D. WATER SUPPLY IMPROVEMENT PLAN

Table D.1 Proposed Works by Alternative

Alternative 1	Alternative 2	Alternative 3	Alternative 4
1. Kaparas Intake Station Q=1,000,000m3/d Pump q=240m3/min H=63m p=3,500kw N=4units	1. Kaparas Intake Station Same as Alternative 1	1. Kaparas Intake Station Q=813,800m3/d	1. Kaparas Intake Station Q=827,100m3/d
2. Raw Water Main Pipeline 2.1 Kaparas I.S. to T-N Intake D=1,400mm L=10.7km D=1,400mm L=10.7km 2.2 Kaparas I.S. to T-U Intake D=1,400mm L=1.0km D=1,400mm L=9.0km	2. Raw Water Main Pipeline Same as Alternative 1	2. Raw Water Main Pipeline 2.1 Kaparas I.S. to T-N Intake D=1,400mm L=10.7km 2.2 Kaparas I.S. to T-U Intake Same as Alternative 1	2. Raw Water Main Pipeline 2.1 Kaparas I.S. to T-N Intake Same as Alternative 3 2.2 Kaparas I.S. to T-U Intake Same as Alternative 1
3. Tuyamuyun Nukus W.T.P. Rehabilitation Q=200,000m3/d Extension Q=150,000m3/d Extension Q=150,000m3/d Total Q=500,000m3/d	3. Tuyamuyun Nukus W.T.P. Same as Alternative 1	3. Tuyamuyun Nukus W.T.P. Rehabilitation Q=200,000m3/d Extension Q=150,000m3/d Total Q=350,000m3/d	3. Tuyamuyun Nukus W.T.P. Same as Alternative 3
4. Tuyamuyun Urgench W.T.P. Rehabilitation Q=200,000m3/d Extension Q=200,000m3/d Extension Q=100,000m3/d Total Q=500,000m3/d	4. Tuyamuyun Urgench W.T.P. Same as Alternative 1	4. Tuyamuyun Urgench W.T.P. Same as Alternative 1	4. Tuyamuyun Urgench W.T.P. Same as Alternative 1
5. Booster Pumping Station (T-N System) 5.1 No.2 B.P.S. Q=306,900m3/d Pump q=60m3/min H=290m p=2,700kw N=6units Chlorination Dosing System Reservoir C=3,000m3 N=3units 5.2 No.3 B.P.S. Q=306,900m3/d Pump q=60m3/min H=290m p=2,700kw N=6units Chlorination Dosing System Reservoir C=3,000m3 N=3units	5. Booster Pumping Station (T-N System) 5.1 No.2 B.P.S. Same as Alternative 1 5.2 No.3 B.P.S. Same as Alternative 1	5. Booster Pumping Station (T-N System) 5.1 No.2 B.P.S. Same as Alternative 1	5. Booster Pumping Station (T-N System) 5.1 No.2 B.P.S. Same as Alternative 1

Table D.1 Proposed Works by Alternative

Alternative 1	Alternative 2	Alternative 3	Alternative 4
6. Transmission & Distribution Station (T-N System) 6.1 Nukus North D.S. Q=255,910m3/d Pump q=30m3/min H=190m p=1,400kw N=6units Chlorination Dosing System 6.2 Kungrad T.D.S. Q=55,020m3/d Pump q=4.5m3/min H=160m p=170kw N=4units Pump q=3.7m3/min H=90m p=75kw N=8units Pump q=3.3m3/min H=125m p=125kw N=4units Chlorination Dosing System Reservoir C=10,000m3 N=3units	6. Transmission & Distribution Station (T-N System) 6.1 Nukus North D.S. Same as Alternative 1	6. Transmission & Distribution Station 6.2 Kungrad T.D.S. Same as Alternative 1	
7. Khazarasp Treatment Pumping Station (T-U System) Q=256,290m3/d Pump q=55m3/min H=90m p=1200kw N=6units Chlorination Dosing System Reservoir C=3,200m3 N=3units	7. Khazarasp Treatment Pumping Station (T-U System) Same as Alternative 1	7. Khazarasp Treatment Pumping Station (T-U System) Same as Alternative 1	7. Khazarasp Treatment Pumping Station (T-U System) Same as Alternative 1
8. Transmission Pipeline (T-N System) WTP - No.1 B.P.S. D=1,400mm L=63.0km No.1 - No.2 B.P.S. D=1,400mm L=59.0km Nukus - Takhiatash (L=21.0km) D=1,200mm L=11.0km Kungrad - Muynak D=500mm L=96.5km Others D=400-500mm L=90.5km	8. Transmission Pipeline (T-N System) WTP - No.1 B.P.S. D=1,400mm L=63.0km No.1 - No.2 B.P.S. D=1,400mm L=59.0km Nukus - Takhiatash (L=21.0km) D=1,200mm L=11.0km Others D=400-500mm L=90.5km	8. Transmission Pipeline (T-N System) WTP - No.1 B.P.S. D=1,400mm L=63.0km Kungrad - Muynak D=500mm L=96.5km Others D=400-500mm L=90.5km	8. Transmission Pipeline (T-N System) WTP - No.1 B.P.S. D=1,400mm L=63.0km Others D=400-500mm L=90.5km

Table D.1 Proposed Works by Alternative

Alternative 1	Alternative 2	Alternative 3	Alternative 4
9. Transmission Pipeline (T-U System) D=1,200mm L=55.8km D=600mm L=43.5km D=500mm L=20.0km	9. Transmission Pipeline (T-U System) Same as Alternative 1	9. Transmission Pipeline (T-U System) Same as Alternative 1	9. Transmission Pipeline (T-U System) Same as Alternative 1
	10. Muynak Water Treatment Plant 10.1 Rehabilitation & Extension Q=13,300m3/d 10.2 Reverse Osmosis Q=520m3/d	Alternative 3-1 10. Muynak Water Treatment Plant 10.2 Reverse Osmosis Q=520m3/d	10. Muynak Water Treatment Plant Same as Alternative 2
		Alternative 3-1 11. Takhiatash Water Treatment Plant 11.1 Rehabilitation & Extension Q=186,200m3/d 11.2 Reverse Osmosis Q=6,760m3/d	Alternative 4-1 11. Takhiatash Water Treatment Plant 11.1 Rehabilitation & Extension Q=172,900m3/d 11.2 Reverse Osmosis Q=6,760m3/d
		Alternative 3-2 12. Raw Reservoir Propose C=65,000,000m3	Alternative 4-2 12. Raw Reservoir Same as Alternative 3-2
		13. Takhiatash Water Treatment Plant Rehabilitation & Extension Q=186,200m3/d	13. Takhiatash Water Treatment Plant Rehabilitation & Extension Q=172,900m3/d

Table D.2 Cost Comparison of Alternatives

No.	Item	Description				Alternative 1 Cost (1,000USD) Con-strution	Alternative 1 Cost (1,000USD) O&M Cost	Alternative 2 Cost (1,000USD) Con-strution	Alternative 2 Cost (1,000USD) O&M Cost	Alternative 3-1 Cost (1,000USD) Con-strution	Alternative 3-1 Cost (1,000USD) O&M Cost	Alternative 4-1 Cost (1,000USD) Con-strution	Alternative 4-1 Cost (1,000USD) O&M Cost
1	Intake Station	Kaparas Reservior		Q=1,000 km3/d	50% for T-N	10,324	26	10,324	26	10,324	26	10,324	26
		Right Bank	q=14,400 m3/hr	H=63 m	P=3,500 kw		1,465		1,423		876		876
					Total 1	10,324	1,491	10,324	1,449	10,324	902	10,324	902
2	Raw Water Main Pipeline	Kaparas - T-N		D=1,400 mm	L=10.7 km	18,713	19	18,713	19	18,713	19	18,713	19
		Kaparas - T-N		D=1,400 mm	L=10.7 km	15,037	15	15,037	15		0		0
					Total 2	33,750	34	33,750	34	18,713	19	18,713	19
3	Water Treatment Plant	T-N		1 Q=150 km3/d	Extension	57,194	6,971	57,194	6,779	57,194	4,285	57,194	4,285
				2 Q=150 km3/d	Extension	42,889	214	42,889	214		0		0
			q=4,000 m3/d	H= 95 m	P=1,600 kw		6,396		6,213		3,826		3,826
			q=3,600 m3/d	H=230 m	P=2,500 kw		0		0				
					Total 3	100,083	13,581	100,083	13,206	57,194	8,111	57,194	8,111
4	Booster Pumping Station	No 2		Q=306.94 km3/d		15,945	40	15,945	40	15,945	40	15,945	40
			q=3,600 m3/hr	H=290 m	P=2,700 kw		2,989		2,871		1,337		1,337
			Chlorination				83		80		37		37
					Sub total	15,945	3,112	15,945	2,991	15,945	1,414	15,945	1,414
		No.3		Q=306.94 km3/d		15,945	40	15,945	40		0		0
			q=3,600 m3/hr	H= 290m	P=2,700 kw		2,989		2,871				
			Chlorination				83		80				
					Sub total	15,945	3,112	15,945	2,991	0	0	0	0
					Total 4	31,890	6,224	31,890	5,982	15,945	1,414	15,945	1,414
5	Transmission Pumping Station	Nukus North		Q=255.91 km3/d		10,860	27	10,860	27		0		0
			q=1,800 m3/d	H=190 m	P=1,400 kw		1,713		1,591				
			Chlorination	Takhiatash			46		43				
					Total 5	10,860	1,786	10,860	1,661	0	0	0	0
6	Tr. & Distribution Pumping Station	Kungrad		Q= 55.02 km3/d		18,933	47		0	18,933	47		0
							0				0		
			q=220 m3/d	H= 90 m	P= 75 kw		190				190		
			q=270 m3/hr	H=160 m	P=170 kw		99				99		
			Chlorination	Kungrad			12				12		
			Chlorination	Muynak			3				3		
					Total 6	18,933	351	0	0	18,933	351	0	0
7	Transmission Pipeline	T-N - No.1 B.P.S		D=1,400 mm	L=63.0 km	82,632	83	82,632	83	82,632	83	82,632	83
		No.1 B.P.S - No. 2 B.P.S		D=1,400 mm	L=59.0 km	77,344	77	77,344	77		0		0
		Nukus - Takhiatash (L=21 km)		D=1,200 mm	L=11.0 km	14,687	15	14,687	15		0		0
		Kungrad - Muynak (Q=12.09 km3/d)		D= 500 mm	L=96.5 km	28,475	28		0	31,267	31		0
					Total 7	203,138	203	174,663	175	113,899	114	82,632	83
8	Water Treatment Plant	Muynak	Rehbili. & Exten.	Q=13.3 km3/d			0	5,440	238		0	5,440	238
			Revers Osmosis 1	Q=1.015 km3/d			0	8,824	0	8,824	0	8,824	0
			Power						111		111		111
			Chemical						27		27		27
			Sell						64		64		64
			Repair						84		84		84
					Total 8	0	0	14,264	524	8,824	286	14,264	524
9	Water Treatment Plant	Takhiatash	Rehbili. & Exten.	Q=186.2 km3/d			0		0	63,494	4,454		0
		(Left Bank)	Rehbili. & Exten.	Q=172.9 km3/d			0		0		0	56,538	4,125
			Revers Osmosis	Q=13.593 km3/d			0		0	99,341	0	99,341	0
			Power								1,424		1,424
			Chemical								345		345
			Sell								820		820
			Repair								1,079		1,079
					Total 9	0	0	0	0	162,835	8,122	155,879	7,793
10	Distribution Network	Muynak	for R/O	D=100 - 150 mm	L= 60 km		0	6,314	64	6,314	64	6,314	64
		Takhiatash	ditto	D=100 - 400 mm	L=250 km		0		0	43,525	713	43,525	713
					Total 10	0	0	6,314	64	49,839	777	49,839	777
					Grand Total	408,978	23,670	382,148	23,095	456,506	20,096	404,790	19,623

Table D.3 Construction Cost Estimation (B/P)

(Unit : thousand USD)

Description		Total	Local Currency Portion	Foreign Currency Portion
1. Kaparas Raw Water Intake System				
1.1 Kaparas Intake Station				
1.1.1 Kaparas Intake Station	Q=1,000,000 m3/d	6,864	6,864	0
1.1.2 Machinery Equipments		2,272	440	1,832
1.1.3 Electric Equipments		3,237	591	2,646
1.1.4 Monitoring Water Quality		523	88	435
	Total 1.1	12,897	7,984	4,913
1.2 Raw Water Mains				
1.2.1 Kaparas I.S. to T-N existing intake st.	D=1,400 L=10.7 km	18,713	4,460	14,253
1.2.2 Kaparas I.S. to T-N existing intake st.	D=1,400 L=10.7 km	15,039	1,593	13,446
1.2.3 Kaparas I.S. to T-U existing intake st.	D=1,400 L= 1.0 km	1,643	146	1,497
1.2.4 Kaparas I.S. to T-U existing intake st.	D=1,400 L= 9.0 km	12,679	1,316	11,363
	Total 1.2	48,072	7,513	40,559
	Total 1	60,970	15,498	45,472
2. Tuyamuyun Nukus Water Supply System				
2.1 Water Treatment Plant	Q=500,000 m3/d			
2.1.1 Rehabilitation	Q=200,000 m3/d	0	0	0
(1) Machinery Equipments		11,742	1,997	9,745
(2) Chemical and Chlorination Equipments		0	0	0
(3) Electric Equipments		3,555	596	2,959
(4) Laboratory Equipments		209	0	209
	Total 2.1.1	15,507	2,594	12,913
2.1.2 Expansion Phase - I	Q=150,000 m3/d	7,142	6,948	194
(1) Machinery Equipments		29,016	4,929	24,087
(2) Chemical and Chlorination Equipments		3,426	585	2,841
(3) Electric Equipments		5,013	852	4,161
	Total 2.1.2	44,597	13,315	31,282
2.1.3 Expansion Phase - III	Q=150,000 m3/d	7,097	6,999	98
(1) Machinery Equipments		20,618	3,517	17,101
(2) Chemical and Chlorination Equipments		3,426	585	2,841
(3) Electric Equipments		5,013	852	4,161
	Total 2.1.3	36,154	11,955	24,199
	Total 2.1	96,256	27,861	68,395
2.2 Transmission and Distribution Pumping St.				
2.2.1 No. 2 Booster Pumping Station Phase - I	Q=306,940m3/d	5,745	5,745	0
(1) Machinery Equipments		2,615	489	2,126
(2) Electric Equipments		1,166	75	1,091
	Total 2.2.1	9,527	6,309	3,218
2.2.2 No. 3 Booster Pumping Station Phase - III	Q=306,940m3/d	5,745	5,745	0
(1) Machinery Equipments		2,615	489	2,126
(2) Electric Equipments		1,166	75	1,091
	Total 2.2.2	9,527	6,309	3,218
2.2.3 Nukus North Distribution Station	Q=255,910 m3/d	4,687	4,687	0
(1) Machinery Equipments		4,580	273	4,307
(2) Electric Equipments		1,593	74	1,519
	Total 2.2.3	10,861	5,035	5,826
2.2.4 Kungrad Transmission and Distribution St.	Q= 55,020 m3/d	13,031	13,031	0
(1) Machinery Equipments		4,287	196	4,091
(2) Electric Equipments		1,364	62	1,302
(2) Chlorination Equipments		258	44	214
	Total 2.2.4	18,939	13,333	5,606
	Total 2.2	48,853	30,985	17,868
2.3 Transmission Pipeline				
2.3.1 W.T.P. - No. 1 Pumping st.	D=1,400 L= 63.0 km	82,632	9,211	73,421
2.3.2 No.1 P.S. to No.2 P.S.	D=1,400 L= 59.0 km	77,344	8,608	68,736
2.3.3 Nukus - Takhiatash (Khodjeili) L=21 km	D=1,200 L= 11.0 km	14,687	3,723	10,964

Description		Total	Local Currency Portion	Foreign Currency Portion
2.3.4 Takhiatash (Khodjeili) - Kungrad	D=1,000 L= 111.0 km	86,816	8,667	78,149
2.3.5 Kungrad - Muinak (Q=8,870 m3/d)	D=500 L= 96.5 km	28,475	3,546	24,929
2.3.6 Khalkabad - Kegeili	D=500 L= 11.5 km	3,449	576	2,873
2.3.7 Kegeili - Bozatau	D=400 L= 50.0 km	15,043	1,436	13,607
2.3.8 Karauzyak - Takhtakupyr	D=500 L= 29.0 km	8,564	1,061	7,503
	Total 2.3	317,011	36,831	280,180
	Total 2	462,121	95,678	366,443
3. Tuyamuyun Urgench Water Supply System				
3.1 Water Treatment Plant	Q=500,000 m3/d			
3.1.1 Rehabilitation	Q=200,000 m3/d	0	0	0
(1) Machinery Equipments		11,742	1,997	9,745
(2) Chemical and Chlorination Equipments		0	0	0
(3) Electric Equipments		3,555	596	2,959
(4) Laboratory Equipments		207	0	207
	Total 3.1.1	15,504	2,593	12,911
3.1.2 Expansion Phase - I	Q=200,000 m3/d	10,103	9,909	194
(1) Machinery Equipments		35,425	6,011	29,414
(2) Chemical and Chlorination Equipments		4,584	784	3,800
(3) Electric Equipments		6,690	1,140	5,550
	Total 3.1.2	56,801	17,844	38,957
3.1.3 Expansion Phase - III	Q=100,000 m3/d	6,291	6,193	98
(1) Machinery Equipments		17,694	3,021	14,673
(2) Chemical and Chlorination Equipments		2,268	387	1,881
(3) Electric Equipments		3,335	565	2,770
	Total 3.1.3	29,588	10,166	19,422
	Total 3.1	101,893	30,602	71,291
3.2 Transmission Pipeline				
3.2.1 W.T.P. - Khazarasp Pum. St. Phase - I	D=1,200 L=27.0 km	27,649	2,809	24,840
3.2.2 Khanki - Urgench	D=1,200 L=13.2 km	8,068	771	7,297
3.2.3 Yangiaryk - Khiva	D=600 L=20.0 km	7,296	741	6,555
3.2.4 S.P.1 - Koshkupyr	D=600 L=14.0 km	5,121	608	4,513
3.2.5 Koshkupyr - Shavat	D=600 L=10.0 km	3,704	428	3,276
3.2.6 Gurlen - Shavat	D=600 L=19.5 km	3,350	275	3,075
	Total 3.2	55,189	5,633	49,556
3.3 Transmission Pumping Station				
3.3.1 Khazarasp Pumping Station Phase - III	Q=256,290m3/d	5,941	5,941	0
(1) Machinery Equipments		5,190	302	4,888
(2) Electric Equipments		979	45	934
	Total 3.3	12,110	6,289	5,821
	Total 3	169,191	42,523	126,668
4 VodoKanal Karakalpakstan				
4.1 Water Treatment Plant				
4.1.1 Nukus W.T.P (Rehabilitation)	Q=65,000 m3/d	0	0	0
(1) Machinery Equipments		12,736	1,173	11,563
(2) Chemical and Chlorination Equipments		1,807	314	1,493
(3) Electric Equipments		3,177	146	3,031
	Total 4.1.1	17,719	1,632	16,087
4.1.2 Nukus W.T.P (Expansion)	Q=35,000 m3/d	1,425	1,327	98
(1) Machinery Equipments		6,274	822	5,452
(2) Chemical and Chlorination Equipments		1,086	189	897
(3) Electric Equipments		1,763	247	1,516
	Total 4.1.2	10,548	2,585	7,963
4.1.3 Chimbai W.T.P (Rehabilitation)	Q= 2,200 m3/d	8	8	0
(1) Machinery Equipments		1,058	48	1,010
(2) Chemical and Chlorination Equipments		32	6	26
(3) Electric Equipments		501	23	478
	Total 4.1.3	1,600	85	1,515
4.1.4 Turtkul W.T.P (Rehabilitation)	Q=8,400 m3/d	3,796	318	3,478
4.1.5 Beruni W.T.P (Rehabilitation)	Q=4,600 m3/d	2,079	175	1,904

B/P

Description		Total	Local Currency Portion	Foreign Currency Portion
4.1.6 Kegeili W.T.P (Rehabilitation)	Q=1,000 m3/d	728	38	690
	Total 4.1	36,470	4,833	31,637
4.2 Distribution Network				
4.2.1 Replacement D=100～D=400	L=228.8 km	53,216	31,819	21,397
4.2.2 Expansion D=100～D=400 Phase - I	L=119.6 km	27,993	16,737	11,256
4.2.3 Expansion D=100～D=400 Phase - II	L=66.0 km	24,728	14,784	9,944
4.2.4 Expansion D=100～D=400 Phase - III	L=174.0 km	40,590	24,268	16,322
	Total 4.2	146,528	87,609	58,919
4.3 Metering System				
4.3.1 Meter Installation D=20 Phase - I	N=37,710 pieces	3,348	781	2,567
4.3.2 Meter Installation D=20 Phase - II	N=30,390 pieces	2,698	629	2,069
4.3.3 Meter Installation D=20 Phase - III	N=73,660 pieces	6,539	1,525	5,014
	Total 4.3	12,584	2,934	9,650
	Total 4	195,584	95,379	100,205
5. VodoKanal Khorezm				
5.1 Water Treatment Plant				
5.1.1 Urgench W.T.P (Rehabilitation)	Q= 50,000 m3/d	0	0	0
(1) Machinery Equipments		14,051	1,100	12,951
(2) Chemical and Chlorination Equipments		1,421	241	1,180
(3) Electric Equipments		4,219	194	4,025
	Total 5.1.1	19,691	1,535	18,156
5.1.2 Urgench W.T.P (Expansion)	Q= 50,000 m3/d	1,119	1,021	98
(1) Machinery Equipments		7,334	1,001	6,333
(2) Chemical and Chlorination Equipments		1,421	241	1,180
(3) Electric Equipments		2,116	319	1,797
	Total 5.1.2	11,990	2,582	9,408
5.1.3 Chalish(Rehabilitation)	Q= 11,000 m3/d	24	24	0
(1) Machinery Equipments		1,274	58	1,216
(2) Chemical and Chlorination Equipments		153	26	127
(3) Electric Equipments		501	23	478
	Total 5.1.3	1,953	133	1,820
5.1.4 Chalish(Expansion)	Q= 22,000 m3/d	2,640	1,467	1,173
(1) Machinery Equipments		398	18	380
(2) Chemical and Chlorination Equipments		306	53	253
(3) Electric Equipments		0	0	0
	Total 5.1.4	3,343	1,537	1,806
	Total 5.1	36,977	5,787	31,190
5.2 Distribution Network				
5.2.1 Replacement D=100～D=400	L=170.3 km	39,833	23,817	16,016
5.2.2 Expansion D=100～D=400 Phase - I	L= 71.5 km	16,796	10,042	6,754
5.2.3 Expansion D=100～D=400 Phase - II	L= 30.0 km	12,597	7,531	5,066
5.2.4 Expansion D=100～D=400 Phase - III	L= 80.0 km	18,663	11,158	7,505
	Total 5.2	87,890	52,549	35,341
5.3 Metering System				
5.3.1 Meter Installation D=20 Phase - I	N=17,550 pieces	1,557	363	1,194
5.3.2 Meter Installation D=20 Phase - II	N=14,460 pieces	1,283	299	984
5.3.3 Meter Installation D=20 Phase - III	N=34,240 pieces	3,039	708	2,331
	Total 5.3	5,880	1,371	4,509
	Total 5	130,747	59,707	71,040
	Total 1 - 5	1,018,614	308,786	709,828

INNER MORTAR LINING

(1) Inner Lining

The merit for with inner lining and the demerit for without inner lining are summarized below.

1) Inner lining prevents corrosion of pipe surface. If pipe surface is corroded, the surface become uneven, lost its smoothness, section becomes smaller, and flow capacity is down.

2) Steel Pipe is easy to be corroded and lost its useful life. Inner lining prevents this.

3) Steel pipe is also corroded by chlorine and consumes chlorine. Inner lining prevents these.

4) The inner surface corrosion of steel pipe causes red water or water quality problem.

(2) Cost Comparison for with and without mortar lining

Basically, there are some inner lining materials. Since the inner lining are planned to do at site in this project, mortar lining method is recommended and considered for comparison because of its ease for execution. For a comparison, the following conditions are assumed.

1) Useful life of the pipe is same. In the case of without inner lining, to keep the same useful life as with inner lining pipe, thickness of pipe is adjusted considering corrosion, viz., corrosion thickness is added.

2) Condition of pipe

Useful life	: 40 years
Price of steel pipe	: 1,000 USD / ton (CIF)
Cost for mortar lining	: 64 USD / m2
Diameter of pipe	: 1,400 mm
Thickness of pipe with mortal lining	: 13 mm
Thickness of pipe without mortar lining	: 21 mm (13 + 8 = 21)
Corrosion rate	: 0.2 mm / year (source : H.H. Uhling Corrosion Hand Book 1948)

The costs of pipe are estimated as follows,

With mortar lining	: 733 USD / m
Without mortar lining	: 736 USD / m

It is concluded to be almost same costs.

(3) Conclusion

Pipe transfers safe drinkable water. To secure safe and quantity of precious drinkable water conveyance, inner lining is essential. Since the costs for with and without mortar lining are nearly same, inner mortar lining is recommended for the project.

