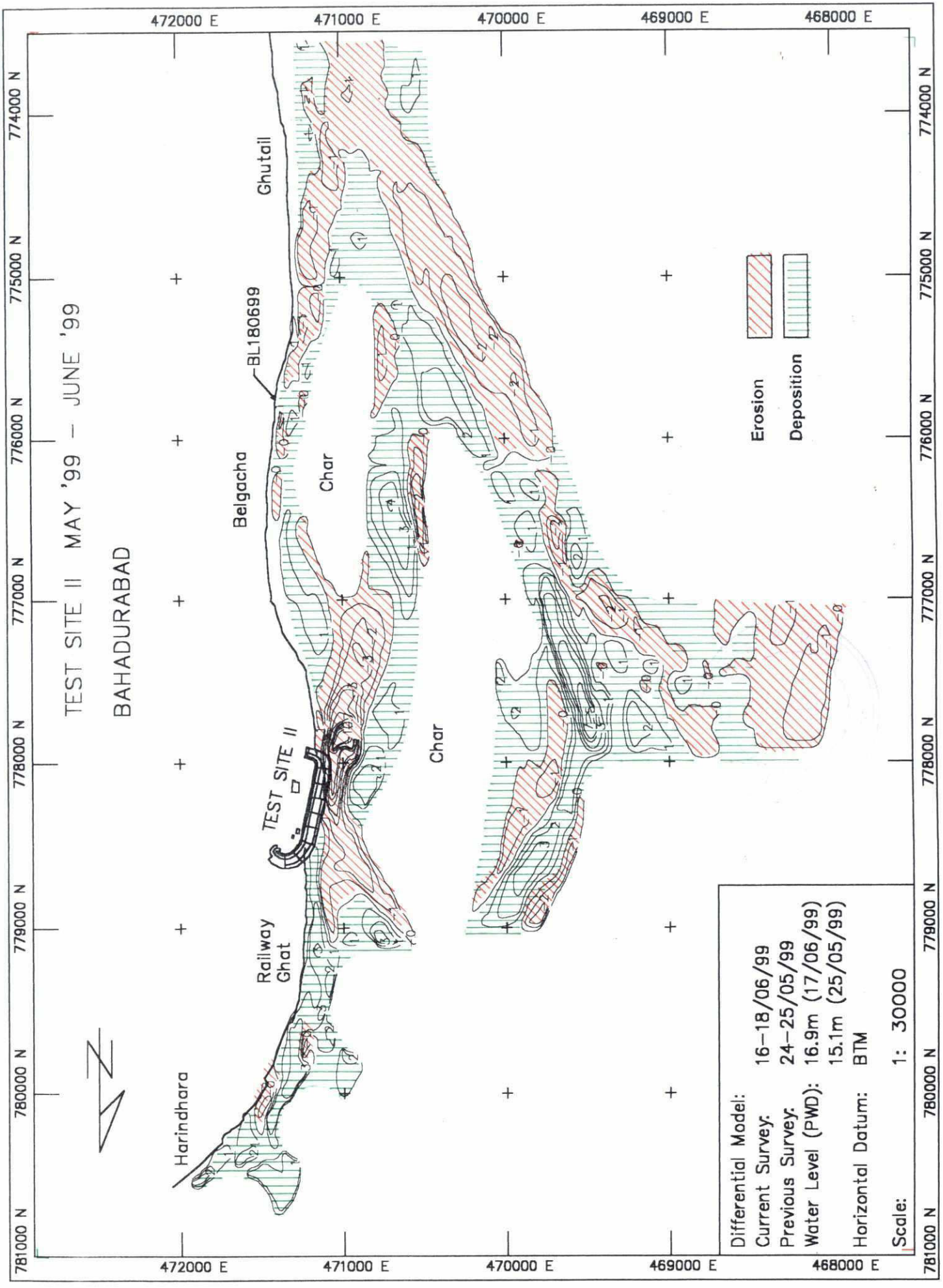
ANNEX H

FAP 21 / Test Site II

- Differential Models


781000 N
780000 N
779000 N
778000 N
777000 N
776000 N
775000 N
774000 N
TEST SITE II MAR '99 - APR '99
BAHADURABAD
472000 E
471000 E
470000 E
469000 E
468000 E
BANKLINE 22/04/99
RAILWAY GHAT
TEST SITE II
WATERLINE 13+15/03/99
BELGACHA
GHUTAIL
CHAR
CHAR
WATER LINE 22/04/99
Erosion
Deposition
Differential Model
Current Survey: 15-18/04/99
Previous Survey: 10-15/03/99
Water Level (PWD): 13.9m (16/04/99)
13.1m (13/03/99)
Horizontal Datum: BTM
Scale: 1: 30000


TEST SITE II APR '99 - MAY '99
BAHADURABAD
Ghutail
Belgach
TEST SITE II
Char
Bankline
01/05/99
Erosion
Deposition
Differential Model
Current Survey: 24+25/05/99
Previous Survey: 15-18/04/99
Water Level (PWD):15.1m (25/05/99)
13.9 m (16/04/99)
Horizontal Datum: BTM
Scale: 1: 30000
472000 E
471000 E
470000 E
469000 E
468000 E
774000 N
775000 N
776000 N
777000 N
778000 N
779000 N
780000 N
781000 N

