

PN-ACB-138

Environmental Policy and Technology Project
Contract No. CCN-003-Q-00-3165

Muynak, Uzbekistan
Central Asian Republics

**EPT Project Report:
Proposed Water System Improvements
City of Muynak**

October 1996

Prepared for:
Regional Mission for Central Asia
U.S. Agency for International Development

Prepared by:
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Environmental Policy and Technology Project
A USAID Project Consortium Led by CH2M-Hill

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ENVIRONMENTAL POLICY AND TECHNOLOGY PROJECT

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DATE: 25 October 1996
TO: Barry Primm, USAID/Almaty
David Mandel, USAID/Tashkent
FROM: Paul Dreyer, EPT/Almaty
SUBJECT: Uzbekistan Activities
Proposed Muynak Program

The attached report summarizes the proposed Muynak water system improvements program in Uzbekistan. Based on the initiative of Ambassador Stanley Escudero this summer, we visited the water system facilities in Muynak and have prepared the attached report.

The intent is to complete the proposed activities by reprogramming some of the existing funds in Delivery Order No. 6 to completed this work as part of the on-going program. The funds for these activities are now available since the GOU has provided chemicals to the water plants and USAID funding for these chemicals is not necessary. Chlorination facilities were installed at the two water treatment plants and the two reservoirs serving the cities of Urgench and Nukus. Similar facilities were also installed at the pump stations serving the cities of Chimbai and Kegili earlier this year. The basis of the enclosed recommendations is to utilize the familiar equipment that has been fully accepted and utilized by the local authorities.

The schedule for completing these activities will extend beyond the completion for Delivery Order No. 6 of 31 March 1997, and a no-cost time extension will be required. All efforts will be made to accelerate these activities.

Please advise of the mission concurrence to complete the proposed activities as part of the on-going program. Thank you.

cc: Syed Mahmood, EPT/Almaty
Randall Hoffman, EPT/Moscow
James Westfield, EPT/Washington
AID252
Enclosure

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Section 1 INTRODUCTION

1.1 BACKGROUND

This report is prepared as part of the program outlined in the Memorandum of Understanding executed on 20 April 1994 between the government of the United States and the Government of Uzbekistan. These activities are being completed for the United States Agency for International Development (USAID) by the Environmental Policy and Technology (EPT) Project. Previous improvements have been made to the water systems in Khorezm Oblast and Karakalpakstan at water treatment plant and pump stations in the area near the Aral Sea.

On 1 February 1996, the Chairman of the Committee on Nature Protection requested the assistance of USAID in a letter for the "resolution of the Muynak water supply problem by incorporating into the 1996 work plan the furnishing of one or two demineralization units for this purpose." At that time funding was not available for this purpose through the USAID program. The United States Ambassador, Stanley Escudero, visited the City of Nukus in July 1996 and was asked if the United States Government could assist the citizens with some immediate improvements to the water system serving the city. An EPT assessment team visited the city and toured the facilities in August with representatives of the Muynak Water System and the construction office of the Muynarsky District. The field team is shown in Photograph 1.

The City of Muynak is located on the delta of the Amu Darya and was a major fishing port until the vast irrigation schemes diverted flow to the sea. Forty years ago more than 160 trawlers worked out of Muynak, and now the city is 100 km from the shore. The area is one of extreme temperatures ranging from -40 C in January to +40 C in July. In addition, the dry sea bed has been a source of salt and sand for storms that causing respiratory and other diseases. The city is approximately 160 km north of Nukus in Karakalpakstan, an autonomous republic in Uzbekistan. The location of the city is shown in Figure 1.

The estimated population of the city is 14,200.

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UZBEKISTAN ACTIVITIES

CITY OF MUYNAK IN KARAKALPAKSTAN

Field team visit to the City of Muynak, from left: Kenes Aitmuratov (Hakim of Muynak), Paul Dreyer (EPT Regional Director), Maksat Baranbayev (Deputy Hakim of Construction for the Muynaksky District), Sabit Yusupov (Chief Engineer Karakalpak Industrial Office), Zhaksylyk Rakhmetov (Manager of the Muynak Water System), and Ronald Melesky (EPT Construction Manager in Uzbekistan.)

August 1996

Photograph 1

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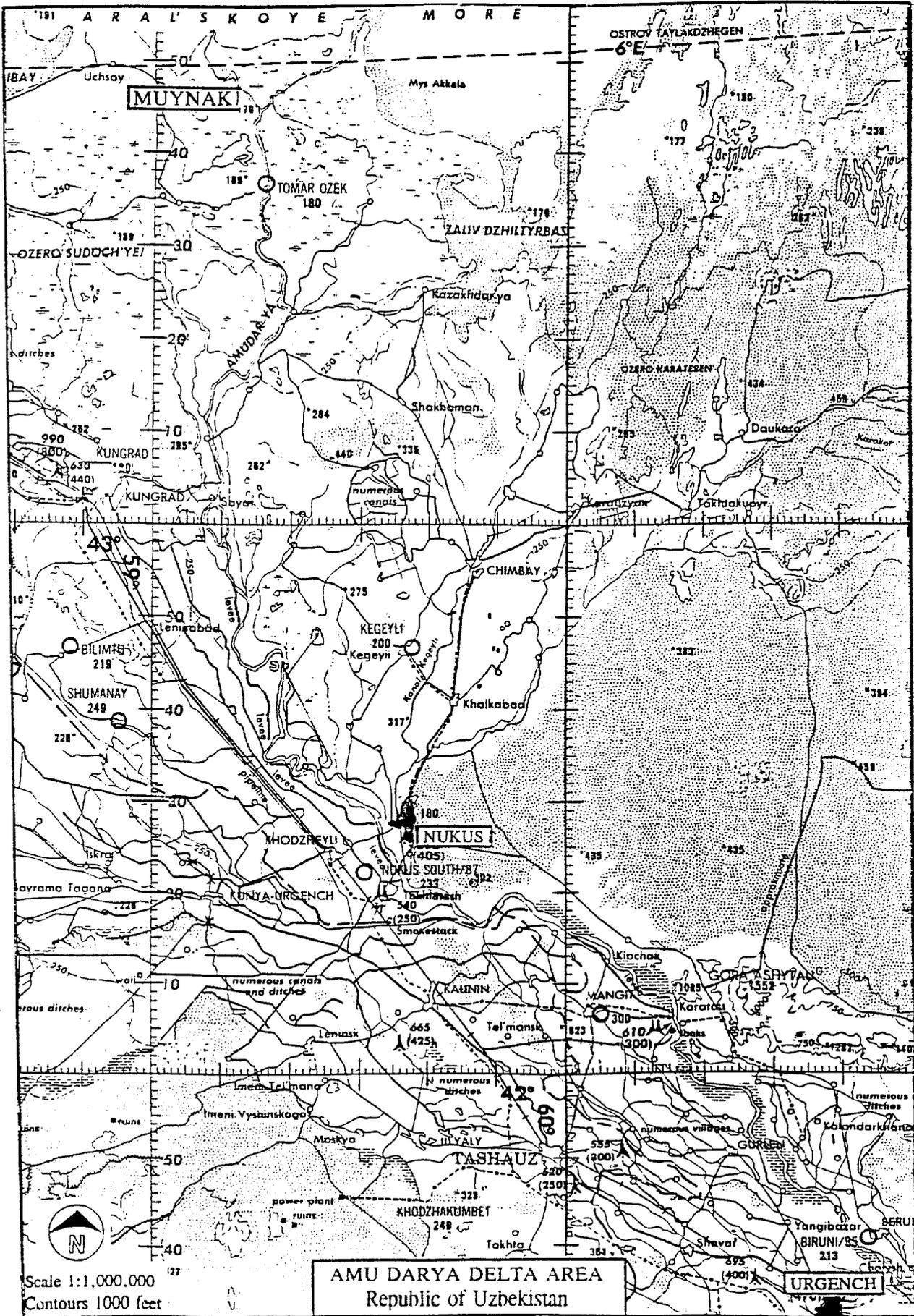


