Public Service Company
of New Mexico
Alvarado Square MS. 0408
Albuquerque, NM 87158

October 28, 1996

Certified Mail,
Return Receipt Requested

PNM

Mr. Benito Garcia
New Mexico Environment Department
Hazardous and Radioactive Materials Bureau
P.O. Box 26110
Santa Fe, NM 87502

Dear Mr. Garcia:

Subject: Post Corrective Measures Implementation Report, Phase II, Person Generating Station, NMT360010342

Enclosed please find two copies of the report Post Corrective Measures Implementation Report, Phase II, Person Generating Station, Albuquerque, NM, NMT360010342 prepared pursuant to requirements in the Person Station Corrective Action Directive issued September 1991.

If you have any questions, please contact me at (505) 241-2998.

Sincerely,

~~Ron D.~~ Johnson
Technical Group Leader

enclosure
cc: Carl Will - NMED HRMB

Post Corrective Measures Implementation Report
Phase II
Person Generating Station
Albuquerque, New Mexico

RCRA Permit: NMT 360010342

Prepared for

PNM

Public Service Company
of New Mexico

October 1996

PARSONS
PARSONS ENGINEERING SCIENCE, INC.

1700 Broadway, Suite 900 • Denver, Colorado 80290

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1.0 INTRODUCTION

As required by the Corrective Action Directive (CAD), Public Service Company of New Mexico (PNM) has prepared this Post-Corrective Measures Implementation Report to briefly describe the major elements of the Phase II groundwater extraction and treatment system, including an updated assessment of its continuing efficiency, for the Person Generating Station. This report presents a narrative description of the major additions and/or improvements made to the groundwater extraction and treatment system as part of Phase II corrective action measures at the site. As-built diagrams and photographic documentation of the Phase II groundwater extraction and treatment devices and a map (at a scale of 1 inch equals 200 feet) of the full-scale system are included in Appendix A. Recent sampling data relevant to assessing the continuing effectiveness of the implemented "through-put" remediation approach are included in Appendix B. The complete operations and maintenance (O&M) manual for the Phase II system (Parsons ES, 1996) is included as Appendix C.

1.1 Site Background

A summary of pertinent site background information was compiled from the Corrective Measures Proposal (CMP) for the Person Generating Station (ES, 1994), and from subsequent documentation on remedial system operations prepared in response to the CAD and/or the Resource Conservation and Recovery Act (RCRA) Post-Closure Care Permit requirements. This information is provided only to support a description of the Phase II groundwater extraction and treatment system.

1.1.1 Operational History

The Person Generating Station site was operated and maintained by PNM from 1952 through 1986. The Person Generating Station site included a maintenance area to support, among other activities, equipment cleaning efforts. The parts wash area included a sump and a below-grade, vertically installed, open-bottomed, 3.5' x 10' cylindrical waste oil storage vessel located on the north side of the site to collect wastes generated during equipment cleaning. Waste oils and greases, kerosene, a watertrisodium phosphate mixture used in steam cleaning, Stoddard® solvent, Dowclene EC®, and other solvent mixtures generated during maintenance activities were piped to the vessel for storage (METRIC, 1993).

The vessel was apparently in use from about July 1976 until October 13, 1983, when it was discovered that the bottom of the vessel was open (i.e., the vessel bottom consisted of the underlying soil). Upon making this discovery on October 13, 1983, PNM immediately emptied the vessel and removed it from service. PNM arranged for the most grossly contaminated source material to be removed from the bottom of the vessel and placed in 55-gallon steel drums in 1983; this drummed material was ultimately transported offsite for disposal as hazardous waste in 1987 (ES, 1994). Following removal of the vessel from service, PNM installed a RCRA closure cap on the 25' x 35' source area to minimize precipitation infiltration.

1.1.2 Implemented Corrective Action Program

Based on the results of initial assessment activities completed at the site to delineate the nature and extent of environmental contamination resulting from use of the below-grade vessel, the New Mexico Environment Department (NMED) directed PNM to select and implement one or more corrective action technologies to contain, remove, or treat the hazardous waste constituents escaping from the permitted unit. Groundwater extraction and onsite treatment was selected as the treatment technology for shallow groundwater. This technology was selected to prevent the further migration of a shallow dissolved plume of volatile organic compounds (VOCs). The VOCs of interest include tetrachloroethene (PCE), 1,1-dichloroethene (1,1-DCE), and 1,1,1-trichloroethane (1,1,1-TCA). The technical basis for and conceptual design of the recommended remedial approach for shallow groundwater was presented in the Corrective Measures Proposal (CMP), which was submitted to NMED in January 1994 in partial response to the CAD.

The CMP proposed a two-phase approach to implementing the selected corrective measures at the site: Phase I pilot testing and system optimization, followed by Phase II full-scale system design, installation, and operation. As of August 26, 1996, PNM is operating the full-scale Phase II groundwater extraction and treatment system for shallow groundwater contamination. As required by the CAD, this report summarizes the full-scale Phase II system design and operating information for the shallow groundwater extraction and treatment system.

2.0 PHASE II GROUNDWATER EXTRACTION AND TREATMENT

The objective of the groundwater extraction and treatment system at the Person Generating Station is to:

- Capture shallow groundwater contaminated with VOCs;
- Deliver the captured groundwater to an onsite treatment plant;
- Treat the delivered groundwater to NMED's specified cleanup goals through use of air stripping followed by granulated activated carbon (GAC) polishing; and
- Discharge treated groundwater to the University of New Mexico (UNM) Championship Golf Course pond.

