Environmental Policy and Technology Project

Contract No. CCN-0003-Q-00-3165

KAZAKHSTAN

FIELD REPORT

Proposed Chlorination System Improvements at Regional Water Systems: Kyzl Orda Oblast, Kazakhstan

January 1995
Delivery Order 02, Task 3

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

Prepared by:
Central Asia Regional EPT Office in Almaty, Kazakhstan
Environmental Policy and Technology Project
For the New Independent States of the former Soviet Union
A USAID Project Consortium Led by CH2M HILL

KZYL ORDA OBLAST REGIONAL WATER SYSTEMS
PROPOSED CHLORINATION SYSTEM IMPROVEMENTS

BACKGROUND

This project is a part of the program as defined in the Memorandum of Understanding executed between the Government of the United States and the Government of Kazakhstan on 18 February 1994 to "promote improved environmental health" in the environmental disaster areas lying around the Aral Sea.

The Environmental Policy and Technology Project (EPT) Field Report "Interim Field Investigations in Kazakhstan: Regional Water Systems in Kzyl-Orda Oblast" dated October 1994 included recommendations for providing a variety of new equipment to upgrade and improve the regional water systems. This equipment included laboratory equipment for the existing laboratories in Aralsk and NovoKazalinsk, new chlorination equipment for booster pump station along the transmission pipeline and at the NovoKazalinsk water treatment plant, supplement pumps for the booster pump stations, new submersible well pumps for the Kozaman and Berdykol well fields and other related improvements. The regional water systems are shown in Figure 1.

CONCEPTUAL DESIGN

All of the chlorination systems in the Kzyl-Orda regional water systems are antiquated and in poor states of repair. The conceptual design is based in installing new chlorination equipment at eight (8) locations: six (6) of the federal transmission system booster pump stations (PS 1, PS 2, PS 3, PS 5, PS 4 and PS 7), in the City of Aralsk's pump station, and in the City of NovoKazalinsk's water treatment plant. Installation of new equipment in the city of Aralsk's pump station was not previously identified for replacement; however, subsequent reviews with local officials indicate a priority need for equipment at this location.

New equipment provided will include chlorinators, ejectors, piping, valves, alarms, and safely equipment. It is assumed that the existing buildings, (i.e. booster station pump houses and chlorination room at NovoKazalinsk water treatment plant) will continue to be used for housing the chlorination equipment. Cylinders will be provided by the local supplier of chlorine and the procurement does not include additional cylinders. It is assumed that the local government responsible for the operation and maintenance of the regional water systems will procure adequate supplies of chlorine for system operation.

The intent of the conceptual design described herein is to upgrade chlorination systems to international standards. The proposed design meets current United States Environmental Protection Agency (USEPA) and Chlorine Institute standards.

Hydraulic Demands

The estimated hydraulic demands of the regional water system are shown in Figure 2. The demands and flows shown are estimates based on field observations and information from Kazakh engineers at the Design Institute. However, as actual flow measurements are still uncertain, the demands shown should be considered best estimates and subject to revision. Proposed new equipment will be based on these hydraulic demand estimates as well as on the sizes of existing equipment.

The conceptual design is based on 20 operating wells at the Kozaman well field and 10 operating wells at the Berdykol well field. The design capacity of each well within both wellfields will be assumed to 20 liters/second (lps) or 0.5 million gallons per day (mgd). The reported capacity of each well from field interviews is only about 11 lps; however, new wells are expected to produce at higher capacities. Thus, the average daily production at the Kozaman field is estimated at 440 lps (10.0 mgd) and 220 lps (5.0 mgd) at the Berdykol field. Pump Station 1 at the Kozaman Well Field pumps to Pump Station 2 at the Berdykol Well field where 610 lps (14.0 mgd) is repumped through the transmission main.

The city of Aralsk taps off the federal transmission main upstream of Pump Station 3 and repumps to its distribution system. Total demand from Aralsk is estimated by Kazakh engineers to be 260 lps (5.9 mgd).

Settlement demands at Pump Stations 1, 2, 3 and 4 and at several locations along the transmission main vary from 1 to 38 lps which are shown in Figure 1. Term 3 settlements which will be served from PS 5 are estimated to have future demands in the order of 46 lps (1.0 mgd).

Present demands from NovoKazalinsk, Kazaklinsk and other rural settlements in the vicinity of PS 7 are estimated 249 lps (5.6 mgd). It is unclear what demand from NovoKazalinsk is actually supplied by PS 7 in that field observations indicated most, if not all, of NovoKazalinsk's water supply is from its water treatment plant which draws water from the Syr Darya (river). However, Kazakh engineers report that the transmission main is designed for a present flow to NovoKazalinsk of about 148 lps (3.3 mgd). Future demands at PS 7 are estimated by Kazakh engineers to be 325 lps (7.4 mgd). This would presumable be the capacity of the proposed new pump station (PS 7A) that was proposed in 1993.

