

No.39 Kaqavadzor

Information on Existing Water Sources (Aragatsotn)

Study for Improvement of
Rural Water Supply and
Sewage Systems in RA

No.39 Community Kaqavadzor
District Talin
Marz Aragatsotn

No	Water source	Latitude			Longitude			Atitude	Yeild(L/sec)		
		deg	min	sec	deg	min	sec	(m)	Min	Max	At site
1	12 springs	40	23	53.5	44	2	58.4	2,262	3.0	10.0	8.0
2											
3											
4											
5											
6											
7											
8											
9											
10											
<i>Notes:</i>											
<i>Latitude, Longitude, Atitude:</i>		<i>Measured at site</i>									
<i>Yield (Min, Max):</i>		<i>Interviewed to the Community</i>									
<i>Yield (at site):</i>		<i>Measured / estimated at site in summer of 2007</i>									

Users Acceptnce for water quality	Acceptable
Notes	No.06 Avtona Community takes water, 7 lit/sec, from Kaqavadzor transmission pipeline. In winter the house connections do not receive water because of water scarcity.
Alternative sources if any	There is a prospective spring with 15l/sec discharge volume.

No.39 Community Kaqavadzor
District Talin
Marz Aragatsotn
Sampling date 17/Aug/2007

	Parameters analysed	Units	No.1				Guidelines	
							WHO	Armenia
a	pH		7.4				6.5-8	6.0 - 9.0
b	Temperature	Deg.C	11.5					
c	TDS	Mg/L	49				1000	1000
1	Al:Aluminum	Mg/L	n.d				0.10	0.50
2	B:Boron	Mg/L	n.d				0.70	0.50
3	Cl:Chloride	Mg/L	5				250	350
4	Cr:Chrome	Mg/L	<0.01				0.05	0.05
5	Cu:Copper	Mg/L	n.d				2	1
6	F:Fluoride	Mg/L	0.02				1.50	
7	Hardness	Mg/L	80				500	700
8	Fe:Iron	Mg/L	n.d				0.30	0.30
9	Mn:Manganese	Mg/L	n.d				0.40	0.10
10	Mo:Molibdenum	Mg/L	<0.02				0.070	0.250
11	Ni:Nickel	Mg/L	0.006				0.020	0.100
12	Nitrate(NO3+)	Mg/L	1.8				50.0	45.0
13	SO4:Sulfate	Mg/L	7.0				250.0	500.0
14	Zn:Zink	Mg/L	n.d				3.0	5.0
15	As:Arsenic	Mg/L	n.d				0.0	0.1
16	Ba:Barium	Mg/L	<0.01				0.70	0.10
17	Be:Berillium	Mg/L	0.00005				NA	0.00020
18	Cd:Cadmium	Mg/L	n.d				0.0030	0.0010
19	Pb:Lead	Mg/L	<0.001				0.010	0.030
20	Hg:Mercury	Mg/L	n.d				0.00100	0.00050
21	Se:Selenium	Mg/L	<0.001				0.010	0.010
22	Sr:Strontium	Mg/L	n.d				NA	7.0
23	CN:Cyanide	Mg/L	n.d				0.070	0.035
24	Coli form bacteria	bacteria per 100 ml	n.d				-	0
25	Thermo-tolerant coli form bacteria	bacteria per 100 ml	n.d				0	0
26	Total bacteria	bacteria per 1 ml	n.d				-	50

Information on Existing Water Sources

Existing Bacteriological Test

Study for Improvement of Rural Water Supply and Sewage Systems in RA

No.39	Community District Marz	Kaqavadzor Talin Aragatsotn
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No. 39 Marz Aragatsotn Community Kaqavadzor**1. ACCESSIBILITY TO THE SITE**

No.	Structures	Access by vehicle	Machine construction	Remarks
1	Intake	Difficult	Difficult	
2	Transmission pipeline	Difficult	Difficult	Pipeline is mostly far from the road
3	Reservoir	Fair	Possible	

2. INTAKE STRUCTURE

No.	Water source	N	E	El. (m)	Year	Material	Volume (l/s)	Rehabilitation Necessity (Y/N)
1	Spring	44°23'53.5"	44°02'58.4"	2,262	2000	reinforced concrete	8.0	No

3. TRANSMISSION PIPELINE

No.	Pipeline length (m)	Pipe diameter	Material	Flow rate (l/s)	Year	Leakage	Rehabilitation Necessity (Y/N)
1	800	200	AsbestosCement	7.2	1997	Huge	Yes
	1,000	200	Steel		1997	Huge	Yes
	2,000	200	Steel		1997	Huge	Yes
2	200	150	Steel	5.0	1997	Huge	Yes
	500	100	Steel		1997	Huge	Yes

4. RESERVOIR

No.	N	E	El. (m)	Material	Shape	Dimension (m)	Volume (m3)	Rehabilitation Necessity (Y/N)
1	40°21'40.8"	44°03'11.4"	1,794	reinforced concrete	Rectangular	2x(6x10x3)	2x150	Yes

5. CHLORINATION

No.	Existence (Y/N)	Location	Chlorine type	Chlorine duration
1	Yes	Reservoir	Powder	5times/month

6. DISTRIBUTION PIPELINE

No.	Pipeline length (m)	Pipe diameter	Material	Year	Leakage	Rehabilitation Necessity (Y/N)
1	2,500	200	AsbestosCement	1970	Medium	Yes
2	5,300	100	Steel	1970	Medium	Yes
3	200	250	Steel	1970	Little	No

7. PUMP STATION

Existence (Y/N)	Power source	Type	Capacity (l/s)	Pump head (m)	Tank cap. (m3)	House size (m)	Rehabilitation Necessity (Y/N)
No							

8. PUBLIC TAPS

No. of taps	Old one (year)	New one (year)	Valves (Y/N)	Valve rate (%)	Rehabilitation Necessity (Y/N)
8	1970	1990	No	0	Yes

9. DRAINAGE SYSTEM

Existence (Y/N)	Rehabilitation Necessity (Y/N)	Remarks
No	Yes	

Questionnaire on Existing Water Supply Conditions by Socio-Economic Survey

Marz	Aragatsotn
Number and Name of Community	No.39 Kaqavadzor
District	Talin

No.	Question	Answer
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A: Baseline Data

A1	Actual population in 2001	1,005
A2	Actual population in 2007	1,130
A3	Number of households	240
A4.1	Elderly people	116
A4.2	Population in labor force (age from 16 to 62)	695
A4.3	Children	319
A5.1	Pensioners	140
A5.2	Unemployed	0
A5.3	Receiving benefits	62
A6	Average monthly income of household (AMD)	20,000
A7	Number of medical ambulance staion/first and health post	absent
A8	Number of beds in each medical ambulance staion	0
A9	Number of school	1
A10	Number of pupils	226

B: Budget

B1	Annual Budget of the community 2004, in thousand AMD	6,798
	Annual Budget of the community 2005, in thousand AMD	884
	Annual Budget of the community 2006, in thousand AMD	10,835
	Annual Budget of the community 2007, in thousand AMD	9,052
	Annual Budget of the community 2008, in thousand AMD	is not planned.
B2	Amount spent in drinking water sector 2004, in thousand AMD	360
	Amount spent in drinking water sector 2005, in thousand AMD	360
	Amount spent in drinking water sector 2006, in thousand AMD	420
	Amount spent in drinking water sector 2007, in thousand AMD	930
	Amount spent in drinking water sector 2008, in thousand AMD	is not planned.

C: Socio-Economic Survey

C1	Major industries of the community:	dairy, meat
C2	Is there any community activities carrying out by women? 1-Yes, 2-No	no

D: Water Usage and Water Demand Survey

D1	Does the community hold water use permit? 1-Yes, 2-No	yes
D2	Water use permit number	004116
D3	Date of expiry of water use permit	04.07.07-04.07.10
D4	Planned date of obtaining water use permit	
D5	Present condition of the water supply volume of Domestic use	in summer - 2, in
D6	Present condition of the water supply volume of Irrigation water	2-almost sufficient
D7	Number of house connection to drinking water system	240
D8	How many house connection household set the water meter	0
D9	Number of public taps	25
D10.1	How is the regime of water supply in your community in the dry season?	In summer HHs do not have water at all, and public taps operate-24 hrs.
D10.2	How is the regime of water supply in your community in the wet season?	24 hrs
D11	What time of day water is given?	-
D12	Are you pleased with duration of domestic water supply?	-
D13	Are hours of water supply convenient?	-
D14.1	How long the taps are open to provide the domestic water (cooking, washing, foodstuffs, dishes, Landry, bathing, etc) of each houshold a day?	-

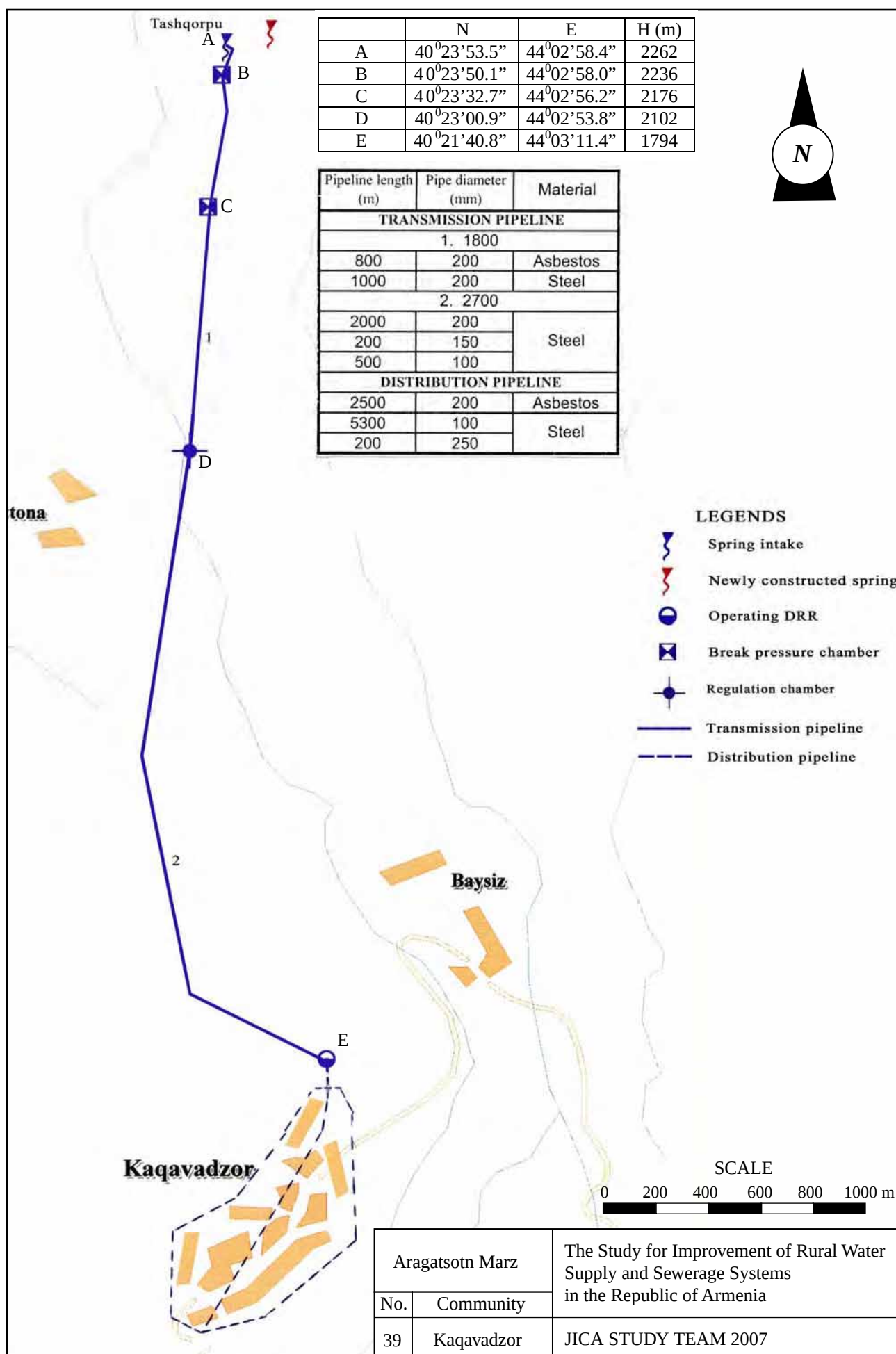
No.	Question	Answer
D14.2	Estimate quantity of domestic water use of each household (litter per day)	700
D15.1	How long the taps are open to provide the each household for filling	-
D15.2	Estimate quantity of water for filling containers of each household (litter per	800
D16	Drinking water monthly water fee per household	0
D17	How often do you usually pay water fees?	-
D18	Water fee structure 1Flat rate, 2 Having water tariff	-
D19	Where do you acquire the irrigation water?	from reservoir by pipelines
D20	Are you satisfied with irrigation water supply volume?	no

E: Present Operation and Maintenance Works

E1	Name of responsible for water supply	Gagikyan Tonakan
E2	Position	water distributor
E3	Telephone	with the help of administration head
E4	Quantity and present condition of the water supply facilities: spring/ intake	8 - rehabilitated.
E5	Quantity and present condition of the water supply facilities:	1- deteriorated
E6	Quantity and present condition of the water supply facilities: DRR(Daily Regulatory Reservoir)	1- partially repaired
E7	Quantity and present condition of the water supply facilities: net/distribution pipes	deteriorated
E8	Quantity and present condition of the water supply facilities: public tap	bad
E9	Quantity and present condition of the water supply facilities: pump	absent
E10	Who is the owner of the water supply facilities?	community
E11	Who is engaged in the water supply facilities repairing works?	residents
E12	How do you repair the water supply facilities?	by ourselves
E13	Who is in charge of the repair work in the community?	absent
E14	How you prepare O&M costs?	collection from residents and from community budget
E15	Please indicate the O&M cost breakdown per year for water supply	
	Electricity (AMD)	0
	Labor cost (AMD)	480,000
	Repair cost(AMD)	450,000
	Others(AMD)	0
	Total (AMD)	930,000
E16	Do the residents participate in the O&M works?	manpower
E17	What kind of OM method is preferable to you?	water fee

F: Initial Environmental Examination (IEE)

F1	Are any of the following areas located inside or around the project site?	
F1.1	National park, protected area designated by the government (coast line, water lands, reserved are for ethnic or indigenous people, cultural heritage), and areas being considered for national parks or proposed areas.	absent
F1.2	Virgin forests, tropical forests	absent
F1.3	Ecological improvement habits areas (coral reef, mangrove wetland, tidal	absent
F1.4	Habit of valuable species protected by domestic laws or international treaties	absent
F1.5	Likely salts cumulus or soil erosion areas on a massive scale	absent
F1.6	Remarkable desertification trend areas	absent
F1.7	Archaeological historical or cultural valuable areas	absent
F1.8	Living areas of ethic, indigenous people or nomads who have a traditional lifestyle or special socially valuable areas	absent

