

**PRE-FINAL CONSTRUCTION INSPECTION REPORT
Groundwater Extraction and Treatment System E-F
Western Groundwater Operable Unit (OU-3)**

**Aerojet General Corporation Superfund Site
Rancho Cordova, California**

February 2012

Prepared for:



**United States Environmental Protection Agency
Region 9
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San Francisco, CA 94105**

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Final

**PRE-FINAL CONSTRUCTION INSPECTION REPORT
Groundwater Extraction and Treatment System E-F
Western Groundwater Operable Unit (OU-3)**

**AEROJET GENERAL CORPORATION SUPERFUND SITE
RANCHO CORDOVA, CALIFORNIA**

February 2012

**Contract Number EP-R9-09-01
Work Assignment No.: Task 0001**

Prepared for:
U.S. Environmental Protection Agency

REVIEW AND APPROVAL

Inspector:

John M. Warren, P.E.

John Warren, P.E.
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2/3/12

Date

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ACRONYMS/ABBREVIATIONS

Aerojet	Aerojet General Corporation
AST	Aboveground storage tank
EPA	U.S. Environmental Protection Agency
GET	Groundwater Extraction and Treatment
gpm	Gallons per minute
NDMA	n-Nitrosodimethylamine
NPL	National Priorities List
OU	Operable Unit
PCD	Partial Consent Decree
PCE	Tetrachloroethylene (perchloroethylene)
PFCI	Pre-Final Construction Inspection
PVC	Polyvinyl chloride
ROD	Record of Decision
SOW	Statement of Work
UV	Ultraviolet
VOC	Volatile organic compound

1.0 INTRODUCTION

This Pre-Final Construction Inspection (PFCI) Report is in accordance with the United States Environmental Protection Agency's (EPA) Record of Decision (ROD) and Remedial Design/Remedial Action Statement of Work (SOW) with respect to Western Groundwater Operable Unit 3 (OU-3) at the Aerojet General Corporation (Aerojet) Superfund Site in Rancho Cordova, California ([Figure 1](#)). The Groundwater Extraction and Treatment (GET) System E-F has been in operation for approximately 23 years. Although preliminary inspections have been held as each treatment system was completed, formal engineering inspections were not conducted until the entire remedial system for OU-3 had been constructed as approved in the Remedial Design.

During June 2011, construction inspections were conducted on behalf of EPA at OU-3 Area 5, to verify that the operational status of the GET System E-F is in accordance with the approved Remedial Design. The construction inspections covered the GET System E-F groundwater extraction wells, treatment facility, and effluent discharge.

Figures in this document have been taken from record drawings provided by Aerojet. The direction of north is toward the top of the page on [Figures 1, 2, 13, 16, 19, 21, 26, and 29](#). The drawings provided by Aerojet are as follows:

- SFE – 1295 Perchlorate Treatment Plan Sheets 1 – 48
- SFE – 1403 GET “F” Treatment Plan Expansion Sheets 1 - 48
- SFE – 1404 GET “F” Expansion Pipelines Sheets 1 – 15
- SFE – 1548 GET “E-F” Pipeline and Extraction Wells Sheets 1 – 49
- SFE – 1549 GET “E-F” Treatment Plant Expansion Sheets 1 – 21
- SFE – 1550 GET “E-F” Clarifier Addition Sheets 1 – 25
- SFE – 1569 GET “E-F” Plant Improvements Sheets 1 – 15

1.1 PURPOSE AND OBJECTIVE

The objectives of these construction inspections were to confirm that the GET System E-F components were installed and constructed in accordance with the system specifications, and that the Remedial Action (or the inspected portion of the overall GET System E-F) is operational and functional, as described in Section IV.F.4 of the SOW ([Attachment 1](#)). Outstanding construction items discovered during the inspection were to be identified and noted in this report. The PFCI Report will be submitted to Aerojet and will provide the outline of outstanding construction items, actions required to resolve the items, expected completion date for the items, and an anticipated date for a Final Inspection, if required.

1.2 GENERAL HISTORY AND BACKGROUND

In 1951, Aerojet began operations in Rancho Cordova, Sacramento County, California. Aerojet and its subsidiaries manufactured liquid and solid propellants; fabricated, assembled, tested, and rehabilitated rocket engines; and manufactured paint components, herbicides, and pharmaceutical products. Wastes from these operations were disposed of by burial, open burning, discharge into unlined evaporation ponds, and injection into wells. As a result of the disposal, volatile organic compounds (VOC), perchlorate, n-nitrosodimethylamine (NDMA), and other compounds leached into the drinking-water aquifers for various communities located in the area.

