

No.7 Avshen

Information on Existing Water Sources (Aragatsotn)

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

No.7 Community Avshen
District Aragats
Marz Aragatsotn

No	Water source	Latitude			Longitude			Altitude (m)	Yield(L/sec)		
		deg	min	sec	deg	min	sec		Min	Max	At site
1	Karyaspi sprng	40	43	16	45	17	38.0	2,150	0.2	0.4	0.3
2	Khrbeyori spring 1	40	44	4.4	44	17	6.6	2,218	0.5	0.8	0.7
3	Khrbeyori spring 2	40	43	58.7	44	17	30.3	2,281			
4	Chavkani spring	40	43	17.6	44	17	52.0	2,197	0.2	0.4	0.3
5											
6											
7											
8											
9											
10											

Notes:

Latitude, Longitude, Altitude:	Measured at site
Yield (Min, Max):	Interviewed to the Community
Yield (at site):	Measured / estimated at site in summer of 2007

Users Acceptnce for water quality	Acceptable
Notes	
Alternative sources if any	There is a 0,7l/sec capacity spring at 1,5km distance from "Khrbeyori" springs.

No.7 Community Avshen
District Aragats
Marz Aragatsotn
Sampling date 03/Aug/2007

	Parameters analysed	Units	No.1	No.2	No.3		Guidelines	
			Khrbejuri aghbyur				WHO	Armenia
a	pH		7.5	7.6	8.1		6.5-8	6.0 - 9.0
b	Temperature	Deg.C	8.2	9.1	7.5			
c	TDS	Mg/L	70	68	102		1000	1000
1	Al:Aluminum	Mg/L	n.d	n.d	<0.01		0.10	0.50
2	B:Boron	Mg/L	n.d	n.d	n.d		0.70	0.50
3	Cl:Chloride	Mg/L	4.97	4	5		250	350
4	Cr:Chrome	Mg/L	n.d	n.d	n.d		0.05	0.05
5	Cu:Copper	Mg/L	n.d	n.d	n.d		2	1
6	F:Fluoride	Mg/L	0.02	0.02	0.02		1.50	
7	Hardness	Mg/L	185	120	195		500	700
8	Fe:Iron	Mg/L	n.d	n.d	n.d		0.30	0.30
9	Mn:Manganese	Mg/L	0.10	n.d	0.10		0.40	0.10
10	Mo:Molibdenum	Mg/L	n.d	n.d	n.d		0.070	0.250
11	Ni:Nickel	Mg/L	n.d	n.d	n.d		0.020	0.100
12	Nitrate(NO3+)	Mg/L	2.7	2.2	2.2		50.0	45.0
13	SO4:Sulfate	Mg/L	4.0	4.0	4.5		250.0	500.0
14	Zn:Zink	Mg/L	n.d	n.d	n.d		3.0	5.0
15	As:Arsenic	Mg/L	n.d	n.d	n.d		0.0	0.1
16	Ba:Barium	Mg/L	<0.01	<0.01	<0.01		0.70	0.10
17	Be:Berillium	Mg/L	0.00005	0.00005	0.00005		NA	0.00020
18	Cd:Cadmium	Mg/L	0.0002	0.0002	0.0002		0.0030	0.0010
19	Pb:Lead	Mg/L	0.001	<0.001	<0.001		0.010	0.030
20	Hg:Mercury	Mg/L	n.d	n.d	n.d		0.00100	0.00050
21	Se:Selenium	Mg/L	0.001	<0.001	<0.001		0.010	0.010
22	Sr:Strontium	Mg/L	<0.7	<0.7	<0.7		NA	7.0
23	CN:Cyanide	Mg/L	n.d	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.7	Community District Marz	Avshen Aragats Aragatsotn
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No. 7 Marz Aragatsotn Community Avshen

1. ACCESSIBILITY TO THE SITE

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

2. IN Water main

No.	Water source	N	E	El. (m)	Year	Material	Volume (l/s)	Rehabilitation Necessity (Y/N)
1	Spring	40°43'16.0"	45°17'38.0"	2,150	1959	reinforced concrete	0.3	Yes
2	Spring	40°44'04.4"	44°17'06.6"	2,218	1968	reinforced concrete	0.7	Yes
3	Spring	40°43'58.7"	44°17'30.3"	2,281	1968	reinforced concrete	-	Yes
4	Spring	40°43'17.6"	44°17'52.0"	2,197	1965	reinforced concrete	0.3	Yes

3. TRANSMISSION PIPELINE

No.	Pipeline length (m)	Pipe diameter	Material	Flow rate (l/s)	Year	Leakage	Rehabilitation Necessity (Y/N)
1	3,200	100	Steel	0.6	1985	Little	Yes
	400	80	cast iron		1968	Little	Yes
2	2,200	100	Steel	0.24	1968	Little	Yes

4. RESERVOIR

No.	N	E	El. (m)	Material	Shape	Dimension (m)	Volume (m3)	Rehabilitation Necessity (Y/N)
1	40°43'24.9"	44°17'18.1"	2,196	reinforced concrete	Circle	d=6m, h=3m	75	Yes

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	300	100	Steel	1968	Little	Yes
2	1,000	80	cast iron	1958	Little	Yes
3	200	50	Steel	1968	Little	Yes
4	500	32	Steel	1968	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)
11	1958	1968	Yes	40	Yes

9. DRAINAGE SYSTEM

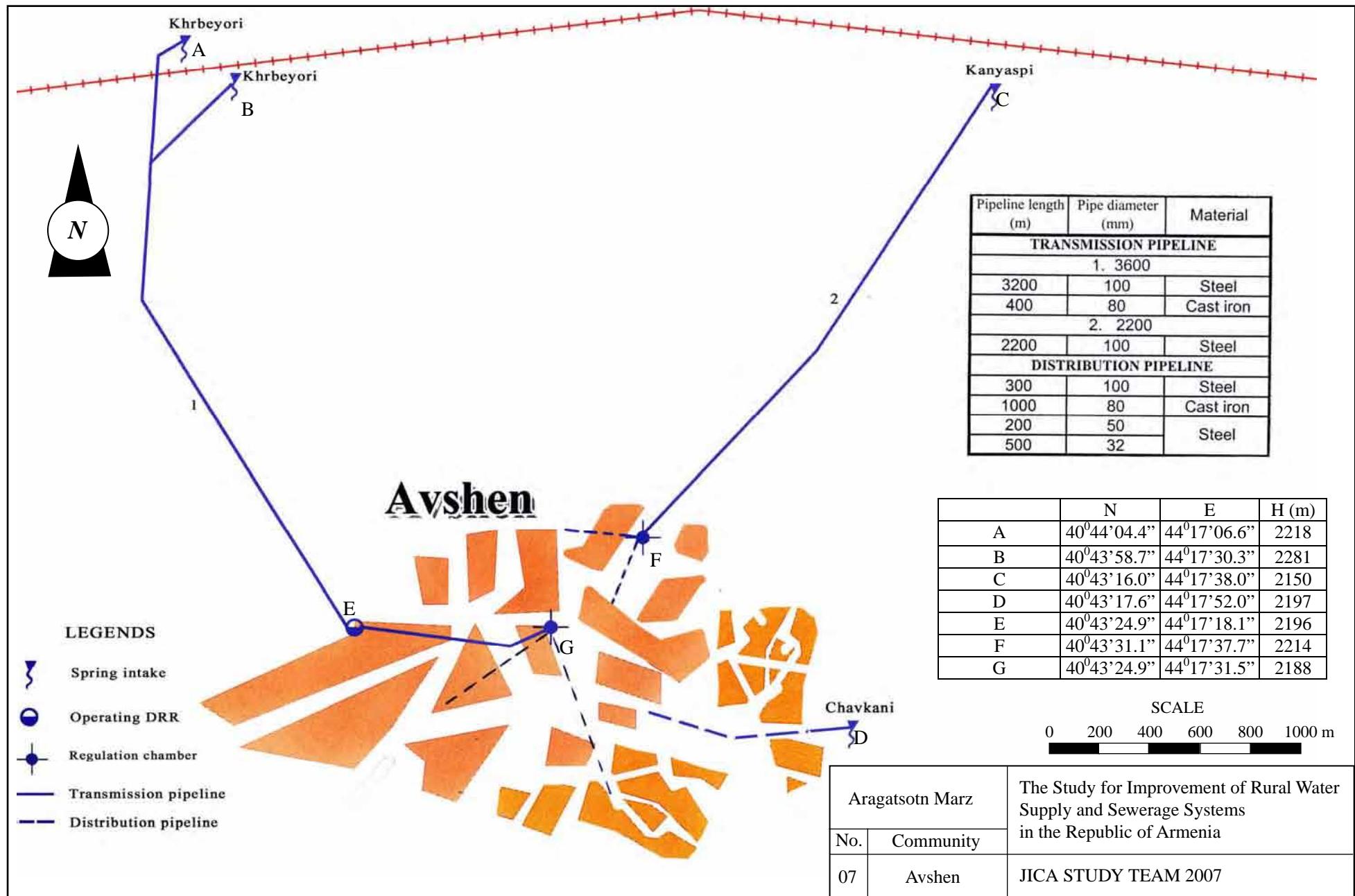
Existence (Y/N)	Rehabilitation Necessity (Y/N)	Remarks
No	Yes	