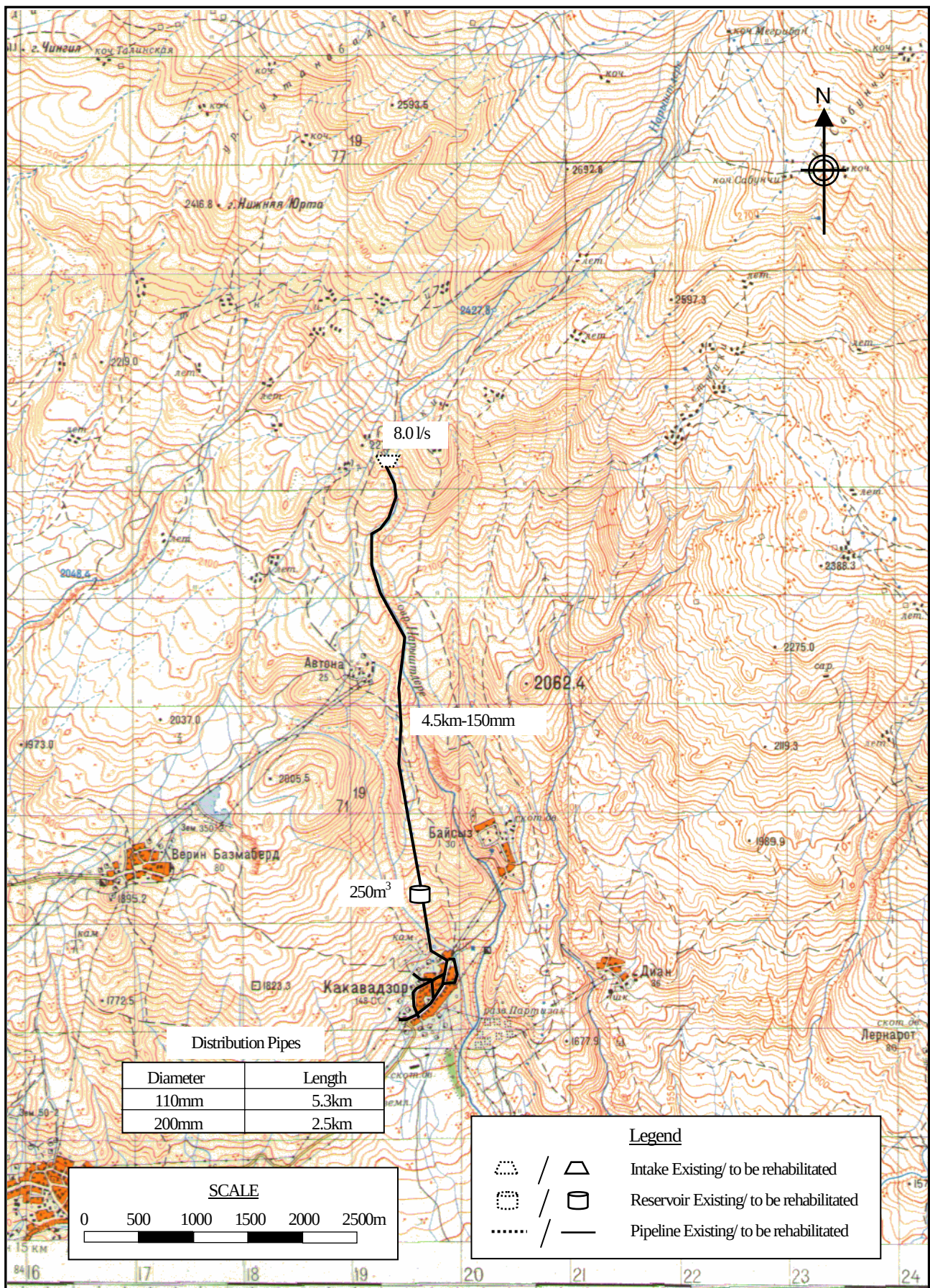


Marz : **Aragatsotn**
Name : **Kaqavadzor**

No.39

No.	Item	Quantity	Unit	Water demand (m3/d)	
A.	WATER DEMAND				
	1 Population	1,130	persons	113.0	
	2 Factory	-	nos	0.0	
	3 School (pupils)	226	pupils	2.3	
	4 Medical Ambulance Station	-	nos	-	
	5 Polyclinic	-	nos	-	
	6 Livestocks (87lit/household)	240	household	20.9	
	Sub-total			136.2	
	Unaccounted for water (20%)			27.2	
1	Average Daily Water Demand			163.4	m3/day
2	Maximum Daily Water Demand			196.1	m3/day
3	Maximum Hourly Water Demand			21.2	m3/hr
B	WATER SUPPLY PLAN				
	1 Water source type	Nr.	Total vol.		
	a Spring	1	8.0	lit/sec	691.2 m3/day
	Total				691.2 m3/day
	2 Required reservoir volume				255 m3

C	WATER SUPPLY FACILITIES REHABILITATION PLAN		
No	Item	Quantity	Unit
1	Intake		
	1m3		nos
	2m3		nos
	3m3		nos
	4m3		nos
2	Transmission pipe		
	50mm diameter		m
	75mm diameter		m
	90mm diameter		m
	110mm diameter		m
	150mm diameter	4,500	m
	200mm diameter		m
	250mm diameter		m
3	Reservoir		
	250m3 capacity	1	nos
4	Distribution pipe		
	50mm diameter		m
	75mm diameter		m
	90mm diameter		m
	110mm diameter	5,300	m
	150mm diameter		m
	200mm diameter	2,500	m
	250mm diameter		m
5	House connection	-	nos
6	Water meter installation	240	nos
7	Public tap	3	nos
8	Chlorination	1	nos
9	Pumps	-	nos



Water Supply Facilities Rehabilitation Plan		The Study for Improvement of Rural Water Supply and Sewerage Systems in the Republic of Armenia
Marz	Aragatsotn	
No. 39	Kaqavadzor	
		JICA STUDY TEAM

Marz : **Aragatsotn**
No. : **39**
Name : **Kaqavadzor**

No	Item	Specification	Quantity	Unit	Unit Price	Total
1	Intake					
		1m3		nos	367,700	
		2m3		nos	545,000	
		3m3		nos	669,100	
		4m3		nos	805,100	
	Sub-total					
2	Transmission Pipe					
		50mm		m	5,520	
		75mm		m	7,160	
		90mm		m	8,040	
		110mm		m	9,680	
		150mm	4,500	m	13,140	59,130,000
		200mm		m	19,440	
		250mm		m	27,040	
	Sub-total					59,130,000
3	Reservoir					
		50m3		nos	8,363,900	
		100m3		nos	12,968,300	
		150m3		nos	18,804,500	
		200m3		nos	22,524,600	
		250m3	1	nos	25,952,800	25,952,800
		300m3		nos	29,630,400	
		350m3		nos	33,528,700	
		400m3		nos	36,388,000	
		450m3		nos	39,392,500	
		500m3		nos	42,520,900	
	Sub-total					25,952,800
4	Distribution Pipe					
		50mm		m	5,520	
		75mm		m	7,160	
		90mm		m	8,040	
		110mm	5,300	m	9,680	51,304,000
		150mm		m	13,140	
		200mm	2,500	m	19,440	48,600,000
		250mm		m	27,040	
	Sub-total					99,904,000
5	House Connection			nos	74,000	
6	Water Meter Installation		240	nos	80,000	19,200,000
7	Public Tap		3	nos	90,000	270,000
8	Chlorilation Equipment		1	nos	500,000	500,000
9	Pump Replacement			nos	10,000,000	
10	Drainage and Sewerage	concrete surfa	3,120	m	3,600	11,232,000
Total					AMD	216,188,800
					Equivalent to USD	707,609
					Equivalent to JPY	74,652,783
					AMD	USD
Investment Cost per household			240	HH	900,787	2,948
Investment Cost per person			1,130	persons	191,318	626

ARAGATSOTN MARZ
Talin District
No 39 Kaqavadzor

PROJECTED INCOME STATEMENT

PROJECTED INCOME STATEMENT			Unit: million AMD																																													
Description	Unit		Total	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40					
A Water Sales Revenue																																																
Consumption water volume	1000m3/yr		49.7																																													
Unit rate	AMD/m3				40.00	40.00	40.00	41.32	70.00	72.31	74.70	77.16	115.65	119.47	123.41	127.48	131.69	136.03	140.52	145.16	149.95	154.90	160.01	165.29	170.75	176.38	182.20	188.21	194.42	200.84	207.47	214.31	221.39	228.69	236.24	244.04	252.09	260.41	269.00	277.88	287.05	296.52						
Sub-total			277.66	0.00	0.00	0.79	1.57	1.79	1.85	3.13	3.24	3.34	3.45	5.17	5.35	5.52	5.70	5.89	6.09	6.29	6.49	6.71	6.93	7.16	7.40	7.64	7.89	8.15	8.42	8.70	8.99	9.28	9.59	9.91	10.23	10.57	10.92	11.28	11.65	12.04	12.43	12.84	13.27					
B Operating Costs																																																
1. Staff salary																																																
Inspectors	person					1																																										
Pump operators	person					0																																										
Base Salary	AMD/m/p				20,000	20,660	21,342	22,046	22,774	23,525	24,301	25,103	25,932	26,788	27,672	28,585	29,528	30,502	31,509	32,549	33,623	34,732	35,879	37,063	38,286	39,549	40,854	42,202	43,595	45,034	46,520	48,055	49,641	51,279	52,971	54,719	56,525	58,390	60,317	62,308	64,364	66,488						
Sub-total			17.70		0.24	0.25	0.26	0.26	0.27	0.28	0.29	0.30	0.31	0.32	0.33	0.34	0.35	0.37	0.38	0.39	0.40	0.42	0.43	0.44	0.46	0.47	0.49	0.51	0.52	0.54	0.56	0.58	0.60	0.62	0.64	0.66	0.68	0.70	0.72	0.75	0.77	0.80						
2. Chlorine																																																
Pouring volume	kg/yr				299																																											
Unit rate	AMD/kg				600	620	640	661	683	706	729	753	778	804	830	858	886	915	945	976	1009	1042	1076	1112	1149	1186	1226	1266	1308	1351	1396	1442	1489	1538	1589	1642	1696	1752	1810	1869	1931	1995						
Sub-total			13.11		0.08	0.17	0.19	0.20	0.20	0.21	0.22	0.23	0.23	0.24	0.25	0.26	0.26	0.27	0.28	0.29	0.30	0.31	0.32	0.33	0.34	0.35	0.37	0.38	0.39	0.40	0.42	0.43	0.45	0.46	0.48	0.49	0.51	0.52	0.54	0.56	0.58	0.60	0.00	0.00	0.00	0.00	0.00	
3. Electricity (for pump)			0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4. Maintenance cost			32.15		0.19	0.40	0.47	0.49	0.50	0.52	0.53	0.55	0.57	0.59	0.61	0.63	0.65	0.67	0.69	0.72	0.74	0.76	0.79	0.82	0.84	0.87	0.90	0.93	0.96	0.99	1.02	1.06	1.09	1.13	1.17	1.20	1.24	1.28	1.33	1.37	1.42	1.46						
Pump repair					0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Pipe repair					0.19	0.4	0.47	0.49	0.50	0.52	0.53	0.55	0.57	0.59	0.61	0.63	0.65	0.67	0.69	0.72	0.74	0.76	0.79	0.82	0.84	0.87	0.90	0.93	0.96	0.99	1.02	1.06	1.09	1.13	1.17	1.20	1.24	1.28	1.33	1.37	1.42	1.46						
5. Pump replacement			0.00															0.00																														
Sub-total			62.96	0.00	0.00	0.51	0.82	0.92	0.95	0.97	1.01	1.04	1.08	1.11	1.15	1.19	1.23	1.26	1.31	1.35	1.40	1.44	1.49	1.54	1.59	1.64	1.69	1.76	1.82	1.87	1.93	2.00	2.07	2.14	2.21	2.29	2.35	2.43	2.50	2.59	2.68	2.77	2.86					
C Gross Income (A-B)			214.70	0.00	0.00	0.28	0.75	0.87	0.90	2.16	2.23	2.30	2.37	4.06	4.20	4.33	4.47	4.63	4.78	4.94	5.09	5.27	5.44	5.62	5.81	6.00	6.20	6.39	6.60	6.83	7.06	7.28	7.52	7.77	8.02	8.28	8.57	8.85	9.15	9.45	9.75	10.07	10.41					
D Depreciation cost			205.45					5.87	5.87	5.87	5.87	5.87	5.87	5.87	5.87	5.87	5.87	5.87	5.87	5.87	5.87	5.87	5.87	5.87	5.87	5.87	5.87	5.87	5.87	5.87	5.87	5.87	5.87	5.87	5.87	5.87	5.87	5.87	5.87	5.87	5.87	5.87	5.87	5.87	5.87	5.87	5.87	5.87
E Interest paid			62.68	0.02	0.04	1.16	2.32	2.65	2.66	2.66	2.66	2.66	2.66	2.66	2.58	2.50	2.43	2.35	2.27	2.19	2.11	2.03	1.94	1.86	1.77	1.69	1.60	1.52	1.43	1.34	1.25	1.16	1.07	0.98	0.88	0.79	0.69	0.60	0.50	0.40	0.30	0.20	0.10					
F Net Income			-53.43	-0.02	-0.04	-0.88	-1.57	-1.78	-7.63	-6.37	-6.30	-6.23	-6.16	-4.47	-4.25	-4.04	-3.83	-3.59	-3.36	-3.12	-2.89	-2.63	-2.37	-2.11	-1.83	-1.56	-1.27	-1.00	-0.70	-0.38	-0.06	0.25	0.58	0.92	1.27	1.62	2.01	2.38	2.78	3.18	3.58	4.00	4.44					
G Tax and duties			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
H Net Income after deduction of TAX			-53.43	-0.02	-0.04	-0.88	-1.57	-1.78	-7.63	-6.37	-6.30	-6.23	-6.16	-4.47	-4.25	-4.04	-3.83	-3.59	-3.36	-3.12	-2.89	-2.63	-2.37	-2.11	-1.83	-1.56	-1.27	-1.00	-0.70	-0.38	-0.06	0.25	0.58	0.92	1.27	1.62	2.01	2.38	2.78	3.18	3.58	4.00	4.44					
OM Cost Recovery Ratio (A/B)			441%	0%	0%	155%	192%	195%	195%	323%	321%	319%	466%	465%	464%	463%	467%	465%	466%	464%	466%	465%	465%	465%	466%	467%	463%	463%	465%	466%	464%	463%	463%	463%	462%	465%	464%	466%	465%	464%	464%	464%	464%	464%	464%	464%	464%	464%