In 1983, the Aerojet Rancho Cordova facility was placed on the National Priorities List (NPL). Between 1983 and 1988, Aerojet constructed five treatment systems to extract, treat, and re-inject groundwater from its Rancho Cordova facility. From 1988 until 1999, GET Facility E and Facility F were separate systems. In 1999, GET E and GET F were combined. During the previous year, 1998, biological treatment of perchlorate had been added to GET F. Treated groundwater (effluent) continued to be re-injected until 2001. In 2001, Aerojet discontinued re-injection of treated groundwater, installed extraction wells for recovery and began discharging treated effluent to Buffalo Creek. In 2002 and as part of the Partial Consent Decree (PCD), the Site was divided into OUs. The cleanup approach for the Site under the modified PCD is to

control groundwater contamination moving across the facility boundary within two OUs (OU-3 and OU-5), then remediate soil and groundwater at source areas, which consist of five OUs.

OU-3 provides for: 1) an inner groundwater boundary to prevent further contamination from flowing off-property on the western side of the Aerojet Site, 2) an outer boundary at the leading edge of groundwater contamination to prevent the further contamination of the aquifer above the cleanup levels specified in the ROD, and 3) the eventual restoration of the drinking-water aquifer.

1.3 DESCRIPTION OF FACILITY AND COMPONENTS

As previously noted, this PFCI Report is for GET Facility E-F and the associated extraction-well system. GET Facility E-F is located within the Aerojet Rancho Cordova Facility. The area location of the combined treatment system is west of Area 15 Plant 2 and west and slightly south of Area 16. [Figure 1](#) presents a site map that shows the location of the GET Facility E-F and the location of the extraction wells. Photographs of the facility are provided in [Appendix A](#).

The treatment facility receives groundwater from 21 extraction wells (see [Figure 2](#)), which are screened in five different water-bearing zones (see [Table 1](#)). Extracted groundwater reaches the GET E-F facility via a 20-inch polyvinyl chloride (PVC) pipeline. The GET E-F groundwater treatment system has been modified on six occasions. The current treatment system process flow consists of the collection of groundwater from Areas E and F which then flows to a 42,000-gallon above ground influent storage tank (AST) tank. The purpose of this influent tank is to allow for flow through the treatment process to be balanced or equalized, and for particulate matter to settle. From the influent tank, extracted groundwater is dosed with de-natured alcohol ([Appendix A](#), Photograph 1) and a proprietary nutrient solution and injected into fluid bed reactors. The primary purpose of the fluidized bed reactors is to break down perchlorate. Effluent from the fluid bed reactors is then pumped to the sand filters. Effluent and back-wash from the sand filters flows to a holding tank. The next step in the process is peroxide (H₂O₂) treatment, where the holding-tank contents are metered and mixed using a static mixer. After application of the peroxide, the treated groundwater is passed through ultraviolet (UV) reactors (Photograph 2) and air strippers.

Major equipment components are as follows.

- 42,000-gallon Influent Equalization Tank
- 40,000-gallon Holding Tank
- Fluid Bed Reactors
- Sand Filters
- Peroxide Storage Tank
- Peroxide Metering Pumps and Controls
- Static Mixer
- UV Reactors
- Air Strippers
- Bag Filters
- Transfer and Discharge Pumps

The UV reactors serve the dual role of destroying both VOCs and NDMA. The addition of the hydrogen peroxide prior to the UV reactors allows for the energy from the UV reactors to separate the hydroxyl radical, which in turn has sufficient energy to break apart some of the VOCs. The UV energy is also sufficient to break apart NDMA. The breakdown of the VOCs by the addition of hydrogen peroxide and UV energy has resulted in the ability to better manage the VOC emission rate from the air strippers.

Effluent from the UV reactors is then passed through air strippers (Photograph 3) to further remove more of the chlorinated solvents prior to discharge to Buffalo Creek. In addition, backwash water from the sand filters (Photograph 4) is passed through a clarifier where ferric chloride has been injected to assist in settling solids (Photograph 5). Prior to discharge to Buffalo Creek, effluent is passed through bag filters. A process flow diagram is shown on [Figure 3](#).