Chlorine Dosages

Table 1 summarizes conceptual design criteria for the different locations. Dosages are based on 2.0 mg/l at all locations with the exception of the NovoKazalinsk water plant where the dosage will be based on 4.0 mg/l due to the surface water source. Design of all systems will be based on 62 kg (150 lb) cylinders which should have sufficient capacities for the calculated demands. These systems are similar to those presently in use

at all locations and are consistent with requests from city and federal engineers reviewing this project.

Table 1. Chlorine Dosages.

Location	Design Flow, lps (mgd)	Chlorine dosage, mg/l	Chlorine feed rate, kg/hr (lbs/day)
PS 1	440 (10.0)	2.0	3.1 (165)
PS 2	650 (14.8)	2.0	4.5 (240)
PS 3	275 (6.2)	2.0	2.0 (103)
PS 4	270 (6.1)	2.0	1.9 (100)
PS 5	270 (6.1)	2.0	1.9 (100)
PS 7	250 (5.7)	2.0	1.8 (99)
Aralsk	260 (5.9)	2.0	1.8 (99)
Novokazalinsk	200 (4.5)	4.0	2.7 (143)

Proposed Equipment

Proposed equipment is summarized in Table 2. Equipment would be the same for all locations and would be assembled and shipped in discrete packages for installation at each Location..

Chlorine cylinders would not be provided as part of the contract procurements in that it is assumed that these cylinders will be provided by the local chlorine supplier. Equipment will include adapters to utilize the locally supplied cylinders.

Table 2. Chlorine Equipment

ITEM	SIZE	NUMBER
Cylinders (provided locally)	62 kg (150 lb)	4 ea
Vacuum regulators	100 lb/day	2 ea
Manifolds		2 ea
Auto switchover		1 ea
Remote meter		1 ea
Ejector	100 lb/day	2 ea
Vacuum tubing (PE)		100 feet
Vent Fan w/louvers	1,500 cfm	1 ea
Emergency shower		1 ea
SCBA w/air Pack		1 ea
Service water line (Sch 80, PVC)		100 feet
"Y" Strainer		2 ea
Maintenance tools		1 lot
Spare parts		1 lot
Leak repair kit, safety goggles		1 lot
Gas detectors w/sensors & alarms		1 lot

Figure 3 is a schematic representation of the conceptual design of the chlorine system. Design will be based on two sets of two 62 kg (150 lb) cylinders manifolded to 100 lb/day vacuum regulators and connected with an automatic switchover module. Two ejectors will be provided at the pump stations: one for diffusion into the transmission main, and one for diffusion into the settlement distribution system. Solution water will be from the discharge side of the pumps and diffusion points will be in pump suction piping. The basic layout as shown in Figure 2 will be modified as needed to suit the layout at the NovoKazalinsk Water Treatment Plant.

Safety equipment provided at each location will include vent fans and louvers, emergency eye wash/shower, gas detectors w/sensors and alarms, SCBA air packs, and safety goggles.

INSTALLATION PROCEDURES

Installation will be accomplished by an EPT operations specialist and a fabricator (vendor) installation specialist. It is assumed that plant staff will help the team as needed including hauling and moving equipment. This assistance will be confirmed prior to commencement of work. It is estimated that installation will take approximately one week to complete at each facility. Total time in Kazakhstan is estimated at ten weeks including time for travel, installation, startup, training and debriefing meetings. Installation will include training the local staff in the proper use and operation of the equipment including safety equipment. Operation manuals will instructions on dosage requirements, proper operation and maintenance of equipment, safety procedures, and records management will be provided in Russian.

The proposed chlorination equipment has already been reviewed and approved by Kazakh engineers from the Design Institute. Prior to delivery and installation, coordination will be made with local officials and staff to arrange for transportation and general assistance with the work.