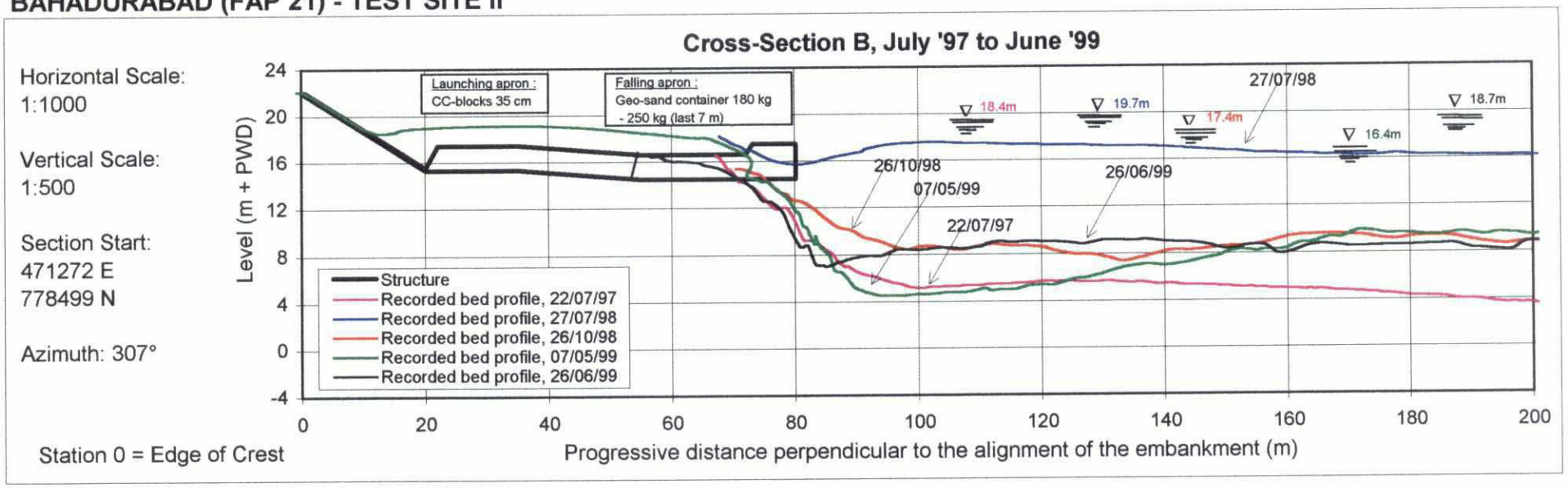

TEST SITE II MAY '99 – JUNE '99
BAHADURABAD
472000 E
471000 E
470000 E
469000 E
468000 E
774000 N
775000 N
776000 N
777000 N
778000 N
779000 N
780000 N
781000 N
Ghutail
BL180699
Belgacha
Char
Char
TEST SITE II
Railway Ghat
Harindhara
Erosion
Deposition
Differential Model:
Current Survey: 16–18/06/99
Previous Survey: 24–25/05/99
Water Level (PWD): 16.9m (17/06/99)
15.1m (25/05/99)
Horizontal Datum: BTM
Scale: 1: 30000

