FAP24

Government of the People's Republic of Bangladesh

Water Resources Planning Organization

European Commission

Delft Hydraulics

Danish Hydraulic Institute

Hydroland

Approtech

Osiris

RIVER SURVEY PROJECT

Special Report No.22

River Data Book January 1993 - March 1995

Part B.10: Arial Khan

October 1996

Special Report 22

River Data Book
January 1993 - March 1995

Part B.10: Arial Khan Off-take

October 1996

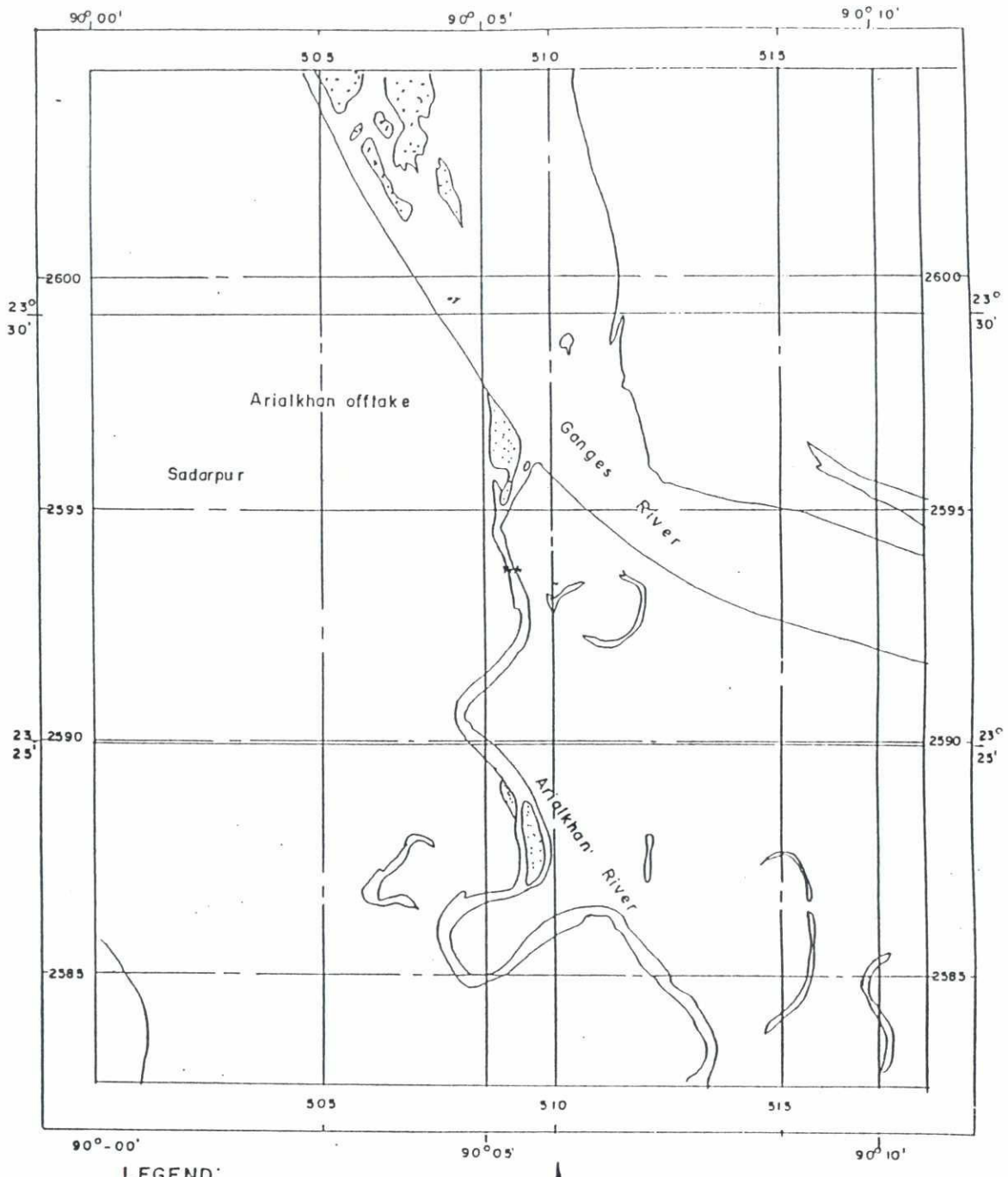
Contents of entire Data Book

Part A: Text volume

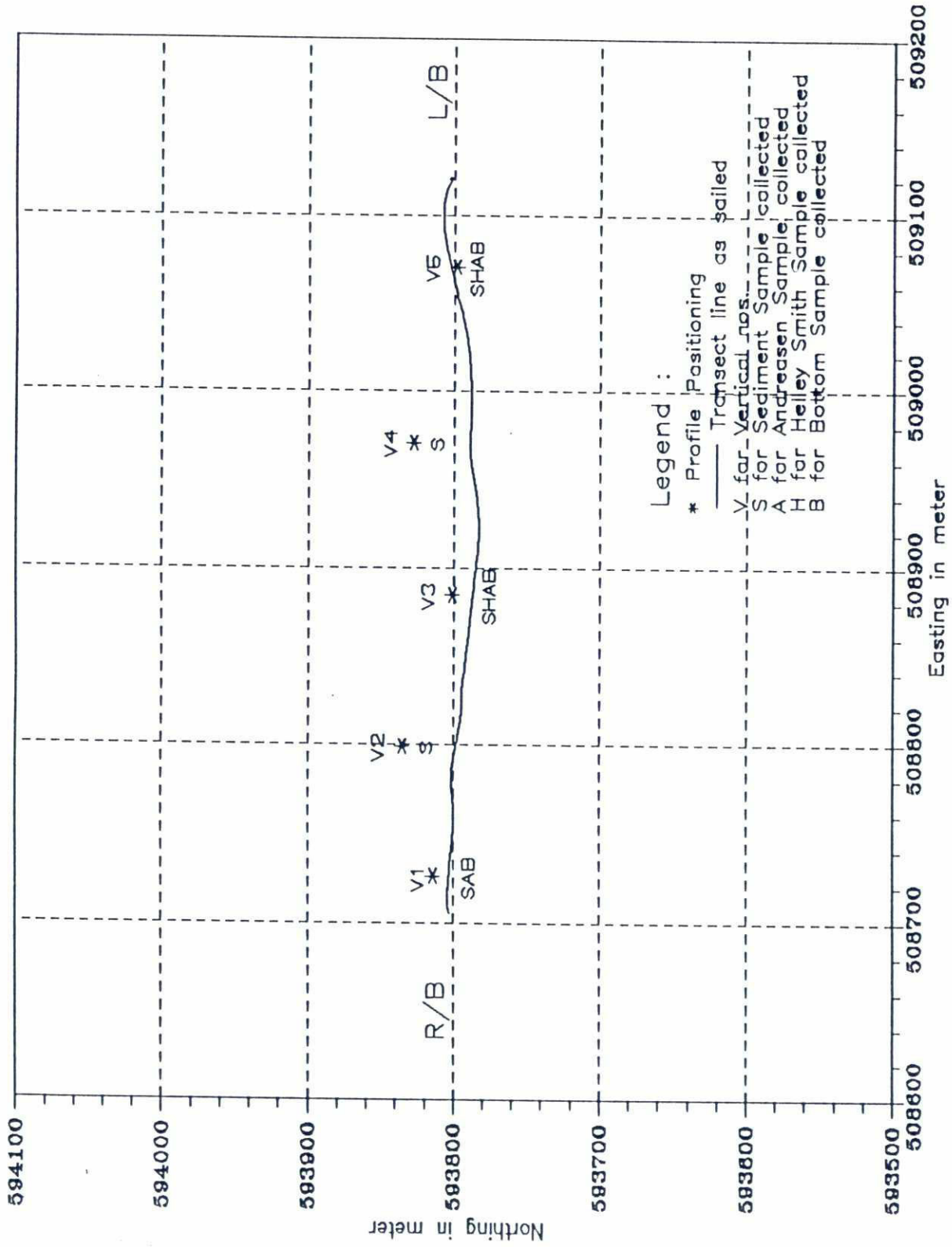
Part B: Routine gauging January 1993 - March 1995

Part C: Special surveys June 1994 - March 1995

Contents of Part B.10



FAP 24 RIVER SURVEY PROJECT Delft Hydraulics/Danish Hydraulic Institute in association with Osiris/Approtech/Hydroland DELFT-DHI		Survey Bulletin No. 19 - Oct., 1993	
		Location No 10 : Arial Khan River Offtake	
File:	Date:	KEY PLAN	Fig.
Scale:	Init:		



FAP 24
DELFT - DHI

RIVER SURVEY PROJECT
Flood Plan Coordination Organization
Commission of the European Communities

Survey Bulletin 19 : October 1993

Location 10 : Arial Khan River, Arial Khan Offtake

Date :

Init :

Location of Measurments

River : Arial Khan
ADCP/EMF Discharge

Date of Survey : 08 October 1993
Location : Arial Khan River at Arial Khan Offtake
Station No. 10

Date	Transect	Bank		Water Level	Total Width	Area	Discharge
		From	To	(m+PWD)	(m)	(sq.m)	(cumec)
08/10/93	O3A81T02	Right	Left	5.65	440	2962	2190
08/10/93	O3A81T03	Left	Right	5.65	428	2945	2124
08/10/93	O3A81T06	Left	Right	5.61	435	3010	2155
08/10/93	O3A81T07	Right	Left	5.61	435	3018	2238

Table 3.1 SUMMARY OF RESULTS (ADCP/EMF-discharge)

River : Arial Khan
S4 velocity

Date of Survey : 08 October 1993
Location : Arial Khan River at Arial Khan Offtake
Station No. 10

Vertical 1	
Total depth = 12.20 m	
Depth	Velocity
[m]	[m/s]
1.08	1.32
1.98	1.80
4.03	1.91
6.17	1.89
8.08	1.82
9.34	1.67

Vertical 2	
Total depth = 9.60 m	
Depth	Velocity
[m]	[m/s]
1.04	1.49
1.81	1.72
3.60	1.77
5.49	1.65
7.39	1.49
8.49	1.31

Vertical 3	
Total depth = 7.50 m	
Depth	Velocity
[m]	[m/s]
1.04	1.77
2.05	1.74
4.08	1.73
6.12	1.61
8.25	1.40
8.41	1.32

Vertical 4	
Total depth = 6.90 m	
Depth	Velocity
[m]	[m/s]
1.00	1.17
2.38	1.01
4.73	0.92
7.10	1.04
9.44	1.04
11.26	0.90

Vertical 5	
Total depth = 5.30 m	
Depth	Velocity
[m]	[m/s]
1.00	1.17
2.38	1.01
4.73	0.92
7.10	1.04
9.44	1.04
11.26	0.90

Qw = 1990 (m^3/s)

Table 3.2 SUMMARY OF RESULTS (S4 Current)

River : Arial Khan
Concentration

Date of Survey : 08 October 1993
Location : Arial Khan River at Arial Khan Offtake
Station No. 10

Vertical 1	
Total depth = 12.20 m	
Depth	Conc.
[m]	[mg/l]
0.50	496.50
2.51	682.68
4.88	739.86
7.42	862.92
9.91	897.40
12.03	956.29

Vertical 2	
Total depth = 9.60 m	
Depth	Conc.
[m]	[mg/l]
0.50	489.36
1.70	542.51
3.33	741.61
5.00	937.02
6.63	943.68
9.28	1103.26

Vertical 3	
Total depth = 7.50 m	
Depth	Conc.
[m]	[mg/l]
0.50	652.63
1.50	910.59
3.00	1123.08
4.50	1313.77
6.00	1425.61
7.00	1487.01

Vertical 4	
Total depth = 6.90 m	
Depth	Conc.
[m]	[mg/l]
0.51	571.43
1.38	1068.75
2.77	1194.44
4.15	1236.64
5.52	1248.44
6.76	1282.81

Vertical 5	
Total depth = 5.30 m	
Depth	Conc.
[m]	[mg/l]
0.50	1113.09
1.06	1220.48
2.10	1277.61
3.18	1271.43
4.23	1337.40
4.81	1732.43

Qs = 1910 (Kg/s)

Table 3.3 SUMMARY OF RESULTS (Suspended Sediment Concentration)

River : Arial Khan
Bed load

Date of Survey : 08 October 1993
Location : Arial Khan River at Arial Khan Offtake
Station No. 10

Helley-Smith samples		
	Bed load sb in Kg/ms	
Vertical No.	1	2
3	0.004825	0.000992
5	0.000594	–

Table 3.4 SUMMARY of RESULTS (sediment transport, bed load)

River : Arial Khan
Grain size of bed material

Date of Survey : 08 October 1993
Location : Arial Khan River at Arial Khan Offtake
Station No. 10

Sample No.	Date	Time	D16 (mm)	D35 (mm)	D50 (mm)	D90 (mm)	Standard Deviation
DHA-1	08/10/93	10:58	0.065	0.106	0.140	0.240	1.866
DHA-2	08/10/93	12:44	0.101	0.140	0.160	0.230	1.473
DHC-1	08/10/93	11:06	0.088	0.138	0.160	0.233	1.597

Table 3.5 SUMMARY of RESULTS (grain size bed material)

River : Arial Khan
Grain size of Suspended Sediment

Date of Survey : 08 October 1993
Location : Arial Khan River at Arial Khan Offtake
Station No. 10

Sample No.	Date	Time	D16 (mm)	D35 (mm)	D50 (mm)	D90 (mm)	Standard Deviation
A720	08/10/93	10:55	0.003	0.005	0.006	0.015	2.083
A721	08/10/93	12:40	0.004	0.012	0.020	0.084	3.700
A852	08/10/93	11:00	0.007	0.017	0.026	0.061	2.838

Table 3.6 SUMMARY OF RESULTS (grain size suspended sediment)

River : Arial Khan
Grain size of Bed load

Date of Survey : 08 October 1993
Location : Arial Khan River at Arial Khan Offtake
Station No. 10

Sample No.	Date	Time	D35 (mm)	D50 (mm)	D65 (mm)	Standard Deviation
A698	08/10/93	12:35	0.171	0.198	0.230	1.541
A748	08/10/93	12:45	0.191	0.233	0.291	1.633
A354	08/10/93	10:45	0.170	0.205	0.246	1.647

Table 3.7 SUMMARY OF RESULTS (grain size bed load)

Type	Time		File Name	Ver. No.	Easting (meter)	Northing (meter)	DISCHARGE GAUGING					SEDIMENT TRANSPORT GAUGING				
	From	To					ADCP	HYDRO	EMF	S4	MEX	Suspended Sediment Samples	Andreasen Tube Samples	Helley Smith Samples	Integrated Sediment Samples	Bottom Samples
Transect	09:29:58	09:35:38	O3A81T02*				T	T	T							
Transect	09:39:15	09:45:13	O3A81T03				T	T	T							
Transect	14:22:03	14:27:46	O3A81T06				T	T	T							
Transect	14:28:56	14:34:42	O3A81T07				T	T	T							
Profile	10:43:13	11:13:44	O3A82P01	5	509071	593798		P		P						
Profile	10:31:45	11:13:56	O3A81P01	1	508727	593814	P	P	P	P		6	1	1	-	1
Profile	11:57:58	12:28:03	O3A82P02	4	508971	593828		P		P		6	1	-	-	1
Profile	11:15:20	12:58:48	O3A81P04	3	508885	593801	P	P	P			6	-	-	-	-
Profile	12:52:40	13:34:39	O3A82P03	2	508799	593835		P		P		6	1	2	-	1
												6	-	-	-	-

* transect in PSD 24 data base

Date of Survey : 08 October 1993
Location : Arial Khan River at Arial Khan Offtake
Station No. 10

Table 2.1 SURVEY PROGRAMME AS MADE

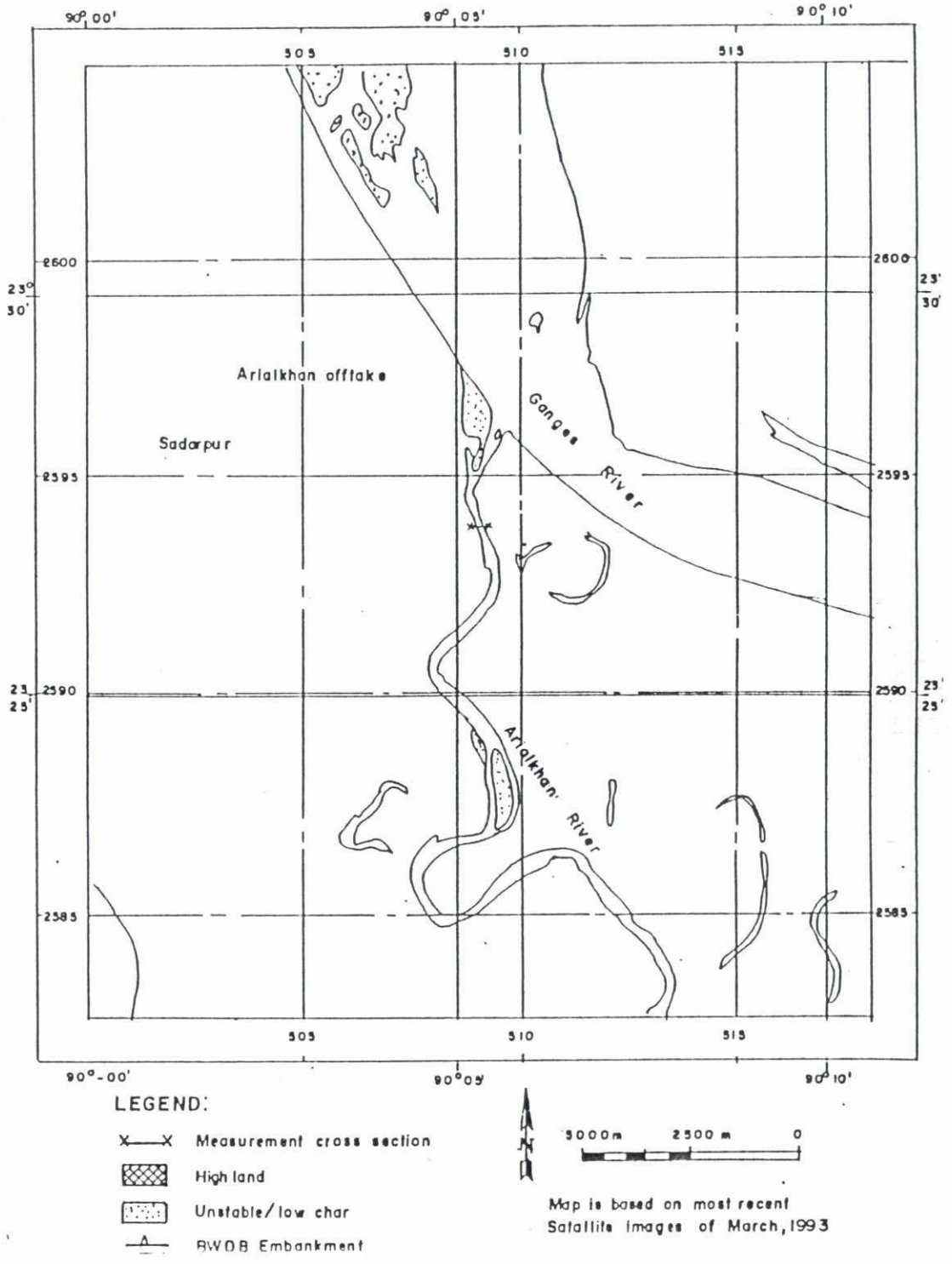
Type Of Samples	Sample Nos.	Total Sample Nos.	Vertical No.
Point Integrated Samples	A788,A797,A791,A796,A793,A795	6	1
	A156,A171,A173,A192,A844,A184	6	2
	A787,A794,A786,A789,A790,A785	6	3
	A188,A147,A152,A175,A166,A182	6	4
	A209,A149,A177,A176,A183,A178	6	5
Andreasen Tube Samples	A720	1	1
	A721	1	3
	A852	1	5
Helley-Smith Samples	A698,A748	2	3
	A354	1	5
Vanveen Samples	DHA-1	1	1
	DHA-2	1	3
	DHC-1	1	5

Date of Survey : 08 October 1993
Location : Arial Khan River at Arial Khan Offtake
Station No. 10

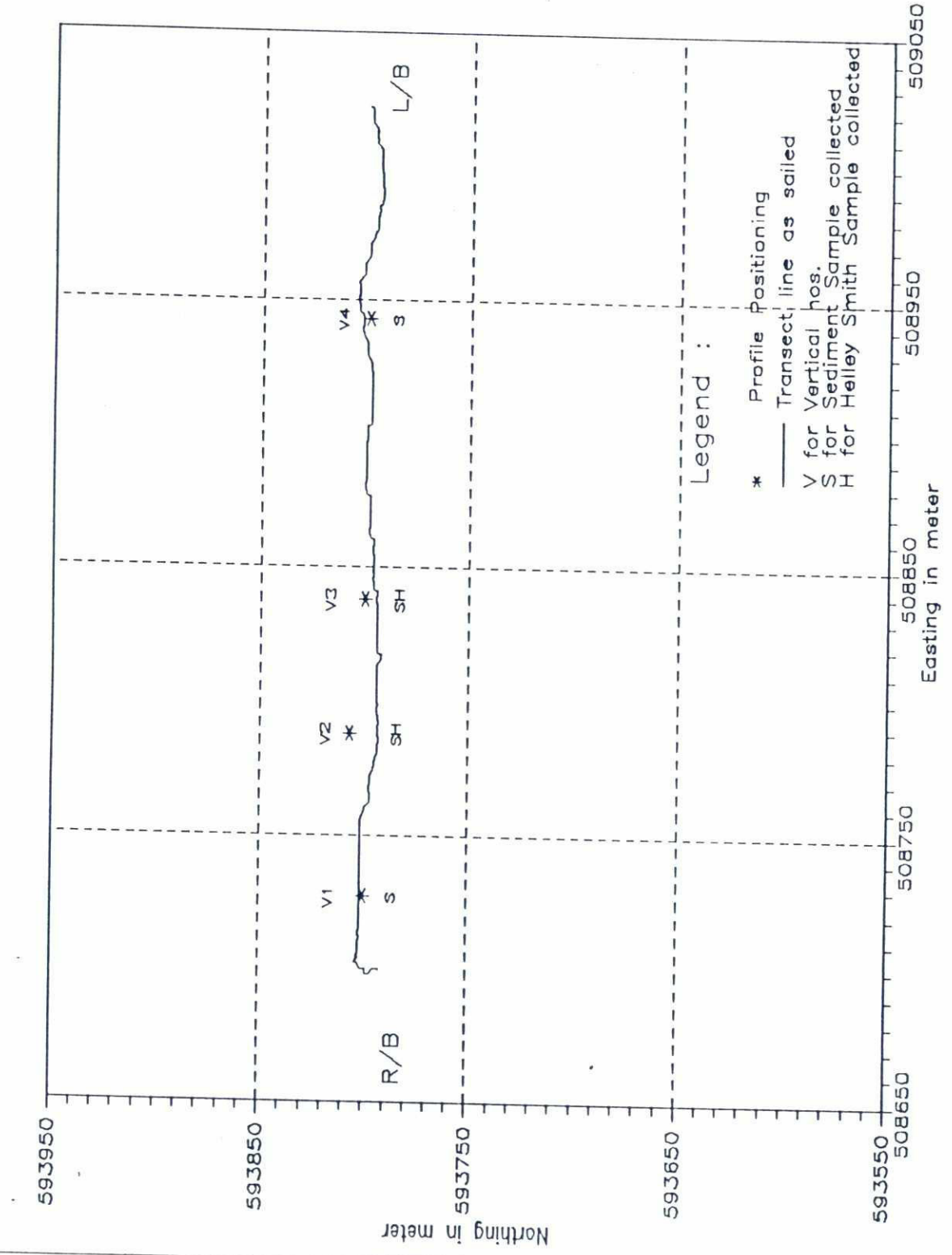
Table 2.2 List of Sediment Samples

Types of Data	Channel	Format	Filename
ADCP/S4/EMF	1	QUATTRO	O3A81T02 .ase
Echosounder	1	QUATTRO	O3A81T02 .ech
Sediment transport data	1	QUATTRO	O3A81T02 .sed
Bed load sediment analysis	1	QUATTRO	O3A81T02 .bdl
Suspended sed. conc. analysis	1	QUATTRO	O3A81T02 .ssc
Transect plot data	1	QUATTRO	O3A81T02 .trs
Iso-velocity plot data	1	MIKE 21	O3A81T02 .ct2 O3A81T02 .dt2

Table 5.1 PSD 24 Database file description



FAP 24 RIVER SURVEY PROJECT DELFT-DHI Delft Hydraulics/Danish Hydraulic Institute in association with Osiris/Approtech/Hydroland		Survey Bulletin 33 - 09 Feb, 1994	
		Location No.10 : Arial Khan river at Arial Khan Offtake	
File:	Date:	KEY PLAN	Fig.
Scale:	Init:		



FAP 24

DELFT - DHI

RIVER SURVEY PROJECT

Flood Plan Coordination Organization

Commission of the European Communities

Survey Bulletin 33 : February 1994

Location 10 : Arial Khan River, Arial Khan Offtake

Date

Init

Location of Measurments

River : Arial Khan
S4 Discharge

Date of Survey : 09 February 1994
Location : Arial Khan River at Arial Khan Offtake
Location No : 10

Date	Profile	Bathy File	Level (m+PWD)	Width (m)	Area (sq.m)	Discharge (cumec)	Sediment Transport (Kg/s)
09/02/94	O4292P01	O4292b01a	6.79	325	1257	171	3.89
09/02/94	O4292P02	O4292b01b	6.79	313	1184	167	3.83
09/02/94	O4292P03	O4292b03	6.79	322	1237	165	3.86
09/02/94	O4292P04						

Table 3.1 SUMMARY OF RESULTS (S4-discharge)

River : Arial Khan
S4 Velocity

Date of Survey : 09 February 1994
Location : Arial Khan River at Arial Khan Offtake
Location No : 10

Vertical 1	
Total depth = 6.70 m	
Depth	Velocity
[m]	[m/s]
1.37	0.12
2.67	0.10
4.11	0.09
5.47	0.07
6.30	0.07