**Questionnaire on Existing Water Supply Conditions
by Socio-Economic Survey**

Marz	Aragatsotn
Number and Name of Community	No.7 Avshen
District	Aragats

No.	Question	Answer
A: Baseline Data		
A1	Actual population in 2001	425
A2	Actual population in 2007	275
A3	Number of households	50
A4.1	Elderly people	30
A4.2	Population in labor force (age from 16 to 62)	187
A4.3	Children	58
A5.1	Pensioners	36
A5.2	Unemployed	0
A5.3	Receiving benefits	8
A6	Average monthly income of household (AMD)	20,000
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	32
B: Budget		
B1	Annual Budget of the community 2004, in thousand AMD	1,200
	Annual Budget of the community 2005, in thousand AMD	1,400
	Annual Budget of the community 2006, in thousand AMD	1,300
	Annual Budget of the community 2007, in thousand AMD	700
	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	0
	Amount spent in drinking water sector 2006, in thousand AMD	0
	Amount spent in drinking water sector 2007, in thousand AMD	0
	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, 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	1168
D3	Date of expiry of water use permit	2006-2009
D4	Planned date of obtaining water use permit	-
D5	Present condition of the water supply volume of Domestic use	almost sufficient
D6	Present condition of the water supply volume of Irrigation water	almost sufficient
D7	Number of house connection to drinking water system	1
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?	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?	very 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 household a day?	-

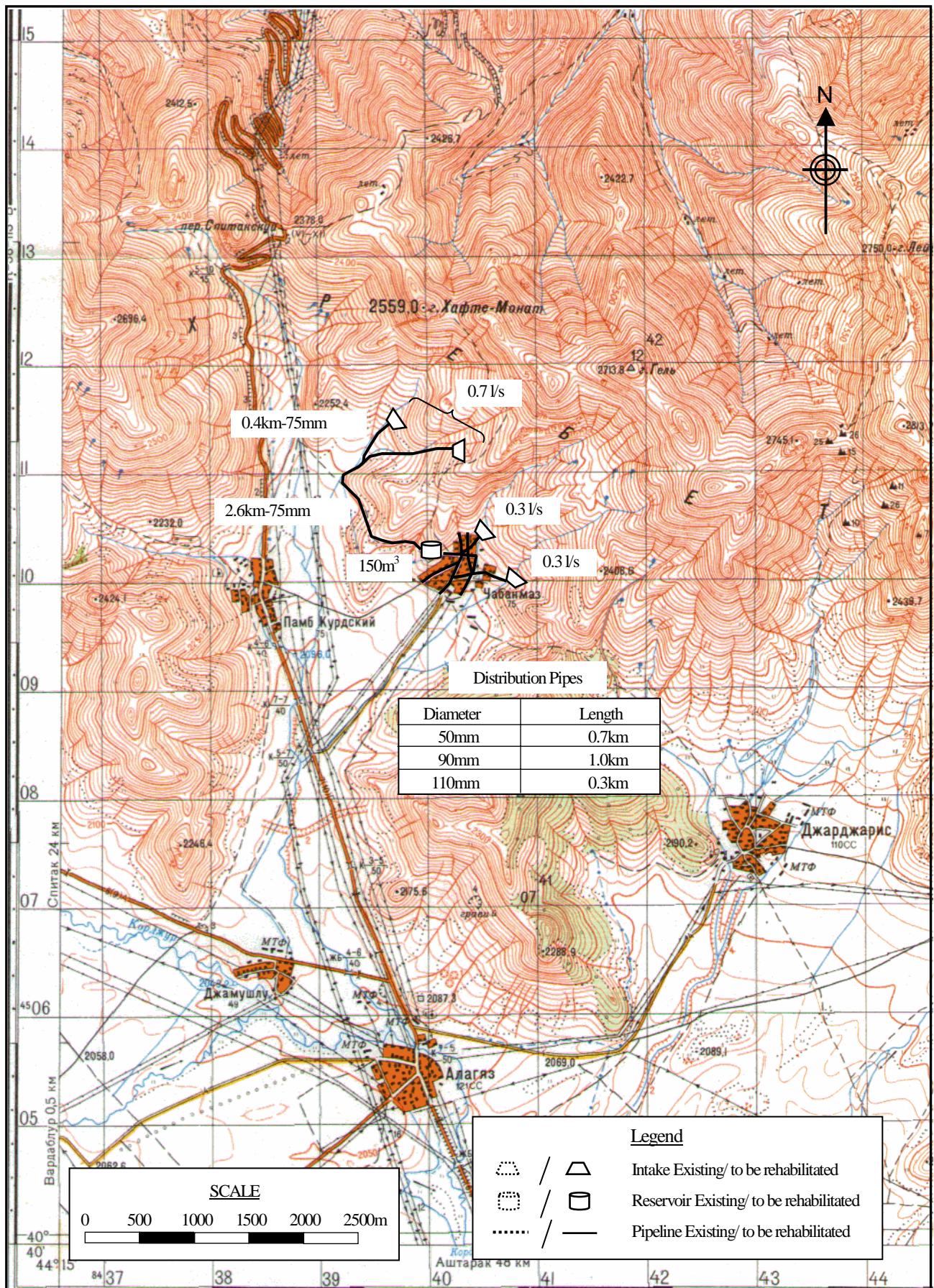
No.	Question	Answer
D14.2	Estimate quantity of domestic water use of each household (liter per day)	400
D15.1	How long the taps are open to provide the each household for filling	-
D15.2	Estimate quantity of water for filling containers of each household (liter per	400
D16	Drinking water monthly water 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?	spring
D20	Are you satisfied with irrigation water supply volume?	almost sufficient
E: Present Operation and Maintenance Works		
E1	Name of responsible for water supply	nobody
E2	Position	-
E3	Telephone	-
E4	Quantity and present condition of the water supply facilities: spring/ intake	3 partially repaired
E5	Quantity and present condition of the water supply facilities:	2partially repaired
E6	Quantity and present condition of the water supply facilities: DRR(Daily Regulatory Reservoir)	absent
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?	volunteers from community
E14	How you prepare O&M costs?	donation from residents
E15	Please indicate the O&M cost breakdown per year for water supply	
	Electricity (AMD)	0
	Labor cost (AMD)	0
	Repair cost(AMD)	0
	Others(AMD)	0
	Total (AMD)	0
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.	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 : Avshen

No.7

No.	Item	Quantity	Unit	Water demand (m3/d)
A. WATER DEMAND				
1	Population	275	persons	27.5
2	Factory	-	nos	0.0
3	School (pupils)	32	pupils	0.3
4	Medical Ambulance Station	-	nos	-
5	Policlinic	-	nos	-
7	Livestocks (87lit/household)	50	household	4.4
	Sub-total			32.2
	Unaccounted for water (20%)			6.4
1	Average Daily Water Demand			38.6 m3/day
2	Maximum Daily Water Demand			46.4 m3/day
3	Maximum Hourly Water Demand			10.0 m3/hr
B. WATER SUPPLY PLAN				
	1 Water source type	Nr.	Total vol.	
	a Spring	4	1.3 lit/sec	112.3 m3/day
	^ Total			112.3 m3/day
	2 Required reservoir volume			121 m3
C. WATER SUPPLY FACILITIES REHABILITATION PLAN				
No	Item	Quantity	Unit	
1	Intake			
	1m3	4	nos	
	2m3		nos	
	3m3		nos	
	4m3		nos	
2	Transmission pipe			
	50mm diameter		m	
	75mm diameter	3,000	m	
	90mm diameter		m	
	110mm diameter		m	
	150mm diameter		m	
	200mm diameter		m	
	250mm diameter		m	
3	Reservoir			
	150m3 capacity	1	nos	
4	Distribution pipe			
	50mm diameter	700	m	
	75mm diameter		m	
	90mm diameter	1,000	m	
	110mm diameter	300	m	
	150mm diameter		m	
	200mm diameter		m	
	250mm diameter		m	
5	House connection	49	nos	
6	Water meter installation	50	nos	
7	Public tap	1	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. 07