Figure 1 *6*

Section 2 TECHNICAL ISSUES

2.1 EXISTING FACILITIES

The water for the City of Muynak is mainly supplied by a preliminary treatment facility using water from the Cartabay Canal which is connected to the Amu Darya. In addition, some small scale reverse osmosis facilities are located in remote areas which supply a limited amount of drinking water.

The existing Muynak water intake facilities are illustrated in Figure 2. A centrifugal pump is used to lift the water from the canal to the treatment facility. At times, the canal is almost dry and the authorities are intending to provide a small dam on the canal to raise the water level in the canal. This pump is in poor condition and needs to be replaced. This is shown in Photograph 2. The raw water is pumped to earthen clarifiers approximately two meters deep. At the time of the field visit, the clarifiers were overgrown with reeds and bull rushes and very little water depth was observed. The clarifiers should be cleaned to provide for some settling of the turbidity. No water sampling was conducted by the field team during the field visit. However, data on the water quality from 1995 was provided by the City of Muynak as shown in Table A-1 in the Appendix. Also, the quality of the canal water is shown in Table A-2. The average turbidity of the raw water in the canal varies from 7.5 mg/l in summer to 30 mg/l in spring, based on information provided by the World Bank consultants.

The water is transferred to the city reservoirs approximately 8.2 kilometers from the intake/treatment facility. The pump station is shown in Photograph 3. The design capacity of the facility is 7.2 cubic meters per day with a present operating capacity estimated to be 5.2 cubic meters per day.

2.2 DISTRIBUTION SYSTEM

The distribution reservoirs are located in the city opposite city administration complex and consists of three reservoirs: two 1,000 cubic meters and one 2,500 cubic meters. A schematic of this system is shown in Figure 3. The distribution network is approximately 25.7 km although water is not pumped 24 hours per day. The quality of the treated water is shown in Table A-3.

Chlorine is added to the reservoirs using powered bleach mixed in a bath tub and gravity fed to the reservoirs. This system is shown in Photograph 4. There appears to be no control over the dosage amount or frequency, and no equipment was noted for measuring chlorine residual. The chlorine building and the chlorine feed lines to the reservoirs are shown in Photograph 5.

2.3 STATUS OF IMPROVEMENTS

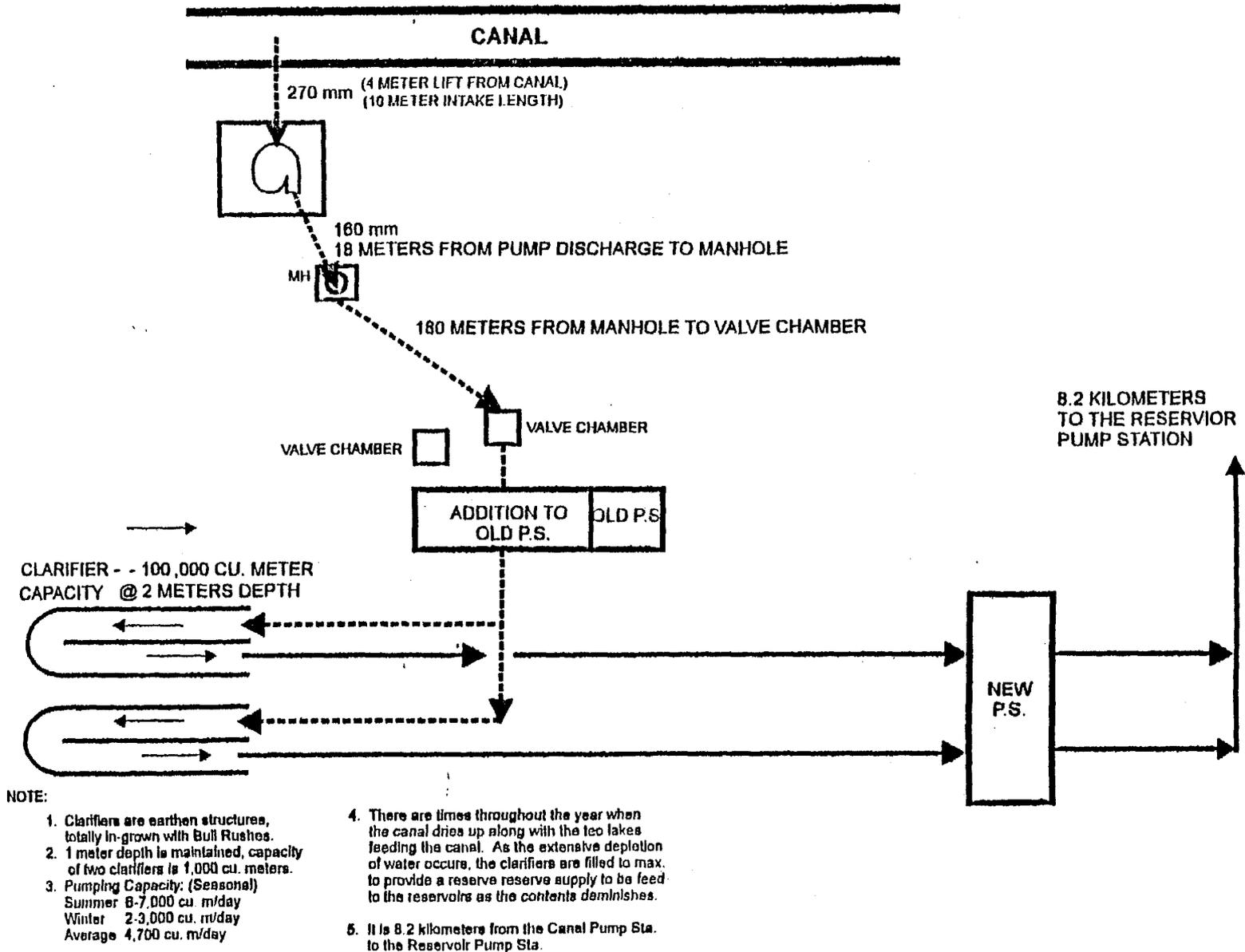
There are two alternatives being considered for providing an improved water supply to the City of Muynak. One alternative is to provide water from the Tuyamuyun-Nukus transmission system by extending the pipeline from Kungrad to Muynak. This would require a 500 mm line 96,400 meters in length as shown in Figure 4, Schematic of the Tuyamuyun Water Supply Systems. The estimated cost of this project is US\$31.2 million and was provided by the Japan International Cooperation Agency (JICA) in a report on Water Supply System in Six Cities of the Aral Sea Region of Uzbekistan dated October 1996.