Two recovery/extraction wells and a single treatment train involving air stripping with GAC polishing [in the event that less than the desired air stripping efficiency was realized] were used to capture and treat VOC-contaminated groundwater during Phase I operations. Data collected during Phase I operations such as the sustained pumping rates, the capture zone of each recovery/extraction well, contaminant concentrations, and air stripper and carbon unit performance were evaluated and incorporated into the Phase II full-scale remedial design. Additionally, any operating problems that surfaced during Phase I were addressed before the Phase II system design was finalized.

The Phase II system includes four additional recovery/extraction wells (to supplement those wells used in Phase I), modifications to Phase I flow and pH controls, and a second (parallel) treatment train. The following narrative summarizes these elements of the Phase II system. As-built diagrams of the full system are presented in Appendix A.

2.1 Recovery/Extraction Wells

The recovery/extraction wells in the Phase II system were located to ensure containment and capture of the dissolved shallow plume. A total of four additional groundwater recovery/extraction wells were added to the Phase I treatment process as part of Phase II corrective action activities. These included the installation of one new extraction well (EW-1) located between the VEW/DW well and PSMW-16, and the conversion of monitoring wells PSMW-24, PSMW-25, and PSMW-26 to recovery/extraction wells. The locations of the Phase II extraction wells in relation to the Person Generating Station are shown in Appendix A (Phase II site map). The Phase II wells are anticipated to provide sufficient drawdown at the boundary of the shallow plume of contamination. Drawdown will create a gradient toward the extraction wells, ensuring that the plume will not migrate beyond its current boundaries, and that contaminated groundwater will be collected for treatment.

A submersible well pump is installed at each groundwater recovery/extraction well. Equipment specifications and operating details for each recovery/extraction well are provided in Appendix C, as part of the O&M manual. The groundwater flow have been set for each of the six Phase II recovery/extraction wells as follows:

1) VEW/DW, 4 gallons per minute (gpm);

2) PSMW-16, 10 gpm;

3) EW-1, 4 gpm;

4) PSMW-24, 7 gpm;

5) PSMW-25, 1.5 gpm; and

6) PSMW-26, 3.5 gpm.

Consequently, the operating flow of the Phase II system is 30 gpm. All groundwater recovered by the wells is pumped into an equalization tank, which is designed to evenly split flow to each of the parallel treatment trains, if necessary. The equalization tank has a capacity of 67 gallons.

2.2 Flow Control

Flow control was incorporated into the Phase II design as an operational control to minimize the on and off cycling of the treatment plant transfer pumps. These flow controls effectively "level" the operation of the transfer pumps based upon the water levels in the respective surge systems (i.e., the air stripper sumps and the surge tank), thereby reducing the on/off cycling of the respective pumps. This allows for more efficient functioning of the system. The flow control valving in the treatment train is shown in as-built diagrams and photographic documentation in Appendix A.

2.3 pH Control

The incorporation of pH control into the Phase II system is a result of the operational problems encountered during Phase I. Due to the carbonate chemistry of the contaminated groundwater, pH elevation within the air strippers (due to the off-gassing of carbon dioxide) caused a resultant precipitation of calcium carbonate scaling within the GAC unit during extended Phase I operations. The precipitation of calcium carbonate effectively fouled (plugged) the upper portions of the GAC unit, thereby increasing the pressures above the pressure rating for the GAC unit. Although the carbonate precipitation problem occurred primarily in the GAC unit, some precipitation was also occurring in the air stripper.

Scale formation can be prevented by acid addition whereby supersaturation of the water, with respect to alkalinity and/or calcium concentration, is achieved. The control of pH related scaling (pH lowering) was incorporated into the Phase II system design by the addition of concentrated sulfuric acid. Bulk storage of sulfuric includes a "tote" provided by chemical suppliers, as documented in Appendix A (Photograph 1), which is located immediately outside the southwest corner of the groundwater treatment plant. The tote will provide approximately seven months of acid supply. Metering pumps are located within 10 feet of the tote and are equipped with calibration tubes on the suction side of the pumps to allow calibration of the pumps.

The pH of the air stripper effluent is maintained within the range of 6.3 to 6.8 standard units. Maintaining this pH ensures that the water chemistry of the treated groundwater is such that the precipitation of insolubles (at moderate pH) is minimized (if not eliminated), thereby increasing the operational life of the GAC unit.

2.4 Phase II Parallel Treatment Train

The Phase I system was expanded in anticipation for Phase II operations to include an additional treatment train (e.g., air stripper, bag filters, and GAC unit) in parallel to the existing treatment train within the groundwater treatment plant. The following presents the "through-put" treatment approach for the Phase II system, including an evaluation its effectiveness. However, this report is not intended to replace or otherwise supersede the performance evaluations conducted pursuant to Phase II, Item 7 of the CAD.

2.4.1 Air Stripper

Air stripping exploits the volatility and insolubility of VOCs in water to transfer (remove) VOCs from water into an air stream that can be safely discharged to the atmosphere. The air stripper is the first treatment operation in the Phase II system. The air stripper is an Ejector Systems Cascade LP5002, factory-equipped with: blower and blower motor; transfer pump and pump motor; two trays; high/low level switch; high and low air pressure switches; and line sampling ports. The additional air stripper has effectively doubled the maximum flow capacity of the plant from 50 to 100 gpm. Contaminated groundwater flows by gravity from the equalization tank into the top of the air stripper and cascades downward through baffled trays to the stripper sump. The stripper blower forces air upward through aeration tubes in the stripper trays, and "countercurrent" to the flow of the water. VOCs are vaporized out of the water into the air flow.