Avshen

JICA STUDY TEAM

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

Marz : **Aragatsotn**

No. : **7**

Name : **Avshen**

No	Item	Specification	Quantity	Unit	Unit Price	Total
1	Intake					
		1m3	4	nos	367,700	1,470,800
		2m3		nos	545,000	
		3m3		nos	669,100	
		4m3		nos	805,100	
	Sub-total					1,470,800
2	Transmission Pipe					
		50mm		m	5,520	
		75mm	3,000	m	7,160	21,480,000
		90mm		m	8,040	
		110mm		m	9,680	
		150mm		m	13,140	
		200mm		m	19,440	
		250mm		m	27,040	
	Sub-total					21,480,000
3	Reservoir					
		50m3		nos	8,363,900	
		100m3		nos	12,968,300	
		150m3	1	nos	18,804,500	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					18,804,500
4	Distribution Pipe					
		50mm	700	m	5,520	3,864,000
		75mm		m	7,160	
		90mm	1,000	m	8,040	8,040,000
		110mm	300	m	9,680	2,904,000
		150mm		m	13,140	
		200mm		m	19,440	
		250mm		m	27,040	
	Sub-total					14,808,000
5	House Connection		49	nos	74,000	3,626,000
6	Water Meter Installation		50	nos	80,000	4,000,000
7	Public Tap		1	nos	90,000	90,000
8	Chlorilation Equipment		1	nos	500,000	500,000
9	Pump Replacement			nos	10,000,000	
10	Drainage and Sewerage concrete surfa		800	m	3,600	2,880,000
Total					AMD	67,659,300
					Equivalent to USD	221,456
					Equivalent to JPY	23,363,630
					AMD	USD
Investment Cost per household					50 HH	1,353,186
Investment Cost per person					275 persons	246,034
						805

**ARAGATSOTN MARZ
Aparan District
No 7 Avshen**

PROJECTED INCOME STATEMENT

Unit: million AMD

PROJECTED CASH FLOW STATEMENT

Unit: million AMD

**ARAGATSOTN MARZ
Aparan District
No 7 Avshen**

FINANCIAL ANALYSIS

A COST RECOVERY ANALYSIS

Item	Million AMD	Rate
1 Revenue		
Water fee revenue	65.63	43.2%
Subsidy	86.39	56.8%
Total	152.02	100.0%
2 Expenditure		
OM cost	40.53	26.7%
Loan repayment	90.28	59.4%
Interest paid	21.21	14.0%
Surplus cash	0.00	0.0%
Total	152.02	100.0%

B. FIRR CALCULATION

Description	Total	Year																																					
		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
A COST																																							
1. Investment Cost	80.94	2.30	1.64	31.38	31.25	13.78	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			
Chlorine	1.50			0.02	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04		
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		
Maintenance cost	10.05			0.11	0.22	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27		
Pump replacement																																							
Sub-total	20.67																																						
Total Outflow	101.61	2.30	1.64	31.75	31.75	14.33	0.88	0.81	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55		
B BENEFIT																																							
1. Water Tariff	41.09	0.00	0.00	0.17	0.35	0.42	0.44	0.74	0.76	0.79	0.82	1.22	1.22	1.22	1.22	1.22	1.22	1.22	1.22	1.22	1.22	1.22	1.22	1.22	1.22	1.22	1.22	1.22	1.22	1.22	1.22	1.22	1.22	1.22	1.22	1.22	1.22	1.22	
2. Subsidy	65.65	0.00	0.00	0.20	0.16	0.18	0.17	0.00	0.00	0.00	0.00	2.10	2.10	2.10	2.11	2.12	2.13	2.15	2.14	2.14	2.16	2.17	2.17	2.18	2.18	2.18	2.18	2.20	2.20	2.20	2.21	2.21	2.20	2.20	2.20	2.19	2.19	2.17	
Total Inflow	106.74	0.00	0.00	0.37	0.51	0.60	0.61	0.74	0.76	0.79	0.82	3.32	3.32	3.32	3.33	3.34	3.35	3.36	3.38	3.39	3.39	3.38	3.40	3.41	3.42	3.42	3.43	3.42	3.42	3.43	3.41	3.41	3.39	3.39	3.38				
NET BENEFIT	5.13	-2.30	-1.64	-31.4	-31.2	-13.7	-0.27	-0.07	0.21	0.24	0.27	2.77	2.77	2.77	2.78	2.79	2.80	2.82	2.81	2.81	2.83	2.84	2.84	2.85	2.86	2.85	2.87	2.87	2.87	2.87	2.87	2.87	2.86	2.86	2.84	2.85	2.84	2.83	

FIRR = **0.29%**

C. SENSITIVITY ANALYSIS

No.	Description	FIRR	Sensitivity indicator	Switching value
1	1 Capital cost 10% up	-0.16%	-28.35	-3.53%
	2 Capital cost 20% up	-0.55%	-15.18	-6.59%
2	1 OM cost 10% up	0.17%	6.65	15.03%
	2 OM cost 20% up	0.06%	40.86	2.45%
3	1 Revenue 10% down	-0.32%	-18.82	-5.31%
	2 Revenue 20% down	-1.00%	-12.86	-7.78%

No.8 Aragats

Information on Existing Water Sources (Aragatsotn)

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

No.8 Community Aragats
District Aparan
Marz Aragatsotn

No	Water source	Latitude			Longitude			Altitude (m)	Yield(L/sec)		
		deg	min	sec	deg	min	sec		Min	Max	At site
1	a spring intake	40	29	24.2	44	17	59.7	2,242	2.0	4.0	3.0
2		40	29	57.7	44	12	41.5	2,943	1.0	10.0	2.0
3		40	29	57.6	44	12	38.1	2,952			
4		40	29	44.6	44	14	27.5	2,709	1.0	2.0	1.0
5		40	30	14.0	44	14	20.4	2,878	2.0	4.0	2.5
6		40	30	21.1	44	14	20.6	2,908	3.0	5.0	3.0
7	2spring intakes	40	30	13.9	44	18	21.1	2,273	1.5	2.5	3.0
8											
9											
10											

Notes:

Latitude, Longitude, Altitude:	Measured at site
Yield (Min, Max):	Interviewed to the Community
Yield (at site):	Measured / estimated at site in summer of 2007

Users Acceptnce for water quality	Acceptable
Notes	The flow of "No.6 Agdanner" spring is divided between 2 Communitys. There is estimated 50 % leakage in the internal network.
Alternative sources if any	No alternative water sources are available

No.8 Community Aragats
District Aparan
Marz Aragatsotn
Sampling date 25/Jul/2007

	Parameters analysed	Units	No.1 Chrikner	No.2 Qaghter jur	No.3 Salov aghbyur		Guidelines	
							WHO	Armenia
a	pH		7.5	7	7.1		6.5-8	6.0 - 9.0
b	Temperature	Deg.C	9.2	10.2	11.2			
c	TDS	Mg/L	17	17	45		1000	1000
1	Al:Aluminum	Mg/L	n.d	n.d	n.d		0.10	0.50
2	B:Boron	Mg/L	n.d	n.d	n.d		0.70	0.50
3	Cl:Chloride	Mg/L	4	4	11		250	350
4	Cr:Chrome	Mg/L	<0.01	<0.01	<0.01		0.05	0.05
5	Cu:Copper	Mg/L	n.d	n.d	n.d		2	1
6	F:Fluoride	Mg/L	0.06	0.02	0.05		1.50	
7	Hardness	Mg/L	30	40	75		500	700
8	Fe:Iron	Mg/L	n.d	n.d	n.d		0.30	0.30
9	Mn:Manganese	Mg/L	n.d	n.d	n.d		0.40	0.10
10	Mo:Molibdenum	Mg/L	<0.02	<0.02	<0.02		0.070	0.250
11	Ni:Nickel	Mg/L	n.d	n.d	n.d		0.020	0.100
12	Nitrate(NO3+)	Mg/L	1.3	1.3	0.9		50.0	45.0
13	SO4:Sulfate	Mg/L	2.0	8.0	24.0		250.0	500.0
14	Zn:Zink	Mg/L	n.d	n.d	n.d		3.0	5.0
15	As:Arsenic	Mg/L	n.d	n.d	n.d		0.0	0.1
16	Ba:Barium	Mg/L	n.d	<0.01	<0.01		0.70	0.10
17	Be:Berillium	Mg/L	n.d	n.d	n.d		NA	0.00020
18	Cd:Cadmium	Mg/L	0.0001	0.0001	0.0001		0.0030	0.0010
19	Pb:Lead	Mg/L	<0.001	<0.001	<0.001		0.010	0.030
20	Hg:Mercury	Mg/L	<0.0002	<0.0002	<0.0002		0.00100	0.00050
21	Se:Selenium	Mg/L	0.001	<0.001	<0.001		0.010	0.010
22	Sr:Strontium	Mg/L	n.d	n.d	n.d		NA	7.0
23	CN:Cyanide	Mg/L	n.d	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.8	Community	Aragats
	District	Aparan
	Marz	Aragatsotn

No. 8 Marz Aragatsotn Community Aragats

1. ACCESSIBILITY TO THE SITE

No.	Structures	Access by vehicle	Machine construction	Remarks
1	Intake	Possible	Possible	
2	Intake	Difficult	Unknown	
3	Intake	Difficult	Unknown	
4	Intake	Difficult	Unknown	
5	Intake	Difficult	Unknown	
6	Intake	Fair	Possible	
7	Water main	Difficult	Unknown	Pipeline is mostly far from the road
8	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°29'24.2"	44°17'59.7"	2,242	1978	RC	3.0	Yes
2	Spring	40°29'57.7"	44°12'41.5"	2,943	2002	RC	2.0	Yes
3	Spring	40°29'57.6"	44°12'38.1"	2,952	2002	RC		Yes
4	Spring	40°30'44.6"	44°14'27.5"	2,709	2002	RC	1.0	No
5	Spring	40°30'14.0"	44°14'20.4"	2,878	2002	RC	2.5	No
6	Spring	40°30'21.1"	44°14'20.6"	2,908	2002	RC	3.0	Yes
7	2 Springs	40°30'13.9"	44°18'21.1"	2,273	2002	RC	3.0	Yes