SCHEDULE

Proposed project schedule is as follows:

*Conceptual design completed - January
*Advertise Project for bids - February
*Contract awarded to lowest responsive bidder - March
*Assembly of equipment completed - April
*Equipment departs US by surface shipping - May
*Equipment arrives in Kzyl-Orda, Kazakhstan - June
*On site services (installation, startup, & training) completed - September 1995

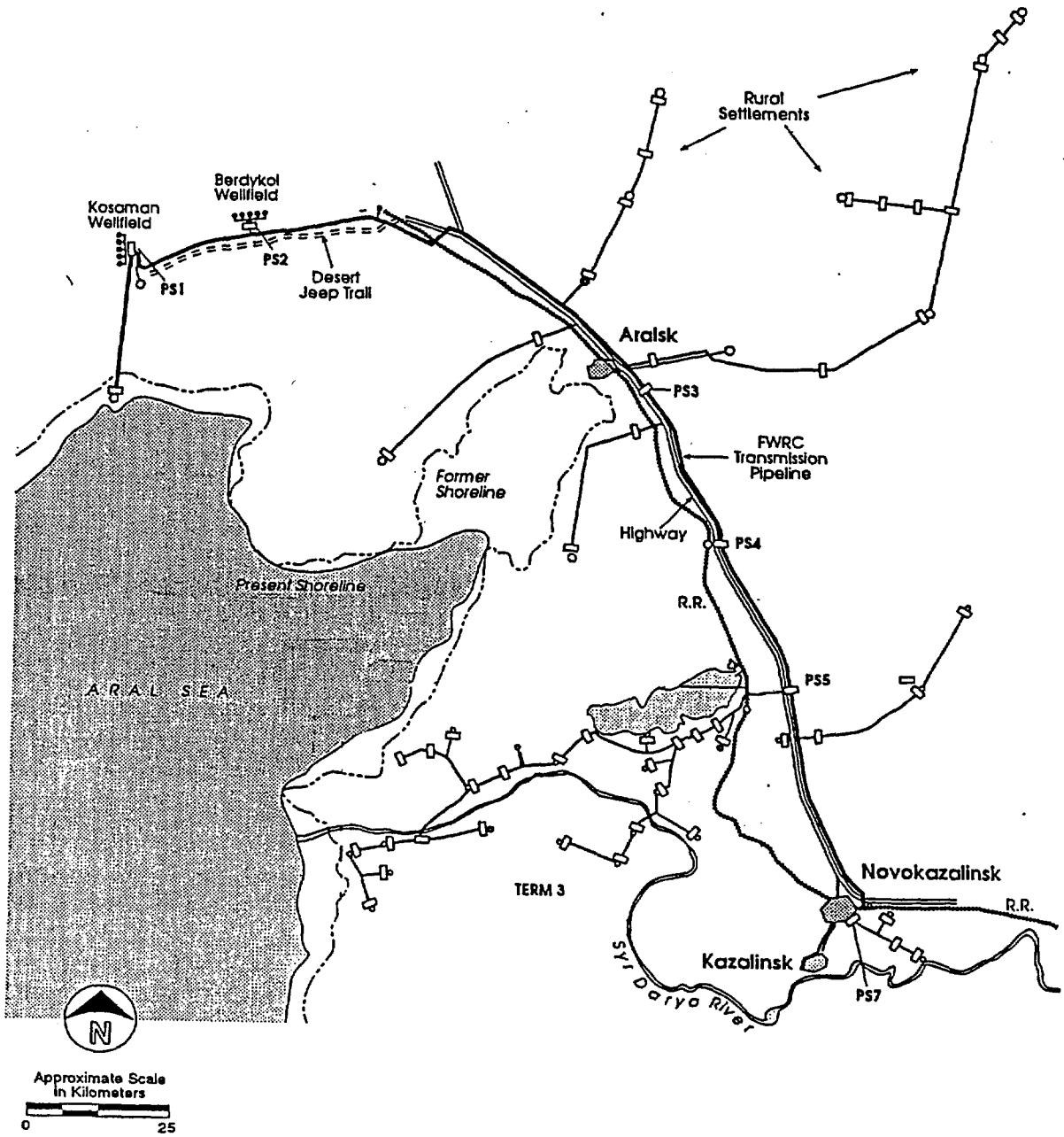

FIGURE 1

REGIONAL WATER SYSTEM
Proposed Chlorination System Improvements
Kzyl Orda Oblast, Kazakhstan