Air stripper liquid effluent is collected in the air stripper's built-in sump, and then pumped to the bag filter and GAC unit (described below). The built-in sump is cast within the curbed area surrounding the air stripper, and is covered with a steel grate.

A high-level switch in the sump is tied into the system shutdown. System shutdown (Appendix C) will be activated by a high-level switch within the sump if the water entering the sump exceeds the discharge capacity of the sump pump.

Air stripper offgas is discharged to the atmosphere outside of the treatment building. Appendix A includes a complete groundwater treatment plant P&ID for the Phase II configuration; Appendix C presents the supplemental O&M manual for the air stripper.

Based on the set pumping rates, the flow of the Phase II treatment system is 30 gpm. Table 2.1 compares analytical water data collected at the upstream sampling port (i.e., between the equalization tank and the air stripper) and the downstream sampling port (i.e., upstream of the GAC unit). Phase II air stripper performance is similar to the level of treatment achieved during Phase I, indicating that the Phase II system can effectively treat contaminated groundwater captured from all six of the recovery/extraction wells.

2.4.2 Bag Filters

Bag filters are used to remove suspended solids from the treated liquid effluent after it leaves the air stripper. Suspended solids must be removed to ensure optimum treatment efficiency of the GAC unit, which is downstream from the bag filters. Two bag filters are installed in each of the treatment trains in a parallel configuration. Parallel installation and operation minimizes the pressure drop due to filtration, and the frequency of bag changes. However, the treatment train can only operate with one bag filter online (i.e., the treated groundwater is not routed through two bag filters in parallel). Details on equipment specifications and operation and maintenance requirements are included in Appendix C.

2.4.3 GAC Units

A GAC unit is installed immediately downstream from the bag filters of each treatment train. The GAC units are included to adsorb any VOCs not removed from the groundwater in the air stripper. As discussed earlier, pH controls were included in

TABLE 2.1
AIR STRIPPER ANALYTICAL DATA

PERSON GENERATING STATION
BERNALILLO COUNTY, NEW MEXICO

VOC COMPOUND	GTS-INFLUENT (μg/L)	GTS-AIR STRIPPER EFFLUENT (μg/L)	EFFICIENCY (%)
PHASE I			
FEBRUARY 1995[a/]			
Tetrachloroethene - High	170	<0.5	> 99.7
Tetrachloroethene - Low	54	<0.5	> 99.1
1,1-Dichloroethene - High	74	<0.5	> 99.4
1,1-Dichloroethene - Low	24	<0.5	> 98.0
1;1,1-Trichloroethane - High	5.5	<0.5	> 91.0
1,1,1-Trichloroethane - Low	2.2	<0.5	100*
NOVEMBER 1995			
Bromoform	0.6	<0.5	100*
1,1 Dichloroethene	17	<0.2	> 98.8
Tetrachloroethene	39	<0.5	> 98.7
1,1,1 Trichloroethane	1.9	<1.0	100*
PHASE II			
AUGUST 1996			
Bromodichloromethane	0.2	<0.2	100*
Chloroform	2.1	<0.5	100*
1,2-Dibromoethane	0.6	<0.2	100*
1,1-Dichloroethane	0.9	<0.3	100*
1,1-Dichloroethene	19	<0.2	> 98.9
Tetrachloroethene	36	<0.5	> 98.6
1,1,1-Trichloroethane	2.1	<1.0	100*
Trichloroethene	0.3	<0.3	100*
SEPTEMBER 1996			
Chloroform	1.0	<0.5	100*
1,1-Dichloroethane	1.0	<0.3	100*
1,1-Dichloroethene	17	<0.2	> 98.8
Tetrachloroethene	40	<0.5	> 98.7
1,1,1 Trichloroethane	2.6	<1.0	100*

[a/] In February 1995, the air stripper efficiencies were calculated for both the high and low influent VOC concentrations encountered. "<" Indicates a value below reporting limit of analysis. ">" Indicates a conservative value based on detection limits. Actual efficiencies may be higher. "*" Indicates influent concentrations were extremely low and further reduced to below detection limits. Air stripper removal of low concentrations of contaminants to below detection indicates a high degree of efficiency that cannot be quantified.

the Phase II system to prevent scaling of the GAC unit(s). The GAC units are Model ASC-1200, supplied by Westates Corporation (Appendix C). Similar to the air stripper, water samples can be collected both upstream and downstream of the GAC unit(s) to evaluate breakthrough and final treated effluent water quality. Table 2.2 compares water quality data collected upstream and downstream of the GAC unit during recent Phase II operations. As expected, most VOC mass is effectively removed from the liquid effluent by air stripping. However, in those rare instances when GAC polishing is necessary, available analytical data demonstrate that the GAC unit effectively reduces VOC mass well below NMED's prescribed discharge standards (see also Appendix C).

2.4.4 Discharge of Treated Liquid Effluent

All treated groundwater from the GAC unit flows to the surge tank, which has a capacity of 500 gallons. A pump and piping system transfers treated groundwater from the surge tank to the primary discharge at UNM's Championship Golf Course pond. An auxiliary discharge valve enables PNM to release treated groundwater from the surge tank to a concrete holding pond.

2.5 Discharge Permit Modification

As a result of the acid addition to the treatment train, an addendum to the discharge approval permit received in January 1995 was required. Approval of the proposed addendum or modification to the approved discharge plan of treated groundwater to the UNM's Championship Golf Course was received March 25, 1996 from NMED (included as part of O&M manual, Appendix C). In approving the discharge plan amendment, NMED has determined that the requirements of the WQCC (Reg. 3109) for the treated groundwater have been met by the Phase II system.