As previously stated, there are 21 extraction wells associated with GET Facility E-F. Locations of the extraction wells are shown on [Figure 1](#). [Table 1](#) lists the wells, their depth, screen interval, and extraction rate. The column listing the GET system for each pump is provided to identify the system under which the listed pump was installed. Those pumps listed as GET E-F were installed after the two systems were combined.

TABLE 1: EXTRACTION WELL INFORMATION

Pre-Final Construction Inspection Report, Groundwater Extraction & Treatment System E-F,
Aerojet General Corporation, Rancho Cordova, California

Extraction Well Number	GET System	Aquifer	Total Depth (in Feet)	Screened Interval in Feet Below Surface Grade	Maximum Extraction Rate in Gallons per Minute (gpm)
4007	F	A	129	75 – 122	2
4060	F	D	295	220 – 280	260
4070	E	N	253	163 – 243	200
4075	E	N	260	150 – 250	380
4140	F	C	255	180 – 240	230
4145	F	C	226	142 – 216	270
4200	E	N	265	160 – 250	360
4425	E	N	260	140 – 240	250
4435	E	N	260	140 – 240	250
4530	EF	C	195	146 – 180	230
4535	EF	D	233	190 – 218	180
4540	EF	E	484	419 – 474	250
4545	EF	D	408	263 – 398	400
4550	EF	C	242	167 – 242	300
4555	EF	C	235	155 – 235	195
4590	EF	E	525	405 – 515	320
4595	EF	D	395	275 – 385	300
4600	EF	C	245	165 – 235	190
4605	EF	D	403	273 – 393	265
4610	EF	E	544.5	434.5 – 534.5	0
4615	EF	C	250	180 – 240	290

Notes:

GET Groundwater Extraction and Treatment
gpm Gallons per minute

FIGURE 1: LOCATION MAP, OU-3 AREA 5

Pre-Final Construction Inspection Report, Groundwater Extraction & Treatment System E-F,
Aerojet General Corporation, Rancho Cordova, California

(Figure Not to Scale)

