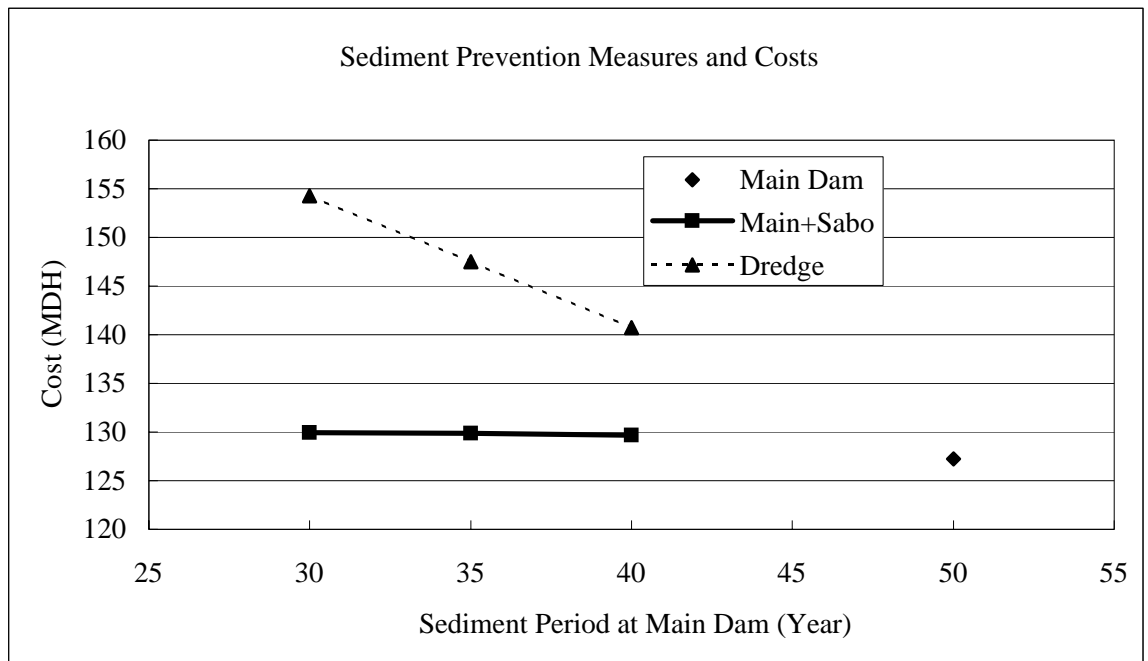


*Feasibility Study on Water Resources Development in
Rural Area in the
Kingdom of Morocco
Final Report
Volume V Supporting Report (2.B)
Feasibility Study
Supporting Report XVII
Preliminary Design and Cost Estimates*

Figures

No.5 N'fifikh

Main Dam	Sed. Period (ys)	50	40	35	30
	Sed. Vol. (Mm3)	1.50	1.20	1.05	0.90
	Crest EL. (m)	247.00	246.88	246.83	246.77
	Dam H. (m)	42.00	41.88	41.83	41.77
Sabo Dam	Sed. Vol. (Mm3)	0.00	0.30	0.45	0.60
	Crest EL. (m)	-	247.32	248.39	249.26
	Dam H. (m)	-	15.32	16.39	17.26
Cost	Main Dam (MDH)	127.24	126.63	126.38	126.08
	Sabo Dam (MDH)	0.00	3.03	3.47	3.83
	Dredging (MDH)	0.00	14.10	21.15	28.20
Total	Main Dam (MDH)	127.24	-	-	-
	Main+Sabo (MDH)	-	129.66	129.85	129.91
	Main+Dredg. (MDH)	-	140.73	147.53	154.28
Minimum					



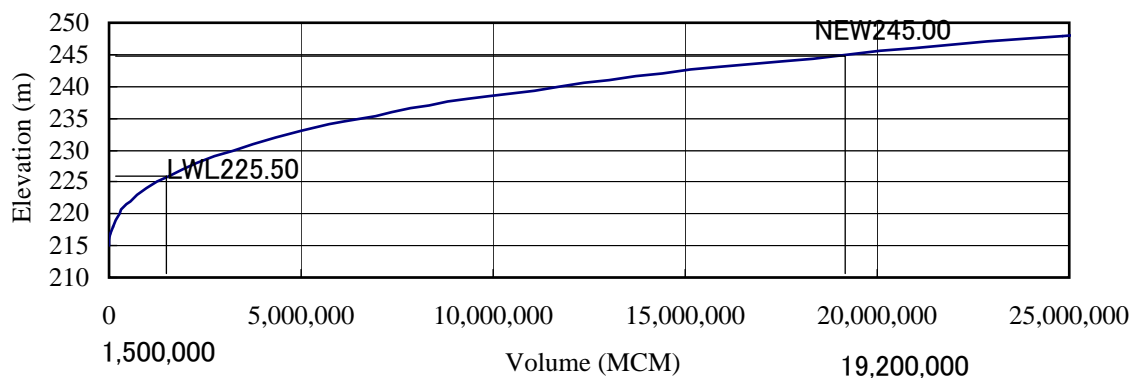
FEASIBILITY STUDY ON
WATER RESOURCES DEVELOPMENT
IN RURAL AREA

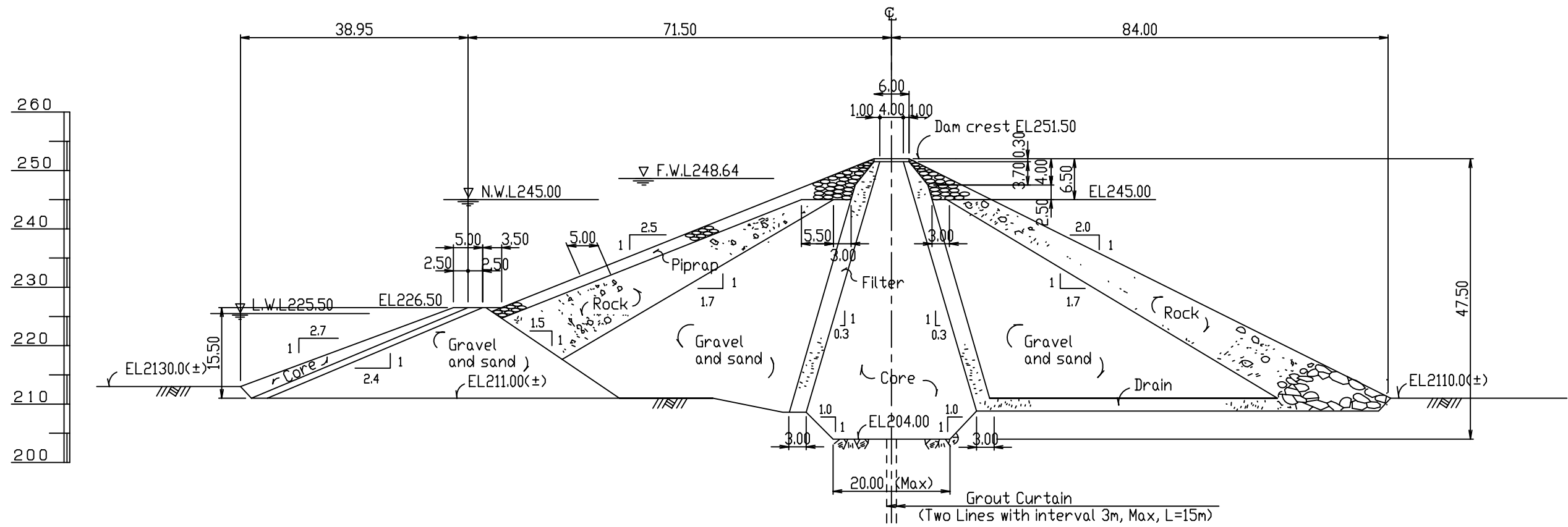
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Figure XVII.2.1.1
Comparison of Sediment Prevention
Measures in N'Fifikh

H(m)	Difference D(m)	Area A(m)	Ave. Area A(m)	Volume V(m)	Accu. Volume $\Sigma V(m)$
215	0	0	0	0	0
216	1	21,240	10,620	10,620	10,620
217	1	42,480	31,860	31,860	42,480
218	1	63,720	53,100	53,100	95,580
219	1	84,960	74,340	74,340	169,920
220	1	106,200	95,580	95,580	265,500
221	1	141,880	124,040	124,040	389,540
222	1	177,560	159,720	159,720	549,260
223	1	213,240	195,400	195,400	744,660
224	1	248,920	231,080	231,080	975,740
225	1	284,600	266,760	266,760	1,242,500
226	1	328,880	306,740	306,740	1,549,240
227	1	373,160	351,020	351,020	1,900,260
228	1	417,440	395,300	395,300	2,295,560
229	1	461,720	439,580	439,580	2,735,140
230	1	506,000	483,860	483,860	3,219,000
231	1	567,240	536,620	536,620	3,755,620
232	1	628,480	597,860	597,860	4,353,480
233	1	689,720	659,100	659,100	5,012,580
234	1	750,960	720,340	720,340	5,732,920
235	1	812,200	781,580	781,580	6,514,500
236	1	902,160	857,180	857,180	7,371,680
237	1	992,120	947,140	947,140	8,318,820
238	1	1,082,080	1,037,100	1,037,100	9,355,920
239	1	1,172,040	1,127,060	1,127,060	10,482,980
240	1	1,262,000	1,217,020	1,217,020	11,700,000
241	1	1,356,720	1,309,360	1,309,360	13,009,360
242	1	1,451,440	1,404,080	1,404,080	14,413,440
243	1	1,546,160	1,498,800	1,498,800	15,912,240
244	1	1,640,880	1,593,520	1,593,520	17,505,760
245	1	1,735,600	1,688,240	1,688,240	19,194,000
246	1	1,826,400	1,781,000	1,781,000	20,975,000
247	1	1,917,200	1,871,800	1,871,800	22,846,800
248	1	2,008,000	1,962,600	1,962,600	24,809,400
249	1	2,098,800	2,053,400	2,053,400	26,862,800
250	1	2,189,600	2,144,200	2,144,200	29,007,000

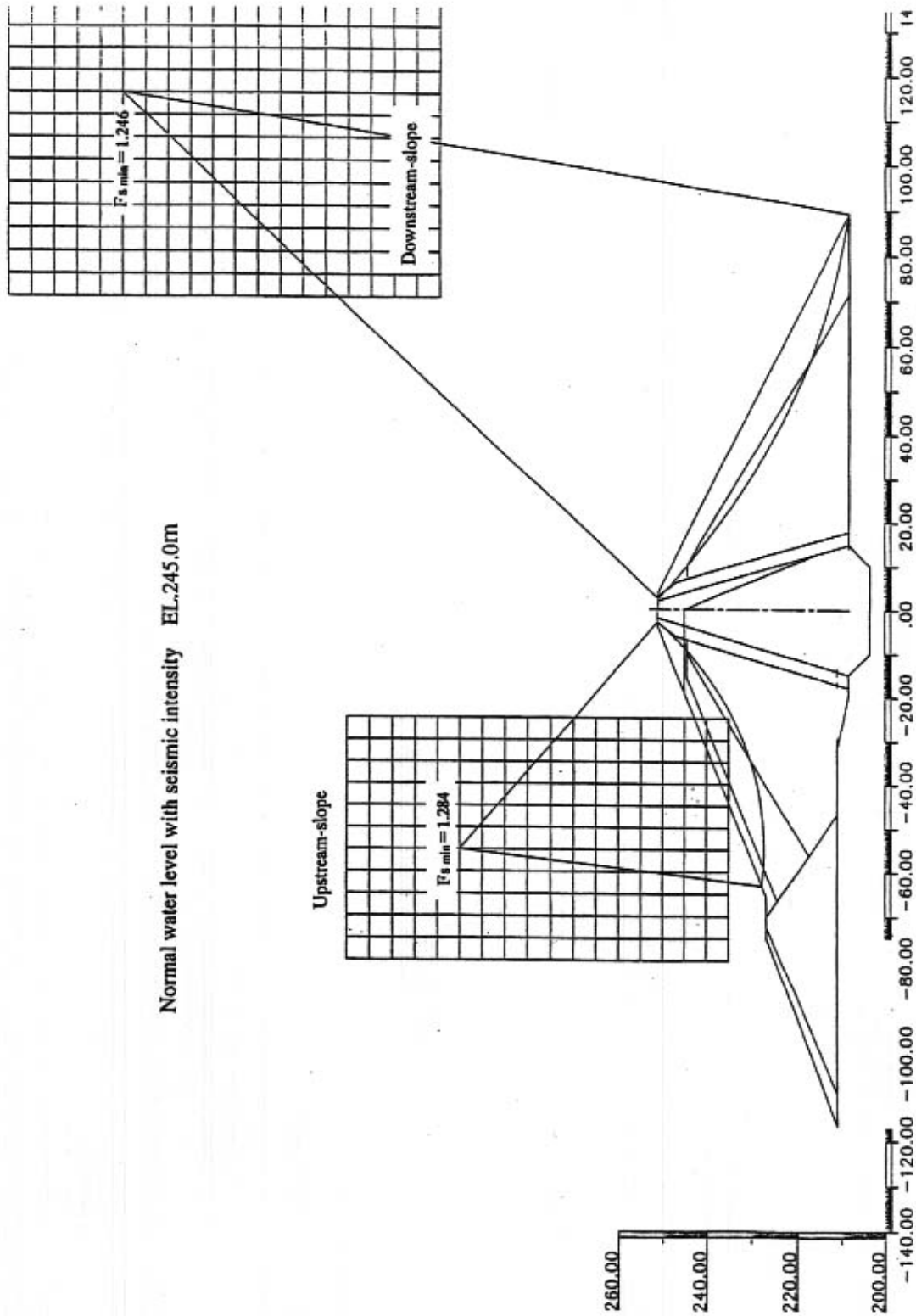
Elevation - Volume Curve of N'FIFIKH DAM