Another alternative is to install a reverse osmosis water treatment plant in the city using the canal or other sources of raw water. Both these alternatives are costly and would not address the immediate need for an improved water system. The consultants to the World Bank indicate that "local opinion is divided on the supply to Muynak - that is whether it should be supplied by desalination or from Tuyamuyun."

2.4 USAID ACTIVITIES

USAID has been implementing a water improvements program in this area of Uzbekistan over the last two years as part of the U.S. Aral Sea Program. A summary of the water system improvements completed are listed in Table A-4. These improvements included chlorination equipment installed at two large water treatment plants, two large reservoirs, and two smaller pumping stations in the Aral Sea area. A comparison was made of the relative sizes of water treatment facilities and chlorination equipment installed in Uzbekistan which is shown in Table 3. Equipment of similar size to the Chimbai and Kegeyki Pump Stations could be provided as part of the EPT program which was readily accepted and is successfully being utilized by the local authorities in each of these facilities.

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MUYNAK WATER INTAKE PUMP STATION SCHEMATIC

Figure 2

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UZBEKISTAN ACTIVITIES

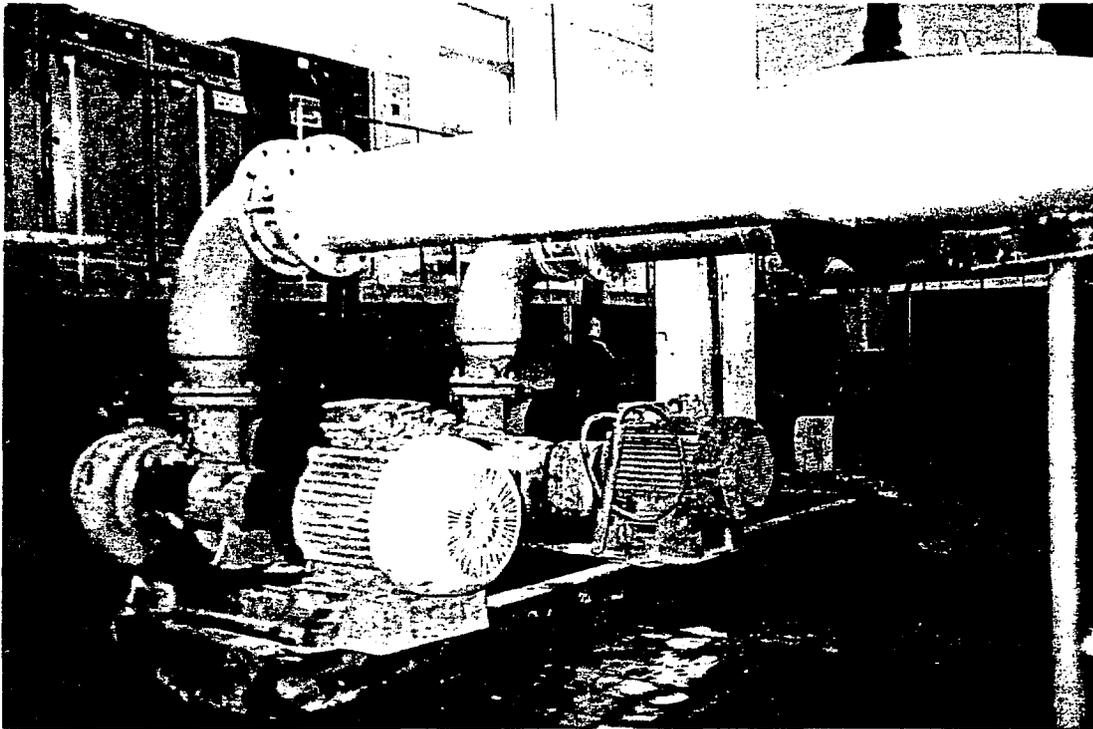
CITY OF MUYNAK IN KARAKALPAKSTAN
Centrifugal pump for water supply from drainage canal.

August 1996

Photograph 2

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USAID Mission for Central Asia

UZBEKISTAN ACTIVITIES

CITY OF MUYNAK IN KARAKALPAKSTAN

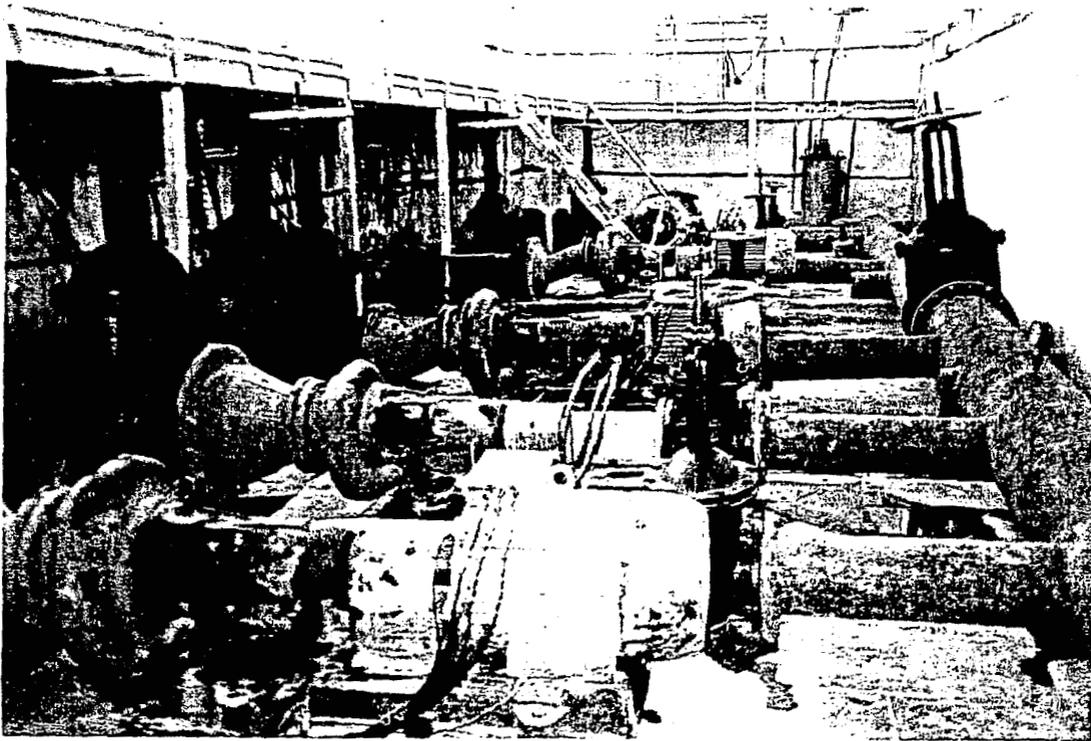
Transfer pump station to the reservoirs in the City of Muynak.