PROJECTED CASH FLOW STATEMENT

PROJECTED CASH FLOW STATEMENT																																										Unit: million AMD
Description	Total	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	
SOURCES OF FUNDS																																										
A Internal Cash Generation																																										
1. Net Income	-53.43	-0.02	-0.04	-0.88	-1.57	-1.78	-7.63	-6.37	-6.30	-6.23	-6.16	-4.47	-4.25	-4.04	-3.83	-3.59	-3.36	-3.12	-2.89	-2.63	-2.37	-2.11	-1.83	-1.56	-1.27	-1.00	-0.70	-0.38	-0.06	0.25	0.58	0.92	1.27	1.62	2.01	2.38	2.78	3.18	3.58	4.00	4.44	
2. Depreciation cost	205.45	0.00	0.00	0.00	0.00	0.00	5.87	5.87	5.87	5.87	5.87	5.87	5.87	5.87	5.87	5.87	5.87	5.87	5.87	5.87	5.87	5.87	5.87	5.87	5.87	5.87	5.87	5.87	5.87	5.87	5.87	5.87	5.87	5.87	5.87	5.87	5.87	5.87	5.87	5.87	5.87	
3. Interest Paid	62.68	0.02	0.04	1.16	2.32	2.65	2.66	2.66	2.66	2.66	2.66	2.58	2.50	2.43	2.35	2.27	2.19	2.11	2.03	1.94	1.86	1.77	1.69	1.60	1.52	1.43	1.34	1.25	1.16	1.07	0.98	0.88	0.79	0.69	0.60	0.50	0.40	0.30	0.20	0.10		
Sub-total	214.70	0.00	0.00	0.28	0.75	0.87	0.90	2.16	2.23	2.30	2.37	4.06	4.20	4.33	4.47	4.63	4.78	4.94	5.09	5.27	5.44	5.62	5.81	6.00	6.20	6.39	6.60	6.83	7.06	7.28	7.52	7.77	8.02	8.28	8.57	8.85	9.15	9.45	9.75	10.07	10.41	
B Finances																																										
1. Project Loan	265.83	2.36	1.67	112.30	115.85	33.01	0.36	0.28																																		
2. Local fund	90.87	0.79	0.56	38.04	39.79	11.48	0.12	0.09																																		
Sub-total	356.70	3.15	2.23	150.34	155.64	44.49	0.48	0.37																																		
C Subsidy from Government																																										
1. Subsidy for O&M cost	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
2. Subsidy for debt services	113.92	0.02	0.04	0.88	1.57	1.78	1.76	0.50	0.43	0.36	0.29	6.24	6.10	5.97	5.83	5.67	5.52	5.36	5.21	5.04	4.86	4.68	4.49	4.30	4.10	3.91	3.70	3.47	3.24	3.02	2.78	2.54	2.28	2.02	1.73	1.45	1.15	0.85	0.55	0.23	0.00	
Sub-total	113.92	0.02	0.04	0.88	1.57	1.78	1.76	0.50	0.43	0.36	0.29	6.24	6.10	5.97	5.83	5.67	5.52	5.36	5.21	5.04	4.86	4.68	4.49	4.30	4.10	3.91	3.70	3.47	3.24	3.02	2.78	2.54	2.28	2.02	1.73	1.45	1.15	0.85	0.55	0.23	0.00	
Total Cash Inflow	685.32	3.17	2.27	151.50	157.96	47.14	3.14	3.03	2.66	2.66	2.66	10.30	10.30	10.30	10.30	10.30	10.30	10.30	10.30	10.31	10.30	10.30	10.30	10.30	10.30	10.30	10.30	10.30	10.30	10.30	10.30	10.31	10.30	10.30	10.30	10.30	10.30	10.30	10.30	10.30	10.41	
APPLICATION OF FUNDS																																										
D Project disbursement																																										
	356.70	3.15	2.23	150.34	155.64	44.49	0.48	0.37																																		
E Total debt services																																										
1. Loan repayment	265.83											7.64	7.72	7.80	7.87	7.95	8.03	8.11	8.19	8.28	8.36	8.44	8.53	8.61	8.70	8.78	8.87	8.96	9.05	9.14	9.23	9.33	9.42	9.51	9.61	9.70	9.80	9.90	10.00	10.10	10.20	
2. Interest paid	62.68	0.02	0.04	1.16	2.32	2.65	2.66	2.66	2.66	2.66	2.66	2.66	2.58	2.50	2.43	2.35	2.27	2.19	2.11	2.03	1.94	1.86	1.77	1.69	1.60	1.52	1.43	1.34	1.25	1.16	1.07	0.98	0.88	0.79	0.69	0.60	0.50	0.40	0.30	0.20	0.10	
Sub-total	328.51	0.02	0.04	1.16	2.32	2.65	2.66	2.66	2.66	2.66	2.66	10.30	10.30	10.30	10.30	10.30	10.30	10.30	10.30	10.31	10.30	10.30	10.30	10.30	10.30	10.30	10.30	10.30	10.30	10.30	10.30	10.31	10.30	10.30	10.30	10.30	10.30	10.30	10.30	10.30	10.30	
Total Cash Outflow	685.21	3.17	2.27	151.50	157.96	47.14	3.14	3.03	2.66	2.66	2.66	10.30	10.30	10.30	10.30	10.30	10.30	10.30	10.30	10.31	10.30	10.30	10.30	10.30	10.30	10.30	10.30	10.30	10.30	10.30	10.30	10.31	10.30	10.30	10.30	10.30	10.30	10.30	10.30	10.30	10.30	
F Net Surplus Cash (A+C2)-E																																										
	0.11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.11	
Project Cost Recovery Ratio (%)																																										
Cost recovery by water fee (A/E)	65%	0%	0%	24%	32%	33%	34%	81%	84%	86%	89%	39%	41%	42%	43%	45%	46%	48%	49%	51%	53%	55%	56%	58%	60%	62%	64%	66%	69%	71%	73%	75%	78%	80%	83%	86%	89%	92%	95%	98%	101%	
Cost recovery by water fee + subsidy ((A+C2)/E)	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	101%	

No 39 Kaqavadzor

A COST RECOVERY ANALYSIS

Item	Million AMD	Rate
1 Revenue		
Water fee revenue	277.66	70.9%
Subsidy	113.92	29.1%
Total	391.58	100.0%
2 Expenditure		
OM cost	62.96	16.1%
Loan repayment	265.83	67.9%
Interest paid	62.68	16.0%
Surplus cash	0.11	0.0%
Total	391.58	100.0%

Unit: million AMD

Description		Total	Year																																								Chg. million AED			
			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40				
A	COST																																													
	1. Investment Cost	237.82	2.30	1.64	102.47	102.47	28.35	0.33	0.26																																					
	2. Operation and Maintenance Cost																																													
	Salary	9.12			0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24
	Chlorine	7.08			0.08	0.16	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	
	Electricity	0.00			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	Maintenance cost	16.42			0.19	0.39	0.44	0.44	0.44	0.44	0.44	0.44	0.44	0.44	0.44	0.44	0.44	0.44	0.44	0.44	0.44	0.44	0.44	0.44	0.44	0.44	0.44	0.44	0.44	0.44	0.44	0.44	0.44	0.44	0.44	0.44	0.44	0.44	0.44	0.44	0.44	0.44	0.44	0.44	0.44	
	Pump replacement																																													
	Sub-total	32.62			0.51	0.79	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	
	Total Outflow	270.44	2.30	1.64	102.98	103.26	29.22	1.20	1.13	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	
B	BENEFIT																																													
	1. Water Tariff	174.26	0.00	0.00	0.79	1.57	1.79	1.85	3.13	3.24	3.34	3.45	5.17	5.17	5.17	5.17	5.17	5.17	5.17	5.17	5.17	5.17	5.17	5.17	5.17	5.17	5.17	5.17	5.17	5.17	5.17	5.17	5.17	5.17	5.17	5.17	5.17	5.17	5.17	5.17	5.17	5.17	5.17	5.17		
	2. Subsidy	63.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.58	3.52	3.47	3.40	3.32	3.25	3.17	3.10	3.01	2.92	2.82	2.72	2.61	2.50	2.39	2.27	2.13	1.99	1.86	1.71	1.56	1.40	1.23	1.04	0.85	0.65	0.45	0.25	0.03	0.00	0.00	0.00		
	Total Inflow	237.46	0.00	0.00	0.79	1.57	1.79	1.85	3.13	3.24	3.34	3.45	8.75	8.69	8.64	8.57	8.49	8.42	8.34	8.27	8.18	8.09	7.99	7.89	7.78	7.67	7.56	7.44	7.30	7.16	7.03	6.88	6.73	6.57	6.40	6.21	6.02	5.82	5.62	5.42	5.20	5.17	5.17	5.17		
NET BENEFIT		-32.98	-2.30	-1.64	-102.2	-101.7	-27.4	0.65	2.00	2.37	2.47	2.58	7.88	7.82	7.77	7.70	7.62	7.55	7.47	7.40	7.31	7.22	7.12	7.02	6.91	6.80	6.69	6.57	6.43	6.29	6.16	6.01	5.86	5.70	5.53	5.34	5.15	4.95	4.75	4.55	4.33	4.30	4.30	4.30		
FIRR =		-0.76%																																												

No.	Description	PV 1.75%	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	
1	Capital cost 10% up	-106.46	-2.53	-1.80	-112.4	-111.9	-30.3	6.2	1.97	2.37	2.47	2.58	7.88	7.82	7.77	7.70	7.62	7.55	7.47	7.40	7.31	7.22	7.12	7.02	6.91	6.80	6.69	6.57	6.43	6.29	6.16	6.01	5.86	5.70	5.53	5.34	5.15	4.95	4.75	4.55	4.33	4.30	
	Capital cost 20% up	-128.78	-2.76	-1.97	-122.7	-122.2	-33.1	0.58	1.95	2.37	2.47	2.58	7.88	7.82	7.77	7.70	7.62	7.55	7.47	7.40	7.31	7.22	7.12	7.02	6.91	6.80	6.69	6.57	6.43	6.29	6.16	6.01	5.86	5.70	5.53	5.34	5.15	4.95	4.75	4.55	4.33	4.30	
2	OM cost 10% up	-86.41	-2.30	-1.64	-102.2	-101.8	-27.5	0.56	1.91	2.28	2.38	2.49	7.71	7.73	7.68	7.61	7.53	7.46	7.38	7.31	7.22	7.13	7.03	6.93	6.82	6.71	6.60	6.48	6.34	6.20	6.07	5.92	5.77	5.61	5.44	5.25	5.06	4.86	4.66	4.46	4.24	4.21	
	OM cost 20% up	-88.68	-2.30	-1.64	-102.2	-101.8	-27.6	0.48	1.83	2.20	2.30	2.41	7.71	7.73	7.68	7.60	7.53	7.46	7.38	7.31	7.22	7.14	7.05	6.95	6.85	6.74	6.63	6.52	6.40	6.26	6.12	5.99	5.84	5.69	5.53	5.36	5.17	4.98	4.78	4.58	4.38	4.16	4.13
3	Revenue 10% down	-100.32	-2.30	-1.64	-102.3	-101.8	-27.6	0.47	1.69	2.05	2.14	2.24	7.01	6.95	6.91	6.84	6.77	6.71	6.64	6.57	6.49	6.41	6.32	6.23	6.13	6.03	5.93	5.83	5.70	5.57	5.46	5.32	5.19	5.04	4.89	4.72	4.55	4.37	4.19	4.01	3.81	3.78	3.27
	Revenue 20% down	-116.51	-2.30	-1.64	-102.3	-102.0	-27.8	0.28	1.37	1.72	1.80	1.89	6.13	6.08	6.04	5.99	5.92	5.87	5.80	5.75	5.67	5.60	5.52	5.44	5.35	5.27	5.18	5.08	4.97	4.86	4.75	4.63	4.51	4.39	4.25	4.10	3.95	3.79	3.63	3.47	3.29	3.27	

No.	Description	FIRR	Sensitivity indicator	Switching value
1	1 Capital cost 10% up	-1.22%	-3.82	-26.16%
	2 Capital cost 20% up	-1.64%	-5.39	-18.54%
2	1 OM cost 10% up	-0.83%	-0.94	-105.92%
	2 OM cost 20% up	-0.91%	-1.73	-57.71%
3	1 Revenue 10% down	-1.36%	-4.43	-22.57%
	2 Revenue 20% down	-2.02%	-6.26	-15.98%

No.40 Hartavan

Information on Existing Water Sources (Aragatsotn)

Study for Improvement of
Rural Water Supply and
Sewage Systems in RA

No.40 Community Hartavan
District Aparan
Marz Aragatsotn

No	Water source	Latitude			Longitude			Atitude	Yeild(L/sec)		
		deg	min	sec	deg	min	sec	(m)	Min	Max	At site
1	a ground spring	40	31	12.6	44	21	43.4	1920	3.0	6.0	5.0
2											
3											
4											
5											
6											
7											
8											
9											
10											
<i>Notes:</i>											
<i>Latitude, Longitude, Atitude:</i>			<i>Measured at site</i>								
<i>Yield (Min, Max):</i>			<i>Interviewed to the Community</i>								
<i>Yield (at site):</i>			<i>Measured / estimated at site in summer of 2007</i>								

Users Acceptnce for water quality	Acceptable
Notes	The flow of this spring is divided between two Communities. The whole water supply system is deteriorated, only 0.5l/sec water enters the Community.
Alternative sources if any	There are also other springs in the area.