3. TRANSMISSION PIPELINE

No.	Pipeline length (m)	Pipe diameter	Material	Flow rate (l/s)	Year	Leakage	Rehabilitation Necessity (Y/N)
1	1,000	125	Steel	2.0	1978	Medium	Yes
	2,000	100	Steel		2002	Little	Yes
2	2,500	150	Steel	1.9	2002	Little	No
3	1,000	125	Steel	0.9	2002	Little	No
4	12,500	200	Steel	2.3	2002	Little	No
5	1,000	125	Steel	2.8	2002	Little	No
	9,500	100	Steel		2002	Little	No
6	4,500	100	Steel	1.3	2002	Little	Yes

4. RESERVOIR

No.	N	E	El. (m)	Material	Shape	Dimension (m)	Volume (m ³)	Rehabilitation Necessity (Y/N)
1	40°29'12.0"	44°19'57.6"	2,075	RC	Rectangular	d=12m, h=4m	400	Yes
2	40°29'11.3"	44°19'59.8"	2,070	RC	Rectangular	24x12x3	800	No

5. CHLORINATION

No.	Existence (Y/N)	Location	Chlorine type	Chlorine duration
1	Yes	Reservoir	Powder	once a wedc

6. DISTRIBUTION PIPELINE

No.	Pipeline length (m)	Pipe diameter	Material	Year	Leakage	Rehabilitation Necessity (Y/N)
1	3,800	150	Steel	1975	Huge	Yes
2	18,700	100	Steel	1960	Huge	Yes
3	9,600	80	Steel	1970	Huge	Yes
4	4,000	50	Steel	1975	Huge	Yes

7. PUMP STATION

Existence (Y/N)	Power source	Type	Capacity (l/s)	Pump head (m)	Tank cap. (m ³)	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)
150	1975	2001	Yes	60	Yes

9. DRAINAGE SYSTEM

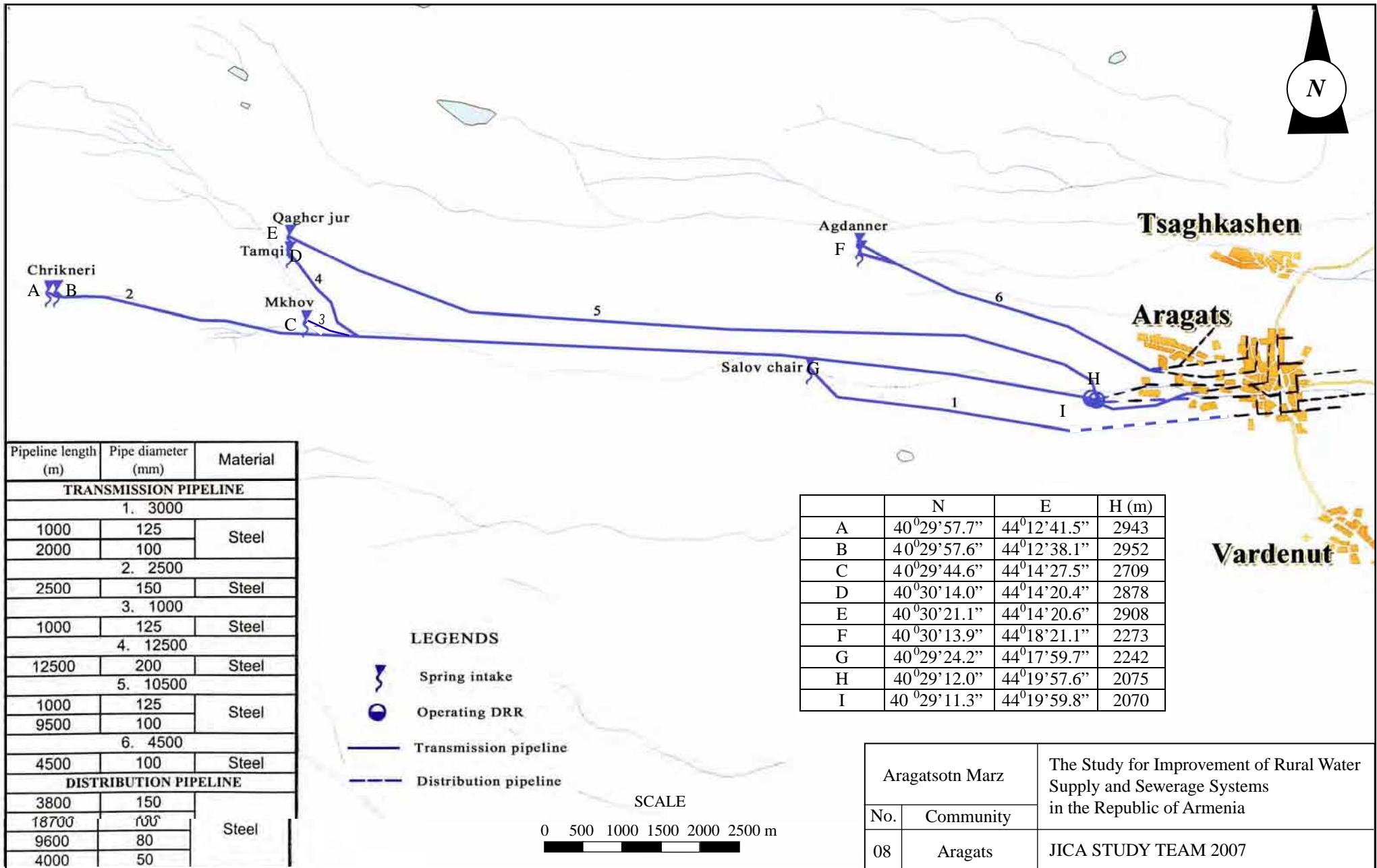
Existence	Rehabilitation	Remarks
No	Yes	

**Questionnaire on Existing Water Supply Conditions
by Socio-Economic Survey**

Marz	Aragatsotn	
Number and Name of Community		
District	Aparan	
No.	Question	Answer
A: Baseline Data		
A1	Actual population in 2001	3,450
A2	Actual population in 2007	3,800
A3	Number of households	600
A4.1	Elderly people	400
A4.2	Population in labor force (age from 16 to 62)	2,750
A4.3	Children	650
A5.1	Pensioners	420
A5.2	Unemployed	2
A5.3	Receiving benefits	75
A6	Average monthly income of household (AMD)	40,000
A7	Number of medical ambulance station/first and health post	1
A8	Number of beds in each medical ambulance station	10
A9	Number of school	2
A10	Number of pupils	500
B: Budget		
B1	Annual Budget of the community 2004, in thousand AMD	7,000
	Annual Budget of the community 2005, in thousand AMD	7,500
	Annual Budget of the community 2006, in thousand AMD	9,000
	Annual Budget of the community 2007, in thousand AMD	3,000
	Annual Budget of the community 2008, in thousand AMD	is not planned.
B2	Amount spent in drinking water sector 2004, in thousand AMD	2,000
	Amount spent in drinking water sector 2005, in thousand AMD	2,200
	Amount spent in drinking water sector 2006, in thousand AMD	2,400
	Amount spent in drinking water sector 2007, in thousand AMD	2,500
	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, artificial diamond
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	no
D2	Water use permit number	-
D3	Date of expiry of water use permit	-
D4	Planned date of obtaining water use permit	is not planned
D5	Present condition of the water supply volume of Domestic use	almost sufficient
D6	Present condition of the water supply volume of Irrigation water	sufficient
D7	Number of house connection to drinking water system	40
D8	How many house connection household set the water meter	0
D9	Number of public taps	500
D10.1	How is the regime of water supply in your community in the dry season?	regularly - 17 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?	07-23;
D12	Are you pleased with duration of domestic water supply?	very 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 household a day?	-

No.	Question	Answer
D14.2	Estimate quantity of domestic water use of each household (liter 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 (liter per	400
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?	river
D20	Are you satisfied with irrigation water supply volume?	almost sufficient
E: Present Operation and Maintenance Works		
E1	Name of responsible for water supply	Hovhannisyan Misha
E2	Position	utility department head
E3	Telephone	(093)206110
E4	Quantity and present condition of the water supply facilities: spring/ intake	6 partially repaired
E5	Quantity and present condition of the water supply facilities:	4 partially repaired
E6	Quantity and present condition of the water supply facilities: DRR(Daily Regulatory Reservoir)	2 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	deteriorated
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
E12	How do you repair the water supply facilities?	by ourselves
E13	Who is in charge of the repair work in the community?	specialist from community
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)	1,100,000
	Repair cost(AMD)	1,400,000
	Others(AMD)	0
	Total (AMD)	2,500,000
E16	Do the residents participate in the O&M works?	no
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	yes
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	yes
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