August 1996

Photograph 3

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USAID Mission for Central Asia

UZBEKISTAN ACTIVITIES

CITY OF MUYNAK IN KARAKALPAKSTAN

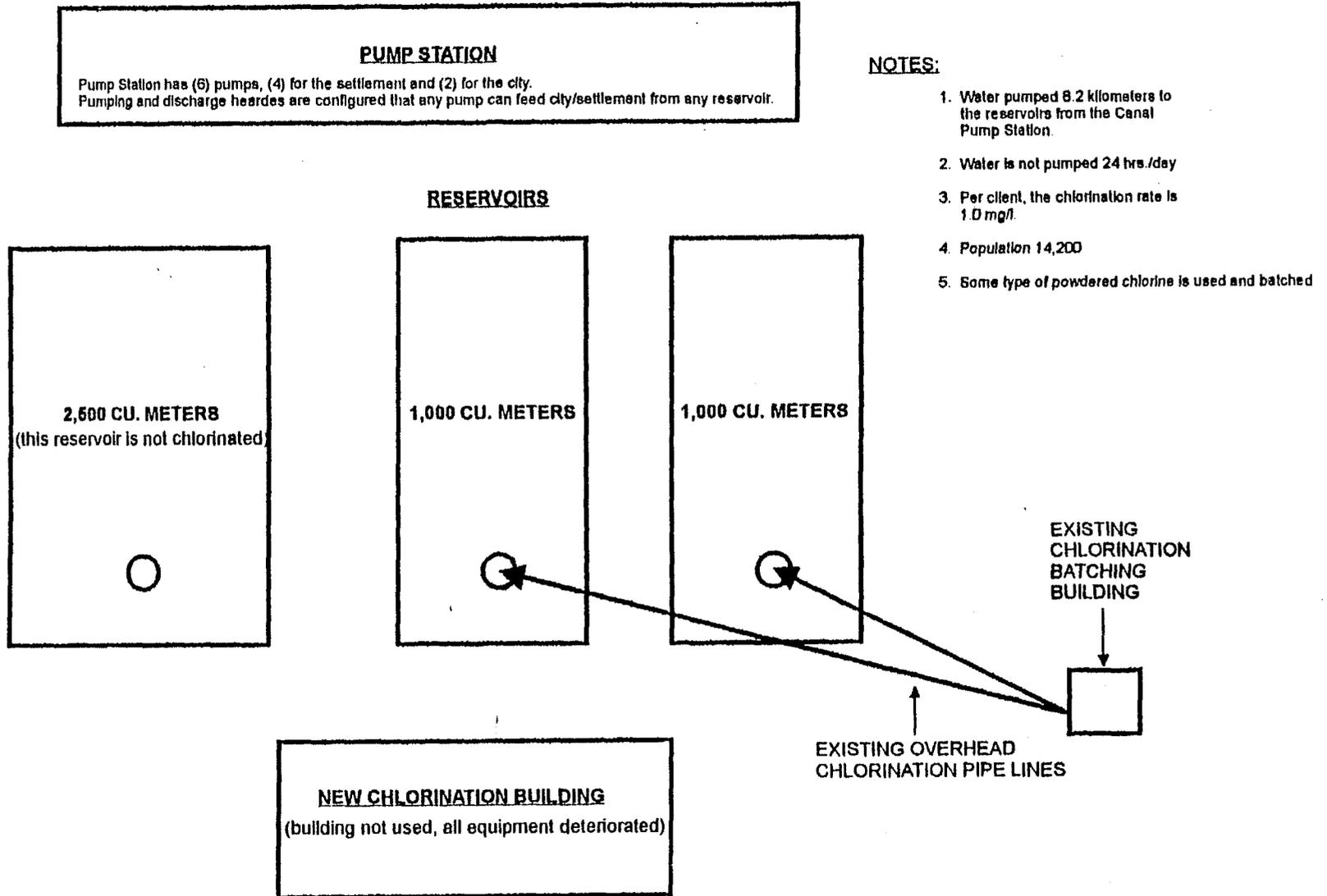
Transfer pump station to the City of Muynak distribution system.

August 1996

Photograph 4

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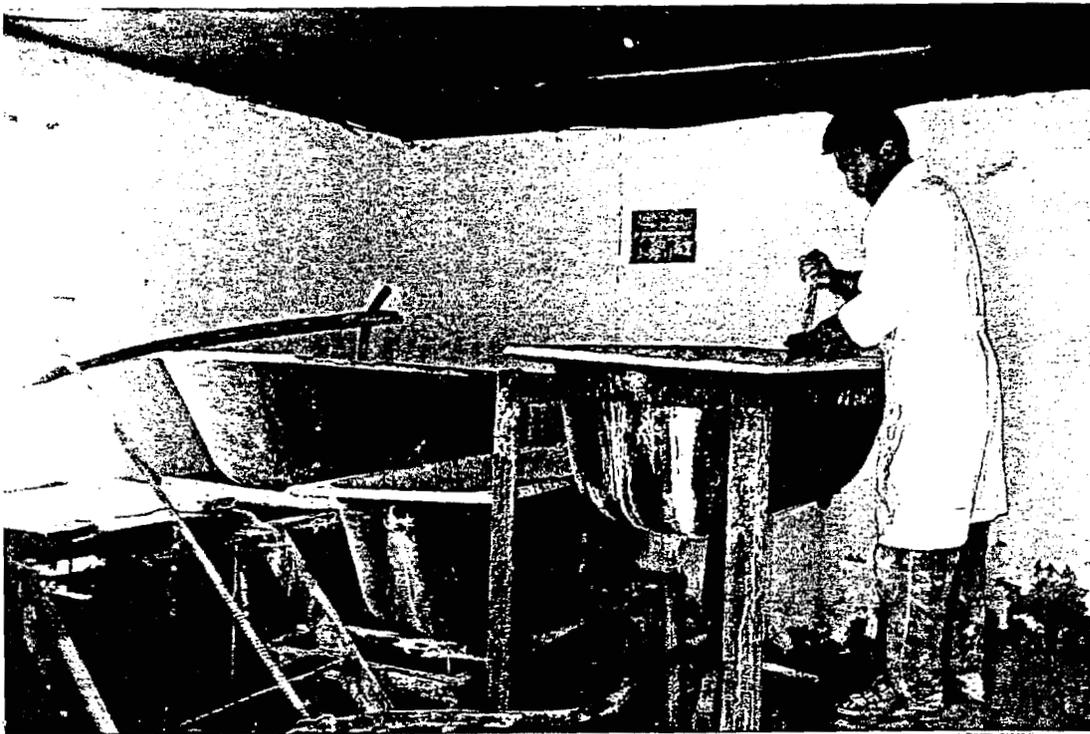