No.40 Community Hartavan
District Aparan
Marz Aragatsotn
Sampling date 19/Jul/2007

	Parameters analysed	Units	No.1				Guidelines	
							WHO	Armenia
<i>a</i>	pH		6.9				6.5-8	6.0 - 9.0
<i>b</i>	Temperature	Deg.C	5.9					
<i>c</i>	TDS	Mg/L	45				1000	1000
1	Al:Aluminum	Mg/L	n.d				0.10	0.50
2	B:Boron	Mg/L	n.d				0.70	0.50
3	Cl:Chloride	Mg/L	4				250	350
4	Cr:Chrome	Mg/L	<0.01				0.05	0.05
5	Cu:Copper	Mg/L	n.d				2	1
6	F:Fluoride	Mg/L	0.04				1.50	
7	Hardness	Mg/L	75				500	700
8	Fe:Iron	Mg/L	n.d				0.30	0.30
9	Mn:Manganese	Mg/L	n.d				0.40	0.10
10	Mo:Molibdenum	Mg/L	n.d				0.070	0.250
11	Ni:Nickel	Mg/L	0.007				0.020	0.100
12	Nitrate(NO3+)	Mg/L	2.2				50.0	45.0
13	SO4:Sulfate	Mg/L	4.0				250.0	500.0
14	Zn:Zink	Mg/L	n.d				3.0	5.0
15	As:Arsenic	Mg/L	n.d				0.0	0.1
16	Ba:Barium	Mg/L	<0.01				0.70	0.10
17	Be:Berillium	Mg/L	0.00005				NA	0.00020
18	Cd:Cadmium	Mg/L	n.d				0.0030	0.0010
19	Pb:Lead	Mg/L	0.001				0.010	0.030
20	Hg:Mercury	Mg/L	<0.0002				0.00100	0.00050
21	Se:Selenium	Mg/L	<0.001				0.010	0.010
22	Sr:Strontium	Mg/L	<0.7				NA	7.0
23	CN:Cyanide	Mg/L	n.d				0.070	0.035
24	Coli form bacteria	bacteria per 100 ml	<9				-	0
25	Thermo-tolerant coli form bacteria	bacteria per 100 ml	n.d				0	0
26	Total bacteria	bacteria per 1 ml	360				-	50

Information on Existing Water Sources

Existing Bacteriological Test

Study for Improvement of Rural Water Supply and Sewage Systems in RA

No.40	Community District Marz	Hartavan Aparan Aragatsotn
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[illegible]

No. 40 Marz Aragatsotn Community Hartavan**1. ACCESSIBILITY TO THE SITE**

No.	Structures	Access by vehicle	Machine construction	Remarks
1	Intake	Possible	Possible	
2	Transmission pipeline	Possible	Possible	Pipeline is generally along or close to the road
3	Reservoir	Fair	Possible	

2. INTAKE STRUCTURE

No.	Water source	N	E	El. (m)	Year	Material	Volume (l/s)	Rehabilitation Necessity (Y/N)
1	Spring	40°31'12.6"	44°21'43.4"	1,920	1953	Concrete	5.0	Yes

3. TRANSMISSION PIPELINE

No.	Pipeline length (m)	Pipe diameter	Material	Flow rate (l/s)	Year	Leakage	Rehabilitation Necessity (Y/N)
1	6,200	100	AsbestosCement	0.5	1953	Huge	Yes
	500	150	Steel		1953	Huge	Yes

4. RESERVOIR

No.	N	E	El. (m)	Material	Shape	Dimension (m)	Volume (m3)	Rehabilitation Necessity (Y/N)
1	40°29'10.4"	44°23'55.5"	1,896	reinforced concrete	Rectangular	24x5x5	500	No

5. CHLORINATION EQUIPMENT

No.	Existence (Y/N)	Location	Chlorine type	Chlorine duration
1	Yes	Intake	Powder	5 times a year

6. DISTRIBUTION PIPELINE

No.	Pipeline length (m)	Pipe diameter	Material	Year	Leakage	Rehabilitation Necessity (Y/N)
1	1,500	150	Steel	1953	Huge	Yes
2	900	80	Steel		Medium	Yes
3	1,600	65	Steel		Huge	Yes
4	600	50	Steel		Huge	Yes
5	1,000	100	AsbestosCement		Huge	Yes
6	170	50	Polyethylene		Little	No

7. PUMP STATION

Existence (Y/N)	Power source	Type	Capacity (l/s)	Pump head (m)	Tank cap. (m3)	House size (m)	Rehabilitation Necessity (Y/N)
No							

8. PUBLIC TAPS

No. of taps	Old one (year)	New one (year)	Valves (Y/N)	Valve rate (%)	Rehabilitation Necessity (Y/N)
5	1953	1980	Yes	100	Yes

9. DRAINAGE SYSTEM

Existence	Rehabilitation	Remarks
No	Yes	

Questionnaire on Existing Water Supply Conditions by Socio-Economic Survey

Marz	Aragatsotn
Number and Name of Community	No.40 Hartavan
District	Aparan

No.	Question	Answer
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A: Baseline Data

A1	Actual population in 2001	913
A2	Actual population in 2007	1,057
A3	Number of households	246
A4.1	Elderly people	88
A4.2	Population in labor force (age from 16 to 62)	700
A4.3	Children	269
A5.1	Pensioners	109
A5.2	Unemployed	32
A5.3	Receiving benefits	13
A6	Average monthly income of household (AMD)	25,000
A7	Number of medical ambulance station/first and health post	absent
A8	Number of beds in each medical ambulance station	0
A9	Number of school	1
A10	Number of pupils	200

B: Budget

B1	Annual Budget of the community 2004, in thousand AMD	3,852
	Annual Budget of the community 2005, in thousand AMD	4,564
	Annual Budget of the community 2006, in thousand AMD	7,286
	Annual Budget of the community 2007, in thousand AMD	1,714
	Annual Budget of the community 2008, in thousand AMD	is not planned.
B2	Amount spent in drinking water sector 2004, in thousand AMD	420
	Amount spent in drinking water sector 2005, in thousand AMD	430
	Amount spent in drinking water sector 2006, in thousand AMD	400
	Amount spent in drinking water sector 2007, in thousand AMD	300
	Amount spent in drinking water sector 2008, in thousand AMD	is not planned.

C: Socio-Economic Survey

C1	Major industries of the community:	meat, dairy, vegetables
C2	Is there any community activities carrying out by women? 1-Yes, 2-No	no

D: Water Usage and Water Demand Survey

D1	Does the community hold water use permit? 1-Yes, 2-No	yes
D2	Water use permit number	1223
D3	Date of expiry of water use permit	09.11.06-09.11.09
D4	Planned date of obtaining water use permit	
D5	Present condition of the water supply volume of Domestic use	sufficient
D6	Present condition of the water supply volume of Irrigation water	almost sufficient
D7	Number of house connection to drinking water system	20
D8	How many house connection household set the water meter	0
D9	Number of public taps	8
D10.1	How is the regime of water supply in your community in the dry season?	regularly 2 hrs
D10.2	How is the regime of water supply in your community in the wet season?	regularly 3 hrs
D11	What time of day water is given?	9-11; 16-18
D12	Are you pleased with duration of domestic water supply?	mainly dispelased
D13	Are hours of water supply convenient?	mainly convenient
D14.1	How long the taps are open to provide the domestic water (cooking, washing, foodstuffs, dishes, Landry, bathing, etc) of each household a day?	-

No.	Question	Answer
D14.2	Estimate quantity of domestic water use of each household (litter per day)	300
D15.1	How long the taps are open to provide the each household for filling	-
D15.2	Estimate quantity of water for filling containers of each household (litter per	300
D16	Drinking water monthly water fee per household	300
D17	How often do you usually pay water fees?	each month
D18	Water fee structure 1Flat rate, 2 Having water tariff	flat rate
D19	Where do you acquire the irrigation water?	from Aparan reservoir
D20	Are you satisfied with irrigation water supply volume?	sufficient

E: Present Operation and Maintenance Works

E1	Name of responsible for water supply	WUA
E2	Position	-
E3	Telephone	-
E4	Quantity and present condition of the water supply facilities: spring/ intake	1 deteriorated
E5	Quantity and present condition of the water supply facilities:	1 deteriorated
E6	Quantity and present condition of the water supply facilities: DRR(Daily Regulatory Reservoir)	1 deteriorated
E7	Quantity and present condition of the water supply facilities: net/distribution pipes	partially repaired
E8	Quantity and present condition of the water supply facilities: public tap	partially repaired
E9	Quantity and present condition of the water supply facilities: pump	partially repaired
E10	Who is the owner of the water supply facilities?	community
E11	Who is engaged in the water supply facilities repairing works?	community
E12	How do you repair the water supply facilities?	by ourselves
E13	Who is in charge of the repair work in the community?	administration head
E14	How you prepare O&M costs?	community budget
E15	Please indicate the O&M cost breakdown per year for water supply	
	Electricity (AMD)	0
	Labor cost (AMD)	20,000
	Repair cost(AMD)	140,000
	Others(AMD)	0
	Total (AMD)	160,000
E16	Do the residents participate in the O&M works?	manpower
E17	What kind of OM method is preferable to you?	water fee

F: Initial Environmental Examination (IEE)

F1	Are any of the following areas located inside or around the project site?	
F1.1	National park, protected area designated by the government (coast line, water lands, reserved are for ethnic or indigenous people, cultural heritage), and areas being considered for national parks or proposed areas.	absent
F1.2	Virgin forests, tropical forests	yes
F1.3	Ecological improvement habits areas (coral reef, mangrove wetland, tidal	absent
F1.4	Habit of valuable species protected by domestic laws or international treaties	absent
F1.5	Likely salts cumulus or soil erosion areas on a massive scale	absent
F1.6	Remarkable desertification trend areas	absent
F1.7	Archaeological historical or cultural valuable areas	yes
F1.8	Living areas of ethic, indigenous people or nomads who have a traditional lifestyle or special socially valuable areas	absent



Ambarlu

A

Kuchak

	N	E	H (m)
A	40°31'12.6"	44°21'43.4"	1920
B	40°29'10.4"	44°23'55.5"	1896

Pipeline length (m)	Pipe diameter (mm)	Material
TRANSMISSION PIPELINE		
6700		
6200	100	Asbestos
500	150	Steel
DISTRIBUTION PIPELINE		
1500	150	Steel
900	80	
1600	65	
600	50	
1000	100	Asbestos
170	50	Polyethylene

LEGENDS



Spring intake



Operating DRR

— Transmission pipeline

- - - Distribution pipeline

Shenavan

Hartavan

SCALE

0 200 400 600 800 1000 m

Vardenut

Aragatsotn Marz

The Study for Improvement of Rural Water
Supply and Sewerage Systems
in the Republic of Armenia

No. Community

40 Hartavan

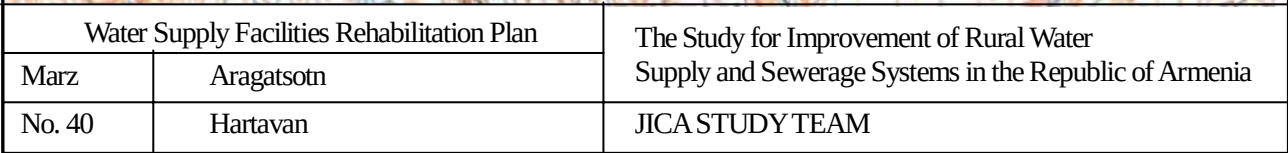
JICA STUDY TEAM 2007

Marz : **Aragatsotn**
Name : **Hartavan**

No.40

No.	Item	Quantity	Unit	Water demand (m3/d)	
A.	WATER DEMAND				
1	Population	1,057	persons	105.7	
2	Factory	-	nos	0.0	
3	School (pupils)	200	pupils	2.0	
4	Medical Ambulance Station	-	nos	-	
5	Polyclinic	-	nos	-	
6	Livestocks (87lit/household)	246	household	21.4	
	Sub-total			129.1	
	Unaccounted for water (20%)			25.8	
1	Average Daily Water Demand			154.9	m3/day
2	Maximum Daily Water Demand			185.9	m3/day
3	Maximum Hourly Water Demand			20.1	m3/hr
B.	WATER SUPPLY PLAN				
1	Water source type	Nr.	Total vol.		
a	Spring	1	5.0	lit/sec	432.0 m3/day
	Total				432.0 m3/day
2	Required reservoir volume				242 m3

C.	WATER SUPPLY FACILITIES REHABILITATION PLAN				
No	Item	Quantity	Unit		
1	Intake				
	1m3	1	nos		
	2m3		nos		
	3m3		nos		
	4m3		nos		
2	Transmission pipe				
	50mm diameter		m		
	75mm diameter		m		
	90mm diameter		m		
	110mm diameter	6,700	m		
	150mm diameter		m		
	200mm diameter		m		
	250mm diameter		m		
3	Reservoir				
4	Distribution pipe				
	50mm diameter	600	m		
	75mm diameter	1,600	m		
	90mm diameter	900	m		
	110mm diameter	1,000	m		
	150mm diameter	1,500	m		
	200mm diameter		m		
	250mm diameter		m		
5	House connection	226	nos		
6	Water meter installation	246	nos		
7	Public tap	3	nos		
8	Chlorination	1	nos		
9	Pumps	-	nos		



STUDY FOR IMPROVEMENT OF
RURAL WATER SUPPLY AND
SEWAGE SYSTEMS IN RA

Marz : **Aragatsotn**

No. : **40**

Name : **Hartavan**

No	Item	Specification	Quantity	Unit	Unit Price	Total
1	Intake					
		1m3	1	nos	367,700	367,700
		2m3		nos	545,000	
		3m3		nos	669,100	
		4m3		nos	805,100	
	Sub-total					367,700
2	Transmission Pipe					
		50mm		m	5,520	
		75mm		m	7,160	
		90mm		m	8,040	
		110mm	6,700	m	9,680	64,856,000
		150mm		m	13,140	
		200mm		m	19,440	
		250mm		m	27,040	
	Sub-total					64,856,000
3	Reservoir					
		50m3		nos	8,363,900	
		100m3		nos	12,968,300	
		150m3		nos	18,804,500	
		200m3		nos	22,524,600	
		250m3		nos	25,952,800	
		300m3		nos	29,630,400	
		350m3		nos	33,528,700	
		400m3		nos	36,388,000	
		450m3		nos	39,392,500	
		500m3		nos	42,520,900	
	Sub-total					
4	Distribution Pipe					
		50mm	600	m	5,520	3,312,000
		75mm	1,600	m	7,160	11,456,000
		90mm	900	m	8,040	7,236,000
		110mm	1,000	m	9,680	9,680,000
		150mm	1,500	m	13,140	19,710,000
		200mm		m	19,440	
		250mm		m	27,040	
	Sub-total					51,394,000
5	House Connection		226	nos	74,000	16,724,000
6	Water Meter Installation		246	nos	80,000	19,680,000
7	Public Tap		3	nos	90,000	270,000
8	Chlorilation Equipment		1	nos	500,000	500,000
9	Pump Replacement			nos	10,000,000	
10	Drainage and Sewerage concrete surfa		2,240	m	3,600	8,064,000
Total					AMD	161,855,700
					Equivalent to USD	529,771
					Equivalent to JPY	55,890,863
					AMD	USD
Investment Cost per household			246	HH	657,950	2,154
Investment Cost per person			1,057	persons	153,127	501