Vertical 2	
Total depth = 4.20 m	
Depth	Velocity
[m]	[m/s]
0.90	0.16
2.67	0.14
3.40	0.12

Vertical 3	
Total depth = 1.70 m	
Depth	Velocity
[m]	[m/s]
0.37	0.21
1.10	0.24
1.30	0.23

Vertical 4	
Total depth = 4.00 m	
Depth	Velocity
[m]	[m/s]
0.76	0.20
2.37	0.15
3.20	0.21

Table 3.2 SUMMARY OF RESULTS (S4 Current)

River : Arial Khan
Concentration

Date of Survey : 09 February 1994
Location : Arial Khan River at Arial Khan Offtake
Location No : 10

Vertical 1	
Total depth = 6.70 m	
Depth	Conc.
[m]	[mg/l]
0.50	30.10
1.37	32.31
2.67	32.66
4.11	32.54
5.47	33.05
6.30	48.10

Vertical 2	
Total depth = 4.20 m	
Depth	Conc.
[m]	[mg/l]
0.90	13.70
2.67	16.61
3.40	26.28

Vertical 3	
Total depth = 1.70 m	
Depth	Conc.
[m]	[mg/l]
0.37	15.98
1.10	16.89
1.30	23.46

Vertical 4	
Total depth = 4.00 m	
Depth	Conc.
[m]	[mg/l]
0.76	20.78
2.37	22.55
3.20	24.63

Table 3.3 SUMMARY OF RESULTS (Suspended Sediment Concentration)

River : Arial Khan
Bed load

Date of Survey : 09 February 1994
Location : Arial Khan River at Arial Khan Offtake
Location No : 10

Helley-Smith samples		
Vertical no.	Bed load sb in Kg/ms	
	1	2
2	0.001505	0.007840
3	0.000040	-

Table 3.4 SUMMARY of RESULTS (sediment transport, bed load)

River : Arial Khan
Grain size of bed material

Date of Survey : 09 February 1994
Location : Arial Khan River at Arial Khan Offtake
Location No : 10

Sample No	Date	Time	D35 (mm)	D50 (mm)	D65 (mm)	Standard Deviation
A359	09/02/94	11:35	0.091	0.121	0.155	1.821
A338	09/02/94	11:55	0.095	0.121	0.152	1.711
A917	09/02/94	12:30	0.166	0.200	0.241	1.656

Table 3.5 SUMMARY OF RESULTS (grain size bed load)

Type	Time		File Name	Ver No	Easting (meter)	Northing (meter)	DISCHARGE GAUGING					SEDIMENT TRANSPORT GAUGING				
	From	To					ADCP	HYDRO	EMF	S4	MEX	Suspended Sediment Samples	Andreasen Tube Samples	Helley Smith Samples	Integrated Sediment Samples	Bottom Samples
Transect	09:11:41	09:14:53	O4292T01A*					B								
Transect	09:24:21	09:27:12	O4292T01B					B								
Transect	09:28:26	09:31:21	O4292T03					B								
Profile	10:38	11:00	O4292P01	1	508727	593800		P		P		6	-	-	-	-
Profile	11:30	12:01	O4292P02	2	508788	593807		P		P		3	-	2	-	-
Profile	12:22	12:38	O4292P03	3	508838	593800		P		P		3	-	1	-	-
Profile	12:53	13:22	O4292P04	4	508943	593799		P		P		3	-	-	-	-

* transect in PSD 24 data base

Date of Survey : 09 February 1994
Location : Arial Khan River at Arial Khan Offtake
Location No : 10

Table 2 1 SURVEY PROGRAMME AS MADE

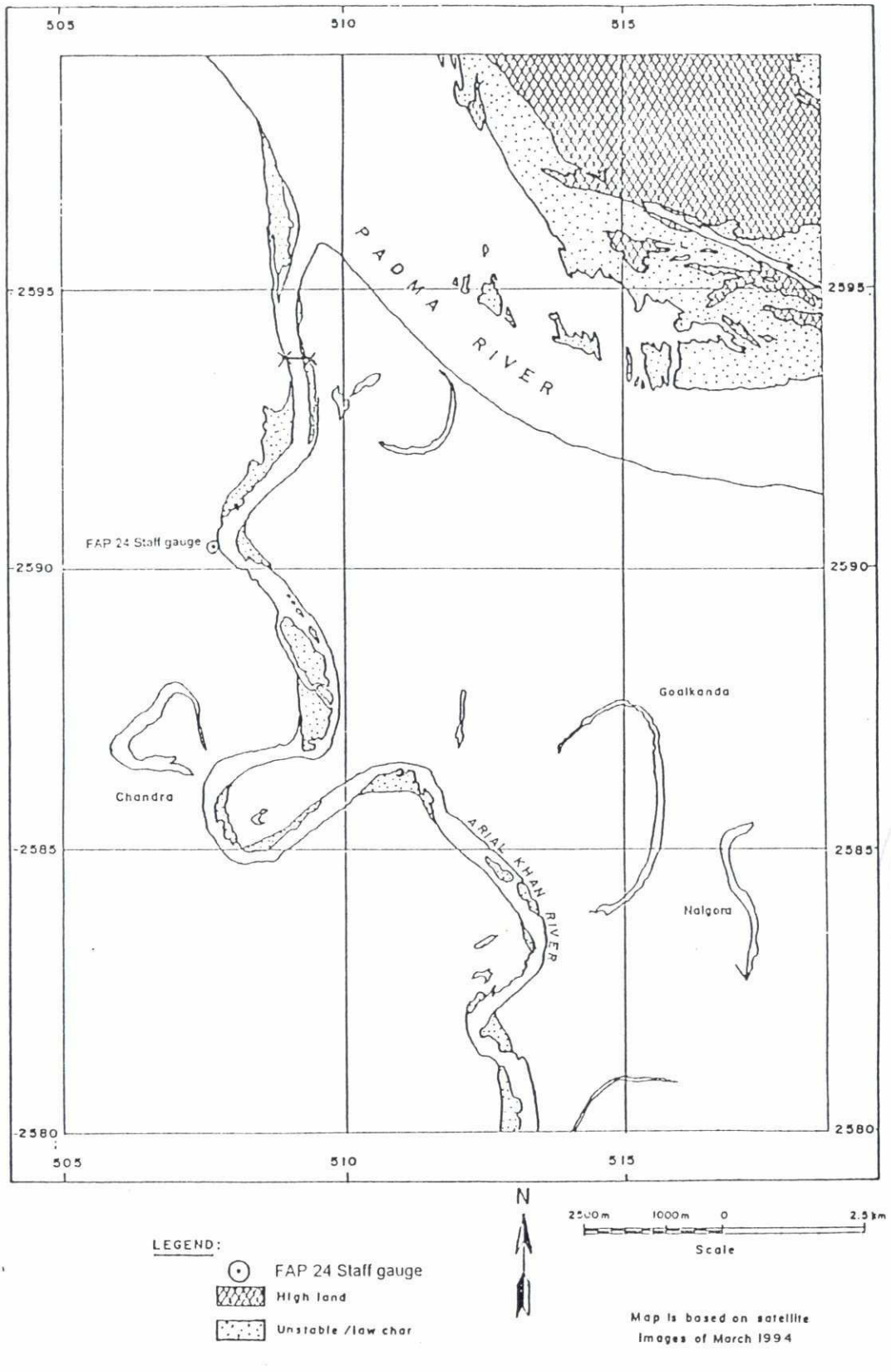
Type Of Samples	Sample Nos.	Total Sample Nos.	Vertical No.
Point Integrated Samples	A1323,A1315,A1324,A1318,A1326,A1317	6	1
	A1336,A1314,A1335	3	2
	A1303,A1256,A1302	3	3
	A1334,A1321,A1251	3	4
Helley Smith samples	A359,A338	2	2
	A917	1	3

Date of Survey : 09 February 1994
Location : Arial Khan River at Arial Khan Offtake
Location No : 10

Table 2.2 List of Sediment Samples

Types of Data	Channel	Format	Filename
ADCP/S4/EMF	1	QUATTRO	O4292T01A .ase
Echosounder	1	QUATTRO	O4292T01A .ech
Sediment transport data	1	QUATTRO	O4292T01A .sed
Bed load sediment analysis	1	QUATTRO	O4292T01A .bdl
Suspended sed conc analysis	1	QUATTRO	O4292T01A .ssc
Transect plot data	1	QUATTRO	O4292T01A .trs
Iso-velocity plot data	1	MIKE 21	O4292T01A .ct2 O4292T01A .dt2

Table 5.1 PSD 24 Database file description



FAP 24 RIVER SURVEY PROJECT DELFT-DHI Delft Hydraulics/Danish Hydraulic Institute in association with Osiris/Approtech/Hydroland		Survey Bulletin No. 46 - March 1994 Location No.10 : Arial Khan River Offtake	
File:	Date:	KEY PLAN	Fig.
Scale:	Init:		

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FAP 24

DELFT - DHI

RIVER SURVEY PROJECT

Flood Plan Coordination Organisation

Commission of the European Communities

Survey Bulletin 46 : March 1994

Location 10 : Arial Khan River, Arial Khan Offtake

Date

Init

Location of Measurments

River : Arial Khan
S4 Discharge

Date of Survey : 24 March 1994
Location : Arial Khan River, Arial Khan Offtake
Station No. 10

Date	Profile Files	Bathy Files	Water Level (m+PWD)	Total Width (m)	Area (sq.m)	Discharge (cumec)	Sediment Transport (Kg/s)
24/03/94	O43O2P01	O43O2T01	1.52	361	1164	201	2.80
24/03/94	O43O2P02	O43O2T02	1.52	386	1282	226	2.97
24/03/94	O43O2P03						
24/03/94	O43O2P04						

Table 3.1 SUMMARY OF RESULTS (S4-discharge)

River : Arial Khan
S4 Velocity

Date of Survey : 24 March 1994
Location : Arial Khan River, Arial Khan Offtake
Station No. 10

Vertical 1	
Total depth = 5.50 m	
Depth	Velocity
[m]	[m/s]
1.10	0.11
2.18	0.03
3.27	0.07
4.16	0.03

Vertical 2	
Total depth = 3.40 m	
Depth	Velocity
[m]	[m/s]
0.65	0.24
2.04	0.26

Vertical 3	
Total depth = 3.00 m	
Depth	Velocity
[m]	[m/s]
0.60	0.19
1.77	0.26
2.46	0.33

Vertical 4	
Total depth = 2.10 m	
Depth	Velocity
[m]	[m/s]
0.04	0.21
1.14	0.18
1.54	0.21

Table 3.2 SUMMARY OF RESULTS (S4 Current)

Date of Survey : 24 March 1994
Location : Arial Khan River, Arial Khan Offtake

Concentration

Vertical 1	
Total depth = 5.50 m	
Depth	Conc.
[m]	[mg/l]
0.50	6.21
1.10	7.06
2.18	6.19
3.27	7.95
4.16	41.18

Vertical 2	
Total depth = 3.40 m	
Depth	Conc.
[m]	[mg/l]
0.65	2.20
2.04	2.88

Vertical 3	
Total depth = 3.00 m	
Depth	Conc.
[m]	[mg/l]
0.60	8.09
1.77	8.86
2.46	26.78

Vertical 4	
Total depth = 2.10 m	
Depth	Conc.
[m]	[mg/l]
0.40	3.53
1.14	7.12
1.54	21.30

Table 3.3 SUMMARY OF RESULTS (Suspended Sediment Concentration)

Type	Time		File Name	Ver. No.	Easting (meter)	Northing (meter)	DISCHARGE GAUGING					SEDIMENT TRANSPORT GAUGING				
	From	To					ADCP	HYDRO	EMF	S4	MEX	Suspended Sediment Samples	Andreasen Tube Samples	Helley Smith Samples	Integrated Sediment Samples	Bottom Samples
Transect	09:21:50	09:24:49	O43O2T01*					B								
Transect	09:26:12	09:29:12	O43O2T02					B								
Profile	10:25:00	10:53:00	O43O2P01	1	508722	593822	P	P	P	P		5	-	-	-	-
Profile	11:11:00	11:30:00	O43O2P02	2	508839	593794	P	P	P	P		2	-	-	-	-
Profile	11:39:00	11:57:00	O43O2P03	3	508930	593803	P	P	P	P		3	-	-	-	-
Profile	12:19:00	12:36:00	O43O2P04	4	508977	593798	P	P	P	P		3	-	-	-	-

* transect in PSD 24 data base

Date of Survey : 24 March 1994
Location : Arial Khan River, Arial Khan Offtake
Station No. 10

Table 2.1 (SURVEY PROGRAMME AS MADE)

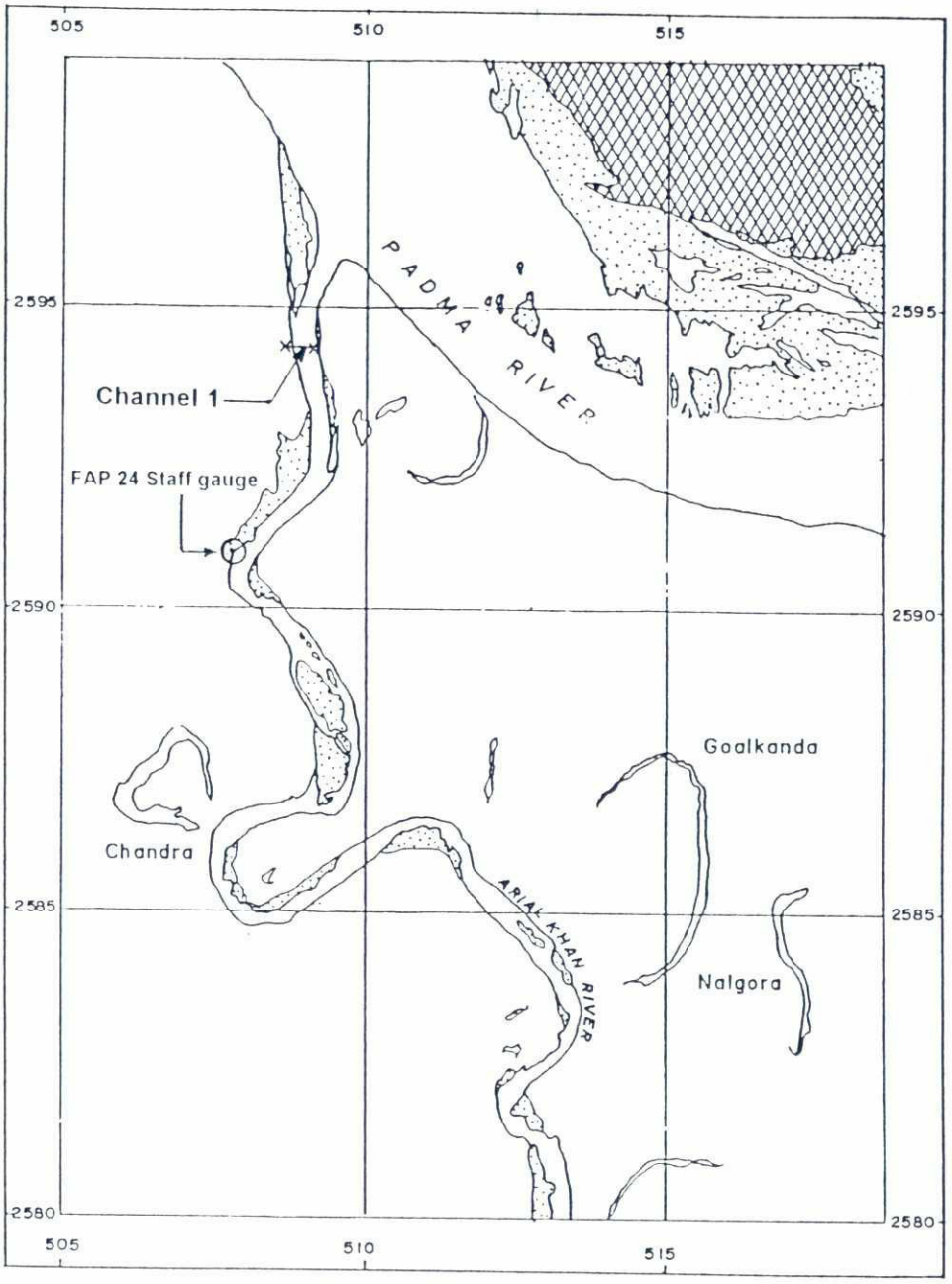
Type Of Samples	Sample Nos.	Total Sample Nos.	Vertical No.
Point Integrated Samples	A1258,A1332,A1219	5	1
	A1218,A1225		
	A1242,A1292	2	2
	A1308,A1176,A1271	3	3
	A1338,A1217,A1269	3	4

Date of Survey : 24 March 1994
Location : Arial Khan River, Arial Khan Offtake
Station No. 10

Table 2.2 List of Sediment Samples

Types of Data	Channel	Format	Filename
ADCP/S4/EMF	1	QUATTRO	O43O2T01 .ase
Echosounder	1	QUATTRO	O43O2T01 .ech
Sediment transport data	1	QUATTRO	O43O2T01 .sed
Bed load sediment analysis	1	QUATTRO	O43O2T01 .bdl
Suspended sed. conc. analysis	1	QUATTRO	O43O2T01 .ssc
Transect plot data	1	QUATTRO	O43O2T01 .trs
Iso-velocity plot data	1	MIKE 21	O43O2T01 .ct2 O43O2T01 .dt2

Table 5.1 PSD 24 Database file description



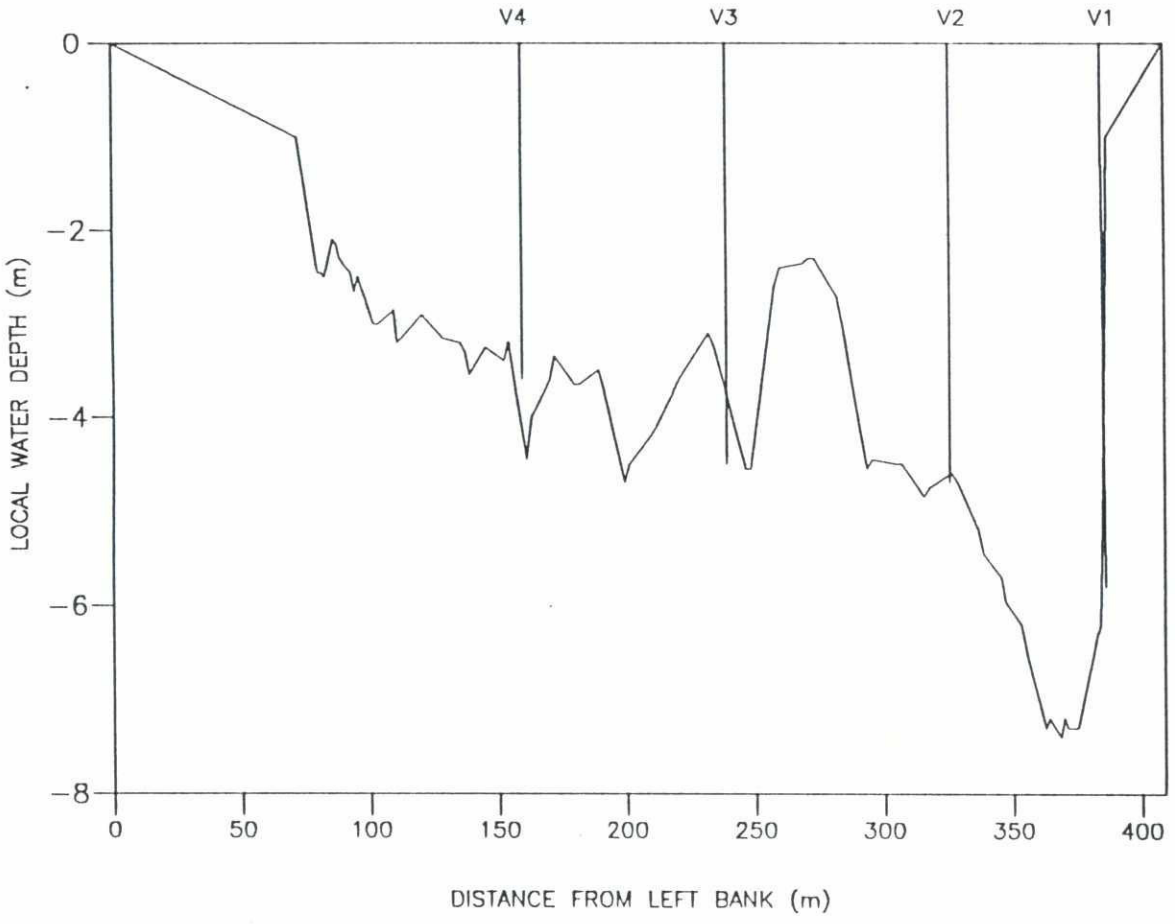
LEGEND:

- Cross section
- High land
- Unstable / low char
- FAP 24 Staff gauge

2500 m 1000 m 0 2.5 km
Scale

Map is based on satellite images of March 1994

FAP 24 DELFT - DHI	RIVER SURVEY PROJECT Flood Plan Coordination Organization Commission of the European Communities	Survey Bulletin 53 : 18 - 19 April, 1994	
		Location 10 : Arial Khan river (offtake)	
	Date : 11 Aug 1994	Location map	page 1.1
	Init : mzh/sjr		



Water level : 7.90 m + PWD measured at the station indicated on page 1.1

FAP 24 DELFT - DHI	RIVER SURVEY PROJECT Flood Plan Coordination Organization Commission of the European Communities	Survey Bulletin 53 : 18 - 19 April, 1994	
		Location 10 : Arial Khan river (offtake)	
File : O44I1T01	Date : 11 Aug 1994	Cross-sections and measured verticals	page
	Init : mzh/sjr	Channel 1	1.2

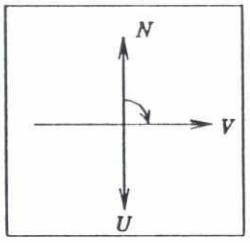
Type of measurement	Method	No. of measurements in channel			
		1	2	3	4
Discharge	ADCP transect	46	-	-	-
	EMF transect	-	-	-	-
	Echo-Sounding	-	-	-	-
Vertical current profile	No.of verticals in channel	4	-	-	-
	ADCP	-	-	-	-
	S4 current meter	43	-	-	-
	Ott current meter	-	-	-	-
Vertical sediment profile	Pump bottle sampling	130	-	-	-
	Andreasen settling tube	-	-	-	-
	MEX turbidity meter	20	-	-	-
	Integrated bottle sampling	7	-	-	-
	Collapsible bag	-	-	-	-
Bed load	Dune tracking	-	-	-	-
	Helley-smith sampler	-	-	-	-
	Delft Bottle	-	-	-	-
Bed material	US BM-54 bed sampler	-	-	-	-
	Van Veen bed sampler	-	-	-	-

Table 2.1: Survey programme as made

Channel 1 File Names	Width (m)	Area (m^2)	AWLR h (m+PWD)	Discharge Q (m^3/s)
O44I1T01 *	409	1289	2.360	256
O44I1T02	413	1286	2.325	267
O44I1T05	406	1272	2.296	430
O44I1T09	393	1273	2.138	450
O44I1T11	391	1247	2.074	454
O44I1T12	402	1292	2.013	301
O44I1T13	381	1235	2.013	300
O44I1T15	396	1252	1.953	153
O44I1T16	403	1208	1.926	195
O44I1T17	345	923	1.909	261
O44I1T19	356	1115	2.001	344
O44I1T21	373	1231	2.207	219
O44I1T22	361	1134	2.207	177
O44I1T23	356	1211	2.269	342
O44J1T02	342	1031	2.324	360
O44J1T03	367	1167	2.227	382
O44J1T07	388	1329	2.137	348
O44J1T09	382	1340	2.079	365
O44J1T11	366	1351	2.033	372
O44J1T18	386	1319	1.949	401
O44J1T19	397	1367	2.085	316
O44J1T21	384	1333	2.160	195
O44J1T22	383	1353	2.161	198
O44J1T23	405	1369	2.117	302
O44J1T24	390	1340	2.117	276

Table 2.2: Key figures

* iso velocity plot & velocity distribution presented

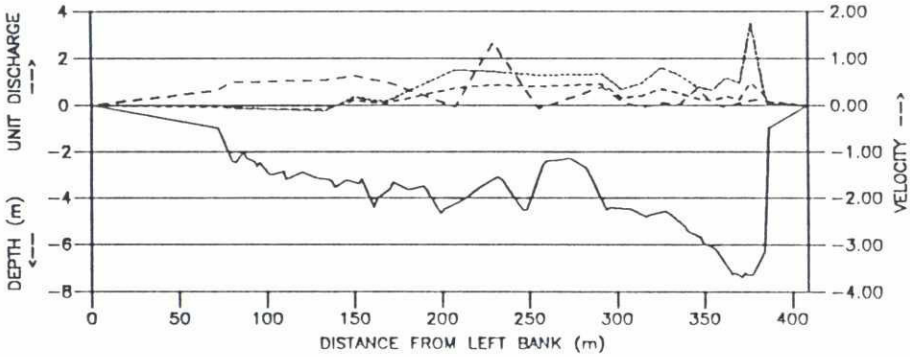


TRANSECT AZIMUTH = 90°

U – VELOCITY NORMAL TO TRANSECT (m/s)

V – VELOCITY PARALLEL TO TRANSECT (m/s)

N – MAGNETIC NORTH



FLOW

LEGEND :

WATER DEPTH (m below STAGE)

UNIT DISCHARGE (m²/s.m)

U (m/s)