FEASIBILITY STUDY
 ON WATER RESOURCES DEVELOPMENT
 IN RURAL AREA
 JAPAN INTERNATIONAL COOPERATION AGENCY

FigureXVII2.1.3
Typical Cross Section of N'FIFIKH DAM



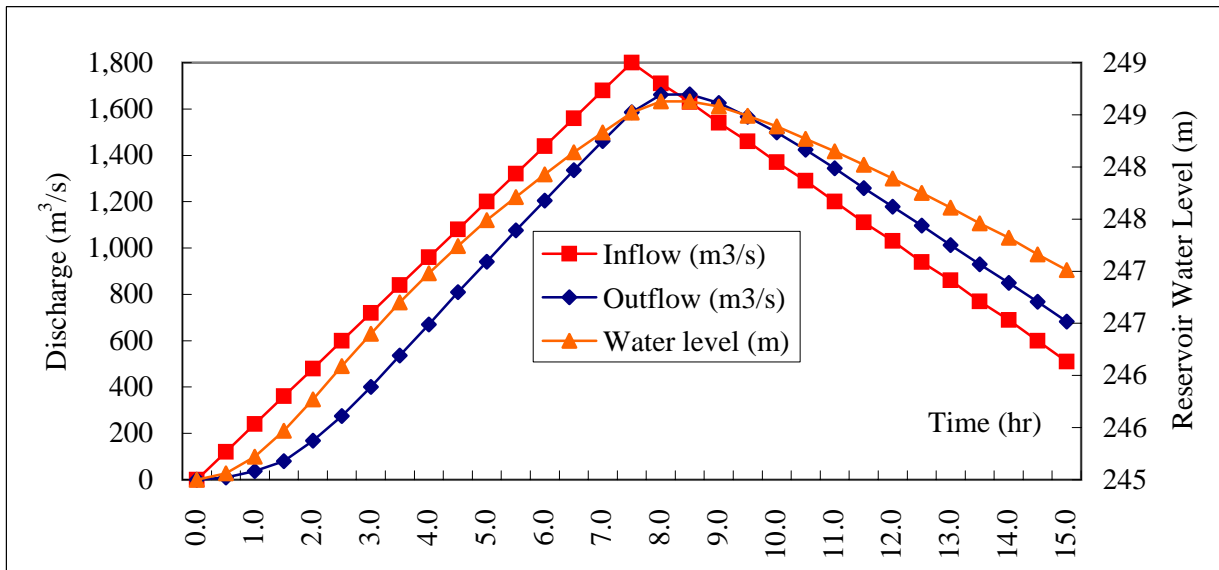
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Figure XVII2.1.4

N'FIFIKH DAM Result of Stability
Analysis on Case A

Time (min)	Time (hr.)	Inflow (m ³ /s)	Outflow (m ³ /s)	Water level (m)	Area (m ²)
0	0.0	0	0.000	245.00	1,735,600.0
30	0.5	120	9.969	245.06	1,740,924.5
60	1.0	240	37.548	245.22	1,755,655.1
90	1.5	360	79.553	245.47	1,778,090.5
120	2.0	480	168.115	245.77	1,805,344.6
150	2.5	600	274.700	246.09	1,834,237.8
180	3.0	720	400.730	246.40	1,862,704.3
210	3.5	840	536.307	246.70	1,889,980.5
240	4.0	960	669.747	246.98	1,915,434.9
270	4.5	1,080	809.633	247.24	1,939,165.6
300	5.0	1,200	941.205	247.49	1,961,289.4
330	5.5	1,320	1,076.729	247.71	1,982,059.4
360	6.0	1,440	1,205.212	247.93	2,001,633.6
390	6.5	1,560	1,335.188	248.14	2,020,357.3
420	7.0	1,680	1,462.166	248.33	2,038,149.9
450	7.5	1,800	1,586.348	248.52	2,055,396.5
480	8.0	1,710	1,661.254	248.63	2,065,140.8
510	8.5	1,630	1,663.394	248.63	2,065,419.3
540	9.0	1,540	1,625.563	248.58	2,060,497.9
570	9.5	1,460	1,566.630	248.49	2,052,787.6
600	10.0	1,370	1,498.939	248.39	2,043,302.5
630	10.5	1,290	1,423.644	248.27	2,032,751.9
660	11.0	1,200	1,343.593	248.15	2,021,534.9
690	11.5	1,110	1,258.826	248.02	2,009,657.0
720	12.0	1,030	1,178.475	247.89	1,997,560.3
750	12.5	940	1,096.199	247.75	1,985,025.6
780	13.0	860	1,012.551	247.61	1,972,281.9
810	13.5	770	929.612	247.46	1,959,339.9
840	14.0	690	850.032	247.32	1,945,958.8
870	14.5	600	767.709	247.16	1,932,116.3
900	15.0	510	681.859	247.01	1,917,680.8

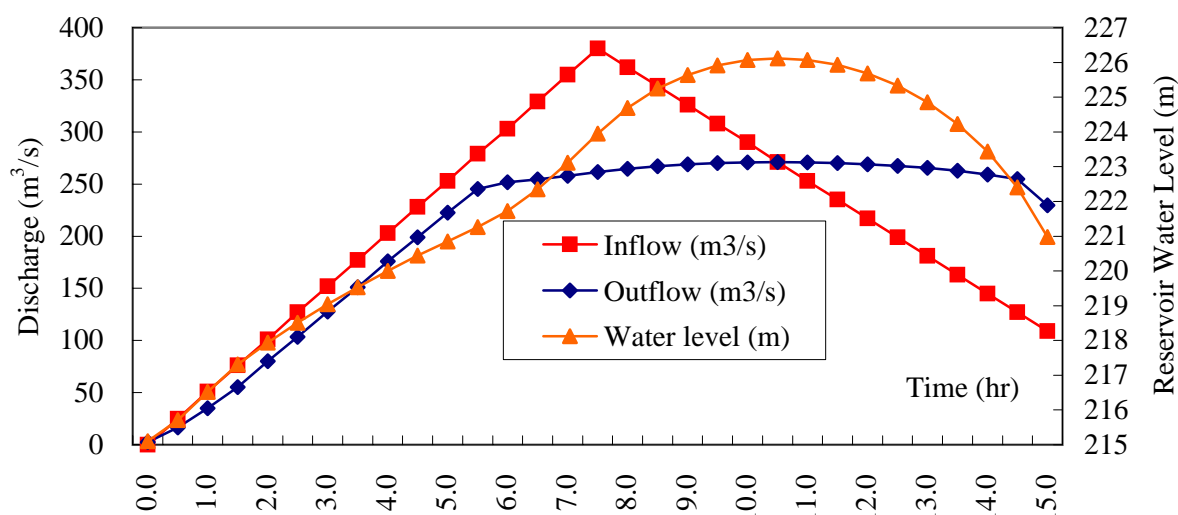


FEASIBILITY STUDY ON
WATER RESOURCES DEVELOPMENT
IN RURAL AREA

JAPAN INTERNATIONAL COOPERATION AGENCY

Figure XVII.2.1.5
N'FIFIKH DAM Hydrograph
Routine Analysis Result of Design
Flood

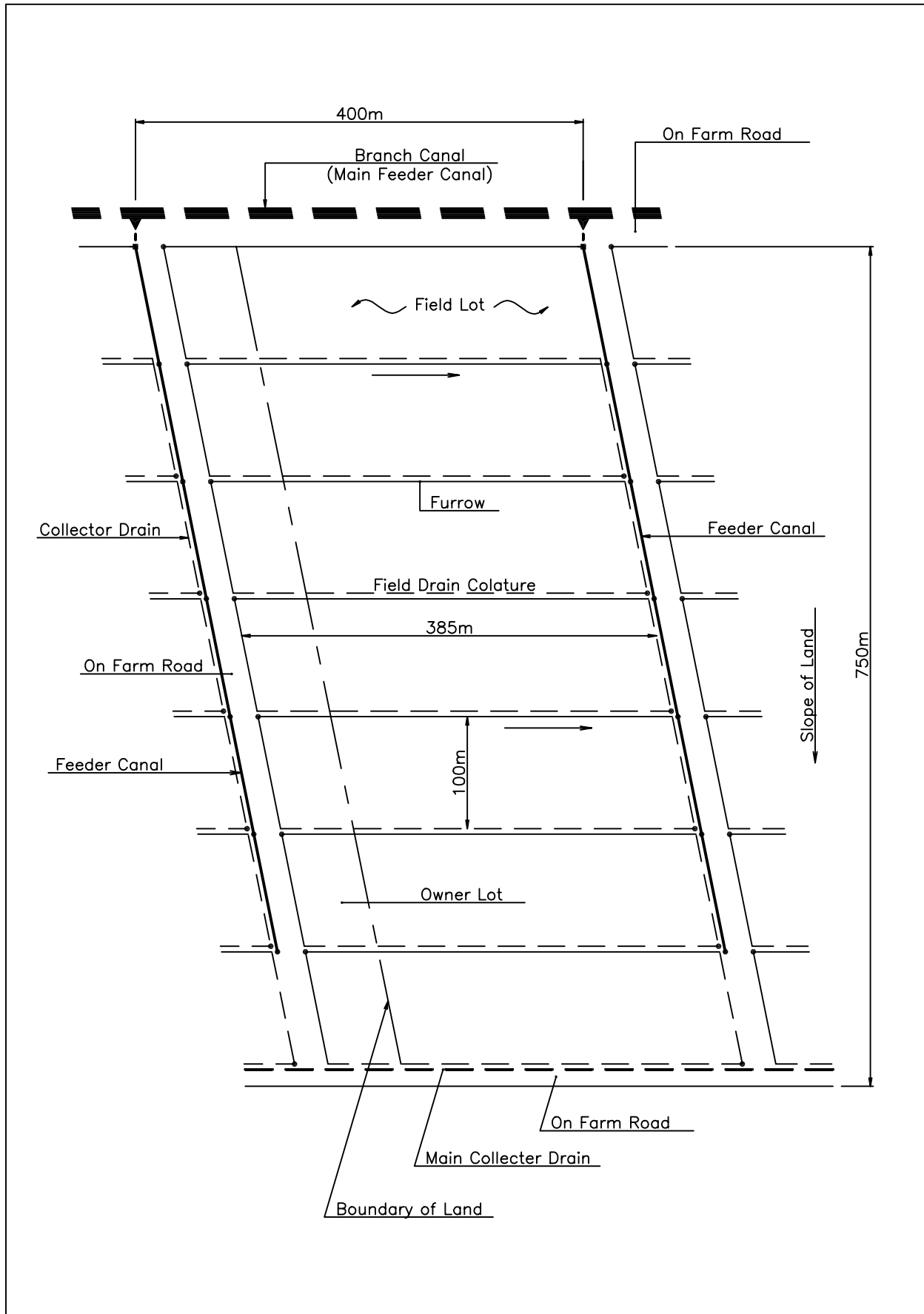
Time (min)	Time (hr.)	Inflow (m ³ /s)	Outflow (m ³ /s)	Water level (m)	Area (m ²)
0	0.0	0	2.304	215.10	7,024.1
30	0.5	25	16.459	215.71	19,457.6
60	1.0	51	34.970	216.52	35,718.3
90	1.5	76	55.404	217.31	51,699.1
120	2.0	101	80.173	217.94	64,432.5
150	2.5	127	103.330	218.51	76,067.9
180	3.0	152	127.829	219.04	86,679.3
210	3.5	177	150.962	219.53	96,652.3
240	4.0	203	175.756	220.00	106,187.0
270	4.5	228	198.996	220.44	121,932.5
300	5.0	253	222.414	220.85	136,688.3
330	5.5	279	245.272	221.26	151,042.3
360	6.0	303	251.660	221.72	167,514.7
390	6.5	329	254.441	222.35	190,142.4
420	7.0	355	257.772	223.11	217,236.7
450	7.5	380	261.442	223.95	247,089.6
480	8.0	362	264.711	224.69	273,688.5
510	8.5	344	267.130	225.25	295,481.5
540	9.0	326	268.868	225.64	313,019.6
570	9.5	308	270.043	225.91	324,889.6
600	10.0	290	270.730	226.07	331,825.2
630	10.5	271	270.958	226.12	334,127.8
660	11.0	253	270.748	226.07	332,000.9
690	11.5	235	270.112	225.93	325,585.5
720	12.0	217	269.037	225.68	314,727.7
750	12.5	199	267.485	225.33	299,065.9
780	13.0	181	265.394	224.85	279,242.2
810	13.5	163	262.683	224.23	257,190.0
840	14.0	145	259.207	223.44	228,911.5
870	14.5	127	254.666	222.40	191,970.1
900	15.0	109	229.697	220.98	141,261.5