TABLE 2.2
GAC ANALYTICAL DATA

PERSON GENERATING STATION
BERNALILLO COUNTY, NEW MEXICO

VOC COMPOUND	GTS-AIR STRIPPER EFFLUENT (μg/L)	GAC EFFLUENT (μg/L)	EFFICIENCY (%)
PHASE I			
FEBRUARY 1995[a/]			
Tetrachloroethene - High	<0.5	<0.5	100*
Tetrachloroethene - Low	<0.5	<0.5	100*
1,1 Dichloroethene - High	<0.5	<0.5	100*
1,1 Dichloroethene - Low	<0.5	<0.5	100*
1,1,1 Trichloroethane - High	<0.5	<0.5	100*
1,1,1 Trichloroethane - Low	<0.5	<0.5	100*
NOVEMBER 1995			
Bromoform	<0.5	<0.5	100*
1,1 Dichloroethene	<0.2	<0.2	100*
Tetrachloroethene	<0.5	<0.5	100*
1,1,1 Trichloroethane	<1.0	<1.0	100*
PHASE II			
AUGUST 1996			
Bromodichloromethane	<0.2	<0.2	100*
Chloroform	<0.5	<0.5	100*
1,2 Dibromoethane	<0.2	<0.2	100*
1,1 Dichloroethane	<0.3	<0.3	100*
1,1 Dichloroethene	<0.2	<0.2	100*
Tetrachloroethene	<0.5	<0.5	100*
1,1,1 Trichloroethane	<1.0	<1.0	100*
Trichloroethene	<0.3	<0.3	100*
SEPTEMBER 1996			
Chloroform	<0.5	<1.0	100*
1,1-Dichloroethane	<0.3	<0.3	100*
1,1-Dichloroethene	<0.2	<0.2	100*
Tetrachloroethene	<0.5	<0.5	100*
1,1,1 Trichloroethane	<1.0	<1.0	100*

[a/] In February 1995 the GAC efficiencies were calculated for both the high and low influent VOC concentrations encountered. "<" Indicates a value below reporting limit of analysis. ">" Indicates a conservative value based on detection limits. "*" Indicates influent concentrations were at or below detection levels and further reduced to below detection limits. GAC removal of contaminants to below detection indicates a high degree of efficiency that cannot be quantifiable.

3.0 REFERENCES

Engineering-Science, Inc. (ES). 1994. *Corrective Measures Proposal for the Person Generating Station*, Public Service Company of New Mexico, NMT360010342. Prepared for the Public Service Company of New Mexico, Albuquerque, New Mexico. January.

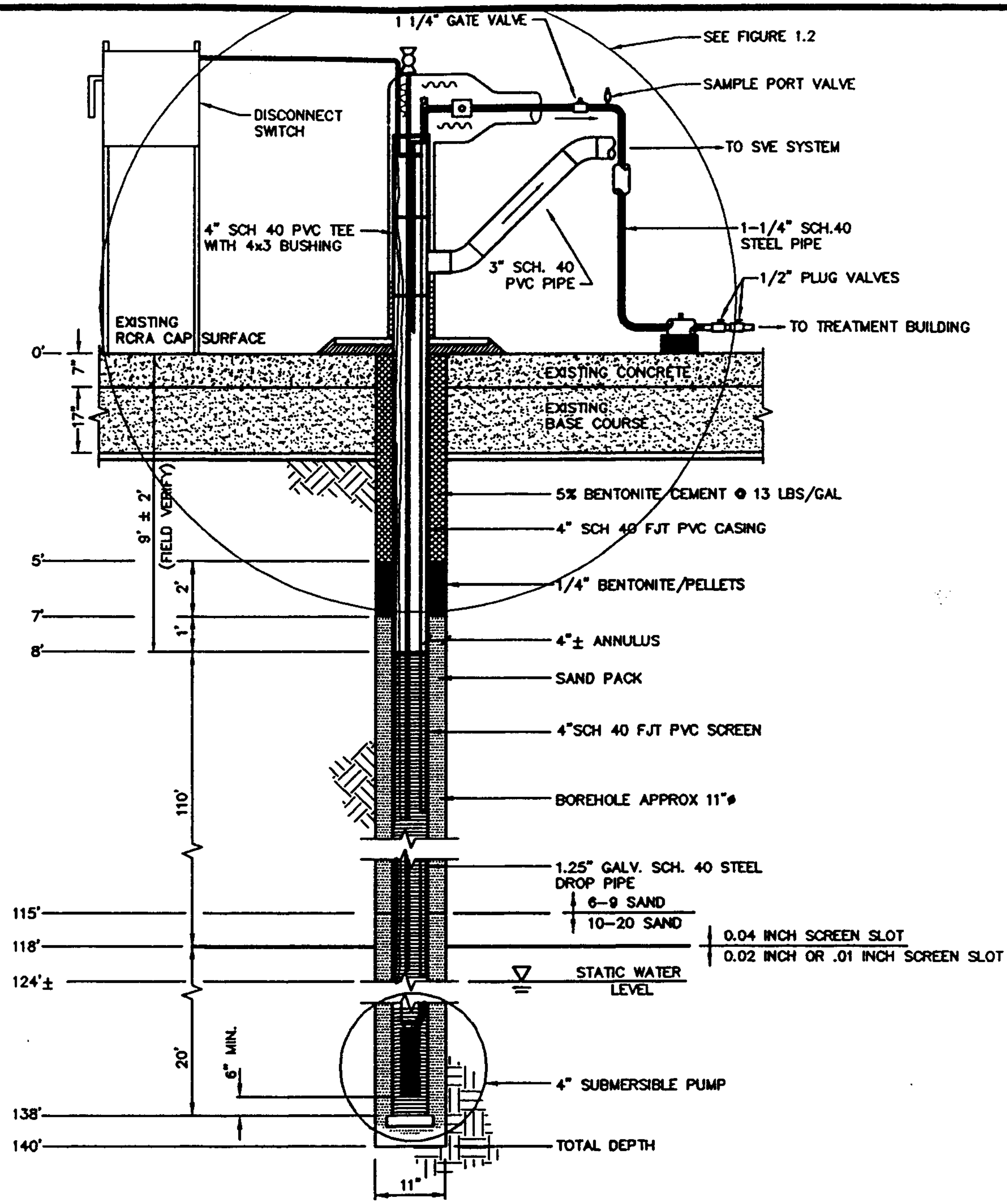
METRIC Corporation. 1993. *Corrective Action Directive Assessment Summary Report*, Person Generating Station, NMT360010342. Prepared for the Public Service Company of New Mexico, Albuquerque, New Mexico.