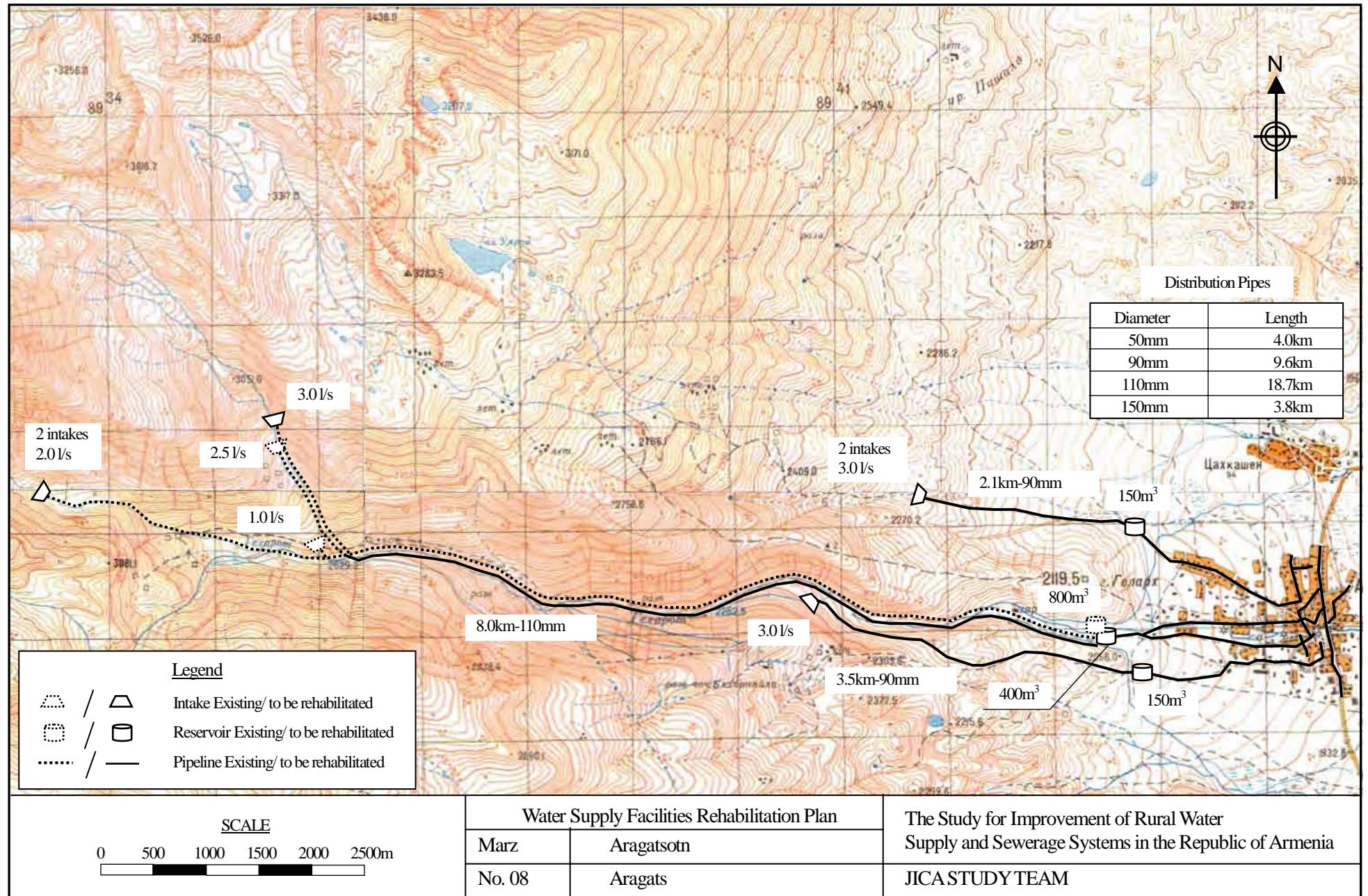
Aragatsotn
No.8 Aragats



Marz : Aragatsotn
Name : Aragats

No.8

No.	Item	Quantity	Unit	Water demand (m3/d)
A. WATER DEMAND				
1	Population	3,800	persons	380.0
2	Factory	-	nos	0.0
3	School (pupils)	500	pupils	5.0
4	Medical Ambulance Station	1	nos	1.2
5	Policlinic	-	nos	-
7	Livestocks (87lit/household)	600	household	52.2
	Sub-total			438.4
	Unaccounted for water (20%)			87.7
1	Average Daily Water Demand			526.1 m3/day
2	Maximum Daily Water Demand			631.3 m3/day
3	Maximum Hourly Water Demand			54.7 m3/hr
B. WATER SUPPLY PLAN				
	1 Water source type	Nr.	Total vol.	
	a Spring	8	14.5 lit/sec	1252.8 m3/day
	^ Total			1252.8 m3/day
	2 Required reservoir volume			657 m3
C. WATER SUPPLY FACILITIES REHABILITATION PLAN				
No	Item	Quantity	Unit	
1	Intake			
	1m3	6	nos	
	2m3		nos	
	3m3		nos	
	4m3		nos	
2	Transmission pipe			
	50mm diameter		m	
	75mm diameter		m	
	90mm diameter	5,600	m	
	110mm diameter	8,000	m	
	150mm diameter		m	
	200mm diameter		m	
	250mm diameter		m	
3	Reservoir			
	150m3 capacity	2	nos	
	400m3 capacity	1	nos	
4	Distribution pipe			
	50mm diameter	4,000	m	
	75mm diameter		m	
	90mm diameter	9,600	m	
	110mm diameter	18,700	m	
	150mm diameter	3,800	m	
	200mm diameter		m	
	250mm diameter		m	
5	House connection	560	nos	
6	Water meter installation	600	nos	
7	Public tap	6	nos	
8	Chlorination	3	nos	
9	Pumps	-	nos	



Marz : **Aragatsotn**

No. : **8**

Name : **Aragats**

No	Item	Specification	Quantity	Unit	Unit Price	Total
1	Intake					
		1m3	6	nos	367,700	2,206,200
		2m3		nos	545,000	
		3m3		nos	669,100	
		4m3		nos	805,100	
	Sub-total					2,206,200
2	Transmission Pipe					
		50mm		m	5,520	
		75mm		m	7,160	
		90mm	5,600	m	8,040	45,024,000
		110mm	8,000	m	9,680	77,440,000
		150mm		m	13,140	
		200mm		m	19,440	
		250mm		m	27,040	
	Sub-total					122,464,000
3	Reservoir					
		50m3		nos	8,363,900	
		100m3		nos	12,968,300	
		150m3	2	nos	18,804,500	37,609,000
		200m3		nos	22,524,600	
		250m3		nos	25,952,800	
		300m3		nos	29,630,400	
		350m3		nos	33,528,700	
		400m3	1	nos	36,388,000	36,388,000
		450m3		nos	39,392,500	
		500m3		nos	42,520,900	
	Sub-total					73,997,000
4	Distribution Pipe					
		50mm	4,000	m	5,520	22,080,000
		75mm		m	7,160	
		90mm	9,600	m	8,040	77,184,000
		110mm	18,700	m	9,680	181,016,000
		150mm	3,800	m	13,140	49,932,000
		200mm		m	19,440	
		250mm		m	27,040	
	Sub-total					330,212,000
5	House Connection		560	nos	74,000	41,440,000
6	Water Meter Installation		600	nos	80,000	48,000,000
7	Public Tap		6	nos	90,000	540,000
8	Chlorilation Equipment		3	nos	500,000	1,500,000
9	Pump Replacement			nos	10,000,000	
10	Drainage and Sewerage concrete surfa		14,440	m	3,600	51,984,000
Total					AMD	672,343,200
					Equivalent to USD	2,200,652
					Equivalent to JPY	232,168,786
					AMD	USD
Investment Cost per household				600	HH	1,120,572
Investment Cost per person				3,800	persons	3,668
						579

ARAGATSOTN MARZ
Aparan District
No 8 Aragats

PROJECTED INCOME STATEMENT

Unit: million AMD

PROJECTED CASH FLOW STATEMENT

Unit: million AMD

ARAGATSOTN MARZ
Aparan District
No 8 Aragats

FINANCIAL ANALYSIS

A COST RECOVERY ANALYSIS

Item	Million AMD	Rate
1 Revenue		
Water fee revenue	891.74	71.1%
Subsidy	362.13	28.9%
Total	1,253.87	100.0%
2 Expenditure		
OM cost	256.20	20.4%
Loan repayment	808.06	64.4%
Interest paid	189.61	15.1%
Surplus cash	0.00	0.0%
Total	1,253.87	100.0%