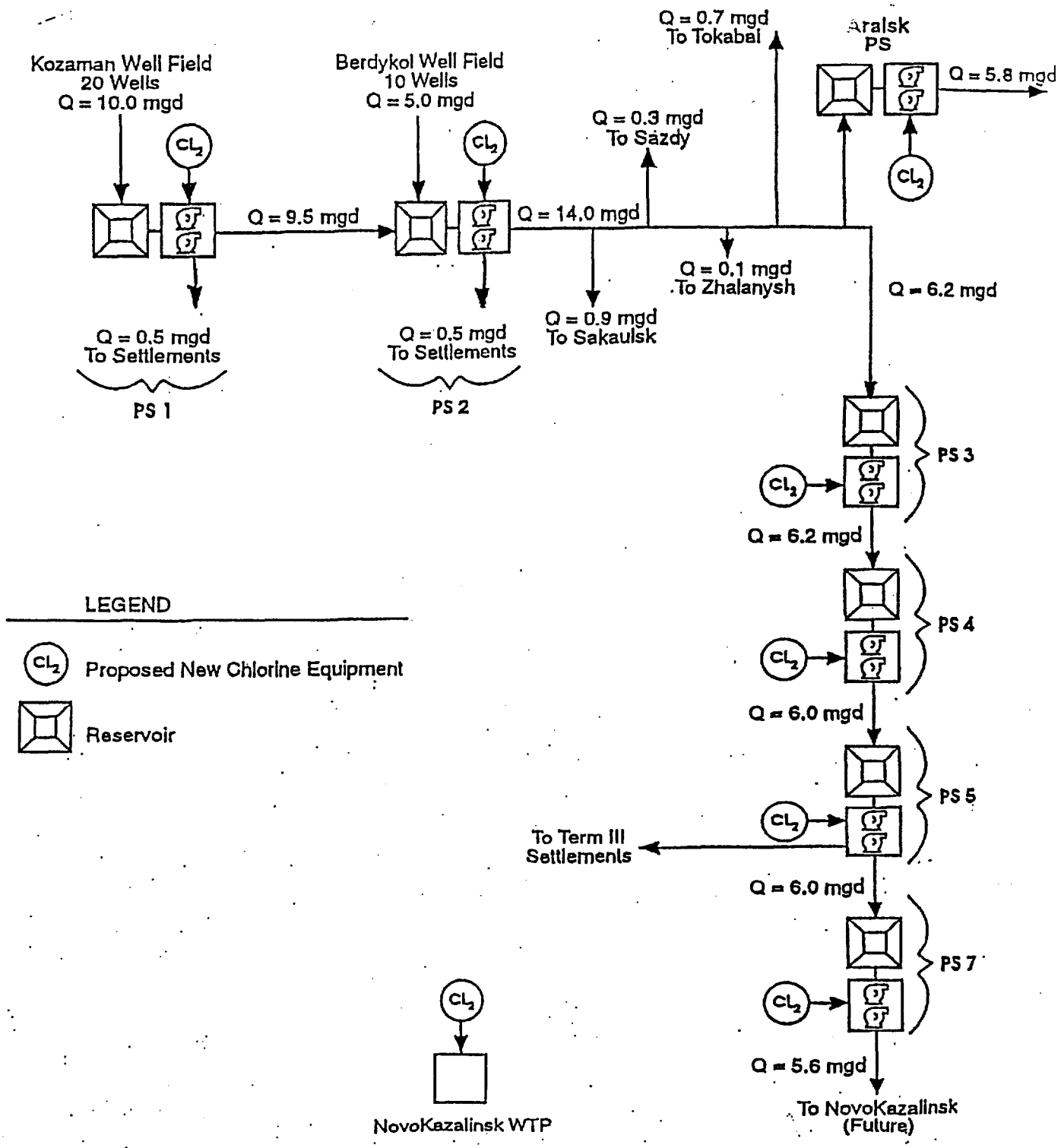

FIGURE 2

ESTIMATED HYDRAULIC DEMENDS
Proposed Chlorination System Improvements
Kzyl Orda Oblast, Kazakhstan