PROJECTED INCOME STATEMENT

PROJECTED INCOME STATEMENT

PROJECTED INCOME STATEMENT

Unit: million AMD

PROJECTED CASH FLOW STATEMENT		Unit: million AMD																																									
Description	Total	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40		
SOURCES OF FUNDS																																											
A Internal Cash Generation																																											
1. Net Income	-18.50	-0.02	-0.04	-0.72	-1.23	-1.49	-5.87	-4.69	-4.63	-4.58	-4.52	-2.93	-2.75	-2.57	-2.39	-2.22	-2.02	-1.83	-1.62	-1.42	-1.21	-0.98	-0.76	-0.54	-0.30	-0.06	0.17	0.45	0.71	0.97	1.24	1.53	1.81	2.11	2.42	2.74	3.06	3.40	3.73	4.09	4.46		
2. Depreciation cost	153.65	0.00	0.00	0.00	0.00	0.00	4.39	4.39	4.39	4.39	4.39	4.39	4.39	4.39	4.39	4.39	4.39	4.39	4.39	4.39	4.39	4.39	4.39	4.39	4.39	4.39	4.39	4.39	4.39	4.39	4.39	4.39	4.39	4.39	4.39	4.39	4.39	4.39	4.39	4.39	4.39		
3. Interest Paid	47.45	0.02	0.04	0.83	1.64	2.01	2.02	2.02	2.02	2.02	2.02	1.96	1.90	1.84	1.79	1.72	1.66	1.60	1.54	1.48	1.41	1.35	1.28	1.22	1.15	1.09	1.02	0.95	0.88	0.81	0.74	0.67	0.60	0.53	0.45	0.38	0.31	0.23	0.15	0.08	0.00	0.00	
Sub-total	182.60	0.00	0.00	0.11	0.41	0.52	0.54	1.72	1.78	1.83	1.89	3.48	3.60	3.72	3.84	3.96	4.09	4.22	4.37	4.51	4.66	4.82	4.98	5.13	5.31	5.48	5.65	5.86	6.05	6.24	6.44	6.66	6.87	7.10	7.34	7.58	7.83	8.10	8.35	8.63	8.93		
B Finances																																											
1. Project Loan	202.09	2.36	1.67	79.02	81.46	36.94	0.36	0.28																																			
2. Local fund	69.13	0.79	0.56	26.76	27.96	12.85	0.12	0.09																																			
Sub-total	271.22	3.15	2.23	105.78	109.42	49.79	0.48	0.37																																			
C Subsidy from Government																																											
1. Subsidy for O&M cost	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
2. Subsidy for debt services	69.65	0.02	0.04	0.72	1.23	1.49	1.48	0.30	0.24	0.19	0.13	4.35	4.23	4.11	3.99	3.88	3.74	3.61	3.46	3.32	3.17	3.01	2.85	2.70	2.52	2.35	2.19	1.97	1.78	1.59	1.39	1.17	0.96	0.73	0.49	0.25	0.00	0.00	0.00	0.00	0.00	0.00	
Sub-total	69.65	0.02	0.04	0.72	1.23	1.49	1.48	0.30	0.24	0.19	0.13	4.35	4.23	4.11	3.99	3.88	3.74	3.61	3.46	3.32	3.17	3.01	2.85	2.70	2.52	2.35	2.19	1.97	1.78	1.59	1.39	1.17	0.96	0.73	0.49	0.25	0.00	0.00	0.00	0.00	0.00	0.00	
Total Cash Inflow	523.47	3.17	2.27	106.61	111.06	51.80	2.50	2.39	2.02	2.02	2.02	7.83	7.83	7.83	7.83	7.84	7.83	7.83	7.83	7.83	7.83	7.83	7.83	7.83	7.83	7.83	7.84	7.83	7.83	7.83	7.83	7.83	7.83	7.83	7.83	7.83	7.83	8.10	8.35	8.63	8.93		
APPLICATION OF FUNDS																																											
D Project disbursement																																											
	271.22	3.15	2.23	105.78	109.42	49.79	0.48	0.37																																			
E Total debt services																																											
1. Loan repayment	202.12											5.81	5.87	5.93	5.99	6.05	6.11	6.17	6.23	6.29	6.35	6.42	6.48	6.55	6.61	6.68	6.75	6.81	6.88	6.95	7.02	7.09	7.16	7.23	7.30	7.38	7.45	7.53	7.60	7.68	7.75		
2. Interest paid	47.45	0.02	0.04	0.83	1.64	2.01	2.02	2.02	2.02	2.02	2.02	1.96	1.90	1.84	1.79	1.72	1.66	1.60	1.54	1.48	1.41	1.35	1.28	1.22	1.15	1.09	1.02	0.95	0.88	0.81	0.74	0.67	0.60	0.53	0.45	0.38	0.31	0.23	0.15	0.08	0.00	0.00	
Sub-total	249.57	0.02	0.04	0.83	1.64	2.01	2.02	2.02	2.02	2.02	2.02	7.83	7.83	7.83	7.83	7.84	7.83	7.83	7.83	7.83	7.83	7.83	7.83	7.83	7.83	7.84	7.83	7.83	7.83	7.83	7.83	7.83	7.83	7.83	7.83	7.83	7.83	7.83	7.83	7.83	7.83	7.83	7.83
Total Cash Outflow	520.79	3.17	2.27	106.61	111.06	51.80	2.50	2.39	2.02	2.02	2.02	7.83	7.83	7.83	7.83	7.84	7.83	7.83	7.83	7.83	7.83	7.83	7.83	7.83	7.83	7.83	7.84	7.83	7.83	7.83	7.83	7.83	7.83	7.83	7.83	7.83	7.83	7.83	7.83	7.83	7.83	7.83	7.83
F Net Surplus Cash (A+C2)-E	2.68	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.26	0.52	0.80	1.10	
Project Cost Recovery Ratio (%)																																											
Cost recovery by water fee (A/E)	73%	0%	0%	13%	25%	26%	27%	85%	88%	91%	94%	44%	46%	49%	51%	52%	54%	56%	58%	60%	62%	64%	66%	68%	70%	72%	75%	77%	80%	82%	85%	88%	91%	94%	97%	100%	103%	107%	110%	114%			
Cost recovery by water fee + subsidy ((A+C2)/E)	101%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	103%	107%	110%	114%			

FINANCIAL ANALYSIS

Item	Million AMD	Rate
1 Revenue		
Water fee revenue	263.05	79.1%
Subsidy	69.65	20.9%
Total	332.70	100.0%
2 Expenditure		
OM cost	80.45	24.2%
Loan repayment	202.12	60.8%
Interest paid	47.45	14.3%
Surplus cash	2.68	0.8%
Total	332.70	100.0%

C. SENSITIVITY ANALYSIS

No.	Description	FIRR	Sensitivity indicator	Switching value
1	Capital cost 10% up	-1.21%	-3.87	-25.83%
2	Capital cost 20% up	-1.63%	-5.44	-18.37%
3	OM cost 10% up	-0.88%	-1.52	-65.97%
2	OM cost 20% up	-1.01%	-2.65	-37.74%
3	Revenue 10% down	-1.40%	-4.71	-21.24%
2	Revenue 20% down	-2.14%	-6.53	-15.32%

No.41 Dzoraglukh

Information on Existing Water Sources (Aragatsotn)

Study for Improvement of
Rural Water Supply and
Sewage Systems in RA

No.41 Community Dzoraglukh
District Aparan
Marz Aragatsotn

No	Water source	Latitude			Longitude			Atitude (m)	Yeild(L/sec)		
		deg	min	sec	deg	min	sec		Min	Max	At site
1	Spring	40	34	29.9	44	31	0.6	2,261	1.5	4.5	2.0
2	Jagha spring	40	35	13.5	44	30	8.6	2,238	0.6	2.0	0.6
3	Aknezor spring	40	35	9.4	44	29	36.5	2,243	1.0	4.0	1.2
4											
5											
6											
7											
8											
9											
10											
<i>Notes:</i>											
<i>Latitude, Longitude, Atitude:</i>		<i>Measured at site</i>									
<i>Yield (Min, Max):</i>		<i>Interviewed to the Community</i>									
<i>Yield (at site):</i>		<i>Measured / estimated at site in summer of 2007</i>									

Users Acceptnce for water quality	Acceptable
Notes	From "Java" spring source to the spring intake, water flows through rocks.
Alternative sources if any	No alternative water sources are available

No.41 Community Dzoraglukh
District Aparan
Marz Aragatsotn
Sampling date 10/Aug/2007

	Parameters analysed	Units	No.1 Aknerov aghbyur	No.2 Poshteri aghbuur			Guidelines	
							WHO	Armenia
a	pH		7.8	7.7			6.5-8	6.0 - 9.0
b	Temperature	Deg.C	10.5	13.1				
c	TDS	Mg/L	35	28			1000	1000
1	Al:Aluminum	Mg/L	<0.01	n.d			0.10	0.50
2	B:Boron	Mg/L	n.d	n.d			0.70	0.50
3	Cl:Chloride	Mg/L	4	4			250	350
4	Cr:Chrome	Mg/L	0.01	0.01			0.05	0.05
5	Cu:Copper	Mg/L	n.d	n.d			2	1
6	F:Fluoride	Mg/L	0.10	0.15			1.50	
7	Hardness	Mg/L	55	35			500	700
8	Fe:Iron	Mg/L	n.d	n.d			0.30	0.30
9	Mn:Manganese	Mg/L	n.d	n.d			0.40	0.10
10	Mo:Molibdenum	Mg/L	0.060	n.d			0.070	0.250
11	Ni:Nickel	Mg/L	n.d	n.d			0.020	0.100
12	Nitrate(NO3+)	Mg/L	3.6	1.8			50.0	45.0
13	SO4:Sulfate	Mg/L	3.0	3.3			250.0	500.0
14	Zn:Zink	Mg/L	n.d	<0.1			3.0	5.0
15	As:Arsenic	Mg/L	n.d	n.d			0.0	0.1
16	Ba:Barium	Mg/L	<0.01	<0.01			0.70	0.10
17	Be:Berillium	Mg/L	n.d	n.d			NA	0.00020
18	Cd:Cadmium	Mg/L	n.d	n.d			0.0030	0.0010
19	Pb:Lead	Mg/L	<0.001	<0.001			0.010	0.030
20	Hg:Mercury	Mg/L	<0.00005	<0.0002			0.00100	0.00050
21	Se:Selenium	Mg/L	<0.001	<0.001			0.010	0.010
22	Sr:Strontium	Mg/L	n.d	n.d			NA	7.0
23	CN:Cyanide	Mg/L	n.d	n.d			0.070	0.035
24	Coli form bacteria	bacteria per 100 ml					-	0
25	Thermo-tolerant coli form bacteria	bacteria per 100 ml					0	0
26	Total bacteria	bacteria per 1 ml					-	50

Information on Existing Water Sources

Existing Bacteriological Test

Study for Improvement of Rural Water Supply and Sewage Systems in RA

No.41	Community District Marz	Dzoraglukh Aparan Aragatsotn
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[illegible]

No. 41 Marz Aragatsotn Community Dzoraglukh**1. ACCESSIBILITY TO THE SITE**

No.	Structures	Access by vehicle	Machine construction	Remarks
1	Intake	Possible	Possible	
2	Intake	Possible	Possible	
3	Intake	Difficult	Difficult	
4	Transmission pipeline	Difficult	Difficult	Pipeline is mostly far from the road
5	Reservoir	Difficult	Possible	
6	Reservoir	Difficult	Possible	

Water main

2. INTAKE STRUCTURE

No.	Water source	N	E	El. (m)	Year	Material	Volume (l/s)	Rehabilitation Necessity (Y/N)
1	Spring	40°34'29.9"	44°31'00.6"	2,261	1975	reinforced concrete	2.0	No
2	Spring	40°35'13.5"	44°30'08.6"	2,238	2000	Steel	0.6	Yes
3	Spring	40°35'09.4"	44°29'36.5"	2,243	1950	reinforced concrete	1.2	Yes

3. TRANSMISSION PIPELINE

No.	Pipeline length (m)	Pipe diameter	Material	Flow rate (l/s)	Year	Leakage	Rehabilitation Necessity (Y/N)
1	3,500	150	cast iron	2.0	1975	Little	Yes
2	400	100	Steel	0.57	2000	Little	No
	600	80	Steel			Little	No
3	1,000	65	Steel	1.2	1950	Little	Yes
	200	100	Steel			Little	Yes

4. RESERVOIR

No.	N	E	El. (m)	Material	Shape	Dimension (m)	Volume (m3)	Rehabilitation Necessity (Y/N)
1	40°34'39.0"	44°29'29.9"	2,069	reinforced concrete	Rectangular	12x8x2.5	200	No
2	40°34'51.3"	44°29'31.7"	2,127	reinforced concrete	Rectangular	5x6x2.5	75	No

5. CHLORINATION EQUIPMENT

No.	Existence (Y/N)	Location	Chlorine type	Chlorine duration
1	No			

6. DISTRIBUTION PIPELINE

No.	Pipeline length (m)	Pipe diameter	Material	Year	Leakage	Rehabilitation Necessity (Y/N)
1	2,150	50	Steel	1976	Medium	Yes
2	400	80	Steel	1976	Little	Yes
3	310	100	Steel	1976	Little	No

7. PUMP STATION

Existence (Y/N)	Power source	Type	Capacity (l/s)	Pump head (m)	Tank cap. (m3)	House size (m)	Rehabilitation Necessity (Y/N)
No							

8. PUBLIC TAPS

No. of taps	Old one (year)	New one (year)	Valves (Y/N)	Valve rate (%)	Rehabilitation Necessity (Y/N)
10	1976	1999	No	0	Yes

9. DRAINAGE SYSTEM

Existence (Y/N)	Rehabilitation Necessity (Y/N)	Remarks
No	Yes	

Questionnaire on Existing Water Supply Conditions by Socio-Economic Survey

Marz	Aragatsotn
Number and Name of Community	No.41 Dzoraglukh
District	Aparan

No.	Question	Answer
-----	----------	--------

A: Baseline Data

A1	Actual population in 2001	370
A2	Actual population in 2007	370
A3	Number of households	98
A4.1	Elderly people	61
A4.2	Population in labor force (age from 16 to 62)	194
A4.3	Children	70
A5.1	Pensioners	65
A5.2	Unemployed	0
A5.3	Receiving benefits	7
A6	Average monthly income of household (AMD)	20,000
A7	Number of medical ambulance staion/first and health post	absent
A8	Number of beds in each medical ambulance staion	0
A9	Number of school	1
A10	Number of pupils	87

B: Budget

B1	Annual Budget of the community 2004, in thousand AMD	1,059
	Annual Budget of the community 2005, in thousand AMD	1,016
	Annual Budget of the community 2006, in thousand AMD	3,157
	Annual Budget of the community 2007, in thousand AMD	3,554
	Annual Budget of the community 2008, in thousand AMD	is not planned.
B2	Amount spent in drinking water sector 2004, in thousand AMD	200
	Amount spent in drinking water sector 2005, in thousand AMD	180
	Amount spent in drinking water sector 2006, in thousand AMD	300
	Amount spent in drinking water sector 2007, in thousand AMD	250
	Amount spent in drinking water sector 2008, in thousand AMD	is not planned.