Table D.4 Project Cost

(unit : million USD)

Work Item	Specification	Total			First Priority Pro.(FPP)			Second Priority Pro.(SPP)		
		Total	L/C	F/C	Total	L/C	F/C	Total	L/C	F/C
1. Kaparas Raw Water Intake System										
1.1 Kaparas Intake Station	Q=750,000 m3/d	12.9	8.0	4.9	12.9	8.0	4.9			
1.2 Raw Water Mains Pipeline										
1.2.1 Kaparas I.S. to T-N Existing Intake Station	D=1,400 L=10.7 km	14.2	4.5	9.7	14.2	4.5	9.7			
1.2.2 Kaparas I.S. to T-U Existing Intake Station	D=1,400 L= 1.0 km	1.6	0.1	1.5	1.6	0.1	1.5			
1.2.3 Kaparas I.S. to T-U Existing Intake Station	D=1,400 L= 9.0 km	8.9	1.3	7.6	8.9	1.3	7.6			
Sub-Total		37.6	13.9	23.7	37.6	13.9	23.7			
2. Tuyamuyun-Nukus Water Supply System										
2.1 Water Treatment Plant	Q=350,000 m3/d									
2.1.1 Rehabilitation	Q=200,000 m3/d	15.5	2.6	12.9				15.5	2.6	12.9
2.1.2 Expansion	Q=150,000 m3/d	44.6	13.3	31.3				44.6	13.3	31.3
2.2 Transmission and Distribution Pumping Station										
2.2.1 No. 2 Booster Pumping Station	Q=234,410 m3/d	9.5	6.3	3.2				9.5	6.3	3.2
2.2.2 Nukus North Distribution Station	Q=122,950 m3/d	10.8	5.0	5.8	10.8	5.0	5.8			
2.2.3 Kungrad Transmission and Distribution Station	Q= 42,130 m3/d	10.5	6.7	3.8	10.5	6.7	3.8			
2.3 Transmission Pipeline										
2.3.1 W.T.P. - No. 1 Pumping Station	D=1,400 L= 63.0 km	56.3	9.3	47.0				56.3	9.3	47.0
2.3.2 Nukus - Takhiatash L=21 km	D=1,200 L= 11.0 km	10.7	3.7	7.0	10.7	3.7	7.0			
2.3.3 Kungrad - Muynak (Q=8,870 m3/d)	D=500 L= 96.5 km	21.4	3.6	17.8	21.4	3.6	17.8			
2.3.4 Kegeili - Bozatau	D=400 L= 50.0 km	13.1	1.4	11.7				13.1	1.4	11.7
Sub-Total		192.4	51.9	140.5	53.4	19.0	34.4	139.0	32.9	106.1
3. Tuyamuyun-Urogench Water Supply System										
3.1 Water Treatment Plant	Q=400,000 m3/d									
3.1.1 Rehabilitation	Q=200,000 m3/d	15.5	2.5	13.0				15.5	2.5	13.0
3.1.2 Expansion	Q=200,000 m3/d	56.8	17.8	39.0	56.8	17.8	39.0			
3.2 Transmission Pipeline										
3.2.1 W.T.P. - Khazarasp Pumping Station	D=1,200 L=27.0 km	17.9	2.8	15.1	17.9	2.8	15.1			
3.2.2 Khanki - Urgench	D=1,200 L=13.2 km	5.4	0.8	4.6	5.4	0.8	4.6			
3.2.3 Yangiaryk - Khiva	D=600 L=20.0 km	5.0	0.7	4.3	5.0	0.7	4.3			
3.2.4 S.P.I - Koshkupyr	D=600 L=14.0 km	3.6	0.7	2.9	3.6	0.7	2.9			
3.2.5 Gurlen - Shavat	D=600 L=19.5 km	2.6	0.3	2.3	2.6	0.3	2.3			
Sub-Total		106.8	25.6	81.2	91.3	23.1	68.2	15.5	2.5	13.0
4. VodoKanal Karakalpakistan										
4.1 Water Treatment Plant										
4.1.1 Nukus W.T.P (Rehabilitation)	Q= 65,000 m3/d	17.7	1.6	16.1				17.7	1.6	16.1
4.1.2 Chimbai W.T.P (Rehabilitation)	Q= 2,200 m3/d	1.6	0.1	1.5				1.6	0.1	1.5
4.1.3 Water Treatment Plant (Rehabilitation), 3Cities	Q= 14,000 m3/d	6.6	0.5	6.1				6.6	0.5	6.1
4.2 Distribution Network										
4.2.1 Replacement D=100～D=400	L=228.8 km	53.2	31.8	21.4	20.5	12.2	8.3	32.7	19.6	13.1
4.2.2 Expansion D=100～D=400	L=119.6 km	28.0	16.8	11.2	10.8	6.5	4.3	17.2	10.3	6.9
4.3 Metering System										
4.3.1 Meter Installation D=20	N=115,960 Pieces	10.3	2.4	7.9	3.9	0.9	3.0	6.4	1.5	4.9
Sub-Total		117.4	53.2	64.2	35.2	19.6	15.6	82.2	33.6	48.6
5. VodoKanal Khorezm										
5.1 Water Treatment Plant										
5.1.1 Urgench W.T.P (Rehabilitation)	Q= 50,000 m3/d	19.7	1.5	18.2				19.7	1.5	18.2
5.1.2 Chalish (Rehabilitation)	Q= 11,000 m3/d	1.9	0.1	1.8				1.9	0.1	1.8
5.2 Distribution Network										
5.2.1 Replacement D=100～D=400	L=170.3 km	39.8	23.8	16.1	15.3	9.1	6.2	24.6	14.7	9.9
5.2.2 Expansion D=100～D=400	L= 71.5 km	16.8	10.1	6.7	6.5	3.9	2.6	10.3	6.2	4.1
5.3 Metering System										
5.3.1 Meter Installation D=20	N=60,970 Pieces	5.4	1.3	4.1	2.1	0.5	1.6	3.3	0.8	2.5
Sub-Total		83.7	36.8	46.9	23.9	13.5	10.4	59.8	23.3	36.6
Total		538.0	181.4	356.5	241.4	89.1	152.3	296.6	92.3	204.2

Note :
L/C : Local currency portion, F/C : Foreign currency portion
This construction cost is pipeline without inner cement mortar lining.

E. ENGINEERING DESIGN

Table E.1 FS(2010)

Pipe data & hydraulic calculation result of Tuyamuyum-Nukus raw water main

Node No.	Pipe diameter	Nos. of pipe	Section length	Flow rate	Flow velocity	Hydraulic gradient	Head loss	Remarks
	D (mm)		L (km)	Q (m3/day)	V (m/sec)	I (%o)	H (m)	
1 - 2	1,400	1	6700	328,000	2.47	4.089	27.4	240,467
2 - 3	1,400	1	3972	328,000	2.47	4.089	16.2	
3 - 4	1,200	2	1539	164,000	1.68	2.403	3.7	
4 - 5	1,200	2	400	164,000	1.68	2.403	1.0	

For this hydraulic calculation, Hazen-Williams formula is used. C = 110

I = 10.666 * C^-1.85 * (D/1000)^-4.87 * (Q/86400)^1.85

H= I/1000 * L

Coefficient (C) in the formula is set at 110

Node data & hydraulic calculation result of Tuyamuyum-Nukus raw water main

No	Node Point	Total length from base point	Required water amount	Total water head	Ground level (G.L)	Water level of receiving tank	Water head from G.L	Pumping head	Minimum water level of pump operation	Total water head of pump	Remark
		(m)	(m3/day)	(m)	(m)	(m)	(m)	(m)	(m)	(m)	
1	Kaparas Pump. st.	0	0	179.0	131.3		47.7	63.0	116.0	179.0	
2	Branch to T-U W.T.P	6700	0	151.6	122.4		29.3				
3	Existing intake	10672	0	135.4	118.6		16.8				
4	T-N W.T.P	12211	0	131.7	121.0		10.7				
5	Receiving well	12611	328,000	130.7	130.0	129.0	1.7				
		total	328,000								

demand year 2000

Pipe data & hydraulic calculation result of Tuyamuyum-Urgench raw water main

Node No.	Pipe diameter	Nos. of pipe	Section length	Flow rate	Flow velocity	Hydraulic gradient	Head loss	Remarks
	D (mm)		L (m)	Q (m3/day)	V (m/sec)	I (%o)	H (m)	
1 - 2	1,400	2	6700	196,700	1.48	1.588	10.6	240,467
2 - 3	1,400	2	2297	196,700	1.48	1.588	3.6	
3 - 4	1,400	1	8250	236,100	1.78	2.226	18.4	
3 - 4	1,200	1	8250	157,300	1.61	2.224	18.3	157,300

For this hydraulic calculation, Hazen-Williams formula is used. C = 110

I = 10.666 * C^-1.85 * (D/1000)^-4.87 * (Q/86400)^1.85

H= I/1000 * L

Coefficient (C) in the formula is set at 110

Node data & hydraulic calculation result of Tuyamuyum-Urgench raw water main

Node Data

	Node	Length from base point	Required water amount	Total water head	Ground level (G.L)	Water level of receiving tank	Water head from G.L	Pumping head	Minimum water level of pump operation	Total water head	Remark
		(m)	(m3/day)	(m)	(m)	(m)	(m)	(m)	(m)	(m)	
1	Kaparas pump station	0	0	179.0	131.3		47.7	63.0	116.0	179.0	
2	Branch to T-N W.T.P	6700	0	168.4	118.6		49.8				
3	Existing intake pump	8997	0	164.8	116.2		48.6				
4	T-U W.T.P	17247	393,400	146.4	125.0	125.8	20.6				
		total	393,400								

Pipe Diameter x Nos. of lines	mm	1400 x 1	1400 x 1	1200 x 2
Water Flow rate	m3/day	328000	328000	328000
Hydraulic gradient	‰	4.089	4.089	2.403
Head loss	m	27.4	16.2	3.7
Section distance	m	6700	3972	1539
Chainage	m	6700	10672	12211
Total water head	m			
Grand level/reciving water level	m			
Water head from ground level	m			
Total water head of pump (m)	m			

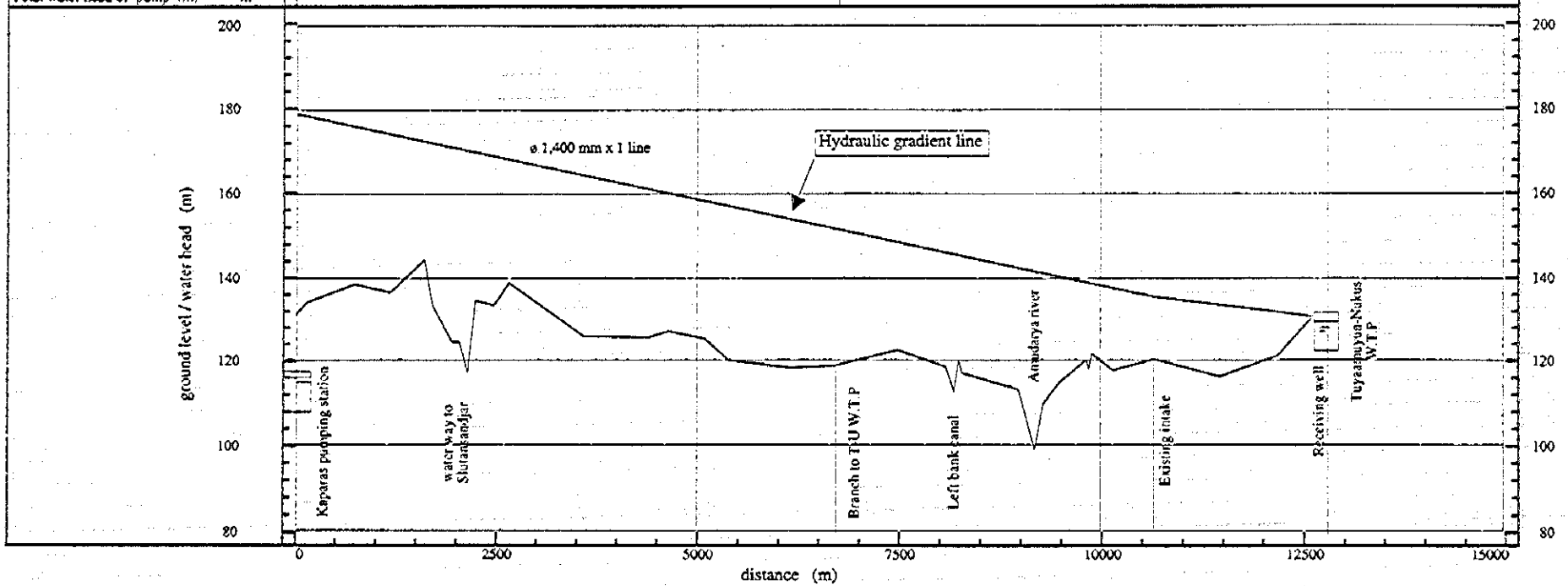

Fig. E.1 Longitudinal Section of Raw water main from Kaparas pump station to Tuyamuyum-Nukus W.T.P

Pipe Diameter x No. of lines	mm	1400 x 2	1400x2	1400 x 1, 1200 x 1
Water Flow rate	m3/day	393400	393400	393400
Hydraulic gradient	‰	1.588	1.588	2.226
Head loss	m	10.6	3.6	18.4
Section distance	m	6700	2297	8250
Chainage	m	6700	8997	17247
Total water head	m			
Grand level/reciving water level	m			
Water head from ground level	m			
Pump operation level (m)	m			

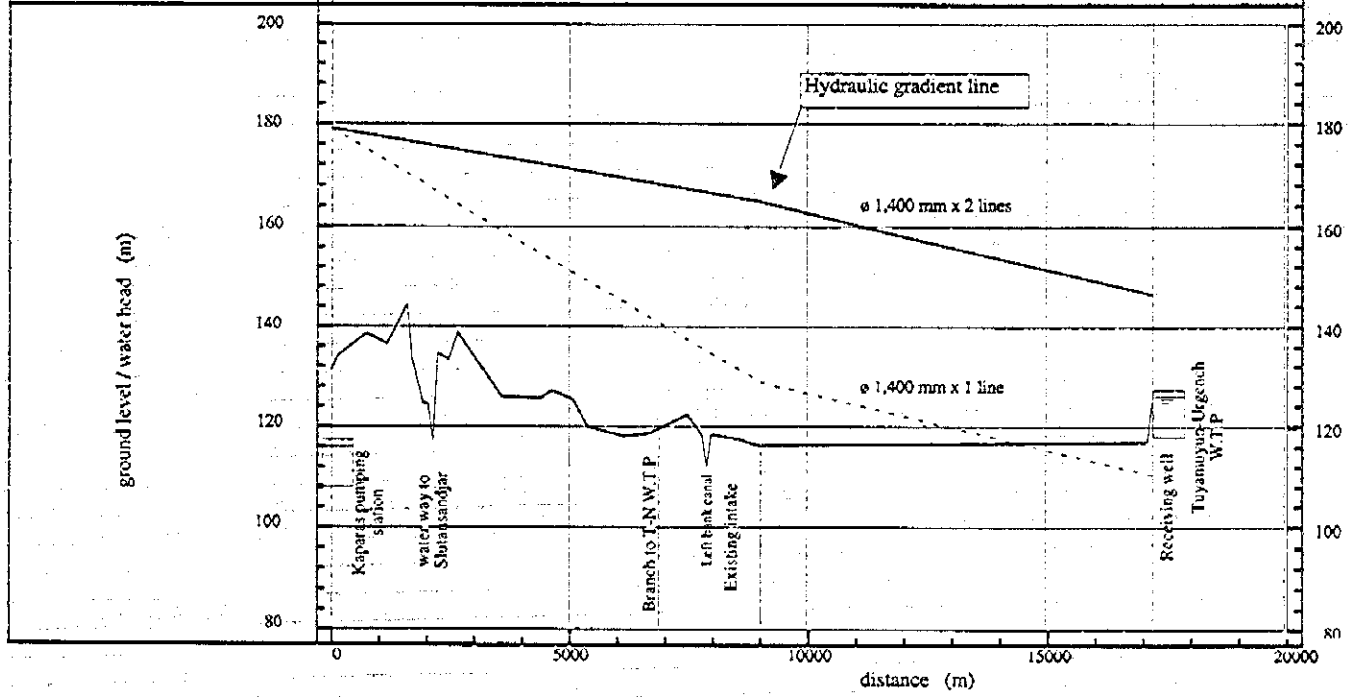

Fig. E.2 Longitudinal Section of Raw Water Main from Kaparas pump station to Tuyamuyum-Urgench W.T.P

Table E.2 Tuyamuyum-Nukus Pipeline System / Transmission Pipe Data Result (2010)

transmission Pipeline				pipe diamater D (mm)	distance L (km)	transmission water volume Q (m3/day)	velocity of flow V (m/sec)	hydraulic gradient I (‰)	head loss H (m)	Remark
1 ~	2	T-N W.T.P.	~ (P.S.1)	1,822	63.00	313,730	1.39	1.044	65.8	transmission pump
2 ~	3	(P.S.1)	~ P.S.2	1,400	59.00	302,930	2.28	3.530	208.3	
3	101	P.S.2	~ highest point	1,400	24.00	244,920	1.84	2.382	57.2	**transmission pump**
101 ~	4	highest point	~ P.S.3	1,400	32.00	244,920	1.84	2.382	76.2	
4 ~	102	P.S.3	~ S.P.1	1,400	42.00	244,920	1.84	2.382	100.0	
102 ~	5	S.P.1	~ Nukus north	1,200	14.00	188,750	1.93	3.116	43.6	
102 ~	6	S.P.1	~ Nukus south	1,000	9.00	56,170	0.83	0.804	7.2	
5 ~	7	Nukus north	~ Kalkabad	1,000	28.00	59,640	0.88	0.899	25.2	transmission pump
7 ~	8	Kalkabad	~ Chimbay	1,000	21.80	41,750	0.62	0.465	10.1	
8 ~	103	Chimbay	~ D.C.P.1	700	11.80	18,930	0.57	0.611	7.2	transmission pump
103 ~	9	D.C.P.1	~ Karauzyak	600	19.20	18,930	0.77	1.294	24.8	
9 ~	10	Karauzyak	~ Takhtakupir	500	29.00	10,260	0.60	1.013	29.4	
7 ~	11	Kalkabad	~ Kegeily	500	11.50	12,070	0.71	1.368	15.7	transmission pump
11 ~	17	Kegeily	~ Bozataus	400	50.00	3,230	0.30	0.354	17.7	
5 ~	12	Nukus north	~ Takhiatash	1,200	21.00	129,110	1.32	1.544	32.4	**transmission pump**
12 ~	13	Takhiatash	~ Shumanai	1,200	59.00	57,550	0.59	0.346	20.4	
13 ~	14	Shumanai	~ Kanlykul	1,200	22.00	49,070	0.50	0.258	5.7	
14 ~	15	Kanlykul	~ Kungrad	1,200	30.00	42,290	0.43	0.196	5.9	
15 ~	16	Kungrad	~ Muynak	500	96.50	9,040	0.53	0.801	77.3	**transmission pump**

*1) Pipe diameter : 1822 = 1400*2line
*2) Pipe diameter : 651 = 500*2line
*3) P.S. = Pump Station
*4) S.P. = Sparate Point
*5) D.C.P. = Diamater Change Point

Hazen-Williams formula

I = 10.666 * C^-1.85 * (D/1000)^-4.87 * (Q/86400)^1.85 * 1000 (‰) coefficient of velocity C = 110

H = I / 1000 * L (m)

Pipe conbimation formula

D = (d1^2.63 + d2^2.63) ^ (1/2.63)

TAble E.3 Tuyamuyum-Nukus Pipline System / Node Data Result (2010)

Node		out put water volume (q) (m3/day)	activity water head (h1) (m)	grand level (h2) (m)	reciving water level (h3) (m)	effective water head (h4=h1-h2) (=h1-h3) (m)	pump head (h) (m)	discharge water head (h5=h+h2) (m)	Remark
1	T-N W.T.P.	0	408.3	118.3		290.0	290.0	408.3	to Nukus
2	(P.S.1)	10,800	342.5	98.0	101.0	241.5			
3	P.S.2	58,010	134.2	88.8	91.0	43.2	**290.0**	**378.8**	**to Nukus**
101	highest point	0	321.6	220.0		101.6			
4	P.S.3	0	245.4	91.5	95.0	150.4			
102	S.P.1	0	145.4	79.0		66.4			
5	Nukus north	0	101.8	79.0	84.0	17.8	62.0	141.0	to Chimbay
							190.0	**269.0**	**to Kungrad**
6	Nukus south	56,170	138.2	79.0	84.0	54.2			
7	Kalkabad	5,820	115.8	67.0		48.8			
8	Chimbay	22,820	105.7	65.0	68.0	37.7	90.0	155.0	to Takhtakpyr
103	D.C.P.1	0	147.8	62.5		85.3			
9	Karauzyak	8,670	123.0	63.0		60.0			
10	Takhtakupir	10,260	93.6	59.8	64.0	29.6			
11	Kegeily	8,840	100.1	67.4		32.7	60.0	127.4	to Bozataus
17	Bozataus	3,230	109.7	65.0		44.7			
12	Takhiatash	71,560	236.6	75.0		161.6			
13	Shumanai	8,480	216.2	70.0		146.2			
14	Kanlykul	6,780	210.5	65.0		145.5			
15	Kungrad	33,250	204.6	61.0	65.0	139.6	**160.0**	**221.0**	**to Muynak**
16	Muynak	9,040	143.7	55.0	59.0	84.7			
	total	313,730							

Table E.4 Tuyamuyum-Urgench Pipeline System / Transmission Pipe Data Result (2010)

transmission Pipeline			pipe diamater D (mm)	distance L (km)	transmission water volume Q (m3/day)	velocity of flow V (m/sec)	hydraulic gradient I (‰)	head loss H (m)	Remark
1 ~ 2	T-U W.T.P.	~ Khazarasp	1,822	27.00	353,360	1.57	1.301	35.1	transmission pump
2 ~ 101	Khazarasp	~ Node.1	1,562	15.00	257,480	1.56	1.533	23.0	
101 ~ 3	Node.1	~ Khanki	1,562	15.60	257,480	1.56	1.533	23.9	
3 ~ 4	Khanki	~ Urgench	1,562	13.20	225,470	1.36	1.199	15.8	
4 ~ 5	Urgench	~ Yangibazar	1,200	23.20	101,780	1.04	0.994	23.1	transmission pump
5 ~ 6	Yangibazar	~ Gurlen	1,200	12.80	86,370	0.88	0.734	9.4	
6 ~ 7	Gurlen	~ Mangit	1,000	48.30	37,520	0.55	0.381	18.4	
2 ~ 8	Khazarasp	~ Bagat	1,000	22.30	64,780	0.95	1.047	23.3	
8 ~ 9	Bagat	~ Yangiaryk	1,000	22.50	40,660	0.60	0.442	9.9	
9 ~ 10	Yangiaryk	~ Khiva	600	20.00	22,000	0.90	1.709	34.2	
4 ~ 102	Urgench	~ S.P.1	1,183	19.20	51,520	0.54	0.302	5.8	transmission pump
102 ~ 10	S.P.1	~ Khiva	800	16.60	27,770	0.64	0.648	10.8	
102 ~ 11	S.P.1	~ Koshkupyr	721	14.00	23,750	0.67	0.805	11.3	
6 ~ (12)	Gurlen	~ ((6) + 11.6 km)	600	11.60	27,200	1.11	2.531	29.4	
(12) ~ 12	((6) + 11.6 km)	~ Shavat	600	11.60	19,850	0.81	1.413	16.4	

*1) Pipe diameter : 1822 = 1200*3line
*2) Pipe diameter : 1562 = 1200*2line
*3) Pipe diameter : 721 = 500 + 600
*4) Pipe diameter : 1183 = 1000 + 800
*5) S.P. = Sparate Point

Hazen-Williams formula

I = 10.666 * C^-1.85 * (D/1000)^-4.87 * (Q/86400)^1.85 * 1000 (‰) coefficient of velocity C = 110

H = I / 1000 * L (m)

Pipe conbimation formula

D = (d1^2.63 + d2^2.63) ^ (1/2.63)

* To minimize the investment, laying of the water supply pipes between Koshkupyr and Shavat should be made in the form of Phase III. As a result, the water conveying pipes are rendered unable to form a network and prove insufficient with a resultant lack of pressure hydraulically. Under a feasibility study we propose a hydraulic calculation with an approach as follows.

The amount of water supply in Shavat is set up as under. The hydraulic calculation takes place on the assumption that the amount of rural water supply is entirely consumed between Gurlen and Shavat. The amount of water supply between Gurlen and Shavat are set up as follows.

	Koshkupyr - Koshkupyr+11.6km	Koshkupyr+11.6km - Shavat
Urban	12,500 m3/d	12,500 m3/d
Rural	14,700 m3/d	7,350 m3/d (50%)
Total	27,200 m3/d	19,850 m3/d

Table E.5 Tuyamuyum-Urgench Pipline System / Node Data Result (2010)

Node		out put water volume (q) (m3/day)	activity water head (h1) (m)	ground level (h2) (m)	reciving water level (h3) (m)	effective water head (h4=h1-h2) (=h1-h3) (m)	pump head (h) (m)	discharge water head (h5=h+h2) (m)	Remark
1	T-U W.T.P.	14,770	200.3	110.3		90.0	90.0	200.3	to Urgench
2	Khazarasp	31,100	165.2	106.1		59.1			
101	Node.1	0	142.2	99.0		43.2			
3	Khanki	32,010	118.3	97.3		21.0			
4	Urgench	72,170	102.5	99.0		3.5	75.0	174.0	to Mangit
							90.0	189.0	to Khiva
5	Yangibazar	15,410	150.9	94.0		56.9			
6	Gurlen	29,000	141.5	91.0		50.5			
7	Mangit	30,170	123.1	82.5		40.6			
8	Bagat	24,120	141.9	103.0		38.9			
9	Yangiaryk	18,660	132.0	97.5		34.5			
102	S.P.1	0	183.2	94.0		89.2			
10	Khiva	49,770	97.8	94.0		3.8			from Bagat
			172.4	94.0		78.4			from Urgench
11	Koshkupyr	23,750	171.9	94.0		77.9			
(12)	Shavat(rural)	7,350	112.1	92.2		19.9			
12	Shavat	19,850	95.7	92.2		3.5			
	Total	368,130							

pipe diameter		(mm)		1822		1400		1400	1400	1400	1200
transmission water volume		(1000m3/d)		313.73		302.93		244.92	244.92	244.92	188.75
hydraulic gradient		(‰)		1.044		3.530		2.382	2.382	2.382	3.116
head loss		(m)		65.8		208.3		57.2	76.2	100.0	43.6
section distance		(km)		63.00		59.00		24.00	32.00	42.00	14.00
addition distance		(km)		63.00		122.00		146.00	178.00	220.00	234.00
hydraulic water head	hw	(m)	408.3		342.5		134.2	321.6	245.4	145.4	101.8
(discharge)	hpd=hp=hg	(m)	408.3		0.0		378.8				
ground level	hg	(m)	118.3		98.0		88.8	220.0	91.5	79.0	79.0
receiving water level	hr	(m)			101.0		91.0				84.0
effective water head	he=hw-hg(hr)	(m)	290.0		241.5		43.2	101.6	150.4	66.4	17.8

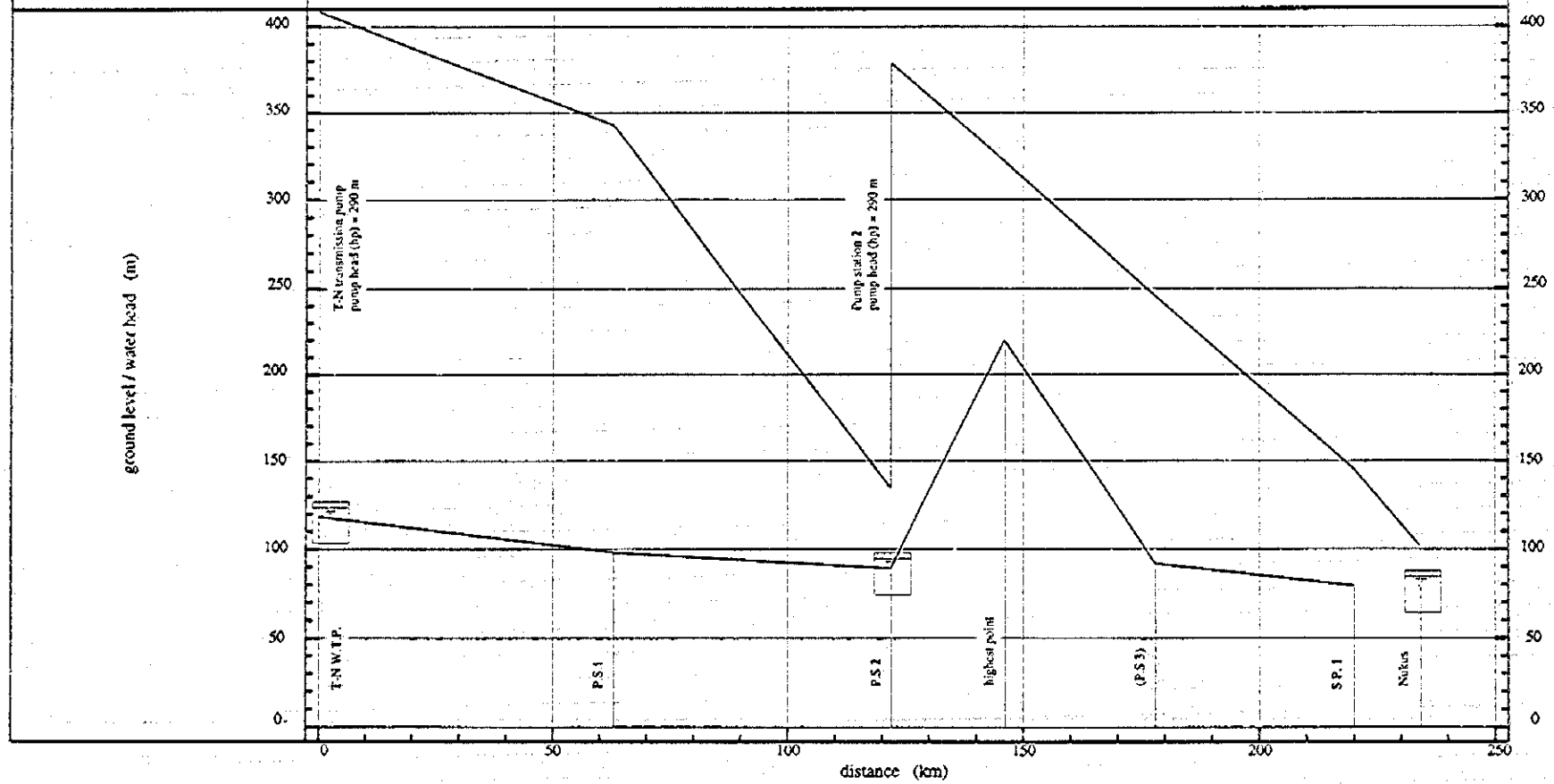

Fig. E.3 Tuyamuyum-Nukus pipeline system / T-N W.T.P - Nukus

pipe diameter		(mm)	1000	1000	700	600	500	
transmission water volume		(1000m3/d)	59.64	41.75	18.93	18.93	10.26	
hydraulic gradient		(‰)	0.899	0.465	0.611	1.294	1.013	
head loss		(m)	25.2	10.1	7.2	24.8	29.4	
section distance		(km)	28.00	21.80	11.80	19.20	29.00	
addition distance		(km)	28.00	49.80	61.60	80.80	109.80	
hydraulic water head	hw	(m)	141.0	115.8	105.7	147.8	123.0	93.6
(discharge)	hpd=hp+hg	(m)	141.0		155.0			
ground level	hg	(m)	79.0	67.0	65.0	62.5	63.0	59.8
receiving water level	hr	(m)			68.0			64.0
effective water head	he=hw-hg(hr)	(m)	62.0	48.8	37.7	85.3	60.0	29.6