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WATER RESOURCES DEVELOPMENT
IN RURAL AREA

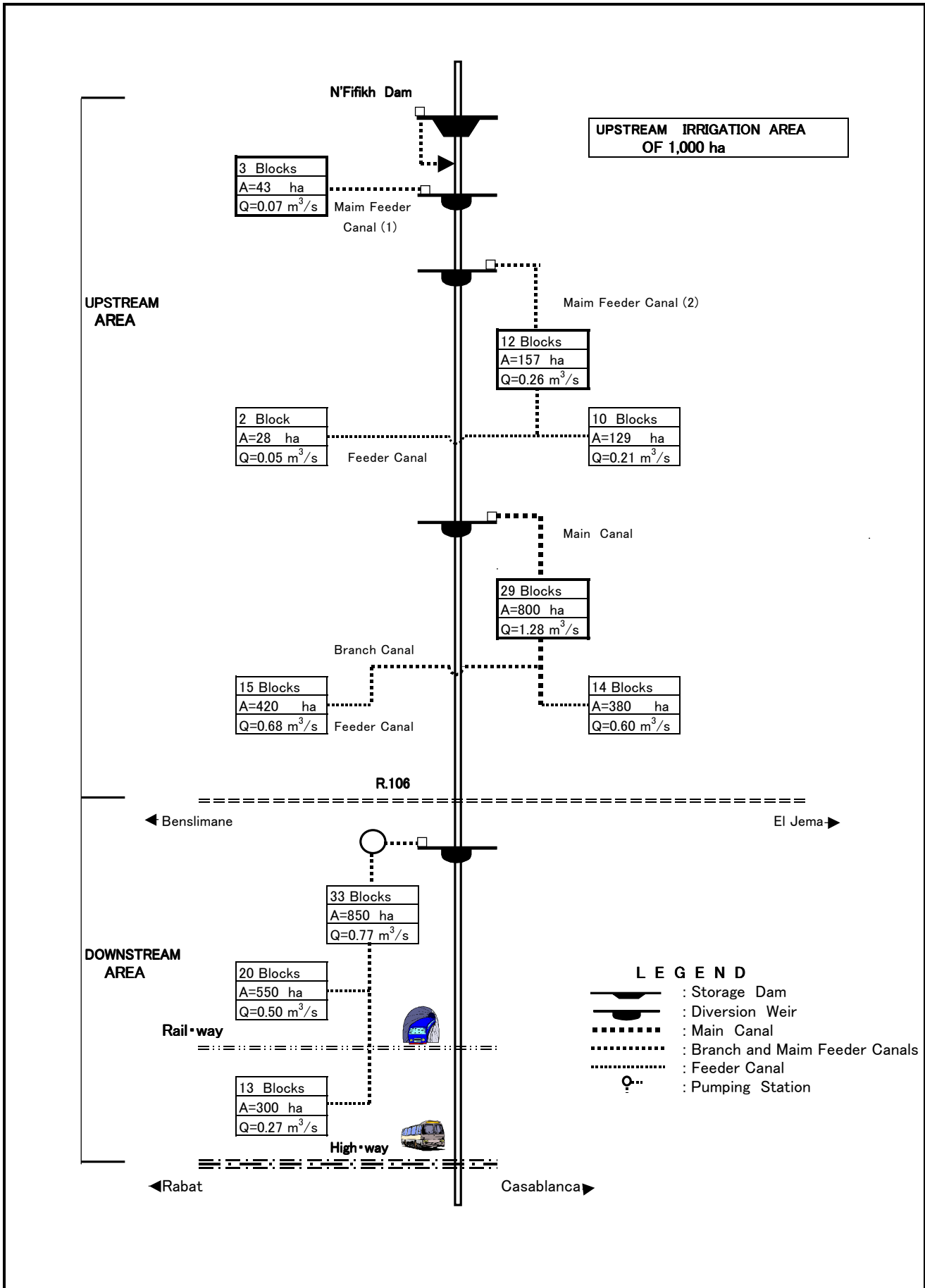
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Figure XVII.2.1.6
N'FIFIKH DAM Hydrograph
Routine Analysis Result of
Diversion Check Flood (50yr)



FEASIBILITY STUDY ON
 WATER RESOURCES DEVELOPMENT
 IN RURAL AREA
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Figure XVII.2.1.7
Typical Layout of Crop Field



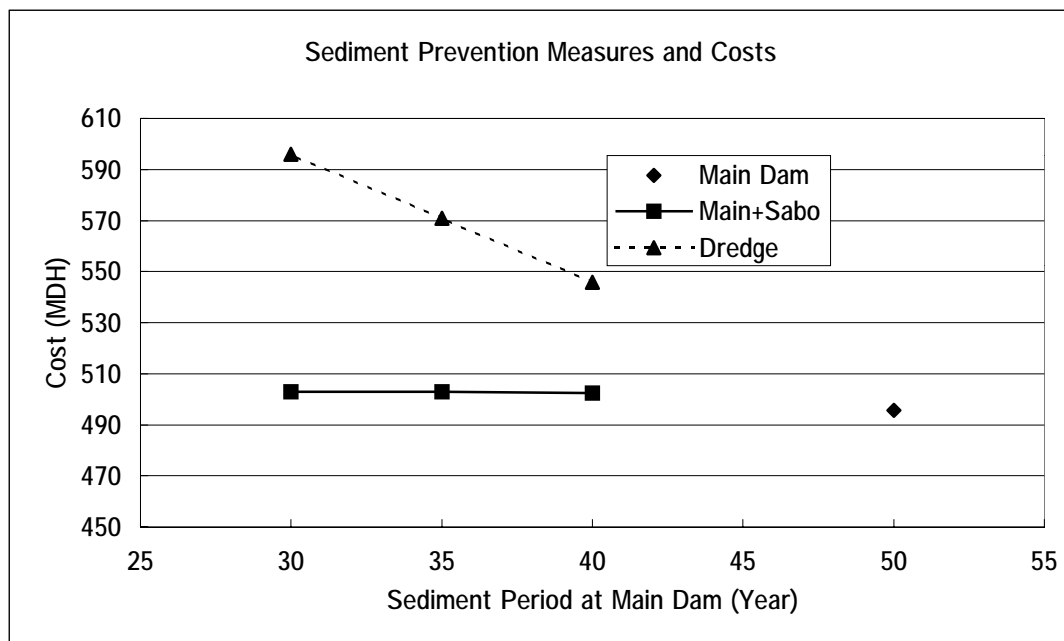
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IN RURAL AREA

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Figure XVII.2.1.8
Irrigation Diagram of N'fifikh

No.9 Taskourt

Main Dam	Sed. Period	(ys)	50	40	35	30
	Sed. Vol.	(Mm3)	6.00	4.80	4.20	3.60
	Crest EL.	(m)	1025.50	1025.02	1024.78	1024.54
	Dam H.	(m)	91.50	91.02	90.78	90.54
Sabo Dam	Sed. Vol.	(Mm3)	0.00	1.20	1.80	2.40
	Crest EL.	(m)	-	1,056.55	1,059.49	1,061.89
	Dam H.	(m)	-	26.55	29.49	31.89
Cost	Main Dam	(MDH)	495.58	489.37	486.26	483.15
	Sabo Dam	(MDH)	0.00	12.94	16.68	19.87
	Dredging	(MDH)	0.00	56.40	84.60	112.80
Total	Main Dam	(MDH)	495.58	-	-	-
	Main+Sabo	(MDH)	-	502.30	502.94	503.02
[Minimum]	Main+Dredg.	(MDH)	-	545.77	570.86	595.95

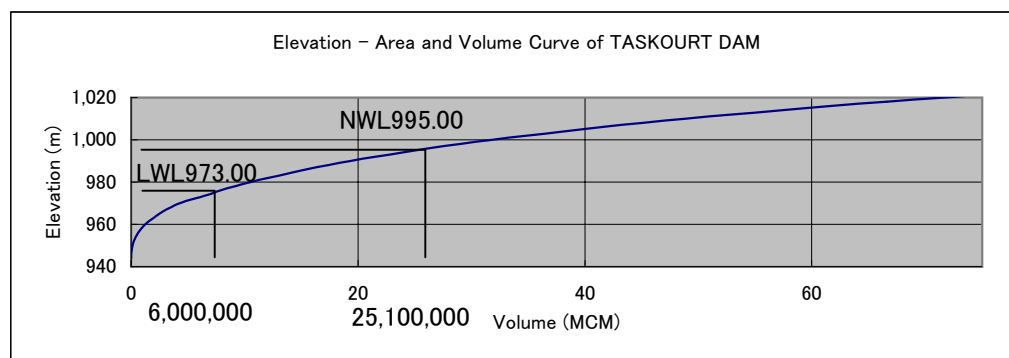


FEASIBILITY STUDY ON
WATER RESOURCES DEVELOPMENT
IN RURAL AREA

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Figure XVII2.2.1
Comparison of Sediment
Prevention Measures in Taskourt

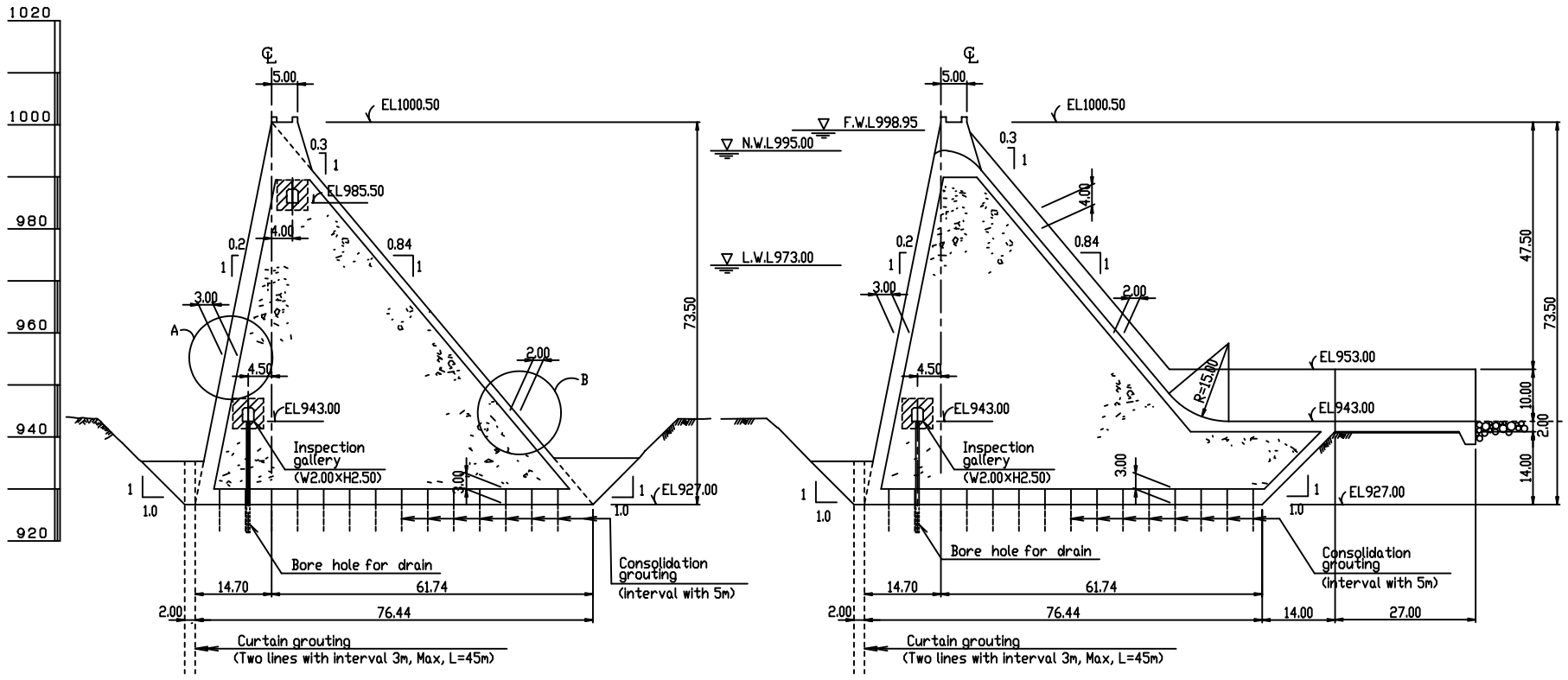
Elevation H(m)	Difference D(m)	Area A(m)	Ave. Area A(m)	Volume V(m)	Accu. Volume $\Sigma V(m)$
944	0	0	0	0	0
946	2	12,733	6,367	12,733	12,733
948	2	25,467	19,100	38,200	50,933
950	2	38,200	31,833	63,667	114,600
952	2	68,480	53,340	106,680	221,280
954	2	98,760	83,620	167,240	388,520
956	2	129,040	113,900	227,800	616,320
958	2	159,320	144,180	288,360	904,680
960	2	189,600	174,460	348,920	1,253,600
962	2	235,720	212,660	425,320	1,678,920
964	2	281,840	258,780	517,560	2,196,480
966	2	327,960	304,900	609,800	2,806,280
968	2	374,080	351,020	702,040	3,508,320
970	2	420,200	397,140	794,280	4,302,600
972	2	732,400	576,300	1,152,600	5,455,200
974	2	545,080	638,740	1,277,480	6,732,680
976	2	607,520	576,300	1,152,600	7,885,280
978	2	669,960	638,740	1,277,480	9,162,760
980	2	732,400	701,180	1,402,360	10,565,120
982	2	791,520	761,960	1,523,920	12,089,040
984	2	850,640	821,080	1,642,160	13,731,200
986	2	909,760	880,200	1,760,400	15,491,600
988	2	968,880	939,320	1,878,640	17,370,240
990	2	1,028,000	998,440	1,996,880	19,367,120
992	2	1,115,720	1,071,860	2,143,720	21,510,840
994	2	1,203,440	1,159,580	2,319,160	23,830,000
996	2	1,291,160	1,247,300	2,494,600	26,324,600
998	2	1,378,880	1,335,020	2,670,040	28,994,640
1,000	2	1,466,600	1,422,740	2,845,480	31,840,120
1,002	2	1,562,600	1,514,600	3,029,200	34,869,320
1,004	2	1,658,600	1,610,600	3,221,200	38,090,520
1,006	2	1,754,600	1,706,600	3,413,200	41,503,720
1,008	2	1,850,600	1,802,600	3,605,200	45,108,920
1,010	2	1,946,600	1,898,600	3,797,200	48,906,120
1,012	2	2,078,360	2,012,480	4,024,960	52,931,080
1,014	2	2,210,120	2,144,240	4,288,480	57,219,560
1,016	2	2,341,880	2,276,000	4,552,000	61,771,560
1,018	2	2,473,640	2,407,760	4,815,520	66,587,080
1,020	2	2,605,400	2,539,520	5,079,040	71,666,120
1,022	2	2,738,240	2,671,820	5,343,640	77,009,760
1,024	2	2,871,080	2,804,660	5,609,320	82,619,080
1,026	2	3,003,920	2,937,500	5,875,000	88,494,080
1,028	2	3,136,760	3,070,340	6,140,680	94,634,760
1,030	2	3,269,600	3,203,180	6,406,360	101,041,120
1,032	2	3,400,720	3,335,160	6,670,320	107,711,440
1,034	2	3,531,840	3,466,280	6,932,560	114,644,000
1,036	2	3,662,960	3,597,400	7,194,800	121,838,800
1,038	2	3,794,080	3,728,520	7,457,040	129,295,840
1,040	2	3,925,200	3,859,640	7,719,280	137,015,120