MUYNAK RESERVOIR PUMP STATION SCHEMATIC

Figure 3

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ENVIRONMENTAL POLICY AND TECHNOLOGY PROJECT
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USAID Mission for Central Asia

UZBEKISTAN ACTIVITIES

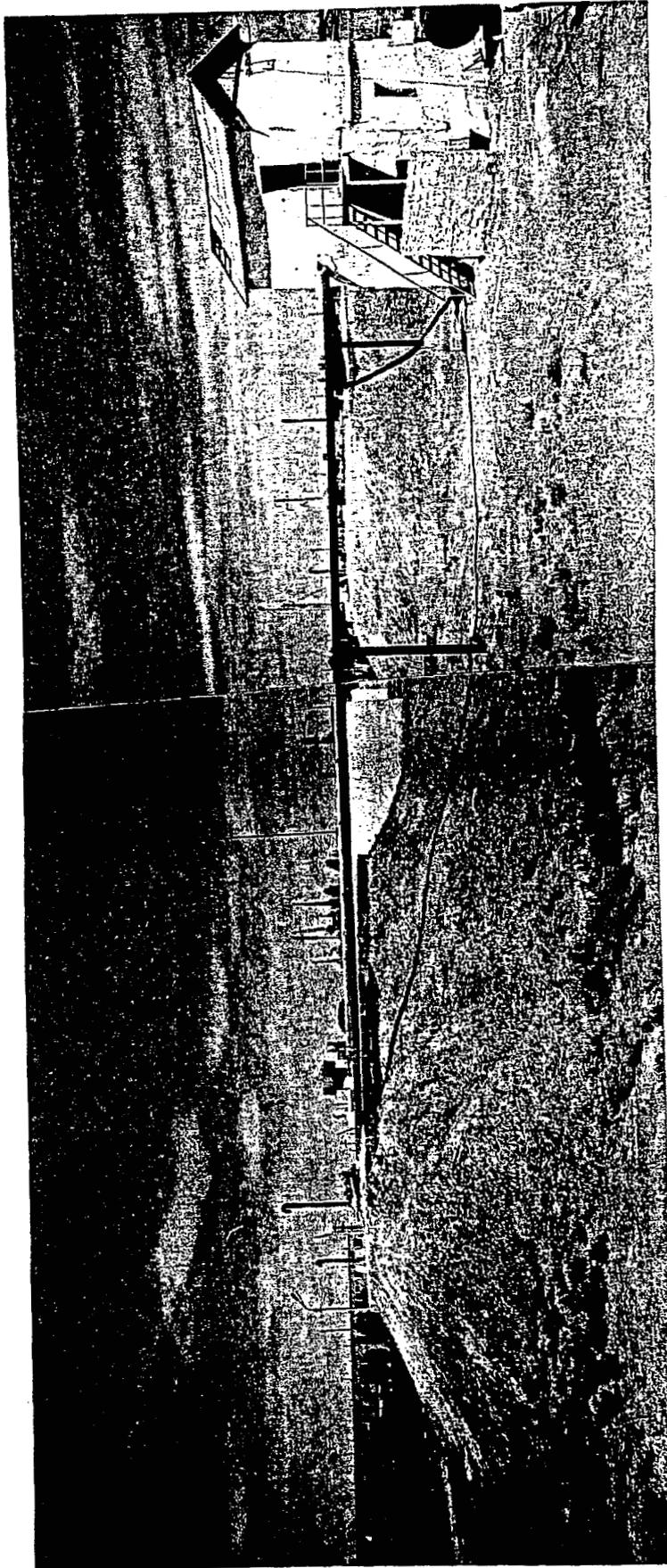
CITY OF MUYNAK IN KARAKALPAKSTAN
Preparation of batch chlorination the existing building.

August 1996

Photograph 5

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ENVIRONMENTAL POLICY AND TECHNOLOGY PROJECT
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USAID Mission for Central Asia