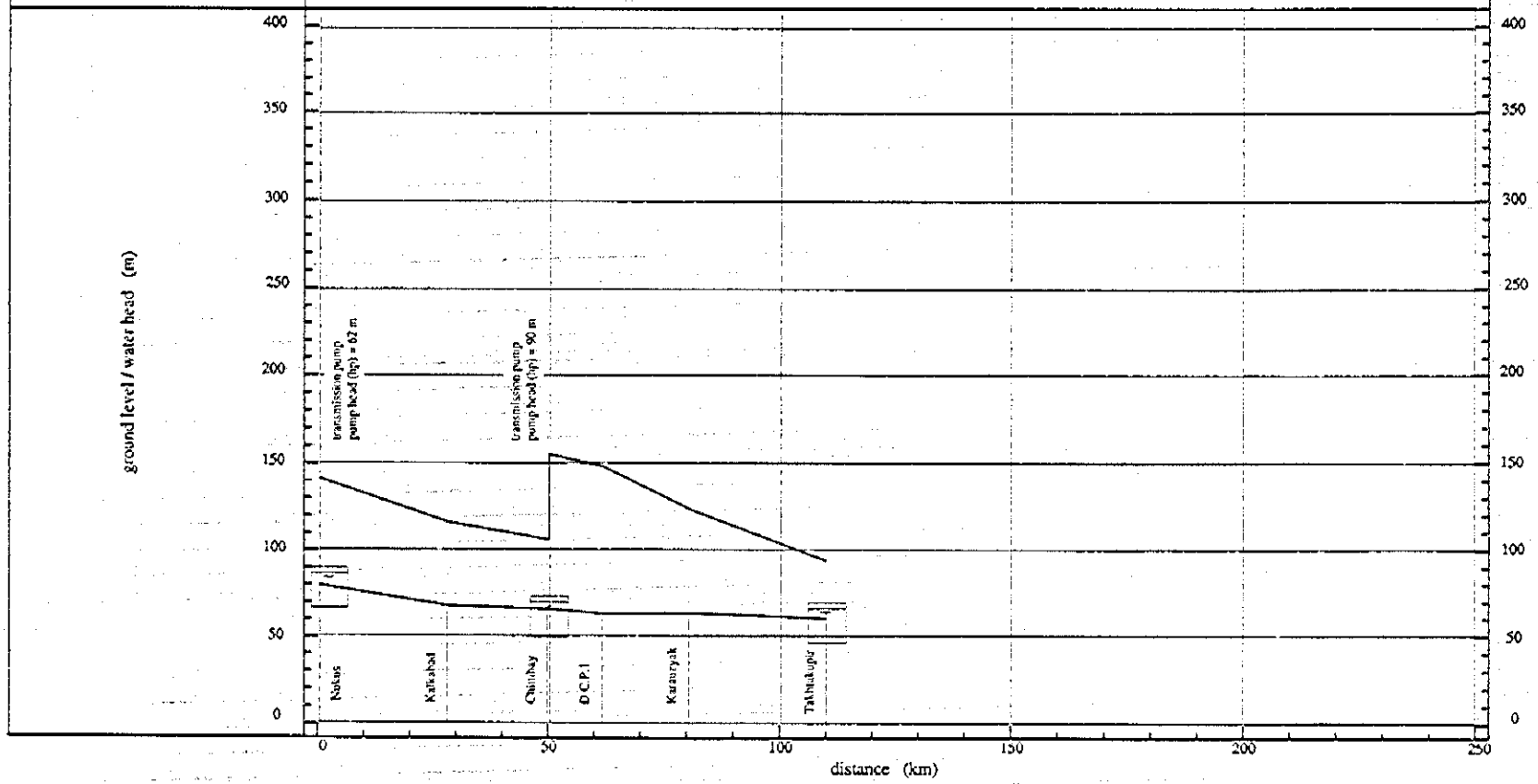

Fig. E.4 Tuyamuyum-Nukus pipeline system / Nukus - Takhtakupir

pipe diameter		(mm)	1200		1200		1200	1200		500	
transmission water volume		(1000m3/d)	129.11		57.55		49.07	42.29		9.04	
hydraulic gradient		(‰)	1.544		0.346		0.258	0.196		0.801	
head loss		(m)	32.4		20.4		5.7	5.9		77.3	
section distance		(km)	21.00		59.00		22.00	30.00		96.50	
addition distance		(km)	21.00		80.00		102.00	132.00		228.50	
hydraulic water head	hw	(m)	269.0	236.6		216.2	210.5	204.6			143.7
(discharge)	hpd=hp=hg	(m)	269.0								
ground level	hg	(m)	79.0	75.0		70.0	65.0	61.0			55.0
receiving water level	hr	(m)									59.0
effective water head	he=hw-hg(hr)	(m)	190.0	161.6		146.2	145.5	139.6			84.7

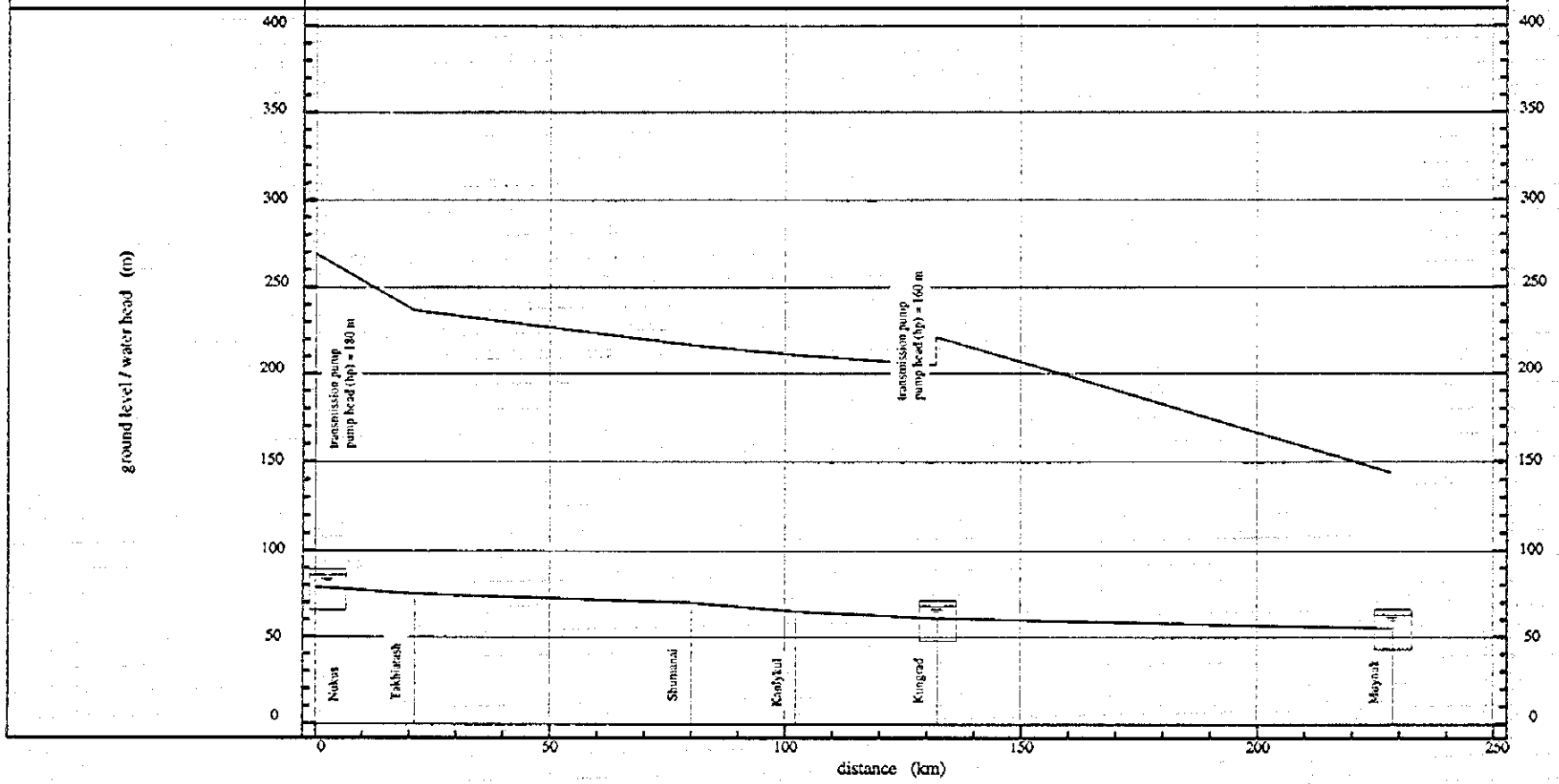

Fig. E.5 Tuyamuyum-Nukus pipeline system / Nukus - Kungrad - Muynak

pipe diameter		(mm)	1822	1562	1562	1562
transmission water volume		(1000m3/d)	353.36	257.48	257.48	225.47
hydraulic gradient		(‰)	1.301	1.533	1.533	1.199
head loss		(m)	35.1	23.0	23.9	15.8
section distance		(km)	27.00	15.00	15.60	13.20
addition distance		(km)	27.00	42.00	57.60	70.80
hydraulic water head	hw	(m)	200.3	165.2	142.2	118.3	102.5
(discharge)	hpd=hp+hg	(m)	200.3				
ground level	hg	(m)	110.3	106.1	99.0	97.3	99.0
receiving water level	hr	(m)					
effective water head	he=hw-hg(hr)	(m)	90.0	59.1	43.2	21.0	3.5

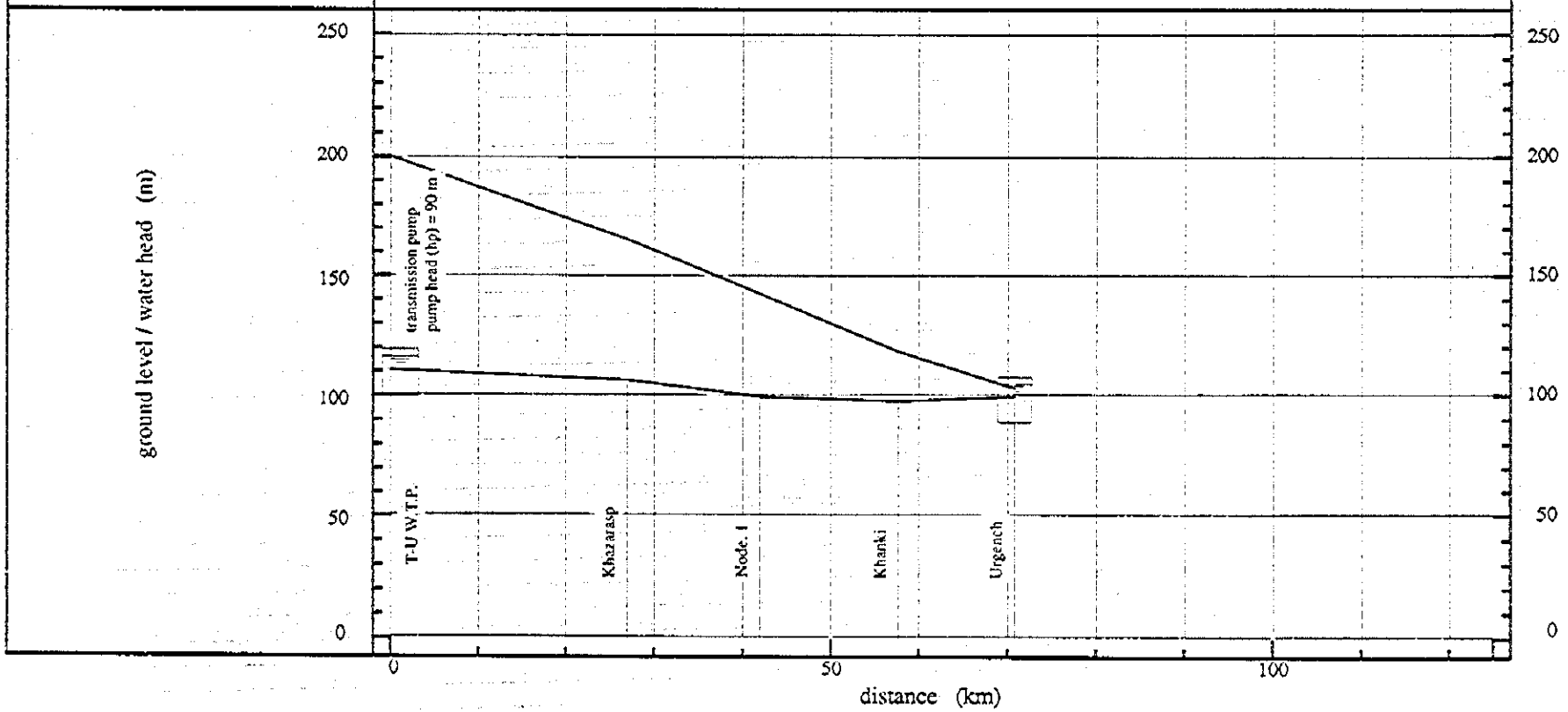

Fig. E.6 Tuyamuyum-Urgench pipeline system / T-U W.T.P - Urgench

pipe diameter		(mm)	1183	800	
transmission water volume		(1000m3/d)	51.52	27.77	
hydraulic gradient		(‰)	0.302	0.648	
head loss		(m)	5.8	10.8	
section distance		(km)	19.20	16.60	
addition distance		(km)	19.20	35.80	
hydraulic water head	hw	(m)	189.0	183.2	172.4
(discharge)	hpd=hp+hg	(m)	189.0		
ground level	hg	(m)	99.0	94.0	94.0
receiving water level	hr	(m)			
effective water head	he=hw-hg(hr)	(m)	90.0	89.2	78.4

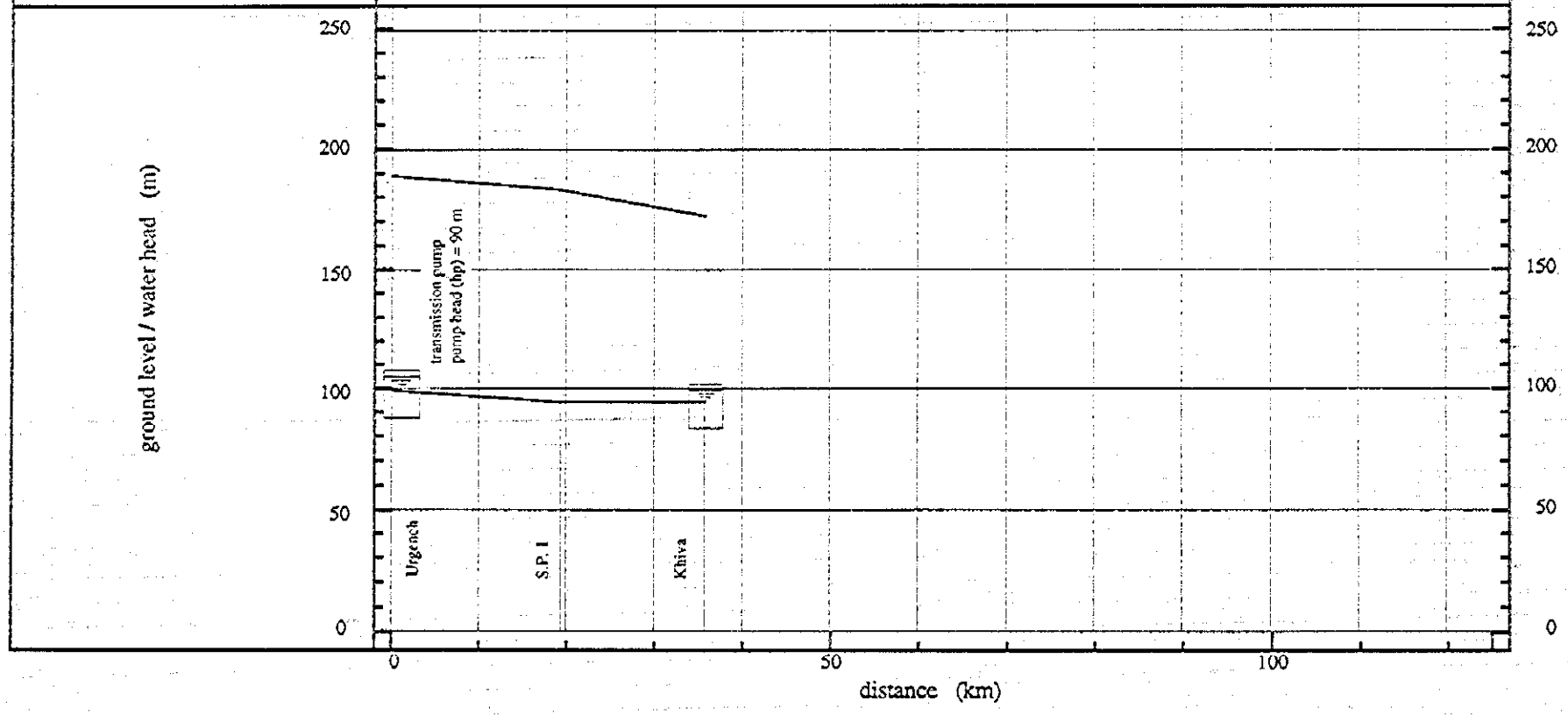

Fig. E.7 Tuyamuyum-Urgench pipeline system / Urgench - Khiva

pipe diameter		(mm)	1000	1000	600	
transmission water volume		(1000m3/d)	64.78	40.66	22.00	
hydraulic gradient		(‰)	1.047	0.442	1.709	
head loss		(m)	23.3	9.9	34.2	
section distance		(km)	22.30	22.50	20.00	
addition distance		(km)	22.30	44.80	64.80	
hydraulic water head	hw	(m)	165.2	141.9	132.0	97.8
(discharge)	hpd=hp+hg	(m)				
ground level	hg	(m)	106.1	103.0	97.5	94.0
receiving water level	hr	(m)				
effective water head	he=hw-hg(hr)	(m)	59.1	38.9	34.5	3.8

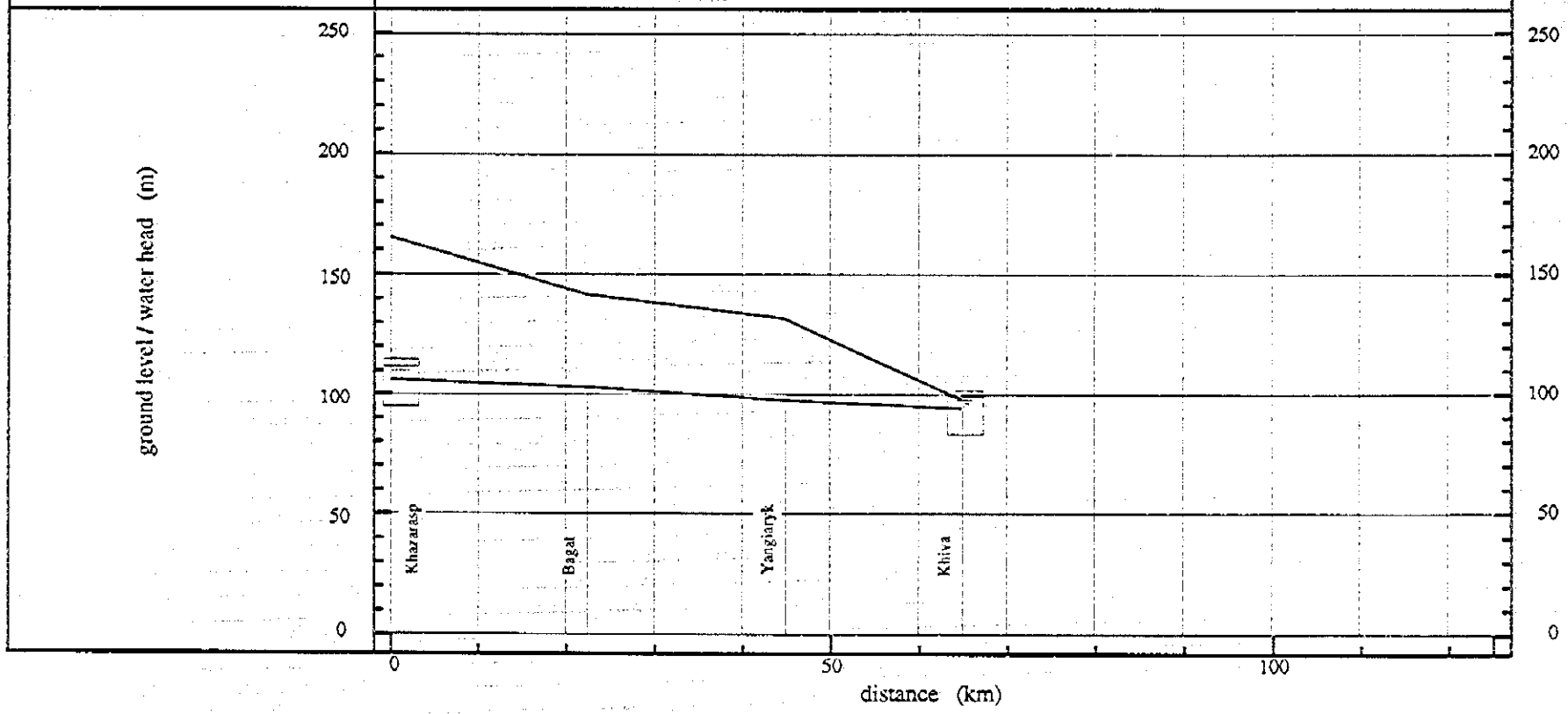

Fig. E.8 Tuyamuyum-Urgench pipeline system / Khazarasp - Khiva

pipe diameter		(mm)	1200	1200	1000		
transmission water volume		(1000m3/d)	101.78	86.37	37.52		
hydraulic gradient		(‰)	0.994	0.734	0.381		
head loss		(m)	23.1	9.4	18.4		
section distance		(km)	23.20	12.80	48.30		
addition distance		(km)	23.20	36.00	84.30		
hydraulic water head	hw	(m)	174.0	150.9	141.5	123.1	
(discharge)	hpd=hp+hg	(m)	174.0				
ground level	hg	(m)	99.0	94.0	91.0	82.5	
receiving water level	hr	(m)					
effective water head	he=hw-hg(hr)	(m)	75.0	56.9	50.5	40.6	

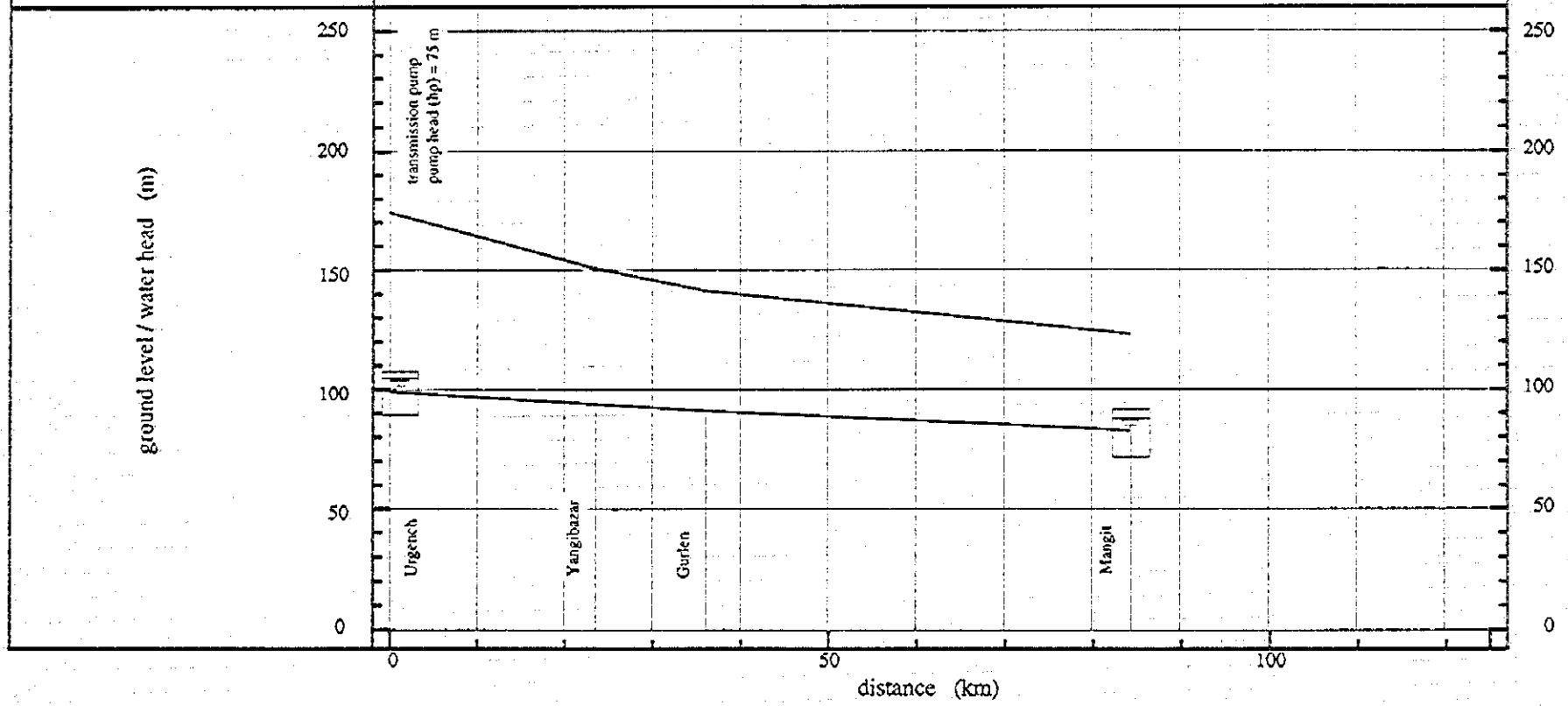

Fig. E.9 Tuyamuyum-Urgench pipeline system / Urgench - Mangit

F. FINANCIAL ANALYSIS

Table F.1 Construction Cost Estimation (F/S:Rescheduled Plan)

(Unit : thousand USD)