C: Socio-Economic Survey

C1	Major industries of the community:	dairy, meat, potatoes, cabbage
----	------------------------------------	--------------------------------

C2	Is there any community activities carrying out by women? 1-Yes, 2-No	no
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D: Water Usage and Water Demand Survey

D1	Does the community hold water use permit? 1-Yes, 2-No	no
D2	Water use permit number	-
D3	Date of expiry of water use permit	-
D4	Planned date of obtaining water use permit	2007
D5	Present condition of the water supply volume of Domestic use	almost sufficient
D6	Present condition of the water supply volume of Irrigation water	insufficient
D7	Number of house connection to drinking water system	78
D8	How many house connection household set the water meter	0
D9	Number of public taps	10
D10.1	How is the regime of water supply in your community in the dry season?	24 hrs
D10.2	How is the regime of water supply in your community in the wet season?	24 hrs
D11	What time of day water is given?	-
D12	Are you pleased with duration of domestic water supply?	mainly pleased
D13	Are hours of water supply convenient?	-
D14.1	How long the taps are open to provide the domestic water (cooking, washing, foodstuffs, dishes, Landry, bathing, etc) of each houshold a day?	-

No.	Question	Answer
D14.2	Estimate quantity of domestic water use of each household (litter per day)	400
D15.1	How long the taps are open to provide the each household for filling	-
D15.2	Estimate quantity of water for filling containers of each household (litter per	difficult to answer
D16	Drinking water monthly water fee per household	0
D17	How often do you usually pay water fees?	-
D18	Water fee structure 1Flat rate, 2 Having water tariff	-
D19	Where do you acquire the irrigation water?	from spring by gravity
D20	Are you satisfied with irrigation water supply volume?	is not sufficient

E: Present Operation and Maintenance Works

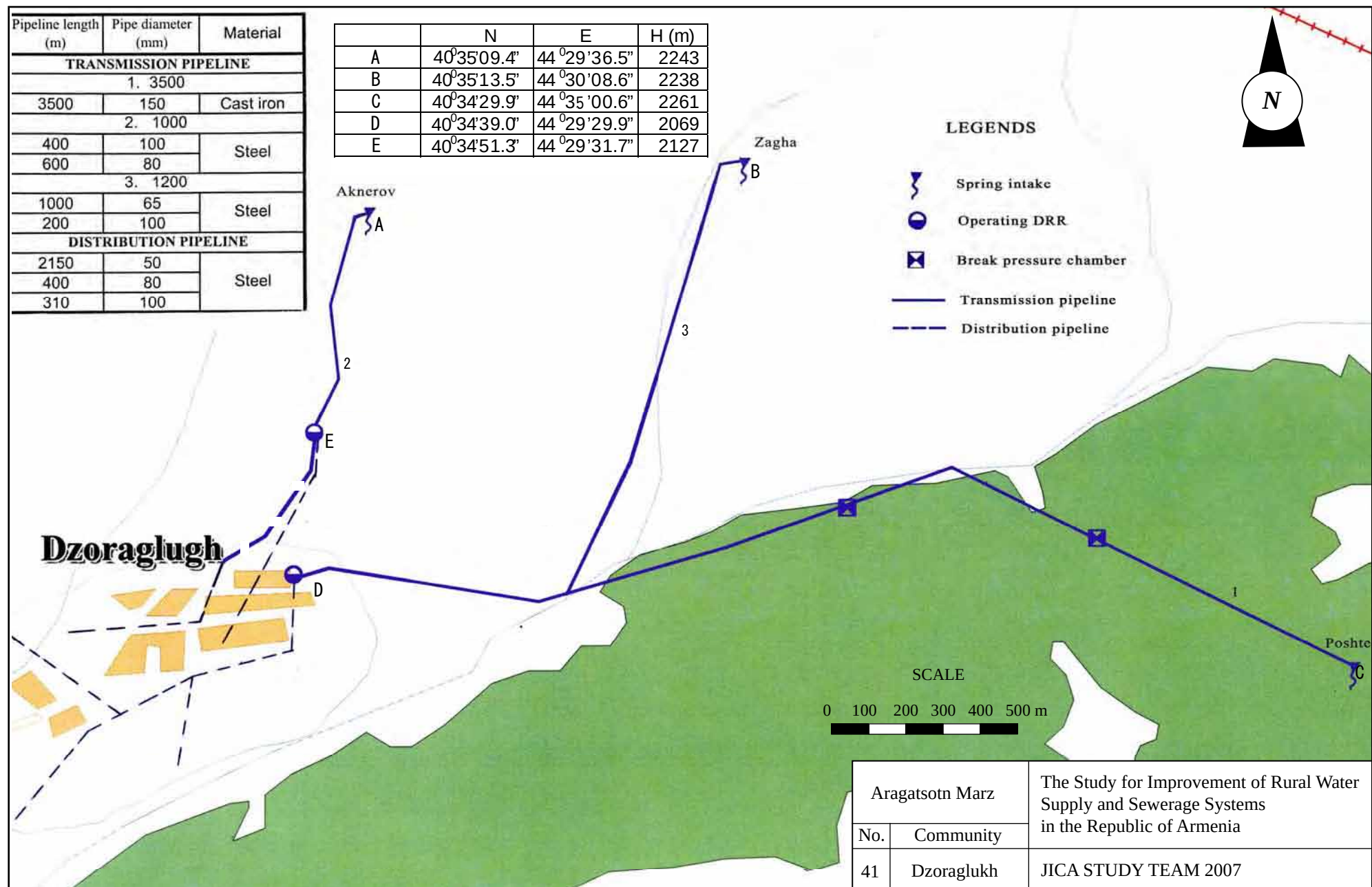
E1	Name of responsible for water supply	Hovhannisyan Khachik
E2	Position	administrtrtion head
E3	Telephone	(093)211684
E4	Quantity and present condition of the water supply facilities: spring/ intake	1 deteriorated 2 rehabilitated·
E5	Quantity and present condition of the water supply facilities:	2 rehabilitated·
E6	Quantity and present condition of the water supply facilities: DRR(Daily Regulatory Reservoir)	2 rehabilitated·
E7	Quantity and present condition of the water supply facilities: net/distribution pipes	deteriorated
E8	Quantity and present condition of the water supply facilities: public tap	rehabilitated
E9	Quantity and present condition of the water supply facilities: pump	absent
E10	Who is the owner of the water supply facilities?	community
E11	Who is engaged in the water supply facilities repairing works?	community and residents
E12	How do you repair the water supply facilities?	by ourselves
E13	Who is in charge of the repair work in the community?	volunteers from community
E14	How you prepare O&M costs?	collection from residents in case of emergency
E15	Please indicate the O&M cost breakdown per year for water supply	
	Electricity (AMD)	0
	Labor cost (AMD)	0
	Repair cost(AMD)	300,000
	Others(AMD)	0
	Total (AMD)	300,000
E16	Do the residents participate in the O&M works?	manpower
E17	What kind of OM method is preferable to you?	water fee

F: Initial Environmental Examination (IEE)

F1	Are any of the following areas located inside or around the project site?	
F1.1	National park, protected area designated by the government (coast line, water lands, reserved are for ethnic or indigenous people, cultural heritage), and areas being considered for national parks or proposed areas.	absent
F1.2	Virgin forests, tropical forests	absent
F1.3	Ecological improvement habits areas (coral reef, mangrove wetland, tidal	absent
F1.4	Habit of valuable species protected by domestic laws or international treaties	absent
F1.5	Likely salts cumulus or soil erosion areas on a massive scale	absent
F1.6	Remarkable desertification trend areas	absent
F1.7	Archaeological historical or cultural valuable areas	absent
F1.8	Living areas of ethic, indigenous people or nomads who have a traditional lifestyle or special socially valuable areas	absent

Pipeline length (m)	Pipe diameter (mm)	Material
TRANSMISSION PIPELINE		
1. 3500		
3500	150	Cast iron
2. 1000		
400	100	Steel
600	80	
3. 1200		
1000	65	Steel
200	100	
DISTRIBUTION PIPELINE		
2150	50	Steel
400	80	
310	100	

	N	E	H (m)
A	40°35'09.4"	44°29'36.5"	2243
B	40°35'13.5"	44°30'08.6"	2238
C	40°34'29.9"	44°35'00.6"	2261
D	40°34'39.0"	44°29'29.9"	2069
E	40°34'51.3"	44°29'31.7"	2127

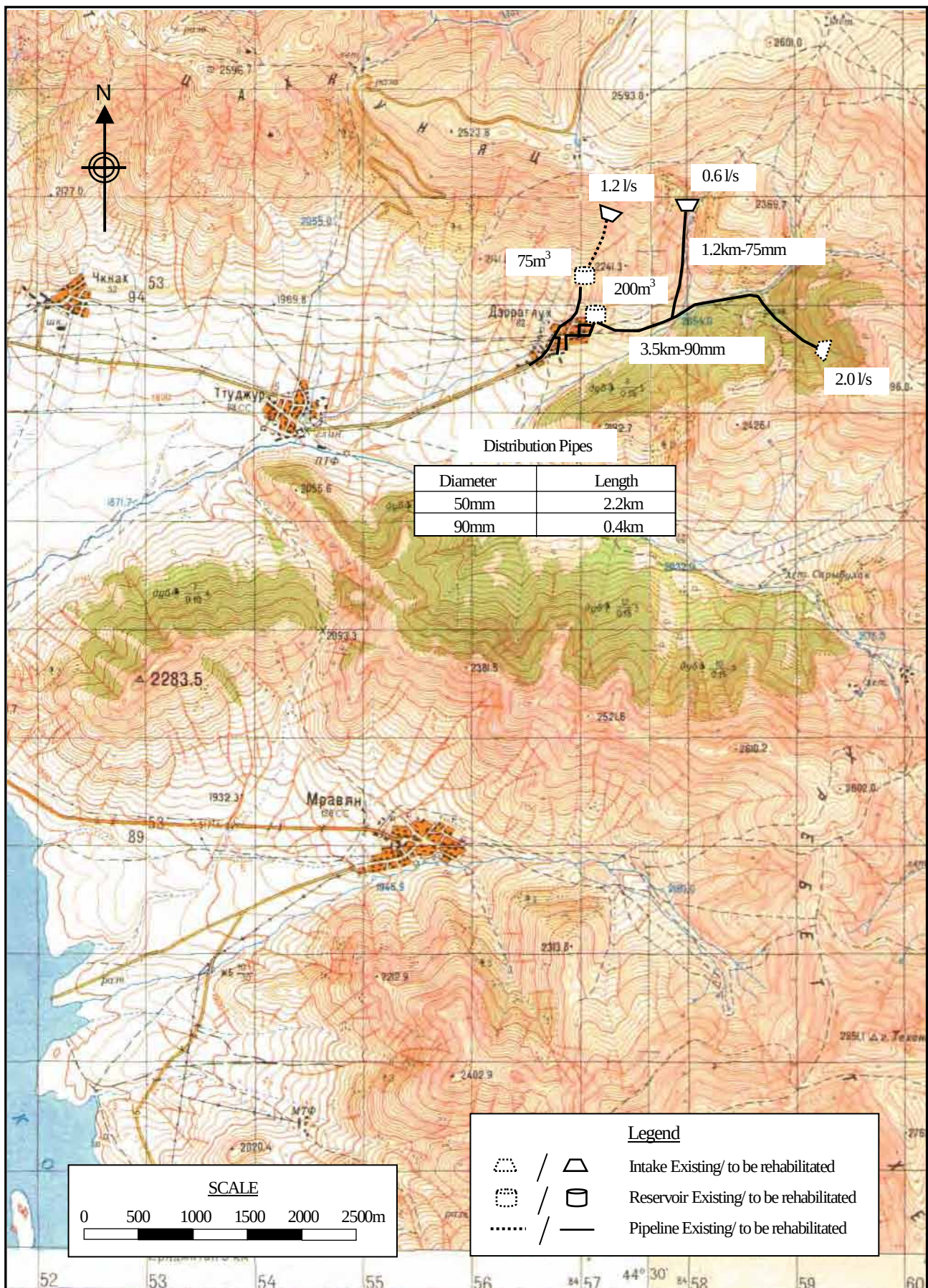


Marz : **Aragatsotn**
Name : **Dzoraglukh**

No.41

No.	Item	Quantity	Unit	Water demand (m3/d)	
A.	WATER DEMAND				
	1 Population	370	persons	37.0	
	2 Factory	-	nos	0.0	
	3 School (pupils)	87	pupils	0.9	
	4 Medical Ambulance Station	-	nos	-	
	5 Polyclinic	-	nos	-	
	6 Livestocks (87lit/household)	98	household	8.5	
	Sub-total			46.4	
	Unaccounted for water (20%)			9.3	
1	Average Daily Water Demand			55.7	m3/day
2	Maximum Daily Water Demand			66.8	m3/day
3	Maximum Hourly Water Demand			12.7	m3/hr
B	WATER SUPPLY PLAN				
	1 Water source type	Nr.	Total vol.		
	a Spring	3	3.8	lit/sec	328.3 m3/day
	Total				328.3 m3/day
	2 Required reservoir volume				152 m3

C	WATER SUPPLY FACILITIES REHABILITATION PLAN		
No	Item	Quantity	Unit
1	Intake		
	1m3	2	nos
	2m3		nos
	3m3		nos
	4m3		nos
2	Transmission pipe		
	50mm diameter		m
	75mm diameter	1,200	m
	90mm diameter	3,500	m
	110mm diameter		m
	150mm diameter		m
	200mm diameter		m
	250mm diameter		m
3	Reservoir		
4	Distribution pipe		
	50mm diameter	2,200	m
	75mm diameter		m
	90mm diameter	400	m
	110mm diameter		m
	150mm diameter		m
	200mm diameter		m
	250mm diameter		m
5	House connection	20	nos
6	Water meter installation	98	nos
7	Public tap	1	nos
8	Chlorination	2	nos
9	Pumps	-	nos



Water Supply Facilities Rehabilitation Plan		The Study for Improvement of Rural Water Supply and Sewerage Systems in the Republic of Armenia
Marz	Aragatsotn	
No. 41	Dzoraglukh	
		JICA STUDY TEAM

Marz : **Aragatsotn**

No. : **41**

Name : **Dzoraglukh**

No	Item	Specification	Quantity	Unit	Unit Price	Total
1	Intake					
		1m3	2	nos	367,700	735,400
		2m3		nos	545,000	
		3m3		nos	669,100	
		4m3		nos	805,100	
	Sub-total					735,400
2	Transmission Pipe					
		50mm		m	5,520	
		75mm	1,200	m	7,160	8,592,000
		90mm	3,500	m	8,040	28,140,000
		110mm		m	9,680	
		150mm		m	13,140	
		200mm		m	19,440	
		250mm		m	27,040	
	Sub-total					36,732,000
3	Reservoir					
		50m3		nos	8,363,900	
		100m3		nos	12,968,300	
		150m3		nos	18,804,500	
		200m3		nos	22,524,600	
		250m3		nos	25,952,800	
		300m3		nos	29,630,400	
		350m3		nos	33,528,700	
		400m3		nos	36,388,000	
		450m3		nos	39,392,500	
		500m3		nos	42,520,900	
	Sub-total					
4	Distribution Pipe					
		50mm	2,200	m	5,520	12,144,000
		75mm		m	7,160	
		90mm	400	m	8,040	3,216,000
		110mm		m	9,680	
		150mm		m	13,140	
		200mm		m	19,440	
		250mm		m	27,040	
	Sub-total					15,360,000
5	House Connection		20	nos	74,000	1,480,000
6	Water Meter Installation		98	nos	80,000	7,840,000
7	Public Tap		1	nos	90,000	90,000
8	Chlorilation Equipment		2	nos	500,000	1,000,000
9	Pump Replacement			nos	10,000,000	
10	Drainage and Sewerage	concrete surfa	1,040	m	3,600	3,744,000
Total					AMD	66,981,400
					Equivalent to USD	219,237
					Equivalent to JPY	23,129,542
					AMD	USD
Investment Cost per household			98	HH	683,484	2,237
Investment Cost per person			370	persons	181,031	593