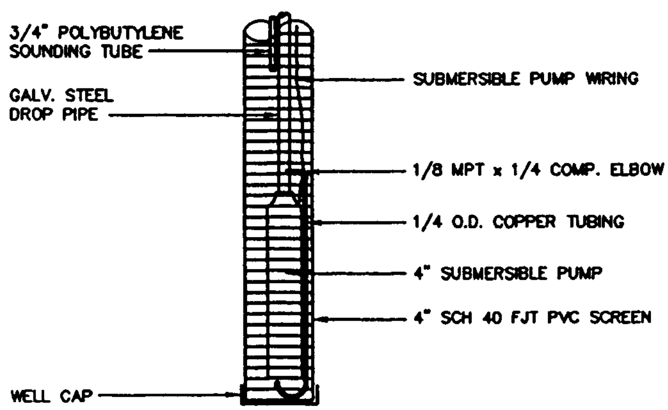
APPENDIX A

AS-BUILTS, PHOTOGRAPHIC DOCUMENTATION, AND SITE MAP (1' = 200' SCALE)

APPENDIX A
SURVEY DATA FOR GROUNDWATER EXTRACTION WELLS
PERSON GENERATING STATION

Recovery/Extraction Well	North NM Coordinate	East NM Coordinate
VEW/DW	1465684.25	382351.75
EW-1	1465605.27	382714.18
PSMW-16	1465500.26	383481.43
PSMW-24	1465389.86	384191.36
PSMW-25	1465780.13	384243.49
PSMW-26	1465007.19	384219.41





4" SUBMERSIBLE PUMP DETAIL

VAPOR EXTRACTION/ DEWATERING WELL (VEW/DW) DETAIL

Public Service Company of New Mexico
Person Generating Station
Albuquerque, New Mexico

PARSONS ENGINEERING SCIENCE, INC.
Denver, Colorado

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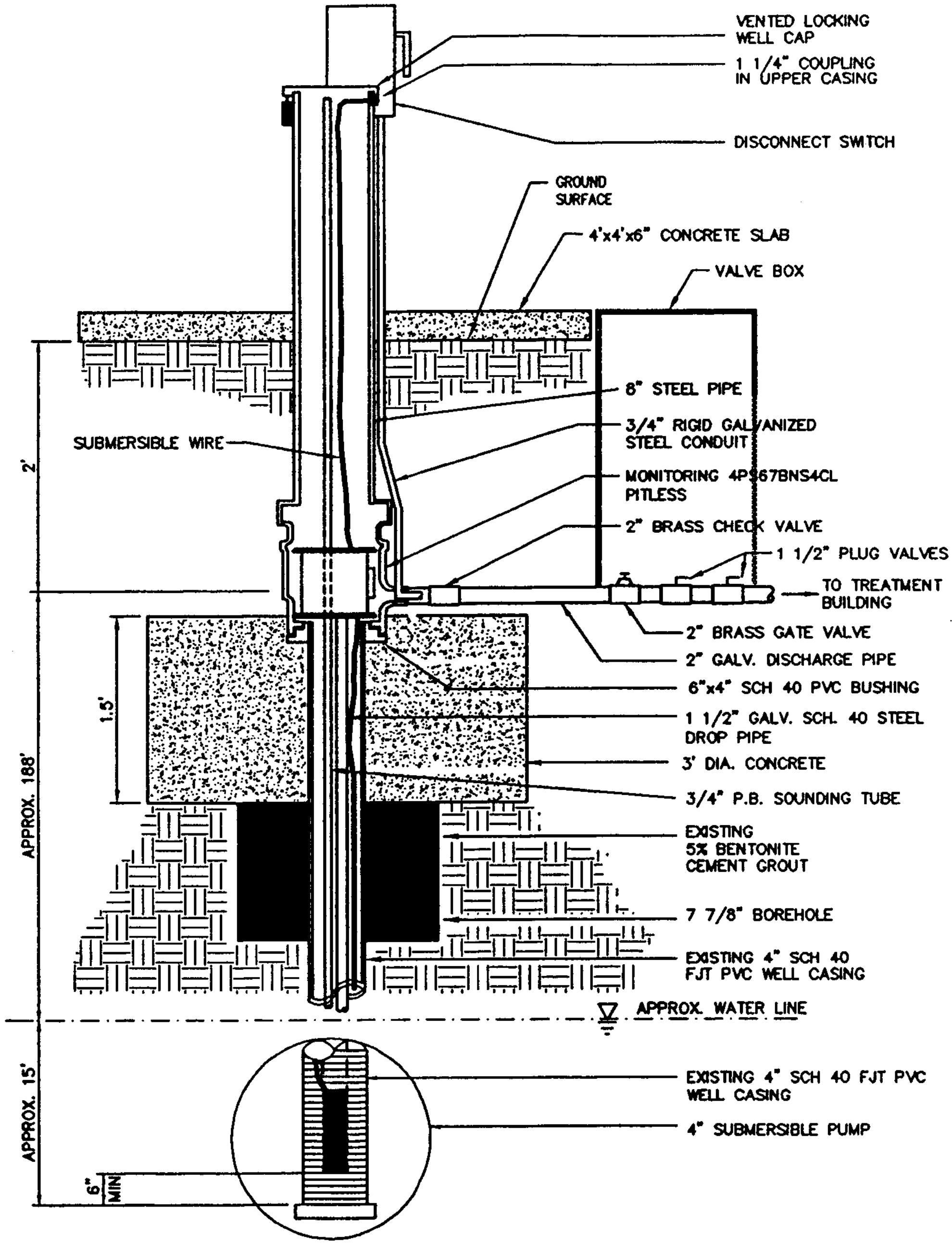
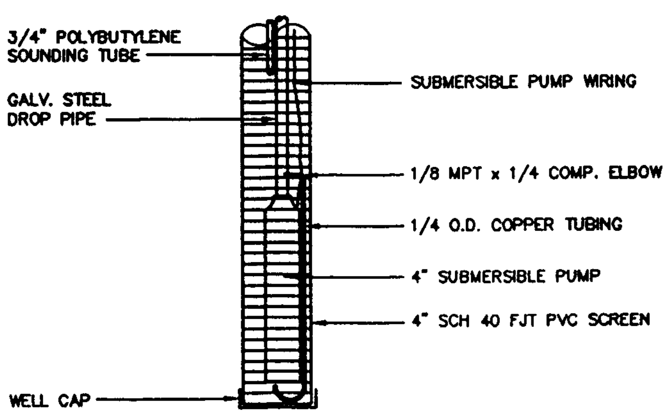