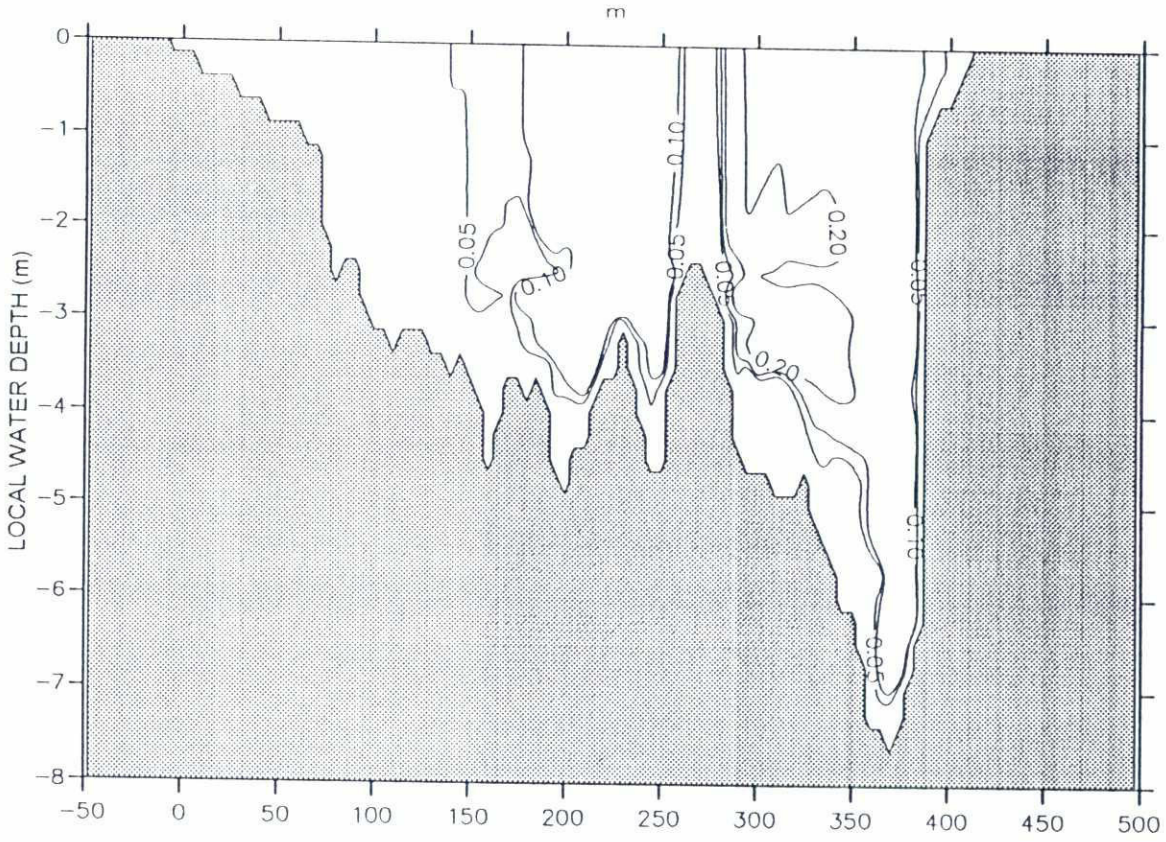
V (m/s)

STAGE = 7.90 (m+PWD)

A = 1289 (m²)

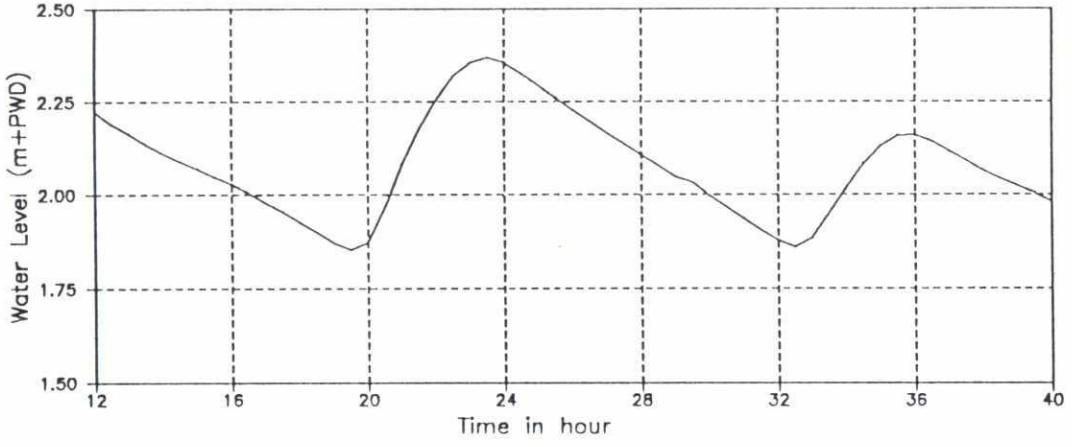
Q = 256 (m³/s)

FAP 24 DELFT - DHI RIVER SURVEY PROJECT Flood Plan Coordination Organization Commission of the European Communities		Survey Bulletin 53 : 18 - 19 April, 1994	
		Location 10 : Arial Khan river (offtake)	
File : O44I1T01	Date : 11 Aug 1994 Init : mzh/sjr	Horizontal distribution of flow Channel 1	page 3.1

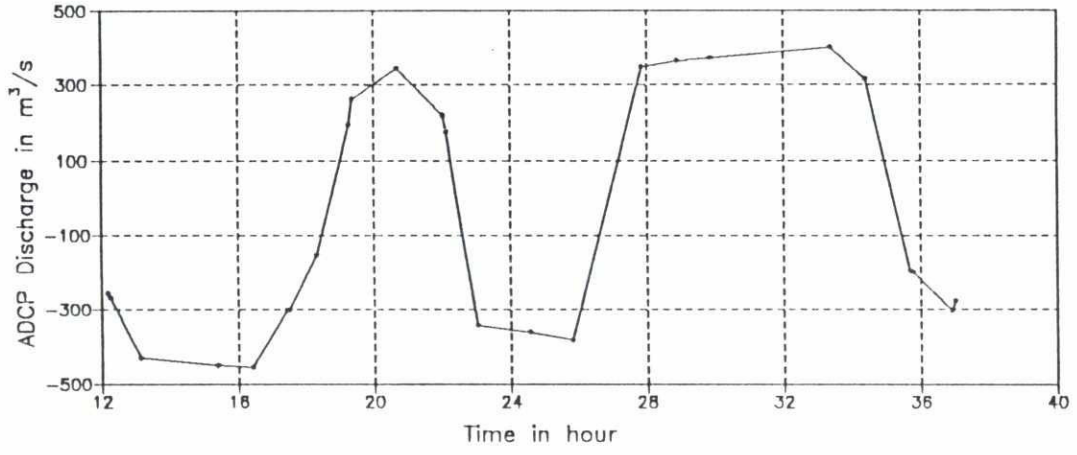


Iso-velocity contours (m/s)
Water level : 7.90 m + PWD measured at the station indicated on page 1.1

FAP 24 DELFT - DHI	RIVER SURVEY PROJECT Flood Plan Coordination Organization Commission of the European Communities	Survey Bulletin 53 : 18 - 19 April, 1994	
		Location 10 : Arial Khan river (offtake)	
File : O44I1T01	Date : 11 Aug 1994	Cross-sectional distribution of flow velocity	page 4.1
	Init : mzh/sjr	Channel 1	



12 hrs. 18/4 | 24 hrs. 19/4 | 12 hrs.



12 hrs. 18/4 | 24 hrs. 19/4 | 12 hrs.

FAP 24 DELFT - DHI	RIVER SURVEY PROJECT Flood Plan Coordination Organization Commission of the European Communities	Survey Bulletin 53 : 18 - 19 April, 1994	
		Location 10 : Arial Khan river (offtake)	
	Date : 11 Aug 1994	Water level and discharge time series	page 5.1
	Init : mzh/sjr		

Method	Channel	Time (YYMMDDHHMM-HHMM)	File name
ADCP & EMF transect	1	9404181210-1213	O44I1T01 *
		9404181215-1219	O44I1T02
		9404181303-1306	O44I1T04
		9404181308-1312	O44I1T05
		9404181405-1408	O44I1T06
		9404181410-1413	O44I1T07
		9404181517-1520	O44I1T08
		9404181523-1525	O44I1T09
		9404181620-1624	O44I1T10
		9404181625-1629	O44I1T11
		9404181726-1729	O44I1T12
		9404181731-1734	O44I1T13
		9404181815-1817	O44I1T14
		9404181819-1822	O44I1T15
		9404181916-1919	O44I1T16
		9404181922-1926	O44I1T17
		9404182031-2035	O44I1T18
		9404182040-2044	O44I1T19
		9404182201-2204	O44I1T21
		9404182206-2210	O44I1T22
		9404182301-2305	O44I1T23
		9404182309-2312	O44I1T24
		9404190026-0029	O44J1T01
		9404190033-0036	O44J1T02
		9404190148-0151	O44J1T03
		9404190154-0157	O44J1T04
		9404190253-0257	O44J1T05
		9404190300-0302	O44J1T06
		9404190351-0355	O44J1T07
		9404190357-0400	O44J1T08
		9404190453-0456	O44J1T09
		9404190458-0501	O44J1T10
		9404190553-0556	O44J1T11
		9404190557-0600	O44J1T12
		9404190658-0701	O44J1T13
		9404190703-0706	O44J1T14
		9404190802-0806	O44J1T15
		9404190808-0811	O44J1T16
		9404190913-0916	O44J1T17
		9404190923-0926	O44J1T18
		9404191024-1028	O44J1T19
		9404191030-1034	O44J1T20
		9404191141-1145	O44J1T21
		9404191147-1150	O44J1T22
		9404191255-1259	O44J1T23
		9404191301-1304	O44J1T24

Table 6.1: ADCP & EMF transects

* : transect in PSD data base and presented in Sections 3 and 4

Method	Channel	Vertical	Time (YYMMDDHHMM-HHMM)	Easting (m)	Northing (m)	Depth (m)	File name
Vertical current & turbidity profiles (ADCP/S4/MEX)	1	2	9404181331-1359	508759	593768	6.70	O44I1P01 *
		3	9404181427-1445	508857	593798	4.10	O44I1P02
		4	9404181545-1611	508937	593796	4.50	O44I1P03
		2	9404181652-1722	508784	593817	4.60	O44I1P04
		3	9404181750-1809	508847	593804	3.90	O44I1P05
		4	9404181832-1900	508954	593787	3.60	O44I1P06
		2	9404181943-2017	508805	593800	4.45	O44I1P08
		3	9404182106-2136	508863	593819	3.40	O44I1P09
		4	9404182224-2251	508941	593807	3.40	O44I1P10
		2	9404182339-2354	508774	593818	4.70	O44I1P11
		1	9404181341-1352	508714	593792	5.80	O44I2P01 *
		1	9404181428-1451	508716	593790	7.00	O44I2P02 *
		1	9404181548-1607	508692	593793	5.70	O44I2P03 *
		1	9404181655-1718	508712	593790	5.70	O44I2P04 *
		1	9404181752-1810	508720	593788	5.70	O44I2P07 *
		1	9404181833-1853	508720	593797	5.70	O44I2P08 *
		1	9404181943-2005	508722	593786	7.10	O44I2P09 *
		1	9404182109-2127	508711	593788	5.90	O44I2P10 *
		1	9404182225-2253	508714	593779	5.90	O44I2P11 *
		1	9404182341-2357	508714	593779	6.40	O44I2P12 *
		1	9404182355-0112	508726	593783	6.60	O44I2P13 *
		3	9404190054-0121	508839	593807	2.80	O44J1P01
		4	9404190221-0245	508942	593813	4.50	O44J1P02
		2	9404190315-0340	508778	593802	4.90	O44J1P03
		3	9404190415-0440	508857	593812	4.30	O44J1P04
		4	9404190518-0547	508939	593804	3.60	O44J1P05
		2	9404190613-0643	508781	593794	5.00	O44J1P06
		3	9404190716-0749	508857	593793	3.80	O44J1P08
		4	9404190827-0900	508933	593802	3.90	O44J1P09
		2	9404190937-1004	508788	593811	4.70	O44J1P10
		3	9404191054-1124	508857	593810	3.90	O44J1P11
		4	9404191209-1235	508931	593810	3.75	O44J1P12
		1	9404190222-0241	508714	593772	5.70	O44J2P01 *
		1	9404190317-0340	508726	593783	5.70	O44J2P02 *
		1	9404190416-0433	508707	593785	5.70	O44J2P03 *
		1	9404190522-0540	508726	593783	5.70	O44J2P04 *
		1	9404190830-0854	508720	593781	6.40	O44J2P07 *
		1	9404190940-0959	508719	593772	6.40	O44J2P08 *
		1	9404191056-1113	508717	593751	6.40	O44J2P09 *
		1	9404191218-1234	508720	593770	6.40	O44J2P10 *
		1	9404191316-1345	508722	593779	6.40	O44J2P12 *

Table 6.2: Vertical profiles

* MEX not available

Method	Channel	Vertical	No. of samples	Time (YYMMDDHHMM-HHMM)	Easting (m)	Northing (m)	Depth (m)
Suspended sediments (pump bottle)	1	2	3	9404181331-1359	508759	593768	4.70
		3	2	9404181427-1445	508857	593798	4.10
		4	3	9404181545-1611	508937	593796	4.50
		2	3	9404181652-1722	508784	593817	4.60
		3	2	9404181750-1809	508847	593804	3.90
		4	3	9404181832-1900	508954	593787	3.60
		2	3	9404181943-2017	508805	593800	4.45
		3	3	9404182106-2136	508863	593819	3.40
		4	3	9404182224-2251	508941	593807	3.40
		2	3	9404182339-2354	508774	593818	4.70
		1	3	9404181341-1352	508714	593792	5.80
		1	3	9404181428-1451	508716	593790	7.00
		1	3	9404181548-1607	508692	593793	5.70
		1	3	9404181655-1718	508712	593790	5.70
		1	3	9404181752-1810	508720	593788	5.70
		1	3	9404181833-1853	508720	593797	5.70
		1	3	9404181943-2005	508722	593786	7.10
		1	3	9404182109-2127	508711	593788	5.90
		1	2	9404182225-2253	508714	593779	5.90
		1	3	9404182341-2357	508714	593779	6.10
		1	3	9404182355-0112	508726	593783	6.60
		3	3	9404190054-0121	508839	593807	2.80
		4	3	9404190221-0245	508942	593813	4.50
		2	3	9404190315-0340	508778	593802	4.90
		3	3	9404190415-0440	508857	593812	4.30
		4	3	9404190518-0547	508939	593804	3.60
		2	3	9404190613-0643	508781	593794	5.00
		3	3	9404190716-0749	508857	593793	3.80
		4	3	9404190827-0900	508933	593802	3.90
		2	3	9404190937-1004	508788	593811	4.70
		3	3	9404191054-1124	508857	593810	3.90
		4	3	9404191209-1235	508931	593810	3.75
		1	3	9404190222-0241	508714	593772	5.70
		1	3	9404190317-0340	508726	593783	5.70
		1	3	9404190416-0433	508707	593785	5.70
		1	3	9404190522-0540	508726	593783	5.70
		1	3	9404190830-0854	508720	593781	6.40
		1	3	9404190940-0959	508719	593772	6.40
		1	3	9404191056-1113	508717	593751	6.40
		1	3	9404191218-1234	508720	593770	6.40
		1	6	9404191316-1345	508722	593779	6.40

Table 6.3: Suspended sediment - point sampled

Method	Channel	Vertical	No. of samples	Time (YYMMDDHHMM-HHMM)	Easting (m)	Northing (m)	Depth (m)
Suspended sediments	1	2	1	9404190613-0643	508781.1	593794.4	5.00
		3	1	9404190716-0749	508857.3	593793.4	3.80
		4	1	9404190827-0900	508933.3	593802.1	3.90
		2	1	9404190937-1004	508788.3	593810.7	4.70
		3	1	9404191054-1124	508857.1	593810.1	3.90
		4	1	9404191209-1235	508857.1	593810.1	3.75
		1	1	9404191316-1345	508722.0	593779.0	6.40

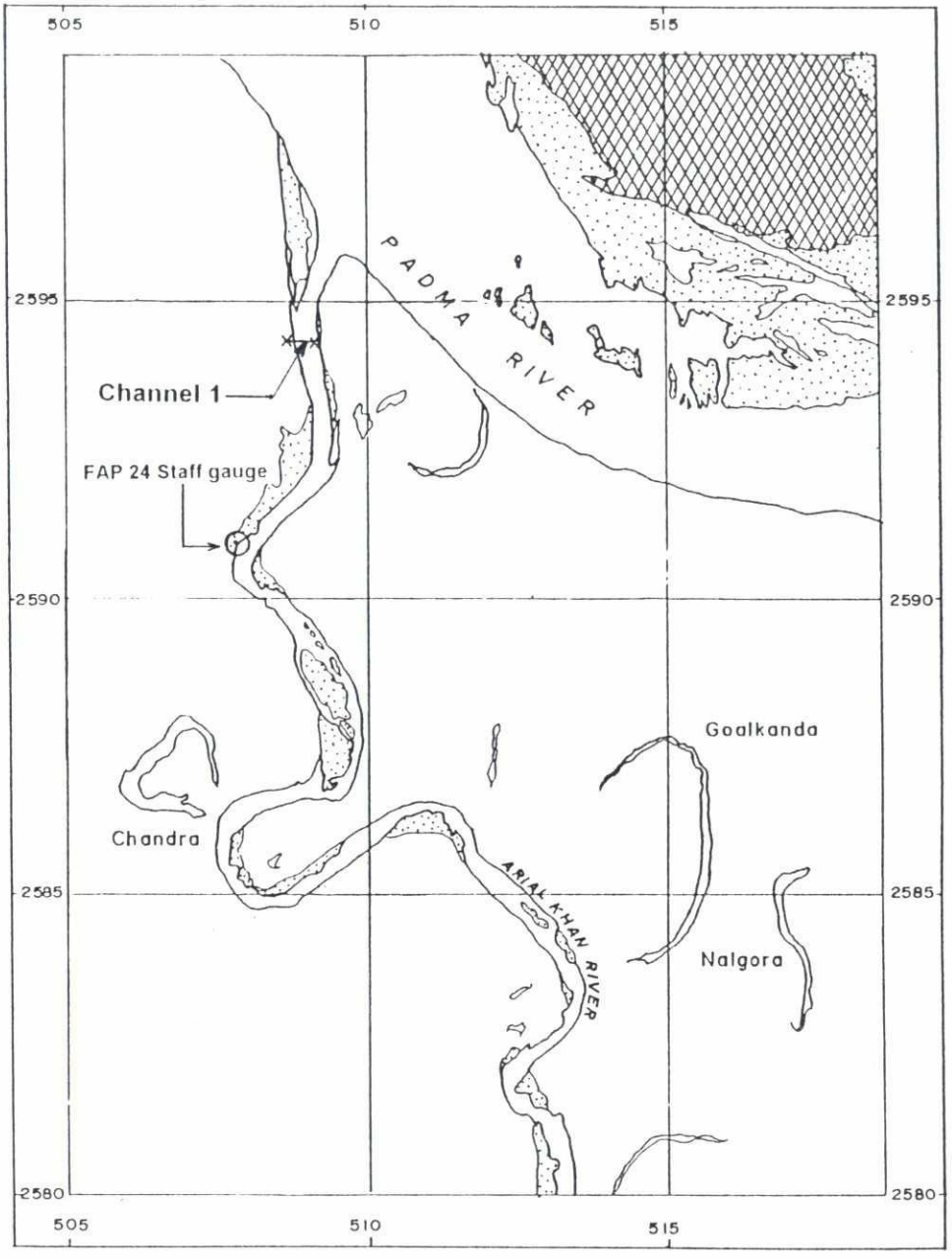
Table 6.4: Suspended sediment - depth integrated

Method	Channel	Vertical	No. of samples	Time (YYMMDDHHMM-HHMM)	Easting (m)	Northing (m)	Depth (m)
Helley Smith Sample	Sample not collected						

Table 6.5: Bed load

Types of Data	Channel	Format	Filename
ADCP/S4/EMF	1	QUATTRO	O44I1T01 .ase
Echosounder	1	QUATTRO	O44I1T01 .ech
Sediment transport	1	QUATTRO	O44I1T01 .sed
Bed load sieve size	1	QUATTRO	O44I1T01 .bdl
Suspended sediment conc.	1	QUATTRO	O44I1T01 .ssc
Transect plot data	1	QUATTRO	O44I1T01 .trs
Iso-velocity plot data	1	MIKE 21 MIKE 21	O44I1T01 .ct2 O44I1T01 .dt2

Table 7.1 PSD 24 Database file description



LEGEND:

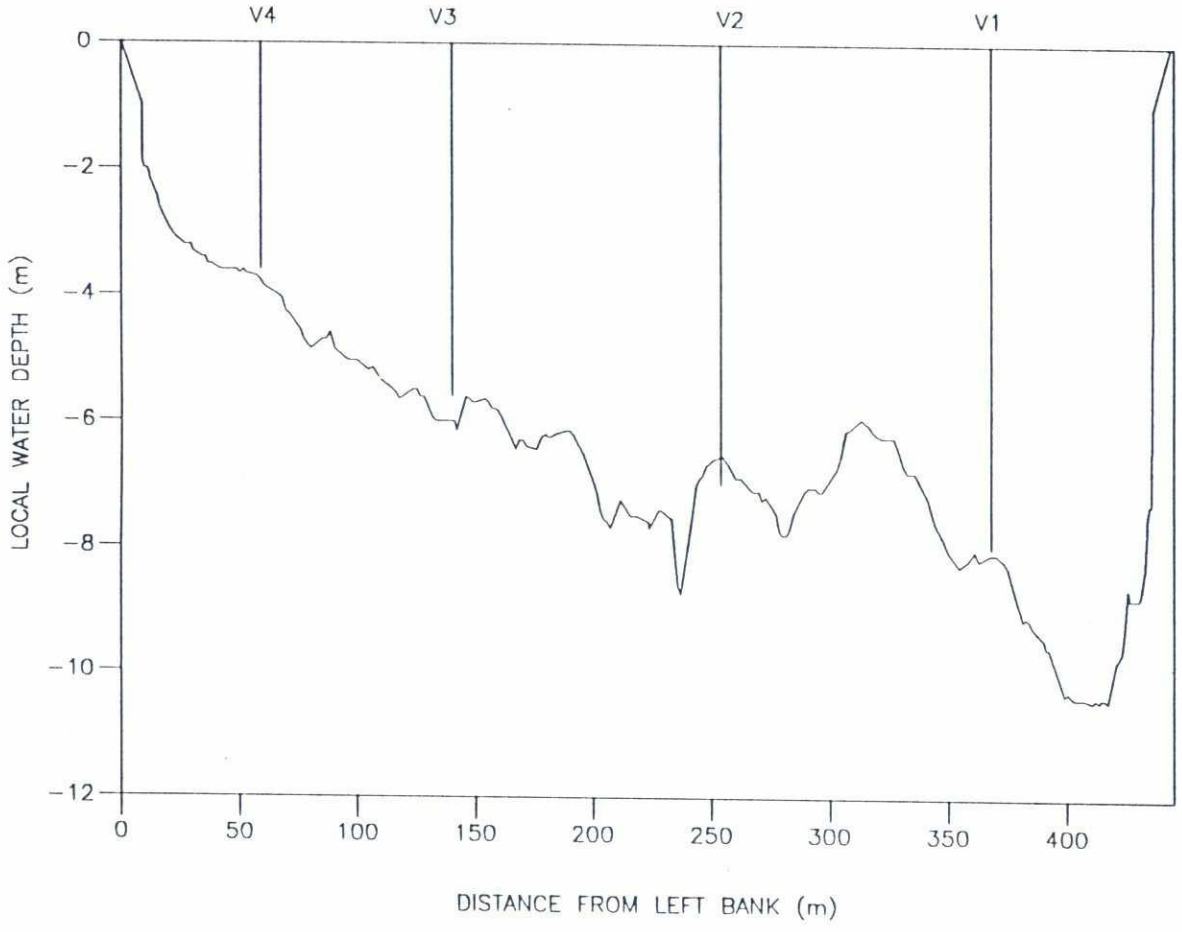
- Cross section
- High land
- Unstable/low char
- FAP 24 Staff gauge

2500 m 1000 m 0 2.5 km

Scale

Map is based on satellite images of March 1994

FAP 24 DELFT - DHI	RIVER SURVEY PROJECT Flood Plan Coordination Organization Commission of the European Communities	Survey Bulletin 75 : 08 July, 1994	
		Location 10 : Arial Khan River, Arial Khan Offtake	
	Date : 12 Oct 1994	Location map	page 1.1
	Init : sjr		



Water level : 5.23 m + PWD measured at the station indicated on page 1.1

FAP 24 DELFT - DHI	RIVER SURVEY PROJEC Flood Plan Coordination Organization Commission of the European Communiti	Survey Bulletin 75 : 08 July , 1994	
		Location 10 : Arial Khan River, Arial Khan Offtake	
File : O4783T01	Date : 12 Oct 1994	Cross-sections and measured verticals	page 1.2
	Init : sjr	Channel 1	

Type of measurement	Method	No. of measurements in channel			
		1	2	3	4
Discharge	ADCP transect	4	-	-	-
	EMF transect	-	-	-	-
	Echo-Sounding	-	-	-	-
Vertical current profile	No.of verticals in channel	4	-	-	-
	ADCP	-	-	-	-
	S4 current meter	4	-	-	-
	Ott current meter	-	-	-	-
Vertical sediment profile	Pump bottle sampling	12	-	-	-
	Andreasen settling tube	-	-	-	-
	MEX turbidity meter	-	-	-	-
	Integrated bottle sampling	4	-	-	-
	Collapsible bag	-	-	-	-
Bed load	Dune tracking	-	-	-	-
	Helley-Smith sampler	8	-	-	-
	Delft Bottle	-	-	-	-
Bed material	US BM-54 bed sampler	-	-	-	-
	Van Veen bed sampler	4	-	-	-

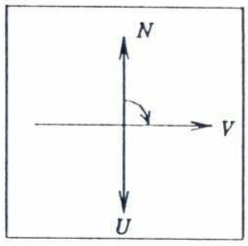
Table 2.1: Survey programme as made

	Width (m)	Area (m^2)	Stage h (m+PWD)	Discharge Q (m^3/s)	Bed load transport Sb (kg/s)	Suspended Sediment transport Ss total (kg/s)
Channel 1	445	2793	5.23	2026	0.42	1743

Table 2.2: Key figures

Gauge Location	Channel	Date	Water level (Daily average) (m+PWD)	Gauge
Arial Khan Offtake	Channel 1	08 Jul 94	5.23	FAP 24