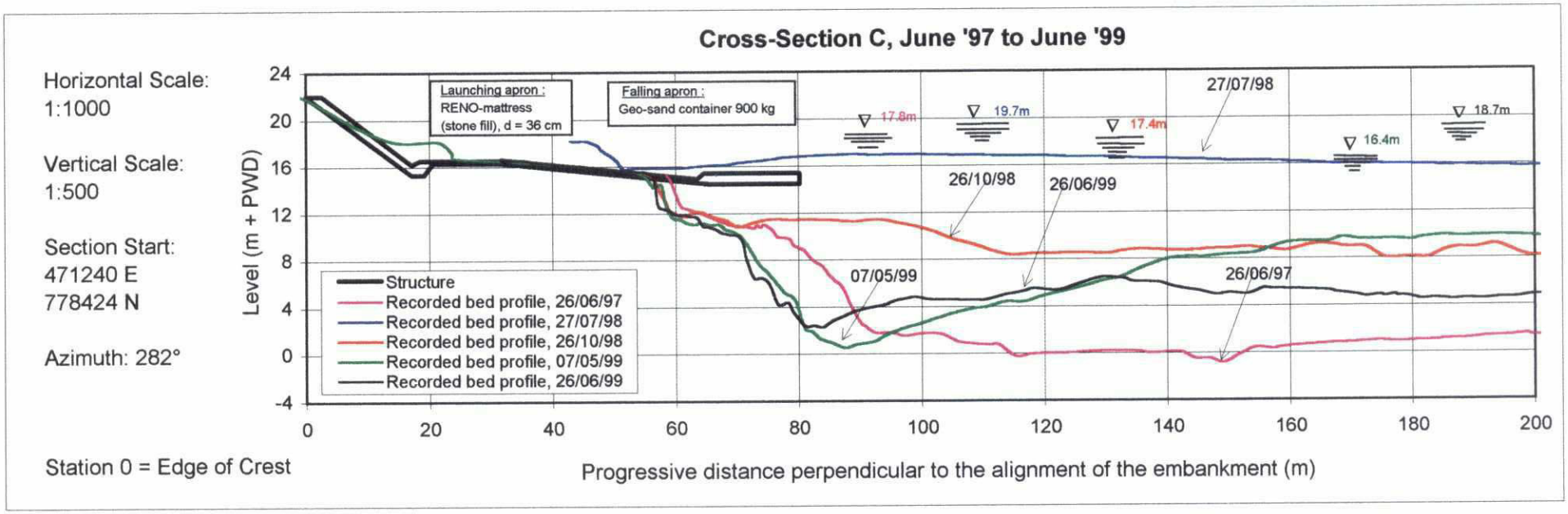
ANNEX I

FAP 21 / Test Site II

- Cross-Sections end of June 1999

BAHADURABAD (FAP 21) - TEST SITE II





BAHADURABAD (FAP 21) - TEST SITE II

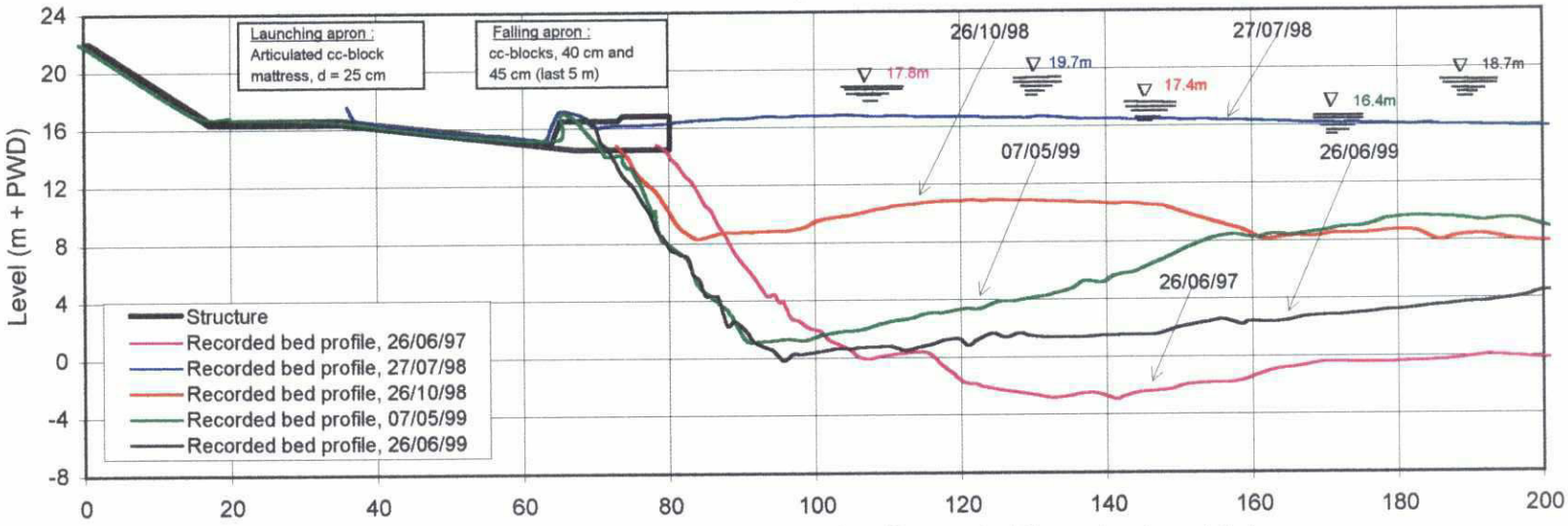
Cross-Section D, June '97 to June '99

Horizontal Scale:
1:1000

Vertical Scale:
1:500

Section Start:
471222 E
778337 N

Azimuth: 282°



Station 0 = Edge of Crest

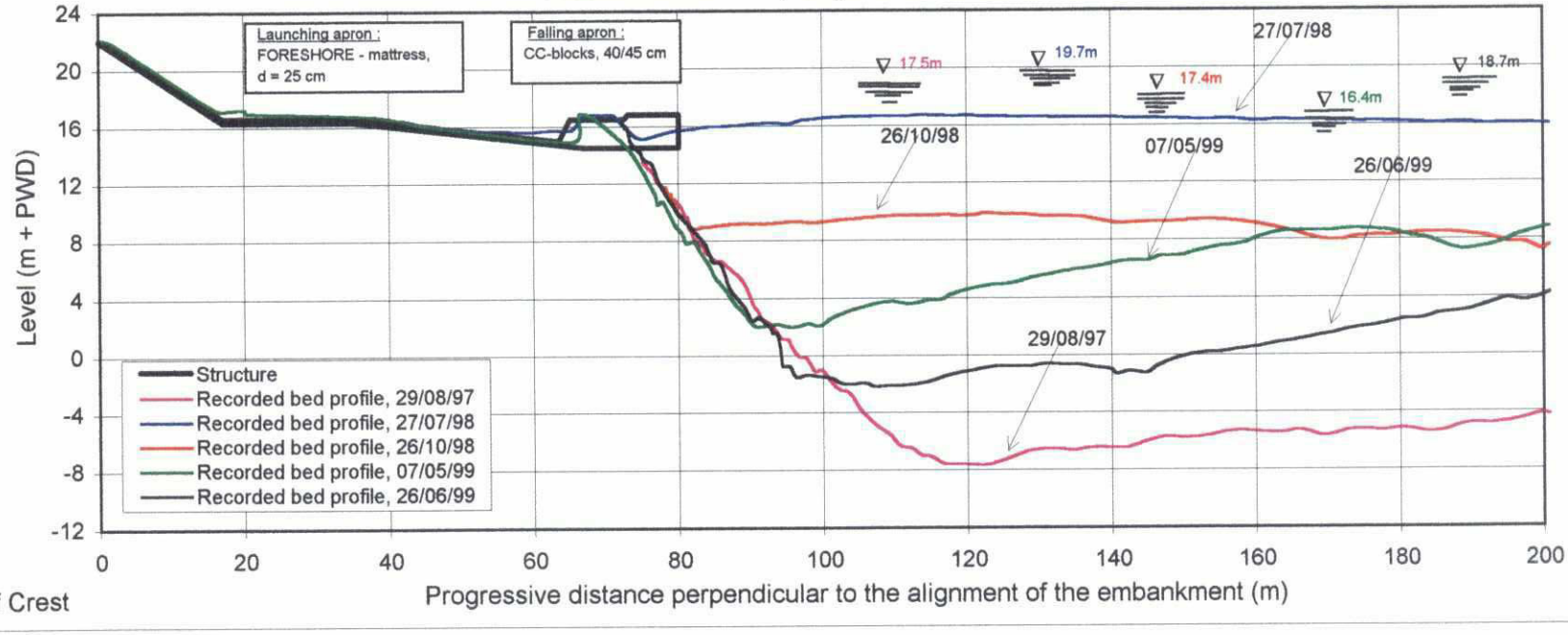
Cross-Section E-1, August '97 to June '99