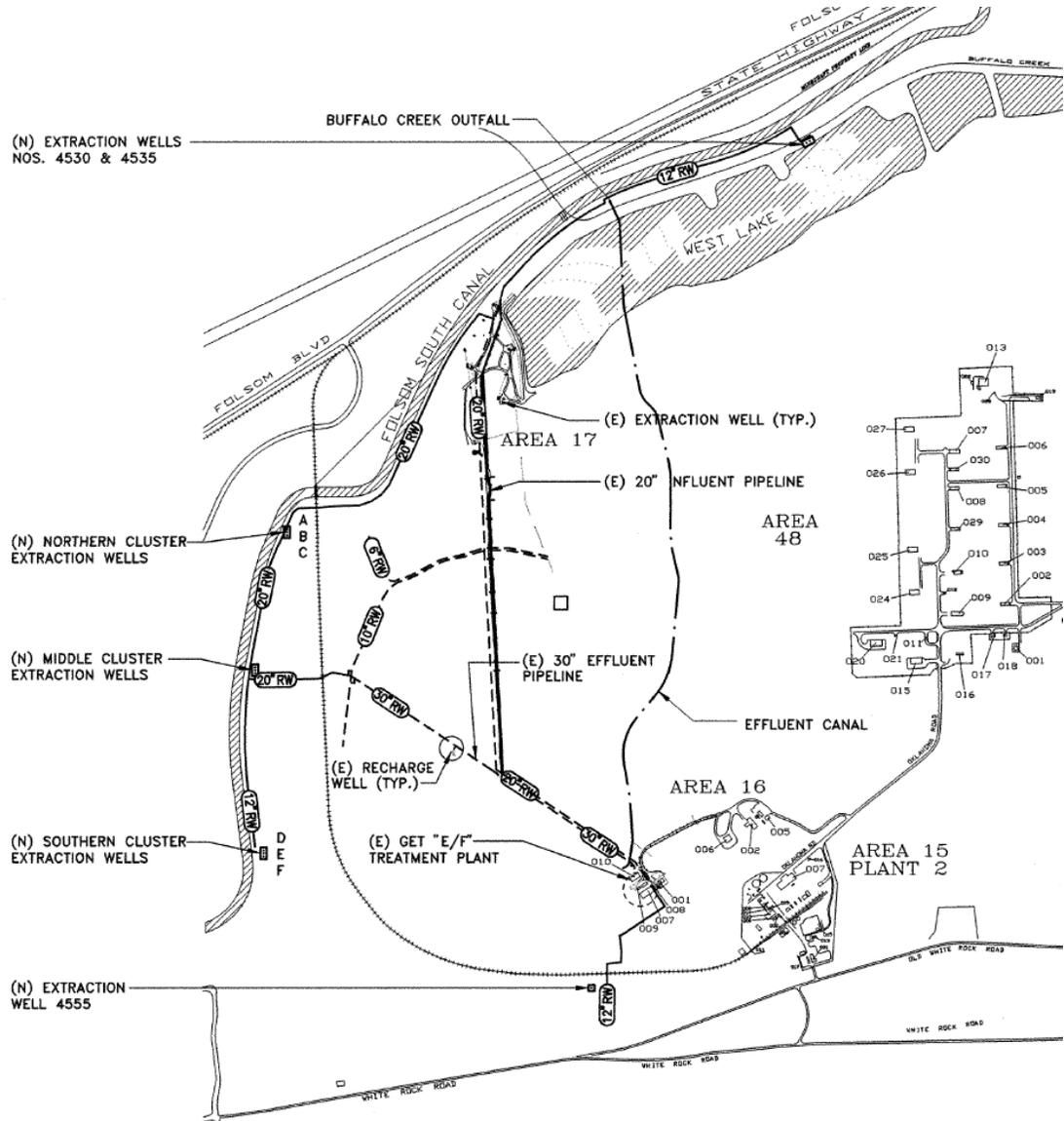


FIGURE 2: WELL LOCATION MAP, OU-3 AREA 5

Pre-Final Construction Inspection Report, Groundwater Extraction & Treatment System E-F,
Aerojet General Corporation, Rancho Cordova, California

(Figure Not to Scale)