B. FIRR CALCULATION

Description	Total	Year																																											
		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	719.80	2.30	1.64	292.96	293.29	129.02	0.33	0.26																																					
2. Operation and Maintenance Cost																																													
Salary	18.24		0.48	0.48	0.48	0.48	0.48	0.48	0.48	0.48	0.48	0.48	0.48	0.48	0.48	0.48	0.48	0.48	0.48	0.48	0.48	0.48	0.48	0.48	0.48	0.48	0.48	0.48	0.48	0.48	0.48	0.48	0.48	0.48	0.48	0.48	0.48								
Chlorine	21.97		0.24	0.49	0.59	0.59	0.59	0.59	0.59	0.59	0.59	0.59	0.59	0.59	0.59	0.59	0.59	0.59	0.59	0.59	0.59	0.59	0.59	0.59	0.59	0.59	0.59	0.59	0.59	0.59	0.59	0.59	0.59	0.59	0.59	0.59	0.59	0.59	0.59						
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					
Maintenance cost	91.22		1.01	2.01	2.45	2.45	2.45	2.45	2.45	2.45	2.45	2.45	2.45	2.45	2.45	2.45	2.45	2.45	2.45	2.45	2.45	2.45	2.45	2.45	2.45	2.45	2.45	2.45	2.45	2.45	2.45	2.45	2.45	2.45	2.45	2.45	2.45	2.45	2.45						
Pump replacement																																													
Sub-total	131.43		1.73	2.98	3.52	3.52	3.52	3.52	3.52	3.52	3.52	3.52	3.52	3.52	3.52	3.52	3.52	3.52	3.52	3.52	3.52	3.52	3.52	3.52	3.52	3.52	3.52	3.52	3.52	3.52	3.52	3.52	3.52	3.52	3.52	3.52	3.52	3.52	3.52	3.52					
Total Outflow	851.23	2.30	1.64	294.69	296.27	132.54	3.85	3.78	3.52	3.52	3.52	3.52	3.52	3.52	3.52	3.52	3.52	3.52	3.52	3.52	3.52	3.52	3.52	3.52	3.52	3.52	3.52	3.52	3.52	3.52	3.52	3.52	3.52	3.52	3.52	3.52	3.52	3.52	3.52						
B BENEFIT																																													
1. Water Tariff	559.96	0.00	0.00	2.36	4.72	5.75	5.94	10.06	10.40	10.74	11.09	16.63	16.63	16.63	16.63	16.63	16.63	16.63	16.63	16.63	16.63	16.63	16.63	16.63	16.63	16.63	16.63	16.63	16.63	16.63	16.63	16.63	16.63	16.63	16.63	16.63	16.63	16.63	16.63	16.63	16.63	16.63	16.63	16.63	16.63
2. Subsidy	204.43	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	11.15	10.97	10.81	10.61	10.42	10.21	9.99	9.75	9.49	9.22	8.94	8.65	8.34	8.01	7.66	7.30	6.93	6.53	6.12	5.67	5.22	4.73	4.22	3.69	3.16	2.58	1.99	1.36	0.69	0.02	0.00			
Total Inflow	764.39	0.00	0.26	2.36	4.72	5.75	5.94	10.06	10.40	10.74	11.09	27.98	27.78	27.44	27.24	27.05	26.84	26.62	26.38	26.12	25.85	25.57	25.28	24.97	24.64	24.29	23.93	23.56	23.16	22.75	22.30	21.85	21.36	20.85	20.23	19.79	19.21	18.62	17.99	17.32	16.65				
NET BENEFIT	-86.84	-2.30	-1.64	-292.23	-291.5	-126.8	2.09	6.28	6.88	7.22	7.57	24.26	24.08	23.92	23.72	23.53	23.32	23.10	22.86	22.60	22.33	22.05	21.76	21.45	21.12	20.77	20.41	20.04	19.64	19.23	18.78	18.33	17.84	17.33	16.80	16.27	15.69	15.10	14.47	13.80	13.13				

FIRR = -0.65%

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	-313.33	-2.53	-1.80	-320.6	-320.9	-139.7	2.06	6.25	6.88	7.22	7.57	24.26	24.08	23.92	23.72	23.53	23.32	23.10	22.86	22.60	22.33	21.76	21.45	21.12	20.77	20.41	20.04	19.64	19.23	18.78	18.33	17.84	17.33	16.80	16.27	15.69	15.10	14.47	13.80	13.13		
2	Capital cost 20% up	-380.77	-2.76	-1.97	-350.9	-350.2	-152.6	2.02	6.23	6.88	7.22	7.57	24.26	24.08	23.92	23.72	23.53	23.32	23.10	22.86	22.60	22.33	21.76	21.45	21.12	20.77	20.41	20.04	19.64	19.23	18.78	18.33	17.84	17.33	16.80	16.27	15.69	15.10	14.47	13.80	13.13		
2	1 OM cost 10% up	-255.04	-2.30	-1.64	-292.5	-291.8	-127.1	1.74	5.93	6.53	6.87	7.22	23.91	23.73	23.57	23.37	23.18	22.97	22.75	22.51	22.25	21.98	21.70	21.41	21.10	20.77	20.42	20.06	19.69	19.29	18.88	18.43	17.98	17.49	16.98	16.45	15.92	15.34	14.75	14.12	13.45	12.78	
2	OM cost 20% up	-264.20	-2.30	-1.64	-292.7	-292.1	-127.5	1.39	5.58	6.18	6.52	6.87	23.56	23.38	23.22	23.00	22.84	22.62	22.40	22.16	21.90	21.63	21.35	21.06	20.75	20.42	20.07	19.71	19.34	18.94	18.53	18.08	17.63	17.14	16.63	16.10	15.57	14.99	14.40	13.77	13.10	12.43	
3	1 Revenue 10% down	-297.90	-2.30	-1.64	-292.6	-292.0	-127.4	1.50	5.27	5.84	6.15	6.46	21.48	21.32	21.18	21.00	20.83	20.64	20.44	20.22	19.99	19.75	19.49	19.23	18.95	18.66	18.34	18.02	17.68	17.32	16.96	16.55	16.15	15.70	15.25	14.77	14.29	13.77	13.24	12.67	12.07	11.47	
3	Revenue 20% down	-349.91	-2.30	-1.64	-292.4	-292.8	-127.9	0.90	4.27	4.80	5.05	5.37	18.50	18.26	18.43	18.27	18.12	17.95	17.78	17.58	17.38	17.16	16.94	16.70	16.45	16.19	15.91	15.62	15.33	15.01	14.68	14.32	13.96	13.57	13.16	12.74	12.31	11.85	11.38	10.87	10.34	9.80	

No.	Description	FIRR	Sensitivity indicator	Switching value
1	1 Capital cost 10% up	-1.12%	-4.19	-23.88%
	2 Capital cost 20% up	-1.54%	-5.77	-17.33%
2	1 OM cost 10% up	-0.75%	-1.37	-73.05%
	2 OM cost 20% up	-0.86%	-2.42	-41.31%
3	1 Revenue 10% down	-1.28%	-4.91	-20.35%
	2 Revenue 20% down	-1.98%	-6.71	-14.91%

No.9 Aragats

Information on Existing Water Sources (Aragatsotn)

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

No.9 Community Aragatsotn
District Talin
Marz Aragatsotn

No	Water source	Latitude			Longitude			Altitude (m)	Yield(L/sec)		
		deg	min	sec	deg	min	sec		Min	Max	At site
1	Chikanner water main	40	19	59.4	43	40	8.8	1,282	-	-	0.0
2	borehole	40	19	32.8	43	39	19.3	1,262	-	-	10.0
3	borehole	40	19	33.9	43	40	35.6	1,237	-	-	10.0
4											
5											
6											
7											
8											
9											
10											

Notes:

Latitude, Longitude, Altitude:	Measured at site
Yield (Min, Max):	Interviewed to the Community
Yield (at site):	Measured / estimated at site in summer of 2007

Users Acceptnce for water quality	Not acceptable
Notes	"Chikanner" water main currently does not supply water to the community. It was planned to supply 20l/sec of water through this water main. Currently the community uses 2 boreholes, water of which used for non-drinking purposes.
Alternative sources if any	No alternative water sources are available

No.9 Community Aragatsotn
District Talin
Marz Aragatsotn
Sampling date 27/Jul/2007

	Parameters analysed	Units	No.1 well	No.2 well			Guidelines	
							WHO	Armenia
a	pH		7.2	7.3			6.5-8	6.0 - 9.0
b	Temperature	Deg.C	21	20.5				
c	TDS	Mg/L	412	452			1000	1000
1	Al:Aluminum	Mg/L	n.d	n.d			0.10	0.50
2	B:Boron	Mg/L	n.d	n.d			0.70	0.50
3	Cl:Chloride	Mg/L	45	45			250	350
4	Cr:Chrome	Mg/L	n.d	n.d			0.05	0.05
5	Cu:Copper	Mg/L	n.d	n.d			2	1
6	F:Fluoride	Mg/L	0.36	0.39			1.50	
7	Hardness	Mg/L	965	970			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	n.d	n.d			0.070	0.250
11	Ni:Nickel	Mg/L	n.d	n.d			0.020	0.100
12	Nitrate(NO3+)	Mg/L	1.3	1.3			50.0	45.0
13	SO4:Sulfate	Mg/L	80.0	80.0			250.0	500.0
14	Zn:Zink	Mg/L	n.d	n.d			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	0.00005	0.00005			NA	0.00020
18	Cd:Cadmium	Mg/L	0.0001	0.0001			0.0030	0.0010
19	Pb:Lead	Mg/L	<0.001	<0.001			0.010	0.030
20	Hg:Mercury	Mg/L	<0.0002	<0.0002			0.00100	0.00050
21	Se:Selenium	Mg/L	<0.001	<0.001			0.010	0.010
22	Sr:Strontium	Mg/L	<0.7	<0.7			NA	7.0
23	CN:Cyanide	Mg/L	n.d	n.d			0.070	0.035
24	Coli form bacteria	bacteria per 100 ml	>1100				-	0
25	Thermo-tolerant coli form bacteria	bacteria per 100 ml	n.d				0	0
26	Total bacteria	bacteria per 1 ml	640				-	50