Horizontal Scale:
1:1000

Vertical Scale:
1:500

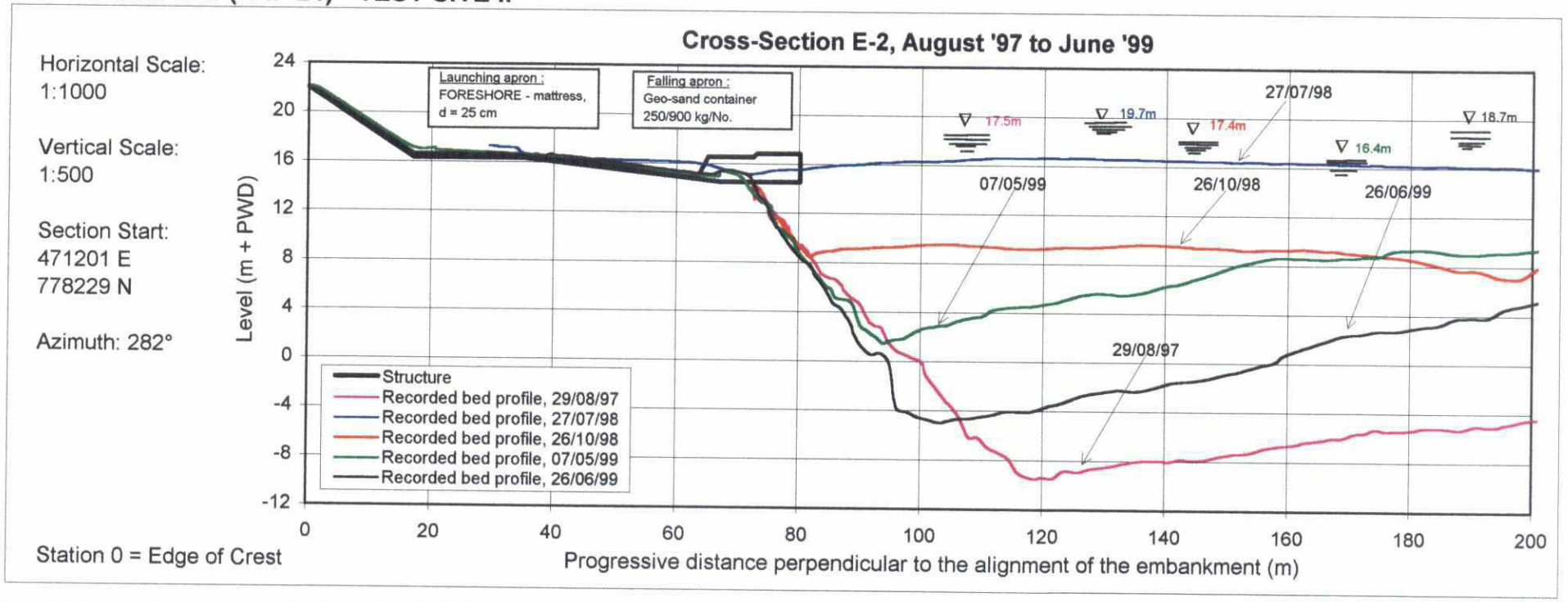
Section Start:
471203 E
778250 N

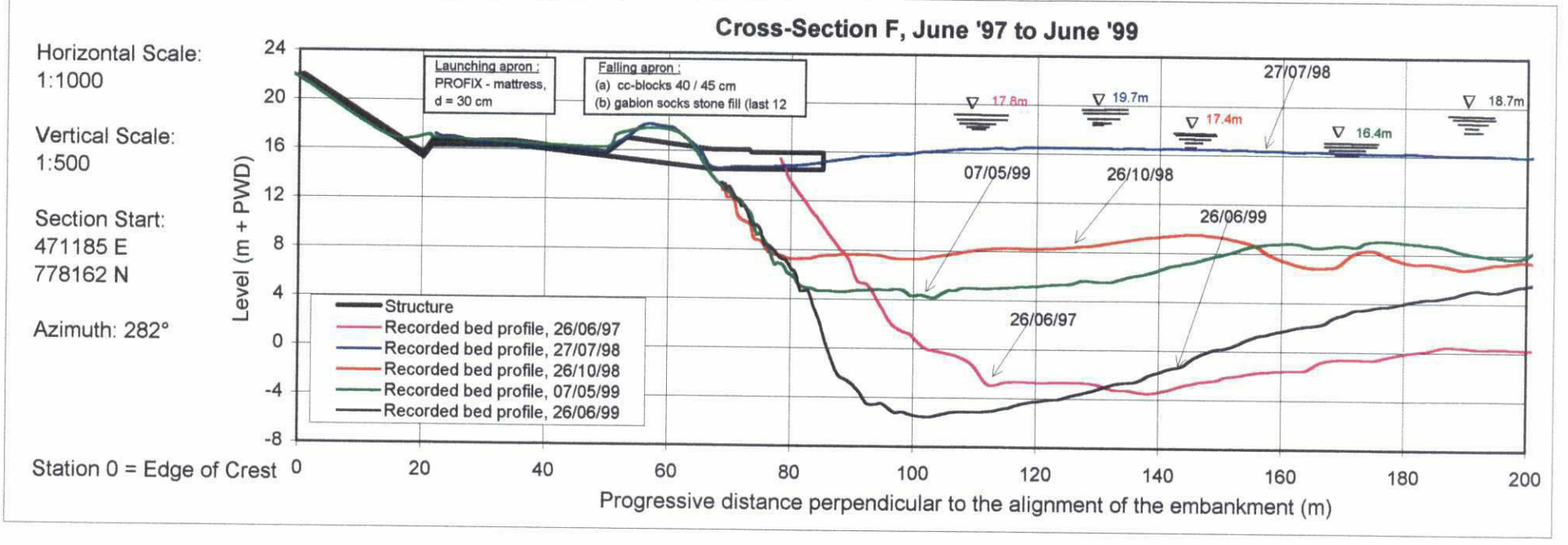
Azimuth: 282°



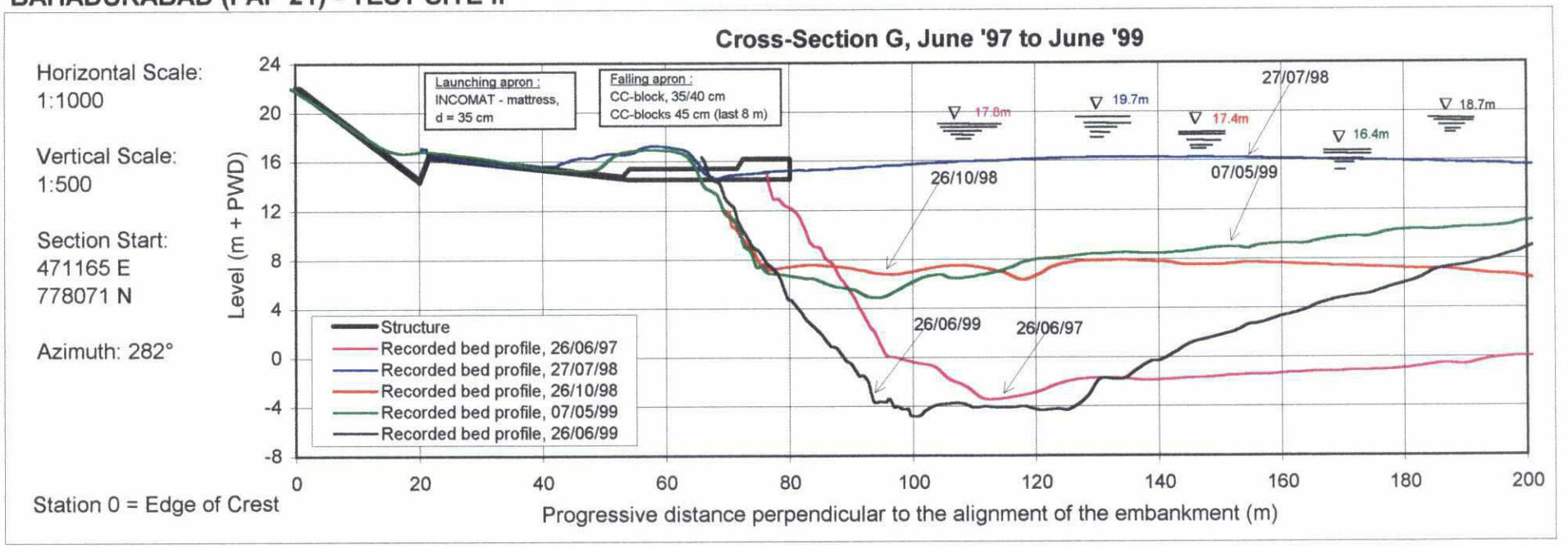
Station 0 = Edge of Crest

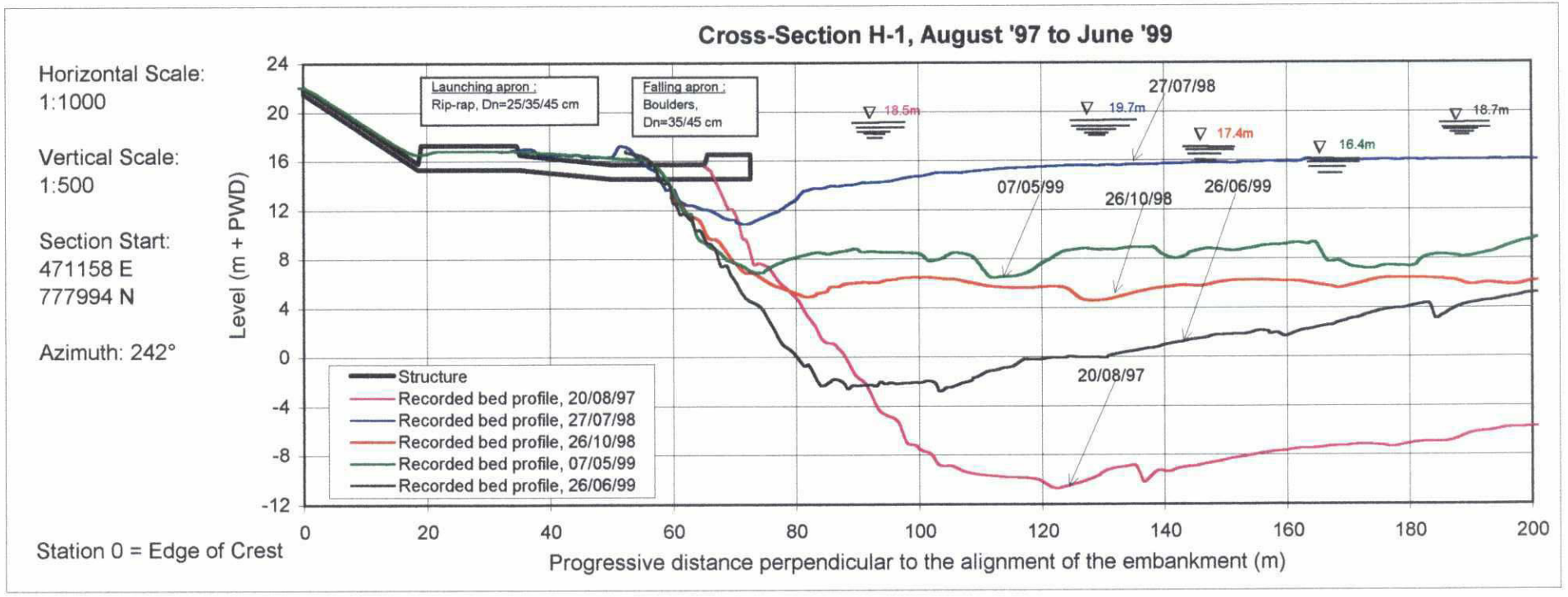