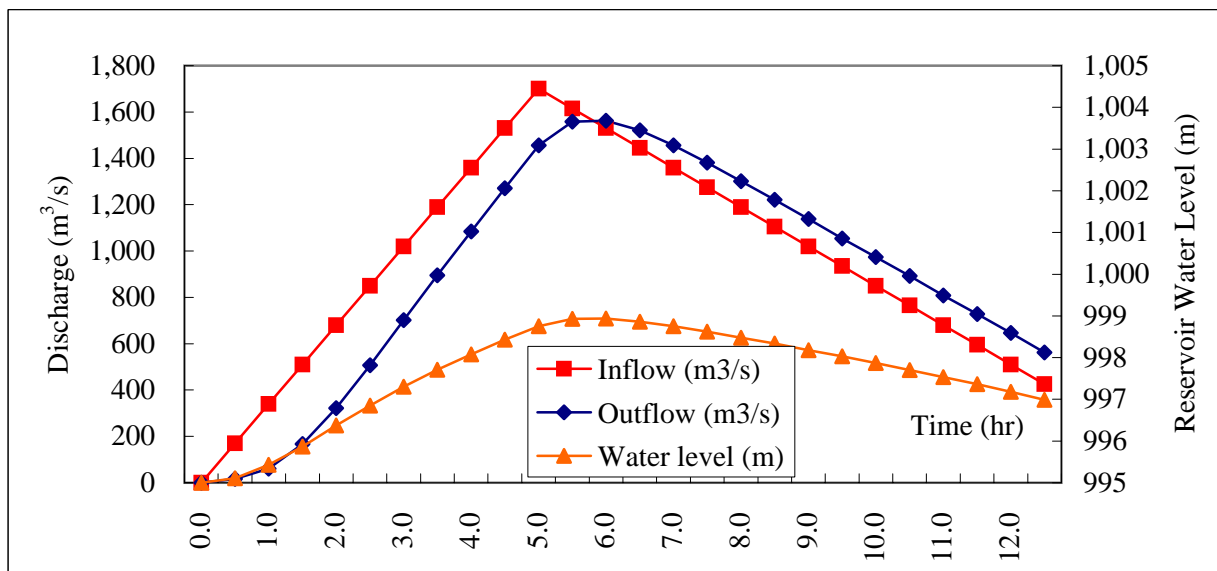
FEASIBILITY STUDY ON
WATER RESSOURCES DEVELOPMENT
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JAPAN INTERNATIONAL COOPERATION AGENCY

Figure XVII.2.2
Elevation - Area and Volume Curve
of TASKOURT DAM

Figure XVII.2.3
Typical Cross Section of
TASKOURT DAM



Time (min)	Time (hr.)	Inflow (m ³ /s)	Outflow (m ³ /s)	Water level (m)	Area (m ²)
0	0.0	0	0.000	995.00	1,247,300.0
30	0.5	170	16.251	995.11	1,252,319.4
60	1.0	340	60.626	995.43	1,266,025.6
90	1.5	510	167.278	995.87	1,285,597.3
120	2.0	680	322.111	996.37	1,301,711.3
150	2.5	850	506.606	996.85	1,315,713.3
180	3.0	1,020	701.654	997.30	1,337,763.5
210	3.5	1,190	895.686	997.71	1,361,873.0
240	4.0	1,360	1,084.917	998.08	1,382,595.6
270	4.5	1,530	1,271.394	998.43	1,397,686.0
300	5.0	1,700	1,455.602	998.75	1,411,820.5
330	5.5	1,615	1,558.192	998.93	1,419,578.5
360	6.0	1,530	1,562.936	998.94	1,419,937.1
390	6.5	1,445	1,520.951	998.86	1,416,762.3
420	7.0	1,360	1,456.416	998.75	1,411,882.1
450	7.5	1,275	1,381.013	998.62	1,406,180.1
480	8.0	1,190	1,300.936	998.48	1,400,076.5
510	8.5	1,105	1,221.343	998.34	1,393,635.6
540	9.0	1,020	1,138.739	998.18	1,386,951.1
570	9.5	935	1,054.614	998.03	1,380,143.5
600	10.0	850	974.306	997.87	1,371,202.8
630	10.5	765	892.053	997.70	1,361,441.9
660	11.0	680	808.044	997.53	1,351,472.6
690	11.5	595	728.103	997.36	1,341,223.1
720	12.0	510	646.283	997.18	1,330,521.0
750	12.5	425	562.891	996.99	1,319,794.5

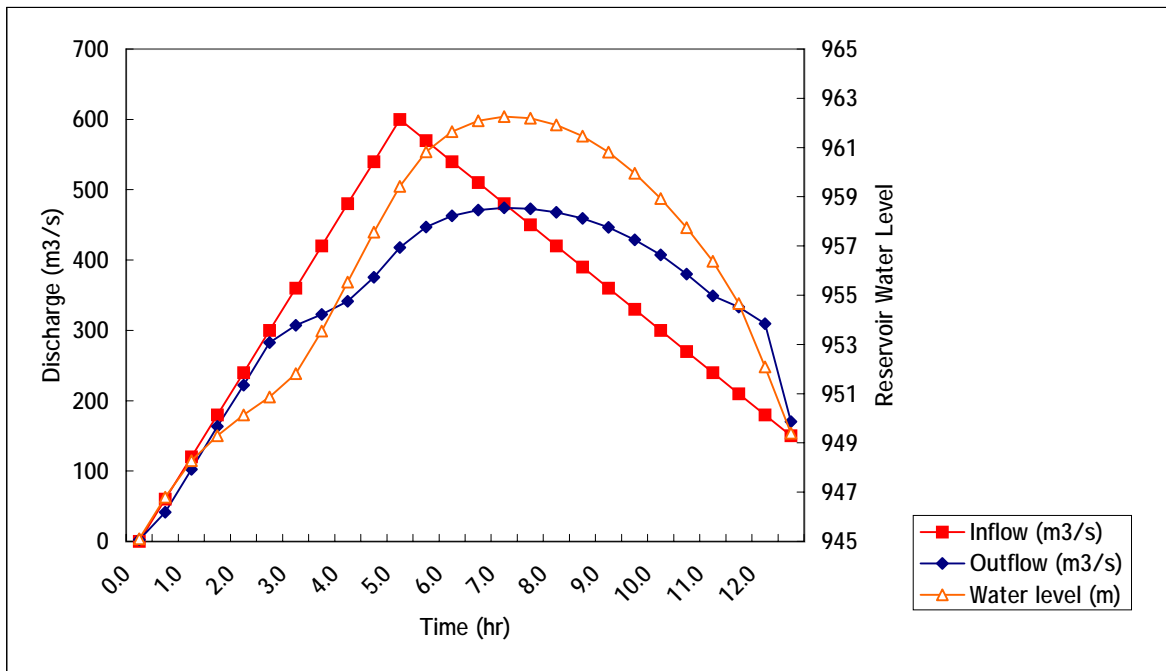


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IN RURAL AREA

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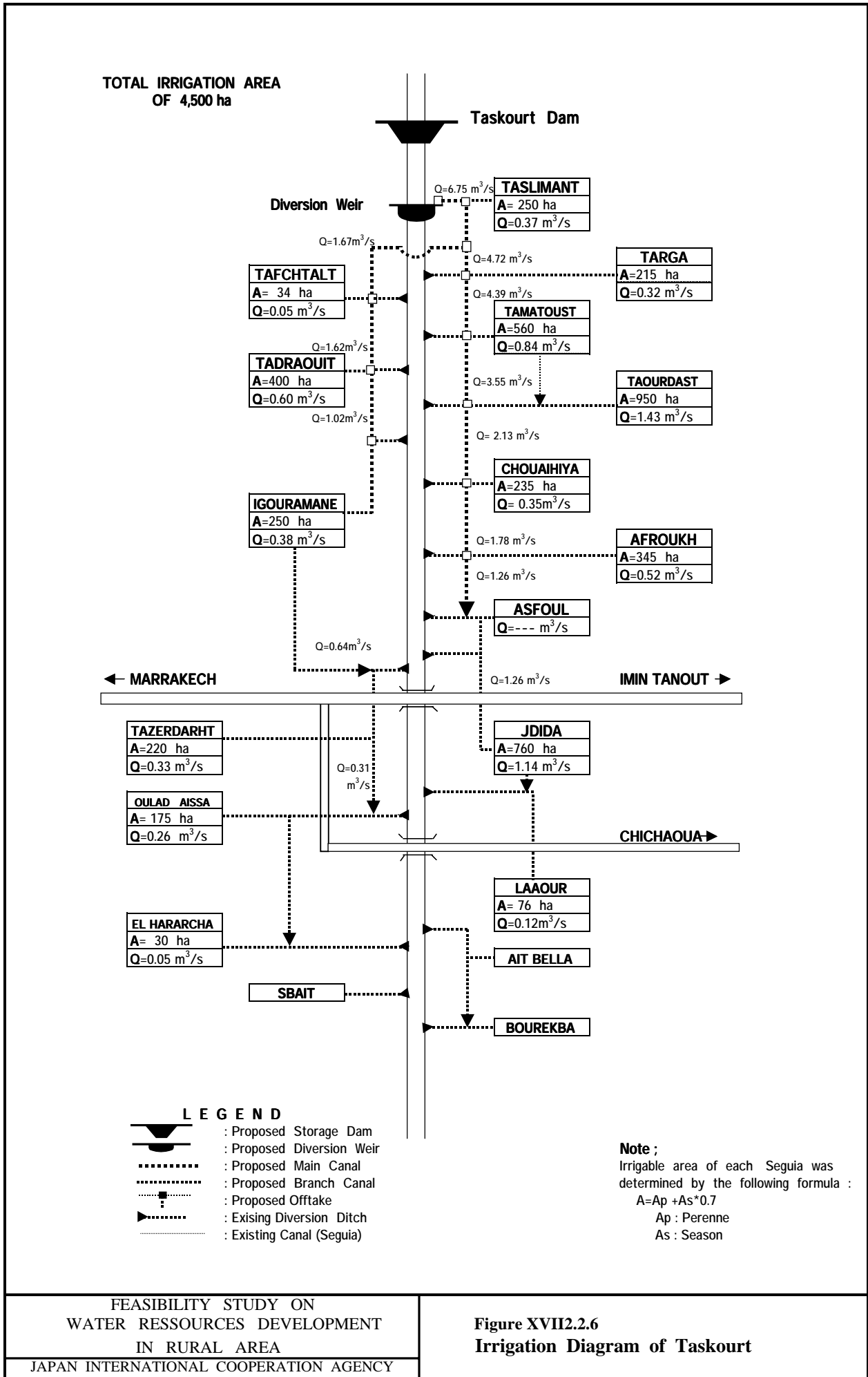
Figure XVII.2.4
TASKOURT DAM Hydrograph
Routine Analysis Result of Design
Flood

Time (min)	Time (hr.)	Inflow (m3/s)	Outflow (m3/s)	Water level (m)	Area (m2)
0	0.0	0	2.3	945.1	5663.8
30	0.5	60	41.3	946.8	16853
60	1.0	120	102.3	948.3	26781.8
90	1.5	180	163.4	949.3	33502.9
120	2.0	240	221.9	950.1	40246.8
150	2.5	300	282.5	950.9	51395.8
180	3.0	360	307.0	951.8	65610.8
210	3.5	420	322.9	953.5	91727.8
240	4.0	480	341.2	955.5	121855.3
270	4.5	540	375.7	957.6	152645.4
300	5.0	600	417.6	959.4	180832.4
330	5.5	570	447.1	960.8	208723.3
360	6.0	540	462.7	961.7	227613
390	6.5	510	471.1	962.1	237890.3
420	7.0	480	474.1	962.3	241700.3
450	7.5	450	472.9	962.2	240173.2
480	8.0	420	467.8	961.9	233926.9
510	8.5	390	459.2	961.5	223251.2
540	9.0	360	446.6	960.8	208184.3
570	9.5	330	428.9	960.0	189021.5
600	10.0	300	407.4	958.9	173464.8
630	10.5	270	379.9	957.7	155340.9
660	11.0	240	349.1	956.4	134826.5
690	11.5	210	333.2	954.7	108731.7
720	12.0	180	309.6	952.1	69861.5
750	12.5	150	170.1	949.4	34142