Table 2.3: Water-levels

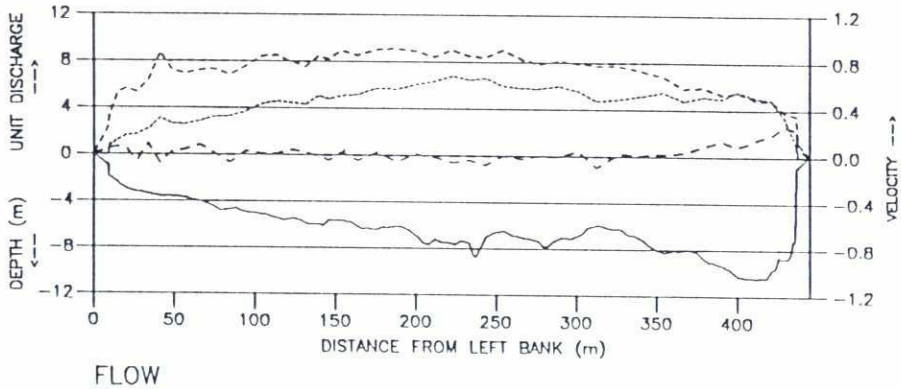


TRANSECT AZIMUTH = 90°

U – VELOCITY NORMAL TO TRANSECT (m/s)

V – VELOCITY PARALLEL TO TRANSECT (m/s)

N – MAGNETIC NORTH



FLOW

LEGEND :

WATER DEPTH (m below STAGE)

UNIT DISCHARGE ($m^2/s.m$)

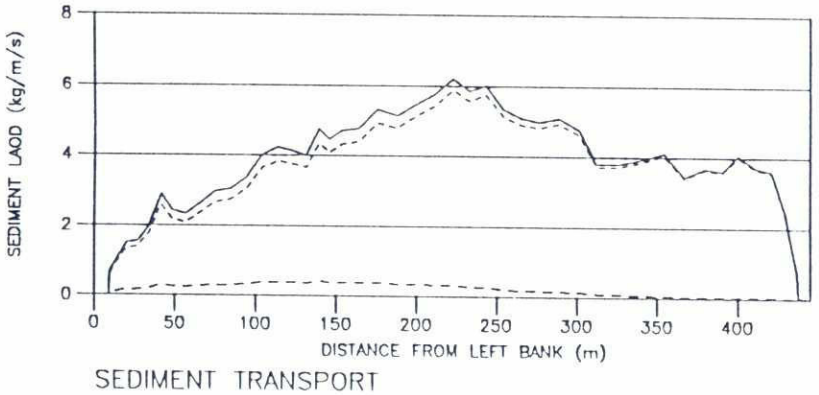
U (m/s)

V (m/s)

STAGE = 5.23 (m+PWD)

A = 2793 (m^2)

Q = 2026 (m^3/s)



SEDIMENT TRANSPORT

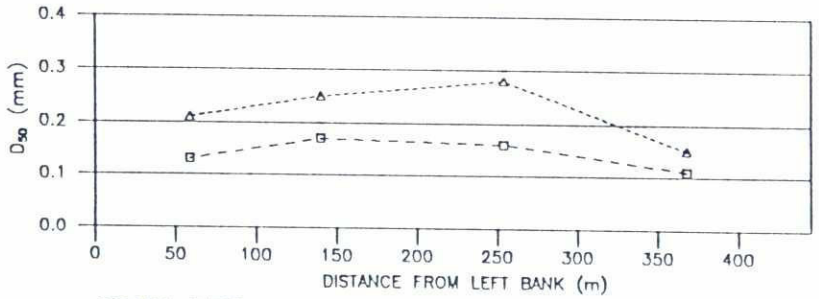
LEGEND :

S_{TOTAL} 1744 (kg/s)

$S_{WASH\ LOAD}$ 1652 (kg/s)

$S_{SUSP.\ BED}$ 92 (kg/s)

$S_{BED\ LOAD}$ 0.42 (kg/s)



GRAIN SIZE

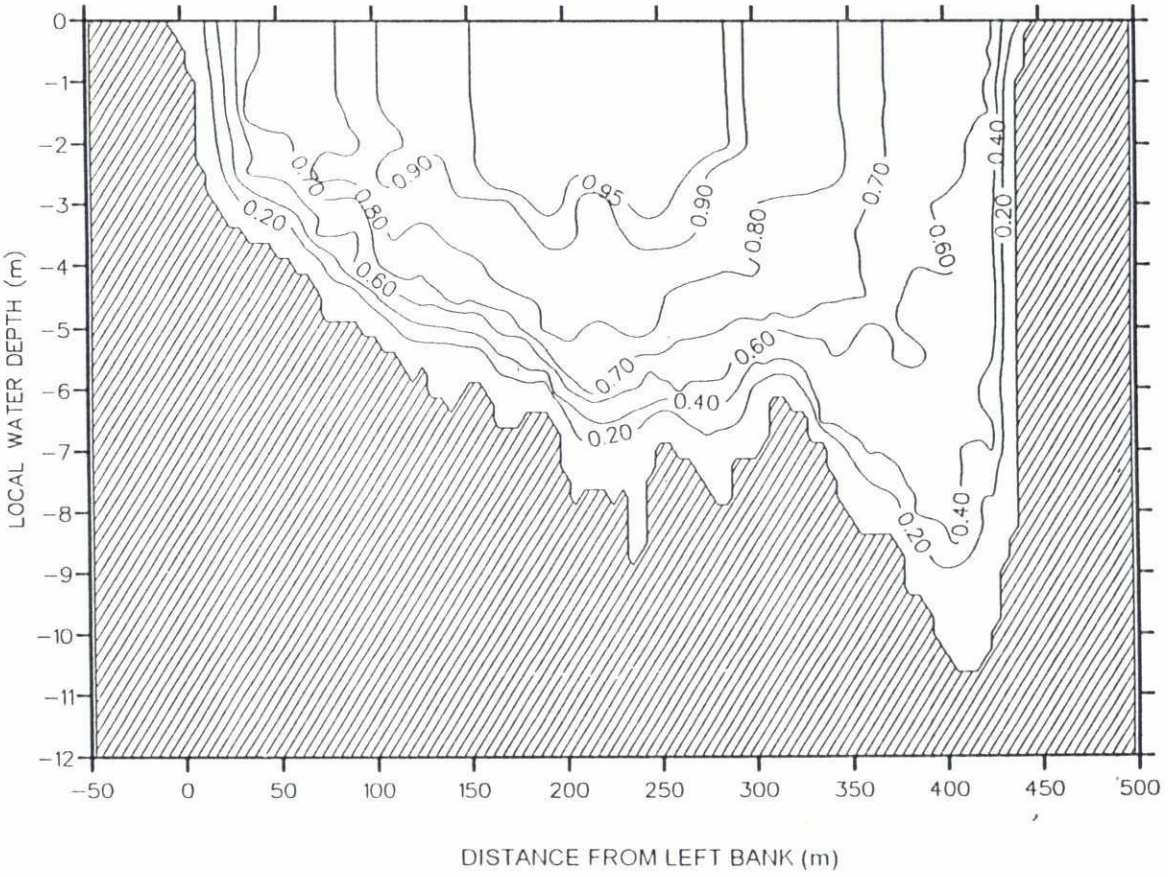
LEGEND :

$D_{50\ SUSP.}$ (mm)

$D_{50\ BED\ LOAD}$ (mm)

$D_{50\ BED\ MAT.}$ (mm)

FAP 24 DELFT - DHI RIVER SURVEY PROJECT Flood Plan Coordination Organization Commission of the European Communities		Survey Bulletin 75 : 08 July , 1994	
		Location 10 : Arial Khan River, Arial Khan Offtake	
File : O4783T01	Date : 12 Oct 1994 Init : sjr	Horizontal distribution of flow and sediments Channel 1	page 3.1



Iso-velocity contours (m/s)
Water level : 5.23 m + PWD measured at the station indicated on page 1.1

FAP 24 DELFT · DHI RIVER SURVEY PROJECT Flood Plan Coordination Organization Commission of the European Communities		Survey Bulletin 75 : 08 July , 1994	
		Location 10 : Arial Khan River, Arial Khan Offtake	
File : O4783T01	Date : 12 Oct 1994 Init : sjr	Cross-sectional distribution of flow velocity Channel 1	page 4.1

Andreasen settling tube

Channel	Vertical	Time (YYMMDDHHMM-HHMM)	Depth	Weight percent < 0.06 mm	Weight percent > 0.06 mm	D35 (mm)	D50 (mm)	D65 (mm)
Sample not collected								

Table 5.1: Grain size of near bed suspended sediment (0.3 m above river bed)

Van Veen bed samples

Channel	Vertical	Time (YYMMDDHHMM-HHMM)	Depth	Weight percent < 0.06 mm	Weight percent > 0.06 mm	D35 (mm)	D50 (mm)	D65 (mm)
1	1	9407081141-1155	8.00	6.04	93.965	0.089	0.106	0.128
	2	9407081253-1306	7.00	6.07	93.928	0.144	0.163	0.186
	3	9407081405-1419	5.60	4.02	95.984	0.145	0.165	0.189
	4	9407081457-1504	3.60	2.11	97.894	0.106	0.133	0.161

Table 5.2 : Grain size of bed material

Helley-Smith

Channel	Vertical	Time (YYMMDDHHMM-HHMM)	Depth (m)	Weight percent < 0.06 mm	Weight percent > 0.06 mm	D35 (mm)	D50 (mm)	D65 (mm)
1	1	9407081136-1138	8.00	7.451	92.549	0.118	0.154	0.197
	2	9407081248-1250	7.00	3.133	96.867	0.219	0.278	0.335
	3	9407081400-1402	5.60	2.085	97.915	0.256	0.300	0.352
	4	9407081452-1454	3.60	2.434	97.566	0.164	0.206	0.260
	1	9407081139-1141	8.00	55.346	44.654	-	-	0.123
	2	9407081251-1253	7.00	1.111	98.889	0.241	0.291	0.345
	3	9407081403-1405	5.60	2.757	97.243	0.166	0.196	0.231
	4	9407081455-1457	3.60	3.632	96.368	0.169	0.217	0.280

Table 5.3 : Grain sizes of bed load

Method	Channel	Time (YYMMDDHHMM-HHMM)	File name
ADCP & EMF transect	1	9407080949-0954 9407081006-1011 9407081630-1634 9407081645-1650	O4783T01 * O4783T02 O4783T09 O4783T11

Table 6.1: ADCP & EMF transects

* : transect in PSD 24 data base and presented in Sections 3 and 4

Method	Channel	Vertical	Time (YYMMDDHHMM-HHMM)	Easting (m)	Northing (m)	Depth (m)	File name
Vertical current & turbidity profiles (ADCP/S4/MEX)	1	1	9407081141-1155	508770	593797	8.00	O4782P02 *
		2	9407081253-1306	508884	593800	7.00	O4782P03 *
		3	9407081405-1419	508998	593807	5.60	O4782P05 *
		4	9407081457-1504	509079	593800	3.60	O4782P07 *

Table 6.2: Vertical profiles

* ADCP & MEX not available

Method	Channel	Vertical	No. of samples	Time (YYMMDDHHMM-HHMM)	Easting (m)	Northing (m)	Depth (m)
Suspended sediments (pump bottle)	1	1	3	9407081141-1155	508770	593797	8.00
		2	3	9407081253-1306	508884	593800	7.00
		3	3	9407081405-1419	508998	593807	5.60
		4	3	9407081457-1504	509079	593800	3.60

Table 6.3: Suspended sediment - point sampled

Method	Channel	Vertical	No. of samples	Time (YYMMDDHHMM-HHMM)	Easting (m)	Northing (m)	Depth (m)
Suspended sediments	1	1	1	9407081141-1155	508770	593797	8.00
		2	1	9407081253-1306	508884	593800	7.00
		3	1	9407081405-1419	508998	593807	5.60
		4	1	9407081457-1504	509079	593800	3.60

Table 6.4: Suspended sediment - depth integrated

Method	Channel	Vertical	Time (YYMMDDHHMM-HHMM)	Easting (m)	Northing (m)	Depth (m)	Sample No.
Helley-Smith Sample	1	1	9407081136-1138	508770	593797	8.00	A1594
		2	9407081248-1250	508884	593800	7.00	A357
		3	9407081400-1402	508998	593807	5.60	A866
		4	9407081452-1454	509079	593800	3.60	A1668
		1	9407081139-1141	508770	593797	8.00	A1604
		2	9407081251-1253	508884	593800	7.00	A1600
		3	9407081403-1405	508998	593807	5.60	A1639
		4	9407081455-1457	509079	593800	3.60	A740

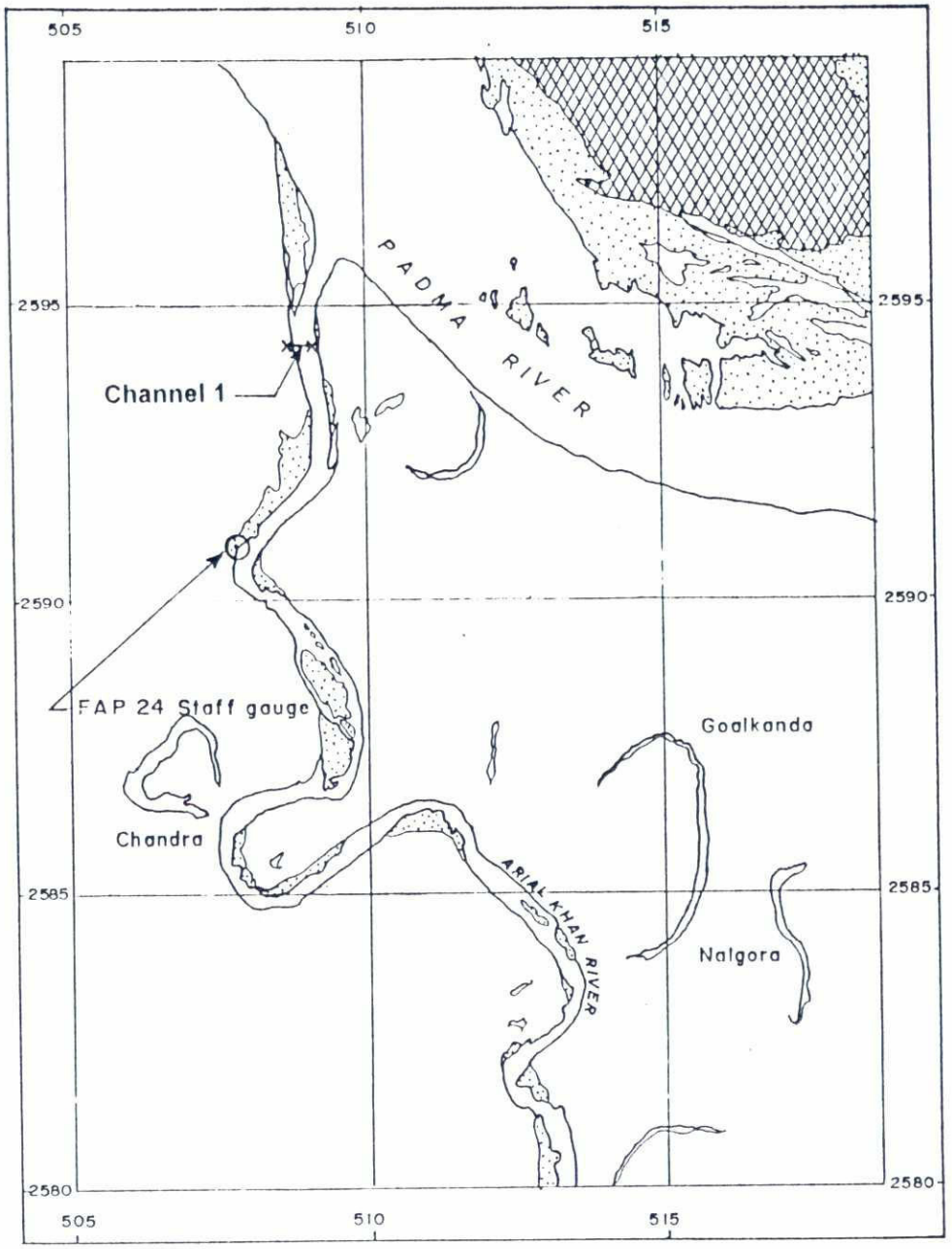
Table 6.5 : Bed load

Method	Channel	Vertical	Time (YYMMDDHHMM-HHMM)	Easting (m)	Northing (m)	Depth (m)	Sample No.
Van Veen Sample	1	1	9407081136-1138	508770	593797	8.00	DHB1
		2	9407081248-1250	508884	593800	7.00	DHB2
		3	9407081400-1402	508998	593807	5.60	DHB3
		4	9407081452-1454	509079	593800	3.60	DHB 4

Table 6.6 : Bed material

Types of Data	Channel	Format	Filename
ADCP/S4/EMF data	1	QUATTRO	O4783T01.ase
Echosounder data	1	QUATTRO	O4783T01.ech
Sediment transport data	1	QUATTRO	O4783T01.sed
Bed load sediment analysis	1	QUATTRO	O4783T01.bdl
Susp. sed. conc. analysis	1	QUATTRO	O4783T01.ssc
Transect plot data	1	QUATTRO	O4783T01.trs
Iso-velocity plot data	1	MIKE 21 MIKE 21	O4783T01.ct2 O4783T01.dt2

Table 7.1 PSD 24 Database file description



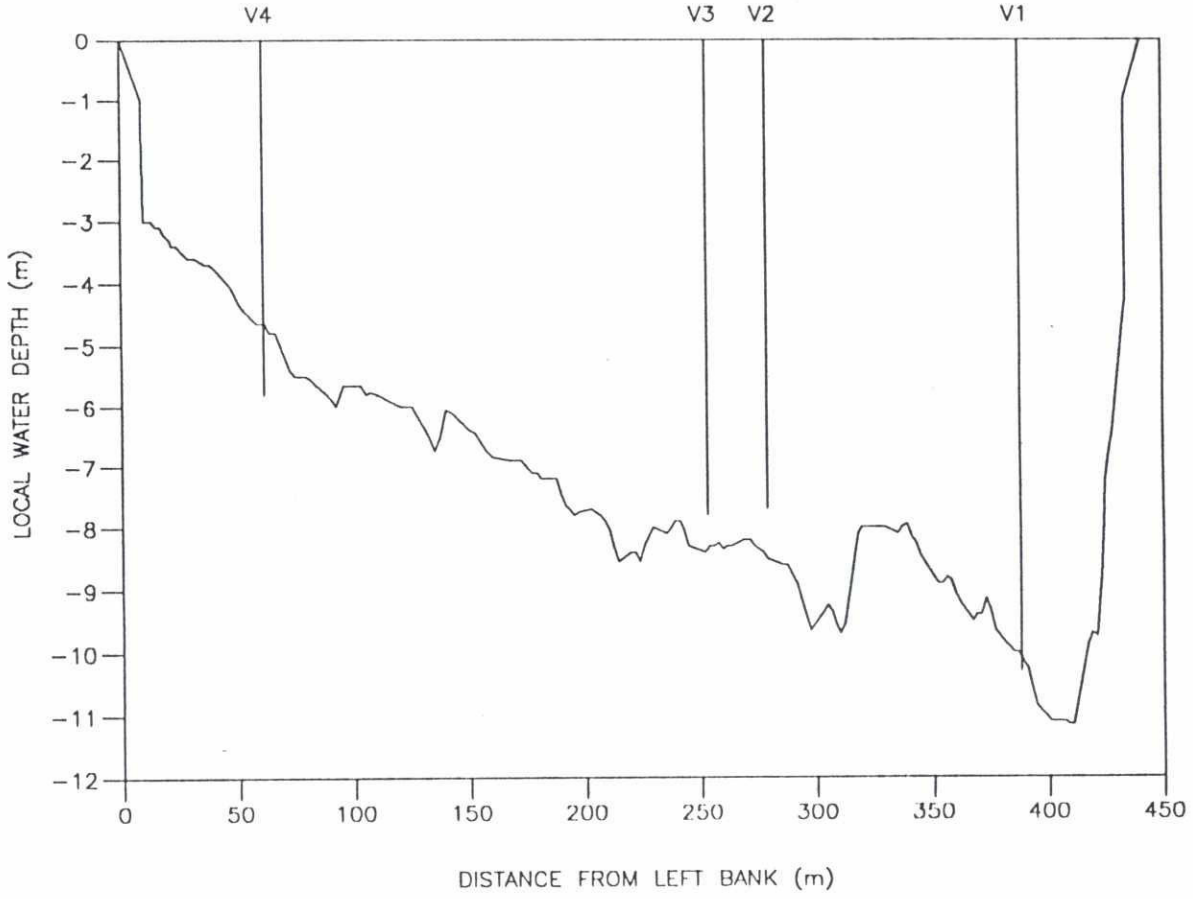
LEGEND:

- Cross section
- High land
- Unstable/low char
- FAP 24 Staff gauge

2500 m 1000 m 0 2.5 km
Scale

Map is based on satellite images of March 1994

FAP 24 DELFT - DHI	RIVER SURVEY PROJECT Flood Plan Coordination Organization Commission of the European Communities	Survey Bulletin 90 : 10 August, 1994	
		Location 10 : Arial Khan River, Arial Khan Offtake	
	Date : 27 Oct 1994	Location map	page 1.1
	Init : mk		



Water level : 5.89 m + PWD measured at the station indicated on page 1.1

FAP 24 DELFT - DHI	RIVER SURVEY PROJECT Flood Plan Coordination Organization Commission of the European Communities	Survey Bulletin 90 : 10 August, 1994	
		Location 10 : Arial Khan River, Arial Khan Offtake	
File : O48A3T03	Date : 27 Oct 1994	Cross-sections and measured verticals	page
	Init : mk	Channel 1	1.2

Type of measurement	Method	No. of measurements in channel			
		1	2	3	4
Discharge	ADCP transect	3	-	-	-
	EMF transect	-	-	-	-
	Echo-Sounding	-	-	-	-
Vertical current profile	No.of verticals in channel	4	-	-	-
	ADCP	4	-	-	-
	S4 current meter	1	-	-	-
	Ott current meter	-	-	-	-
Vertical sediment profile	Pump bottle sampling	24	-	-	-
	Andreasen settling tube	-	-	-	-
	MEX turbidity meter	-	-	-	-
	Integrated bottle sampling	4	-	-	-
	Collapsible bag	-	-	-	-
Bed load	Dune tracking	-	-	-	-
	Helley-Smith sampler	8	-	-	-
	Delft Bottle	-	-	-	-
Bed material	US BM-54 bed sampler	-	-	-	-
	Van Veen bed sampler	-	-	-	-

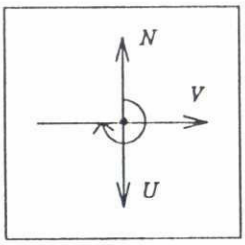
Table 2.1: Survey programme as made

Channel	Width (m)	Area (m^2)	Stage h (m+PWD)	Discharge Q (m^3/s)	Bed load transport Sb (kg/s)	Suspended Sediment transport Ss total (kg/s)
Channel 1	442	3141	5.89	2738	7	4381

Table 2.2: Key figures

Gauge Location	Channel	Date	Water level (Daily average) (m+PWD)	Gauge
Arial Khan Offtake	Channel 1	10 Aug 94	5.89	FAP 24

Table 2.3: Water-levels

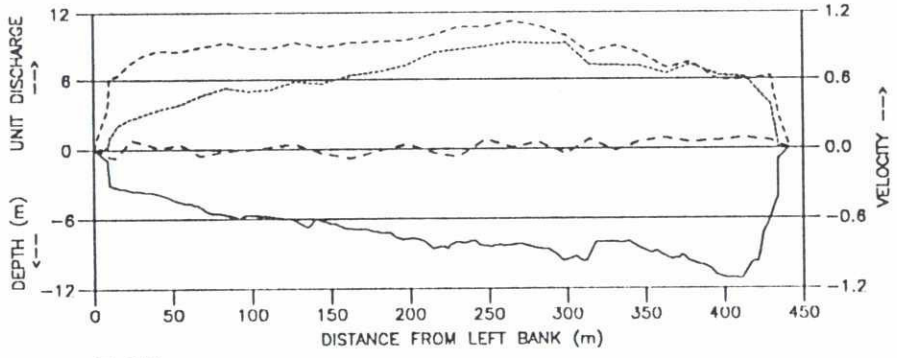


TRANSECT AZIMUTH = 270°

U – VELOCITY NORMAL TO TRANSECT (m/s)

V – VELOCITY PARALLEL TO TRANSECT (m/s)

N – MAGNETIC NORTH



FLOW

LEGEND :

WATER DEPTH (m below STAGE)

UNIT DISCHARGE (m^2/s.m)

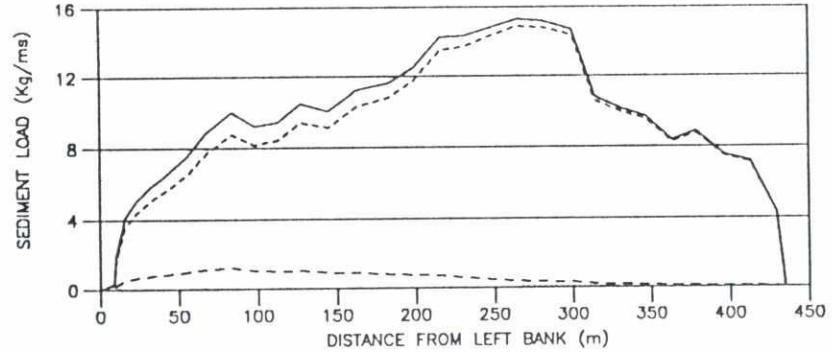
U – (m/s)

V – (m/s)

STAGE = 5.89 (m+PWD)

A = 3141 (m^2)

Q = 2738 (m^3/s)



SEDIMENT TRANSPORT

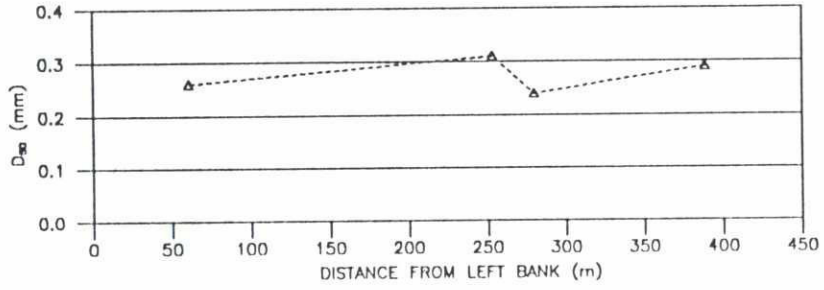
LEGEND :