BAHADURABAD (FAP 21) - TEST SITE II



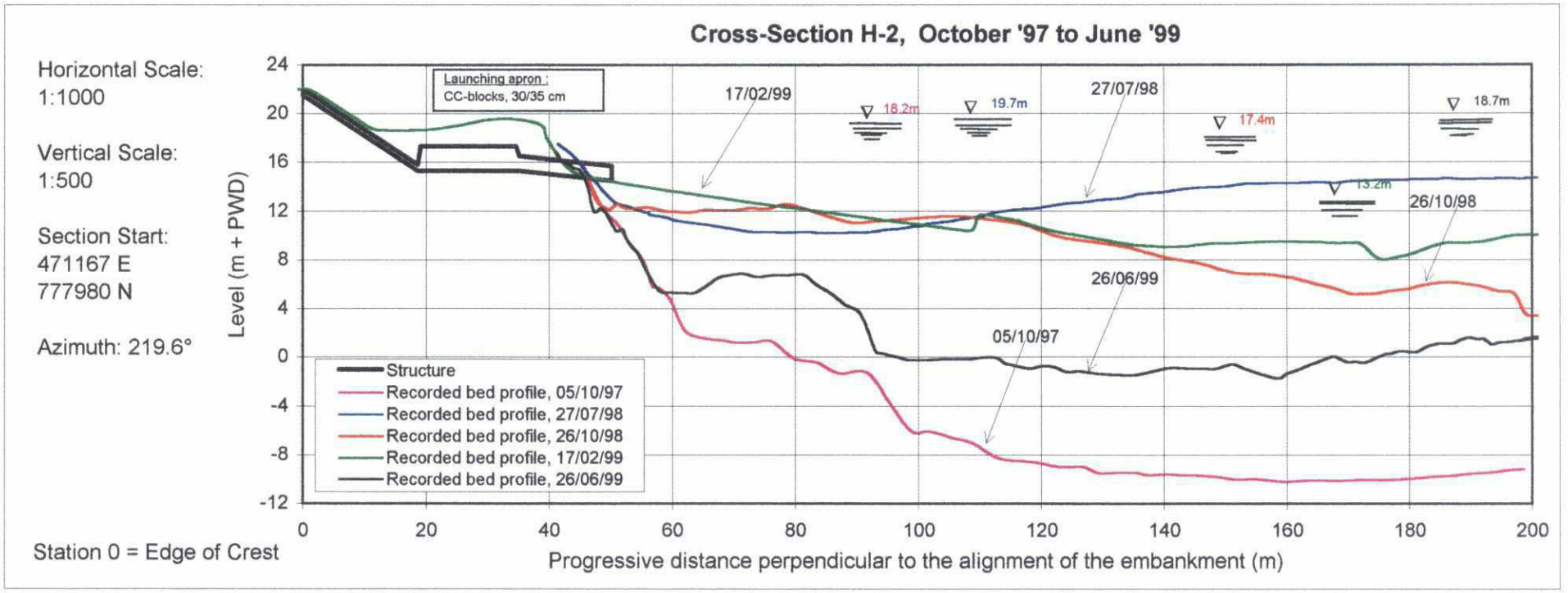


BAHADURABAD (FAP 21) - TEST SITE II





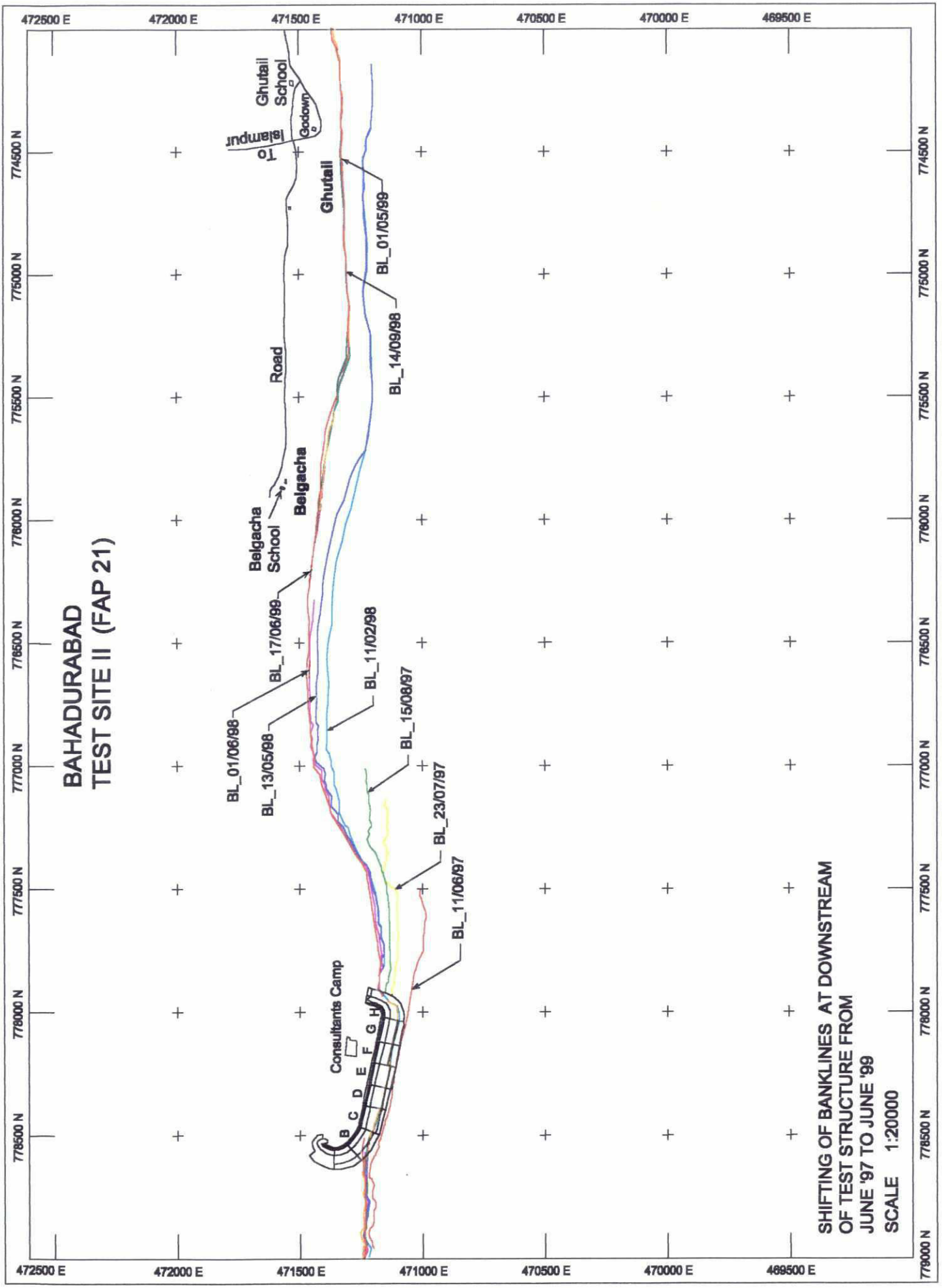
BAHADURABAD (FAP 21) - TEST SITE II



ANNEX K

FAP 21 / Test Site II

- Change of Bankline


BAHADURABAD
TEST SITE II (FAP 21)
SHIFTING OF BANKLINES AT DOWNSTREAM