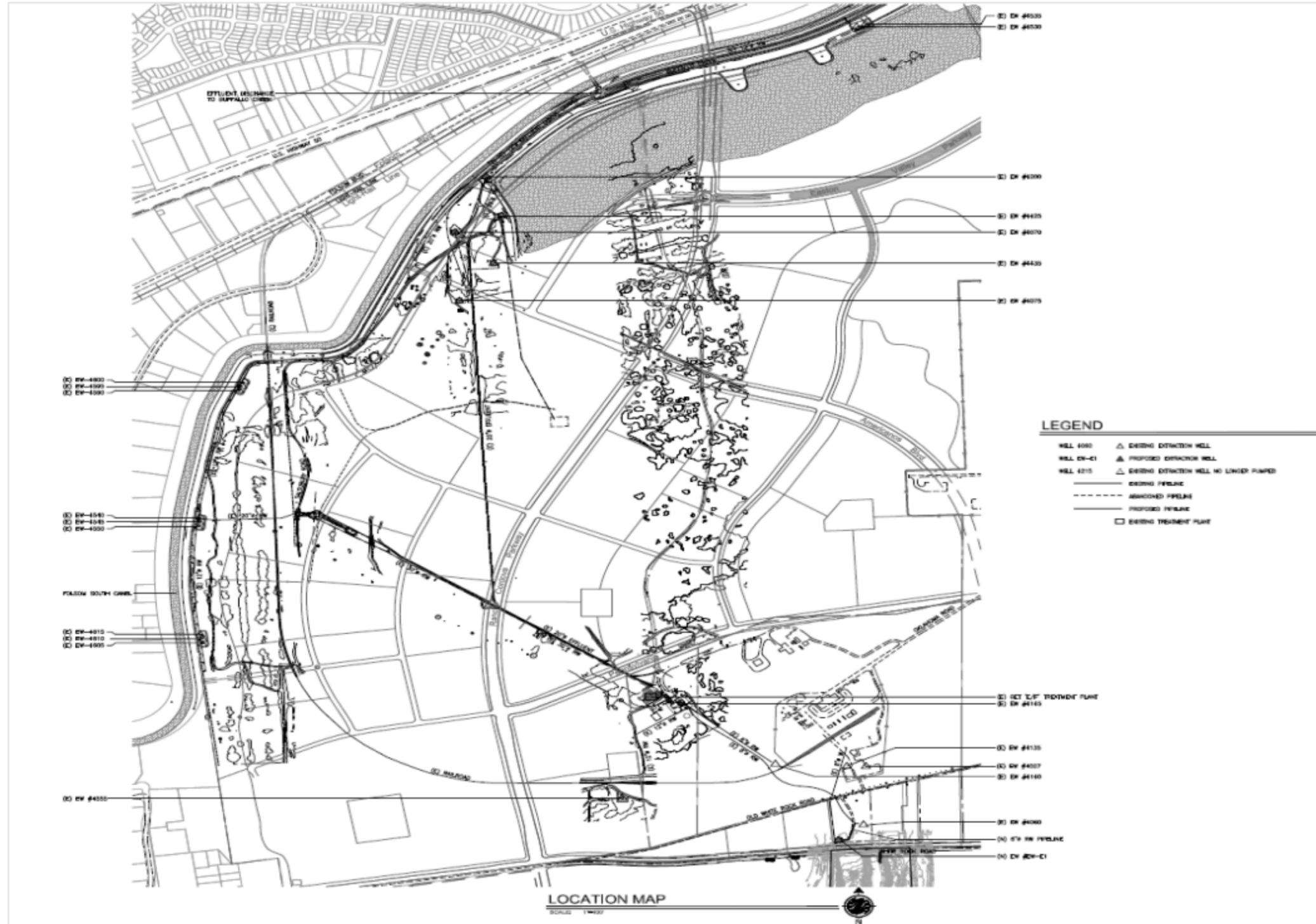
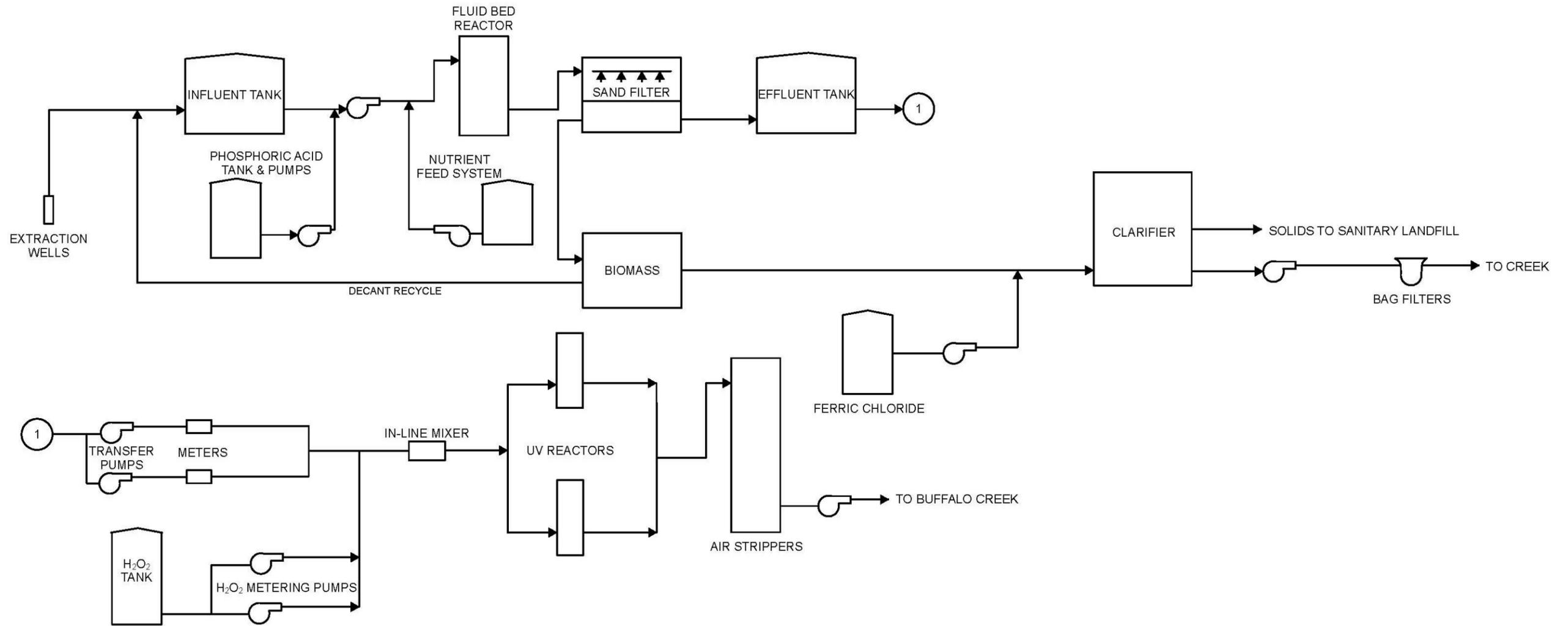