S_{TOTAL} 4388 (kg/s)

$S_{WASH\ LOAD}$ 4135 (kg/s)

$S_{SUSP.\ BED}$ 246 (kg/s)

$S_{BED\ LOAD}$ 7 (kg/s)



GRAIN SIZE

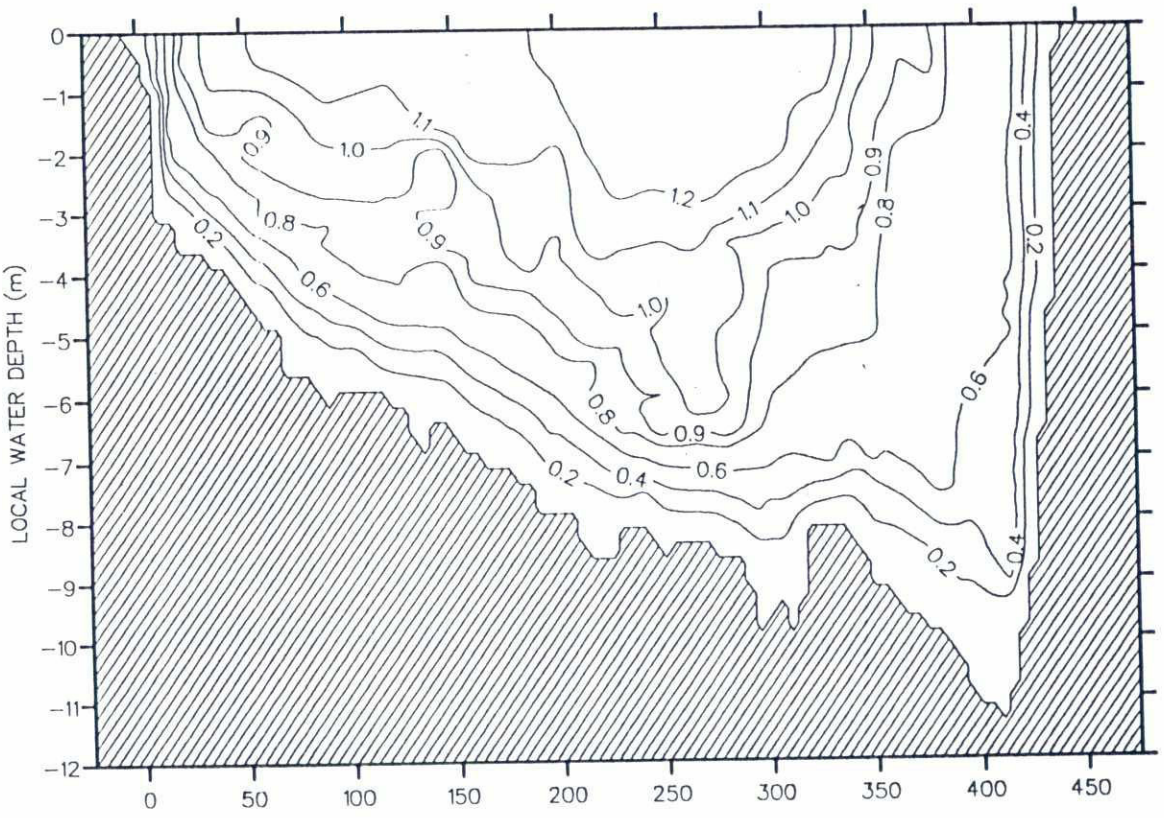
LEGEND :

$D_{50\ SUSP.}$ (mm)

$D_{50\ BED\ LOAD}$ (mm)

$D_{50\ BED\ MAT.}$ (mm)

FAP 24 DELFT - DHI RIVER SURVEY PROJECT Flood Plan Coordination Organization Commission of the European Communities		Survey Bulletin 90 : 10 August, 1994	
		Location 10 : Arial Khan River, Arial Khan Offtake	
File : O48A3T03	Date : 27 Oct 1994 Init : mk	Horizontal distribution of flow and sediments Channel 1	page 3.1



Iso-velocity contours (m/s)
Water level : 5.89 m + PWD measured at the station indicated on page 1.1

FAP 24 DELFT - DHI	RIVER SURVEY PROJECT Flood Plan Coordination Organization Commission of the European Communities	Survey Bulletin 90 : 10 August, 1994	
		Location 10 : Arial Khan River, Arial Khan Offtake	
File : O48A3T03	Date : 27 Oct 1994	Cross-sectional distribution of flow velocity	page 4.1
	Init : mk	Channel 1	

Andreasen settling tube							
Channel	Vertical	Time (YYMMDDHHMM-HHMM)	Depth	Weight percent < 0.06 mm > 0.06 mm	D10 (mm)	D50 (mm)	D90 (mm)
Sample not collected							

Table 5.1: Grain size of near bed suspended sediment (0.3 m above river bed)

US BM-54 bed samples							
Channel	Vertical	Time (YYMMDDHHMM-HHMM)	Depth	Weight percent < 0.06 mm > 0.06 mm	D10 (mm)	D50 (mm)	D90 (mm)
Sample not collected							

Table 5.2 : Grain size of bed material

Helley-Smith								
Channel	Vertical	Time (YYMMDDHHMM-HHMM)	Depth (m)	Weight percent < 0.06 mm	> 0.06 mm	D35 (mm)	D50 (mm)	D65 (mm)
1	1	9408101035-1138	10.3	8.238	91.760	0.258	0.305	0.361
	1	9408101035-1138	10.3	13.81	86.190	0.207	0.283	0.342
	2	9408101157-1228	7.70	0.200	99.800	0.259	0.303	0.355
	2	9408101157-1228	7.70	0.528	99.470	0.153	0.173	0.195
	3	9408101320-1355	7.80	1.384	98.620	0.249	0.295	0.349
	3	9408101320-1355	7.80	0.624	99.380	0.280	0.322	0.370
	4	9408101415-1446	5.80	0.689	99.310	0.187	0.226	0.281
	4	9408101415-1446	5.80	0.814	99.190	0.237	0.288	0.342

Table 5.3 : Grain sizes of bed load

Method	Channel	Time (YYMMDDHHMM-HHMM)	File name
ADCP & EMF transect	1	9408100912-0916 9408100923-0927 9408101437-1451	O48A3T01 O48A3T03 * O48A3T05

Table 6.1: ADCP & EMF transects

* : transect in PSD 24 data base and presented in Sections 3 and 4

Method	Channel	Vertical	Time (YYMMDDHHMM-HHMM)	Easting (m)	Northing (m)	Depth (m)	File name
Vertical current & turbidity profiles (ADCP/S4/MEX)	1	1	9408101035-1138	508746	593801	10.3	O48A3P03 **
		2	9408101157-1228	508855	593806	7.70	O48A3P04 *
		3	9408101320-1355	508892	593867	7.80	O48A3P05 *
		4	9408101415-1446	509078	593817	5.80	O48A3P06 *

Table 6.2: Vertical profiles

** MEX not available

* S4 and MEX not available

Method	Channel	Vertical	No. of samples	Time (YYMMDDHHMM-HHMM)	Easting (m)	Northing (m)	Depth (m)
Suspended sediments (pump bottle)	1	1	6	9408101035-1138	508746	593801	10.3
		2	6	9408101157-1228	508855	593806	7.70
		3	6	9408101320-1355	508892	593867	7.80
		4	6	9408101415-1446	509078	593817	5.80

Table 6.3: Suspended sediment - point sampled

Method	Channel	Vertical	No. of samples	Time (YYMMDDHHMM-HHMM)	Easting (m)	Northing (m)	Depth (m)
Suspended sediments	1	1	1	9408101035-1138	508746	593801	10.3
		2	1	9408101157-1228	508855	593806	7.70
		3	1	9408101320-1355	508892	593867	7.80
		4	1	9408101415-1446	509078	593817	5.80

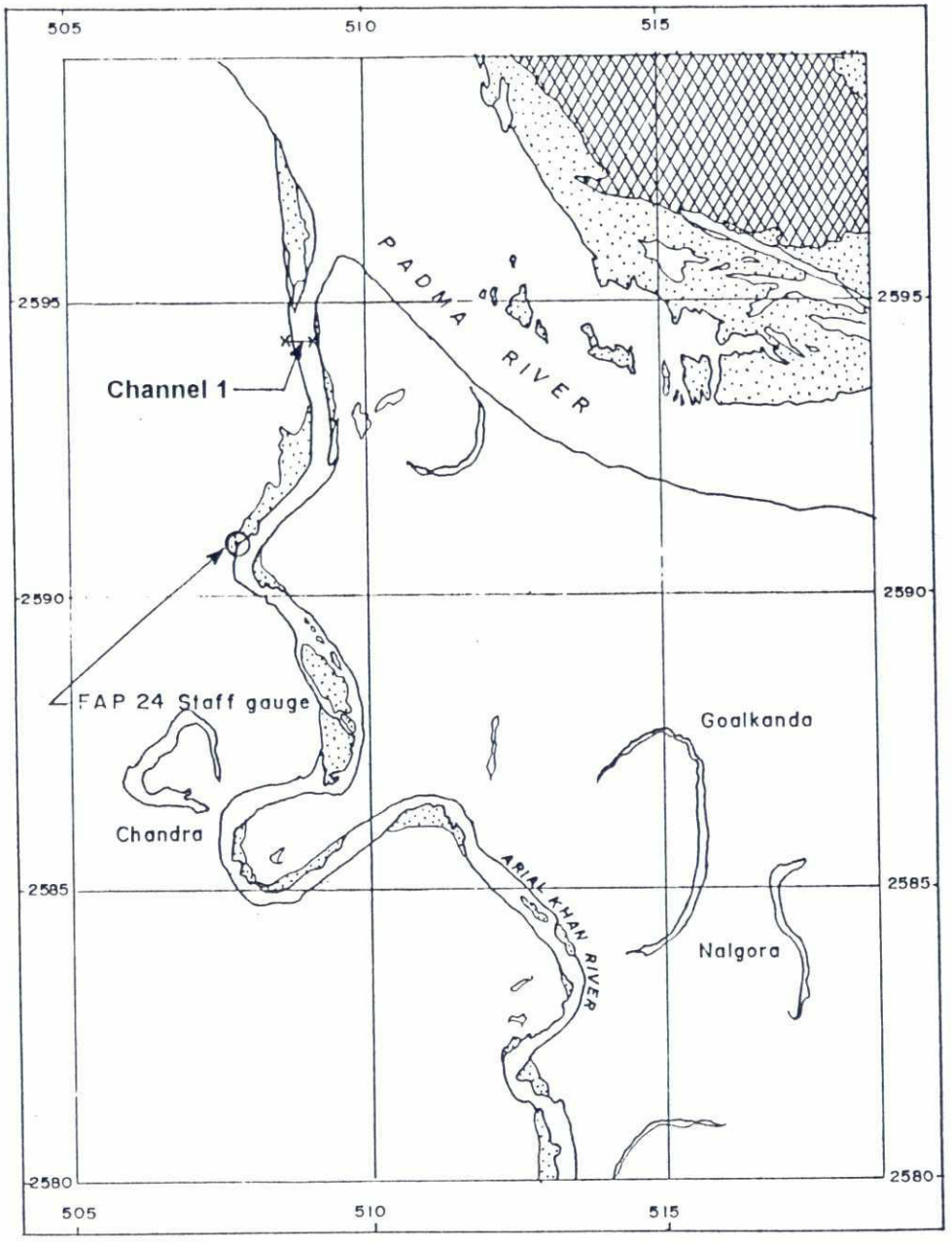
Table 6.4: Suspended sediment - depth integrated

Method	Channel	Vertical	Time (YYMMDDHHMM-HHMM)	Easting (m)	Northing (m)	Depth (m)	Sample No.
Helley-Smith Sample	1	1	9408101035-1138	508746	593801	10.3	A2140
		1	9408101035-1138	508746	593801	10.3	A2184
		2	9408101157-1228	508855	593806	7.70	A2173
		2	9408101157-1228	508855	593806	7.70	A2155
		3	9408101320-1355	508892	593867	7.80	A2156
		3	9408101320-1355	508892	593867	7.80	A2139
		4	9408101415-1446	509078	593817	5.80	A1840
		4	9408101415-1446	509078	593817	5.80	A1852

Table 6.5: Bed load

Types of Data	Channel	Format	Filename
ADCP/S4/EMF data	1	QUATTRO	O48A3T03 .ase
Echosounder data	1	QUATTRO	O48A3T03 .ech
Sediment transport data	1	QUATTRO	O48A3T03 .sed
Sus. sed. conc. analysis	1	QUATTRO	O48A3T03 .ssc
Bead load sediment analysis	1	QUATTRO	O48A3T03 .bdl
Transect plot data	1	QUATTRO	O48A3T03 .trs
Iso-velocity plot data	1	MIKE 21	O48A3T03 .dt2 O48A3T03 .ct2

Table 7.1 PSD 24 Database file description



LEGEND:

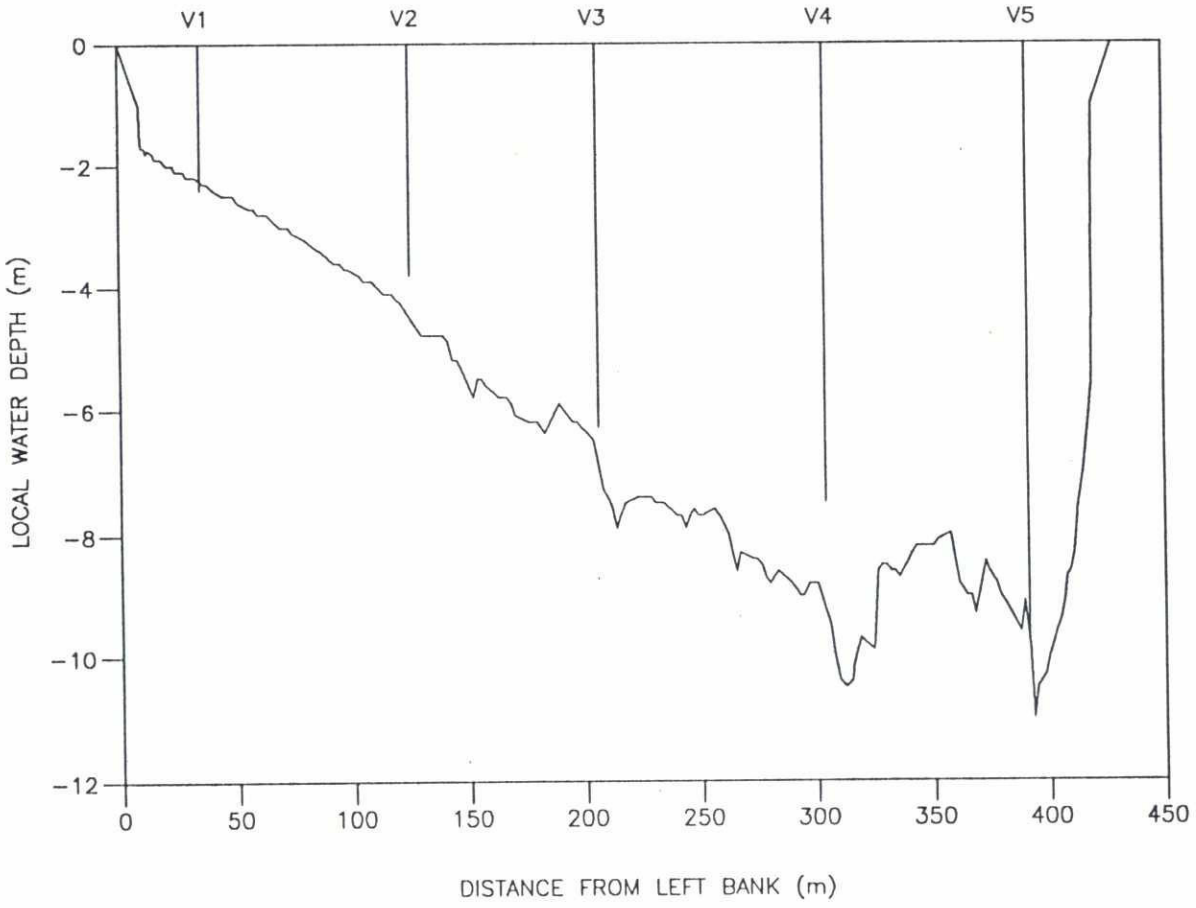
- Cross section
- High land
- Unstable / low char
- FAP 24 Staff gauge

2500 m 1000 m 0 2.5 km

Scale

Map is based on satellite images of March 1994

FAP 24 RIVER SURVEY PROJECT Flood Plan Coordination Organization Commission of the European Communities DELFT - DHI		Survey Bulletin 101 : 07 October, 1994	
		Location 10 : Arial Khan River, Arial Khan Offtake	
	Date : 18 Jan 1995	Location map	page 1.1
	Init : mk/lr		



Water-level : 4.48 m + PWD measured at the station indicated on page 1.1

FAP 24 DELFT - DHI	RIVER SURVEY PROJECT Flood Plan Coordination Organization Commission of the European Communities	**Survey Bulletin 101 : 07 October, 1994**	
		Location 10 : Arial Khan River, Arial Khan Offtake	
File : O4A73T01	Date : 18 Jan 1995 Init : mk/tr	**Cross-sections and measured verticals** **Channel 1**	page 1.2

Type of measurement	Method	No. of measurements in channel			
		1	2	3	4
Discharge	ADCP transect	4	-	-	-
	EMF transect	-	-	-	-
	Echo-Sounding	-	-	-	-
Vertical current profile	No.of verticals in channel	5	-	-	-
	ADCP	5	-	-	-
	S4 current meter	1	-	-	-
	Ott current meter	-	-	-	-
Vertical sediment profile	Pump bottle sampling	6	-	-	-
	Andreasen settling tube	-	-	-	-
	MEX turbidity meter	-	-	-	-
	Integrated bottle sampling	5	-	-	-
	Collapsible bag	-	-	-	-
Bed load	Dune tracking	-	-	-	-
	Helley-Smith sampler	4	-	-	-
	Delft Bottle	-	-	-	-
Bed material	US BM-54 bed sampler	-	-	-	-
	Van Veen bed sampler	-	-	-	-

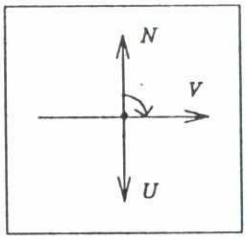
Table 2.1: Survey programme as made

Channel	Width (m)	Area (m^2)	Stage h (m+PWD)	Discharge Q (m^3/s)	Bed load transport Sb (kg/s)	Suspended Sediment transport Ss total (kg/s)
Channel 1	430	2646	4.48	1534	0.2	943.3

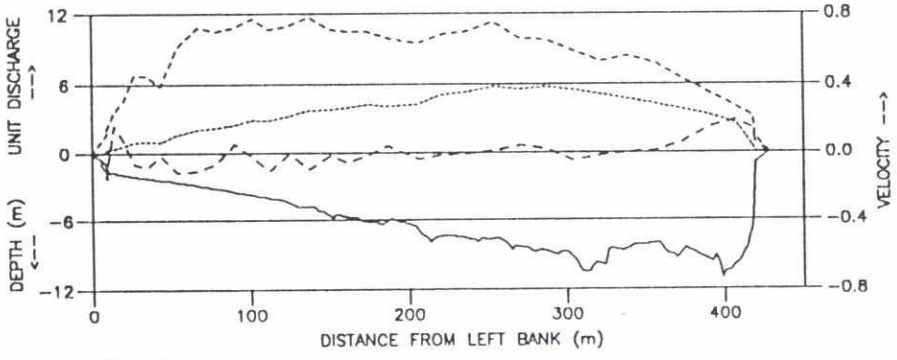
Table 2.2: Key figures

Gauge Location	Channel	Date	Water level (Daily average) (m + PWD)	Gauge
Arial Khan Offtake	Channel 1	07 Oct 1994	4.48	FAP 24

Table 2.3: Water-levels



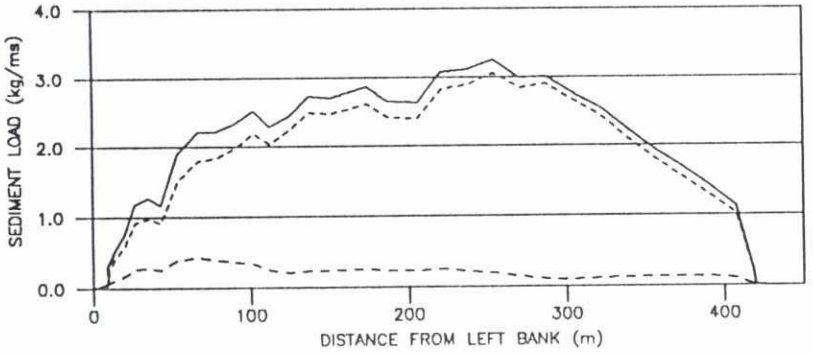
TRANSECT AZIMUTH = 90°
U – VELOCITY NORMAL TO TRANSECT (m/s)
V – VELOCITY PARALLEL TO TRANSECT (m/s)
N – MAGNETIC NORTH



FLOW

LEGEND :

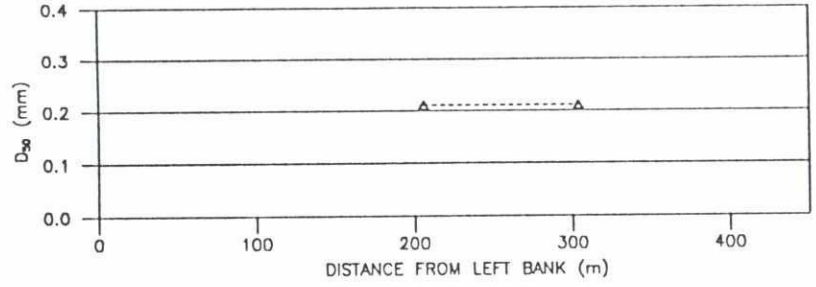
WATER DEPTH (m below STACE)
UNIT DISCHARGE (m^2/s.m)
U – (m/s)
V – (m/s)
STACE = 4.48 (m+PWD)
A = 2646 (m^2)
Q = 1534 (m^3/s)



SEDIMENT TRANSPORT

LEGEND :

S_{TOTAL} 943.5 (kg/s)
$S_{WASH\ LOAD}$ 856.4 (kg/s)
$S_{SUSP.\ BED}$ 86.9 (kg/s)
$S_{BED\ LOAD}$ 0.2 (kg/s)

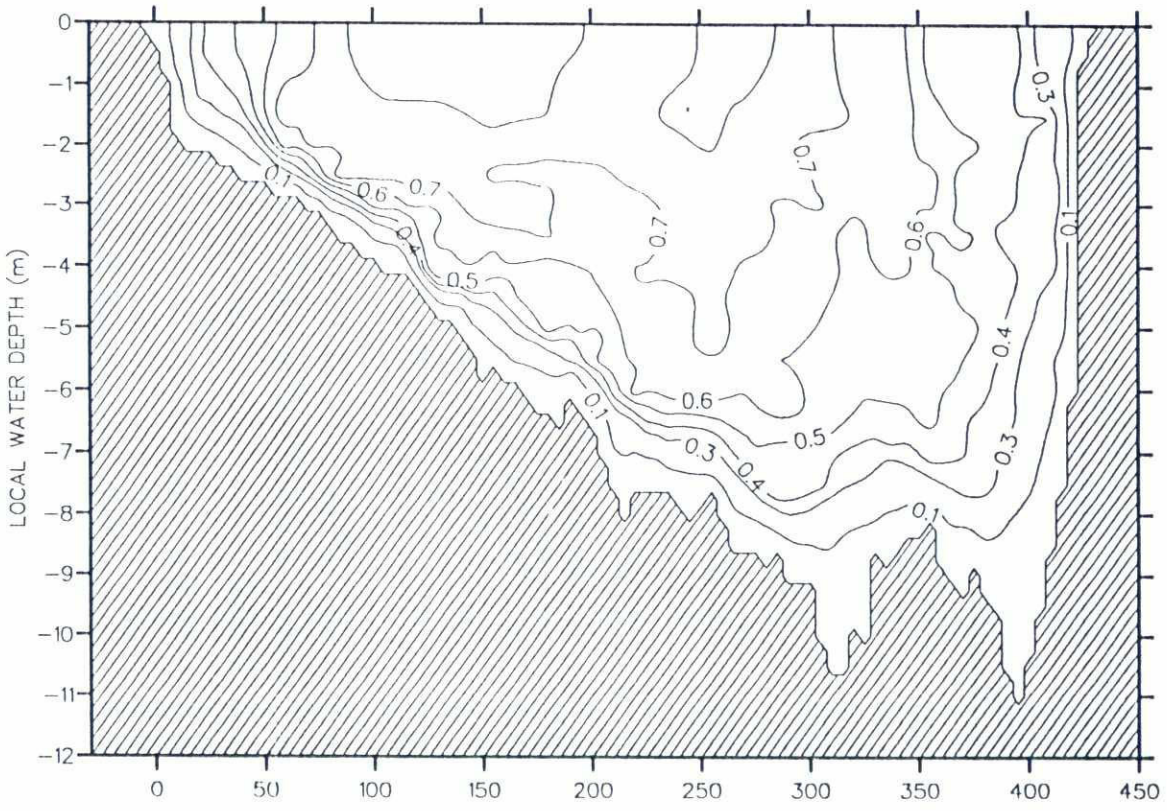


GRAIN SIZE

LEGEND :

◊◊◊◊◊ $D_{50\ SUSP.}$ (mm)
△△△△△ $D_{50\ BED\ LOAD}$ (mm)
□□□□□ $D_{50\ BED\ MAT.}$ (mm)

FAP 24 RIVER SURVEY PROJECT Flood Plan Coordination Organization Commission of the European Communities DELFT - DHI		Survey Bulletin 101 : 07 October, 1994	
		Location 10 : Arial Khan River, Arial Khan Offtake	
File : O4A73T01	Date : 18 Jan 1995	Horizontal distribution of flow and sediments	page
	Init : mk/tr	Channel 1	3.1