OF TEST STRUCTURE FROM
JUNE '97 TO JUNE '99
SCALE 1:20000
472500 E
472000 E
471500 E
471000 E
470500 E
470000 E
469500 E
774500 N
775000 N
775500 N
776000 N
776500 N
777000 N
777500 N
778000 N
778500 N
779000 N
Ghutail School
Godown
To Islampur
Ghutail
Road
Belgacha
Belgacha School
Consultants Camp
B
C
D
E
F
G
H
BL_01/05/99
BL_14/09/98
BL_17/06/99
BL_11/02/98
BL_15/08/97
BL_23/07/97
BL_11/06/97
BL_01/06/98
BL_13/05/98

ANNEX L

FAP 21 / Test Site II

- Photographs

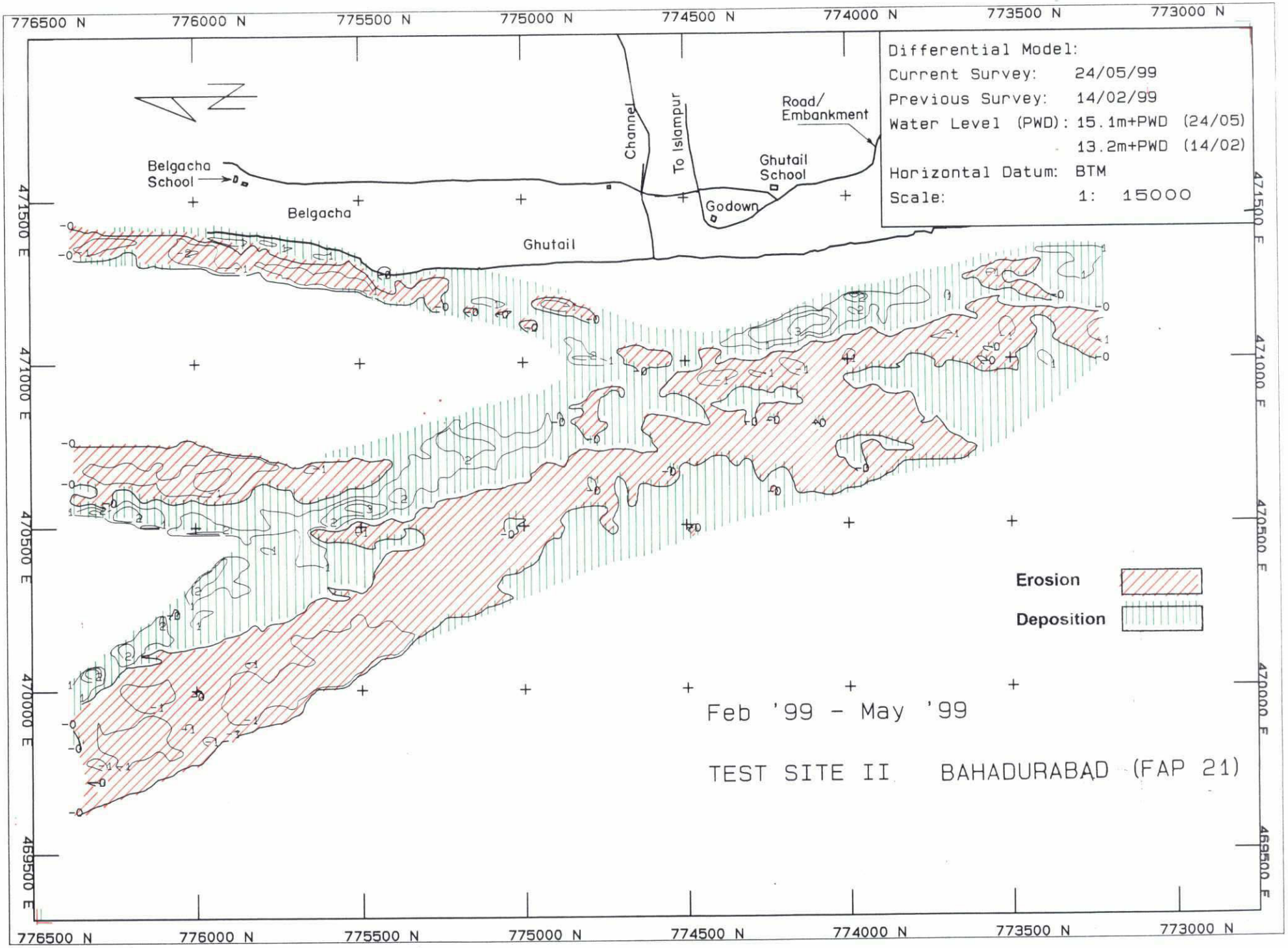
There was no further development at the test site during the period under review.