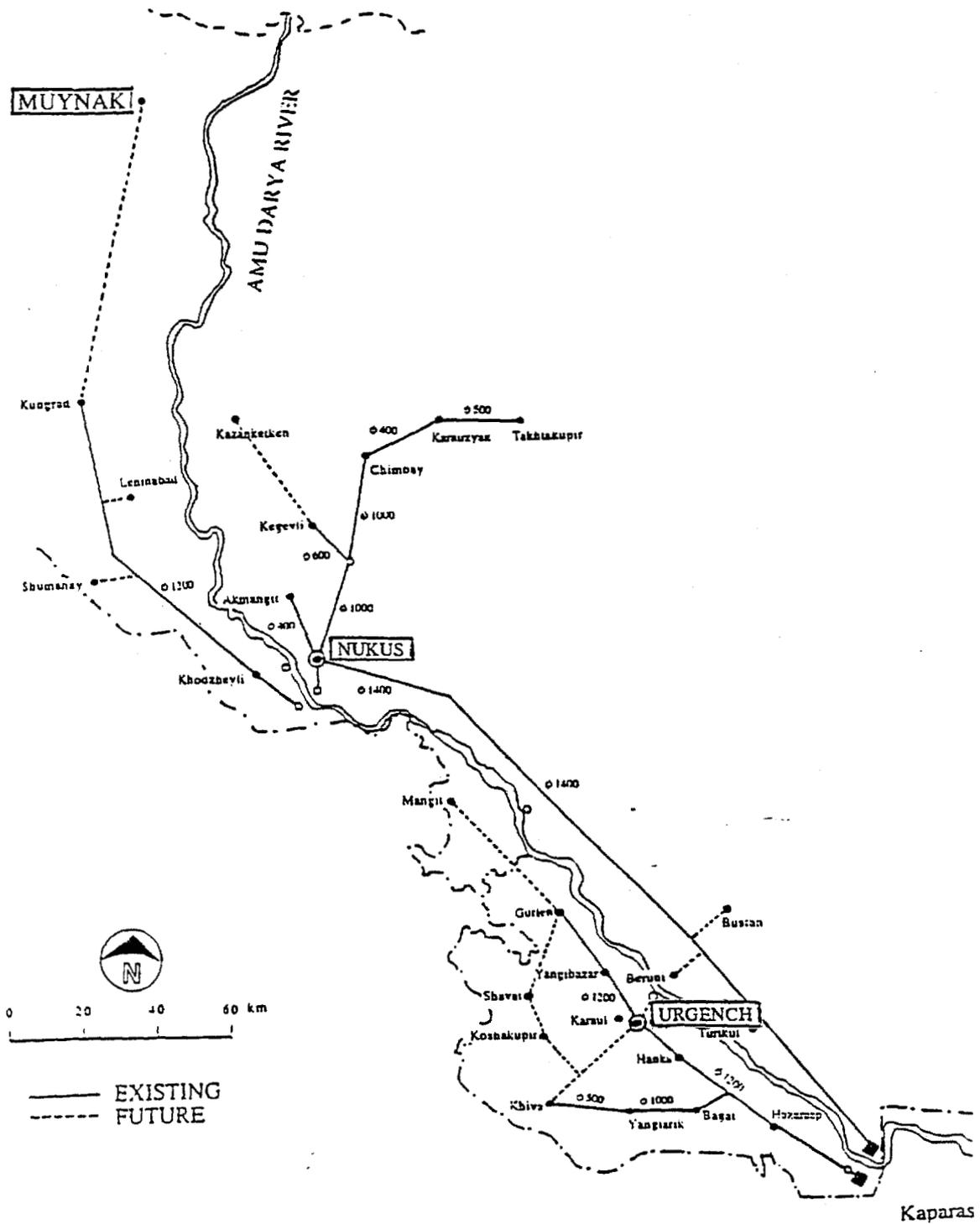
UZBEKISTAN ACTIVITIES

CITY OF MUYNAK IN KARAKALPAKSTAN

1,000 cubic meter reservoirs and the existing batch chlorination building.

August 1996

ENVIRONMENTAL POLICY AND TECHNOLOGY PROJECT
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SCHMATIC OF THE TUYAMUYUN WATER SUPPLY SYSTEMS
 Republic of Uzbekistan

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UZBEKISTAN ACTIVITIES
RELATIVE SIZES OF WATER FACILITIES

Facility	Population	Size (cu m/day)	Chlorinator (kg/hr)	Chlorine Use (kg/hr)
I. ARAL SEA AREA				
Nukus WTP	229,500	200,000	38*	3.0 - 15.0
Nukus Reservoir	75,000	200,000	38*	0.6 - 2.0
Urgench WTP	800,000	200,000	38*	12.0 - 20.0
Urgench Reservoir	135,600	250,000	38*	8.3 - 10.0
Chimbay PS	43,000	9,450	3.8*	7.0
Kegeyli PS	31,900	2,860	3.8*	7.0
Vodacanal-Nukus	175,000	65,000	-	1.7 - 5.0
Muynak	14,800	800	-	-
II. FERGANA VALLEY				
Andizhan	310,000			
Kharabek		180,000	25	-
Kampyuravat		400,000	50	-
Fergana	186,000	190,000	25	-
Kokand	190,000	150,000	25	-
Margilan	160,000	55,000	25	-
Namangan	361,000			
Ychurgan		200,000	25	-
Djida Kapa		300,000	50	-

* installed by USAID

AID252

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Section 3
RECOMMENDATIONS

3.1 PROPOSED ACTIVITIES

Based on the request to provide immediate water supply improvements to the City of Muynak, the following activities are recommended for consideration by USAID:

1. provide a new raw water intake pump and motor at the canal;
2. provide and oversee the installation of the new chlorination equipment (approximately 3 km per hr) at the reservoirs;
3. provide hand-held laboratory instruments for monitoring the water quality and chlorine residual in the distribution system; and
4. conduct operation and maintenance training for proper use of the equipment provided.

In order to provide for sustainable operations, the following activities are recommended for the City of Muynak:

1. provide an adequate supply of the local equipment, materials, and labor for the installation of the equipment provided by USAID in accordance with the Memorandum of Understanding;
2. install the proposed low level dam in the Cartabay Canal which will reduce the turbidity and provide additional storage of water;
3. clean and maintain the earthen clarifiers at the existing facility thereby immediately improving the water quality which is necessary for the effective use of the chlorination equipment;
4. repair and remove all debris and provide an adequate source of electrical power in the former chlorination building which will be utilized for the new equipment; and
5. assign adequate personnel and budgetary support for the continued operations and chlorine supply of the equipment provided by USAID.

The cost of equipment purchases and providing technical assistance in the design, procurement, and delivery all equipment provide by USAID, as well overseeing the installation by the local authority is estimated to cost US\$100,000. It is recommended that USAID approve the reallocation of the funding in Delivery Order No. 6 to cover the cost of the recommended facilities. These funds are available at this time since the Government of Uzbekistan has provided treatment chemicals at the two major water treatment plants which was originally intended to be provided by the EPT project activities.

3.2 SCHEDULE

The proposed schedule is dependent on the purchase and delivery of all equipment in accordance with USAID procurement regulations. It is proposed that USAID approve a modification of the purchase order with Capital Controls Inc. for the equipment listed in Table A-5 based on the following criteria:

- * this equipment was competitively bid in accordance with the USAID regulations, and a modification is expected to accelerate the procurement process by at least one month;
- * the equipment supplied will be similar and from the same manufacturer as the equipment installed as part of the EPT project activities, thereby simplifying the operation and maintenance of these facilities for the local authorities, and
- * the EPT field teams are presently on site and will continue the installation of the equipment in the area, thereby providing for reduced cost for overseeing these activities.

Based on the above, the following schedule of activities has been developed:

WEEK	ITEM	ESTIMATED DATE
1	approval from the mission	1 November 1996
3	approval from the COTR	21 November
6	design documents completed	15 December
8	negotiations completed	30 December
12	shipping of materials	30 January 1997
18	arrival on site	15 March
20	installation of equipment	30 March
24	training of operators	30 April
26	completion of all activities	30 May 1997

The schedule for completion of the present EPT activities in Uzbekistan is 31 March 1997 and a no-cost extension will be required to complete the proposed activities.