Iso-velocity contours (m/s)
Water-level : 4.48 m + PWD measured at the station indicated on page 1.1

FAP 24 DELFT - DHI	RIVER SURVEY PROJECT Flood Plan Coordination Organization Commission of the European Communities	Survey Bulletin 101 : 07 October, 1994	
		Location 10 : Arial Khan River, Arial Khan Offtake	
File : O4A73T01	Date : 18 Jan 1995	Cross-sectional distribution of flow velocity	page
	Init : mk/tr	Channel 1	4.1

Andreasen settling tube

Channel	Vertical	Time (YYMMDDHHMM-HHMM)	Depth	Weight percent < 0.06 mm	Weight percent > 0.06 mm	D10 (mm)	D50 (mm)	D90 (mm)
Sample not collected								

Table 5.1: Grain size of near bed suspended sediment (0.3 m above river bed)

US BM-54 bed samples

Channel	Vertical	Time (YYMMDDHHMM-HHMM)	Depth	Weight percent < 0.06 mm	Weight percent > 0.06 mm	D10 (mm)	D50 (mm)	D90 (mm)
Sample not collected								

Table 5.2 : Grain size of bed material

Helley-Smith

Channel	Vertical	Time (YYMMDDHHMM)	Depth (m)	Weight percent < 0.06 mm	Weight percent > 0.06 mm	D35 (mm)	D50 (mm)	D65 (mm)
1	3	9410071204-1220	6.30	2.159	97.841	0.173	0.202	0.235
	4	9410071256-1310	7.50	7.977	92.023	0.173	0.228	0.296
	3	9410071204-1220	6.30	1.269	98.731	0.183	0.218	0.266
	4	9410071256-1310	7.50	0.270	99.730	0.161	0.183	0.209

Table 5.3 : Grain sizes of bed load

Method	Channel	Time (YYMMDDHHMM-HHMM)	File name
ADCP & EMF transect	1	9410070959-1003 9410071010-1013 9410071342-1346 9410071348-1352	O4A73T01 * O4A73T02 O4A73T03 O4A73T04

Table 6.1: ADCP & EMF transects * : transect in PSD 24 data base and presented in Sections 3 and 4

Method	Channel	Vertical	Time (YYMMDDHHMM-HHMM)	Easting (m)	Northing (m)	Depth (m)	File name
Vertical current & turbidity profiles (ADCP/S4/MEX)	1	1	9410071108-1121	509085	593803	2.40	O4A73P02 *
		2	9410071128-1138	509003	593800	3.80	O4A73P03 *
		3	9410071204-1220	508914	593803	6.30	O4A73P04 *
		4	9410071256-1310	508828	593803	7.50	O4A73P05 *
		4	9410071206-1254	508820	593802	9.60	O4A72P01 **
		5	9410071037-1049	508738	593802	9.80	O4A73P01 *

Table 6.2: Vertical profiles * S4 and MEX not available ** ADCP and MEX not available

Method	Channel	Vertical	No. of samples	Time (YYMMDDHHMM-HHMM)	Easting (m)	Northing (m)	Depth (m)
Suspended sediments (pump bottle)	1	4	6	9410071206-1254	508820	593802	9.60

Table 6.3: Suspended sediment - point sampled

Method	Channel	Vertical	No. of samples	Time (YYMMDDHHMM-HHMM)	Easting (m)	Northing (m)	Depth (m)
Suspended sediments	1	1	1	9410071108-1121	509085	593803	2.40
		2	1	9410071128-1138	509003	593800	3.80
		3	1	9410071204-1220	508914	593803	6.30
		4	1	9410071256-1310	508828	593803	7.50
		5	1	9410071037-1049	508738	593802	9.80

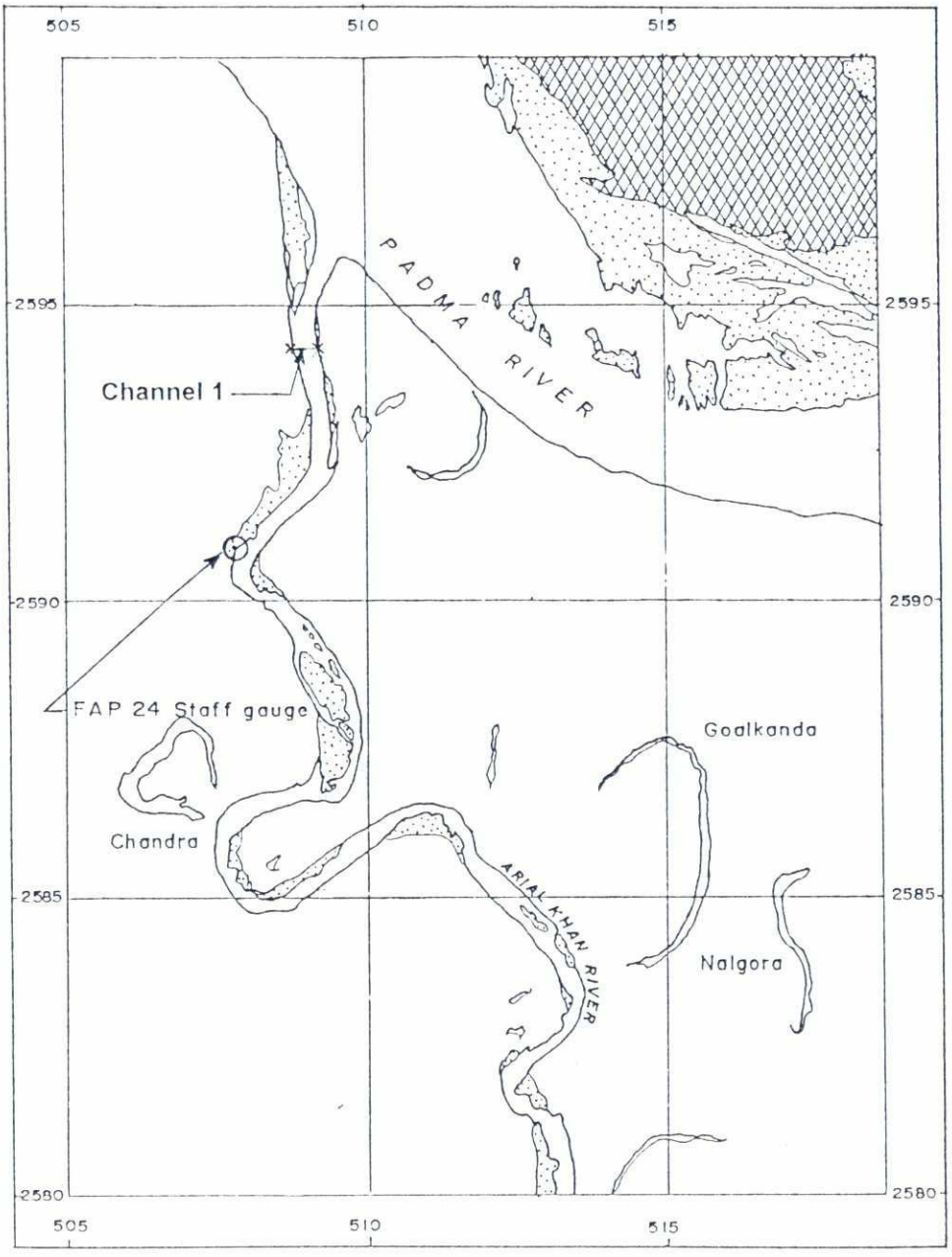
Table 6.4: Suspended sediment - depth integrated

Method	Channel	Vertical	Time (YYMMDDHHMM-HHMM)	Easting (m)	Northing (m)	Depth (m)	Sample No
Helley-Smith Sample	1	3	9410071204-1220	508914	593803	6.30	A1910
		4	9410071256-1310	508828	593803	7.50	A2171
		3	9410071204-1220	508914	593803	6.30	A2273
		4	9410071256-1310	508828	593803	7.50	A2299

Table 6.5: Bed load

Types of Data	Channel	Format	Filename
ADCP/S4/EMF data	1	QUATTRO	O4A73T01 .ase
Echosounder data	1	QUATTRO	O4A73T01 .ech
Sediment transport data	1	QUATTRO	O4A73T01 .sed
Bed load sed. analysis	1	QUATTRO	O4A73T01 .bdl
Sus. sed. conc. analysis	1	QUATTRO	O4A73T01 .ssc
Transect plot data	1	QUATTRO	O4A73T01 .trs
Iso-velocity plot data	1	MIKE 21	O4A73T01 .ct2 O4A73T01 .dt2

Table 7.1 PSD 24 Database file description



LEGEND:

- Cross section
- High land
- Unstable/low char
- FAP 24 Staff gauge

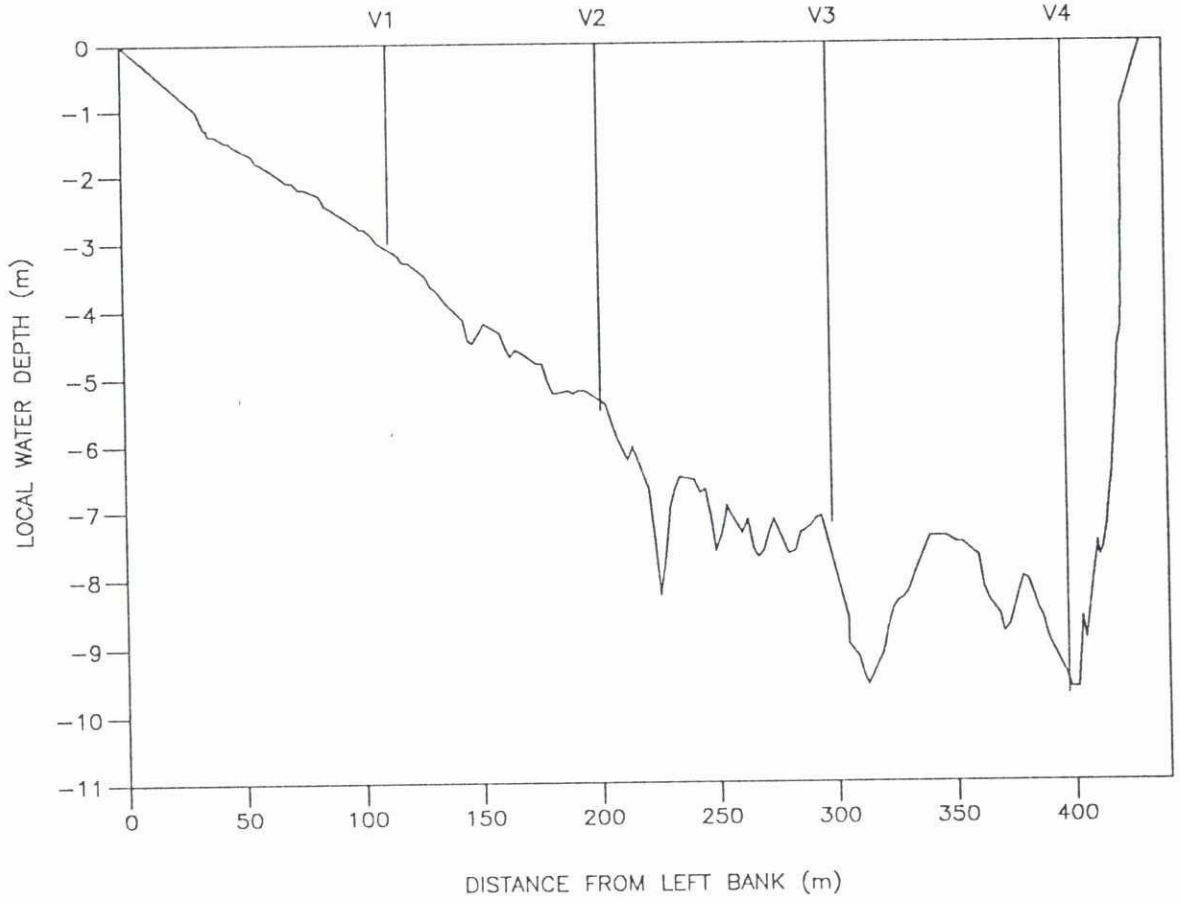
2500 m 1000 m 0 2.5 km

Scale

N

Map is based on satellite images of March 1994

FAP 24 DELFT - DHI	RIVER SURVEY PROJECT Flood Plan Coordination Organization Commission of the European Communities	Survey Bulletin 110 : 25 October, 1994	
		Location 10 : Arial Khan River, Arial Khan Offtake	
	Date : 12 Jan 1995	Location map	page 1.1
	Init : mk/tr		



Water-level : 3.89 m + PWD measured at the station indicated on page 1.1

FAP 24 DELFT - DHI	RIVER SURVEY PROJECT Flood Plan Coordination Organization Commission of the European Communities	Survey Bulletin 110 : 25 October, 1994	
		Location 10 : Arial Khan River, Arial Khan Offtake	
File : O4AP3T05	Date : 12 Jan, 1995	Cross-sections and measured verticals	page
	Init : mk/tr	Channel 1	1.2

Type of measurement	Method	No. of measurements in channel			
		1	2	3	4
Discharge	ADCP transect	4	-	-	-
	EMF transect	-	-	-	-
	Echo-Sounding	-	-	-	-
Vertical current profile	No.of verticals in channel	4	-	-	-
	ADCP	4	-	-	-
	S4 current meter	-	-	-	-
	Ott current meter	-	-	-	-
Vertical sediment profile	Pump bottle sampling	-	-	-	-
	Andreasen settling tube	-	-	-	-
	MEX turbidity meter	-	-	-	-
	Integrated bottle sampling	4	-	-	-
	Collapsible bag	-	-	-	-
Bed load	Dune tracking	-	-	-	-
	Helley-Smith sampler	6	-	-	-
	Delft Bottle	-	-	-	-
Bed material	US BM-54 bed sampler	-	-	-	-
	Van Veen bed sampler	-	-	-	-

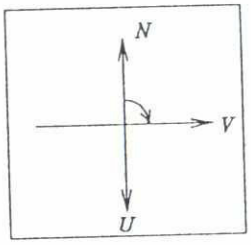
Table 2.1: Survey programme as made

Channel	Width (m)	Area (m^2)	Stage h (m+PWD)	Discharge Q (m^3/s)	Bed load transport Sb (kg/s)	Suspended Sediment transport Ss total (kg/s)
Channel 1	431	2273	3.89	1156	0.1	269.5

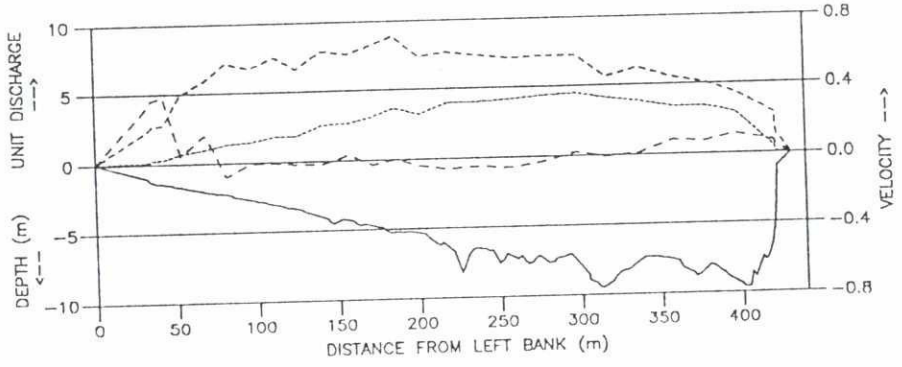
Table 2.2: Key figures

Gauge Location	Channel	Date	Water level (Daily average) (m + PWD)	Gauge
Arial Khan Offtake	Channel 1	25 Oct 94	3.89	FAP 24

Table 2.3: Water-levels



TRANSECT AZIMUTH = 90°
U – VELOCITY NORMAL TO TRANSECT (m/s)
V – VELOCITY PARALLEL TO TRANSECT (m/s)
N – MAGNETIC NORTH

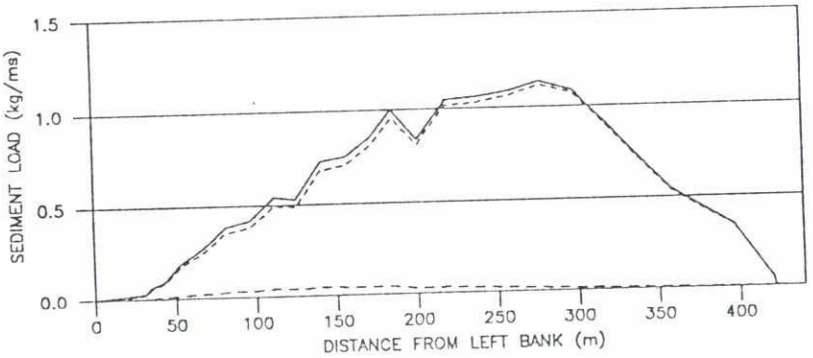


FLOW

LEGEND :

—— WATER DEPTH (m below STAGE)
····· UNIT DISCHARGE ($m^2/s.m$)
---- U – (m/s)
- - - V – (m/s)

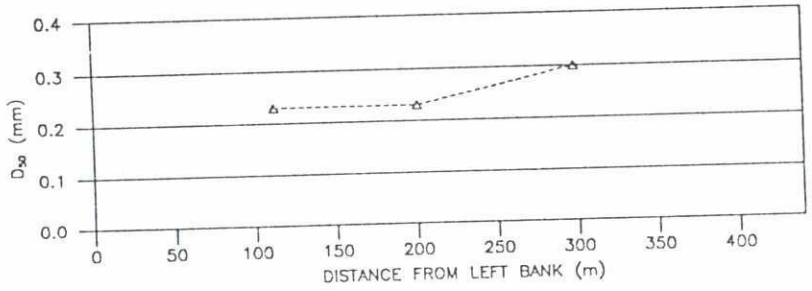
STAGE = 3.89 (m+PWD)
A = 2273 (m^2)
Q = 1156 (m^3/s)



SEDIMENT TRANSPORT

LEGEND :

—— S_{TOTAL} 269.6 (kg/s)
----- $S_{WASH\ LOAD}$ 260.1 (kg/s)
- - - $S_{SUSP.\ BED}$ 9.4 (kg/s)
····· $S_{BED\ LOAD}$ 0.1 (kg/s)

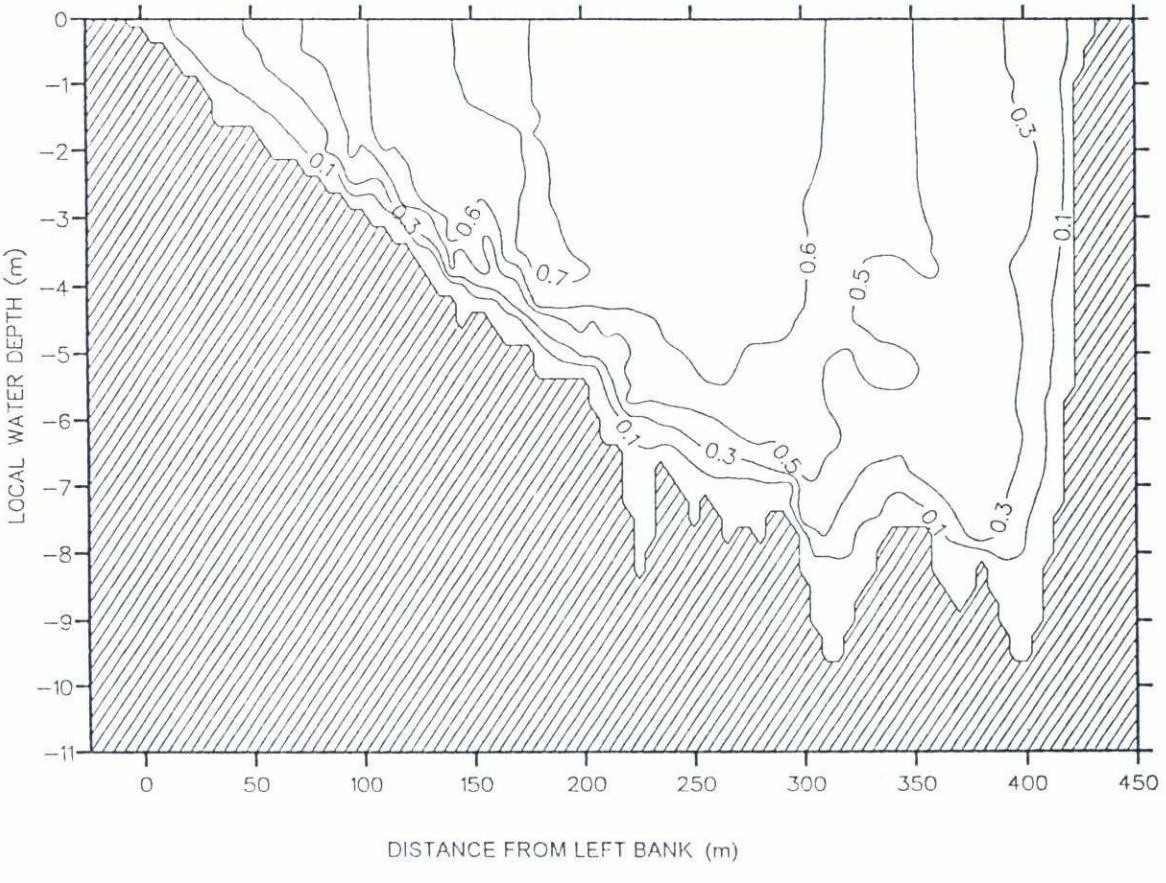


GRAIN SIZE

LEGEND :

◇◇◇◇◇ $D_{50\ SUSP.}$ (mm)
△△△△△ $D_{50\ BED\ LOAD}$ (mm)
□□□□□ $D_{50\ BED\ MAT.}$ (mm)

FAP 24 DELFT - DHI RIVER SURVEY PROJECT Flood Plan Coordination Organization Commission of the European Communities		Survey Bulletin 110 : 25 October, 1994	
		Location 10 : Arial Khan River, Arial Khan Offtake	
File : O4AP3T05	Date : 12 Jan, 1995 Init : mk/tr	Horizontal distribution of flow and sediments Channel 1	page 3.1



Iso-velocity contours (m/s)
Water-level : 3.89 m + PWD measured at the station indicated on page 1.1

FAP 24 DELFT - DHI	RIVER SURVEY PROJECT Flood Plan Coordination Organization Commission of the European Communities	Survey Bulletin 110 : 25 October, 1994	
		Location 10 : Arial Khan River, Arial Khan Offtake	
File : O4AP3T05	Date : 12 Jan, 1995	Cross-sectional distribution of flow velocity	page
	Init : mk/tr	Channel 1	4.1

Andreasen settling tube

Channel	Vertical	Time (YYMMDDHHMM-HHMM)	Depth	Weight percent < 0.06 mm > 0.06 mm	D10 (mm)	D50 (mm)	D90 (mm)
Sample not collected							

Table 5.1: Grain size of near bed suspended sediment (0.3 m above river bed)

US BM-54 bed samples

Channel	Vertical	Time (YYMMDDHHMM-HHMM)	Depth	Weight percent < 0.06 mm > 0.06 mm	D10 (mm)	D50 (mm)	D90 (mm)
Sample not collected							

Table 5.2 : Grain size of bed material

Helley-Smith

Channel	Vertical	Time (YYMMDDHHMM)	Depth (m)	Weight percent < 0.06 mm	> 0.06 mm	D35 (mm)	D50 (mm)	D65 (mm)
1	1	9410251532-1539	3.00	0.171	99.829	0.196	0.240	0.299
	2	9410251503-1518	5.50	0.534	99.466	0.192	0.232	0.289
	3	9410251434-1459	7.20	1.046	98.954	0.236	0.287	0.341
	1	9410251532-1539	3.00	4.468	95.532	0.172	0.216	0.275
	2	9410251503-1518	5.50	0.288	99.712	0.190	0.227	0.282
	3	9410251434-1459	7.20	0.763	99.237	0.265	0.309	0.359

Table 5.3 : Grain sizes of bed load

Method	Channel	Time (YYMMDDHHMM-HHMM)	File name
ADCP & EMF transect	1	9410251342-1345 9410251348-1351 9410251615-1618 9410251623-1626	O4AP3T05 * O4AP3T06 O4AP3T07 O4AP3T08

Table 6.1: ADCP & EMF transects * : transect in PSD 24 data base and presented in Sections 3 and 4

Method	Channel	Vertical	Time (YYMMDDHHMM-HHMM)	Easting (m)	Northing (m)	Depth (m)	File name
Vertical current & turbidity profiles (ADCP/S4/MEX)	1	1	9410251532-1539	509015	593797	3.00	O4AP3P05 *
		2	9410251503-1518	508924	593800	5.50	O4AP3P03 *
		3	9410251434-1459	508835	593800	7.20	O4AP3P02 *
		4	9410251406-1420	508732	593809	9.70	O4AP3P01 *

Table 6.2: Vertical profiles * S4 and MEX not available

Method	Channel	Vertical	No. of samples	Time (YYMMDDHHMM-HHMM)	Easting (m)	Northing (m)	Depth (m)
Suspended sediments (pump bottle)	Sample not collected						

Table 6.3: Suspended sediment - point sampled

Method	Channel	Vertical	No. of samples	Time (YYMMDDHHMM-HHMM)	Easting (m)	Northing (m)	Depth (m)
Suspended sediments (pump bottle)	1	1	1	9410251532-1539	509015	593797	3.00
		2	1	9410251503-1518	508924	593800	5.50
		3	1	9410251434-1459	508835	593800	7.20
		4	1	9410251406-1420	508732	593809	9.70