FIGURE 3: PROCESS FLOW DIAGRAM FOR GET E-F

Pre-Final Construction Inspection Report, Groundwater Extraction & Treatment System E-F,
Aerojet General Corporation, Rancho Cordova, California

(Figure Not to Scale)



2.0 PRE-FINAL CONSTRUCTION REVIEW

This section presents the PFCI and verification findings for the groundwater extraction well-heads and the treatment facility of the GET System E-F. Underground features of the GET System E-F were installed and covered prior to the PFCI. Therefore, construction inspections and verification were not conducted for buried piping and valve sizes, buried connections between pieces of equipment, nor installed submersible pumps. Above-ground or accessible pumps were inspected. In addition, since GET System E-F has been operational for approximately 23 years, the construction inspection verified the equipment, its size, and its material to the extent feasible (equipment that could be physically reached, observed, and compared to the drawings was inspected).

2.1 GROUNDWATER EXTRACTION WELL-HEAD INSPECTIONS AND VERIFICATION

Physical inspection and verification of the 21 GET System E-F extraction well-heads ([Table 1](#)) was conducted in June 2011 by comparing the installed equipment and material to the record drawings provided by Aerojet representing the “as constructed” state of each extraction well-head. The pump pit for each well-head was inspected from aboveground. A plan view and section view of each well-head and vault, as well as the completed PFCI checklist, are provided. The sequence of drawings is given below.

- Extraction Well 4007 ([Figure 4](#) and [Table 2](#))
- Extraction Well 4060 ([Figure 5](#) and [Table 3](#))
- Extraction Well 4070 ([Figure 6](#) and [Table 4](#))
- Extraction Well 4075 ([Figure 7](#) and [Table 5](#))
- Extraction Well 4140 ([Figure 8](#) and [Table 6](#))
- Extraction Well 4145 ([Figure 9](#) and [Table 7](#))
- Extraction Well 4200 ([Figure 10](#) and [Table 8](#))
- Extraction Wells 4425 ([Figure 11](#) and [Table 9](#))
- Extraction Well 4435 ([Figure 12](#) and [Table 10](#))

- Extraction Wells 4530 and 4535 ([Figures 13, 14, 15](#) and [Table 11](#))
- Extraction Wells 4540, 4545, 4550 ([Figures 16, 17, 18](#) and [Table 12](#))
- Extraction Well 4555 ([Figures 19, 20](#) and [Table 13](#))
- Extraction Wells 4590, 4595, 4600 ([Figures 21, 22, 23, 24, 25](#) and [Tables 14 & 15](#))
- Extraction Wells 4605, 4610, 4615 ([Figures 26, 27, 28](#) and [Table 16](#))

FIGURE 4: SECTION VIEW OF WELL 4007

Pre-Final Construction Inspection Report, Groundwater Extraction & Treatment System E-F,
Aerojet General Corporation, Rancho Cordova, California

(Figure Not to Scale)