Information on Existing Water Sources Existing Bacteriological Test

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

No.9 Community Aragats
 District Talin
 Marz Aragatsotn

No. 9 Marz Aragatsotn Community Aragats

1. ACCESSIBILITY TO THE SITE

No.	Structures	Access by vehicle	Machine construction	Remarks
1	Intake	Difficult	Difficult	
2	Transmission pipeline	Difficult	Difficult	Difficult to find the pipeline route
3	Reservoir	Possible	Possible	

2. INTAKE STRUCTURE

No.	Water source	N	E	El. (m)	Year	Material	Volume (l/s)	Rehabilitation Necessity (Y/N)
1	Water main	40°19'59.4"	43°40'08.8"	1,282	2004	Steel	0.0	Yes
2	Groundwater	40°19'32.8"	43°39'19.3"	1,262	1979	Steel	10.0	Yes
3	Groundwater	40°19'33.9"	43°40'35.6"	1,237	1970	Steel	10.0	Yes

3. TRANSMISSION PIPELINE

No.	Pipeline length (m)	Pipe diameter	Material	Flow rate (l/s)	Year	Leakage	Rehabilitation Necessity (Y/N)
1	1,800	200	cast iron	0.0	1960	Huge	Yes

4. RESERVOIR

No.	N	E	El. (m)	Material	Shape	Dimension (m)	Volume (m3)	Rehabilitation Necessity (Y/N)
1	40°19'59.4"	43°40'08.8"	1,260	reinforced concrete	Circle	2x(d=9m, h=3m)	2x150	Yes
2	40°19'29.9"	43°38'58.0"	1,289	reinforced concrete	Rectangular	12x12x4	500	Yes

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	1,200	150	Steel	1964	Medium	Yes
2	1,150	100	Steel	1964	Medium	Yes
3	14,350	150	cast iron	1964	Medium	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)
Yes	Commercial	Centrifugal	40	30		3x4x3	Yes

8. PUBLIC TAPS

No. of taps	Old one (year)	New one (year)	Valves (Y/N)	Valve rate (%)	Rehabilitation Necessity (Y/N)
15	1964		No	0	Yes

9. DRAINAGE SYSTEM

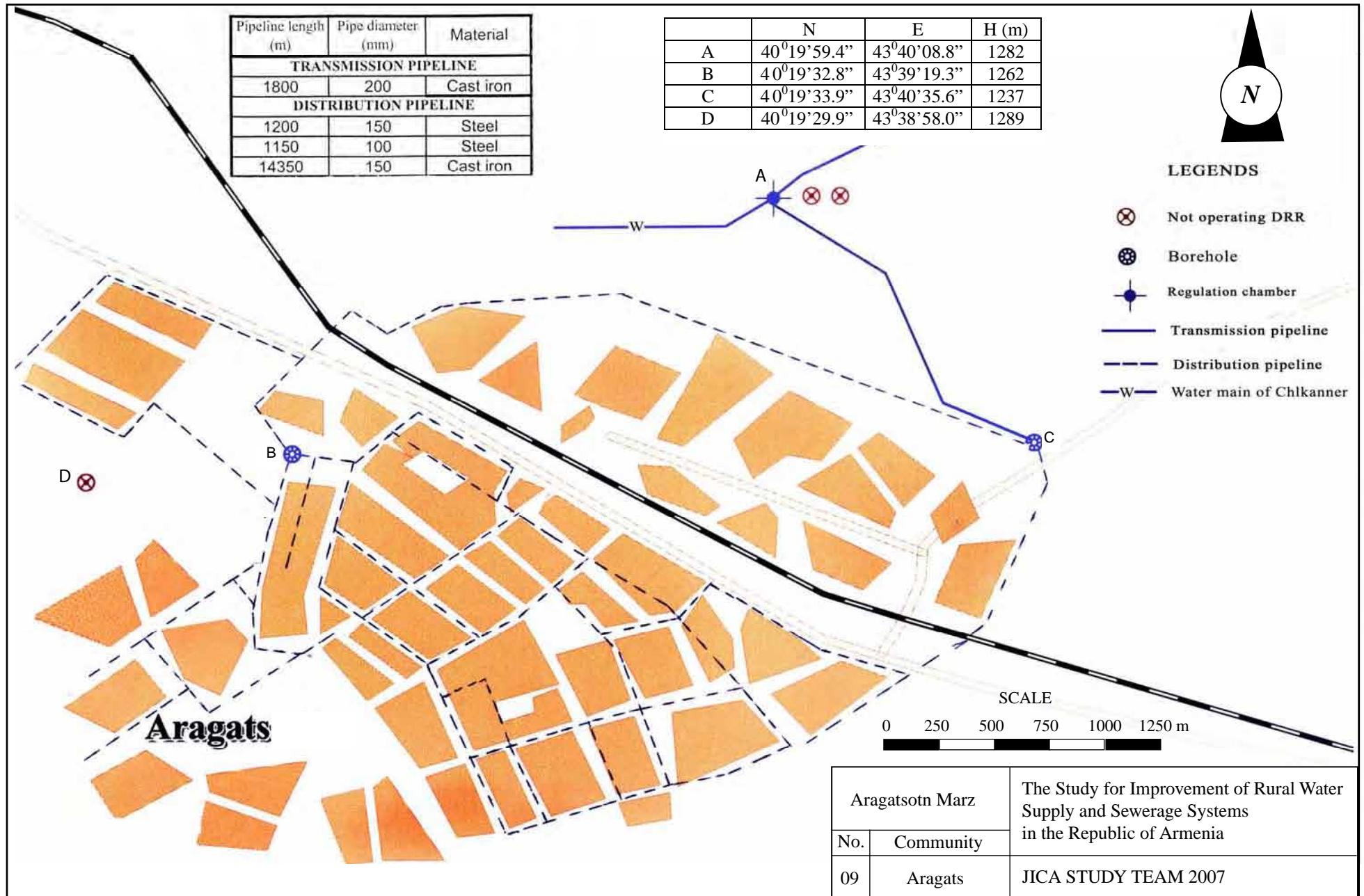
Existence (Y/N)	Rehabilitation Necessity	Remarks
Yes	Yes	only 300m long asbestos DN200 sewage pipeline exists

**Questionnaire on Existing Water Supply Conditions
by Socio-Economic Survey**

Marz	Aragatsotn
Number and Name of Community	No.9 Aragats
District	Talin

No.	Question	Answer
A: Baseline Data		
A1	Actual population in 2001	7,200
A2	Actual population in 2007	5,600
A3	Number of households	1,600
A4.1	Elderly people	796
A4.2	Population in labor force (age from 16 to 62)	4,564
A4.3	Children	1,082
A5.1	Pensioners	996
A5.2	Unemployed	20
A5.3	Receiving benefits	220
A6	Average monthly income of household (AMD)	15,000
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	3
A10	Number of pupils	1,100
B: Budget		
B1	Annual Budget of the community 2004, in thousand AMD	15,000
	Annual Budget of the community 2005, in thousand AMD	16,000
	Annual Budget of the community 2006, in thousand AMD	16,000
	Annual Budget of the community 2007, in thousand AMD	17,000
	Annual Budget of the community 2008, in thousand AMD	is not planned.
B2	Amount spent in drinking water sector 2004, in thousand AMD	12,000
	Amount spent in drinking water sector 2005, in thousand AMD	12
	Amount spent in drinking water sector 2006, in thousand AMD	12
	Amount spent in drinking water sector 2007, in thousand AMD	12
	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, fruit, reinforced concrete structures
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	no
D2	Water use permit number	-
D3	Date of expiry of water use permit	-
D4	Planned date of obtaining water use permit	is not planned
D5	Present condition of the water supply volume of Domestic use	insufficient
D6	Present condition of the water supply volume of Irrigation water	sufficient
D7	Number of house connection to drinking water system	1600
D8	How many house connection household set the water meter	0
D9	Number of public taps	15
D10.1	How is the regime of water supply in your community in the dry season?	no water at all
D10.2	How is the regime of water supply in your community in the wet season?	no water at all
D11	What time of day water is given?	-
D12	Are you pleased with duration of domestic water supply?	mainly displeased
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 household a day?	-