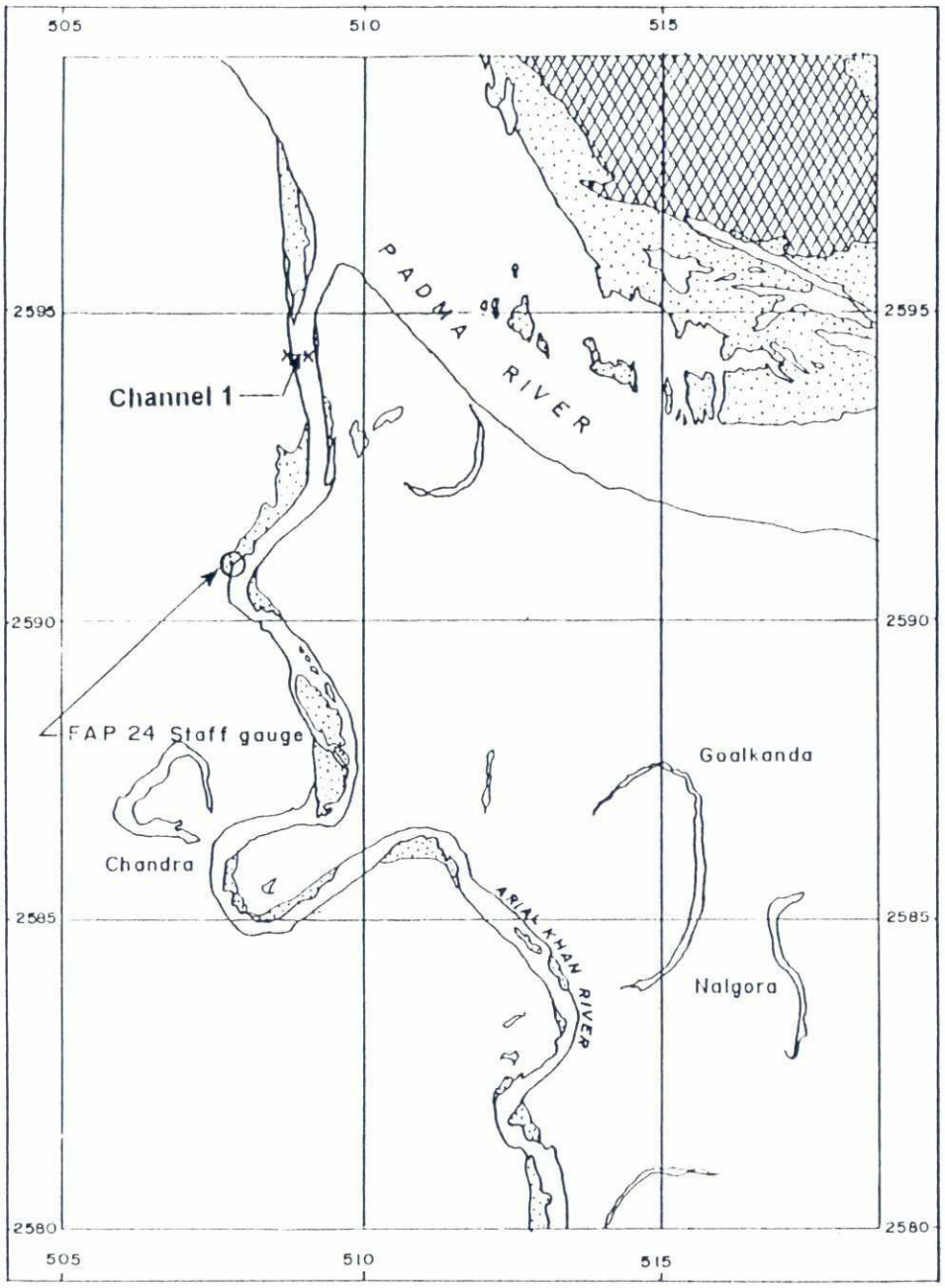
Table 6.4: Suspended sediment - depth integrated

Method	Channel	Vertical	Time (YYMMDDHHMM-HHMM)	Easting (m)	Northing (m)	Depth (m)	Sample No.
Helley-Smith Sample	1	1	9410251532-1539	509015	593797	3.00	A2180
		2	9410251503-1518	508924	593800	5.50	A2173
		3	9410251434-1459	508835	593800	7.20	A2157
		1	9410251532-1539	509015	593797	3.00	A1691
		2	9410251503-1518	508924	593800	5.50	A1946
		3	9410251434-1459	508835	593800	7.20	A1900

Table 6.5: Bed load

Types of Data	Channel	Format	Filename
ADCP/S4/EMF data	1	QUATTRO	O4AP3T05 .ase
Echosounder data	1	QUATTRO	O4AP3T05 .ech
Sediment transport data	1	QUATTRO	O4AP3T05 .sed
Bed load sed. analysis	1	QUATTRO	O4AP3T05 .bdl
Sus. sed. conc. analysis	1	QUATTRO	O4AP3T05 .ssc
Transect plot data	1	QUATTRO	O4AP3T05 .trs
Iso-velocity plot data	1	MIKE 21	O4AP3T05 .ct2 O4AP3T05 .dt2

Table 7.1 PSD 24 Database file description



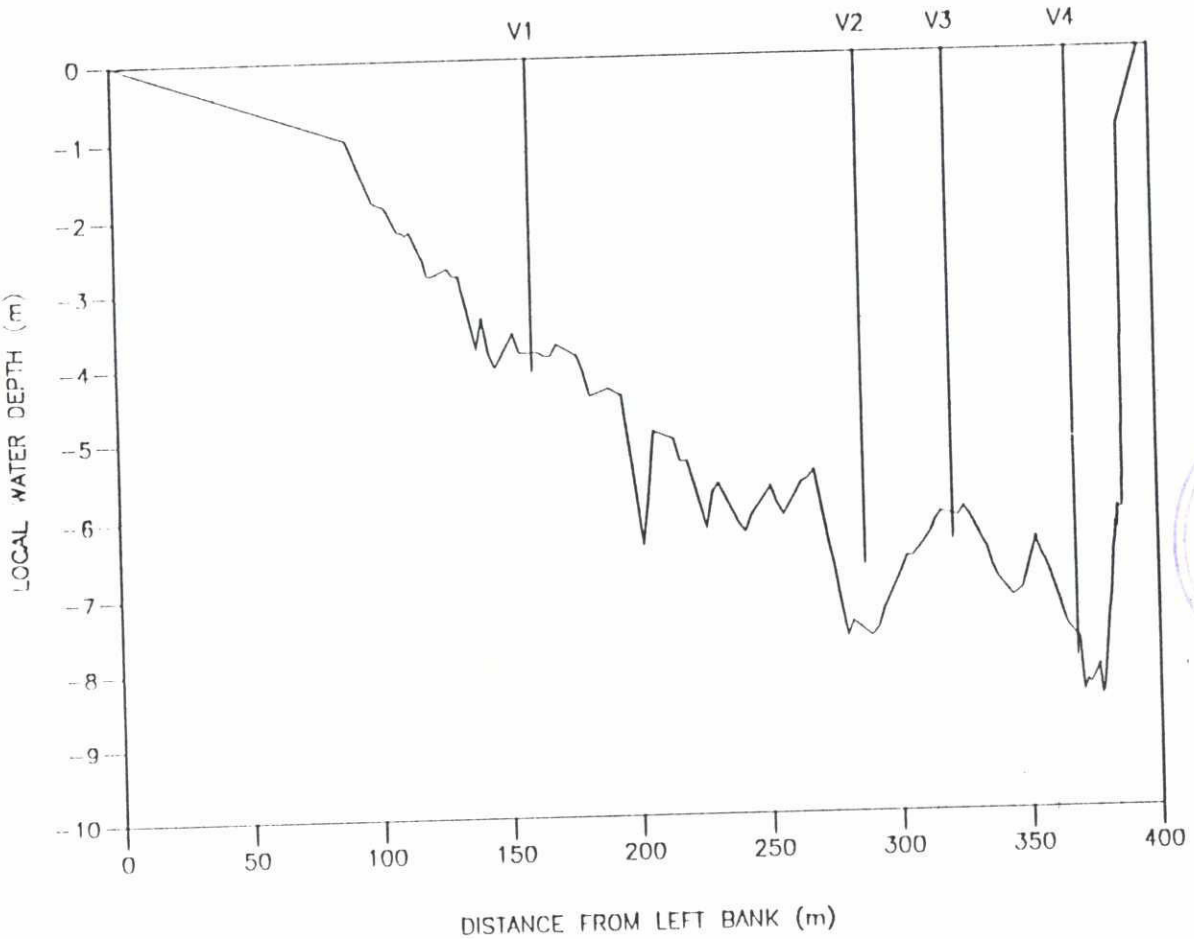
LEGEND:

- Cross section
- High land
- Unstable/low char
- FAP 24 Staff gauge

2500 m 1000 m 0 2.5 km
Scale

Map is based on satellite images of March 1994

FAP 24 DELFT - DHI	RIVER SURVEY PROJECT Flood Plan Coordination Organization Commission of the European Communities	Survey Bulletin 120 : 17 November, 1994	
		Location 10 : Arial Khan River, Arial Khan Offtake	
	Date : 30 Jan 1995	Location map	page 11
	Init : mk/tr		



Water-level : 2.49 m + PWD measured at the station indicated on page 1.1

FAP 24 DELFT - DHI	RIVER SURVEY PROJECT Flood Plan Coordination Organization Commission of the European Communities	Survey Bulletin 120 : 17 November, 1994	
		Location 10 : Arial Khan River, Arial Khan Offtake	
File : O4BH1101	Date : 30 Jan 1995	Cross-sections and measured verticals	page
	Init : mk / tr	Channel 1	1.2

Type of measurement	Method	No of measurements in channel			
		1	2	3	4
Discharge	ADCP transect	4	-	-	-
	EMF transect	-	-	-	-
	Echo-Sounding	-	-	-	-
Vertical current profile	No of verticals in channel	4	-	-	-
	ADCP	3	-	-	-
	S4 current meter	-	-	-	-
	Ott current meter	-	-	-	-
Vertical sediment profile	Pump bottle sampling	6	-	-	-
	Andreasen settling tube	-	-	-	-
	MEX turbidity meter	-	-	-	-
	Integrated bottle sampling	4	-	-	-
	Collapsible bag	-	-	-	-
Bed load	Dune tracking	-	-	-	-
	Helley-Smith sampler	2	-	-	-
	Delft Bottle	-	-	-	-
Bed material	US BM-54 bed sampler	-	-	-	-
	Van Veen bed sampler	-	-	-	-

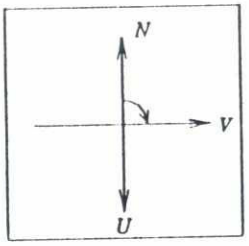
Table 2.1: Survey programme as made

Channel	Width (m)	Area (m^2)	Stage h (m+PWD)	Discharge Q (m^3/s)	Bed load transport Sb (kg/s)	Suspended Sediment transport Ss total (kg/s)
Channel 1	396	1625	2.49	585	0	60

Table 2.2: Key figures

Gauge Location	Channel	Date	Water level (Daily average) (m + PWD)	Gauge
Arial Khan Offtake	Channel 1	17 Nov 94	2.49	FAP 24

Table 2.3: Water-levels

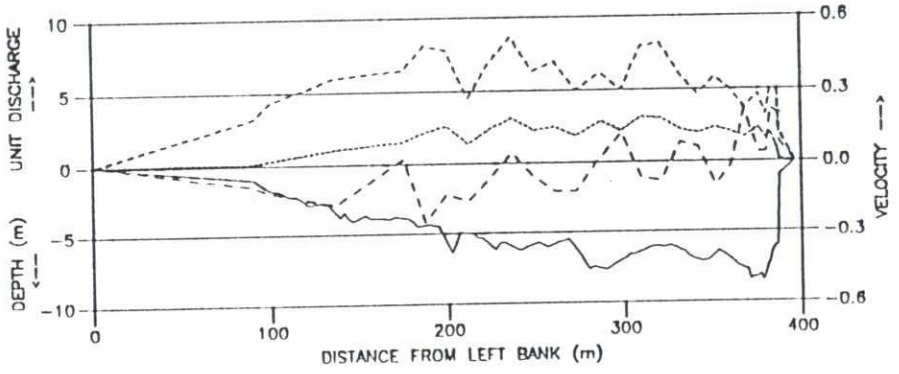


TRANSECT AZIMUTH = 90°

U – VELOCITY NORMAL TO TRANSECT (m/s)

V – VELOCITY PARALLEL TO TRANSECT (m/s)

N – MAGNETIC NORTH



LEGEND :

WATER DEPTH (m below STACE)

UNIT DISCHARGE (m^2/s.m)

U – (m/s)

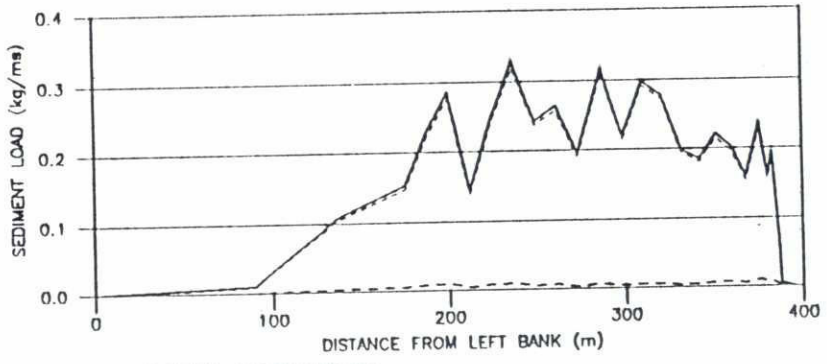
V – (m/s)

STACE = 2.49 (m+PWD)

A = 1625 (m^2)

Q = 585 (m^3/s)

FLOW



LEGEND :

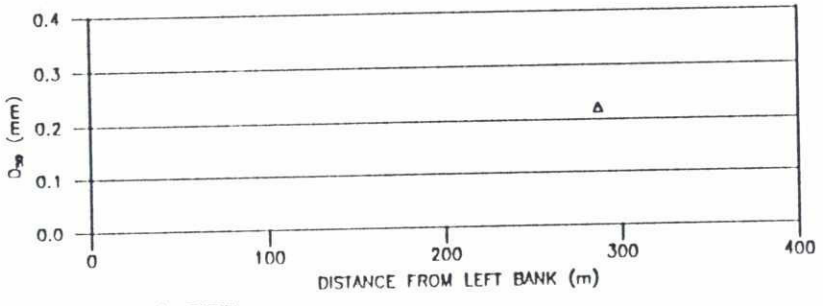
S_{TOTAL} 60 (kg/s)

$S_{WASH\ LOAD}$ 58 (kg/s)

$S_{SUSP.\ BED}$ 2 (kg/s)

$S_{BED\ LOAD}$ 0 (kg/s)

SEDIMENT TRANSPORT



LEGEND :

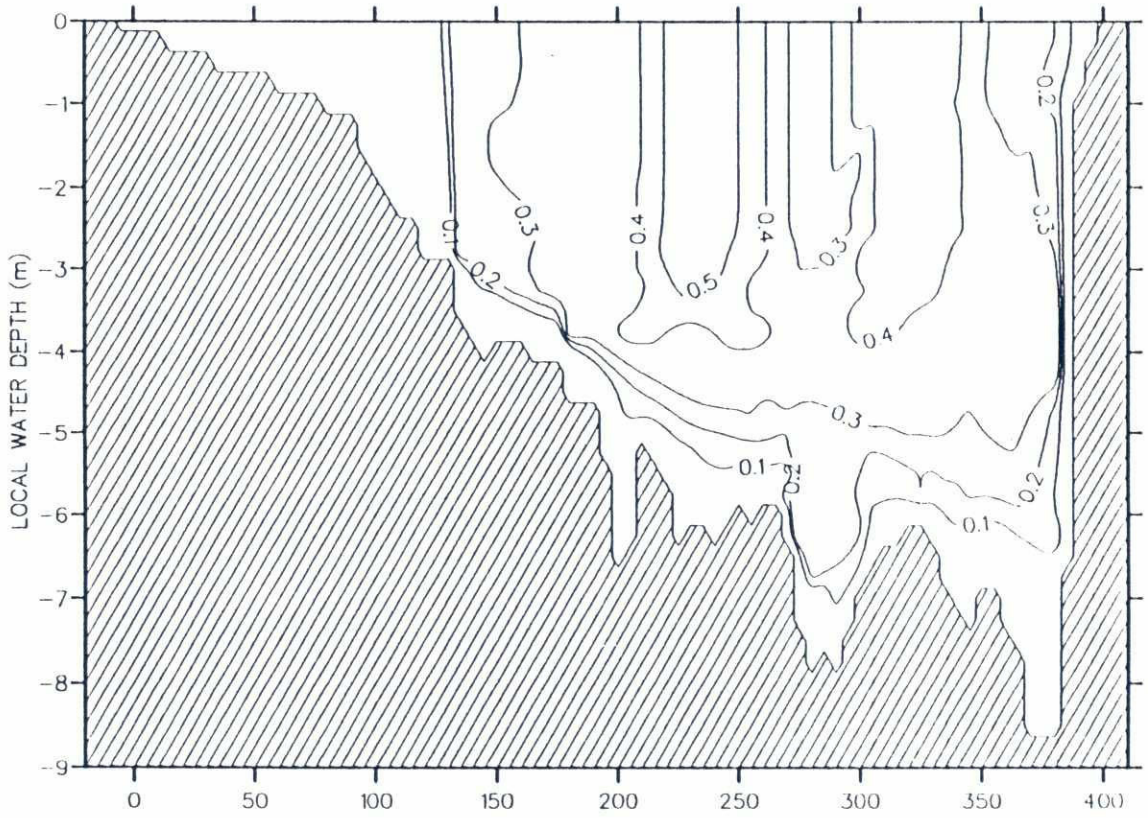
◊◊◊◊◊ $D_{50\ SUSP.}$ (mm)

△△△△△ $D_{50\ BED\ LOAD}$ (mm)

□□□□□ $D_{50\ BED\ MAT.}$ (mm)

GRAIN SIZE

FAP 24 DELFT - DHI RIVER SURVEY PROJECT Flood Plan Coordination Organization Commission of the European Communities		Survey Bulletin 120 : 17 November, 1994	
		Location 10 : Arial Khan River, Arial Khan Offtake	
File O4BH1T01	Date : 30 Jan 1995 Init : mk / tr	Horizontal distribution of flow and sediments Channel 1	page 3.1



Iso-velocity contours (m/s)
Water-level : 2.49 m + PWD measured at the station indicated on page 1.1

FAP 24 DELFT - DHI	RIVER SURVEY PROJECT Flood Plan Coordination Organization Commission of the European Communities	Survey Bulletin 120 : 17 November, 1994	
		Location 10 : Arial Khan River, Arial Khan Offtake	
File : O4BH1T01	Date : 30 Jan 1995	Cross-sectional distribution of flow velocity	page 4.1
	Init : mk / tr	Channel 1	

92

Andreasen settling tube

Channel	Vertical	Time (YYMMDDHHMM-HHMM)	Depth	Weight percent < 0.06 mm	Weight percent > 0.06 mm	D10 (mm)	D50 (mm)	D90 (mm)
Sample not collected								

Table 5.1: Grain size of near bed suspended sediment (0.3 m above river bed)

US BM-54 bed samples

Channel	Vertical	Time (YYMMDDHHMM-HHMM)	Depth	Weight percent < 0.06 mm	Weight percent > 0.06 mm	D10 (mm)	D50 (mm)	D90 (mm)
Sample not collected								

Table 5.2 : Grain size of bed material

Helley-Smith

Channel	Vertical	Time (YYMMDDHHMM)	Depth (m)	Weight percent < 0.06 mm	Weight percent > 0.06 mm	D35 (mm)	D50 (mm)	D65 (mm)
1	2	9411171407-1418	6.70	1.463	98.537	0.180	0.220	0.277
	2	9411171407-1418	6.70	1.115	98.885	0.185	0.226	0.285

Table 5.3 : Grain sizes of bed load

Method	Channel	Time (YYMMDDHHMM-HHMM)	File name
ADCP & EMF transect	1	9411171038-1040 9411171047-1050 9411171504-1506 9411171508-1511	O4BH1T01 * O4BH1T02 O4BH1T05 O4BH1T06

Table 6.1: ADCP & EMF transects * : transect in PSD 24 data base and presented in Sections 3 and 4

Method	Channel	Vertical	Time (YYMMDDHHMM-HHMM)	Easting (m)	Northing (m)	Depth (m)	File name
Vertical current & turbidity profiles (ADCP/S4/MEX)	1	1	9411171442-1446	508938	593801	4 10	O4BH1P04 *
		2	9411171407-1418	508822	593806	6 70	O4BH1P03 *
		3	9411171342-1352	508777	593795	6 40	O4BH1P02 *
		4	9411171209-1303	508735	593799	8 00	O4BH1P01 **

Table 6.2: Vertical profiles ** ADCP and S4 and MEX not available * S4 and MEX not available

Method	Channel	Vertical	No. of samples	Time (YYMMDDHHMM-HHMM)	Easting (m)	Northing (m)	Depth (m)
Suspended sediments (pump bottle)	1	4	6	9411171209-1303	508735	593799	8 00

Table 6.3. Suspended sediment - point sampled

Method	Channel	Vertical	No of samples	Time (YYMMDDHHMM-HHMM)	Easting (m)	Northing (m)	Depth (m)
Suspended sediments	1	1	1	9411171442-1446	508938	593801	4.10
		2	1	9411171407-1418	508822	593806	6.70
		3	1	9411171342-1352	508777	593795	6.40
		4	1	9411171209-1303	508735	593799	8.00

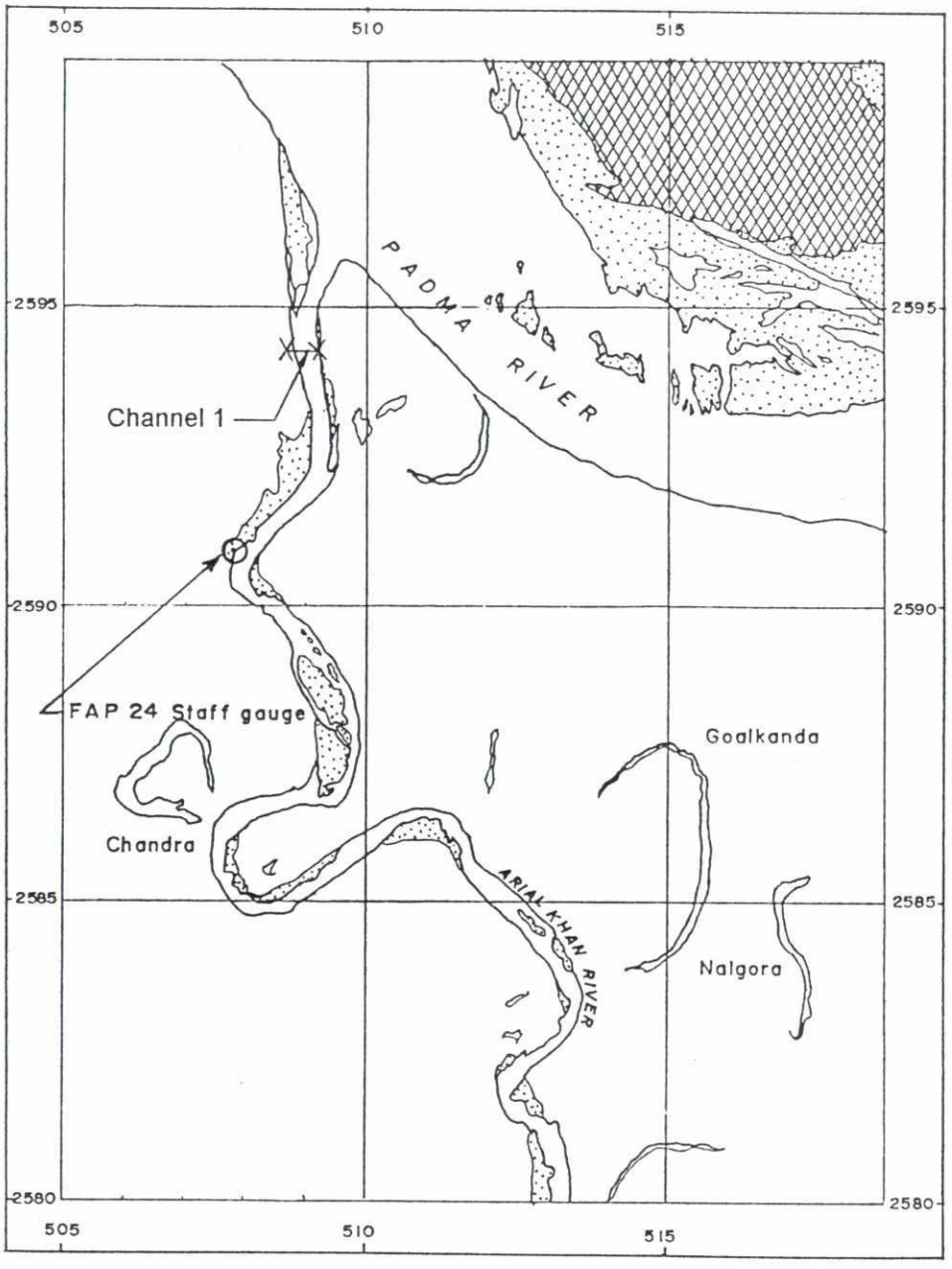
Table 6.4 Suspended sediment - depth integrated

Method	Channel	Vertical	Time (YYMMDDHHMM-HHMM)	Easting (m)	Northing (m)	Depth (m)	Sample No
Helley-Smith Sample	1	2	9411171407-1418	508822	593806	6.70	A1825
		2	9411171407-1418	508822	593806	6.70	A1915

Table 6.5 Bed load

Types of Data	Channel	Format	Filename
ADCP/S4/EMF data	1	QUATTRO	O4BH1T01 .ase
Echosounder data	1	QUATTRO	O4BH1T01 .ech
Sediment transport data	1	QUATTRO	O4BH1T01 .sed
Bed load sed. analysis	1	QUATTRO	O4BH1T01 .bdl
Sus. sed. conc. analysis	1	QUATTRO	O4BH1T01 .ssc
Transect plot data	1	QUATTRO	O4BH1T01 .trs
Iso-velocity plot data	1	MIKE 21	O4BH1T01 .ct2 O4BH1T01 .dt2

Table 7.1 PSD 24 Database file description



LEGEND:

- Cross section
- High land
- Unstable/low char
- FAP 24 Staff gauge

2500 m 1000 m 0 2.5 km
Scale

Map is based on satellite images of March 1994

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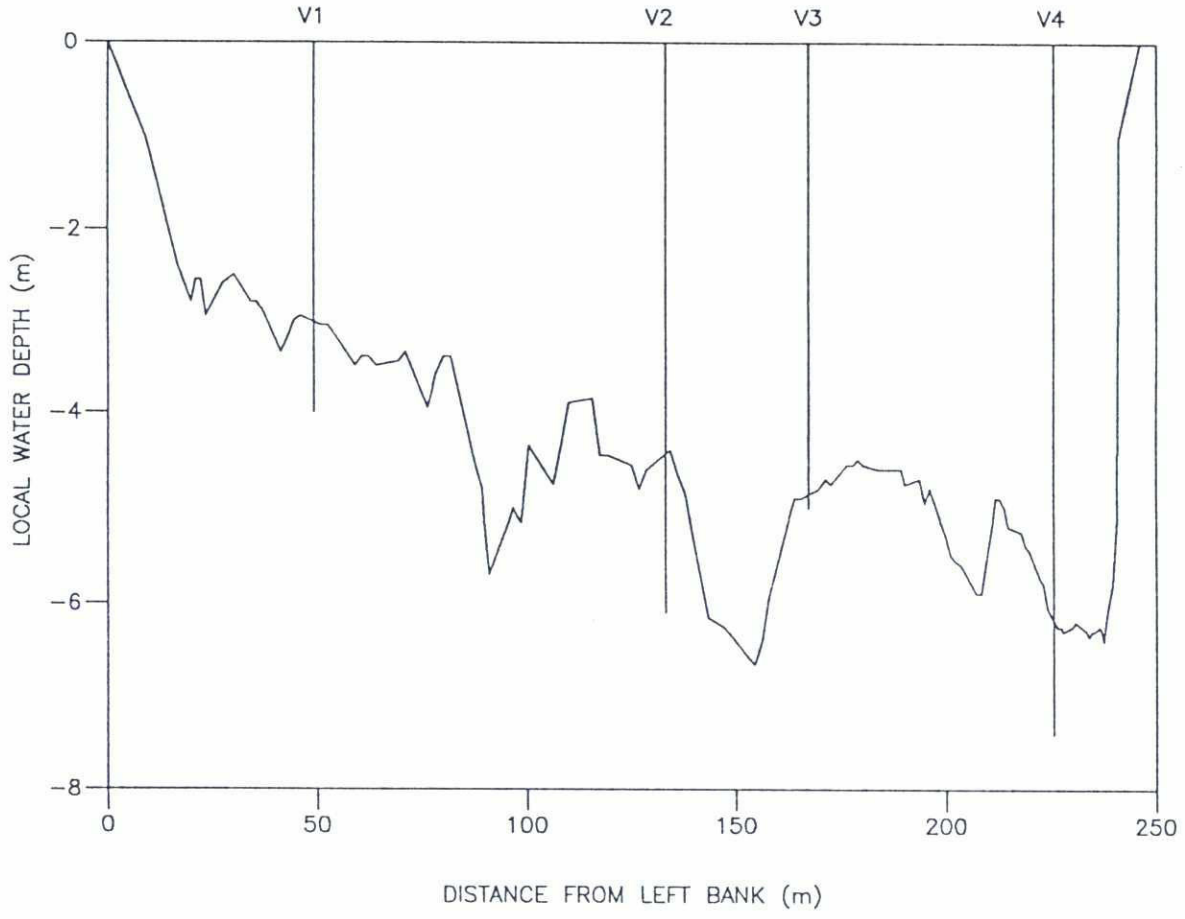
		Location 10 : Arial Khan River , Arial Khan Offtake	
	Date : 27 Aug 1995	Location map	page 1.1
	Init : mk/ss		



Water level : 1.19 m + PWD measured at the station indicated on page 1.1

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		Location 10 : Arial Khan River , Arial Khan Offtake	
File : O52N1T08	Date : 27 Aug 1995 Init : mk/ss	Cross-sections and measured verticals Channel 1	page 1.2

Type of measurement	Method	No. of measurements in channel			
		1	2	3	4
Discharge	ADCP transect	26	-	-	-
	EMF transect	-	-	-	-
	Echo-Sounding	-	-	-	-
Vertical current profile	No.of verticals in channel	4	-	-	-
	ADCP	4	-	-	-
	S4 current meter	1	-	-	-
	Ott current meter	-	-	-	-
Vertical sediment profile	Pump bottle sampling	6	-	-	-
	Andreasen settling tube	-	-	-	-
	MEX turbidity meter	-	-	-	-
	Integrated bottle sampling	4	-	-	-
	Collapsible bag	-	-	-	-
Bed load	Dune tracking	-	-	-	-
	Helley-Smith sampler	2	-	-	-
	Delft Bottle	-	-	-	-
Bed material	US BM-54 bed sampler	-	-	-	-
	Van Veen bed sampler	-	-	-	-

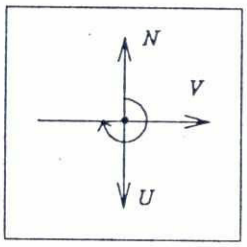
Table 2.1: Survey programme as made

Channel 1 File Names	Width (m)	Area (m^2)	Stage h (m+PWD)	Discharge Q (m^3/s)
O52N1T01	255	1105	1.22	154
O52N1T04	285	1298	1.17	191
O52N1T08 *	239	1042	1.19	198
O52N1T09	248	1076	1.14	181
O52N1T15	237	1027	1.09	165
O52N1T18	221	1003	1.14	271
O52N1T20 *	234	1049	1.26	298
O52N1T21	251	1123	1.28	236
O52N1T25	237	1033	1.27	202
O52N1T29 *	231	1045	1.25	210
O52N1T33	239	1068	1.19	171
O52N1T36	258	1166	1.17	177
O52N1T38	247	1085	1.14	120

Table 2.2: Key figures

* iso-velocity plots & velocity distribution presented

Note : Each transect measurement performed twice (reverse direction)

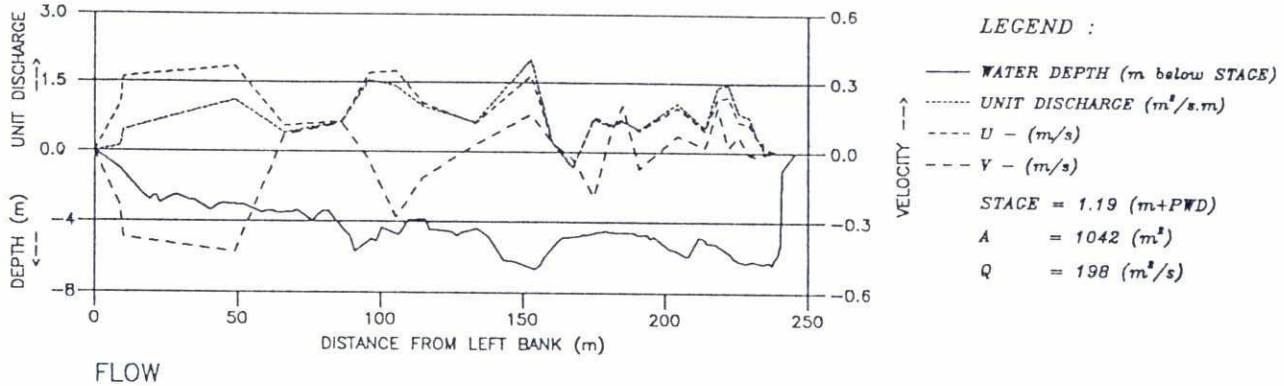


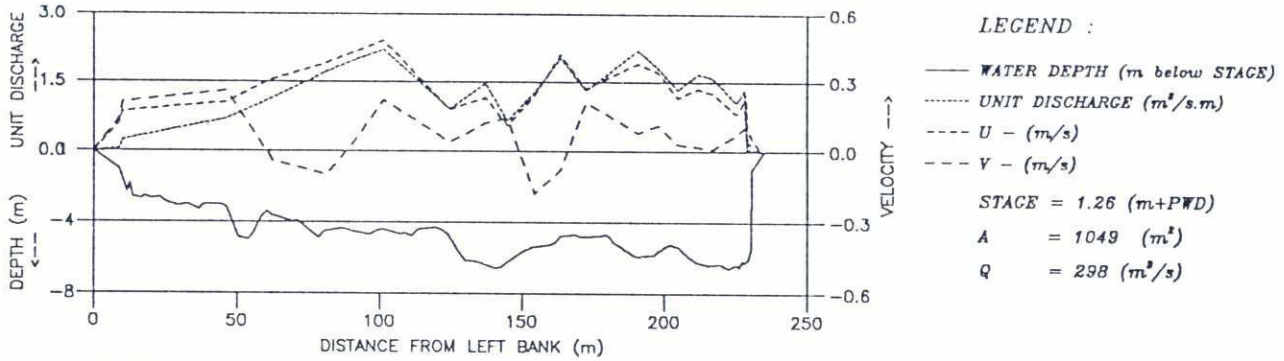
TRANSECT AZIMUTH = 270°

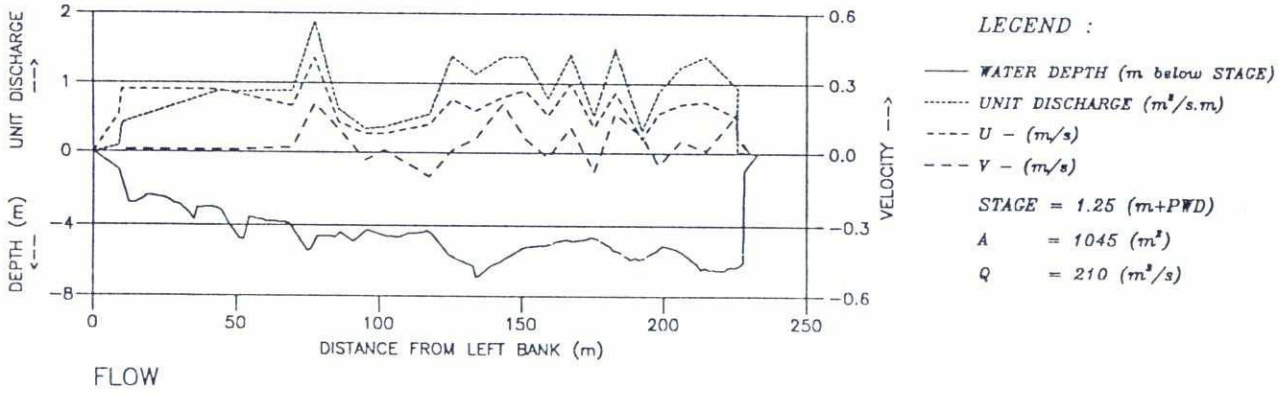
U – VELOCITY NORMAL TO TRANSECT (m/s)

V – VELOCITY PARALLEL TO TRANSECT (m/s)

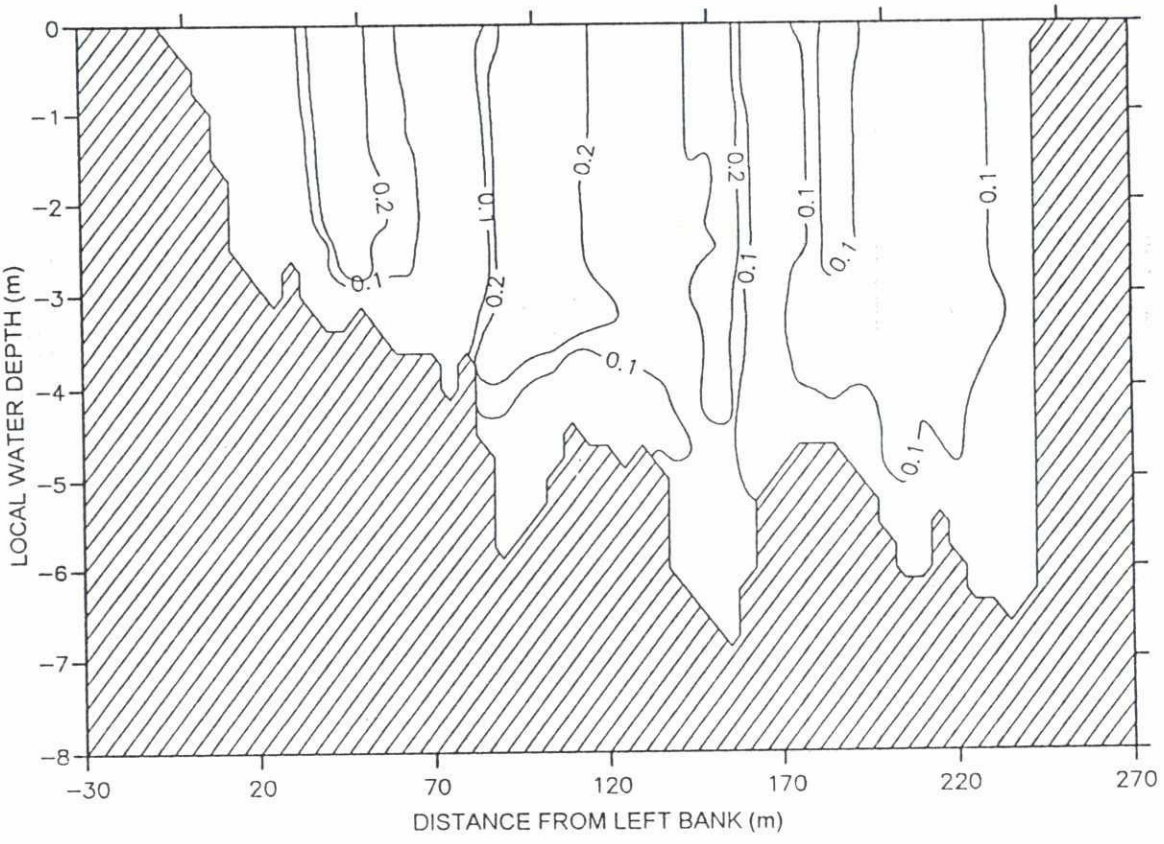
N – MAGNETIC NORTH





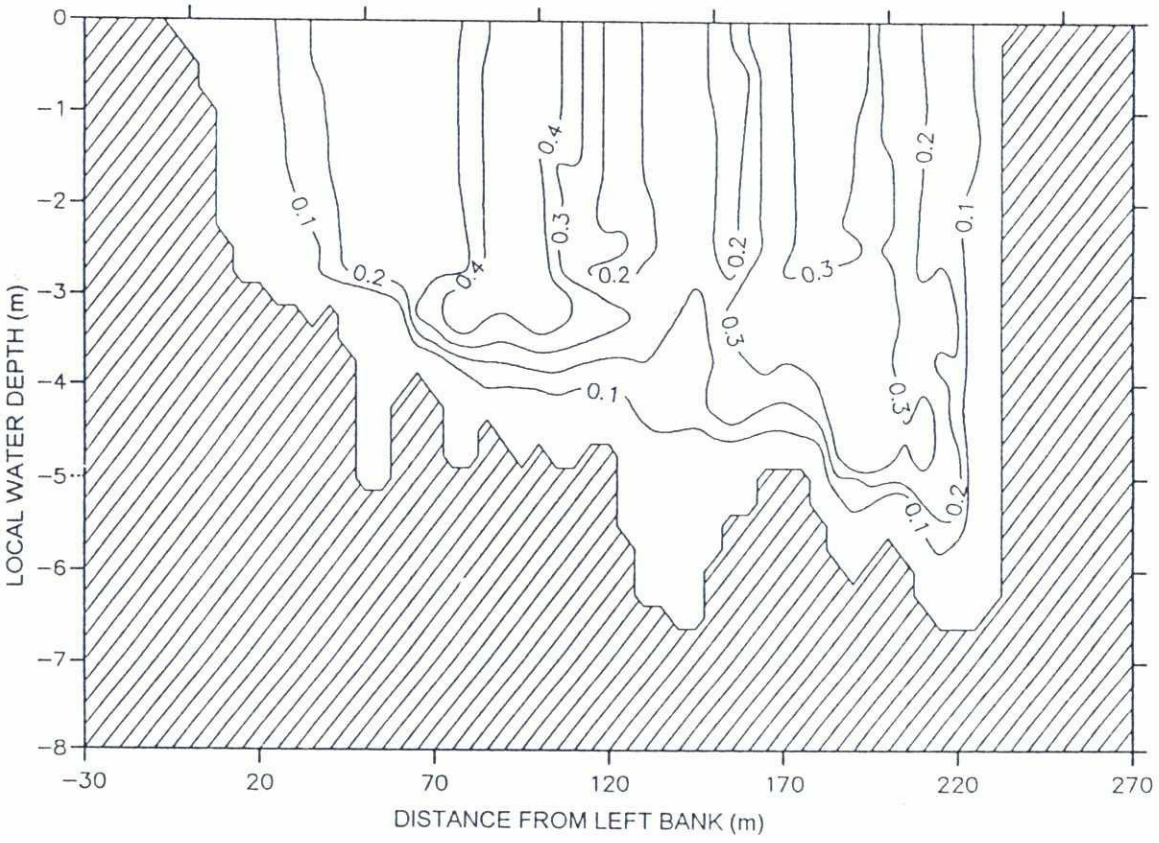


FAP 24 DELFT - DHI	RIVER SURVEY PROJECT Flood Plan Coordination Organization Commission of the European Communities	Survey Bulletin 136 : 23 February , 1995	
		Location 10 : Arial Khan River , Arial Khan Offtake	
File : O52N1T08 O52N1T20 O52N1T29	Date : 27 Aug 1995 Init : mk/ss	Horizontal distribution of flow Channel 1	page 3.1



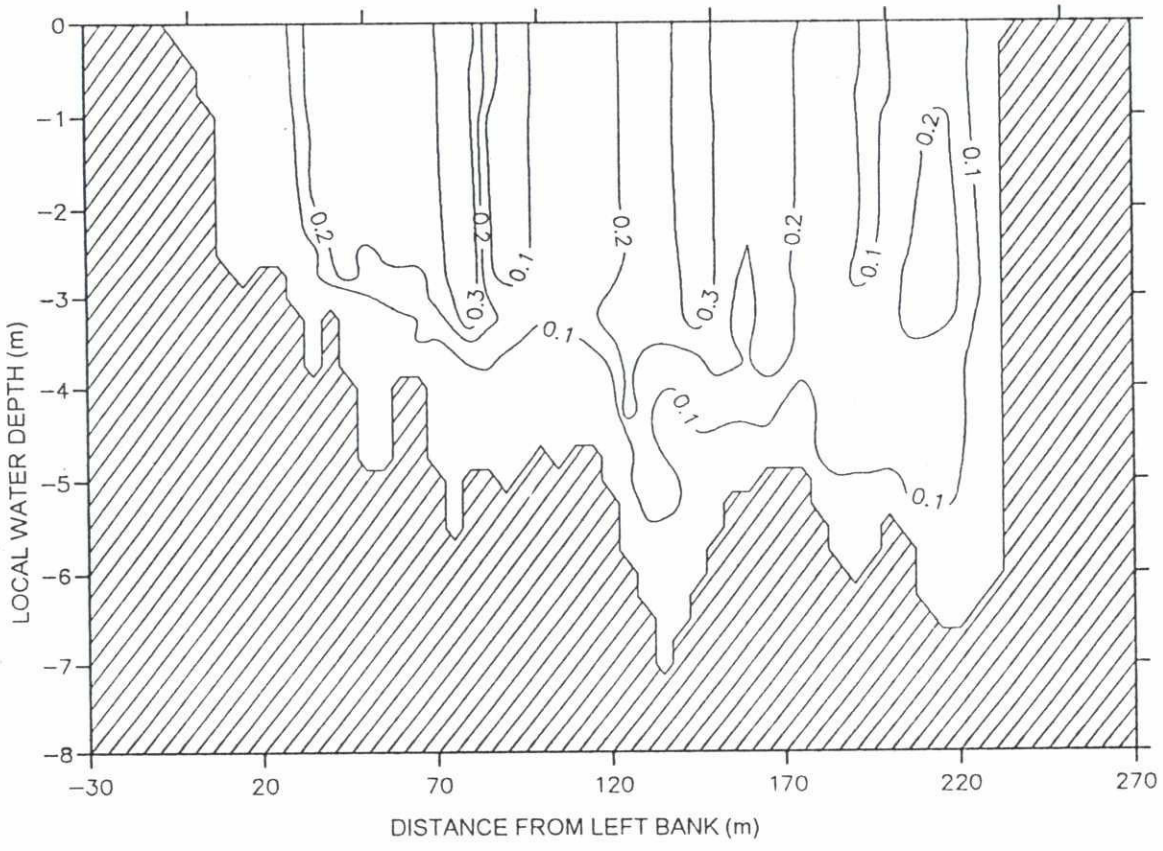
Iso-velocity contours (m/s)
Water level : 1.19 m + PWD measured at the station indicated on page 1.1 at 10:40 hours on 23 Feb 95

FAP 24 DELFT - DHI RIVER SURVEY PROJECT Flood Plan Coordination Organization Commission of the European Communities		Survey Bulletin 136 : 23 February , 1995	
		Location 10 : Arial Khan River , Arial Khan Offtake	
File : O52N1T08	Date : 27 Aug 1995 Init : mk/ss	Cross-sectional distribution of flow velocity Channel 1	page 4.1



Iso-velocity contours (m/s)
Water level : 1.26 m + PWD measured at the station indicated on page 1.1
at 15:00 hours on 23 Feb 95

FAP 24 DELFT - DHI RIVER SURVEY PROJECT Flood Plan Coordination Organization Commission of the European Communities		Survey Bulletin 136 : 23 February , 1995	
		Location 10 : Arial Khan River , Arial Khan Offtake	
File : O52N1T20	Date : 27 Aug 1995 Init : mk/ss	Cross-sectional distribution of flow velocity Channel 1	page 4.2



Iso-velocity contours (m/s)
Water level : 1.25 m + PWD measured at the station indicated on page 1.1
at 17:35 hours on 23 Feb 95

FAP 24 DELFT - DHI	RIVER SURVEY PROJECT Flood Plan Coordination Organization Commission of the European Communities	Survey Bulletin 136 : 23 February , 1995	
		Location 10 : Arial Khan River , Arial Khan Offtake	
File : O52N1T29	Date : 27 Aug 1995	Cross-sectional distribution of flow velocity	page 4.3
	Init : mk/ss	Channel 1	

Helley-Smith

Channel	Vertical	Time (YYMMDDHHMM-HHMM	Depth (m)	Weight percent < 0.06 mm	Weight percent > 0.06 mm	D35 (mm)	D50 (mm)	D65 (mm)
1	4	9502231403- 1441	7.4	62.7	37.3	-	-	0.066
	4	9502231403- 1441	7.4	11.4	88.6	0.151	0.199	0.262

Table 5.1 : Grain size of bed load

Method	Channel	Time (YYMMDDHHMM-HHMM)	File name
ADCP & EMF transect	1	9502230830-0832	O52N1T01
		9502230834-0838	O52N1T02
		9502230930-0933	O52N1T04
		9502230935-0938	O52N1T05
		9502231032-1034	O52N1T07
		9502231036-1039	O52N1T08 *
		9502231126-1128	O52N1T09
		9502231129-1132	O52N1T10
		9502231234-1237	O52N1T14
		9502231240-1242	O52N1T15
		9502231324-1326	O52N1T17
		9502231330-1332	O52N1T18
		9502231455-1458	O52N1T19
		9502231500-1503	O52N1T20 *
		9502231528-1531	O52N1T21
		9502231533-1535	O52N1T22
		9502231624-1626	O52N1T24
		9502231631-1634	O52N1T25
		9502231731-1733	O52N1T28
		9502231735-1738	O52N1T29 *
		9502231928-1931	O52N1T33
		9502231934-1936	O52N1T34
		9502232026-2030	O52N1T36
		9502232032-2035	O52N1T37
		9502232127-2130	O52N1T38
		9502232133-2136	O52N1T39

Table 6.1: ADCP & EMF transects

* : transect in PSD 24 data base and presented in Sections 3 and 4

Method	Channel	Vertical	Time (YYMMDDHHMM-HHMM)	Easting (m)	Northing (m)	Depth (m)	File name
Vertical current & turbidity profiles (ADCP/S4/MEX)	1	1	9502231701-1721	508898	593822	4.00	O52N1P04 *
		2	9502231725-1730	508817	593815	6.10	O52N1P06 *
		3	9502231552-1558	508782	593805	5.00	O52N1P02 *
		4	9502231403-1441	508728	593797	7.40	O52N1P01 **

Table 6.2 Vertical profiles

* S4 & MEX are not available

** MEX not available

Method	Channel	Vertical	No of samples	Time (YYMMDDHHMM-HHMM)	Easting (m)	Northing (m)	Depth (m)
Suspended sediment (pump bottle)	1	4	6	9502231403-1441	508728	593797	7.4

Table 6.3 Suspended sediment - point sampled

Method	Channel	Vertical	No of samples	Time (YYMMDDHHMM-HHMM)	Easting (m)	Northing (m)	Depth (m)
Suspended sediments	1	1	1	9502231701-1721	508898	593822	4.00
		2	1	9502231725-1730	508817	593815	6.10
		3	1	9502231552-1558	508782	593805	5.00
		4	1	9502231403-1441	508728	593799	7.40

Table 6.4 Suspended sediment - depth integrated

Method	Channel	Vertical	Time (YYMMDDHHMM-HHMM)	Easting (m)	Northing (m)	Depth (m)	Sample No.
Helley-Smith Sample	1	4	9502231403-1441	508728	593797	7.40	A1893
		4	9502231403-1441	508728	593797	7.40	A2155

Table 6.5: Bed load

Types of Data	Channel	Format	Filename
ADCP/S4/EMF data	1	QUATTRO	O52N1T08 .ase
		QUATTRO	O52N1T20 .ase
		QUATTRO	O52N1T29 .ase
Echosounder data	1	QUATTRO	O52N1T08 .ech
		QUATTRO	O52N1T20 .ech
		QUATTRO	O52N1T29 .ech
Transect plot data	1	QUATTRO	O52N1T08 .trs
		QUATTRO	O52N1T20 .trs
		QUATTRO	O52N1T29 .trs
Iso-velocity plot data	1	MIKE 21	O52N1T08 .ct2
		MIKE 21	O52N1T08 .dt2
		MIKE 21	O52N1T20 .ct2
		MIKE 21	O52N1T20 .dt2
		MIKE 21	O52N1T29 .ct2
		MIKE 21	O52N1T29 .dt2

Table 7.1 PSD 24 Database file description