Section 4
APPENDIX

- 4.1 Request from the Government
- 4.2 Chemical Analyses of Water
- 4.3 Summary of Equipment Installed
- 4.4 List of Chlorination Equipment

Ms. Patricia Buckles,
Acting Director
USAID/Regional Mission for Central Asia

1 February, 1996

The State Committee on Nature Protection of the Republic of Uzbekistan has reviewed your letter to the GOU on extending of the Memorandum till December 31, 1996 and the 1996 workplan. Committee approves it and thanks for the charitable assistance in the potable water quality improvement in Uzbekistan. Our proposal with request to endorse the submitted documents has been forwarded to the Cabinet of ministers of the Republic of Uzbekistan.

At the same time, in view of the unsatisfactory drinking water supply for the population of the Muinak city (15 thousand residents), we would appreciate your help in resolution of the Muinak water supply problem by incorporating into the 1996 workplan the furnishing of one or two demineralization units for this purpose.

Many thanks for your support and cooperation. We can assure you of our highest commitments to full accomplishment of the Environmental Policy and Technology Project under the Memorandum.

Truly yours,

A. Habibullaev
Chairman
Committee on Nature Protection of
the Republic of Uzbekistan

ENVIRONMENTAL POLICY AND TECHNOLOGY PROJECT
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MUYNAC REGIONAL WATER SYSTEM
CHEMICAL ANALYSIS FROM 1995

points of water sampling	temp. C	odour at 20 degrees	Taste & smack wa available	Colour in degrees	Muddiness mg/dm3	pH value	oxidizability mg/dm3	ammonia mg/dm3	Nitres mg/dm3	Nitrates mg/dm3	Total hardness of water mg equiva- tent/dms	Solids mg/dm3	Calcium mg/dm3
Acc. to State													
Standard: 2874-82		2	2	20	1.5	6.0-9.0	3.0	0	0	45	7.0	1000	
March: Channe	+ 12 degr.	0	1	0	30	8.0	2.2	0.02	wasn't	3.08	9.1	1220	102.02
	+11 degr.	0	1	0	1.7	8.1	1.7	wasn't	wasn't	1.76	8.7	1196	126.2
								found	found				
June: Channel	+26 degr.	1	2	5	7.5	8.1	5.2	0.75	wasn't	wasn't	8.2	990	86.17
									found	found			
	+25 degr.	1	2	5	5.2	8.0	2.5	wasn't	wasn't	wasn't	8.3	1000	90.18
								found	found	found			
September: Channel	+ 18 degr	0	0	2.5	2.5	8.1	2.6	wasn't	wasn't	1.68	7.8	998.0	110.0
								found	found				
	+ 18 degr.	0	0	1.5	1.5	7.8	2.1	wasn't	wasn't	0.73	7.4	203.0	102.0
								found	found				
December: channel	+ 4 degr	0	0	3.0	3.0	8.5	2.3	wasn't	wasn't	2.7	11.2	1760	140.2
								found	found				
	+ 3 deg	0	0	2.7	1.4	8.3	1.6	wasn't	wasn't	1.3	10.8	1600	134.2
								found	found				

points of water sampling	Magnesium mg/dm3	chlorides mg/dm3	alcalinity mg equivalent/dm3	Sulphates mg/dm3	Total iron mg/dm3	Copper mg/dm3	Zink mg/dm3	Molybde- num mg/d	Arsenic mg/dm3	Lead mg/dm3	Fluorine mg/dm3	Manganese mg/dm3
Acc. to State												
Standard: 2874-82		350	3.0	500	0.3	1.0	5.0	0.25	0.05	0.03	0.7	0.1
March: Channe	48.6	304	2.2	384	0.21	0.21	0.1	0.05	0.007	asn't foun	0.13	0.061
	29.1	350	2.1	378	0.21	0.23	0.1	0.05	0.005	wasn't	0.11	0.062
										found		
June: Channel	47.4	226.8	2.9	311	0.29						0.2	
	46.2	234.0	2.8	315	0.27					wasn't	0.18	
										found		
September: Channel	48.0	260.0	2.3	360.0	0.17						0.20	
	35.0	292.0	2.2	347	0.13						0.16	
December: channel	51.2	482.4	2.6	510	0.19	0.19	0.1	0.004		wasn't	0.31	0.05
										found		
	49.8	468.0	2.6	490	0.09	0.09	0.05	0.002		wasn't	0.21	0.03
										found		

Note: Data provided by the City of Muynak.

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Water quality of Canal water [Muynak cily]

Date	1993/8/10	1993/9/23	1993/10/14	1993/11/30	1993/12/7	1994/1/26	1994/2/7	1994/3/11	1994/4/5	1994/5/18	1994/6/3	1994/7/10	1994/8/15
Odour	0	0	0	1	1	0	0	0	0	0	0	0	0
Taste	0	0	0	1	1	0	0	0	4.5	10.0	103.0	26.0	97.0
Turbidity	1.3	1.5	90.0	32.0	110.0	7.2	5.5	5.5	0	0	0	0	0
Chromaticity	0	0	0	0	0	0	0	0	0	0	0	0	0
pH	8.4	8.5	8.7	8.5	8.0	8.4	8.7	8.7	7.9	7.5	8.1	7.9	8.0
Alkalinity	1.9	2.0	1.8	2.5	2.7	2.8	3.0	3.1	2.7	2.7	2.5	2.6	2.8
Ca	0	0	0	0	0	0	0	0	0	0	0	0	0
Mg	0	0	0	0	0	0	0	0	0	0	0	0	0
Fe	0	0	0	0	0	0	0	0	0	0	0	0	0
SO ₄	0	0	0	0	0	0	0	0	0	0	0	0	0
Cl	0	0	0	0	0	0	0	0	0	0	0	0	0
Solids	0	0	0	0	0	0	0	0	0	0	0	0	0
Total hardness	0	0	0	0	0	0	0	0	0	0	0	0	0
Zn	0	0	0	0	0	0	0	0	0	0	0	0	0
Cu	0	0	0	0	0	0	0	0	0	0	0	0	0
Mn	0	0	0	0	0	0	0	0	0	0	0	0	0
Pb	0	0	0	0	0	0	0	0	0	0	0	0	0
As	0	0	0	0	0	0	0	0	0	0	0	0	0
Mo	0	0	0	0	0	0	0	0	0	0	0	0	0
Na K	0	0	0	0	0	0	0	0	0	0	0	0	0
Oxygen	0	0	0	0	0	0	0	0	0	0	0	0	0
Water temp	0	0	0	0	0	0	0	0	0	0	0	0	0
Color	0	0	0	0	0	0	0	0	0	0	0	0	0

Note: Interim Report, Uzbekistan Water Supply, Sanitation and Health Project, Binnie and Partners, May 1996.