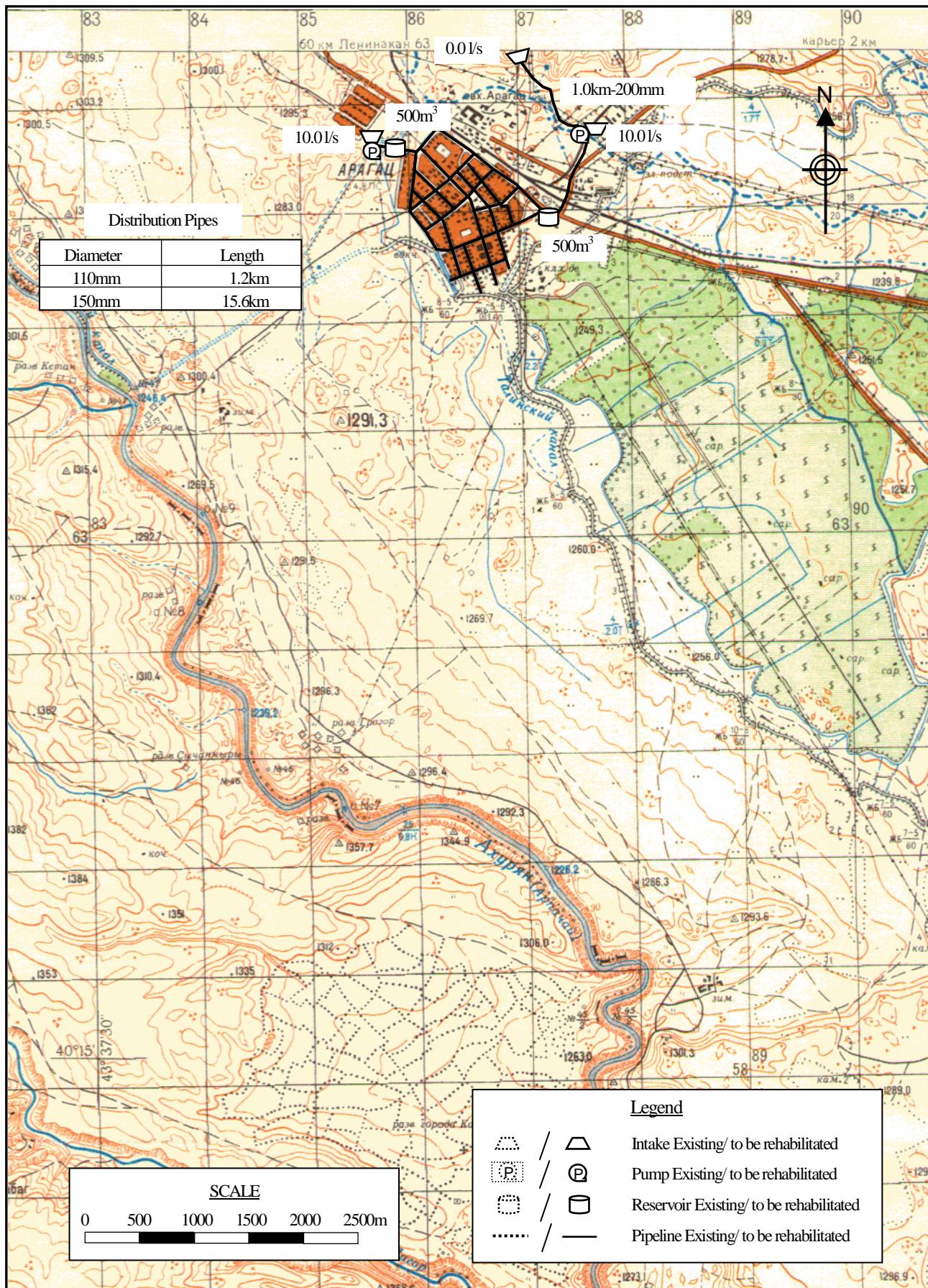
No.	Question	Answer
D14.2	Estimate quantity of domestic water use of each household (liter per day)	200
D15.1	How long the taps are open to provide the each household for filling	-
D15.2	Estimate quantity of water for filling containers of each household (liter per	400
D16	Drinking water monthly water fee per household	400drams
D17	How often do you usually pay water fees?	do not pay
D18	Water fee structure 1Flat rate, 2 Having water tariff	flat rate
D19	Where do you acquire the irrigation water?	WUA
D20	Are you satisfied with irrigation water supply volume?	sufficient
E: Present Operation and Maintenance Works		
E1	Name of responsible for water supply	absent
E2	Position	-
E3	Telephone	-
E4	Quantity and present condition of the water supply facilities: spring/ intake	absent
E5	Quantity and present condition of the water supply facilities:	absent
E6	Quantity and present condition of the water supply facilities: DRR(Daily Regulatory Reservoir)	2 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	deteriorated
E9	Quantity and present condition of the water supply facilities: pump	2 rehabilitated
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?	hired specialist from community
E14	How you prepare O&M costs?	community budget
E15	Please indicate the O&M cost breakdown per year for water supply	
	Electricity (AMD)	2,500,000
	Labor cost (AMD)	2,100,000
	Repair cost(AMD)	7,400,000
	Others(AMD)	0
	Total (AMD)	12,000,000
E16	Do the residents participate in the O&M works?	no
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	yes
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 : Aragats

No.9

No.	Item	Quantity	Unit	Water demand (m3/d)
A. WATER DEMAND				
1	Population	5,600	persons	560.0
2	Factory	-	nos	0.0
3	School (pupils)	1,100	pupils	11.0
4	Medical Ambulance Station	-	nos	-
5	Policlinic	-	nos	-
7	Livestocks (87lit/household)	1,600	household	139.2
Sub-total				710.2
Unaccounted for water (20%)				142.0
1	Average Daily Water Demand			852.2 m3/day
2	Maximum Daily Water Demand			1022.7 m3/day
3	Maximum Hourly Water Demand			83.1 m3/hr
B. WATER SUPPLY PLAN				
	1 Water source type	Nr.	Total vol.	
a	Borehole	2	20.0	lit/sec
b	Existing transmission	1	0.0	lit/sec
	Total			1728.0 m3/day
	2 Required reservoir volume			997 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	1,000		m	
250mm diameter			m	
3	Reservoir			
500m3 capacity	2		nos	
4	Distribution pipe			
50mm diameter			m	
75mm diameter			m	
90mm diameter			m	
110mm diameter	1,200		m	
150mm diameter	15,600		m	
200mm diameter			m	
250mm diameter			m	
5	House connection	-	nos	
6	Water meter installation	1,600	nos	
7	Public tap	16	nos	
8	Chlorination	2	nos	
9	Pumps	2	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. 09	Aragats	JICA STUDY TEAM

Marz : **Aragatsotn**

No. : **9**

Name : **Aragats**

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	1,000	m	19,440	19,440,000
		250mm		m	27,040	
	Sub-total					19,440,000
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	2	nos	42,520,900	85,041,800
	Sub-total					85,041,800
4	Distribution Pipe					
		50mm		m	5,520	
		75mm		m	7,160	
		90mm		m	8,040	
		110mm	1,200	m	9,680	11,616,000
		150mm	15,600	m	13,140	204,984,000
		200mm		m	19,440	
		250mm		m	27,040	
	Sub-total					216,600,000
5	House Connection			nos	74,000	
6	Water Meter Installation		1,600	nos	80,000	128,000,000
7	Public Tap		16	nos	90,000	1,440,000
8	Chlorilation Equipment		2	nos	500,000	1,000,000
9	Pump Replacement		2	nos	10,000,000	20,000,000
10	Drainage and Sewerage concrete surfa		6,720	m	3,600	24,192,000
Total					AMD	496,816,900
					Equivalent to USD	1,626,135
					Equivalent to JPY	171,557,289
					AMD	USD
Investment Cost per household		1,600	HH		310,511	1,016
Investment Cost per person		5,600	persons		88,717	290

**ARAGATSOTN MARZ
Talin District
No 9 Aragats**

PROJECTED INCOME STATEMENT

Unit: million AMD

PROJECTED CASH FLOW STATEMENT

Unit: million AMD

ARAGATSOTN MARZ
Talin District
No 9 Aragats

FINANCIAL ANALYSIS

A COST RECOVERY ANALYSIS

Item	Million AMD	Rate
1 Revenue		
Water fee revenue	1,603.54	92.6%
Subsidy	128.23	7.4%
Total	1,731.77	100.0%
2 Expenditure		
OM cost	837.80	48.4%
Loan repayment	597.99	34.5%
Interest paid	140.86	8.1%
Surplus cash	155.12	9.0%
Total	1,731.77	100.0%

B. FIRR CALCULATION

FIRR = **1.44%**

C. SENSITIVITY ANALYSIS

No.	Description	FIRR	Sensitivity indicator	Switching value
1	1 Capital cost 10% up	0.87%	6.66	15.01%
	2 Capital cost 20% up	0.36%		3.33%
2	1 OM cost 10% up	1.05%	3.68	27.16%
	2 OM cost 20% up	0.65%		8.22%
3	1 Revenue 10% down	0.39%	26.70	3.75%
	2 Revenue 20% down	-0.79%		-3.52%