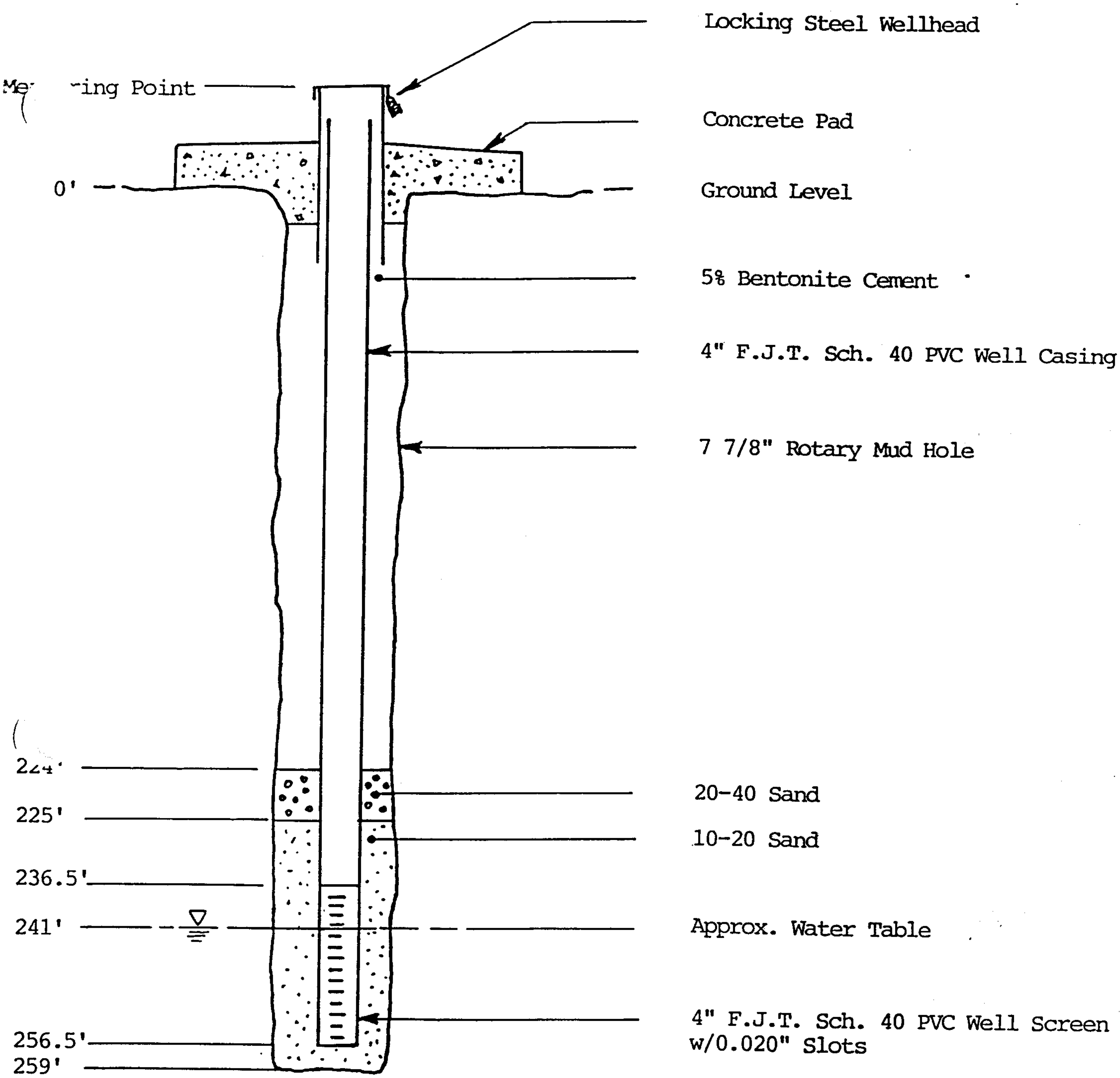
4" SUBMERSIBLE PUMP DETAIL

PUMP & TREAT WELL HEAD DETAIL (PSMW-16)