FINANCIAL ANALYSIS

A COST RECOVERY ANALYSIS

Item	Million AMD	Rate
1 Revenue		
Water fee revenue	94.54	61.1%
Subsidy	60.07	38.9%
Total	154.61	100.0%
2 Expenditure		
OM cost	44.03	28.5%
Loan repayment	89.49	57.9%
Interest paid	21.09	13.6%
Surplus cash	0.00	0.0%
Total	154.61	100.0%

B. FIRR CALCULATION Unit: million AMD

[illegible]

C. SENSITIVITY ANALYSIS

No.	Description	PV 1.75%	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	
1	Capital cost 10% up	-31.48	-2.53	-1.80	-3.42	-3.40	-15.0	-0.30	0.18	0.50	0.54	0.58	2.75	2.74	2.73	2.73	2.71	2.71	2.70	2.69	2.66	2.66	2.64	2.62	2.61	2.58	2.57	2.55	2.52	2.51	2.48	2.45	2.42	2.39	2.35	2.32	2.29	2.26	2.19	2.15	2.12	2.07	
2	Capital cost 20% up	-39.01	-2.76	-1.97	-3.73	-3.71	-16.3	-0.34	0.16	0.50	0.54	0.58	2.75	2.74	2.73	2.73	2.71	2.71	2.70	2.69	2.66	2.66	2.64	2.62	2.61	2.58	2.57	2.55	2.52	2.51	2.48	2.45	2.42	2.39	2.35	2.32	2.29	2.25	2.19	2.15	2.12	2.07	
1	OM cost 10% up	-25.53	-2.30	-1.64	-3.11	-3.10	-13.7	-0.33	0.15	0.44	0.48	0.52	2.69	2.68	2.67	2.67	2.65	2.65	2.64	2.63	2.60	2.60	2.58	2.56	2.55	2.52	2.51	2.49	2.46	2.45	2.42	2.39	2.36	2.33	2.29	2.26	2.23	2.19	2.13	2.09	2.06	2.01	
2	OM cost 20% up	-27.10	-2.30	-1.64	-3.12	-3.10	-13.7	-0.39	0.09	0.38	0.42	0.46	2.63	2.62	2.61	2.61	2.59	2.59	2.58	2.57	2.54	2.54	2.52	2.50	2.49	2.46	2.45	2.43	2.40	2.39	2.36	2.33	2.30	2.27	2.23	2.20	2.17	2.13	2.07	2.03	2.00	1.95	
3	Revenue 10% down	-30.66	-2.30	-1.64	-3.11	-3.10	-13.7	-0.34	0.10	0.39	0.43	0.46	2.42	2.41	2.40	2.40	2.38	2.38	2.37	2.36	2.33	2.33	2.32	2.30	2.29	2.26	2.25	2.24	2.21	2.20	2.17	2.15	2.12	2.09	2.06	2.03	2.00	1.97	1.91	1.88	1.85	1.80	
2	Revenue 20% down	-37.36	-2.30	-1.64	-3.12	-3.10	-13.7	-0.40	0.00	0.28	0.31	0.34	2.08	2.07	2.06	2.06	2.05	2.05	2.04	2.03	2.03	2.01	2.01	1.99	1.98	1.97	1.94	1.94	1.92	1.90	1.89	1.86	1.84	1.82	1.79	1.76	1.74	1.71	1.68	1.63	1.60	1.58	1.54

No.	Description	FIRR	Sensitivity indicator	Switching value
1	1 Capital cost 10% up	-0.63%	-7.23	-13.83%
2	2 Capital cost 20% up	-1.03%	-8.32	-12.02%
1	1 OM cost 10% up	-0.31%	-4.47	-22.38%
2	2 OM cost 20% up	-0.46%	-6.20	-16.14%
3	1 Revenue 10% down	-0.82%	-7.89	-12.67%
2	2 Revenue 20% down	-1.55%	-8.88	-11.26%

No.42 Dzoragyugh

Information on Existing Water Sources (Aragatsotn)

Study for Improvement of
Rural Water Supply and
Sewage Systems in RA

No.42 Community Dzoragyugh
District Talin
Marz Aragatsotn

No	Water source	Latitude			Longitude			Atitude (m)	Yeild(L/sec)		
		deg	min	sec	deg	min	sec		Min	Max	At site
1	Mastaza pipe	40	28	00.6	43	54	21.7	1,858	3.0	-	3.0
2	Mastaza pipe	40	27	57.0	43	54	20.7	1,901			
3	Mastaza pipe	40	27	54.5	43	54	16.1	1,895			
4											
5											
6											
7											
8											
9											
10											
<i>Notes:</i>											
<i>Latitude, Longitude, Atitude:</i>		<i>Measured at site</i>									
<i>Yield (Min, Max):</i>		<i>Interviewed to the Community</i>									
<i>Yield (at site):</i>		<i>Measured / estimated at site in summer of 2007</i>									

Users Acceptnce for water quality	Acceptable
Notes	Dzoragyugh uses Mastara's water main, taking 0.35l/sec.
Alternative sources if any	No alternative water sources are available

No.42 Community Dzoragyugh
District Talin
Marz Aragatsotn
Sampling date 28/Aug/2007

	Parameters analysed	Units	No.1 Chlkanner				Guidelines	
							WHO	Armenia
a	pH		7.2				6.5-8	6.0 - 9.0
b	Temperature	Deg.C	10.4					
c	TDS	Mg/L	29				1000	1000
1	Al:Aluminum	Mg/L	0.01				0.10	0.50
2	B:Boron	Mg/L	n.d				0.70	0.50
3	Cl:Chloride	Mg/L	4				250	350
4	Cr:Chrome	Mg/L	<0.01				0.05	0.05
5	Cu:Copper	Mg/L	n.d				2	1
6	F:Fluoride	Mg/L	0.08				1.50	
7	Hardness	Mg/L	60				500	700
8	Fe:Iron	Mg/L	n.d				0.30	0.30
9	Mn:Manganese	Mg/L	n.d				0.40	0.10
10	Mo:Molibdenum	Mg/L	<0.02				0.070	0.250
11	Ni:Nickel	Mg/L	0.016				0.020	0.100
12	Nitrate(NO3+)	Mg/L	2.2				50.0	45.0
13	SO4:Sulfate	Mg/L	2.0				250.0	500.0
14	Zn:Zink	Mg/L	n.d				3.0	5.0
15	As:Arsenic	Mg/L	n.d				0.0	0.1
16	Ba:Barium	Mg/L	<0.01				0.70	0.10
17	Be:Berillium	Mg/L	n.d				NA	0.00020
18	Cd:Cadmium	Mg/L	0.0001				0.0030	0.0010
19	Pb:Lead	Mg/L	<0.001				0.010	0.030
20	Hg:Mercury	Mg/L	n.d				0.00100	0.00050
21	Se:Selenium	Mg/L	<0.001				0.010	0.010
22	Sr:Strontium	Mg/L	n.d				NA	7.0
23	CN:Cyanide	Mg/L	n.d				0.070	0.035
24	Coli form bacteria	bacteria per 100 ml	>9				-	0
25	Thermo-tolerant coli form bacteria	bacteria per 100 ml	n.d				0	0
26	Total bacteria	bacteria per 1 ml	110				-	50

Information on Existing Water Sources

Existing Bacteriological Test

Study for Improvement of Rural Water Supply and Sewage Systems in RA

No.42	Community District Marz	Dzoragyugh Talin Aragatsotn
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[illegible]

No. 42 Marz Aragatsotn Community Dzoragyugh**1. ACCESSIBILITY TO THE SITE**

No.	Structures	Access by vehicle	Machine construction	Remarks
1	Intake	Fair	Possible	
2	Transmission pipeline	Fair	Possible	Pipeline is generally along or close to the road
3	Reservoir			No reservoir

2. INTAKE STRUCTURE

No.	Water source	N	E	El. (m)	Year	Material	Volume (l/s)	Rehabilitation Necessity (Y/N)
1	Existing pipeline	40°28'00,6"	43°54'21,7"	1,858	1965	iron	3.0	Yes
2	Existing pipeline	40°27'57,0"	43°54'20,7"	1,901	1965	iron		Yes
3	Existing pipeline	40°27'54,5"	43°54'16,1"	1,895	1965	iron		Yes

3. TRANSMISSION PIPELINE

No.	Pipeline length (m)	Pipe diameter	Material	Flow rate (l/s)	Year	Leakage	Rehabilitation Necessity (Y/N)
1	No						

4. RESERVOIR

No.	N	E	El. (m)	Material	Shape	Dimension (m)	Volume (m3)	Rehabilitation Necessity (Y/N)
1	No							

5. CHLORINATION EQUIPMENT

No.	Existence (Y/N)	Location	Chlorine type	Chlorine duration
1	No			

6. DISTRIBUTION PIPELINE

No.	Pipeline length (m)	Pipe diameter	Material	Year	Leakage	Rehabilitation Necessity (Y/N)
1	250	50	Polyethylene	2001	Little	Yes

7. PUMP STATION

Existence (Y/N)	Power source	Type	Capacity (l/s)	Pump head (m)	Tank cap. (m3)	House size (m)	Rehabilitation Necessity (Y/N)
No							

8. PUBLIC TAPS

No. of taps	Old one (year)	New one (year)	Valves (Y/N)	Valve rate (%)	Rehabilitation Necessity (Y/N)
3	1967	2001	No	0	Yes

9. DRAINAGE SYSTEM

Existence (Y/N)	Rehabilitation Necessity (Y/N)	Remarks
No	Yes	

Questionnaire on Existing Water Supply Conditions by Socio-Economic Survey

Marz	Aragatsotn
Number and Name of Community	No.42 Dzoragyugh
District	Talin

No.	Question	Answer
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A: Baseline Data

A1	Actual population in 2001	2,580
A2	Actual population in 2007	2,696
A3	Number of households	798
A4.1	Elderly people	490
A4.2	Population in labor force (age from 16 to 62)	1,392
A4.3	Children	714
A5.1	Pensioners	496
A5.2	Unemployed	0
A5.3	Receiving benefits	94
A6	Average monthly income of household (AMD)	60,000
A7	Number of medical ambulance staion/first and health post	absent
A8	Number of beds in each medical ambulance staion	0
A9	Number of school	1
A10	Number of pupils	500

B: Budget

B1	Annual Budget of the community 2004, in thousand AMD	603
	Annual Budget of the community 2005, in thousand AMD	913
	Annual Budget of the community 2006, in thousand AMD	1,800
	Annual Budget of the community 2007, in thousand AMD	1,161
	Annual Budget of the community 2008, in thousand AMD	is not planned.
B2	Amount spent in drinking water sector 2004, in thousand AMD	0
	Amount spent in drinking water sector 2005, in thousand AMD	25
	Amount spent in drinking water sector 2006, in thousand AMD	35
	Amount spent in drinking water sector 2007, in thousand AMD	53
	Amount spent in drinking water sector 2008, in thousand AMD	is not planned.

C: Socio-Economic Survey

C1	Major industries of the community:	meat, cereals
C2	Is there any community activities carrying out by women? 1-Yes, 2-No	no

D: Water Usage and Water Demand Survey

D1	Does the community hold water use permit? 1-Yes, 2-No	yes
D2	Water use permit number	1173
D3	Date of expiry of water use permit	22.08.06.22.08.09
D4	Planned date of obtaining water use permit	
D5	Present condition of the water supply volume of Domestic use	insufficient
D6	Present condition of the water supply volume of Irrigation water	insufficient
D7	Number of house connection to drinking water system	400
D8	How many house connection household set the water meter	0
D9	Number of public taps	10
D10.1	How is the regime of water supply in your community in the dry season?	regularly 2 hrs
D10.2	How is the regime of water supply in your community in the wet season?	regularly. 10 hrs
D11	What time of day water is given?	9-11; 9-19
D12	Are you pleased with duration of domestic water supply?	mainly displeased
D13	Are hours of water supply convenient?	mainly convenient
D14.1	How long the taps are open to provide the domestic water (cooking, washing, foodstuffs, dishes, Landry, bathing, etc) of each houshold a day?	-

No.	Question	Answer
D14.2	Estimate quantity of domestic water use of each household (litter per day)	400
D15.1	How long the taps are open to provide the each household for filling	-
D15.2	Estimate quantity of water for filling containers of each household (litter per	400
D16	Drinking water monthly water fee per household	150/per capita
D17	How often do you usually pay water fees?	each month
D18	Water fee structure 1Flat rate, 2 Having water tariff	flat rate
D19	Where do you acquire the irrigation water?	From Lake Shenik
D20	Are you satisfied with irrigation water supply volume?	almost sufficient

E: Present Operation and Maintenance Works

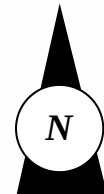
E1	Name of responsible for water supply	Mnacakanyan Farad
E2	Position	water distributor
E3	Telephone	(093)960401
E4	Quantity and present condition of the water supply facilities: spring/ intake	1 deteriorated
E5	Quantity and present condition of the water supply facilities:	1 partially repaired
E6	Quantity and present condition of the water supply facilities: DRR(Daily Regulatory Reservoir)	1 partially repaired
E7	Quantity and present condition of the water supply facilities: net/distribution pipes	deteriorated
E8	Quantity and present condition of the water supply facilities: public tap	partially repaired
E9	Quantity and present condition of the water supply facilities: pump	absent
E10	Who is the owner of the water supply facilities?	community
E11	Who is engaged in the water supply facilities repairing works?	residents
E12	How do you repair the water supply facilities?	by ourselves
E13	Who is in charge of the repair work in the community?	administration head
E14	How you prepare O&M costs?	community budget
E15	Please indicate the O&M cost breakdown per year for water supply	
	Electricity (AMD)	0
	Labor cost (AMD)	53,000
	Repair cost(AMD)	0
	Others(AMD)	0
	Total (AMD)	53,000
E16	Do the residents participate in the O&M works?	manpower
E17	What kind of OM method is preferable to you?	resident participation

F: Initial Environmental Examination (IEE)

F1	Are any of the following areas located inside or around the project site?	
F1.1	National park, protected area designated by the government (coast line, water lands, reserved are for ethnic or indigenous people, cultural heritage), and areas being considered for national parks or proposed areas.	yes
F1.2	Virgin forests, tropical forests	absent
F1.3	Ecological improvement habits areas (coral reef, mangrove wetland, tidal	absent
F1.4	Habit of valuable species protected by domestic laws or international treaties	absent
F1.5	Likely salts cumulus or soil erosion areas on a massive scale	absent
F1.6	Remarkable desertification trend areas	absent
F1.7	Archaeological historical or cultural valuable areas	yes
F1.8	Living areas of ethic, indigenous people or nomads who have a traditional lifestyle or special socially valuable areas	absent

	N	E	H (m)
A	40°28'00.6"	43°54'21.7"	1858
B	40°27'57.0"	43°54'20.7"	1901
C	40°27'54.5"	43°54'16.1"	1895

Pipeline length (m)	Pipe diameter (mm)	Material
TRANSMISSION PIPELINE		
Absent		
DISTRIBUTION PIPELINE		
250	50	Polyethylene