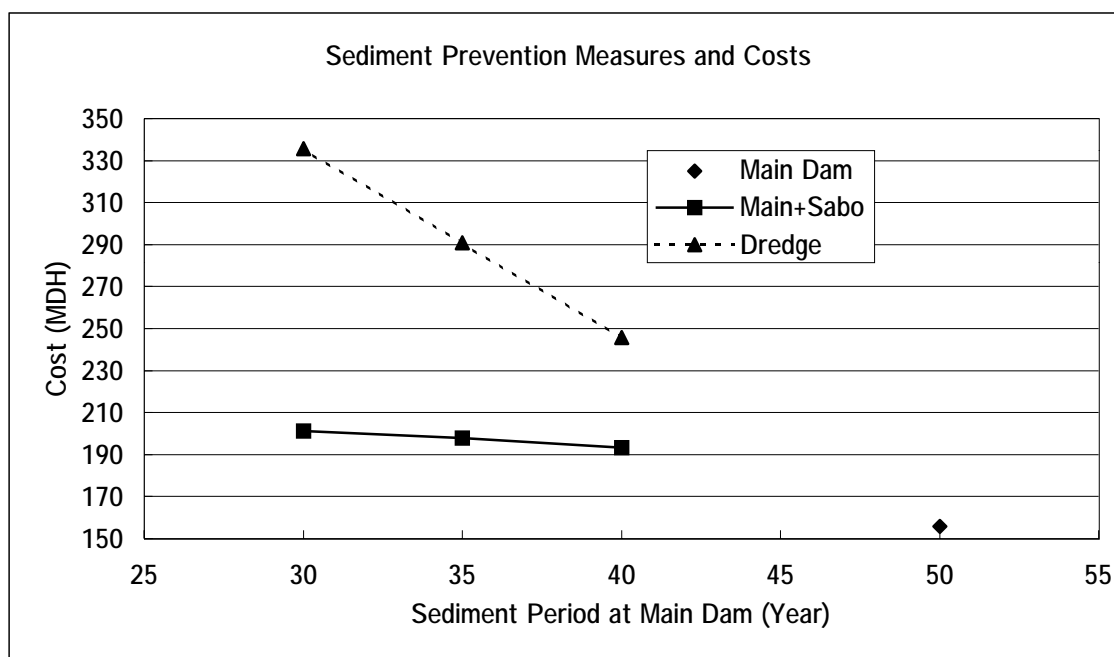
FEASIBILITY STUDY ON
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IN RURAL AREA
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Figure XVII.2.5
TASKOURT DAM
Hydrograph Routine Analysis Result
of Diversin Check Flood (20yr)



No.10 Timkit No.1

Main Dam	Sed. Period	(ys)	50	40	35	30
	Sed. Vol.	(Mm3)	10.00	8.00	7.00	6.00
	Crest EL.	(m)	1260.60	1259.81	1259.41	1259.01
	Dam H.	(m)	60.60	59.81	59.41	59.01
Sabo Dam	Sed. Vol.	(Mm3)	0.00	2.00	3.00	4.00
	Crest EL.	(m)	-	1,262.07	1,264.08	1,265.71
	Dam H.	(m)	-	21.77	23.78	25.41
Cost	Main Dam	(MDH)	155.81	151.83	149.81	147.79
	Sabo Dam	(MDH)	0.00	41.62	48.13	53.37
	Dredging	(MDH)	0.00	94.00	141.00	188.00
Total	Main Dam	(MDH)	155.81	-	-	-
	Main+Sabo	(MDH)	-	193.44	197.94	201.17
	Main+Dredg.	(MDH)	-	245.83	290.81	335.79



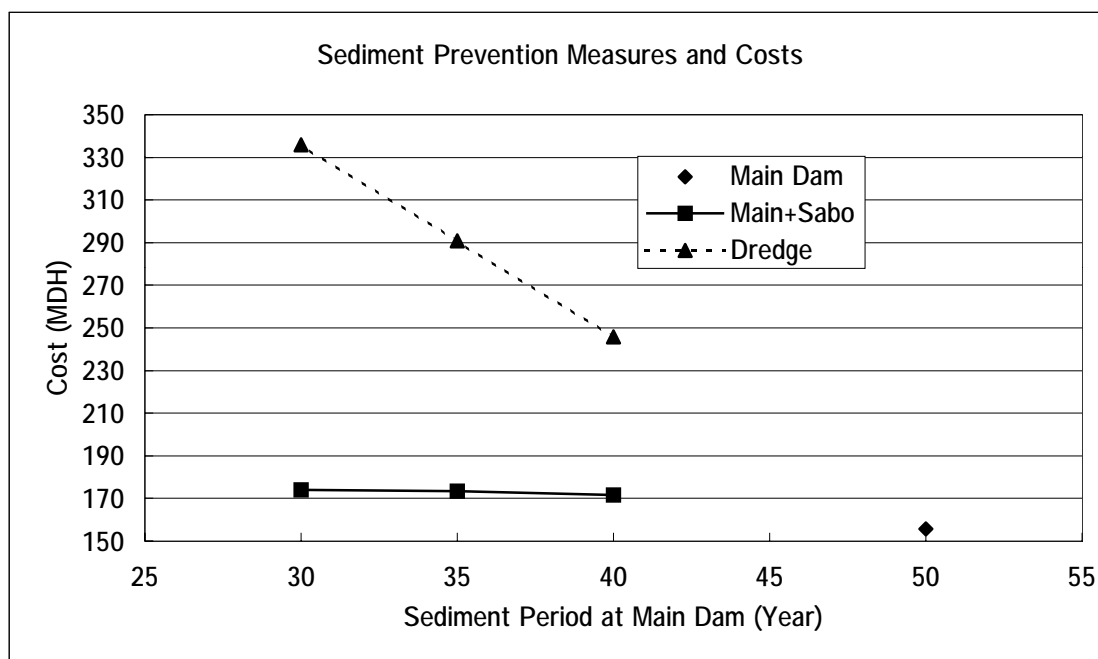
FEASIBILITY STUDY ON
WATER RESOURCES DEVELOPMENT
IN RURAL AREA

JAPAN INTERNATIONAL COOPERATION AGENCY

Figure XVII2.3.1
Comparison of Sediment
Prevention Measures in Timkit (1/2)

No.10 Timkit No.2

Main Dam	Sed. Period	(ys)	50	40	35	30
	Sed. Vol.	(Mm3)	10.00	8.00	7.00	6.00
	Crest EL.	(m)	1260.60	1259.81	1259.41	1259.01
	Dam H.	(m)	60.60	59.81	59.41	59.01
Sabo Dam	Sed. Vol.	(Mm3)	0.00	2.00	3.00	4.00
	Crest EL.	(m)	-	1,364.22	1,367.20	1,369.30
	Dam H.	(m)	-	34.22	37.20	39.30
Cost	Main Dam	(MDH)	155.81	151.83	149.81	147.79
	Sabo Dam	(MDH)	0.00	19.87	23.63	26.31
	Dredging	(MDH)	0.00	94.00	141.00	188.00
Total	Main Dam	(MDH)	155.81	-	-	-
	Main+Sabo	(MDH)	-	171.69	173.44	174.10
	Main+Dredg.	(MDH)	-	245.83	290.81	335.79

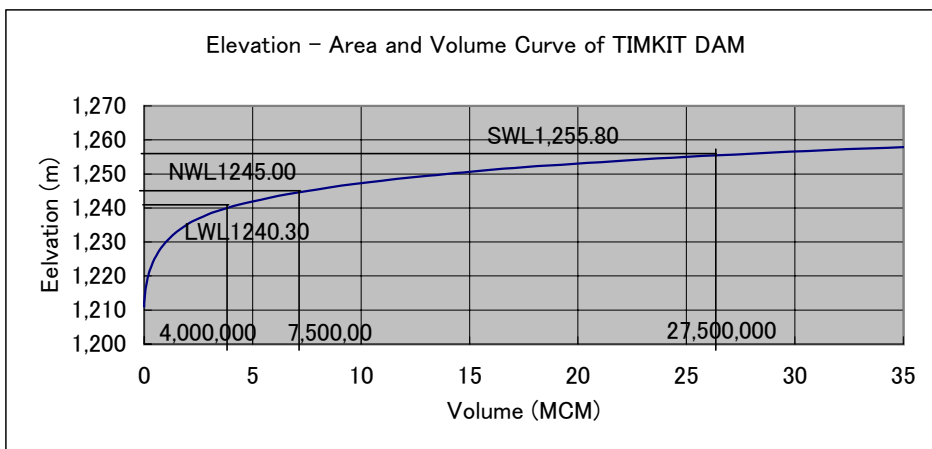


FEASIBILITY STUDY ON
WATER RESOURCES DEVELOPMENT
IN RURAL AREA

JAPAN INTERNATIONAL COOPERATION AGENCY

Figure XVII2.3.1
Comparison of Sediment
Prevention Measures in Timkit (2/2)

Elevation H(m)	Difference D(m)	Area A(m ²)	Ave. Area A(m ²)	Volume V(m ³)	Accu. Volume ΣV (m ³)
1,211	0	0	0	0	0
1,212	1	5,000	2,500	2,500	2,500
1,213	1	10,000	7,500	7,500	10,000
1,214	1	15,000	12,500	12,500	22,500
1,215	1	20,000	17,500	17,500	40,000
1,216	1	23,560	21,780	21,780	61,780
1,217	1	27,120	25,340	25,340	87,120
1,218	1	30,680	28,900	28,900	116,020
1,219	1	34,240	32,460	32,460	148,480
1,220	1	37,800	36,020	36,020	184,500
1,221	1	45,600	41,700	41,700	226,200
1,222	1	53,400	49,500	49,500	275,700
1,223	1	61,200	57,300	57,300	333,000
1,224	1	69,000	65,100	65,100	398,100
1,225	1	76,800	72,900	72,900	471,000
1,226	1	88,560	82,680	82,680	553,680
1,227	1	100,320	94,440	94,440	648,120
1,228	1	112,080	106,200	106,200	754,320
1,229	1	123,840	117,960	117,960	872,280
1,230	1	135,600	129,720	129,720	1,002,000
1,231	1	156,520	146,060	146,060	1,148,060
1,232	1	177,440	166,980	166,980	1,315,040
1,233	1	198,360	187,900	187,900	1,502,940
1,234	1	219,280	208,820	208,820	1,711,760
1,235	1	240,200	229,740	229,740	1,941,500
1,236	1	295,560	267,880	267,880	2,209,380
1,237	1	350,920	323,240	323,240	2,532,620
1,238	1	406,280	378,600	378,600	2,911,220
1,239	1	461,640	433,960	433,960	3,345,180
1,240	1	517,000	489,320	489,320	3,834,500
1,241	1	604,440	560,720	560,720	4,395,220
1,242	1	691,880	648,160	648,160	5,043,380
1,243	1	779,320	735,600	735,600	5,778,980
1,244	1	866,760	823,040	823,040	6,602,020
1,245	1	954,200	910,480	910,480	7,512,500
1,246	1	1,083,000	1,018,600	1,018,600	8,531,100
1,247	1	1,211,800	1,147,400	1,147,400	9,678,500
1,248	1	1,340,600	1,276,200	1,276,200	10,954,700
1,249	1	1,469,400	1,405,000	1,405,000	12,359,700
1,250	1	1,598,200	1,533,800	1,533,800	13,893,500
1,251	1	1,850,920	1,724,560	1,724,560	15,618,060
1,252	1	2,103,640	1,977,280	1,977,280	17,595,340
1,253	1	2,356,360	2,230,000	2,230,000	19,825,340
1,254	1	2,609,080	2,482,720	2,482,720	22,308,060
1,255	1	2,861,800	2,735,440	2,735,440	25,043,500
1,256	1	3,220,280	3,041,040	3,041,040	28,084,540
1,257	1	3,578,760	3,399,520	3,399,520	31,484,060
1,258	1	3,937,240	3,758,000	3,758,000	35,242,060
1,259	1	4,295,720	4,116,480	4,116,480	39,358,540
1,260	1	4,654,200	4,474,960	4,474,960	43,833,500