Public Service Company of New Mexico
Person Generating Station
Albuqueque, New Mexico

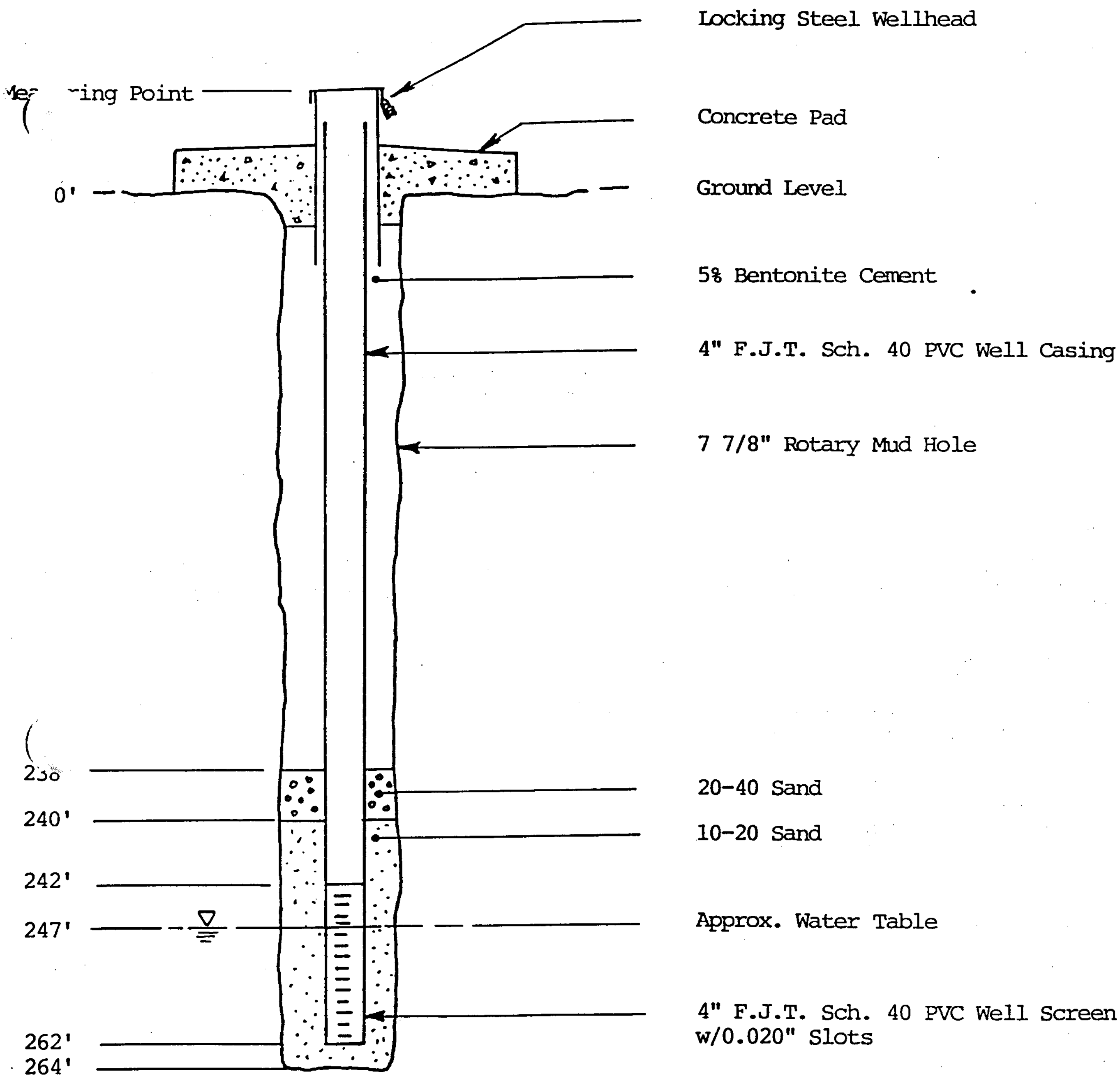
PARSONS ENGINEERING SCIENCE, INC.
Denver, Colorado