Description		Total	Local Currency Portion	Foreign Currency Portion
1. Kaparas Raw Water Intake System				
1.1 Kaparas Intake Station				
1.1.1 Kaparas Intake Station	Q=750,000 m3/d	6,864	6,864	0
1.1.2 Machinery Equipments		2,272	440	1,832
1.1.3 Electric Equipments		3,237	591	2,646
1.1.4 Monitoring Water Quality		523	88	435
	Total 1.1	12,897	7,984	4,913
1.2 Raw Water Main				
1.2.1 Kaparas I.S. to T-N existing intake st.	D=1,400 L=10.7 km	18,713	4,460	14,253
1.2.2 Kaparas I.S. to T-U existing intake st.	D=1,400 L= 1.0 km	1,643	146	1,497
1.2.3 Kaparas I.S. to T-U existing intake st.	D=1,400 L= 9.0 km	12,679	1,316	11,363
	Total 1.2	33,035	5,921	27,114
	Total 1	45,932	13,906	32,026
2. Tuyamuyun Nukus Water Supply System				
2.1 Water Treatment Plant	Q=350,000 m3/d			
2.1.1 Rehabilitation	Q=200,000 m3/d	0	0	0
(1) Machinery Equipments		11,742	1,997	9,745
(2) Chemical and Chlorination Equipments		0	0	0
(3) Electric Equipments		3,555	596	2,959
(4) Laboratory Equipments		209	0	209
	Total 2.1.1	15,505	2,592	12,913
2.1.2 Expansion Phase I	Q=150,000 m3/d	7,142	6,948	194
(1) Machinery Equipments		29,016	4,929	24,087
(2) Chemical and Chlorination Equipments		3,426	585	2,841
(3) Electric Equipments		5,013	852	4,161
	Total 2.1.2	44,596	13,314	31,282
	Total 2.1	60,101	15,905	44,196
2.2 Transmission and Distribution Pumping St.				
2.2.1 No. 2 Booster Pumping Station Phase - I	Q=234,410m3/d	5,745	5,745	0
(1) Machinery Equipments		2,615	489	2,126
(2) Electric Equipments		1,166	75	1,091
	Total 2.2.1	9,527	6,309	3,218
2.2.2 Nukus North Distribution Station	Q=122,950 m3/d	4,687	4,687	0
(1) Machinery Equipments		4,580	273	4,307
(2) Electric Equipments		1,593	74	1,519
	Total 2.2.2	10,861	5,035	5,826
2.2.3 Kungrad Transmission and Distribution St.	Q= 42,130 m3/d	6,498	6,498	0
(1) Machinery Equipments		2,859	131	2,728
(2) Electric Equipments		910	42	868
(2) Chlorination Equipments		258	44	214
	Total 2.2.3	10,524	6,714	3,810
	Total 2.2	30,911	18,057	12,854
2.3 Transmission Pipeline				
2.3.1 W.T.P. - No. 1 Pumping st.	D=1,400 L= 63.0 km	82,632	9,211	73,421
2.3.2 Nukus - Takhiatash (Khodjeili) L=21 km	D=1,200 L= 11.0 km	14,687	3,723	10,964
2.3.3 Kungrad - Muinak (Q=8,870 m3/d)	D=500 L= 96.5 km	28,475	3,546	24,929
2.3.4 Kegeili - Bozatau	D=400 L= 50.0 km	15,043	1,436	13,607
	Total 2.3	140,837	17,917	122,920
	Total 2	231,849	51,880	179,969
3. Tuyamuyun Urgench Water Supply System				
3.1 Water Treatment Plant	Q=400,000 m3/d			
3.1.1 Rehabilitation	Q=200,000 m3/d	0	0	0
(1) Machinery Equipments		11,742	1,997	9,745
(2) Chemical and Chlorination Equipments		0	0	0
(3) Electric Equipments		3,555	596	2,959
(4) Laboratory Equipments		207	0	207
	Total 3.1.1	15,503	2,592	12,911

Description		Total	Local Currency Portion	Foreign Currency Portion
3.1.2 Expansion Phase I	Q=200,000 m3/d	10,103	9,909	194
(1) Machinery Equipments		35,425	6,011	29,414
(2) Chemical and Chlorination Equipments		4,584	784	3,800
(3) Electric Equipments		6,690	1,140	5,550
	Total 3.1.2	56,801	17,844	38,957
	Total 3.1	72,304	20,436	51,868
3.2 Transmission Pipeline				
3.2.1 W.T.P. - Khazarasp Pum. St. Phase - I	D=1,200 L=27.0 km	27,649	2,809	24,840
3.2.2 Khanki - Urgench	D=1,200 L=13.2 km	8,068	771	7,297
3.2.3 Yangiaryk - Khiva	D=600 L=20.0 km	7,296	741	6,555
3.2.4 S.P.I - Koshkupyr	D=600 L=14.0 km	5,121	608	4,513
3.2.5 Gürlen - Shavat	D=600 L=19.5 km	3,350	275	3,075
	Total 3.2	51,484	5,205	46,279
	Total 3	123,788	25,640	98,148
4 VodoKanal Karakalpakstan				
4.1 Water Treatment Plant				
4.1.1 Nukus W.T.P (Rehabilitation)	Q=65,000 m3/d	0	0	0
(1) Machinery Equipments		12,736	1,173	11,563
(2) Chemical and Chlorination Equipments		1,807	314	1,493
(3) Electric Equipments		3,177	146	3,031
	Total 4.1.1	17,720	1,633	16,087
4.1.2 Chimbai W.T.P (Rehabilitation)	Q= 2,200 m3/d	8	8	0
(1) Machinery Equipments		1,058	48	1,010
(2) Chemical and Chlorination Equipments		32	6	26
(3) Electric Equipments		501	23	478
	Total 4.1.2	1,600	85	1,515
4.1.3 Turtkul W.T.P (Rehabilitation)	Q=8,400 m3/d	3,796	318	3,478
4.1.4 Beruni W.T.P (Rehabilitation)	Q=4,600 m3/d	2,079	175	1,904
4.1.5 Kegeili W.T.P (Rehabilitation)	Q=1,000 m3/d	728	38	690
	Total 4.1	25,923	2,249	23,674
4.2 Distribution Network				
4.2.1 Replacement D=100~D=400	L=228.8 km	53,217	31,820	21,397
4.2.2 Expansion D=100~D=400 Phase - I	L=119.6 km	27,993	16,737	11,256
	Total 4.2	81,211	48,558	32,653
4.3 Metering System				
4.3.1 Meter Installation D=20 Phase - I	N=115,960 pieces	10,295	2,400	7,895
	Total 4.3	10,295	2,400	7,895
	Total 4	117,429	53,207	64,222
5. VodoKanal Khorezm				
5.1 Water Treatment Plant				
5.1.1 Urgench W.T.P (Rehabilitation)	Q= 50,000 m3/d	0	0	0
(1) Machinery Equipments		14,051	1,100	12,951
(2) Chemical and Chlorination Equipments		1,421	241	1,180
(3) Electric Equipments		4,219	194	4,025
	Total 5.1.1	19,691	1,535	18,156
5.1.2 Chalish(Rehabilitation)	Q= 11,000 m3/d	24	24	0
(1) Machinery Equipments		1,274	58	1,216
(2) Chemical and Chlorination Equipments		153	26	127
(3) Electric Equipments		501	23	478
	Total 5.1.2	1,953	133	1,820
	Total 5.1	21,644	1,667	19,977
5.2 Distribution Network				
5.2.1 Replacement D=100~D=400	L=170.3 km	39,844	23,818	16,026
5.2.2 Expansion D=100~D=400 Phase -I	L= 71.5 km	16,799	10,042	6,757
	Total 5.2	56,643	33,859	22,784
5.3 Metering System				
5.3.1 Meter Installation D=20 Phase - I	N=60,970 pieces	5,419	1,263	4,156
	Total 5.3	5,419	1,263	4,156
	Total 5	83,706	36,789	46,917
	Total 1 - 5	602,705	181,423	421,282

6.2.6

Financial Feasibility Analysis

of

Phase 1 of The Basec Plan

(Preliminary Evaluation)

Part 2 Chapter 6.

Case 1-1, Case 1-2

	1)Production supply $10^3 \times m^3$		2)Non Sources $10^3 \times m^3$		3)Water Purchase $10^3 \times m^3$		4)Expenditure										10)Present Value	11)Revenue																	19)Rev./Exp. (14)-(4)	20)Discount Rate 7.5%	21) Present Value $10^3 \times \$$	22) Cumulative Total $10^3 \times \$$
							5)Construction Cost $10^3 \times \$$			6)Incidental expenses (40%of(5))		7)O&M cost $10^3 \times \$$	8)Water Purchase $10^3 \times \$$		9)Total Expenditure $10^3 \times \$$		12)Accounted for Water $10^3 \times \$$	Water Revenue 13)GRP1			14)GRP2			15)GRP3			16)Total Revenue $10^3 \times \$$	17)Rate Tariff	18)Present Value $10^3 \times \$$			
	Abs./Day	Total/Yr.	Abs./Day	Total/Yr.	Abs./Day	Total/Yr.	Local C.	Foreign C.	Total	(1)x	Total $10^3 \times \$$		Unit/$	Total				Vol/m³	Unit/$	Total	Vol/m³	Unit/$	Total	Vol/m³	Unit/$	Total										
1995	184.2	67,233	65.1	23,762	119.1	43,472												60,517	26,572			20,440			13,505											
1996	201.3	73,475	70.7	25,806	130.6	47,669												66,102	29,018			22,338			14,746											
1997	218.5	79,753	76.4	27,886	142.1	51,867												71,832	31,536			24,273			16,024											
1998	235.6	85,994	82.1	29,967	153.5	56,028	8,372	7,769	16,141	12,565	970	4,560	0.050	2,780	23,481	21,843	77,417	33,982	0.0525	1,784	26,171	0.241	6,307	17,265	0.241	4,161	12,252	0.158	11,397	-11,229	0.930	-10,446					
1999	252.8	92,272	87.8	32,047	165.0	60,225	9,919	22,342	32,261	12,565	970	4,891	0.050	2,988	40,140	34,735	83,038	36,464	0.0525	1,914	28,069	0.241	6,765	18,506	0.241	4,460	13,139	0.158	11,369	-27,001	0.865	-23,365	-33,811				
2000	269.9	98,514	93.5	34,128	176.4	64,386	8,818	12,326	21,144	12,565	970	5,351	0.050	3,195	29,690	23,899	88,659	38,909	0.0525	2,043	29,967	0.241	7,222	19,783	0.241	4,768	14,032	0.158	11,795	-15,658	0.805	-12,604	-46,415				
2001	278.1	101,507	66.1	24,127	212.0	77,380						5,511	0.050	3,839	9,350	7,001	91,360	40,114	0.0525	2,106	30,879	0.241	7,442	20,367	0.241	4,908	14,456	0.158	10,825	5,106	0.749	3,824	-42,591				
2002	278.1	101,507	66.1	24,127	216.0	78,840						5,511	0.050	3,912	9,422	6,563	91,360	40,114	0.0525	2,106	30,879	0.241	7,442	20,367	0.241	4,908	14,456	0.158	10,070	5,034	0.697	3,506	-39,085				
2003	278.1	101,507	66.1	24,127	216.0	78,840						5,511	0.050	3,912	9,422	6,105	91,360	40,114	0.0525	2,106	30,879	0.241	7,442	20,367	0.241	4,908	14,456	0.158	9,367	5,034	0.648	3,262	-35,823				
2004	278.1	101,507	66.1	24,127	216.0	78,840						5,511	0.050	3,912	9,422	5,679	91,360	40,114	0.0525	2,106	30,879	0.241	7,442	20,367	0.241	4,908	14,456	0.158	8,714	5,034	0.603	3,034	-32,789				
2005	278.1	101,507	66.1	24,127	216.0	78,840						5,511	0.050	3,912	9,422	5,282	91,360	40,114	0.0525	2,106	30,879	0.241	7,442	20,367	0.241	4,908	14,456	0.158	8,106	5,034	0.561	2,822	-29,966				
2006	278.1	101,507	66.1	24,127	216.0	78,840						5,511	0.050	3,912	9,422	4,913	91,360	40,114	0.0525	2,106	30,879	0.241	7,442	20,367	0.241	4,908	14,456	0.158	7,540	5,034	0.522	2,626	-27,341				
2007	278.1	101,507	66.1	24,127	216.0	78,840						5,511	0.050	3,912	9,422	4,572	91,360	40,114	0.0525	2,106	30,879	0.241	7,442	20,367	0.241	4,908	14,456	0.158	7,014	5,034	0.485	2,442	-24,898				
2008	278.1	101,507	66.1	24,127	216.0	78,840						5,511	0.050	3,912	9,422	4,253	91,360	40,114	0.0525	2,106	30,879	0.241	7,442	20,367	0.241	4,908	14,456	0.158	6,525	5,034	0.451	2,272	-22,626				
2009	278.1	101,507	66.1	24,127	216.0	78,840						5,511	0.050	3,912	9,422	3,956	91,360	40,114	0.0525	2,106	30,879	0.241	7,442	20,367	0.241	4,908	14,456	0.158	6,070	5,034	0.420	2,113	-20,513				
2010	278.1	101,507	66.1	24,127	216.0	78,840						5,511	0.050	3,912	9,422	3,680	91,360	40,114	0.0525	2,106	30,879	0.241	7,442	20,367	0.241	4,908	14,456	0.158	5,646	5,034	0.391	1,966	-18,547				
2011	278.1	101,507	66.1	24,127	216.0	78,840						5,511	0.050	3,912	9,422	3,423	91,360	40,114	0.0525	2,106	30,879	0.241	7,442	20,367	0.241	4,908	14,456	0.158	5,252	5,034	0.363	1,829	-16,718				
2012	278.1	101,507	66.1	24,127	216.0	78,840						5,511	0.050	3,912	9,422	3,184	91,360	40,114	0.0525	2,106	30,879	0.241	7,442	20,367	0.241	4,908	14,456	0.158	4,886	5,034	0.338	1,701	-15,017				
2013	278.1	101,507	66.1	24,127	216.0	78,840						5,511	0.050	3,912	9,422	2,962	91,360	40,114	0.0525	2,106	30,879	0.241	7,442	20,367	0.241	4,908	14,456	0.158	4,545	5,034	0.314	1,583	-13,434				
2014	278.1	101,507	66.1	24,127	216.0	78,840						5,511	0.050	3,912	9,422	2,756	91,360	40,114	0.0525	2,106	30,879	0.241	7,442	20,367	0.241	4,908	14,456	0.158	4,228	5,034	0.292	1,472	-11,962				
2015	278.1	101,507	66.1	24,127	216.0	78,840						5,511	0.050	3,912	9,422	2,563	91,360	40,114	0.0525	2,106	30,879	0.241	7,442	20,367	0.241	4,908	14,456	0.158	3,933	5,034	0.272	1,369	-10,593				
2016	278.1	101,507	66.1	24,127	216.0	78,840						5,511	0.050	3,912	9,422	2,385	91,360	40,114	0.0525	2,106	30,879	0.241	7,442	20,367	0.241	4,908	14,456	0.158	3,658	5,034	0.253	1,274	-9,319				
2017	278.1	101,507	66.1	24,127	216.0	78,840						5,511	0.050	3,912	9,422	2,218	91,360	40,114	0.0525	2,106	30,879	0.241	7,442	20,367	0.241	4,908	14,456	0.158	3,403	5,034	0.235	1,185	-8,134				
2018	278.1	101,507	66.1	24,127	216.0	78,840						5,511	0.050	3,912	9,422	2,063	91,360	40,114	0.0525	2,106	30,879	0.241	7,442	20,367	0.241	4,908	14,456	0.158	3,166	5,034	0.219	1,102	-7,031				
2019	278.1	101,507	66.1	24,127	216.0	78,840						5,511	0.050	3,912	9,422	1,919	91,360	40,114	0.0525	2,106	30,879	0.241	7,442	20,367	0.241	4,908	14,456	0.158	2,945	5,034	0.204	1,025	-6,006				
2020	278.1	101,507	66.1	24,127	216.0	78,840						5,511	0.050	3,912	9,422	1,786	91,360	40,114	0.0525	2,106	30,879	0.241	7,442	20,367	0.241	4,908	14,456	0.158	2,739	5,034	0.189	954	-5,052				
2021	278.1	101,507	66.1	24,127	216.0	78,840						5,511	0.050	3,912	9,422	1,661	91,360	40,114	0.0525	2,106	30,879	0.241	7,442	20,367	0.241	4,908	14,456	0.158	2,548	5,034	0.176	887	-4,165				
2022	278.1	101,507	66.1	24,127	216.0	78,840						5,511	0.050	3,912	9,422	1,545	91,360	40,114	0.0525	2,106	30,879	0.241	7,442	20,367	0.241	4,908	14,456	0.158	2,371	5,034	0.164	825	-3,339				
2023	278.1	101,507	66.1	24,127	216.0	78,840						5,511	0.050	3,912	9,422	1,437	91,360	40,114	0.0525	2,106	30,879	0.241	7,442	20,367	0.241	4,908	14,456	0.158	2,205	5,034	0.153	768	-2,571				
2024	278.1	101,507	66.1	24,127	216.0	78,840						5,511	0.050	3,912	9,422	1,337	91,360	40,114	0.0525	2,106	30,879	0.241	7,442	20,367	0.241	4,908	14,456	0.158	2,051	5,034	0.142	714	-1,857				
2025	278.1	101,507	66.1	24,127	216.0	78,840						5,511	0.050	3,912	9,422	1,244	91,360	40,114	0.0525	2,106	30,879	0.241	7,442	20,367	0.241	4,908	14,456	0.158	1,908	5,034	0.132	664	-1,193				
2026	278.1	101,507	66.1	24,127	216.0	78,840						5,511	0.050	3,912	9,422	1,157	91,360	40,114	0.0525	2,106	30,879	0.241	7,442	20,367	0.241	4,908	14,456	0.158	1,775	5,034	0.123	618	-575				
2027	278.1	101,507	66.1	24,127	216.0	78,840						5,511	0.050	3,912	9,422	1,076	91,360	40,114	0.0525	2,106	30,879	0.241	7,442	20,367	0.241	4,908	14,456	0.158	1,651	5,034	0.114	575	0				
							27,109	42,437	69,546	37,695	2,910					167,201														167,202					0

EX.-rate 40cym = 1us$

※Fixed tariff of water purchase & for consumers(unescalated)

- Tariff of base year	US$	/ SYM
water parches	$0.050	/ 1.98cym
tariff : GRP1	$0.0525	/ 2.10cym
GRP2	$0.241	/ 9.64cym
GRP3	$0.241	/ 9.64cym

[O&Mcost]

up to year 2000 $0.0589 × Accounted -for water/m³

from year 2001 $0.0589 × Accounted -for water/m³ + $25,900,000 × 0.5%(item4.1.1, 4.1.3, 4.1.4)

	1)Operating Capa. ($10^3 \times m^3$)		2)Expenditure					6)Revenue													
			3)Construction Cost $10^3 \times \$$			4)O&M cost $10^3 \times \$$	5)Total Expenditure $10^3 \times \$$	Accounter for water $10^3 \times m^3$						10)Selling price US$/m³	11)Water Revenue		14)Total Revenue $10^3 \times \$$	15) Rev-Exp $10^3 \times \$$	16) F.I.R.R. #DIV/0!	17) Present Value $10^3 \times \$$	18) Cumulative Total $10^3 \times \$$
								7)Vodokanal KZ		8)Others		9)Total									
	Max. Daily	Annual Total	Local C.	Foreign C.	Total			Abe./Day	Total/Yr.	Abe./Day	Total/Yr.	Abe./Day	Total/Yr.		12) Vodokanal KKP	13) Others					
1995	170.0	62,050						98.1	35,807	20.2	7,373	118.3	43,180								
1996	170.0	62,050						108.3	39,530	17.2	6,278	125.5	45,808								
1997	170.0	62,050						118.5	43,253	14.2	5,183	132.7	48,436								
1998	170.0	62,050	29,912	72,685	102,597	5,343	107,940	128.7	46,976	11.1	4,052	139.8	51,027	0.050	2,331	201	2,532	-105,408	#DIV/0!	#DIV/0!	
1999	170.0	62,050	27,474	110,243	137,717	5,618	143,335	138.9	50,699	8.1	2,957	147.0	53,655	0.050	2,516	147	2,662	-140,672	#DIV/0!	#DIV/0!	#DIV/0!
2000	170.0	62,050	11,613	91,901	103,514	5,827	109,341	149.0	54,385	5.1	1,862	154.1	56,247	0.050	2,698	92	2,791	-106,550	#DIV/0!	#DIV/0!	#DIV/0!
2001	315.0	114,975				13,404	13,404	212.0	77,380	19.0	6,935	231.0	84,315	0.050	3,839	344	4,183	-9,220	#DIV/0!	#DIV/0!	#DIV/0!
2002	315.0	114,975				13,795	13,795	212.0	77,380	26.0	9,490	238.0	86,870	0.050	3,839	471	4,310	-9,485	#DIV/0!	#DIV/0!	#DIV/0!
2003	315.0	114,975				13,795	13,795	212.0	77,380	26.0	9,490	238.0	86,870	0.050	3,839	471	4,310	-9,485	#DIV/0!	#DIV/0!	#DIV/0!
2004	315.0	114,975				13,795	13,795	212.0	77,380	26.0	9,490	238.0	86,870	0.050	3,839	471	4,310	-9,485	#DIV/0!	#DIV/0!	#DIV/0!
2005	315.0	114,975				13,795	13,795	212.0	77,380	26.0	9,490	238.0	86,870	0.050	3,839	471	4,310	-9,485	#DIV/0!	#DIV/0!	#DIV/0!
2006	315.0	114,975				13,795	13,795	212.0	77,380	26.0	9,490	238.0	86,870	0.050	3,839	471	4,310	-9,485	#DIV/0!	#DIV/0!	#DIV/0!
2007	315.0	114,975				13,795	13,795	212.0	77,380	26.0	9,490	238.0	86,870	0.050	3,839	471	4,310	-9,485	#DIV/0!	#DIV/0!	#DIV/0!
2008	315.0	114,975				13,795	13,795	212.0	77,380	26.0	9,490	238.0	86,870	0.050	3,839	471	4,310	-9,485	#DIV/0!	#DIV/0!	#DIV/0!
2009	315.0	114,975				13,795	13,795	212.0	77,380	26.0	9,490	238.0	86,870	0.050	3,839	471	4,310	-9,485	#DIV/0!	#DIV/0!	#DIV/0!
2010	315.0	114,975				13,795	13,795	212.0	77,380	26.0	9,490	238.0	86,870	0.050	3,839	471	4,310	-9,485	#DIV/0!	#DIV/0!	#DIV/0!
2011	315.0	114,975				13,795	13,795	212.0	77,380	26.0	9,490	238.0	86,870	0.050	3,839	471	4,310	-9,485	#DIV/0!	#DIV/0!	#DIV/0!
2012	315.0	114,975				13,795	13,795	212.0	77,380	26.0	9,490	238.0	86,870	0.050	3,839	471	4,310	-9,485	#DIV/0!	#DIV/0!	#DIV/0!
2013	315.0	114,975				13,795	13,795	212.0	77,380	26.0	9,490	238.0	86,870	0.050	3,839	471	4,310	-9,485	#DIV/0!	#DIV/0!	#DIV/0!
2014	315.0	114,975				13,795	13,795	212.0	77,380	26.0	9,490	238.0	86,870	0.050	3,839	471	4,310	-9,485	#DIV/0!	#DIV/0!	#DIV/0!
2015	315.0	114,975				13,795	13,795	212.0	77,380	26.0	9,490	238.0	86,870	0.050	3,839	471	4,310	-9,485	#DIV/0!	#DIV/0!	#DIV/0!
2016	315.0	114,975				13,795	13,795	212.0	77,380	26.0	9,490	238.0	86,870	0.050	3,839	471	4,310	-9,485	#DIV/0!	#DIV/0!	#DIV/0!
2017	315.0	114,975				13,795	13,795	212.0	77,380	26.0	9,490	238.0	86,870	0.050	3,839	471	4,310	-9,485	#DIV/0!	#DIV/0!	#DIV/0!
2018	315.0	114,975				13,795	13,795	212.0	77,380	26.0	9,490	238.0	86,870	0.050	3,839	471	4,310	-9,485	#DIV/0!	#DIV/0!	#DIV/0!
2019	315.0	114,975				13,795	13,795	212.0	77,380	26.0	9,490	238.0	86,870	0.050	3,839	471	4,310	-9,485	#DIV/0!	#DIV/0!	#DIV/0!
2020	315.0	114,975				13,795	13,795	212.0	77,380	26.0	9,490	238.0	86,870	0.050	3,839	471	4,310	-9,485	#DIV/0!	#DIV/0!	#DIV/0!
2021	315.0	114,975				13,795	13,795	212.0	77,380	26.0	9,490	238.0	86,870	0.050	3,839	471	4,310	-9,485	#DIV/0!	#DIV/0!	#DIV/0!
2022	315.0	114,975				13,795	13,795	212.0	77,380	26.0	9,490	238.0	86,870	0.050	3,839	471	4,310	-9,485	#DIV/0!	#DIV/0!	#DIV/0!
2023	315.0	114,975				13,795	13,795	212.0	77,380	26.0	9,490	238.0	86,870	0.050	3,839	471	4,310	-9,485	#DIV/0!	#DIV/0!	#DIV/0!
2024	315.0	114,975				13,795	13,795	212.0	77,380	26.0	9,490	238.0	86,870	0.050	3,839	471	4,310	-9,485	#DIV/0!	#DIV/0!	#DIV/0!
2025	315.0	114,975				13,795	13,795	212.0	77,380	26.0	9,490	238.0	86,870	0.050	3,839	471	4,310	-9,485	#DIV/0!	#DIV/0!	#DIV/0!
2026	315.0	114,975				13,795	13,795	212.0	77,380	26.0	9,490	238.0	86,870	0.050	3,839	471	4,310	-9,485	#DIV/0!	#DIV/0!	#DIV/0!
2027	315.0	114,975				13,795	13,795	212.0	77,380	26.0	9,490	238.0	86,870	0.050	3,839	471	4,310	-9,485	#DIV/0!	#DIV/0!	#DIV/0!
			68,999	274,829	343,828															#DIV/0!	