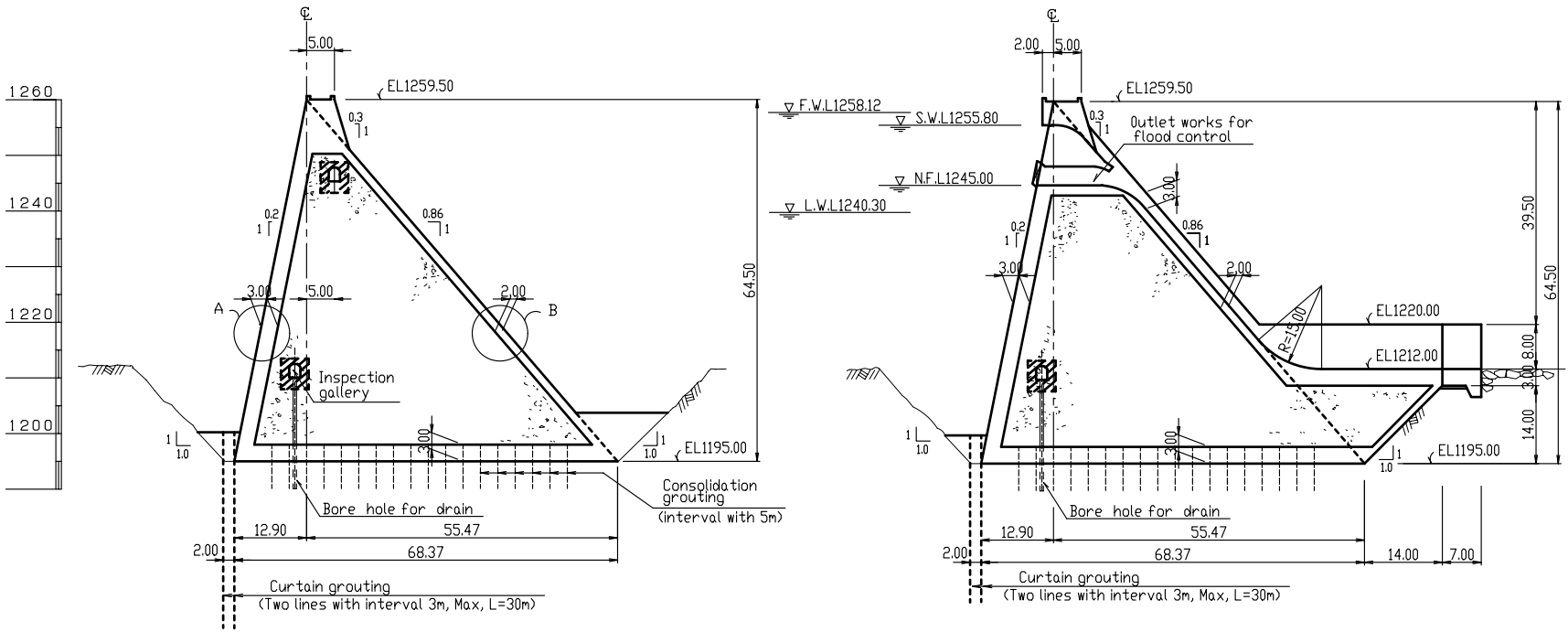
FEASIBILITY STUDY ON
WATER RESSOURCES DEVELOPMENT
IN RURAL AREA

Figure XVII.2.3.2

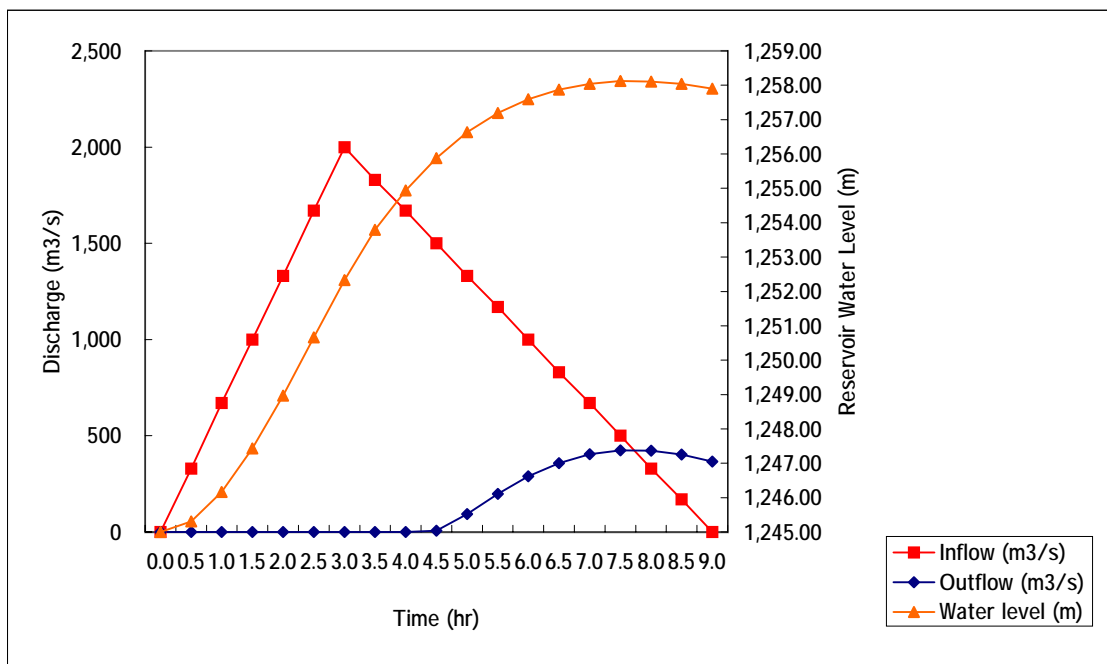
**Elevation - Area and Volume Curve
of TIMKIT DAM**

JAPAN INTERNATIONAL COOPERATION AGENCY

Figure XVIII.2.3.3
Typical Cross Section of
TIMKIT DAM



Time (min)	Time (hr.)	Inflow (m3/s)	Outflow (m3/s)	Water level (m)	Area (m2)
0.0	0.0	0	0	1,245.00	954,200
30.0	0.5	330	0	1,245.31	993,491
60.0	1.0	670	0	1,246.16	1,104,021
90.0	1.5	1,000	0	1,247.43	1,267,301
120.0	2.0	1,330	0	1,248.97	1,465,013
150.0	2.5	1,670	0	1,250.66	1,765,837
180.0	3.0	2,000	0	1,252.33	2,188,076
210.0	3.5	1,830	0	1,253.79	2,555,371
240.0	4.0	1,670	0	1,254.94	2,897,818
270.0	4.5	1,500	7	1,255.88	3,184,430
300.0	5.0	1,330	93	1,256.63	3,445,118
330.0	5.5	1,170	198	1,257.19	3,646,150
360.0	6.0	1,000	290	1,257.59	3,791,870
390.0	6.5	830	358	1,257.87	3,890,855
420.0	7.0	670	404	1,258.04	3,951,243
450.0	7.5	500	424	1,258.12	3,978,768
480.0	8.0	330	423	1,258.11	3,977,062
510.0	8.5	170	403	1,258.04	3,950,324
540.0	9.0	0	366	1,257.90	3,900,920

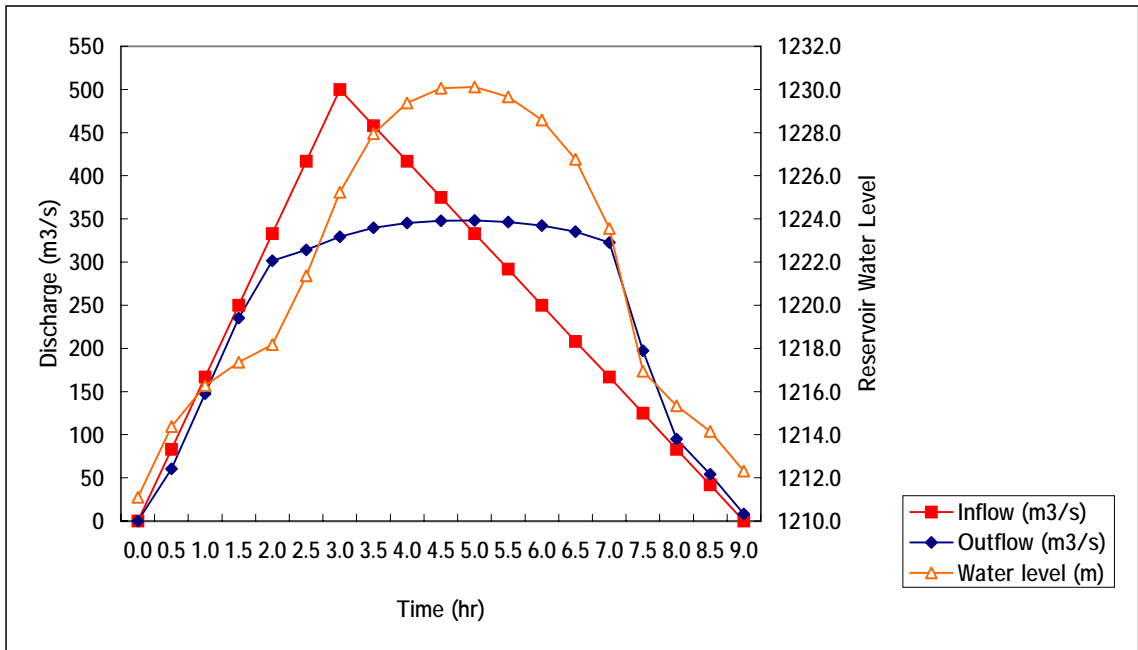


FEASIBILITY STUDY ON
WATER RESSOURCES DEVELOPMENT
IN RURAL AREA

JAPAN INTERNATIONAL COOPERATION AGENCY

Figure XVII.2.3.4
TIMKIT DAM
Hydrograph Routine Analysis Result
of Design Flood





Time (min)	Time (hr.)	Inflow (m3/s)	Outflow (m3/s)	Water level (m)	Area (m2)
0	0.0	0	0	1211.1	792.4
30	0.5	83	61	1214.4	16944.7
60	1.0	167	148	1216.3	24552.6
90	1.5	250	235	1217.4	28404.2
120	2.0	333	302	1218.2	31284.1
150	2.5	417	314	1221.4	48436.4
180	3.0	500	329	1225.2	79567.9
210	3.5	458	340	1228.0	111175.8
240	4.0	417	345	1229.4	127769
270	4.5	375	348	1230.1	136047.9
300	5.0	333	348	1230.1	137617.2
330	5.5	292	346	1229.7	130961.8
360	6.0	250	342	1228.6	118604.3
390	6.5	208	335	1226.8	97242.5
420	7.0	167	323	1223.6	65540.8
450	7.5	125	197	1216.9	26919.2
480	8.0	83	95	1215.3	21197.7
510	8.5	42	54	1214.2	15871.6
540	9.0	0	8	1212.3	6800.1



FEASIBILITY STUDY ON
WATER RESSOURCES DEVELOPMENT
IN RURAL AREA
JAPAN INTERNATIONAL COOPERATION AGENCY

Figure XVII.2.3.5
TIMKIT DAM
Hydrograph Routine Analysis Result
of Diversin Check Flood (20yr)

IRRIGATION AREA
of 3,825 ha in gross

- LEGEND**
-  : Proposed Storage Dam
 -  : Existing Diversion Weir
 -  : Existing Main Canal
 -  : Existing Canal (Seguia)

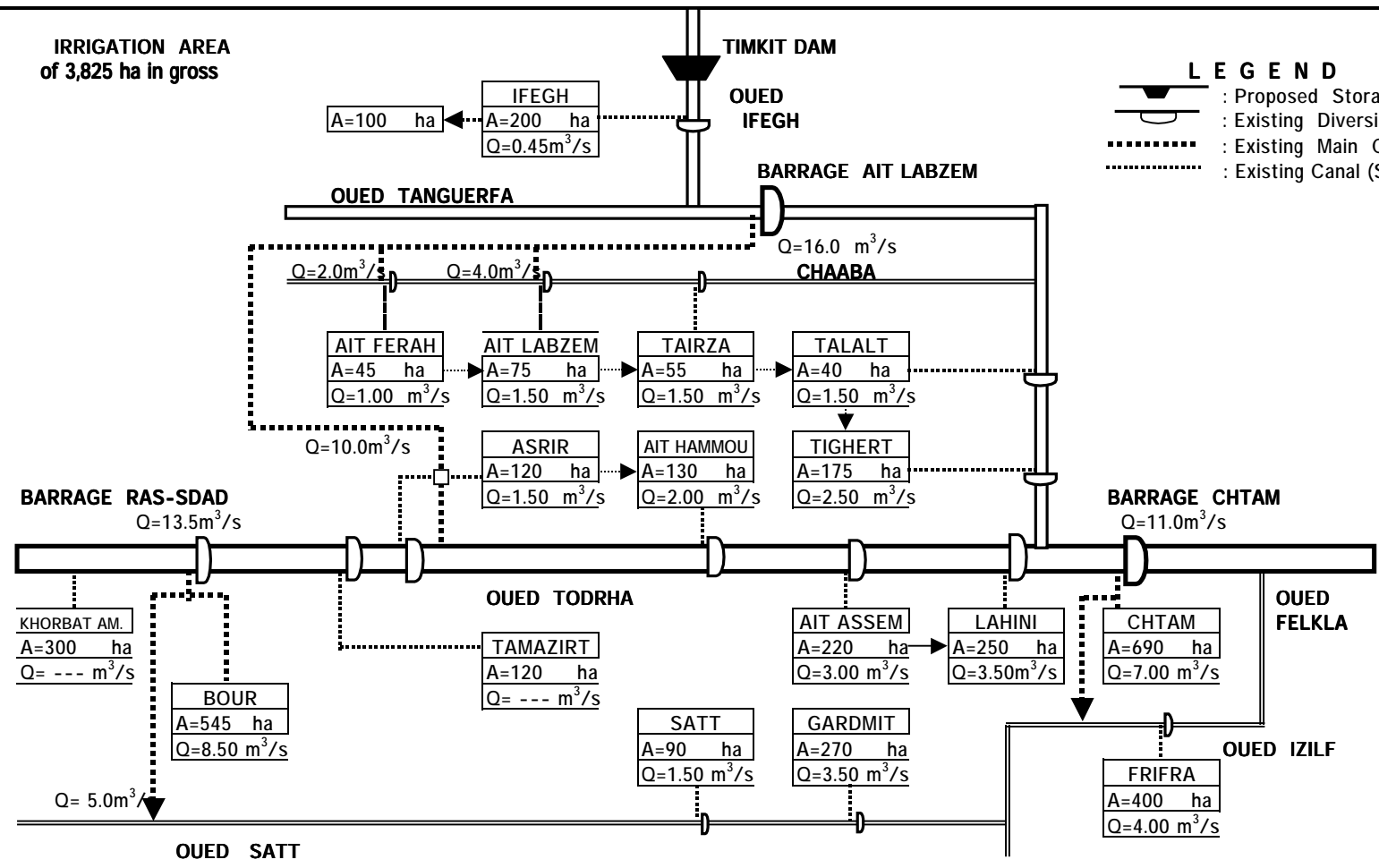
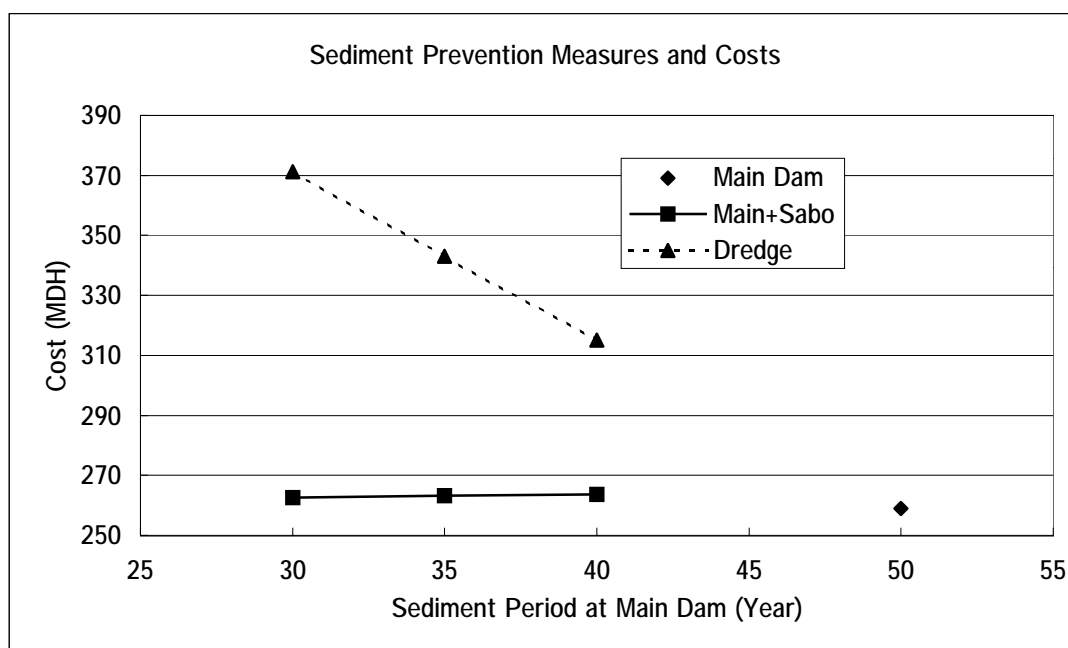