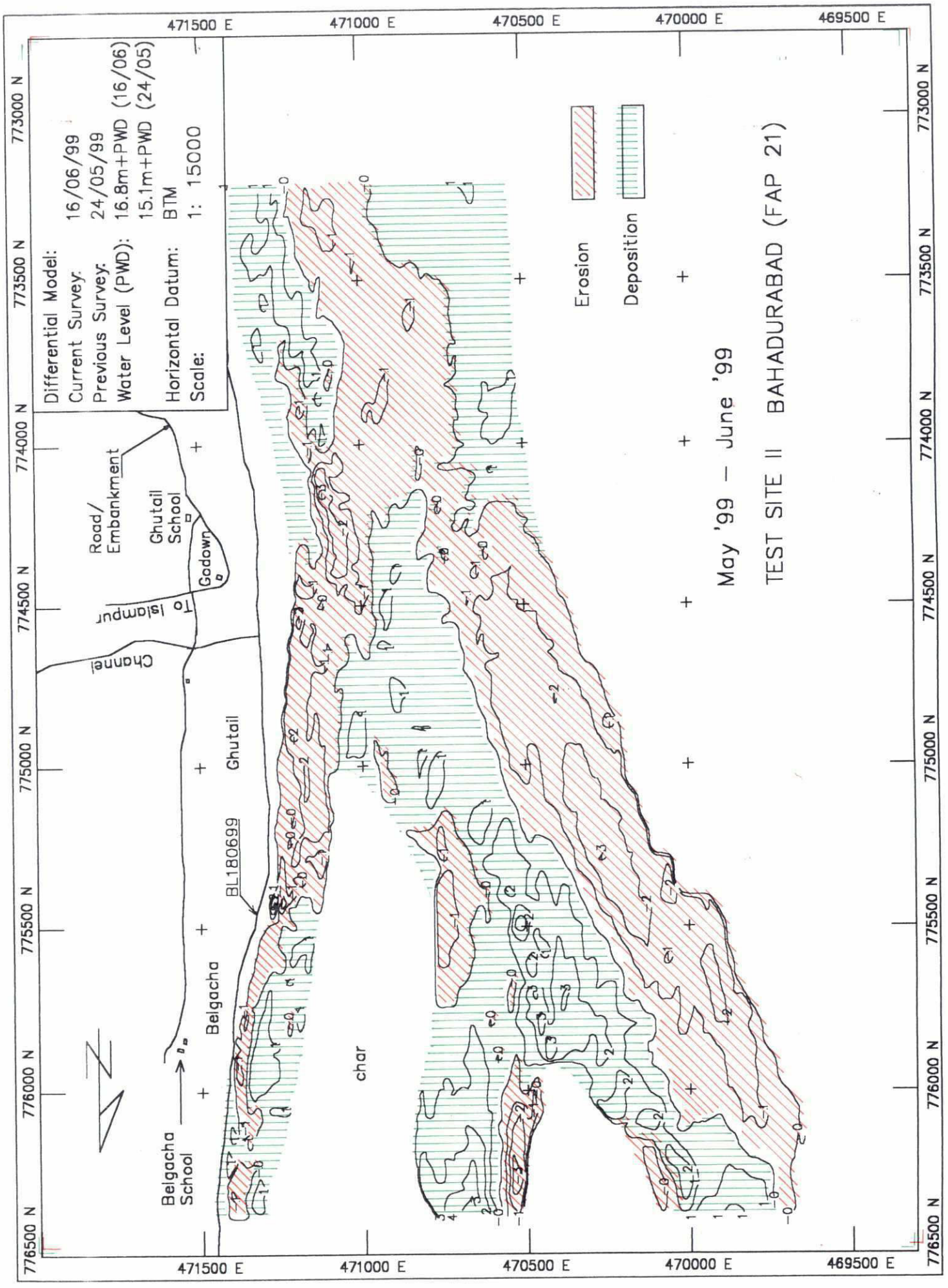
Therefore, there are no photographs.

ANNEX M

FAP 21 / Test Site III

- Differential Models at Ghutail


776500 N
776000 N
775500 N
775000 N
774500 N
774000 N
773500 N
773000 N
471500 E
471000 E
470500 E
470000 E
469500 E
Differential Model:
Current Survey: 24/05/99
Previous Survey: 14/02/99
Water Level (PWD): 15.1m+PWD (24/05)
13.2m+PWD (14/02)
Horizontal Datum: BTM
Scale: 1: 15000
Belgacha School
Belgacha
Ghutail
Channel
To Islampur
Road/ Embankment
Ghutail School
Godown
Erosion
Deposition
Feb '99 - May '99
TEST SITE II BAHADURABAD (FAP 21)


TEST SITE II BAHADURABAD (FAP 21)
May '99 – June '99
Erosion
Deposition
Differential Model:
Current Survey:
Previous Survey:
Water Level (PWD):
Horizontal Datum:
Scale:
16/06/99
24/05/99
16.8m+PWD (16/06)
15.1m+PWD (24/05)
BTM
1: 15000
471500 E
471000 E
470500 E
470000 E
469500 E
773000 N
773500 N
774000 N
774500 N
775000 N
775500 N
776000 N
776500 N
Road/ Embankment
Ghutail School
Godown
To Islampur
Channel
Ghutail
BL180699
Belgacha
char
Belgacha School

ANNEX N

FAP 21/22

- Table of Contents of
  - Final Evaluation Report;
  - Guidelines, and
  - Design Manual

TABLE OF CONTENTS

OF

FINAL EVALUATION REPORT

BANK PROTECTION AND RIVER TRAINING/AFPM PILOT PROJECT
FAP 21/22

FINAL EVALUATION REPORT

Table of Contents

4 THE GROYNE TEST STRUCTURE

202

LIST OF ANNEXES

TABLE OF CONTENTS

OF

GUIDELINES

BANK PROTECTION AND RIVER TRAINING/AFPM PILOT PROJECT
FAP 21/22

GUIDELINES FOR PLANNING, DESIGN AND IMPLEMENTATION OF RIVER TRAINING AND BANK PROTECTION WORKS

Table of Contents

5 PREPARATORY INVESTIGATIONS AND STUDIES

6 GENERAL PLANNING REQUIREMENTS

15 CONSTRUCTION MATERIALS

16 CONSTRUCTION METHODS

17 CONSTRUCTION EQUIPMENT

(to be detailed)

750

TABLE OF CONTENTS

OF

DESIGN MANUAL

BANK PROTECTION AND RIVER TRAINING/AFPM PILOT PROJECT
FAP 21/22

DESIGN MANUAL
FOR
RIVER TRAINING AND BANK PROTECTION WORKS

Table of Contents