EX.-rate 40cym = 1us$

[O&Mcost] up to year 1999 $0.1047×accounted -for water/m³
up to year 2000 $0.1036×accounted -for water/m³
from year 2001 $0.1532×accounted -for water/m³+$97,350,000×0.5%(item 1.1, 2.1.1, 2.1.2, 2.2.1, 2.2.3, 2.2.4)

	1)Hydrological Supply $10^3 \times m^3$ Abs./Day	Total/Yr.	2)Dam Storage $10^3 \times m^3$ Abs./Day	Total/Yr.	3)Water Purchase $10^3 \times m^3$ Abs./Day	Total/Yr.	4)Expenditure 5)Cost/Maintenance Cost $10^3 \times \$$ Local C.	Foreign C.	Total	6)Depreciation (cost in 5) Q'ty	Total $10^3 \times \$$	7)O&M cost $10^3 \times \$$	8)Water Purchase $10^3 \times \$$ Unit/$	Total	9)Total Expenditure $10^3 \times \$$	10)Present Value
1995	160.9	58,729	64.0	23,360	96.9	35,359										
1996	162.5	59,313	64.0	23,360	98.5	35,953										
1997	164.1	59,897	64.0	23,360	100.1	36,537										
1998	165.8	60,517	64.0	23,360	101.8	37,157	5,433	5,703	11,136	5,842	451	1,672	0.065	2,422	15,230	14,167
1999	167.4	61,101	64.0	23,360	103.4	37,741	6,835	22,039	28,874	5,842	451	1,702	0.065	2,450	33,036	28,587
2000	169.0	61,685	64.0	23,360	105.0	38,325	5,301	3,881	9,182	5,842	451	1,837	0.065	2,498	12,518	10,881
2001	246.2	89,863	40.2	14,673	206.0	75,190						2,384	0.065	4,901	7,285	5,455
2002	246.2	89,863	40.2	14,673	206.0	75,190						2,384	0.065	4,901	7,285	5,075
2003	246.2	89,863	40.2	14,673	206.0	75,190						2,384	0.065	4,901	7,285	4,721
2004	246.2	89,863	40.2	14,673	206.0	75,190						2,384	0.065	4,901	7,285	4,391
2005	246.2	89,863	40.2	14,673	206.0	75,190						2,384	0.065	4,901	7,285	4,085
2006	246.2	89,863	40.2	14,673	206.0	75,190						2,384	0.065	4,901	7,285	3,800
2007	246.2	89,863	40.2	14,673	206.0	75,190						2,384	0.065	4,901	7,285	3,535
2008	246.2	89,863	40.2	14,673	206.0	75,190						2,384	0.065	4,901	7,285	3,288
2009	246.2	89,863	40.2	14,673	206.0	75,190						2,384	0.065	4,901	7,285	3,059
2010	246.2	89,863	40.2	14,673	206.0	75,190						2,384	0.065	4,901	7,285	2,845
2011	246.2	89,863	40.2	14,673	206.0	75,190						2,384	0.065	4,901	7,285	2,647
2012	246.2	89,863	40.2	14,673	206.0	75,190						2,384	0.065	4,901	7,285	2,462
2013	246.2	89,863	40.2	14,673	206.0	75,190						2,384	0.065	4,901	7,285	2,290
2014	246.2	89,863	40.2	14,673	206.0	75,190						2,384	0.065	4,901	7,285	2,131
2015	246.2	89,863	40.2	14,673	206.0	75,190						2,384	0.065	4,901	7,285	1,982
2016	246.2	89,863	40.2	14,673	206.0	75,190						2,384	0.065	4,901	7,285	1,844
2017	246.2	89,863	40.2	14,673	206.0	75,190						2,384	0.065	4,901	7,285	1,715
2018	246.2	89,863	40.2	14,673	206.0	75,190						2,384	0.065	4,901	7,285	1,595
2019	246.2	89,863	40.2	14,673	206.0	75,190						2,384	0.065	4,901	7,285	1,484
2020	246.2	89,863	40.2	14,673	206.0	75,190						2,384	0.065	4,901	7,285	1,381
2021	246.2	89,863	40.2	14,673	206.0	75,190						2,384	0.065	4,901	7,285	1,284
2022	246.2	89,863	40.2	14,673	206.0	75,190						2,384	0.065	4,901	7,285	1,195
2023	246.2	89,863	40.2	14,673	206.0	75,190						2,384	0.065	4,901	7,285	1,111
2024	246.2	89,863	40.2	14,673	206.0	75,190						2,384	0.065	4,901	7,285	1,034
2025	246.2	89,863	40.2	14,673	206.0	75,190						2,384	0.065	4,901	7,285	962
2026	246.2	89,863	40.2	14,673	206.0	75,190						2,384	0.065	4,901	7,285	895
2027	246.2	89,863	40.2	14,673	206.0	75,190						2,384	0.065	4,901	7,285	832
							17,569	31,623	49,192	17,526	1,353					120,733

	11)Revenue 12)Accumulated for Water $10^3 \times \$$	Water Revenue 13)GRP1 yen/m³	Unit/$	Total	14)GRP2 yen/m³	Unit/$	Total	15)GRP3 yen/m³	Unit/$	Total	16)Total Revenue $10^3 \times \$$	17)Ave. Tariff	18)Present Value $10^3 \times \$$	19)Rev./Exp. 16)/9)	20)Discount Rate 7.5%	21) Present Value $10^3 \times \$$	22) Cumulative Total $10^3 \times \$$
1995	56,028	15,798			14,573			22,557									
1996	57,305	19,236			15,002			23,068									
1997	58,400	19,601			15,294			23,506									
1998	59,495	19,966	0.0368	735	15,586	0.1590	2,478	23,944	0.1980	4,741	7,954	0.134	7,399	-7,276	0.930	-6,769	
1999	60,554	20,331	0.0368	748	15,841	0.1590	2,519	24,382	0.1980	4,828	8,095	0.134	7,004	-24,941	0.865	-21,583	-28,351
2000	61,539	20,659	0.0368	760	16,097	0.1590	2,559	24,784	0.1980	4,907	8,227	0.134	6,622	-5,291	0.805	-4,259	-32,610
2001	80,994	27,193	0.0368	1,001	21,207	0.1590	3,372	32,595	0.1980	6,454	10,826	0.134	8,107	3,541	0.749	2,651	-29,959
2002	80,994	27,193	0.0368	1,001	21,207	0.1590	3,372	32,595	0.1980	6,454	10,826	0.134	7,541	3,541	0.697	2,466	-27,492
2003	80,994	27,193	0.0368	1,001	21,207	0.1590	3,372	32,595	0.1980	6,454	10,826	0.134	7,015	3,541	0.648	2,294	-25,198
2004	80,994	27,193	0.0368	1,001	21,207	0.1590	3,372	32,595	0.1980	6,454	10,826	0.134	6,526	3,541	0.603	2,134	-23,064
2005	80,994	27,193	0.0368	1,001	21,207	0.1590	3,372	32,595	0.1980	6,454	10,826	0.134	6,070	3,541	0.561	1,985	-21,079
2006	80,994	27,193	0.0368	1,001	21,207	0.1590	3,372	32,595	0.1980	6,454	10,826	0.134	5,647	3,541	0.522	1,847	-19,232
2007	80,994	27,193	0.0368	1,001	21,207	0.1590	3,372	32,595	0.1980	6,454	10,826	0.134	5,253	3,541	0.485	1,718	-17,514
2008	80,994	27,193	0.0368	1,001	21,207	0.1590	3,372	32,595	0.1980	6,454	10,826	0.134	4,886	3,541	0.451	1,598	-15,916
2009	80,994	27,193	0.0368	1,001	21,207	0.1590	3,372	32,595	0.1980	6,454	10,826	0.134	4,545	3,541	0.420	1,487	-14,429
2010	80,994	27,193	0.0368	1,001	21,207	0.1590	3,372	32,595	0.1980	6,454	10,826	0.134	4,228	3,541	0.391	1,383	-13,046
2011	80,994	27,193	0.0368	1,001	21,207	0.1590	3,372	32,595	0.1980	6,454	10,826	0.134	3,933	3,541	0.363	1,285	-11,759
2012	80,994	27,193	0.0368	1,001	21,207	0.1590	3,372	32,595	0.1980	6,454	10,826	0.134	3,659	3,541	0.338	1,197	-10,563
2013	80,994	27,193	0.0368	1,001	21,207	0.1590	3,372	32,595	0.1980	6,454	10,826	0.134	3,404	3,541	0.314	1,113	-9,450
2014	80,994	27,193	0.0368	1,001	21,207	0.1590	3,372	32,595	0.1980	6,454	10,826	0.134	3,166	3,541	0.292	1,036	-8,414
2015	80,994	27,193	0.0368	1,001	21,207	0.1590	3,372	32,595	0.1980	6,454	10,826	0.134	2,945	3,541	0.272	963	-7,451
2016	80,994	27,193	0.0368	1,001	21,207	0.1590	3,372	32,595	0.1980	6,454	10,826	0.134	2,740	3,541	0.253	896	-6,555
2017	80,994	27,193	0.0368	1,001	21,207	0.1590	3,372	32,595	0.1980	6,454	10,826	0.134	2,549	3,541	0.235	834	-5,721
2018	80,994	27,193	0.0368	1,001	21,207	0.1590	3,372	32,595	0.1980	6,454	10,826	0.134	2,371	3,541	0.219	775	-4,946
2019	80,994	27,193	0.0368	1,001	21,207	0.1590	3,372	32,595	0.1980	6,454	10,826	0.134	2,205	3,541	0.204	721	-4,224
2020	80,994	27,193	0.0368	1,001	21,207	0.1590	3,372	32,595	0.1980	6,454	10,826	0.134	2,052	3,541	0.189	671	-3,553
2021	80,994	27,193	0.0368	1,001	21,207	0.1590	3,372	32,595	0.1980	6,454	10,826	0.134	1,908	3,541	0.176	624	-2,929
2022	80,994	27,193	0.0368	1,001	21,207	0.1590	3,372	32,595	0.1980	6,454	10,826	0.134	1,775	3,541	0.164	581	-2,349
2023	80,994	27,193	0.0368	1,001	21,207	0.1590	3,372	32,595	0.1980	6,454	10,826	0.134	1,651	3,541	0.153	540	-1,809
2024	80,994	27,193	0.0368	1,001	21,207	0.1590	3,372	32,595	0.1980	6,454	10,826	0.134	1,536	3,541	0.142	502	-1,306
2025	80,994	27,193	0.0368	1,001	21,207	0.1590	3,372	32,595	0.1980	6,454	10,826	0.134	1,429	3,541	0.132	467	-839
2026	80,994	27,193	0.0368	1,001	21,207	0.1590	3,372	32,595	0.1980	6,454	10,826	0.134	1,329	3,541	0.123	435	-404
2027	80,994	27,193	0.0368	1,001	21,207	0.1590	3,372	32,595	0.1980	6,454	10,826	0.134	1,237	3,541	0.114	404	0
	2,368,412												120,734				0

EX-rate 40cym = 1us$

※Fixed tariff of water purchase & for consumers(unescalated)

	US$	/ SYM
· Tariff of base year		
water parches	$0.065	/ 2.61cym
tariff : GRP1	$0.037	/ 1.47cym
GRP2	$0.159	/ 6.36cym
GRP3	$0.198	/ 7.92cym

[O&Mcost]

up to year 1999 $0.0281 × Accounted -for water/m³

from year 2000 $0.0281 × Accounted -for water/m³ + $21,600,000×0.5%(item 5.1.1, 5.1.3)

T-U(Pre Financial Analysis)

T-U Basic Plan(phase-1)

Part II Chapter 6
Subsidies : 0%

	1)Operating Capa. ($10^3 \times m^3$)		2)Expenditure					6)Revenue													
			3)Construction Cost $10^3 \times \$$			4)O&M cost $10^3 \times \$$	5)Total Expenditure $10^3 \times \$$	Accounter for water $10^3 \times m^3$						10)Selling price US$/m³	11)Water Revenue		14)Total Revenue $10^3 \times \$$	15) Rev-Exp $10^3 \times \$$	16) F.I.R.R. #DIV/0!	17) Present Value $10^3 \times \$$	18) Cumulative Total $10^3 \times \$$
								7)Vodokanal KZ		8)Others		9)Total			12) Vodokanal KZ	13) Others					
	Max. Daily	Annual Total	Local C.	Foreign C.	Total			Abs./Day	Total/Yr.	Abs./Day	Total/Yr.	Abs./Day	Total/Yr.								
1995	180.0	65,700						96.9	35,369	83.2	30,368	180.1	65,737								
1996	180.0	65,700						98.5	35,953	81.6	29,784	180.1	65,737								
1997	180.0	65,700						100.1	36,537	80.0	29,200	180.1	65,737								
1998	180.0	65,700	19,164	42,518	61,682	4,707	66,389	101.8	37,157	78.3	28,580	180.1	65,737	0.065	2,422	1,863	4,285	-62,104	#DIV/0!	#DIV/0!	#DIV/0!
1999	180.0	65,700	8,629	49,788	58,417	4,707	63,124	103.4	37,741	76.7	27,996	180.1	65,737	0.065	2,460	1,825	4,285	-58,839	#DIV/0!	#DIV/0!	#DIV/0!
2000	180.0	65,700	3,303	21,159	24,462	4,168	28,630	105.0	38,325	75.1	27,412	180.1	65,737	0.065	2,498	1,787	4,285	-24,344	#DIV/0!	#DIV/0!	#DIV/0!
2001	360.0	131,400				7,209	7,209	206.0	75,190	88.5	32,303	294.5	107,493	0.065	4,901	2,106	7,007	-202	#DIV/0!	#DIV/0!	#DIV/0!
2002	360.0	131,400				7,517	7,517	206.0	75,190	101.8	37,157	307.8	112,347	0.065	4,901	2,422	7,324	-193	#DIV/0!	#DIV/0!	#DIV/0!
2003	360.0	131,400				7,517	7,517	206.0	75,190	101.8	37,157	307.8	112,347	0.065	4,901	2,422	7,324	-193	#DIV/0!	#DIV/0!	#DIV/0!
2004	360.0	131,400				7,517	7,517	206.0	75,190	101.8	37,157	307.8	112,347	0.065	4,901	2,422	7,324	-193	#DIV/0!	#DIV/0!	#DIV/0!
2005	360.0	131,400				7,517	7,517	206.0	75,190	101.8	37,157	307.8	112,347	0.065	4,901	2,422	7,324	-193	#DIV/0!	#DIV/0!	#DIV/0!
2006	360.0	131,400				7,517	7,517	206.0	75,190	101.8	37,157	307.8	112,347	0.065	4,901	2,422	7,324	-193	#DIV/0!	#DIV/0!	#DIV/0!
2007	360.0	131,400				7,517	7,517	206.0	75,190	101.8	37,157	307.8	112,347	0.065	4,901	2,422	7,324	-193	#DIV/0!	#DIV/0!	#DIV/0!
2008	360.0	131,400				7,517	7,517	206.0	75,190	101.8	37,157	307.8	112,347	0.065	4,901	2,422	7,324	-193	#DIV/0!	#DIV/0!	#DIV/0!
2009	360.0	131,400				7,517	7,517	206.0	75,190	101.8	37,157	307.8	112,347	0.065	4,901	2,422	7,324	-193	#DIV/0!	#DIV/0!	#DIV/0!
2010	360.0	131,400				7,517	7,517	206.0	75,190	101.8	37,157	307.8	112,347	0.065	4,901	2,422	7,324	-193	#DIV/0!	#DIV/0!	#DIV/0!
2011	360.0	131,400				7,517	7,517	206.0	75,190	101.8	37,157	307.8	112,347	0.065	4,901	2,422	7,324	-193	#DIV/0!	#DIV/0!	#DIV/0!
2012	360.0	131,400				7,517	7,517	206.0	75,190	101.8	37,157	307.8	112,347	0.065	4,901	2,422	7,324	-193	#DIV/0!	#DIV/0!	#DIV/0!
2013	360.0	131,400				7,517	7,517	206.0	75,190	101.8	37,157	307.8	112,347	0.065	4,901	2,422	7,324	-193	#DIV/0!	#DIV/0!	#DIV/0!
2014	360.0	131,400				7,517	7,517	206.0	75,190	101.8	37,157	307.8	112,347	0.065	4,901	2,422	7,324	-193	#DIV/0!	#DIV/0!	#DIV/0!
2015	360.0	131,400				7,517	7,517	206.0	75,190	101.8	37,157	307.8	112,347	0.065	4,901	2,422	7,324	-193	#DIV/0!	#DIV/0!	#DIV/0!
2016	360.0	131,400				7,517	7,517	206.0	75,190	101.8	37,157	307.8	112,347	0.065	4,901	2,422	7,324	-193	#DIV/0!	#DIV/0!	#DIV/0!
2017	360.0	131,400				7,517	7,517	206.0	75,190	101.8	37,157	307.8	112,347	0.065	4,901	2,422	7,324	-193	#DIV/0!	#DIV/0!	#DIV/0!
2018	360.0	131,400				7,517	7,517	206.0	75,190	101.8	37,157	307.8	112,347	0.065	4,901	2,422	7,324	-193	#DIV/0!	#DIV/0!	#DIV/0!
2019	360.0	131,400				7,517	7,517	206.0	75,190	101.8	37,157	307.8	112,347	0.065	4,901	2,422	7,324	-193	#DIV/0!	#DIV/0!	#DIV/0!
2020	360.0	131,400				7,517	7,517	206.0	75,190	101.8	37,157	307.8	112,347	0.065	4,901	2,422	7,324	-193	#DIV/0!	#DIV/0!	#DIV/0!
2021	360.0	131,400				7,517	7,517	206.0	75,190	101.8	37,157	307.8	112,347	0.065	4,901	2,422	7,324	-193	#DIV/0!	#DIV/0!	#DIV/0!
2022	360.0	131,400				7,517	7,517	206.0	75,190	101.8	37,157	307.8	112,347	0.065	4,901	2,422	7,324	-193	#DIV/0!	#DIV/0!	#DIV/0!
2023	360.0	131,400				7,517	7,517	206.0	75,190	101.8	37,157	307.8	112,347	0.065	4,901	2,422	7,324	-193	#DIV/0!	#DIV/0!	#DIV/0!
2024	360.0	131,400				7,517	7,517	206.0	75,190	101.8	37,157	307.8	112,347	0.065	4,901	2,422	7,324	-193	#DIV/0!	#DIV/0!	#DIV/0!
2025	360.0	131,400				7,517	7,517	206.0	75,190	101.8	37,157	307.8	112,347	0.065	4,901	2,422	7,324	-193	#DIV/0!	#DIV/0!	#DIV/0!
2026	360.0	131,400				7,517	7,517	206.0	75,190	101.8	37,157	307.8	112,347	0.065	4,901	2,422	7,324	-193	#DIV/0!	#DIV/0!	#DIV/0!
2027	360.0	131,400				7,517	7,517	206.0	75,190	101.8	37,157	307.8	112,347	0.065	4,901	2,422	7,324	-193	#DIV/0!	#DIV/0!	#DIV/0!
			31,096	113,465	144,561	216,220											210,278			#DIV/0!	

EX.-rate 40cym = 1us$

[O&Mcost] up to year 1999 $0.0716×ccounted -for water/m³
from year 2000 $0.0634×ccounted -for water/m³
from year 2001 $0.0634×ccounted -for water/m³+$78,750,000×0.5%(item 3.1.1, 3.1.2)

Table6.2.6(2) TU0%

	1) Average water supply 10^3m^3 Ave./Day	Total/Yr.	2) Gross Source 10^3m^3 Ave./Day	Total/Yr.	3) Water Purchase 10^3m^3 Ave./Day	Total/Yr.	4) Expenditure 5) Construction Cost $10^6x\$$ Local C.	Foreign C.	Total	6) Installed Horsepower (kw) (Ut.) (Day	Total $10^3x\$$	7) O&M cost $10^6x\$$	8) Water Purchase $10^3x\$$ Unit/$	Total	9) Total Expenditure $10^3x\$$	10) Present Value
1995	184.2	67,233	65.1	23,762	119.1	43,472										
1996	201.3	73,475	70.7	25,806	130.6	47,669										
1997	218.5	79,753	76.4	27,886	142.1	51,867										
1998	235.6	85,994	82.1	29,967	153.5	56,028	8,372	7,769	16,141	12,565	970	4,560	0.112	6,278	26,979	25,097
1999	252.8	92,272	87.8	32,047	165.0	60,225	9,919	22,342	32,261	12,565	970	4,891	0.112	6,749	45,901	37,989
2000	269.9	98,514	93.5	34,128	176.4	64,386	8,818	12,326	21,144	12,565	970	5,351	0.112	7,215	33,711	27,136
2001	278.1	101,507	66.1	24,127	212.0	77,380						5,511	0.112	8,671	14,182	10,619
2002	278.1	101,507	66.1	24,127	212.0	77,380						5,511	0.112	8,671	14,182	9,878
2003	278.1	101,507	66.1	24,127	212.0	77,380						5,511	0.112	8,671	14,182	9,189
2004	278.1	101,507	66.1	24,127	212.0	77,380						5,511	0.112	8,671	14,182	8,548
2005	278.1	101,507	66.1	24,127	212.0	77,380						5,511	0.112	8,671	14,182	7,952
2006	278.1	101,507	66.1	24,127	212.0	77,380						5,511	0.112	8,671	14,182	7,397
2007	278.1	101,507	66.1	24,127	212.0	77,380						5,511	0.112	8,671	14,182	6,881
2008	278.1	101,507	66.1	24,127	212.0	77,380						5,684	0.112	8,671	14,355	6,479
2009	278.1	101,507	66.1	24,127	212.0	77,380						5,684	0.112	8,671	14,355	6,027
2010	278.1	101,507	66.1	24,127	212.0	77,380						5,684	0.112	8,671	14,355	5,606
2011	278.1	101,507	66.1	24,127	212.0	77,380						5,511	0.112	8,671	14,182	5,152
2012	278.1	101,507	66.1	24,127	212.0	77,380						5,511	0.112	8,671	14,182	4,793
2013	278.1	101,507	66.1	24,127	212.0	77,380						5,511	0.112	8,671	14,182	4,459
2014	278.1	101,507	66.1	24,127	212.0	77,380						5,511	0.112	8,671	14,182	4,148
2015	278.1	101,507	66.1	24,127	212.0	77,380						5,511	0.112	8,671	14,182	3,858
2016	278.1	101,507	66.1	24,127	212.0	77,380						5,511	0.112	8,671	14,182	3,589
2017	278.1	101,507	66.1	24,127	212.0	77,380						5,511	0.112	8,671	14,182	3,339
2018	278.1	101,507	66.1	24,127	212.0	77,380						5,684	0.112	8,671	14,355	3,144
2019	278.1	101,507	66.1	24,127	212.0	77,380						5,684	0.112	8,671	14,355	2,924
2020	278.1	101,507	66.1	24,127	212.0	77,380						5,684	0.112	8,671	14,355	2,720
2021	278.1	101,507	66.1	24,127	212.0	77,380						5,511	0.112	8,671	14,182	2,500
2022	278.1	101,507	66.1	24,127	212.0	77,380						5,511	0.112	8,671	14,182	2,326
2023	278.1	101,507	66.1	24,127	212.0	77,380						5,511	0.112	8,671	14,182	2,163
2024	278.1	101,507	66.1	24,127	212.0	77,380						5,511	0.112	8,671	14,182	2,012
2025	278.1	101,507	66.1	24,127	212.0	77,380						5,511	0.112	8,671	14,182	1,872
2026	278.1	101,507	66.1	24,127	212.0	77,380						5,511	0.112	8,671	14,182	1,741
2027	278.1	101,507	66.1	24,127	212.0	77,380						5,511	0.112	8,671	14,182	1,620
							27,109	42,437	69,546	37,695	2,910					221,158

	11) Revenue 12) Accounted for Water $10^3x\$$	Water Revenue 13) GRP1 Year/m³	Unit/$	Total	14) GRP2 Year/m³	Unit/$	Total	15) GRP3 Year/m³	Unit/$	Total	16) Total Revenue $10^3x\$$	17) Ave. Tariff	18) Present Value $10^3x\$$	Subsidies (C Cost x 90%) $10^3x\$$	19) Rev./Exp. (19/9)	20) Discount Rate 7.5%	21) Present Value $10^3x\$$	22) Cumulative Total $10^3x\$$
1995	60,517	26,572			20,440			13,505										
1996	66,102	29,018			22,338			14,746										
1997	71,832	31,536			24,273			16,024										
1998	77,417	33,982	0.0525	1,784	26,171	0.241	6,307	17,265	0.241	4,161	12,252	0.158	11,397	14,527	-201	0.930	-187	
1999	83,038	36,464	0.0525	1,914	28,069	0.241	6,765	18,506	0.241	4,460	13,139	0.158	11,369	29,035	-1,727	0.865	-1,495	-1,681
2000	88,659	38,909	0.0525	2,043	29,967	0.241	7,222	19,783	0.241	4,768	14,032	0.158	11,295	19,030	-649	0.805	-522	-2,203
2001	91,360	40,114	0.0525	2,106	30,879	0.241	7,442	20,367	0.241	4,908	14,456	0.158	10,825	0	274	0.749	206	-1,998
2002	91,360	40,114	0.0525	2,106	30,879	0.241	7,442	20,367	0.241	4,908	14,456	0.158	10,070	0	274	0.697	191	-1,807
2003	91,360	40,114	0.0525	2,106	30,879	0.241	7,442	20,367	0.241	4,908	14,456	0.158	9,367	0	274	0.648	178	-1,629
2004	91,360	40,114	0.0525	2,106	30,879	0.241	7,442	20,367	0.241	4,908	14,456	0.158	8,714	0	274	0.603	165	-1,463
2005	91,360	40,114	0.0525	2,106	30,879	0.241	7,442	20,367	0.241	4,908	14,456	0.158	8,106	0	274	0.561	154	-1,309
2006	91,360	40,114	0.0525	2,106	30,879	0.241	7,442	20,367	0.241	4,908	14,456	0.158	7,540	0	274	0.522	143	-1,166
2007	91,360	40,114	0.0525	2,106	30,879	0.241	7,442	20,367	0.241	4,908	14,456	0.158	7,014	0	274	0.485	133	-1,033
2008	91,360	40,114	0.0525	2,106	30,879	0.241	7,442	20,367	0.241	4,908	14,456	0.158	6,525	0	101	0.451	46	-987
2009	91,360	40,114	0.0525	2,106	30,879	0.241	7,442	20,367	0.241	4,908	14,456	0.158	6,070	0	101	0.420	43	-945
2010	91,360	40,114	0.0525	2,106	30,879	0.241	7,442	20,367	0.241	4,908	14,456	0.158	5,646	0	101	0.391	40	-905
2011	91,360	40,114	0.0525	2,106	30,879	0.241	7,442	20,367	0.241	4,908	14,456	0.158	5,252	0	274	0.363	100	-805
2012	91,360	40,114	0.0525	2,106	30,879	0.241	7,442	20,367	0.241	4,908	14,456	0.158	4,886	0	274	0.338	93	-712
2013	91,360	40,114	0.0525	2,106	30,879	0.241	7,442	20,367	0.241	4,908	14,456	0.158	4,545	0	274	0.314	86	-626
2014	91,360	40,114	0.0525	2,106	30,879	0.241	7,442	20,367	0.241	4,908	14,456	0.158	4,228	0	274	0.292	80	-546
2015	91,360	40,114	0.0525	2,106	30,879	0.241	7,442	20,367	0.241	4,908	14,456	0.158	3,933	0	274	0.272	75	-471
2016	91,360	40,114	0.0525	2,106	30,879	0.241	7,442	20,367	0.241	4,908	14,456	0.158	3,658	0	274	0.253	69	-402
2017	91,360	40,114	0.0525	2,106	30,879	0.241	7,442	20,367	0.241	4,908	14,456	0.158	3,403	0	274	0.235	65	-337
2018	91,360	40,114	0.0525	2,106	30,879	0.241	7,442	20,367	0.241	4,908	14,456	0.158	3,166	0	101	0.219	22	-315
2019	91,360	40,114	0.0525	2,106	30,879	0.241	7,442	20,367	0.241	4,908	14,456	0.158	2,945	0	101	0.204	21	-294
2020	91,360	40,114	0.0525	2,106	30,879	0.241	7,442	20,367	0.241	4,908	14,456	0.158	2,739	0	101	0.189	19	-275
2021	91,360	40,114	0.0525	2,106	30,879	0.241	7,442	20,367	0.241	4,908	14,456	0.158	2,548	0	274	0.176	48	-227
2022	91,360	40,114	0.0525	2,106	30,879	0.241	7,442	20,367	0.241	4,908	14,456	0.158	2,371	0	274	0.164	45	-182
2023	91,360	40,114	0.0525	2,106	30,879	0.241	7,442	20,367	0.241	4,908	14,456	0.158	2,205	0	274	0.153	42	-140
2024	91,360	40,114	0.0525	2,106	30,879	0.241	7,442	20,367	0.241	4,908	14,456	0.158	2,051	0	274	0.142	39	-101
2025	91,360	40,114	0.0525	2,106	30,879	0.241	7,442	20,367	0.241	4,908	14,456	0.158	1,908	0	274	0.132	36	-65
2026	91,360	40,114	0.0525	2,106	30,879	0.241	7,442	20,367	0.241	4,908	14,456	0.158	1,775	0	274	0.123	34	-31
2027	91,360	40,114	0.0525	2,106	30,879	0.241	7,442	20,367	0.241	4,908	14,456	0.158	1,651	0	274	0.114	31	0
													167,202					0