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Table A-2

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Water quality of Treated water (Muyrak city)

Date		1993/0/10	1993/9/23	1993/10/14	1993/11/30	1993/12/7	1994/1/26	1994/2/7	1994/3/11	1994/4/5	1994/5/10	1994/6/30	1994/7/10	1994/11/15
Odour		0	0	0	0	0	0	0	1	0	0	0	0	0
Taste		0	0	0	1	1	0	0	0	0	0	0	0	0
Turbidity		1.5	1.4	2.5	1.4	0.7	1.6	1.8	1.3	1.5	2	1.9	1.7	1.6
Chromaticity		0	0	0	0	0	0	0	0	0	0	0	0	0
pH		8.1	8.2	8.6	8.1	8.0	8.2	8.1	8.5	8.1	7.9	7.8	7.7	7.9
Alkalinity		1.8	1.9	1.6	2.3	2.0	2.7	2.7	2.5	2.5	2.9	2.5	2.5	2.7
Residual Cl	mg/l	2.3	2.2	2.21	1.2	1.62	1.07	1.02	1.68	1.75	1.23	2.03	2.05	2.2
NO3	mg/l	0	0	0	0	0	0	0	0	0	0	0	0	0
NO2	mg/l	0.60	0.39	1.60	0.70	0.00	3.60	4.60	0.50	0.09	0.09	2.20	2.20	0.00
F	mg/l	0	0	0	0	0	0	0	0	0	0	0	0	0
Ca	mg/l	0.49	0.40	0.2	0.27	0.27	0.32	0.3	0.36	0.39	0.19	0.23	0.21	0.27
Mg	mg/l	100.2	104.2	104.2	140.2	122.2	121.0	120.2	102.3	84.2	120.2	126.2	102.2	92.1
Fe	mg/l	37.7	56.1	36.4	36.4	43.7	52.2	51.2	42.5	52.2	49.8	44.0	45.7	43.7
SO4	mg/l	0.00	0.10	0.14	0.20	0.04	0.18	0.16	0.19	0.20	0.22	0.29	0.28	0.20
Cl	mg/l	270.0	240.0	254.0	370.0	350.0	307.0	372.0	371.5	340.0	340.0	380.0	280.0	290.0
Solids	mg/l	259.0	224.4	230.0	343.1	330.4	330.5	314.0	343.2	270.0	235.8	320.0	250.1	291.1
Total hardness	mg eq/l	970	950	1000	1301	1201	1300	1200	1330	1100	1110	1300	1091	1110
Zn	mg/l	0	0	0	0	0	0	0	0	0.5	10.1	10.0	0.7	0.2
Cu	mg/l	0	0	0	0	0	0	0	0	0	0	0	0	0
Mn	mg/l	0.02	0.02	0.20	0.20	0.20	0.12	0.18	0.02	0.05	0.05	0.05	0.10	0.10
Pb	mg/l	0.03	0.03	0.03	0.02	0.02	0.02	0.02	0.02	0.03	0.03	0.03	0.03	0.03
As	mg/l	0	0	0	0	0	0	0	0	0	0	0	0	0
Mo	mg/l	0.003	0.003	0.002	0.004	0.002	0.000	0.000	0.000	0.006	0.006	0.006	0.006	0.006
Na K	mg/l	0.01	0.00	0.00	0.00	0.00	0.00	0.05	0.05	0.00	0.00	0.00	0.00	0.00
Color	mg/l	152.0	182.0	120.2	222.2	228.7	225.2	208.2	168.1	209.3	149.9	221.7	205.2	205.2
Oxygen	mg/l	0	0	0	0	0	0	0	0	0	0	0	0	0
Temp	mg/l	1.2	1.1	2.1	2.1	2.2	2.3	2.4	2.0	1.7	2.1	1.7	1.9	2.0
Al	mg/l	26	17	14	5	5	6	7	4	9	19	26	26	26

Note: Interim Report, Uzbekistan Water Supply, Sanitation and Health Project, Binnie and Partners, May 1996.

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Table A-3

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ENVIRONMENTAL POLICY AND TECHNOLOGY PROJECT
Central Asian Regional Office

UZBEKISTAN ACTIVITIES
SUMMARY OF EQUIPMENT INSTALLED AT WATER FACILITIES

I. TUYAMUYUN-NUKUS AND TUYAMUYUN-URGENCH WATER TREATMENT PLANTS

A. Laboratory Equipment (February 1995)

1. water quality laboratory, and spectrophotometer;
2. portable and laboratory turbidimeter and pH meter;
3. conductivity/TDS meter, and MEL/MF laboratory; and
4. related materials, supplies, reagents and training.

B. Additional Laboratory Equipment (August 1996)

1. laboratory operations manual;
2. conductivity meter, portable turbidimeter, and pocket colorimeter;
3. reagent sets for chlorine, chloride, hardness, zinc, and other parameters;
4. extensive supply of laboratory materials; and
5. follow-on laboratory assessment and training.

C. Chlorination Equipment (August 1995)

1. three chlorinators (900 kg/day), two ejectors, and chlorination piping;
2. chlorine emergency units, two self-contained breathing apparatuses; and
3. alarm systems, spare parts, accessories, and training.

D. Plant Equipment

1. eighteen control panels for filter operation (April and May 1996);
2. six alum pumps for chemical addition (October 1996);
3. two polymer pumps for treatment (October 1996); and
4. related materials, piping, accessories, and supplies.

E. Operations Training

1. on-site plant operation evaluations conducted (July and August 1994),
2. collaborated with NET Water Management training in the US (March 1995),
3. collaborated with NET Water Operations training in the US (July 1995),
4. on-site operations training conducted (July and August 1995),
5. wiring and training for filter control panels (April 1996), and
6. labeling program for improved plant operations (May 1996).

II. CITY OF NUKUS WATER DISTRIBUTION SYSTEM

A. Chlorination Equipment at the Nukus Reservoir (August 1996)

1. two chlorinators (900 kg/day), related equipment and piping;
2. chlorine emergency kits, self-contained breathing apparatus; and
3. alarm systems, spare parts, accessories, and training.

B. Chlorination Equipment at the Chimbai and Kagieli Pumping Stations (August 1996)

1. two chlorinators (90 kg/day), related equipment and piping;
2. chlorine emergency kits, self-contained breathing apparatus; and
3. alarm systems, spare parts, accessories, and training.

III. CITY OF URGENCH DISTRIBUTION SYSTEM

A. Chlorination Equipment at the Urgench Reservoir (September 1996)

1. two chlorinators (900 kg/day), related equipment and piping;
2. chlorine emergency kits, self-contained breathing apparatus; and
3. alarm systems, spare parts, accessories, and training.

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