Figure XVII.2.3.6
 Irrigation Diagram of Timkit

No.17 Azghar

Main Dam	Sed. Period	(ys)	50	40	35	30
	Sed. Vol.	(Mm3)	6.50	5.20	4.55	3.90
	Crest EL.	(m)	873.50	872.93	872.65	872.37
	Dam H.	(m)	60.50	59.93	59.65	59.37
Sabo Dam	Sed. Vol.	(Mm3)	0.00	1.30	1.95	2.60
	Crest EL.	(m)	-	879.75	881.66	883.13
	Dam H.	(m)	-	19.75	21.66	23.13
Cost	Main Dam	(MDH)	258.97	253.94	251.47	249.00
	Sabo Dam	(MDH)	0.00	9.66	11.82	13.48
	Dredging	(MDH)	0.00	61.10	91.65	122.20
Total	Main Dam	(MDH)	258.97	-	-	-
	Main+Sabo	(MDH)	-	263.60	263.29	262.49
Minimum	Main+Dredg.	(MDH)	-	315.04	343.12	371.20

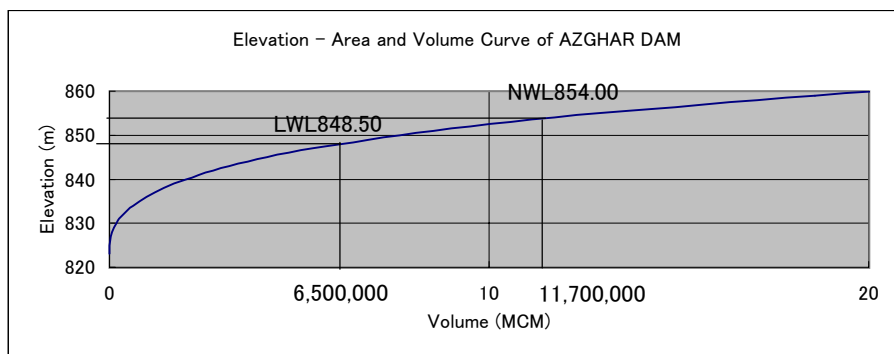


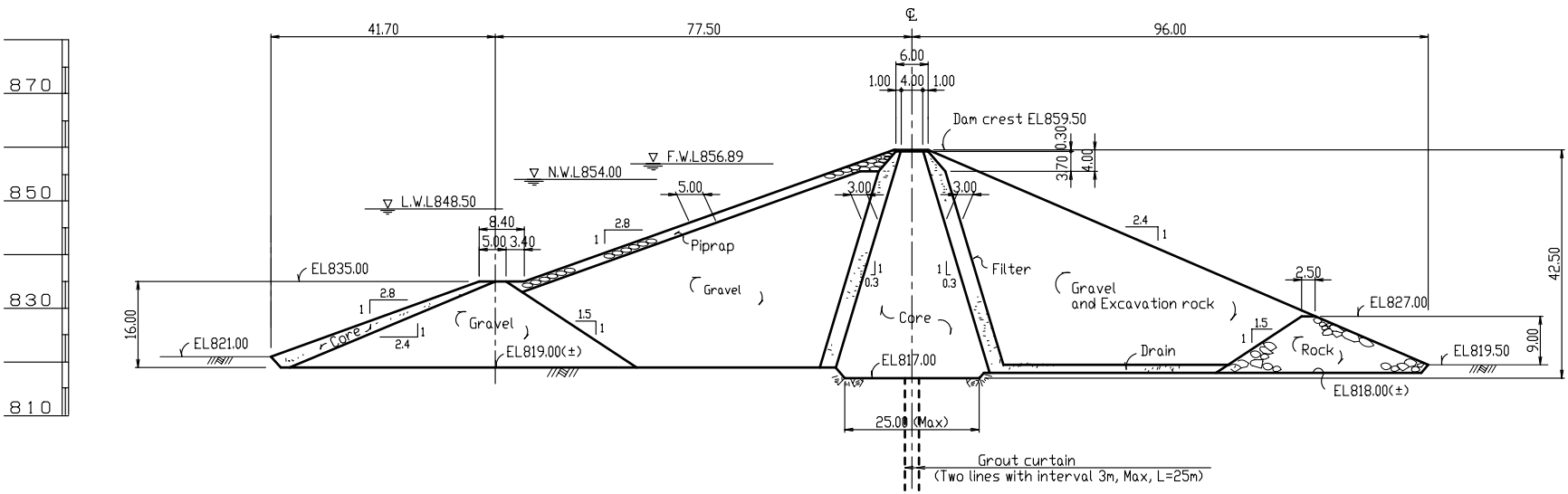
FEASIBILITY STUDY ON
WATER RESOURCES DEVELOPMENT
IN RURAL AREA

JAPAN INTERNATIONAL COOPERATION AGENCY

Figure XVII.2.4.1
Comparison of Sediment
Prevention Measures in Azghar

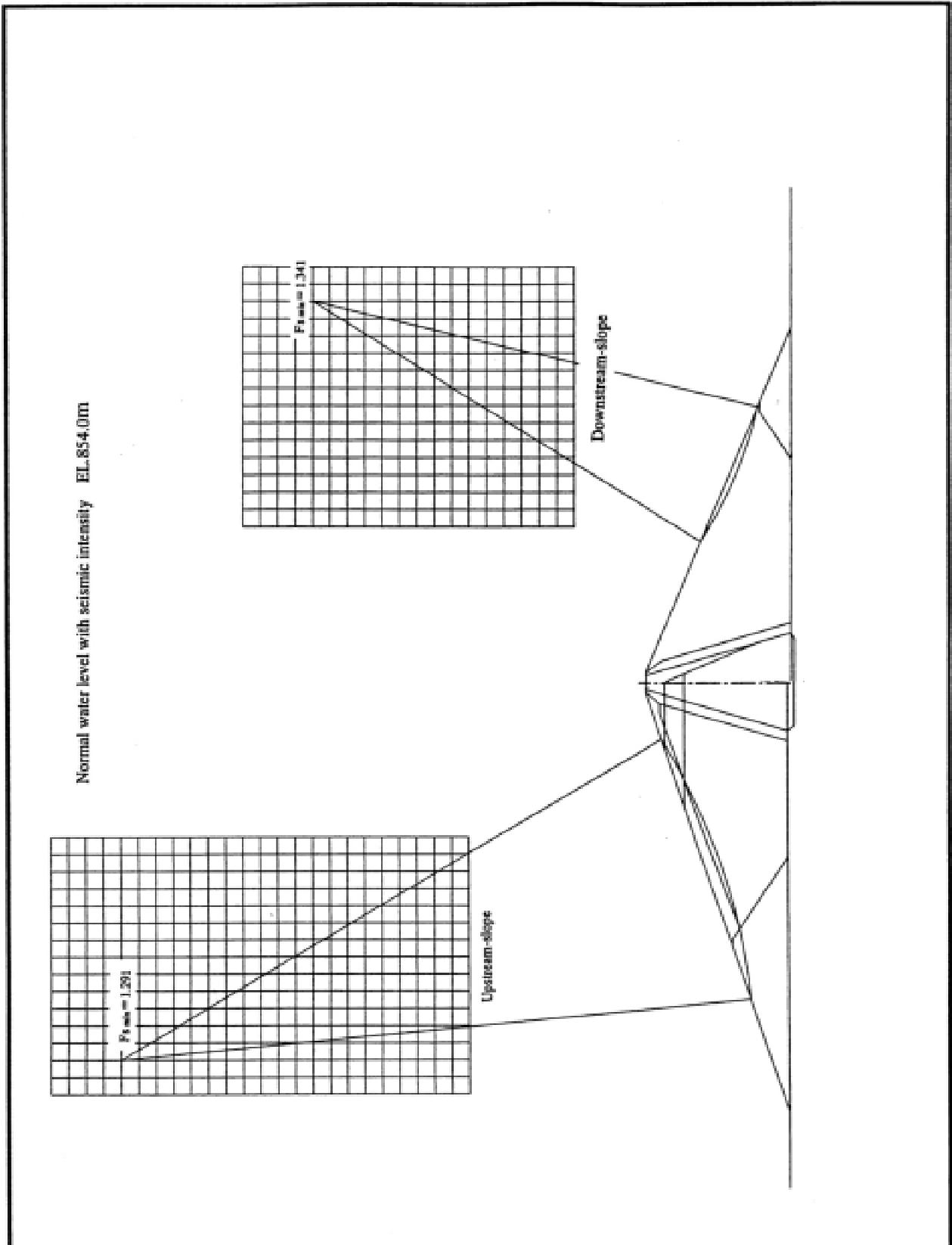
Elevation H(m)	Difference D(m)	Area A(m)	Ave. Area A(m)	Volume V(m)	Accu. Volume ΣV(m)
823	0	0	0	0	0
824	1	400	200	200	200
825	1	800	600	600	800
826	1	14,620	7,710	7,710	8,510
827	1	28,440	21,530	21,530	30,040
828	1	42,260	35,350	35,350	65,390
829	1	56,080	49,170	49,170	114,560
830	1	69,900	62,990	62,990	177,550
831	1	90,620	80,260	80,260	257,810
832	1	111,340	100,980	100,980	358,790
833	1	132,060	121,700	121,700	480,490
834	1	152,780	142,420	142,420	622,910
835	1	173,500	163,140	163,140	786,050
836	1	202,040	187,770	187,770	973,820
837	1	230,580	216,310	216,310	1,190,130
838	1	259,120	244,850	244,850	1,434,980
839	1	287,660	273,390	273,390	1,708,370
840	1	316,200	301,930	301,930	2,010,300
841	1	361,080	338,640	338,640	2,348,940
842	1	405,960	383,520	383,520	2,732,460
843	1	450,840	428,400	428,400	3,160,860
844	1	495,720	473,280	473,280	3,634,140
845	1	540,600	518,160	518,160	4,152,300
846	1	603,320	571,960	571,960	4,724,260
847	1	666,040	634,680	634,680	5,358,940
848	1	728,760	697,400	697,400	6,056,340
849	1	791,480	760,120	760,120	6,816,460
850	1	854,200	822,840	822,840	7,639,300
851	1	936,320	895,260	895,260	8,534,560
852	1	1,018,440	977,380	977,380	9,511,940
853	1	1,100,560	1,059,500	1,059,500	10,571,440
854	1	1,182,680	1,141,620	1,141,620	11,713,060
855	1	1,264,800	1,223,740	1,223,740	12,936,800
856	1	1,337,740	1,301,270	1,301,270	14,238,070
857	1	1,410,680	1,374,210	1,374,210	15,612,280
858	1	1,483,620	1,447,150	1,447,150	17,059,430
859	1	1,556,560	1,520,090	1,520,090	18,579,520
860	1	1,629,500	1,593,030	1,593,030	20,172,550
861	1	1,724,920	1,677,210	1,677,210	21,849,760
862	1	1,820,340	1,772,630	1,772,630	23,622,390
863	1	1,915,760	1,868,050	1,868,050	25,490,440
864	1	2,011,180	1,963,470	1,963,470	27,453,910
865	1	2,106,600	2,058,890	2,058,890	29,512,800
866	1	2,224,320	2,165,460	2,165,460	31,678,260
867	1	2,342,040	2,283,180	2,283,180	33,961,440
868	1	2,459,760	2,400,900	2,400,900	36,362,340
869	1	2,577,480	2,518,620	2,518,620	38,880,960
870	1	2,695,200	2,636,340	2,636,340	41,517,300
871	1	2,824,140	2,759,670	2,759,670	44,276,970
872	1	2,953,080	2,888,610	2,888,610	47,165,580
873	1	3,082,020	3,017,550	3,017,550	50,183,130
874	1	3,210,960	3,146,490	3,146,490	53,329,620
875	1	3,339,900	3,275,430	3,275,430	56,605,050
876	1	3,499,680	3,419,790	3,419,790	60,024,840
877	1	3,659,460	3,579,570	3,579,570	63,604,410
878	1	3,819,240	3,739,350	3,739,350	67,343,760
879	1	3,979,020	3,899,130	3,899,130	71,242,890
880	1	4,138,800	4,058,910	4,058,910	75,301,800