EX-rate 40cym = 1uS

※Fixed tariff of water purchase & for consumers(unescalated)

	US$	/ SYM
• Tariff of base year		
water parches	$0.112	/ 4.48cym
tariff : GRP1	$0.0525	/ 2.10cym
GRP2	$0.241	/ 9.64cym
GRP3	$0.241	/ 9.64cym

[O&Mcost]

up to year 2000 $0.0589 X Accounted -for water/m³

from year 2001 $0.0589 X Accounted -for water/m³ + $25,900,000 X 0.5%(item4.1.1, 4.1.3, 4.1.4)

T – N (Pre Financial Analysis)

T – N Basic Plan(phase-1)

	1)Operating Capa. ($10^3 \times m^3$)		2)Expenditure					6)Revenue															
			3)Construction Cost $10^3 \times \$$			4)O&M cost $10^3 \times \$$	5)Total Expenditure $10^3 \times \$$	Accounter for water $10^3 \times m^3$						10)Selling price US$/m³	11)Water Revenue		14)Total Revenue $10^3 \times \$$	subsidize (C Cost × 90%) $10^3 \times \$$	15) Rev-Exp $10^3 \times \$$	16) F.I.R.R. #DIV/0!	17) Present Value $10^3 \times \$$	18) Cumulative Total $10^3 \times \$$
								7)Vodokanal KZ		8)Others		9)Total			12) Vodokanal KKP	13) Others						
	Max. Daily	Annual Total	Local C.	Foreign C.	Total			Abe./Day	Total/Yr.	Abe./Day	Total/Yr.	Abe./Day	Total/Yr.									
1995	170.0	62,050						98.1	35,807	20.2	7,373	118.3	43,180									
1996	170.0	62,050						108.3	39,530	17.2	6,278	125.5	45,808									
1997	170.0	62,050						118.5	43,253	14.2	5,183	132.7	48,436									
1998	170.0	62,050	29,912	72,685	102,597	5,343	107,940	128.7	46,976	11.1	4,052	139.8	51,027	0.112	5,264	454	5,718	92,337	-9,884	#DIV/0!	#DIV/0!	
1999	170.0	62,050	27,474	110,243	137,717	5,618	143,335	138.9	50,699	8.1	2,957	147.0	53,655	0.112	5,681	331	6,013	123,945	-13,377	#DIV/0!	#DIV/0!	#DIV/0!
2000	170.0	62,050	11,613	91,901	103,514	5,827	109,341	149.0	54,385	5.1	1,862	154.1	56,247	0.112	6,094	209	6,303	93,163	-9,876	#DIV/0!	#DIV/0!	#DIV/0!
2001	315.0	114,975				13,404	13,404	212.0	77,380	19.0	6,935	231.0	84,315	0.112	8,671	777	9,448	0	-3,955	#DIV/0!	#DIV/0!	#DIV/0!
2002	315.0	114,975				13,795	13,795	212.0	77,380	26.0	9,490	238.0	86,870	0.112	8,671	1,063	9,735	0	-4,061	#DIV/0!	#DIV/0!	#DIV/0!
2003	315.0	114,975				13,795	13,795	212.0	77,380	26.0	9,490	238.0	86,870	0.112	8,671	1,063	9,735	0	-4,061	#DIV/0!	#DIV/0!	#DIV/0!
2004	315.0	114,975				13,795	13,795	212.0	77,380	26.0	9,490	238.0	86,870	0.112	8,671	1,063	9,735	0	-4,061	#DIV/0!	#DIV/0!	#DIV/0!
2005	315.0	114,975				13,795	13,795	212.0	77,380	26.0	9,490	238.0	86,870	0.112	8,671	1,063	9,735	0	-4,061	#DIV/0!	#DIV/0!	#DIV/0!
2006	315.0	114,975				13,795	13,795	212.0	77,380	26.0	9,490	238.0	86,870	0.112	8,671	1,063	9,735	0	-4,061	#DIV/0!	#DIV/0!	#DIV/0!
2007	315.0	114,975				13,795	13,795	212.0	77,380	26.0	9,490	238.0	86,870	0.112	8,671	1,063	9,735	0	-4,061	#DIV/0!	#DIV/0!	#DIV/0!
2008	315.0	114,975				13,795	13,795	212.0	77,380	26.0	9,490	238.0	86,870	0.112	8,671	1,063	9,735	0	-4,061	#DIV/0!	#DIV/0!	#DIV/0!
2009	315.0	114,975				13,795	13,795	212.0	77,380	26.0	9,490	238.0	86,870	0.112	8,671	1,063	9,735	0	-4,061	#DIV/0!	#DIV/0!	#DIV/0!
2010	315.0	114,975				13,795	13,795	212.0	77,380	26.0	9,490	238.0	86,870	0.112	8,671	1,063	9,735	0	-4,061	#DIV/0!	#DIV/0!	#DIV/0!
2011	315.0	114,975				13,795	13,795	212.0	77,380	26.0	9,490	238.0	86,870	0.112	8,671	1,063	9,735	0	-4,061	#DIV/0!	#DIV/0!	#DIV/0!
2012	315.0	114,975				13,795	13,795	212.0	77,380	26.0	9,490	238.0	86,870	0.112	8,671	1,063	9,735	0	-4,061	#DIV/0!	#DIV/0!	#DIV/0!
2013	315.0	114,975				13,795	13,795	212.0	77,380	26.0	9,490	238.0	86,870	0.112	8,671	1,063	9,735	0	-4,061	#DIV/0!	#DIV/0!	#DIV/0!
2014	315.0	114,975				13,795	13,795	212.0	77,380	26.0	9,490	238.0	86,870	0.112	8,671	1,063	9,735	0	-4,061	#DIV/0!	#DIV/0!	#DIV/0!
2015	315.0	114,975				13,795	13,795	212.0	77,380	26.0	9,490	238.0	86,870	0.112	8,671	1,063	9,735	0	-4,061	#DIV/0!	#DIV/0!	#DIV/0!
2016	315.0	114,975				13,795	13,795	212.0	77,380	26.0	9,490	238.0	86,870	0.112	8,671	1,063	9,735	0	-4,061	#DIV/0!	#DIV/0!	#DIV/0!
2017	315.0	114,975				13,795	13,795	212.0	77,380	26.0	9,490	238.0	86,870	0.112	8,671	1,063	9,735	0	-4,061	#DIV/0!	#DIV/0!	#DIV/0!
2018	315.0	114,975				13,795	13,795	212.0	77,380	26.0	9,490	238.0	86,870	0.112	8,671	1,063	9,735	0	-4,061	#DIV/0!	#DIV/0!	#DIV/0!
2019	315.0	114,975				13,795	13,795	212.0	77,380	26.0	9,490	238.0	86,870	0.112	8,671	1,063	9,735	0	-4,061	#DIV/0!	#DIV/0!	#DIV/0!
2020	315.0	114,975				13,795	13,795	212.0	77,380	26.0	9,490	238.0	86,870	0.112	8,671	1,063	9,735	0	-4,061	#DIV/0!	#DIV/0!	#DIV/0!
2021	315.0	114,975				13,795	13,795	212.0	77,380	26.0	9,490	238.0	86,870	0.112	8,671	1,063	9,735	0	-4,061	#DIV/0!	#DIV/0!	#DIV/0!
2022	315.0	114,975				13,795	13,795	212.0	77,380	26.0	9,490	238.0	86,870	0.112	8,671	1,063	9,735	0	-4,061	#DIV/0!	#DIV/0!	#DIV/0!
2023	315.0	114,975				13,795	13,795	212.0	77,380	26.0	9,490	238.0	86,870	0.112	8,671	1,063	9,735	0	-4,061	#DIV/0!	#DIV/0!	#DIV/0!
2024	315.0	114,975				13,795	13,795	212.0	77,380	26.0	9,490	238.0	86,870	0.112	8,671	1,063	9,735	0	-4,061	#DIV/0!	#DIV/0!	#DIV/0!
2025	315.0	114,975				13,795	13,795	212.0	77,380	26.0	9,490	238.0	86,870	0.112	8,671	1,063	9,735	0	-4,061	#DIV/0!	#DIV/0!	#DIV/0!
2026	315.0	114,975				13,795	13,795	212.0	77,380	26.0	9,490	238.0	86,870	0.112	8,671	1,063	9,735	0	-4,061	#DIV/0!	#DIV/0!	#DIV/0!
2027	315.0	114,975				13,795	13,795	212.0	77,380	26.0	9,490	238.0	86,870	0.112	8,671	1,063	9,735	0	-4,061	#DIV/0!	#DIV/0!	#DIV/0!
			68,999	274,829	343,828																#DIV/0!	

EX.-rate 40cym = 1us$

[O&Mcost] up to year 1999 $0.1047 × accounted -for water/m³
up to year 2000 $0.1036 × accounted -for water/m³
from year 2001 $0.1532 × accounted -for water/m³ + $97,350,000 × 0.5%(item 1.1, 2.1.1, 2.1.2, 2.2.1, 2.2.3, 2.2.4)

	1)Non-revenue water supply 10^3m^3 Ave./Day	Total/Yr.	2)Non-Revenue 10^3m^3 Ave./Day	Total/Yr.	3)Water Production 10^3m^3 Ave./Day	Total/Yr.	4)Expenditure 5)Construction Cost 10^3US Local C.	Foreign C.	Total	6)Structural replacing cost (ratio 1) Ratio	Total 10^3US	7)O&M cost 10^3US	8)Water Purchase 10^3US Unit/$	Total	9)Total Expenditure 10^3US	10)Present Value	11)Revenue 12)Revenue for water 10^3US	13)BRT Water/m³	Unit/$	Total	14)BRT Water/m³	Unit/$	Total	15)BRT Water/m³	Unit/$	Total	16)Total Revenue 10^3US	17)Water Tariff	18)Revenue Value 10^3US	Subsidize (C.Cost x 90%) 10^3US	19)Net cash flow (19-20)	20)Operation Value 7,8%	21) Revenue Value 10^3US	22) Cumulative Total 10^3US
1995	160.9	58,729	64.0	23,360	96.9	35,369											56,028	18,798			14,673			22,557										
1996	162.5	59,313	64.0	23,360	98.5	35,953											57,305	19,236			15,002			23,068										
1997	164.1	59,897	64.0	23,360	100.1	36,537											58,400	19,601			15,294			23,506										
1998	165.8	60,517	64.0	23,360	101.8	37,157	5,433	5,703	11,136	5,842	451	1,672	0.114	4,222	17,030	15,842	59,495	19,966	0.0368	735	15,586	0.1590	2,476	23,344	0.1980	4,741	7,954	0.134	7,399	10,022	946	0.920	880	
1999	167.4	61,101	64.0	23,360	103.4	37,741	6,835	22,039	28,874	5,842	451	1,702	0.114	4,288	34,864	30,169	60,554	20,331	0.0368	748	15,841	0.1590	2,519	24,382	0.1980	4,828	8,095	0.134	7,004	25,987	-763	0.865	-677	203
2000	169.0	61,685	64.0	23,360	105.0	38,325	5,301	3,881	9,182	5,842	451	1,837	0.114	4,355	15,374	12,373	61,539	20,659	0.0368	760	16,097	0.1590	2,559	24,784	0.1980	4,907	8,227	0.134	6,622	8,264	1,117	0.805	899	1,102
2001	246.2	89,863	40.2	14,673	206.0	75,190						2,384	0.114	8,543	10,927	8,182	80,994	27,193	0.0368	1,001	21,207	0.1590	3,372	32,595	0.1980	6,454	10,826	0.134	8,107	0	-101	0.749	-76	1,026
2002	246.2	89,863	40.2	14,673	206.0	75,190						2,384	0.114	8,543	10,927	7,612	80,994	27,193	0.0368	1,001	21,207	0.1590	3,372	32,595	0.1980	6,454	10,826	0.134	7,541	0	-101	0.697	-70	956
2003	246.2	89,863	40.2	14,673	206.0	75,190						2,384	0.114	8,543	10,927	7,080	80,994	27,193	0.0368	1,001	21,207	0.1590	3,372	32,595	0.1980	6,454	10,826	0.134	7,015	0	-101	0.648	-65	890
2004	246.2	89,863	40.2	14,673	206.0	75,190						2,384	0.114	8,543	10,927	6,586	80,994	27,193	0.0368	1,001	21,207	0.1590	3,372	32,595	0.1980	6,454	10,826	0.134	6,526	0	-101	0.603	-61	829
2005	246.2	89,863	40.2	14,673	206.0	75,190						2,384	0.114	8,543	10,927	6,127	80,994	27,193	0.0368	1,001	21,207	0.1590	3,372	32,595	0.1980	6,454	10,826	0.134	6,070	0	-101	0.561	-57	772
2006	246.2	89,863	40.2	14,673	206.0	75,190						2,384	0.114	8,543	10,927	5,700	80,994	27,193	0.0368	1,001	21,207	0.1590	3,372	32,595	0.1980	6,454	10,826	0.134	5,647	0	-101	0.522	-53	720
2007	246.2	89,863	40.2	14,673	206.0	75,190						2,384	0.114	8,543	10,927	5,302	80,994	27,193	0.0368	1,001	21,207	0.1590	3,372	32,595	0.1980	6,454	10,826	0.134	5,253	0	-101	0.485	-49	671
2008	246.2	89,863	40.2	14,673	206.0	75,190						2,475	0.114	8,543	11,018	4,973	80,994	27,193	0.0368	1,001	21,207	0.1590	3,372	32,595	0.1980	6,454	10,826	0.134	4,886	0	-192	0.451	-87	584
2009	246.2	89,863	40.2	14,673	206.0	75,190						2,475	0.114	8,543	11,018	4,626	80,994	27,193	0.0368	1,001	21,207	0.1590	3,372	32,595	0.1980	6,454	10,826	0.134	4,545	0	-192	0.420	-81	504
2010	246.2	89,863	40.2	14,673	206.0	75,190						2,475	0.114	8,543	11,018	4,303	80,994	27,193	0.0368	1,001	21,207	0.1590	3,372	32,595	0.1980	6,454	10,826	0.134	4,225	0	-192	0.391	-75	429
2011	246.2	89,863	40.2	14,673	206.0	75,190						2,384	0.114	8,543	10,927	3,970	80,994	27,193	0.0368	1,001	21,207	0.1590	3,372	32,595	0.1980	6,454	10,826	0.134	3,933	0	-101	0.363	-37	392
2012	246.2	89,863	40.2	14,673	206.0	75,190						2,384	0.114	8,543	10,927	3,693	80,994	27,193	0.0368	1,001	21,207	0.1590	3,372	32,595	0.1980	6,454	10,826	0.134	3,659	0	-101	0.338	-34	358
2013	246.2	89,863	40.2	14,673	206.0	75,190						2,384	0.114	8,543	10,927	3,435	80,994	27,193	0.0368	1,001	21,207	0.1590	3,372	32,595	0.1980	6,454	10,826	0.134	3,404	0	-101	0.314	-32	326
2014	246.2	89,863	40.2	14,673	206.0	75,190						2,384	0.114	8,543	10,927	3,196	80,994	27,193	0.0368	1,001	21,207	0.1590	3,372	32,595	0.1980	6,454	10,826	0.134	3,166	0	-101	0.292	-30	296
2015	246.2	89,863	40.2	14,673	206.0	75,190						2,384	0.114	8,543	10,927	2,973	80,994	27,193	0.0368	1,001	21,207	0.1590	3,372	32,595	0.1980	6,454	10,826	0.134	2,945	0	-101	0.272	-27	269
2016	246.2	89,863	40.2	14,673	206.0	75,190						2,384	0.114	8,543	10,927	2,765	80,994	27,193	0.0368	1,001	21,207	0.1590	3,372	32,595	0.1980	6,454	10,826	0.134	2,740	0	-101	0.253	-26	243
2017	246.2	89,863	40.2	14,673	206.0	75,190						2,384	0.114	8,543	10,927	2,572	80,994	27,193	0.0368	1,001	21,207	0.1590	3,372	32,595	0.1980	6,454	10,826	0.134	2,549	0	-101	0.235	-24	220
2018	246.2	89,863	40.2	14,673	206.0	75,190						2,475	0.114	8,543	11,018	2,413	80,994	27,193	0.0368	1,001	21,207	0.1590	3,372	32,595	0.1980	6,454	10,826	0.134	2,371	0	-192	0.219	-42	177
2019	246.2	89,863	40.2	14,673	206.0	75,190						2,475	0.114	8,543	11,018	2,245	80,994	27,193	0.0368	1,001	21,207	0.1590	3,372	32,595	0.1980	6,454	10,826	0.134	2,205	0	-192	0.204	-39	138
2020	246.2	89,863	40.2	14,673	206.0	75,190						2,475	0.114	8,543	11,018	2,088	80,994	27,193	0.0368	1,001	21,207	0.1590	3,372	32,595	0.1980	6,454	10,826	0.134	2,052	0	-192	0.189	-36	102
2021	246.2	89,863	40.2	14,673	206.0	75,190						2,384	0.114	8,543	10,927	1,926	80,994	27,193	0.0368	1,001	21,207	0.1590	3,372	32,595	0.1980	6,454	10,826	0.134	1,908	0	-101	0.176	-18	84
2022	246.2	89,863	40.2	14,673	206.0	75,190						2,384	0.114	8,543	10,927	1,792	80,994	27,193	0.0368	1,001	21,207	0.1590	3,372	32,595	0.1980	6,454	10,826	0.134	1,775	0	-101	0.164	-17	68
2023	246.2	89,863	40.2	14,673	206.0	75,190						2,384	0.114	8,543	10,927	1,667	80,994	27,193	0.0368	1,001	21,207	0.1590	3,372	32,595	0.1980	6,454	10,826	0.134	1,651	0	-101	0.153	-15	52
2024	246.2	89,863	40.2	14,673	206.0	75,190						2,384	0.114	8,543	10,927	1,551	80,994	27,193	0.0368	1,001	21,207	0.1590	3,372	32,595	0.1980	6,454	10,826	0.134	1,536	0	-101	0.142	-14	38
2025	246.2	89,863	40.2	14,673	206.0	75,190						2,384	0.114	8,543	10,927	1,442	80,994	27,193	0.0368	1,001	21,207	0.1590	3,372	32,595	0.1980	6,454	10,826	0.134	1,429	0	-101	0.132	-13	24
2026	246.2	89,863	40.2	14,673	206.0	75,190						2,384	0.114	8,543	10,927	1,342	80,994	27,193	0.0368	1,001	21,207	0.1590	3,372	32,595	0.1980	6,454	10,826	0.134	1,329	0	-101	0.123	-12	12
2027	246.2	89,863	40.2	14,673	206.0	75,190						2,384	0.114	8,543	10,927	1,248	80,994	27,193	0.0368	1,001	21,207	0.1590	3,372	32,595	0.1980	6,454	10,826	0.134	1,237	0	-101	0.114	-12	0
							17,569	31,623	49,192	17,526	1,353					159,195	2,368,412												120,734					0

EX-rate 40cym = 1us$

※Fixed tariff of water purchase & for consumers(unescalated)

	US$	/ SYM
- Tariff of base year		
water perches	$0.114	/ 4.54cym
tariff : GRP1	$0.037	/ 1.47cym
GRP2	$0.159	/ 6.36cym
GRP3	$0.198	/ 7.92cym

[O&Mcost]

up to year 1999 $0.0281 X Accounted -for water/m³

from year 2000 $0.0281 X Accounted -for water/m³ = $21,600,000 X 0.5%(item 5.1.1, 5.1.3)

T-U Basic Plan(phase-1)

	1)Operating Capa. (10^3×m³)		2)Expenditure					6)Revenue																
			3)Construction Cost 10^3×$			4)O&M cost 10^3×$	5)Total Expenditure 10^3×$	Accounter for water 10^3×m³						10)Selling price US$/m³	11)Water Revenue		14)Total Revenue 10^3×$	subsidize (C Cost×90%) 10^3×$	15) Rev-Exp 10^3×$	16) F.I.R.R. 46.921%	17) Present Value 10^3×$	18) Cumulative Total 10^3×$
								7)Vodokanal K2		8)Others		9)Total			12) Vodokanal K2	13) Others							
	Max. Daily	Annual Total	Local C.	Foreign C.	Total			Abs./Day	Total/Yr.	Abs./Day	Total/Yr.	Abs./Day	Total/Yr.										
1995	180.0	65,700						96.9	35,369	83.2	30,368	180.1	65,737										
1996	180.0	65,700						98.5	35,953	81.6	29,784	180.1	65,737										
1997	180.0	65,700						100.1	36,537	80.0	29,200	180.1	65,737										
1998	180.0	65,700	19,164	42,518	61,682	4,707	66,389	101.8	37,157	78.3	28,580	180.1	65,737	0.114	4,222	3,247	7,469	55,514	-3,406	0.681	-2,318	-2,318
1999	180.0	65,700	8,629	49,788	58,417	4,707	63,124	103.4	37,741	76.7	27,996	180.1	65,737	0.114	4,288	3,181	7,469	52,575	-3,079	0.463	-1,426	-3,745
2000	180.0	65,700	3,303	21,159	24,462	4,168	28,630	105.0	38,325	75.1	27,412	180.1	65,737	0.114	4,355	3,115	7,469	22,016	855	0.315	270	-3,475
2001	360.0	131,400				7,209	7,209	206.0	75,190	88.5	32,303	294.5	107,493	0.114	8,543	3,670	12,214	0	5,005	0.215	1,074	-2,401
2002	360.0	131,400				7,517	7,517	206.0	75,190	101.8	37,157	307.8	112,347	0.114	8,543	4,222	12,765	0	5,249	0.146	767	-1,634
2003	360.0	131,400				7,517	7,517	206.0	75,190	101.8	37,157	307.8	112,347	0.114	8,543	4,222	12,765	0	5,249	0.099	522	-1,112
2004	360.0	131,400				7,517	7,517	206.0	75,190	101.8	37,157	307.8	112,347	0.114	8,543	4,222	12,765	0	5,249	0.068	355	-757
2005	360.0	131,400				7,517	7,517	206.0	75,190	101.8	37,157	307.8	112,347	0.114	8,543	4,222	12,765	0	5,249	0.046	242	-515
2006	360.0	131,400				7,517	7,517	206.0	75,190	101.8	37,157	307.8	112,347	0.114	8,543	4,222	12,765	0	5,249	0.031	165	-351
2007	360.0	131,400				7,517	7,517	206.0	75,190	101.8	37,157	307.8	112,347	0.114	8,543	4,222	12,765	0	5,249	0.021	112	-239
2008	360.0	131,400				7,517	7,517	206.0	75,190	101.8	37,157	307.8	112,347	0.114	8,543	4,222	12,765	0	5,249	0.015	76	-162
2009	360.0	131,400				7,517	7,517	206.0	75,190	101.8	37,157	307.8	112,347	0.114	8,543	4,222	12,765	0	5,249	0.010	52	-110
2010	360.0	131,400				7,517	7,517	206.0	75,190	101.8	37,157	307.8	112,347	0.114	8,543	4,222	12,765	0	5,249	0.007	35	-75
2011	360.0	131,400				7,517	7,517	206.0	75,190	101.8	37,157	307.8	112,347	0.114	8,543	4,222	12,765	0	5,249	0.005	24	-51
2012	360.0	131,400				7,517	7,517	206.0	75,190	101.8	37,157	307.8	112,347	0.114	8,543	4,222	12,765	0	5,249	0.003	16	-35
2013	360.0	131,400				7,517	7,517	206.0	75,190	101.8	37,157	307.8	112,347	0.114	8,543	4,222	12,765	0	5,249	0.002	11	-24
2014	360.0	131,400				7,517	7,517	206.0	75,190	101.8	37,157	307.8	112,347	0.114	8,543	4,222	12,765	0	5,249	0.001	8	-16
2015	360.0	131,400				7,517	7,517	206.0	75,190	101.8	37,157	307.8	112,347	0.114	8,543	4,222	12,765	0	5,249	0.001	5	-11
2016	360.0	131,400				7,517	7,517	206.0	75,190	101.8	37,157	307.8	112,347	0.114	8,543	4,222	12,765	0	5,249	0.001	4	-7
2017	360.0	131,400				7,517	7,517	206.0	75,190	101.8	37,157	307.8	112,347	0.114	8,543	4,222	12,765	0	5,249	0.000	2	-5
2018	360.0	131,400				7,517	7,517	206.0	75,190	101.8	37,157	307.8	112,347	0.114	8,543	4,222	12,765	0	5,249	0.000	2	-3
2019	360.0	131,400				7,517	7,517	206.0	75,190	101.8	37,157	307.8	112,347	0.114	8,543	4,222	12,765	0	5,249	0.000	1	-2
2020	360.0	131,400				7,517	7,517	206.0	75,190	101.8	37,157	307.8	112,347	0.114	8,543	4,222	12,765	0	5,249	0.000	1	-1
2021	360.0	131,400				7,517	7,517	206.0	75,190	101.8	37,157	307.8	112,347	0.114	8,543	4,222	12,765	0	5,249	0.000	1	-1
2022	360.0	131,400				7,517	7,517	206.0	75,190	101.8	37,157	307.8	112,347	0.114	8,543	4,222	12,765	0	5,249	0.000	0	-1
2023	360.0	131,400				7,517	7,517	206.0	75,190	101.8	37,157	307.8	112,347	0.114	8,543	4,222	12,765	0	5,249	0.000	0	-0
2024	360.0	131,400				7,517	7,517	206.0	75,190	101.8	37,157	307.8	112,347	0.114	8,543	4,222	12,765	0	5,249	0.000	0	-0
2025	360.0	131,400				7,517	7,517	206.0	75,190	101.8	37,157	307.8	112,347	0.114	8,543	4,222	12,765	0	5,249	0.000	0	-0
2026	360.0	131,400				7,517	7,517	206.0	75,190	101.8	37,157	307.8	112,347	0.114	8,543	4,222	12,765	0	5,249	0.000	0	-0
2027	360.0	131,400				7,517	7,517	206.0	75,190	101.8	37,157	307.8	112,347	0.114	8,543	4,222	12,765	0	5,249	0.000	0	0
			31,096	113,465	144,561																0	

EX.-rate 40cym = 1us$

[O&Mcost] up to year 1999 $0.0716×ccounted -for water/m³
from year 2000 $0.0634×ccounted -for water/m³
from year 2001 $0.0634×ccounted -for water/m³+$78,750,000×0.5%(item 3.1.1, 3.1.2)

Table6.2.6(2) TU90%

Projection of Financial Statement

a) Table 6.2.2 Income Statement
b) Table 6.2.3 Cash Flow Statement
c) Table 6.2.4 Balance Sheet

for KKP, T-N, KZ, T-U

Rescheduled Project(FPP)
Case No.20
Sensitive Analysis

Table 6.12(R) PROJECTED INCOME STATEMENT (KKP)

UNIT:US $*$10^3$

Year	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Total Supply (m^3*10^3)	85,994	92,272	98,514	101,507	104,500	104,500	104,500	104,500	104,500	104,500	104,500	104,500	104,500	104,500	104,500
Accounted for Water (m^3*10^3)	77,417	83,038	88,659	91,360	94,061	94,061	94,061	94,061	94,061	94,061	94,061	94,061	94,061	94,061	94,061
Ave. Tariff ($ /m^3)	0.144	0.144	0.144	0.144	0.144	0.144	0.144	0.144	0.144	0.144	0.144	0.144	0.144	0.144	0.144
Water Sales	11,147	11,957	12,766	13,155	13,544	13,544	13,544	13,544	13,544	13,544	13,544	13,544	13,544	13,544	13,544
Other Revenues															
Subsidies	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Water Metering	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-Total Revenues-	11,147	11,957	12,766	13,155	13,544	13,544	13,544	13,544	13,544	13,544	13,544	13,544	13,544	13,544	13,544
Operational & Maintenance Cost															
Water Purchase	6,568	7,039	7,510	7,670	7,830	7,830	7,830	7,830	7,830	7,830	7,830	7,830	7,830	7,830	7,830
Electricity	1,198	1,285	1,372	1,414	1,456	1,456	1,456	1,456	1,456	1,456	1,456	1,456	1,456	1,456	1,456
Wages	569	610	652	671	691	691	691	691	691	691	691	691	691	691	691
Chemicals	252	270	288	297	306	306	306	306	306	306	306	306	306	306	306
Repair Fund	718	770	822	847	872	872	872	872	872	872	1,044	1,044	1,044	1,044	1,044
Social Ins.	228	245	262	270	277	277	277	277	277	277	277	277	277	277	277
Fuel & Gus	182	195	208	215	221	221	221	221	221	221	221	221	221	221	221
Others	1,413	1,516	1,618	1,667	1,718	1,718	1,718	1,718	1,718	1,718	1,718	1,718	1,718	1,718	1,718
-Total Costs-	11,128	11,930	12,732	13,051	13,371	13,371	13,371	13,371	13,371	13,371	13,543	13,543	13,543	13,543	13,543
Income Before Depreciation	19	27	34	104	173	173	173	173	173	173	1	1	1	1	1
Depreciation	149	149	149	149	149	1,029	1,029	1,029	1,029	1,029	1,029	1,029	1,029	1,029	1,029
Income Before Interest	-130	-122	-115	-45	24	-856	-856	-856	-856	-856	-1,028	-1,028	-1,028	-1,028	-1,028
Interest	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Net Income	-130	-122	-115	-45	24	-856	-856	-856	-856	-856	-1,028	-1,028	-1,028	-1,028	-1,028
Aggregated Net Income	-130	-252	-367	-412	-388	-1,244	-2,100	-2,956	-3,812	-4,668	-5,696	-6,724	-7,752	-8,780	-9,808

Note: 100% subsidies are considered.