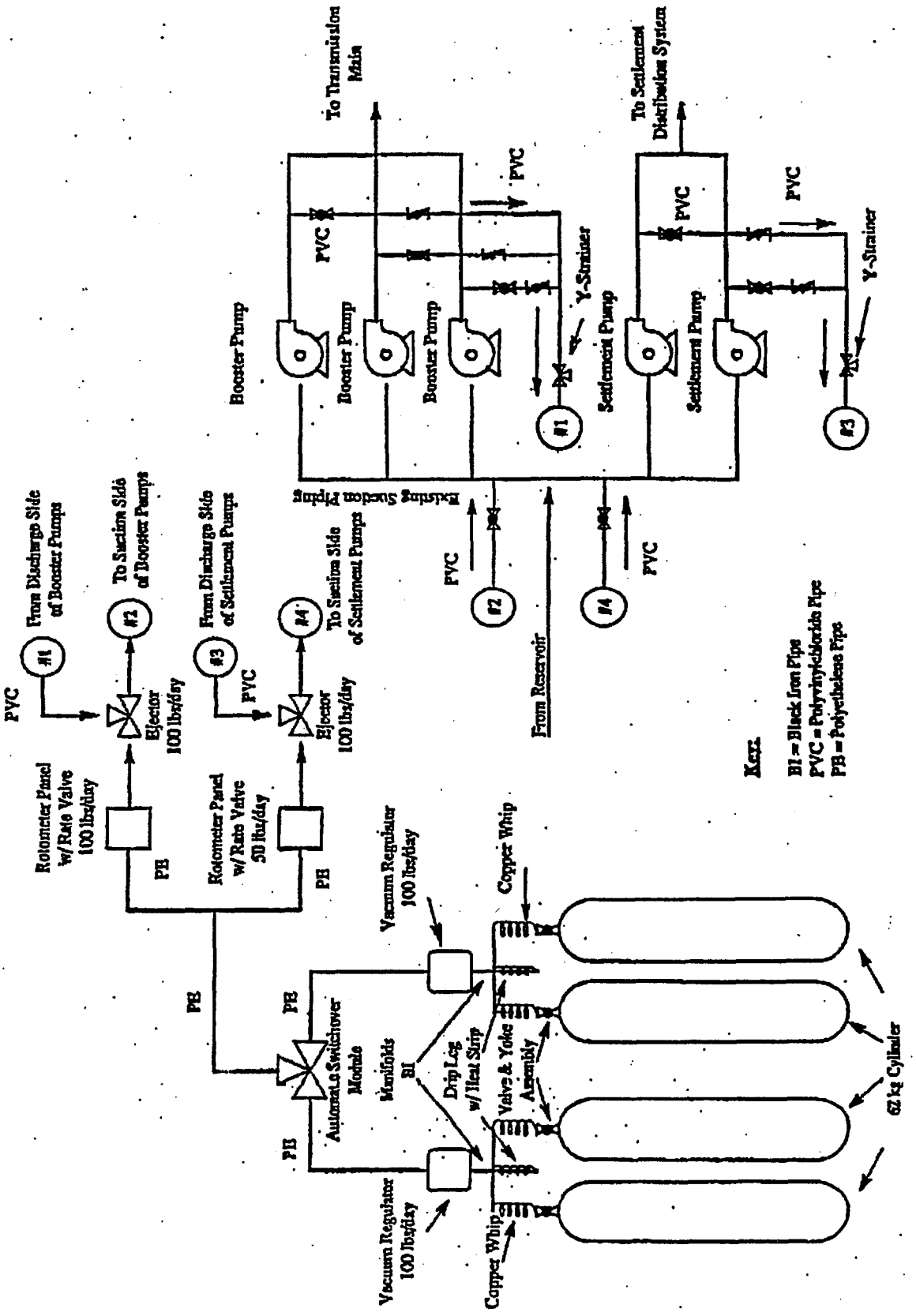

FIGURE 3
CHLORINE SYSTEM SCHEMATIC
Proposed Chlorination System Improvements
Nukus and Urgench, Kazakhstan

New Independent States (NIS)

★ **EPT Regional Offices**

The Environmental Policy and Technology (EPT) Project: Environmental degradation and natural resource mismanagement threaten public health, biodiversity and economic vitality in the New Independent States (NIS). To assist the NIS in alleviating these problems, the U.S. Agency for International Development (USAID) began the EPT Project in 1993. EPT provides technical assistance and policy advice in the environmental sector and promotes environmentally sound economic development through public and private, U.S. and NIS partnerships. The EPT Project is managed by USAID with support from the U.S. Environmental Protection Agency (USEPA). For assistance in project design, management and implementation, USAID has agreements with CH2M HILL International, Harvard Institute for International Development and ISAR. As the primary EPT contractor, CH2M HILL International has the lead role in delivering technical assistance, logistical support and policy support for selected projects. EPT Regional Offices are located in: Washington, D.C.; Moscow, Russia; Kiev, Ukraine; and Almaty, Kazakhstan.

CH2M HILL International Consortium of Subcontractors: Center for International Environmental Law; Clark Atlanta University/Historically Black Colleges, Universities and Minority Institutions Technology Consortium; Consortium for International Development; Ecojuris; Environmental Compliance Inc.; Harvard Institute for International Development; Hughes Technical Services Company; International Programs Consortium; International Resources Group; Interfax; K&M Engineering; Ogden Environmental and Energy Services; Price Waterhouse; the World Wildlife Fund; and numerous local subcontractors and cooperators throughout the NIS.

Environmental Policy and Technology Project
A USAID Project Consortium led by CH2M HILL

CH2M HILL International Services, Inc.
P.O. Box 24548, Denver, Colorado 80224 U.S.A.