FEASIBILITY STUDY
ON WATER RESOURCES DEVELOPMENT
IN RURAL AREA
JAPAN INTERNATIONAL COOPERATION AGENCY

Figure XVIII.2.4.3
Typical Cross Section of
AZGHAR DAM

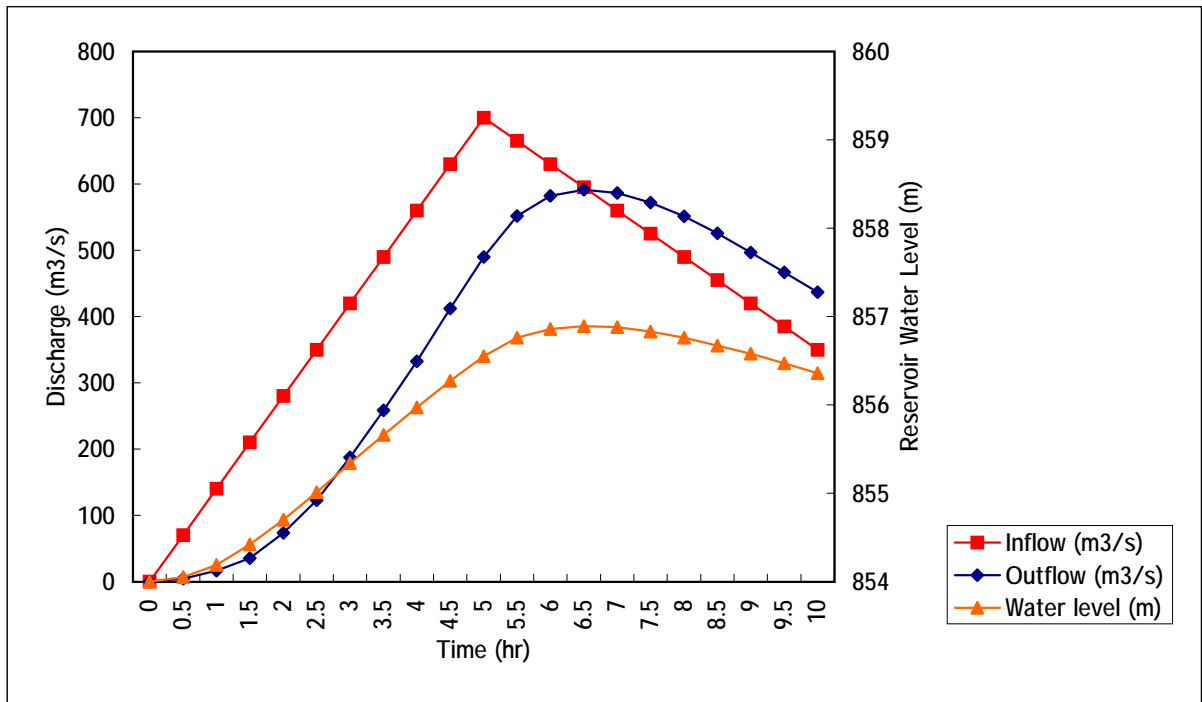


FEASIBILITY STUDY ON
 WATER RESOURCES DEVELOPMENT
 IN RURAL AREA

JAPAN INTERNATIONAL COOPERATION AGENCY

Figure XVVII2.4.4
 AZGHAR DAM
 Result of Stability Analysis on Case A

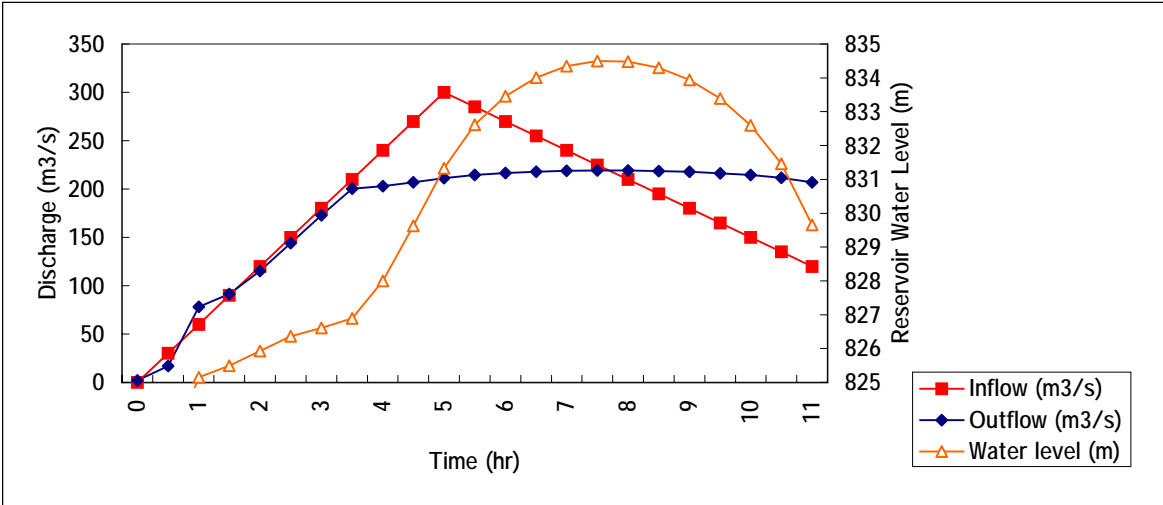
Time (min)	Time (hr.)	Inflow (m3/s)	Outflow (m3/s)	Water level (m)	Area (m2)
0	0.0	0	0	854.00	1,182,680
30	0.5	70	4	854.05	1,186,865
60	1.0	140	16	854.19	1,198,669
90	1.5	210	35	854.42	1,217,004
120	2.0	280	73	854.70	1,240,260
150	2.5	350	123	855.01	1,265,793
180	3.0	420	187	855.34	1,289,415
210	3.5	490	258	855.66	1,312,987
240	4.0	560	332	855.97	1,335,732
270	4.5	630	412	856.27	1,357,449
300	5.0	700	490	856.55	1,378,043
330	5.5	665	552	856.76	1,393,077
360	6.0	630	582	856.86	1,400,463
390	6.5	595	591	856.89	1,402,751
420	7.0	560	587	856.88	1,401,589
450	7.5	525	572	856.83	1,398,068
480	8.0	490	551	856.76	1,392,939
510	8.5	455	525	856.67	1,386,702
540	9.0	420	497	856.58	1,379,704
570	9.5	385	466	856.47	1,372,176
600	10.0	350	437	856.36	1,364,100



FEASIBILITY STUDY ON
WATER RESSOURCES DEVELOPMENT
IN RURAL AREA
JAPAN INTERNATIONAL COOPERATION AGENCY

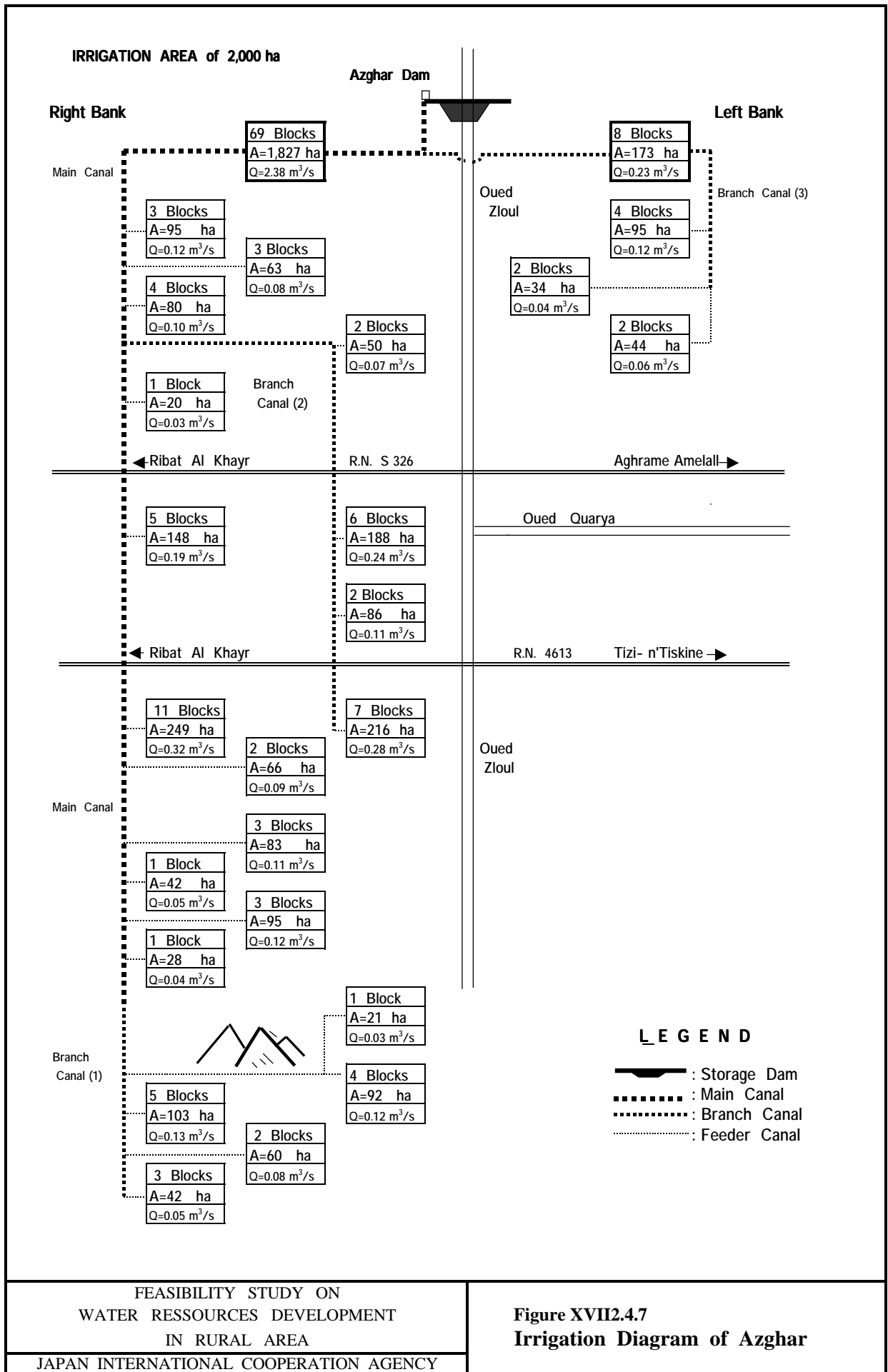
Figure XVII.2.4.5
AZGHAR DAM
Hydrograph Routine Analysis Result
of Design Flood

Time (min)	Time (hr.)	Inflow (m3/s)	Outflow (m3/s)	Water level (m)	Area (m2)
0	0.0	0	2.0	822.1	1233.3
30	0.5	30	17.0	822.8	2948
60	1.0	60	78.2	825.2	9907.2
90	1.5	90	91.4	825.5	14018.5
120	2.0	120	115.4	825.9	19524.6
150	2.5	150	144.1	826.4	24847.2
180	3.0	180	172.9	826.6	27934.6
210	3.5	210	200.2	826.9	31344
240	4.0	240	203.0	828.0	45099.2
270	4.5	270	207.0	829.6	65301.3
300	5.0	300	211.3	831.3	97475.7
330	5.5	285	214.5	832.6	124223
360	6.0	270	216.6	833.5	141594.2
390	6.5	255	217.9	834.0	153036.7
420	7.0	240	218.8	834.4	159972.1
450	7.5	225	219.1	834.5	163089.4
480	8.0	210	219.1	834.5	162710
510	8.5	195	218.6	834.3	158903.4
540	9.0	180	217.8	833.9	151516.6
570	9.5	165	216.4	833.4	140104.4
600	10.0	150	214.4	832.6	123715.9
630	10.5	135	211.6	831.5	100197.2
660	11.0	120	207.1	829.7	65612.6



FEASIBILITY STUDY ON
 WATER RESSOURCES DEVELOPMENT
 IN RURAL AREA
 JAPAN INTERNATIONAL COOPERATION AGENCY

Figure XVII.2.4.6
AZGHAR DAM
 Hydrograph Routine Analysis Result
 of Diversin Check Flood (50yr)



FEASIBILITY STUDY ON
WATER RESSOURCES DEVELOPMENT
IN RURAL AREA
JAPAN INTERNATIONAL COOPERATION AGENCY

Figure XVII.2.4.7
Irrigation Diagram of Azghar

Figure XVIII.3.1
 Construction Schedule

Site	Work	Volume	Unit	1st year	2nd year	3rd year	4th year	
No.5 N'fifikh	Preparatory Work and Access Road etc.	1	LS	██████████				
	River Diversion	200	m	██████████				
	Dam	Excavation	172,900	m ³	██████████			
		Foudation Treatment	3,150	m		██████████		
		Embankment	678,400	m ³		██████████	██████████	
	Spillway	59,700	m ³		██████████	██████████		
	Intake and Outlet	1	LS			██████████		
	Others	1	LS				██████████	
	Irrigation Facilities	1	LS	██████████	██████████	██████████		
No.9 Taskourt	Preparatory Work and Access Road etc.	1	LS	██████████				
	River Diversion	52	m	██████████				
	Dam	Excavation	242,100	m ³		██████████		
		Foudation Treatment	8,500	m			██████████	██████████
		Embankment	415,000	m ³		██████████	██████████	██████████
	Spillway	-	m ³				██████████	
	Intake and Outlet	1	LS				██████████	
	Others	1	LS				██████████	
	Irrigation Facilities	1	LS		██████████	██████████	██████████	
No.10 Timkit	Preparatory Work and Access Road etc.	1	LS	██████████				
	River Diversion	43	m	██████████				
	Dam	Excavation	165,900	m ³		██████████		
		Foudation Treatment	14,800	m			██████████	██████████
		Embankment	227,600	m ³		██████████	██████████	
	Spillway	-	m ³				██████████	
	Intake and Outlet	1	LS				██████████	
	Sabo Dam	47,800	m ³			██████████	██████████	
	Others	1	LS				██████████	
Irrigation Facilities	1	LS	██████████	██████████	██████████	██████████		
No.17 Azghar	Preparatory Work and Access Road etc.	1	LS	██████████				
	River Diversion	240	m	██████████				
	Dam	Excavation	258,000	m ³		██████████		
		Foudation Treatment	4,800	m			██████████	██████████
		Embankment	746,700	m ³		██████████	██████████	
	Spillway	29,400	m ³		██████████	██████████		
	Intake and Outlet	1	LS			██████████	██████████	
	Others	1	LS				██████████	
	Irrigation Facilities	1	LS	██████████	██████████	██████████	██████████	