Table 6.13(R) PROJECTED CASH FLOW STATEMENT (KKP)

UNIT:US $*10^3

Year	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Sources of Funds															
Income Before Depreciation	19	27	34	104	173	173	173	173	173	173	1	1	1	1	1
Foreign Loan	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Subsidies	7,041	7,041	7,041	7,041	7,041	0	0	0	0	0	0	0	0	0	0
-Total Sources of Funds-	7,060	7,068	7,075	7,145	7,214	173	173	173	173	173	1	1	1	1	1
Applications of Funds															
Investment in Project	7,041	7,041	7,041	7,041	7,041	0	0	0	0	0	0	0	0	0	0
Capitalized Interest	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
[Total Investment]	7,041	7,041	7,041	7,041	7,041	0	0	0	0	0	0	0	0	0	0
Interest(Soft Loan)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<Total Operational Interest>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Principal(Soft Loan)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<Total Principal Repayment>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
[Total Debt Services]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Working Capital Increase	3	1	1	12	12	0	0	0	0	0	-29	0	0	0	0
Cash & Other Current Assets	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Accounts Receivable	1,857	1,992	2,127	2,192	2,257	2,257	2,257	2,257	2,257	2,257	2,257	2,257	2,257	2,257	2,257
Reserves	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Accounts Payable	1,854	1,988	2,122	2,175	2,228	2,228	2,228	2,228	2,228	2,228	2,257	2,257	2,257	2,257	2,257
Customers Deposit	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-Total Applications of funds-	7,044	7,042	7,042	7,053	7,053	0	0	0	0	0	-29	0	0	0	0
Cash Surplus	16	26	33	92	161	173	173	173	173	173	30	1	1	1	1
Cumulative Cash Surplus	16	42	75	167	328	501	674	847	1,020	1,193	1,223	1,224	1,225	1,226	1,227
Cash Flow	16	26	33	92	161	173	173	173	173	173	30	1	1	1	1

Note: 100% subsidies are considered.

Table 6.14(R) PROJECTED BALANCE SHEET (KKP)

UNIT:US$ *10³

Year	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Fixed Asset	7,041	14,082	21,123	28,164	35,205	35,205	35,205	35,205	35,205	35,205	35,205	35,205	35,205	35,205	35,205
Depreciation	149	298	447	596	745	1,774	2,803	3,832	4,861	5,890	6,919	7,948	8,977	10,006	11,035
Net Fixed Asset	6,892	13,784	20,676	27,568	34,460	33,431	32,402	31,373	30,344	29,315	28,286	27,257	26,228	25,199	24,170
Current Asset	1,873	2,034	2,202	2,359	2,585	2,758	2,931	3,104	3,277	3,450	3,480	3,481	3,482	3,483	3,484
-Total Assets-	8,765	15,818	22,878	29,927	37,045	36,189	35,333	34,477	33,621	32,765	31,766	30,738	29,710	28,682	27,654
Capital Equity															
Government Grant	7,041	14,082	21,123	28,164	35,205	35,205	35,205	35,205	35,205	35,205	35,205	35,205	35,205	35,205	35,205
Operational Surplus	-130	-252	-367	-412	-388	-1,244	-2,100	-2,956	-3,812	-4,668	-5,696	-6,724	-7,752	-8,780	-9,808
-Total Equity-	6,911	13,830	20,756	27,752	34,817	33,961	33,105	32,249	31,393	30,537	29,509	28,481	27,453	26,425	25,397
Long Term Debt	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Current Liabilities	1,854	1,988	2,122	2,175	2,228	2,228	2,228	2,228	2,228	2,228	2,257	2,257	2,257	2,257	2,257
-Total Equity and Liabilities-	8,765	15,818	22,878	29,927	37,045	36,189	35,333	34,477	33,621	32,765	31,766	30,738	29,710	28,682	27,654

Note: 100% subsidies are considered.

Table 6.12(R) PROJECTED INCOME STATEMENT (T-N _)

UNIT:US$*10³

Year	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Total Supply (m^3*10^3)	62,050	62,050	62,050	62,050	62,050	62,050	62,050	62,050	62,050	62,050	62,050	62,050	62,050	62,050	62,050
Accounted for Water (m^3*10^3)	51,794	54,641	57,488	59,568	61,649	61,649	61,649	61,649	61,649	61,649	61,649	61,649	61,649	61,649	61,649
Ave. Tariff ($/$m^3$)	0.118	0.118	0.118	0.118	0.118	0.118	0.118	0.118	0.118	0.118	0.118	0.118	0.118	0.118	0.118
Water Sales	6,135	6,473	6,810	7,056	7,303	7,303	7,303	7,303	7,303	7,303	7,303	7,303	7,303	7,303	7,303
Other Revenues															
Subsidies	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Water Metering	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-Total Revenues-	6,135	6,473	6,810	7,056	7,303	7,303	7,303	7,303	7,303	7,303	7,303	7,303	7,303	7,303	7,303
Operational & Maintenance Cost															
Water Purchase	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Electricity	3,060	3,228	3,396	4,694	4,858	4,858	4,858	4,858	4,858	4,858	4,858	4,858	4,858	4,858	4,858
Wages	650	686	721	748	774	774	774	774	774	774	774	774	774	774	774
Chemicals	590	623	655	189	196	196	196	196	196	196	196	196	196	196	196
Repair Fund	218	229	241	389	398	398	398	398	398	398	398	398	398	398	398
Social Ins.	260	275	289	299	310	310	310	310	310	310	310	310	310	310	310
Fuel & Gus	290	306	322	334	345	345	345	345	345	345	345	345	345	345	345
Others	355	374	395	408	421	421	421	421	421	421	421	421	421	421	421
-Total Costs-	5,423	5,721	6,019	7,061	7,302	7,302	7,302	7,302	7,302	7,302	7,302	7,302	7,302	7,302	7,302
Income Before Depreciation	712	752	791	-5	1	1	1	1	1	1	1	1	1	1	1
Depreciation	351	351	351	2,594	2,594	2,594	2,594	2,594	2,594	2,594	2,594	2,594	2,594	2,594	2,594
Income Before Interest	361	401	440	-2,599	-2,593	-2,593	-2,593	-2,593	-2,593	-2,593	-2,593	-2,593	-2,593	-2,593	-2,593
Interest	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Net Income	361	401	440	-2,599	-2,593	-2,593	-2,593	-2,593	-2,593	-2,593	-2,593	-2,593	-2,593	-2,593	-2,593
Aggregated Net Income	361	762	1,202	-1,397	-3,990	-6,583	-9,176	-11,769	-14,362	-16,955	-19,548	-22,141	-24,734	-27,327	-29,920

Note: 100% subsidies are considered.

Table 6.13(R) PROJECTED CASH FLOW STATEMENT (T-N)

UNIT:US$ *10^3

Year	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Sources of Funds															
Income Before Depreciation	712	752	791	-5	1	1	1	1	1	1	1	1	1	1	1
Foreign Loan	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Subsidies	45,034	26,184	18,488												
-Total Sources of Funds-	45,746	26,936	19,279	-5	1	1	1	1	1	1	1	1	1	1	1
Applications of Funds															
Investment in Project	45,034	26,184	18,488	0	0	0	0	0	0	0	0	0	0	0	0
Capitalized Interest	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
[Total Investment]	45,034	26,184	18,488	0	0	0	0	0	0	0	0	0	0	0	0
Interest(Soft Loan)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<Total Operational Interest>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Principal(Soft Loan)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<Total Principal Repayment>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
[Total Debt Services]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Working Capital Increase	119	6	7	-132	0	0	0	0	0	0	0	0	0	0	0
Cash & Other Current Assets	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Accounts Receivable	1,022	1,078	1,135	1,176	1,217	1,217	1,217	1,217	1,217	1,217	1,217	1,217	1,217	1,217	1,217
Reserves	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Accounts Payable	903	953	1,003	1,176	1,217	1,217	1,217	1,217	1,217	1,217	1,217	1,217	1,217	1,217	1,217
Customers Deposit	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-Total Applications of funds-	45,153	26,190	18,495	-132	0	0	0	0	0	0	0	0	0	0	0
Cash Surplus	593	746	784	127	1	1	1	1	1	1	1	1	1	1	1
Cumulative Cash Surplus	593	1,339	2,123	2,250	2,251	2,252	2,253	2,254	2,255	2,256	2,257	2,258	2,259	2,260	2,261
Cash Flow	593	746	784	127	1	1	1	1	1	1	1	1	1	1	1

Note: 100% subsidies are considered.

Table 6.14(R) PROJECTED BALANCE SHEET (T-N)

UNIT:US $*10³

Year	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Fixed Asset	45,034	71,218	89,706	89,706	89,706	89,706	89,706	89,706	89,706	89,706	89,706	89,706	89,706	89,706	89,706
Depreciation	351	702	1,053	3,647	6,241	8,835	11,429	14,023	16,617	19,211	21,805	24,399	26,993	29,587	32,181
Net Fixed Asset	44,683	70,516	88,653	86,059	83,465	80,871	78,277	75,683	73,089	70,495	67,901	65,307	62,713	60,119	57,525
Current Asset	1,615	2,417	3,258	3,426	3,468	3,469	3,470	3,471	3,472	3,473	3,474	3,475	3,476	3,477	3,478
-Total Assets-	46,298	72,933	91,911	89,485	86,933	84,340	81,747	79,154	76,561	73,968	71,375	68,782	66,189	63,596	61,003
Capital Equity															
Government Grant	45,034	71,218	89,706	89,706	89,706	89,706	89,706	89,706	89,706	89,706	89,706	89,706	89,706	89,706	89,706
Operational Surplus	361	762	1,202	-1,397	-3,990	-6,583	-9,176	-11,769	-14,362	-16,955	-19,548	-22,141	-24,734	-27,327	-29,920
-Total Equity-	45,395	71,980	90,908	88,309	85,716	83,123	80,530	77,937	75,344	72,751	70,158	67,565	64,972	62,379	59,786
Long Term Debt	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Current Liabilities	903	953	1,003	1,176	1,217	1,217	1,217	1,217	1,217	1,217	1,217	1,217	1,217	1,217	1,217
-Total Equity and Liabilities-	46,298	72,933	91,911	89,485	86,933	84,340	81,747	79,154	76,561	73,968	71,375	68,782	66,189	63,596	61,003

Note: 100% subsidies are considered.

Rescheduled Project(FPP)
Case No.20
Sensitive Analysis

Table 6.12(R) PROJECTED INCOME STATEMENT (K Z)

UNIT:US $*10³

Year	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Total Supply (m^3*10^3)	61,138	61,393	61,649	89,863	91,360	91,360	91,360	91,360	91,360	91,360	91,360	91,360	91,360	91,360	91,360
Accounted for Water (m^3*10^3)	59,897	60,700	61,539	80,994	82,235	82,235	82,235	82,235	82,235	82,235	82,235	82,235	82,235	82,235	82,235
Ave. Tariff ($ /m^3)	0.090	0.090	0.090	0.090	0.090	0.090	0.090	0.090	0.090	0.090	0.090	0.090	0.090	0.090	0.090
Water Sales	5,402	5,474	5,550	7,305	7,417	7,417	7,417	7,417	7,417	7,417	7,417	7,417	7,417	7,417	7,417
Other Revenues															
Subsidies	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Water Metering	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-Total Revenues-	5,402	5,474	5,550	7,305	7,417	7,417	7,417	7,417	7,417	7,417	7,417	7,417	7,417	7,417	7,417
Operational & Maintenance Cost															
Water Purchase	2,518	2,535	2,552	5,037	5,105	5,105	5,105	5,105	5,105	5,105	5,105	5,105	5,105	5,105	5,105
Electricity	720	730	740	974	989	989	989	989	989	989	989	989	989	989	989
Wages	264	267	271	356	362	362	362	362	362	362	362	362	362	362	362
Chemicals	109	111	112	148	150	150	150	150	150	150	150	150	150	150	150
Repair Fund	228	231	234	308	312	312	312	312	312	312	402	402	402	402	402
Social Ins.	106	108	109	144	146	146	146	146	146	146	146	146	146	146	146
Fuel & Gus	76	77	78	103	105	105	105	105	105	105	105	105	105	105	105
Others	180	182	186	242	246	246	246	246	246	246	247	247	247	247	247
-Total Costs-	4,201	4,241	4,282	7,312	7,415	7,415	7,415	7,415	7,415	7,415	7,506	7,506	7,506	7,506	7,506
Income Before Depreciation	1,201	1,233	1,268	-7	2	2	2	2	2	2	-89	-89	-89	-89	-89
Depreciation	152	152	152	152	152	749	749	749	749	749	749	749	749	749	749
Income Before Interest	1,049	1,081	1,116	-159	-150	-747	-747	-747	-747	-747	-838	-838	-838	-838	-838
Interest	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Net Income	1,049	1,081	1,116	-159	-150	-747	-747	-747	-747	-747	-838	-838	-838	-838	-838
Aggregated Net Income	1,049	2,130	3,246	3,087	2,937	2,190	1,443	696	-51	-798	-1,636	-2,474	-3,312	-4,150	-4,988

Note: 100% subsidies are considered.

Table 6.13(R) PROJECTED CASH FLOW STATEMENT (K Z)

UNIT:US $ *10³

Year	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Sources of Funds															
Income Before Depreciation	1,201	1,233	1,268	-7	2	2	2	2	2	2	-89	-89	-89	-89	-89
Foreign Loan	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Subsidies	4,774	4,774	4,774	4,774	4,774	0	0	0	0	0	0	0	0	0	0
-Total Sources of Funds-	5,975	6,007	6,042	4,767	4,776	2	2	2	2	2	-89	-89	-89	-89	-89
Applications of Funds															
Investment in Project	4,774	4,774	4,774	4,774	4,774	0	0	0	0	0	0	0	0	0	0
Capitalized Interest	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
[Total Investment]	4,774	4,774	4,774	4,774	4,774	0	0	0	0	0	0	0	0	0	0
Interest(Soft Loan)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<Total Operational Interest>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Principal(Soft Loan)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<Total Principal Repayment>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
[Total Debt Services]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Working Capital Increase	200	6	6	-213	2	0	0	0	0	0	-16	0	0	0	0
Cash & Other Current Assets	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Accounts Receivable	900	912	925	1,217	1,236	1,236	1,236	1,236	1,236	1,236	1,236	1,236	1,236	1,236	1,236
Reserves	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Accounts Payable	700	706	713	1,218	1,235	1,235	1,235	1,235	1,235	1,235	1,251	1,251	1,251	1,251	1,251
Customers Deposit	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-Total Applications of funds-	4,974	4,780	4,780	4,561	4,776	0	0	0	0	0	-16	0	0	0	0
Cash Surplus	1,001	1,227	1,262	206	0	2	2	2	2	2	-73	-89	-89	-89	-89
Cumulative Cash Surplus	1,001	2,228	3,490	3,696	3,696	3,698	3,700	3,702	3,704	3,706	3,633	3,544	3,455	3,366	3,277
Cash Flow	1,001	1,227	1,262	206	0	2	2	2	2	2	-73	-89	-89	-89	-89

Note: 100% subsidies are considered.

Rescheduled Project(FPP)
Case No.20
Sensitive Analysis

Table 6.14(R) PROJECTED BALANCE SHEET (K Z)

UNIT:US$ *10^3

Year	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Fixed Asset	4,774	9,548	14,322	19,096	23,870	23,870	23,870	23,870	23,870	23,870	23,870	23,870	23,870	23,870	23,870
Depreciation	152	304	456	608	760	1,509	2,258	3,007	3,756	4,505	5,254	6,003	6,752	7,501	8,250
Net Fixed Asset	4,622	9,244	13,866	18,488	23,110	22,361	21,612	20,863	20,114	19,365	18,616	17,867	17,118	16,369	15,620
Current Asset	1,901	3,140	4,415	4,913	4,932	4,934	4,936	4,938	4,940	4,942	4,869	4,780	4,691	4,602	4,513
-Total Assets-	6,523	12,384	18,281	23,401	28,042	27,295	26,548	25,801	25,054	24,307	23,485	22,647	21,809	20,971	20,133
Capital Equity															
Government Grant	4,774	9,548	14,322	19,096	23,870	23,870	23,870	23,870	23,870	23,870	23,870	23,870	23,870	23,870	23,870
Operational Surplus	1,049	2,130	3,246	3,087	2,937	2,190	1,443	696	-51	-798	-1,636	-2,474	-3,312	-4,150	-4,988
-Total Equity-	5,823	11,678	17,568	22,183	26,807	26,060	25,313	24,566	23,819	23,072	22,234	21,396	20,558	19,720	18,882
Long Term Debt	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Current Liabilities	700	706	713	1,218	1,235	1,235	1,235	1,235	1,235	1,235	1,251	1,251	1,251	1,251	1,251
-Total Equity and Liabilities-	6,523	12,384	18,281	23,401	28,042	27,295	26,548	25,801	25,054	24,307	23,485	22,647	21,809	20,971	20,133

Note: 100% subsidies are considered.

Table 6.12(R) PROJECTED INCOME STATEMENT (T-U)

UNIT:US$ *10^3

Year	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Total Supply (m^3*10^3)	65,700	65,700	65,700	131,400	131,400	131,400	131,400	131,400	131,400	131,400	131,400	131,400	131,400	131,400	131,400
Accounted for Water (m^3*10^3)	65,737	65,737	65,737	105,084	108,186	108,186	108,186	108,186	108,186	108,186	108,186	108,186	108,186	108,186	108,186
Ave. Tariff ($ /m^3)	0.067	0.067	0.067	0.067	0.067	0.067	0.067	0.067	0.067	0.067	0.067	0.067	0.067	0.067	0.067
Water Sales	4,382	4,382	4,382	7,005	7,212	7,212	7,212	7,212	7,212	7,212	7,212	7,212	7,212	7,212	7,212
Other Revenues															
Subsidies	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Water Metering	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-Total Revenues-	4,382	4,382	4,382	7,005	7,212	7,212	7,212	7,212	7,212	7,212	7,212	7,212	7,212	7,212	7,212
Operational & Maintenance Cost															
Water Purchase	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Electricity	2,641	2,641	2,641	4,222	4,346	4,346	4,346	4,346	4,346	4,346	4,346	4,346	4,346	4,346	4,346
Wages	455	455	455	728	749	749	749	749	749	749	749	749	749	749	749
Chemicals	749	749	209	334	343	343	343	343	343	343	343	343	343	343	343
Repair Fund	181	181	181	605	614	614	614	614	614	614	614	614	614	614	614
Social Ins.	182	182	182	292	300	300	300	300	300	300	300	300	300	300	300
Fuel & Gus	294	294	294	470	484	484	484	484	484	484	484	484	484	484	484
Others	205	205	745	328	339	339	339	339	339	339	339	339	339	339	339
-Total Costs-	4,707	4,707	4,707	6,979	7,175	7,175	7,175	7,175	7,175	7,175	7,175	7,175	7,175	7,175	7,175
Income Before Depreciation	-325	-325	-325	26	37	37	37	37	37	37	37	37	37	37	37
Depreciation	213	213	213	213	213	3,439	3,439	3,439	3,439	3,439	3,439	3,439	3,439	3,439	3,439
Income Before Interest	-538	-538	-538	-187	-176	-3,402	-3,402	-3,402	-3,402	-3,402	-3,402	-3,402	-3,402	-3,402	-3,402
Interest	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Net Income	-538	-538	-538	-187	-176	-3,402	-3,402	-3,402	-3,402	-3,402	-3,402	-3,402	-3,402	-3,402	-3,402
Aggregated Net Income	-538	-1,076	-1,614	-1,801	-1,977	-5,379	-8,781	-12,183	-15,585	-18,987	-22,389	-25,791	-29,193	-32,595	-35,997

Note: 100% subsidies are considered.

Table 6.13(R) PROJECTED CASH FLOW STATEMENT (T-U)

UNIT:US$*10^3

Year	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Sources of Funds															
Income Before Depreciation	-325	-325	-325	26	37	37	37	37	37	37	37	37	37	37	37
Foreign Loan	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Subsidies	29,003	61,957	24,909	8,068	5,121										
-Total Sources of Funds-	28,678	61,632	24,584	8,094	5,158	37	37	37	37	37	37	37	37	37	37
Applications of Funds															
Investment in Project	29,003	61,957	24,909	8,068	5,121	0	0	0	0	0	0	0	0	0	0
Capitalized Interest	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
[Total Investment]	29,003	61,957	24,909	8,068	5,121	0	0	0	0	0	0	0	0	0	0
Interest(Soft Loan)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<Total Operational Interest>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Principal(Soft Loan)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<Total Principal Repayment>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
[Total Debt Services]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Working Capital Increase	-54	0	0	58	3	0	0	0	0	0	0	0	0	0	0
Cash & Other Current Assets	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Accounts Receivable	730	730	730	1,167	1,202	1,202	1,202	1,202	1,202	1,202	1,202	1,202	1,202	1,202	1,202
Reserves	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Accounts Payable	784	784	784	1,163	1,195	1,195	1,195	1,195	1,195	1,195	1,195	1,195	1,195	1,195	1,195
Customers Deposit	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-Total Applications of funds-	28,949	61,957	24,909	8,126	5,124	0	0	0	0	0	0	0	0	0	0
Cash Surplus	-271	-325	-325	-32	34	37	37	37	37	37	37	37	37	37	37
Cumulative Cash Surplus	-271	-596	-921	-953	-919	-882	-845	-808	-771	-734	-697	-660	-623	-586	-549
Cash Flow	-271	-325	-325	-32	34	37	37	37	37	37	37	37	37	37	37

Note: 100% subsidies are considered.

Table 6.14(R) PROJECTED BALANCE SHEET (T-U)

UNIT:US $*10^3

Year	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Fixed Asset	29,003	90,960	115,869	123,937	129,058	129,058	129,058	129,058	129,058	129,058	129,058	129,058	129,058	129,058	129,058
Depreciation	213	426	639	852	1,065	4,504	7,943	11,382	14,821	18,260	21,699	25,138	28,577	32,016	35,455
Net Fixed Asset	28,790	90,534	115,230	123,085	127,993	124,554	121,115	117,676	114,237	110,798	107,359	103,920	100,481	97,042	93,603
Current Asset	459	134	-191	214	283	320	357	394	431	468	505	542	579	616	653
-Total Assets-	29,249	90,668	115,039	123,299	128,276	124,874	121,472	118,070	114,668	111,266	107,864	104,462	101,060	97,658	94,256
Capital Equity															
Government Grant	29,003	90,960	115,869	123,937	129,058	129,058	129,058	129,058	129,058	129,058	129,058	129,058	129,058	129,058	129,058
Operational Surplus	-538	-1,076	-1,614	-1,801	-1,977	-5,379	-8,781	-12,183	-15,585	-18,987	-22,389	-25,791	-29,193	-32,595	-35,997
-Total Equity-	28,465	89,884	114,255	122,136	127,081	123,679	120,277	116,875	113,473	110,071	106,669	103,267	99,865	96,463	93,061
Long Term Debt	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Current Liabilities	784	784	784	1,163	1,195	1,195	1,195	1,195	1,195	1,195	1,195	1,195	1,195	1,195	1,195
-Total Equity and Liabilities-	29,249	90,668	115,039	123,299	128,276	124,874	121,472	118,070	114,668	111,266	107,864	104,462	101,060	97,658	94,256

Note: 100% subsidies are considered.

Table 6.15. Economic Construction Cost(Case 2)

(UNIT: 10^3×US$)

	T - N				T - U				⑤Total	KKP			KZ			⑧ Total	⑨Total
	① Construction Cost			② Net ※ Investment for VK/KKP	③ Construction Cost			④Net ※ Investment for VK/KZ		⑥ Construction Cost			⑦ Construction Cost				Economic Construction cost
	Local ×0.8(S.E.P)	Foreign	Total	①×0.830	Local ×0.8(S.E.P)	Foreign	Total	③×0.614	②+④	Local ×0.8(S.E.P)	Foreign	Total	Local ×0.8(S.E.P)	Foreign	Total		⑤+⑧
1998	16,806	24,026	40,832	33,891	11,914	14,111	26,025	15,979	49,870	3,136	3,121	6,257	2,162	2,072	4,234	10,491	60,361
1999	2,906	22,551	25,457	21,130	7,127	53,048	60,175	36,948	58,077	3,136	3,121	6,257	2,162	2,072	4,234	10,491	68,568
2000	2,262	15,661	17,923	14,876	2,658	21,586	24,244	14,886	29,762	3,136	3,121	6,257	2,162	2,072	4,234	10,491	40,252
2001	0	0	0	0	617	7,297	7,914	4,859	4,859	3,136	3,121	6,257	2,162	2,072	4,234	10,491	15,350
2002	0	0	0	0	486	4,513	4,999	3,070	3,070	3,136	3,121	6,257	2,162	2,072	4,234	10,491	13,560
2003	12,610	24,669	37,279	30,942	0	0	0	0	30,942	4,142	16,199	20,341	3,146	16,844	19,990	40,331	71,273
2004	7,366	57,490	64,856	53,830	0	0	0	0	53,830	3,812	10,686	14,498	2,354	3,252	5,606	20,104	73,935
2005	5,838	49,114	54,952	45,610	1,598	9,745	11,343	6,964	52,575	3,253	6,153	9,406	2,316	6,097	8,413	17,819	70,394
2006	477	3,168	3,645	3,025	477	3,166	3,643	2,237	5,262	3,136	3,121	6,257	2,162	2,072	4,234	10,491	15,752
2007										3,136	3,121	6,257	2,162	2,072	4,234	10,491	10,491
2008										3,136	3,121	6,257	2,162	2,072	4,234	10,491	10,491
2009										3,136	3,121	6,257	2,162	2,072	4,234	10,491	10,491
2010										3,136	3,095	6,231	2,162	2,072	4,234	10,465	10,465
Total	48,266	196,679	244,945	203,304	24,877	113,466	138,343	84,942	288,246	42,566	64,222	106,788	29,433	46,913	76,346	183,134	471,381

※Note: Investment cost only for the "urban"area (Vodokanals) calculated by the assumed proportional volume of AFW in 2010 year.