K:\PNM\95DN0671, 04/11/95 at 10:42



CONSTRUCTION DIAGRAM

PSMW- 24



CONSTRUCTION DIAGRAM

PSMW- 26

METRIC Corporation ENVIRONMENTAL ENGINEERING AND SCIENCE

8428 WASHINGTON PLACE NE, SUITE A
ALBUQUERQUE, NEW MEXICO 87113
Phone: (505) 828-2801
Fax: (505) 828-2803

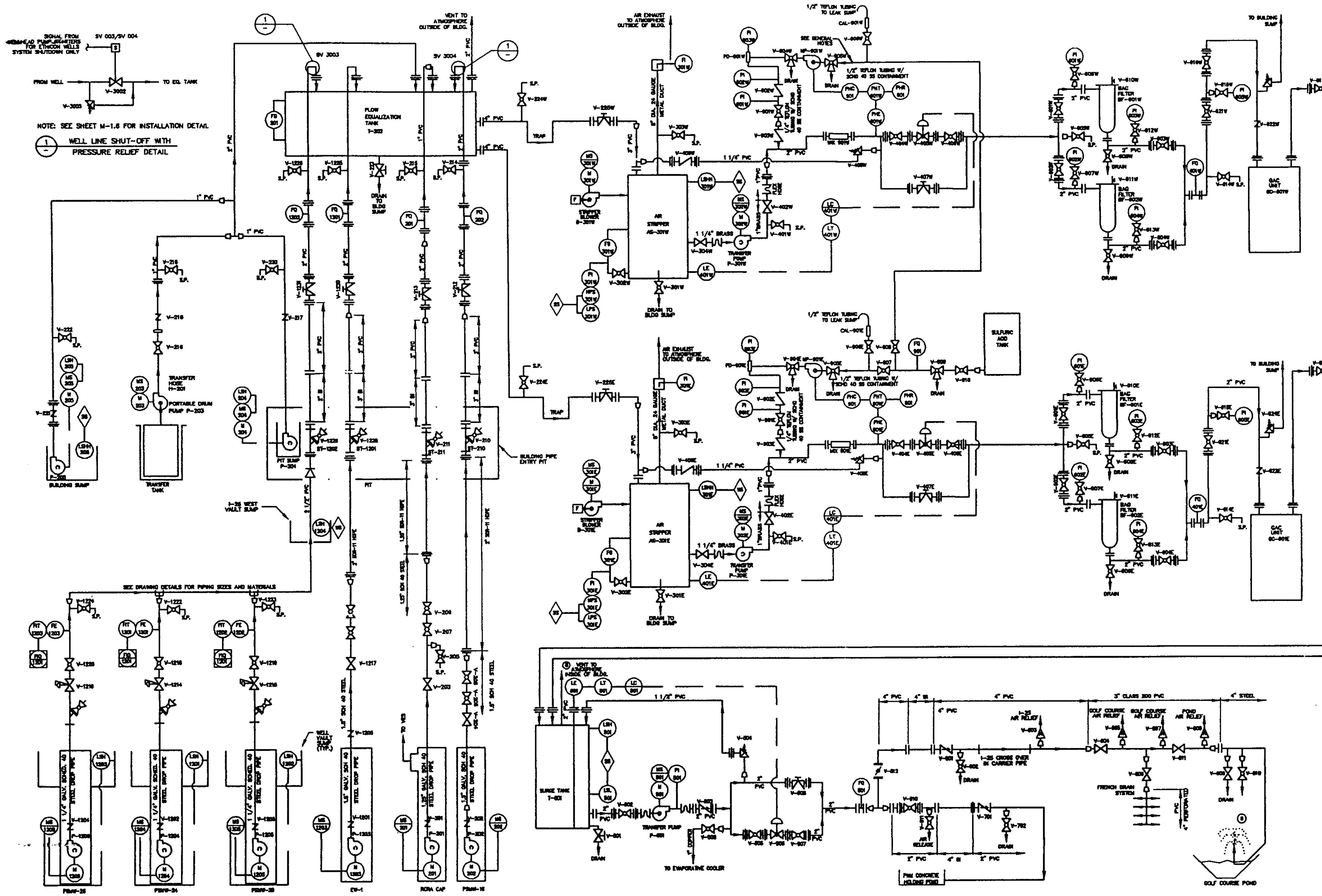
August 28, 1996

Bill Piaz
Public Service Company of New Mexico
Alvarado Square, MS ER16
Albuquerque, NM 87158

Dear Bill:

Enclosed is the information you requested concerning the pumping equipment in the recovery wells at Person Station:

WELL #	DOLE VALVE	PUMP	MOTOR	FRANKLIN MOTOR #
PSMW-16	10 GPM	Sta-Rite L30P4J	5 H.P. 460 v. 3 phase	Model #2343277004 Ser. #11-0900 Date - B 93
VEW	4 GPM	Sta-Rite 10P4C	1 ½ H.P. 480 v. 3 phase	Model #2345249404 Ser. #15-2780 Date - 2A 95
EW-1	4 GPM	Sta-Rite L10P4F	1 ½ H.P. 480 v. 3 phase	Model #2345249404 Ser. #26-4765 Date - 2A 95
PSMW-24	7 GPM	Goulds 13GS10	1 ½ H.P. 460 v. 3 phase	Model #2345249404 Ser. #31-0209 Date - 2A 95
PSMW-25	1.5 GPM	Goulds 10GS07	1 H.P. 460 v. 3 phase	Model #2345231 Ser. #24:0059 Date - 2A 96
PSMW-26	3.5 GPM	Myers N712R	1 H.P. 460 v. 3 phase	Model #2345231 Ser. #24:0049 Date - 2A 96



GENERAL NOTE

SYSTEM SHUTDOWN FOR THE WATER TREATMENT SYSTEM WILL CUTOFF POWER TO SUBMERSIBLE PUMPS (P-201, P-202, P-1203, P-1204, P-1205, AND P-1206), STRIPPER BLOWERS (B-301E AND B-301W), AIR STRIPPER TRANSFER PUMPS (P-301E AND P-1301W), CHEMICAL METERING PUMPS (MP-901E AND MP-901W), AND SURGE TANK TRANSFER PUMP (P-501) BY PLC. SYSTEM SHUTDOWN INITIATES ALARM ANNUNCIATOR AT REEVES STATION VIA MODEM.

PHASE II GROUNDWATER TREATMENT PLANT P&ID

Person Station
Bernalillo County, New Mexico

PARSONS ENGINEERING SCIENCE, INC.
Denver, Colorado

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