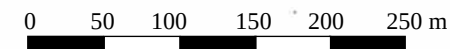
Tsakhkasar

Dzoragyugh

LEGENDS

- Connection to water main
- Transmission pipeline
- Distribution pipeline
- Water main of Mastara

SCALE



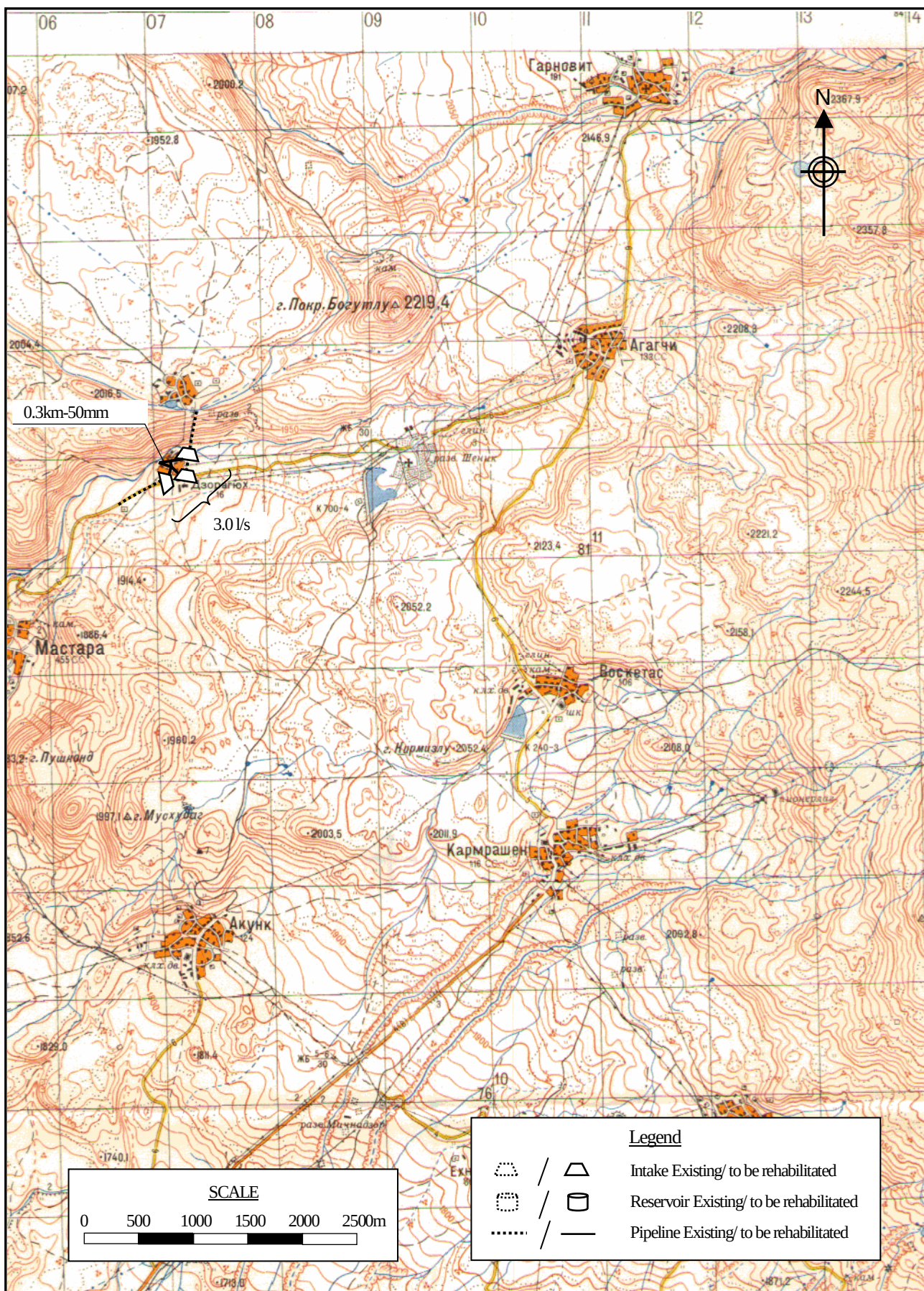
Aragatsotn Marz		The Study for Improvement of Rural Water Supply and Sewerage Systems in the Republic of Armenia
No.	Community	
42	Dzoragyugh	JICA STUDY TEAM 2007

Marz : **Aragatsotn**
Name : **Dzoragyugh**

No.42

No.	Item	Quantity	Unit	Water demand (m3/d)	
A.	WATER DEMAND				
	1 Population	2,696	persons	269.6	
	2 Factory	-	nos	0.0	
	3 School (pupils)	500	pupils	5.0	
	4 Medical Ambulance Station	-	nos	-	
	5 Polyclinic	-	nos	-	
	6 Livestocks (87lit/household)	798	household	69.4	
	Sub-total			344.0	
	Unaccounted for water (20%)			68.8	
1	Average Daily Water Demand		251.0	412.8	m3/day
2	Maximum Daily Water Demand			495.4	m3/day
3	Maximum Hourly Water Demand			120.7	m3/hr
B.	WATER SUPPLY PLAN				
	1 Water source type	Nr.	Total vol.		
	a Existing pipeline	3	3.0	lit/sec	259.2 m3/day
	Total				259.2 m3/day
	2 Additional water source				
	2 Required reservoir volume				1449 m3

C.	WATER SUPPLY FACILITIES REHABILITATION PLAN				
No	Item	Quantity	Unit		
1	Intake				
	1m3	3	nos		
	2m3		nos		
	3m3		nos		
	4m3		nos		
2	Transmission pipe				
	50mm diameter		m		
	75mm diameter		m		
	90mm diameter		m		
	110mm diameter		m		
	150mm diameter		m		
	200mm diameter		m		
	250mm diameter		m		
3	Reservoir				
4	Distribution pipe				
	50mm diameter	300	m		
	75mm diameter		m		
	90mm diameter		m		
	110mm diameter		m		
	150mm diameter		m		
	200mm diameter		m		
	250mm diameter		m		
5	House connection	398	nos		
6	Water meter installation	798	nos		
7	Public tap	7	nos		
8	Chlorination	-	nos		
9	Pumps	-	nos		



Water Supply Facilities Rehabilitation Plan		The Study for Improvement of Rural Water Supply and Sewerage Systems in the Republic of Armenia
Marz	Aragatsotn	
No. 42	Dzoragyugh	
		JICA STUDY TEAM

Marz : **Aragatsotn**
No. : **42**
Name : **Dzoragyugh**

No	Item	Specification	Quantity	Unit	Unit Price	Total
1	Intake					
		1m3	3	nos	367,700	1,103,100
		2m3		nos	545,000	
		3m3		nos	669,100	
		4m3		nos	805,100	
	Sub-total					1,103,100
2	Transmission Pipe					
		50mm		m	5,520	
		75mm		m	7,160	
		90mm		m	8,040	
		110mm		m	9,680	
		150mm		m	13,140	
		200mm		m	19,440	
		250mm		m	27,040	
	Sub-total					
3	Reservoir					
		50m3		nos	8,363,900	
		100m3		nos	12,968,300	
		150m3		nos	18,804,500	
		200m3		nos	22,524,600	
		250m3		nos	25,952,800	
		300m3		nos	29,630,400	
		350m3		nos	33,528,700	
		400m3		nos	36,388,000	
		450m3		nos	39,392,500	
		500m3		nos	42,520,900	
	Sub-total					
4	Distribution Pipe					
		50mm	300	m	5,520	1,656,000
		75mm		m	7,160	
		90mm		m	8,040	
		110mm		m	9,680	
		150mm		m	13,140	
		200mm		m	19,440	
		250mm		m	27,040	
	Sub-total					1,656,000
5	House Connection		398	nos	74,000	29,452,000
6	Water Meter Installation		798	nos	80,000	63,840,000
7	Public Tap		7	nos	90,000	630,000
8	Chlorilation Equipment			nos	500,000	
9	Pump Replacement			nos	10,000,000	
10	Drainage and Sewerage concrete surfa		120	m	3,600	432,000
Total					AMD	97,113,100
					Equivalent to USD	317,862
					Equivalent to JPY	33,534,407
					AMD	USD
Investment Cost per household			3	HH	32,371,033	105,954
Investment Cost per person			6	persons	16,185,517	52,977

PROJECTED INCOME STATEMENT

PROJECTED CASH FLOW STATEMENT

Description		Year																																										
	Total	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40			
SOURCES OF FUNDS																																												
A Internal Cash Generation																																												
1. Net Income	510.25	-0.02	-0.04	0.76	1.97	2.28	-0.26	2.95	3.18	3.41	3.65	7.96	8.39	8.83	9.28	9.75	10.22	10.72	11.23	11.76	12.31	12.88	13.46	14.06	14.68	15.32	15.98	16.64	17.35	18.07	18.82	19.59	20.37	21.19	22.03	22.90	23.81	24.73	25.68	26.67	27.69			
2. Depreciation cost	92.40	0.00	0.00	0.00	0.00	0.00	2.64	2.64	2.64	2.64	2.64	2.64	2.64	2.64	2.64	2.64	2.64	2.64	2.64	2.64	2.64	2.64	2.64	2.64	2.64	2.64	2.64	2.64	2.64	2.64	2.64	2.64	2.64	2.64	2.64	2.64	2.64	2.64	2.64	2.64	2.64	2.64		
3. Interest Paid	29.46	0.02	0.04	0.55	1.09	1.24	1.25	1.25	1.25	1.25	1.25	1.25	1.21	1.18	1.14	1.10	1.07	1.03	0.99	0.95	0.91	0.87	0.83	0.79	0.75	0.71	0.67	0.63	0.59	0.54	0.50	0.46	0.41	0.37	0.33	0.28	0.23	0.19	0.14	0.10	0.05			
Sub-total	632.11	0.00	0.00	1.31	3.06	3.52	3.63	6.84	7.07	7.30	7.54	11.85	12.24	12.65	13.06	13.49	13.93	14.39	14.86	15.35	15.86	16.39	16.93	17.49	18.07	18.67	19.29	19.91	20.58	21.25	21.96	22.69	23.42	24.20	25.00	25.82	26.68	27.56	28.46	29.41	30.38			
B Finances																																												
1. Project Loan	124.89	2.36	1.67	51.67	53.19	15.36	0.36	0.28																																				
2. Local fund	42.64	0.79	0.56	17.50	18.25	5.33	0.12	0.09																																				
Sub-total	167.53	3.15	2.23	69.17	71.44	20.69	0.48	0.37																																				
C Subsidy from Government																																												
1. Subsidy for O&M cost	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
2. Subsidy for debt services	0.06	0.02	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Sub-total	0.06	0.02	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total Cash Inflow	799.70	3.17	2.27	70.48	74.50	24.21	4.11	7.21	7.07	7.30	7.54	11.85	12.24	12.65	13.06	13.49	13.93	14.39	14.86	15.35	15.86	16.39	16.93	17.49	18.07	18.67	19.29	19.91	20.58	21.25	21.96	22.69	23.42	24.20	25.00	25.82	26.68	27.56	28.46	29.41	30.38			
APPLICATION OF FUNDS																																												
D Project disbursement																																												
	167.53	3.15	2.23	69.17	71.44	20.69	0.48	0.37																																				
E Total debt services																																												
1. Loan repayment	124.91											3.59	3.63	3.66	3.70	3.74	3.77	3.81	3.85	3.89	3.93	3.97	4.01	4.05	4.09	4.13	4.17	4.21	4.25	4.29	4.34	4.38	4.43	4.47	4.51	4.56	4.60	4.65	4.70	4.74	4.79			
2. Interest paid	29.46	0.02	0.04	0.55	1.09	1.24	1.25	1.25	1.25	1.25	1.25	1.25	1.21	1.18	1.14	1.10	1.07	1.03	0.99	0.95	0.91	0.87	0.83	0.79	0.75	0.71	0.67	0.63	0.59	0.54	0.50	0.46	0.41	0.37	0.33	0.28	0.23	0.19	0.14	0.10	0.05			
Sub-total	154.37	0.02	0.04	0.55	1.09	1.24	1.25	1.25	1.25	1.25	1.25	1.25	1.21	1.18	1.14	1.10	1.07	1.03	0.99	0.95	0.91	0.87	0.83	0.79	0.75	0.71	0.67	0.63	0.59	0.54	0.50	0.46	0.41	0.37	0.33	0.28	0.23	0.19	0.14	0.10	0.05			
Total Cash Outflow	321.90	3.17	2.27	69.72	72.53	21.93	1.73	1.62	1.25	1.25	1.25	4.84	4.84	4.84	4.84	4.84	4.84	4.84	4.84	4.84	4.84	4.84	4.84	4.84	4.84	4.84	4.84	4.84	4.84	4.83	4.84	4.84	4.84	4.84	4.84	4.84	4.83	4.84	4.84	4.84	4.84	4.84	4.84	
F Net Surplus Cash (A+C2)-E																																												
	477.80	0.00	0.00	0.76	1.97	2.28	2.38	5.59	5.82	6.05	6.29	7.01	7.40	7.81	8.22	8.65	9.09	9.55	10.02	10.51	11.02	11.55	12.09	12.65	13.23	13.83	14.45	15.07	15.74	16.42	17.12	17.85	18.58	19.36	20.16	20.98	21.85	22.72	23.62	24.57	25.54			
Project Cost Recovery Ratio (%)																																												
Cost recovery by water fee (A/E)	409%	0%	0%	239%	280%	284%	290%	547%	566%	584%	603%	245%	253%	261%	270%	279%	288%	297%	307%	317%	328%	339%	350%	361%	373%	386%	399%	411%	425%	440%	454%	469%	484%	500%	517%	533%	552%	569%	588%	608%	628%			
Cost recovery by water fee + subsidy ((A+C2)/E)	410%	100%	100%	239%	280%	284%	290%	547%	566%	584%	603%	245%	253%	261%	270%	279%	288%	297%	307%	317%	328%	339%	350%	361%	373%	386%	399%	411%	425%	440%	454%	469%	484%	500%	517%	533%	552%	569%	588%	608%	628%			

FINANCIAL ANALYSIS

A COST RECOVERY ANALYSIS

Item	Million AMD	Rate
1 Revenue		
Water fee revenue	701.29	100.0%
Subsidy	0.06	0.0%
Total	701.35	100.0%
2 Expenditure		
OM cost	69.18	9.9%
Loan repayment	124.91	17.8%
Interest paid	29.46	4.2%
Surplus cash	477.80	68.1%
Total	701.35	100.0%

B. FIRR CALCULATION

[illegible]

C. SENSITIVITY ANALYSIS

[illegible]

No.	Description	FIRR	Sensitivity indicator	Switching value
1	1 Capital cost 10% up	7.37%	1.05	95.36%
	2 Capital cost 20% up	6.70%	2.16	46.29%
2	1 OM cost 10% up	8.06%	0.11	881.46%
	2 OM cost 20% up	7.97%	0.23	435.70%
3	1 Revenue 10% down	7.20%	1.31	76.07%
	2 Revenue 20% down	6.20%	3.14	31.81%