Table 6.16. Economic Cost (O.&M)(Case 2)

(UNIT: 10⁶ X US$)

	DOMWP											Vodokanal											
	Y - N					Y - U					I	K/P					KZ					II	I + II
	A)with project		B)without project		A)-B)	C)with project		D)without project		C)-D)	Sub Total	A)with project		B)without project		A)-B)	C)with project		D)without project		C)-D)	Sub Total	Total
	AFW	O&M Cost	AFW	O&M Cost	X 10⁶ US$	AFW	O&M Cost	AFW	O&M Cost	X 10⁶ US$		AFW	O&M Cost	AFW	O&M Cost	X 10⁶ US$	AFW	O&M Cost	AFW	O&M Cost	X 10⁶ US$		incremental cost
1998	41,610	4,357	41,610	4,357	0	34,018	2,436	33,288	2,383	52	52	77,380	4,558	77,380	4,558	0	59,824	1,681	59,824	1,681	0	0	52
1999	44,749	4,685	44,749	4,685	0	34,237	2,451	33,286	2,383	68	68	83,038	4,891	83,038	4,891	0	60,663	1,705	60,663	1,705	0	0	68
2000	47,852	5,010	47,852	5,010	0	34,456	2,165	33,288	2,383	-199	-199	88,659	5,222	88,659	5,222	0	61,466	1,727	61,466	1,727	0	0	-199
2001	48,764	5,805	48,764	5,106	700	68,000	4,627	33,288	2,383	2,244	2,944	91,360	5,381	91,360	5,381	0	60,884	2,273	60,663	1,705	568	568	3,512
2002	49,640	5,907	49,640	5,197	710	68,912	4,685	33,288	2,383	2,302	3,011	94,061	5,540	94,061	5,540	0	62,235	2,311	59,933	1,684	627	627	3,638
2003	48,947	5,826	48,947	5,125	702	69,861	4,745	33,288	2,383	2,362	3,064	94,170	5,547	94,170	5,547	0	63,622	2,350	59,203	1,664	686	686	3,750
2004	47,961	5,712	48,947	5,125	587	70,810	4,806	33,288	2,383	2,422	3,009	93,732	5,521	93,732	5,521	0	64,936	2,387	58,546	1,645	742	742	3,751
2005	46,976	5,597	48,947	5,125	473	71,723	4,863	33,288	2,383	2,480	2,953	93,331	5,497	93,331	5,497	0	66,286	2,425	57,889	1,627	798	798	3,751
2006	77,855	12,066	48,947	5,125	6,941	72,599	4,919	33,288	2,383	2,536	9,477	105,011	6,315	92,783	5,465	850	67,673	2,572	57,086	1,604	967	1,817	11,294
2007	79,680	12,694	48,947	5,125	7,569	73,475	5,052	33,288	2,383	2,669	10,238	107,967	6,489	92,272	5,435	1,054	69,060	2,611	56,356	1,584	1,027	2,081	12,318
2008	81,432	12,962	48,947	5,125	7,837	74,351	5,108	33,288	2,383	2,724	10,562	110,867	6,833	91,834	5,409	1,424	90,411	2,739	55,626	1,563	1,176	2,600	13,162
2009	83,220	13,236	48,947	5,125	8,111	74,898	5,142	33,288	2,383	2,759	10,870	113,864	7,007	91,396	5,383	1,624	91,542	2,771	54,933	1,544	1,227	2,851	13,722
2010	84,972	13,504	48,947	5,125	8,380	72,562	4,994	33,288	2,383	2,611	10,991	116,800	7,182	90,995	5,360	1,822	90,447	2,740	54,276	1,525	1,215	3,037	14,027
2011	84,972	13,504	48,947	5,125	8,380	72,562	4,994	33,288	2,383	2,611	10,991	116,800	7,182	90,995	5,360	1,822	90,447	2,740	54,276	1,525	1,215	3,037	14,027
2012	84,972	13,504	48,947	5,125	8,380	72,562	4,994	33,288	2,383	2,611	10,991	116,800	7,182	90,995	5,360	1,822	90,447	2,740	54,276	1,525	1,215	3,037	14,027
2013	84,972	13,504	48,947	5,125	8,380	72,562	4,994	33,288	2,383	2,611	10,991	116,800	7,182	90,995	5,360	1,822	90,447	2,740	54,276	1,525	1,215	3,037	14,027
2014	84,972	13,504	48,947	5,125	8,380	72,562	4,994	33,288	2,383	2,611	10,991	116,800	7,182	90,995	5,360	1,822	90,447	2,740	54,276	1,525	1,215	3,037	14,027
2015	84,972	13,504	48,947	5,125	8,380	72,562	4,994	33,288	2,383	2,611	10,991	116,800	7,182	90,995	5,360	1,822	90,447	2,740	54,276	1,525	1,215	3,037	14,027
2016	84,972	13,504	48,947	5,125	8,380	72,562	4,994	33,288	2,383	2,611	10,991	116,800	7,182	90,995	5,360	1,822	90,447	2,740	54,276	1,525	1,215	3,037	14,027
2017	84,972	13,504	48,947	5,125	8,380	72,562	4,994	33,288	2,383	2,611	10,991	116,800	7,182	90,995	5,360	1,822	90,447	2,740	54,276	1,525	1,215	3,037	14,027
2018	84,972	13,504	48,947	5,125	8,380	72,562	4,994	33,288	2,383	2,611	10,991	116,800	7,182	90,995	5,360	1,822	90,447	2,740	54,276	1,525	1,215	3,037	14,027
2019	84,972	13,504	48,947	5,125	8,380	72,562	4,994	33,288	2,383	2,611	10,991	116,800	7,182	90,995	5,360	1,822	90,447	2,740	54,276	1,525	1,215	3,037	14,027
2020	84,972	13,504	48,947	5,125	8,380	72,562	4,994	33,288	2,383	2,611	10,991	116,800	7,182	90,995	5,360	1,822	90,447	2,740	54,276	1,525	1,215	3,037	14,027
2021	84,972	13,504	48,947	5,125	8,380	72,562	4,994	33,288	2,383	2,611	10,991	116,800	7,182	90,995	5,360	1,822	90,447	2,740	54,276	1,525	1,215	3,037	14,027
2022	84,972	13,504	48,947	5,125	8,380	72,562	4,994	33,288	2,383	2,611	10,991	116,800	7,182	90,995	5,360	1,822	90,447	2,740	54,276	1,525	1,215	3,037	14,027
2023	84,972	13,504	48,947	5,125	8,380	72,562	4,994	33,288	2,383	2,611	10,991	116,800	7,182	90,995	5,360	1,822	90,447	2,740	54,276	1,525	1,215	3,037	14,027
2024	84,972	13,504	48,947	5,125	8,380	72,562	4,994	33,288	2,383	2,611	10,991	116,800	7,182	90,995	5,360	1,822	90,447	2,740	54,276	1,525	1,215	3,037	14,027
2025	84,972	13,504	48,947	5,125	8,380	72,562	4,994	33,288	2,383	2,611	10,991	116,800	7,182	90,995	5,360	1,822	90,447	2,740	54,276	1,525	1,215	3,037	14,027
2026	84,972	13,504	48,947	5,125	8,380	72,562	4,994	33,288	2,383	2,611	10,991	116,800	7,182	90,995	5,360	1,822	90,447	2,740	54,276	1,525	1,215	3,037	14,027
2027	84,972	13,504	48,947	5,125	8,380	72,562	4,994	33,288	2,383	2,611	10,991	116,800	7,182	90,995	5,360	1,822	90,447	2,740	54,276	1,525	1,215	3,037	14,027
Total	2,226,179	336,937	1,456,277	152,472	184,465	2,053,454	140,915	998,640	71,503	69,412	253,878	3,255,837	198,068	2,721,915	160,321	37,747	2,586,646	76,871	1,679,146	47,184	29,687	67,434	321,311

Table6.17 Economic Benefit(Case 2)

(UNIT:10³XUS$)

	KKP					KZ					Total
	A)with project		B)without project		A)-B) Incremental water revenue	C)with project		D)without project		C)-D) Incremental water revenue	
Case 1	AFW	Revenue	AFW	Revenue		AFW	Revenue	AFW	Revenue		
1998	55,699	10,343	54,166	10,059	285	47,158	5,593	45,479	5,394	199	484
1999	61,466	11,414	54,166	10,059	1,356	49,531	5,874	46,173	5,476	398	1,754
2000	66,503	12,350	54,166	10,059	2,291	51,210	17,411	46,793	5,550	11,862	14,153
2001	69,460	25,631	54,166	10,059	15,572	68,292	23,219	46,173	5,476	17,743	33,315
2002	72,453	26,735	54,166	10,059	16,676	70,336	23,914	45,552	5,402	18,512	35,188
2003	71,504	26,385	54,166	10,059	16,326	72,453	24,634	45,005	5,338	19,296	35,622
2004	72,416	26,722	54,166	10,059	16,663	74,570	25,354	44,457	5,273	20,081	36,744
2005	73,000	26,937	54,166	10,059	16,878	76,723	26,086	43,946	5,212	20,874	37,752
2006	85,082	31,395	54,166	10,059	21,336	78,913	26,830	43,289	5,134	21,696	43,033
2007	88,549	32,675	54,166	10,059	22,616	81,140	27,587	42,669	5,060	22,527	45,143
2008	92,053	33,968	54,166	10,059	23,909	83,366	28,344	42,085	4,991	23,353	47,262
2009	95,630	35,287	54,166	10,059	25,229	87,819	29,858	41,574	4,931	24,928	50,157
2010	99,280	36,634	54,166	10,059	26,576	87,162	29,635	41,026	4,866	24,769	51,345
2011	99,280	36,634	54,166	10,059	26,576	87,162	29,635	41,026	4,866	24,769	51,345
2012	99,280	36,634	54,166	10,059	26,576	87,162	29,635	41,026	4,866	24,769	51,345
2013	99,280	36,634	54,166	10,059	26,576	87,162	29,635	41,026	4,866	24,769	51,345
2014	99,280	36,634	54,166	10,059	26,576	87,162	29,635	41,026	4,866	24,769	51,345
2015	99,280	36,634	54,166	10,059	26,576	87,162	29,635	41,026	4,866	24,769	51,345
2016	99,280	36,634	54,166	10,059	26,576	87,162	29,635	41,026	4,866	24,769	51,345
2017	99,280	36,634	54,166	10,059	26,576	87,162	29,635	41,026	4,866	24,769	51,345
2018	99,280	36,634	54,166	10,059	26,576	87,162	29,635	41,026	4,866	24,769	51,345
2019	99,280	36,634	54,166	10,059	26,576	87,162	29,635	41,026	4,866	24,769	51,345
2020	99,280	36,634	54,166	10,059	26,576	87,162	29,635	41,026	4,866	24,769	51,345
2021	99,280	36,634	54,166	10,059	26,576	87,162	29,635	41,026	4,866	24,769	51,345
2022	99,280	36,634	54,166	10,059	26,576	87,162	29,635	41,026	4,866	24,769	51,345
2023	99,280	36,634	54,166	10,059	26,576	87,162	29,635	41,026	4,866	24,769	51,345
2024	99,280	36,634	54,166	10,059	26,576	87,162	29,635	41,026	4,866	24,769	51,345
2025	99,280	36,634	54,166	10,059	26,576	87,162	29,635	41,026	4,866	24,769	51,345
2026	99,280	36,634	54,166	10,059	26,576	87,162	29,635	41,026	4,866	24,769	51,345
2027	99,280	36,634	54,166	10,059	26,576	87,162	29,635	41,026	4,866	24,769	51,345
Total	2,690,853	959,258	1,624,980	301,759	657,500	2,410,424	798,137	1,271,660	150,819	647,318	1,304,818

Table6.18 EIRR CALCLATION(Case 2)

(UNIT: 10^3XUS$)

	①Economic Construction Cost		②Economic O&M Cost (Incremental)		③Total Economic cost	④ Economic Benefit		⑤ Total Eco.Benefit	⑥ Bene.- Cost	EIRR 7.78%	Present Value
	DOMIWP	Vodokanal									
	T-N + T-U	KKP + KZ	T-N + T-U	KKP + KZ	① + ②	KKP	KZ				
1998	49,870	10,491	52	0	60,413	285	199	484	-59,929	0.928	-55,602
1999	58,077	10,491	68	0	68,636	1,356	398	1,754	-66,882	0.861	-57,572
2000	29,762	10,491	-199	0	40,054	2,291	11,862	14,153	-25,901	0.799	-20,686
2001	4,859	10,491	2,944	568	18,861	15,572	17,743	33,315	14,454	0.741	10,710
2002	3,070	10,491	3,011	627	17,198	16,676	18,512	35,188	17,990	0.687	12,368
2003	30,942	40,331	3,064	686	75,023	16,326	19,296	35,622	-39,400	0.638	-25,131
2004	53,830	20,104	3,009	742	77,685	16,663	20,081	36,744	-40,941	0.592	-24,229
2005	52,575	17,819	2,953	798	74,144	16,878	20,874	37,752	-36,392	0.549	-19,982
2006	5,262	10,491	9,477	1,817	27,047	21,336	21,696	43,033	15,986	0.509	8,144
2007		10,491	10,238	2,081	22,809	22,616	22,527	45,143	22,334	0.473	10,556
2008		10,491	10,562	2,600	23,652	23,909	23,353	47,262	23,610	0.439	10,353
2009		10,491	10,870	2,851	24,212	25,229	24,928	50,157	25,944	0.407	10,556
2010		10,465	10,991	3,037	24,492	26,576	24,769	51,345	26,853	0.377	10,136
2011			10,991	3,037	14,027	26,576	24,769	51,345	37,318	0.350	13,069
2012			10,991	3,037	14,027	26,576	24,769	51,345	37,318	0.325	12,126
2013			10,991	3,037	14,027	26,576	24,769	51,345	37,318	0.301	11,250
2014			10,991	3,037	14,027	26,576	24,769	51,345	37,318	0.280	10,438
2015			10,991	3,037	14,027	26,576	24,769	51,345	37,318	0.260	9,684
2016			10,991	3,037	14,027	26,576	24,769	51,345	37,318	0.241	8,985
2017			10,991	3,037	14,027	26,576	24,769	51,345	37,318	0.223	8,336
2018			10,991	3,037	14,027	26,576	24,769	51,345	37,318	0.207	7,734
2019			10,991	3,037	14,027	26,576	24,769	51,345	37,318	0.192	7,176
2020			10,991	3,037	14,027	26,576	24,769	51,345	37,318	0.178	6,658
2021			10,991	3,037	14,027	26,576	24,769	51,345	37,318	0.166	6,177
2022			10,991	3,037	14,027	26,576	24,769	51,345	37,318	0.154	5,731
2023			10,991	3,037	14,027	26,576	24,769	51,345	37,318	0.142	5,317
2024			10,991	3,037	14,027	26,576	24,769	51,345	37,318	0.132	4,933
2025			10,991	3,037	14,027	26,576	24,769	51,345	37,318	0.123	4,577
2026			10,991	3,037	14,027	26,576	24,769	51,345	37,318	0.114	4,247
2027			10,991	3,037	14,027	26,576	24,769	51,345	37,318	0.106	3,940
Total	288,246	183,134	253,878	67,434	792,692	657,500	647,318	1,304,818	512,126		0

G. INITIAL ENVIRONMENTAL EXAMINATION BY UZBEK SIDE

Environmental Matrix

Project Sector \ Environmental Element		Social environment									Natural conditions								Pollution					
		1. Resettlement	2. Economic activities	3. Traffic / public facilities	4. Area separation	5. Archaeological treasures	6. Water right	7. Public health	8. Solid waste	9. Risk of disaster	10. Topography / geography	11. Soil erosion	12. Groundwater	13. Lakes and rivers	14. Coastal and sea area	15. Flora and Fauna	16. Weather	17. Landscape	18. Air pollution	19. Water pollution	20. Soil pollution	21. Noise and vibration	22. Ground subsidence	23. Offensive odor
Single Project	1. Port and Bay area	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
	2. Airport	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
	3. Roads	○	◎	◎	○	○	–	○	○	○	○	–	○	–	–	○	○	○	○	–	○	○	–	–
	4. Railways	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
	5. Rivers, erosion and torrent control	–	○	○	○	–	○	◎	○	○	○	○	○	◎	–	○	○	○	–	◎	○	○	–	–
	6. Waste, garbage control	–	○	◎	○	○	–	◎	◎	○	○	○	–	–	–	○	–	○	○	○	◎	○	–	○
	7. Sewerage	○	◎	○	○	○	○	◎	○	○	○	○	○	○	–	○	○	○	○	◎	○	–	–	○
	8. Underground water development	–	○	○	–	–	○	○	○	–	–	–	◎	–	–	–	–	–	–	–	–	–	○	–
	9. Water Supply	–	◎	○	–	○	◎	◎	○	–	○	–	○	○	–	–	–	○	–	◎	○	–	–	–
Complex Project	10. Regional development plan	○	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
	11. Tourism	–	○	○	–	◎	–	○	○	–	–	–	–	○	–	○	–	○	○	–	–	○	–	–
	12. Transport	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
	13. Urban transportation utilities	○	◎	○	○	○	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–

Note: ◎ : significant influential factors, ○ : influential factors, – : non-influential factors

Environmental Matrix

major development facilities related to a planning \ Environmental Element			Social environment									Natural conditions								Pollution					
			1. Resettlement	2. Economic activities	3. Traffic / public facilities	4. Area separation	5. Archaeological treasures	6. Water right	7. Public health	8. Solid waste	9. Risk of disaster	10. Topography / geography	11. Soil erosion	12. Groundwater	13. Lakes and rivers	14. Coastal and sea area	15. Flora and Fauna	16. Weather	17. Landscape	18. Air pollution	19. Water pollution	20. Soil pollution	21. Noise and vibration	22. Ground subsidence	23. Offensive odor
Water Intake	Overall		–	○	○	–	–	○	○	–	–	–	–	○	–	–	–	–	○	–	○	–	–	–	–
Raw Water Transmission	Construction Phase	Topographical changes' Expand of living territory	○	○	–	○	–	○	–	–	–	○	○	○	–	–	–	–	○	–	–	–	–	–	–
Water Treatment	Construction Phase	Commissioning of structures, machines and transport facilities	–	○	○	○	–	–	○	–	○	–	–	–	–	–	○	–	–	–	○	–	–	–	–
Treated Water Transmission	Operation Phase	Expand of living territory	–	○	○	–	–	○	○	○	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Water Distribution	Operation Phase	Using of mechanisms, tools, instruments	–	○	○	–	–	○	○	○	○	–	–	○	○	–	○	○	○	–	○	○	○	–	–

Note: ○ : influential factors, – : non-influential factors

General Features of IEE & EIA projects

Denomination	Description
1. Name of the Project	Study on water supply system in six citites of the Aral Sea region in Uzbekistan
2. General provisions	Incomplete rate of population served by high quality water supply
3. Objectives	Drinking water quality improvment and feasability study
4. Location area, geographical conditions	Study area is located in the North-West of Republic of Uzbekistan
5. Initiator (organisation) of project developing	Republic of Uzbekistan, MPU and SCNP of Republic of Uzbekistan.
6. Population which will get benefit	1,485.6 ths. people
7. Main planning objectives	Investigation, F/S, construction, commissioning
8. Content of the projects	Investigations and F/S
9. Project specifications	
10. Water sources, water quality	Kaparas reservoir - water supply source
11. Water intake and supply facility	Pumping stations, drinking water pipelines to the consumers
12. Water treatment plant. Process.	Coagulation, sedimentation, Filtration and desinfection
13. Distribution nodes	Water main pipelines
14. Auxialary equipment	Utilisation of water treatment waste products
15. The problems to be highlighted specially	Finding money for project implementation

General Description should be framed by existing information.

Status of the project in relation to the territory

Denomination	Description	
Project name	Study on water supply system in six citites of the Aral Sea region in Uzbekistan	
Occupation of local population	Agricultural activity	
Socio-demografic pattern in Karakalpakstan in Khorezm	Karakalpakstan 32.3% - Karakalpaks, 32,8 %- Uzbeks, 26.7%- Kazakhs and others	Khorezm 95% Uzbeks and others
Water and power supply	Water supply from wells, reservoir, mainly from the surface sources as well as from the local underground lenses	
Sanitation and hygiene condtions. Health condition and infectious deseases	Poor sanitation and hygiene condtions, incresisng of morbidity.	
Geological/topogrphy conditions	Located in Central Asia in the North-West of Uzbekistan	
Meteorogical conditions, lake water, river water, underground water, precipitations .	Amudarya river, Tuyamuyun reservoir, lakes	
Flora and fauna,	Inhabited terrritory in past and present	
Public opinion.	Complaints of inhabitants for environment has changed. Ground soiling. Low quality potable water, increasing morbidity	
How to resolve the problems, what kind of measures are taken by the Government, what kind of subsidies are granted?	High quality water supply program	

The problems to be approached specially:

1. To provide 100% of population with high quality potable water
2. Improving of sanitation and hygiene standards of living conditions
3. Improving of socio-economical conditions

Evaluation matrix of interlinks

		Social environvent									Natural conditions													
		1. Possibility of peoples migration	2. Economical activities, living conditions	3.Everyday transportation conditions	4. Reductions in social environment	5. Historical places and places of interest	6. Conflicts on water usage and rights	7. 'Hygiene conditions, sanitation	8. 'Solid waste	9. Risk of disaster and calamity	10. 'Topographical and geotogical conditions	11.Soil erosion	12. Underground lenses	13. Lakes, rivers, surface waters condition	14. A sea and seaside	15. Flora and fauna	16. Weather and climate	17. Landscape, scenery	18. Air pollution	19. Water pollution	20. Soil pollution	21. Noise, vibration	22. Ground sagging, bad odour	23. Mal- odour, exhausted gases, generation of substancies having mal-odour
Single projects	Change of topographical conditions	+	Δ	Δ	-	-	+	-	Δ	Δ	+	-	-	Δ	+	+	-	Δ	Δ	Δ	Δ	Δ	-	-
	2. Airport	+	Δ	Δ	Δ	-	-	Δ	Δ	-	Δ	-	-	-	-	+	-	Δ	+	Δ	-	+	-	Δ
	3. Roads	+	Δ	-	Δ	-	Δ	-	Δ	-	Δ	Δ	-	-	-	+	-	Δ	+	-	-	+	-	-
	4. Railways	+	Δ	-	Δ	Δ	-	-	Δ	Δ	Δ	Δ	-	-	-	+	-	Δ	+	Δ	-	+	-	-
	5. Rivers, banks condition	+	-	-	Δ	-	+	-	Δ	-	Δ	-	-	+	-	+	-	Δ	-	Δ	-	-	-	-
	6. Waste, garbage incineration	Δ	Δ	-	-	-	-	Δ	+	-	-	-	Δ	-	-	Δ	-	Δ	+	Δ	Δ	-	Δ	+
	7. Sewarage	Δ	-	-	Δ	-	-	Δ	+	-	-	-	-	-	-	Δ	-	Δ	Δ	Δ	Δ	Δ	Δ	+
	8. Underground water	-	-	-	-	-	Δ	Δ	-	-	-	-	+	-	-	-	-	-	-	Δ	-	Δ	-	-
	9. Water supply	Δ	Δ	-	-	-	Δ	Δ	Δ	-	-	-	-	Δ	-	Δ	-	Δ	-	Δ	-	Δ	-	-
Complex projects	10. Local infrastructure	Δ	Δ	Δ	-	-	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	-
	11. Tourism	Δ	Δ	Δ	-	Δ	-	Δ	Δ	Δ	Δ	Δ	-	Δ	Δ	Δ	-	Δ	-	-	-	Δ	-	-
	12. Transport	Δ	Δ	Δ	Δ	Δ	-	Δ	Δ	Δ	Δ	Δ	-	-	-	Δ	Δ	Δ	Δ	Δ	Δ	+	-	Δ
	13. Urban transporatation utilities	Δ	Δ	Δ	Δ	Δ	-	Δ	Δ	Δ	-	-	-	-	-	Δ	-	Δ	+	Δ	Δ	+	-	Δ

+ effecting significant factors

- non-influential factors

Δ influential factors

SCOPING

General process of "SCOPING" to define what kind of facilities should be involved into the construction of water treatment plant

Construction plans of water treatment facilities	The mans activities that caused the influence on environment		Social environvent									Natural conditions														
			1. Possibility of peoples migration	2. Economical activities, living conditions	3.Everyday transportation conditions	4. Reductions in social environment	5. Historical places and places of interest	6. Conflicts on water usage and rights	7. 'Hygiene conditions, sanitation	8. 'Solid waste	9. Risk of disaster and calamity	10. 'Topographical and geological conditions	11.Soil erosion	12. Underground lenses	13. Lakes, rivers, surface waters condition	14. A sea and seaside	15. Flora and fauna	16. Weather and climate	17. Landscape, scenery	18. Air pollution	19. Water pollution	20. Soil pollution	21. Noise, vibration	22. Ground sagging, bad odour	23. Mal- odour, exhausted gases,	generation of substancies having mal-odour
Water intake Water supply Water treatment	Before commissioning	Topographical changes	-	+	-	+	-	+	+	-	-	+	-	-	+	-	+	-	-	-	+	-	-	-	-	
		Expand of living territory. Commissioning of structures,machines and transport facilities	-	+	-	+	-	+	+	-	-	+	-	-	+	-	+	-	-	-	+	-	-	-	-	
Treated water supply	After commissioning	Expand of living territory	-	+	-	+	-	+	+	+	-	-	-	+	+	-	+	-	-	-	-	-	-	-	-	
Water distribution system		Using of mechanisms, tools, instruments	-	+	-	+	-	+	+	+	-	-	-	+	+	-	+	-	-	-	-	-	-	-	-	

\+ influential significant factors

\- non-influential factors

SCREENING

Table for defining the rate of influential factors

1	Possibility of peoples migration	-
2	Economical activities, living conditions	+
3	Everyday transportation conditions	-
4	Reductions in social environment	+
5	Historical places and places of interest	-
6	Conflicts on water usage and rights	+
7	Hygiene conditions, sanitation	+
8	Solid waste	-
9	Risk of disaster and calaminity	-
10	Topographical and geological conditions	+
11	Soil erosion	-
12	Underground lenses	+
13	Lakes, rivers, surface waters condition	-
14	Sea and seaside	-
15	Flora and fauna	+
16	Weather and climate	-
17	Landscape, scenery	-
18	Air pollution	-
19	Water pollution	+
20	Soil pollution	-
21	Noise, vibration	-
22	Ground sagging, bad odour	-
23	Mal- odour	-

- Influential factor
+ Non-influential factor

	SCOPING			
	Table for defining the significance rate of factors			
1	Possibility of peoples migration	-		
2	Economical activities, living conditions	+		
3	Everyday transportation conditions	-		
4	Reductions in social environment	+		
5	Historical places and places of interest	-		
6	Conflicts on water usage and rights	+		
7	Hygiene conditions, sanitation	+		
8	Solid waste	+		
9	Risk of disaster and calaminity	-		
10	Topographical and geological conditions	-		
11	Soil erosion	-		
12	Underground lenses	+		
13	Lakes, rivers, surface waters condition	+		
14	A sea and seaside	-		
15	Flora and fauna	+		
16	Weather and climate	-		
17	Landscape, scenery	-		
18	Air pollution	-		
19	Water pollution	-		
20	Soil pollution	-		
21	Noise, vibration	-		
22	Ground sagging, bad odour	-		
23	Mal- odour	-		
	-	Insignificant factor		
	+	Significant factor		