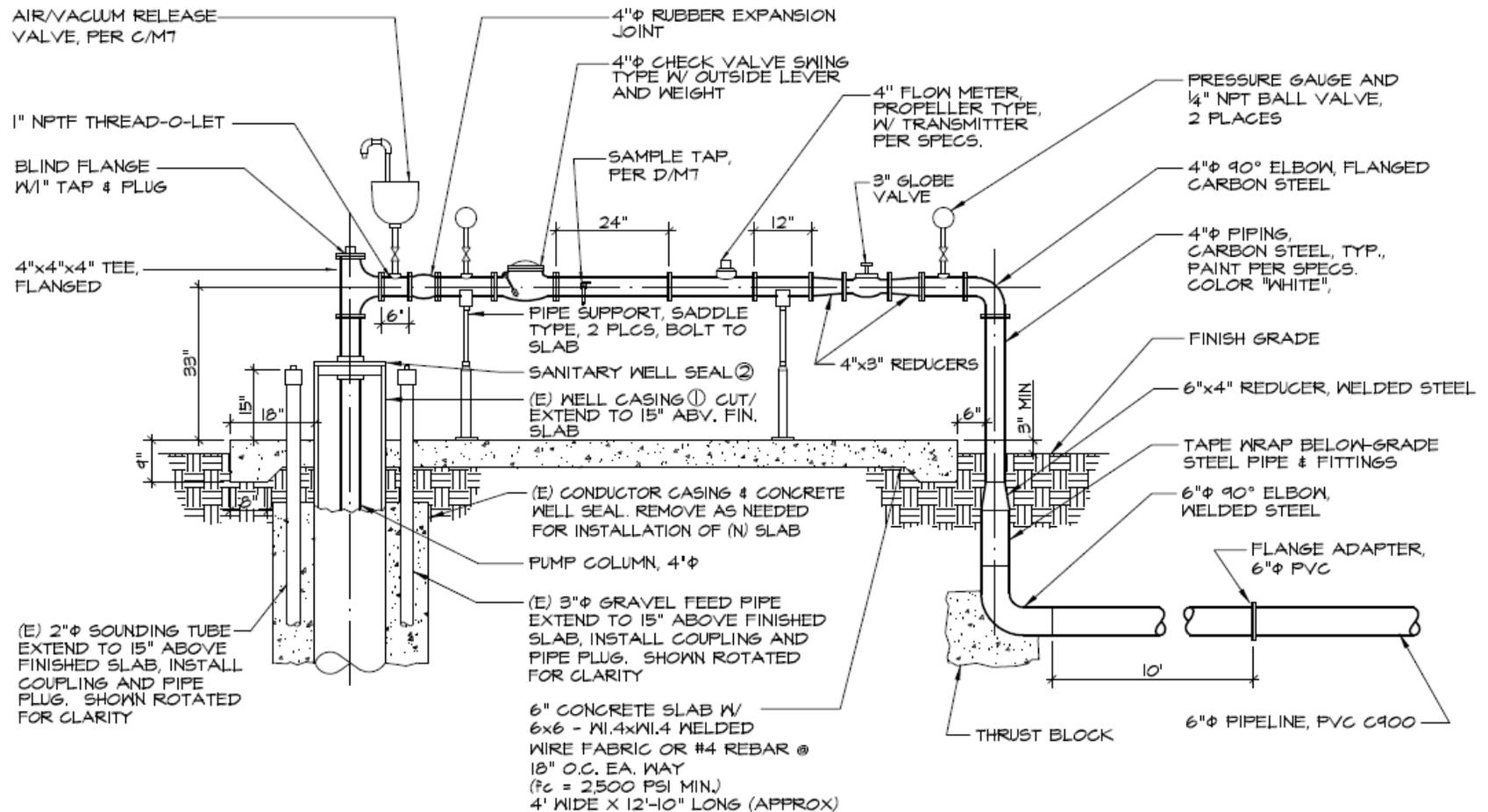


TABLE 2: CHECKLIST FOR EXTRACTION WELL 4007

Pre-Final Construction Inspection Report, Groundwater Extraction & Treatment System E-F,
Aerojet General Corporation, Rancho Cordova, California

Extraction Well 4007						
	Installed	Meets Plans & Specs	Not Compliant	Item to Correct	Estimated Time for Correction	Completed
Extraction Well 4007	√	√				
Concrete Slab	√	√				
Well Head Extension	√	√				
4-Inch by 4-Inch Tee	√	√				
Air/Vacuum Release Valve	√	√				
4-Inch Check Valve	√	√				
4-Inch Flow Meter	√	√				
4-Inch Rubber Expansion Joint	√	√				
3-Inch Globe Valve	√	√				
Pressure Gauge (2 such)	√	√				
¼-Inch Ball Valve	√	√				
Sample Station						
Eclipse 88 Sampling Station	√	√				
Aluminum Housing	√	√				
Copper Vent Tube	√	√				
2-Inch Sounding Tube	√	√				
3-Inch Gravel Feed Tube	√	√				
Electrical Panel	√	√				

FIGURE 5: SECTION VIEW OF WELL 4060

Pre-Final Construction Inspection Report, Groundwater Extraction & Treatment System E-F,
Aerojet General Corporation, Rancho Cordova, California

(Figure Not to Scale)

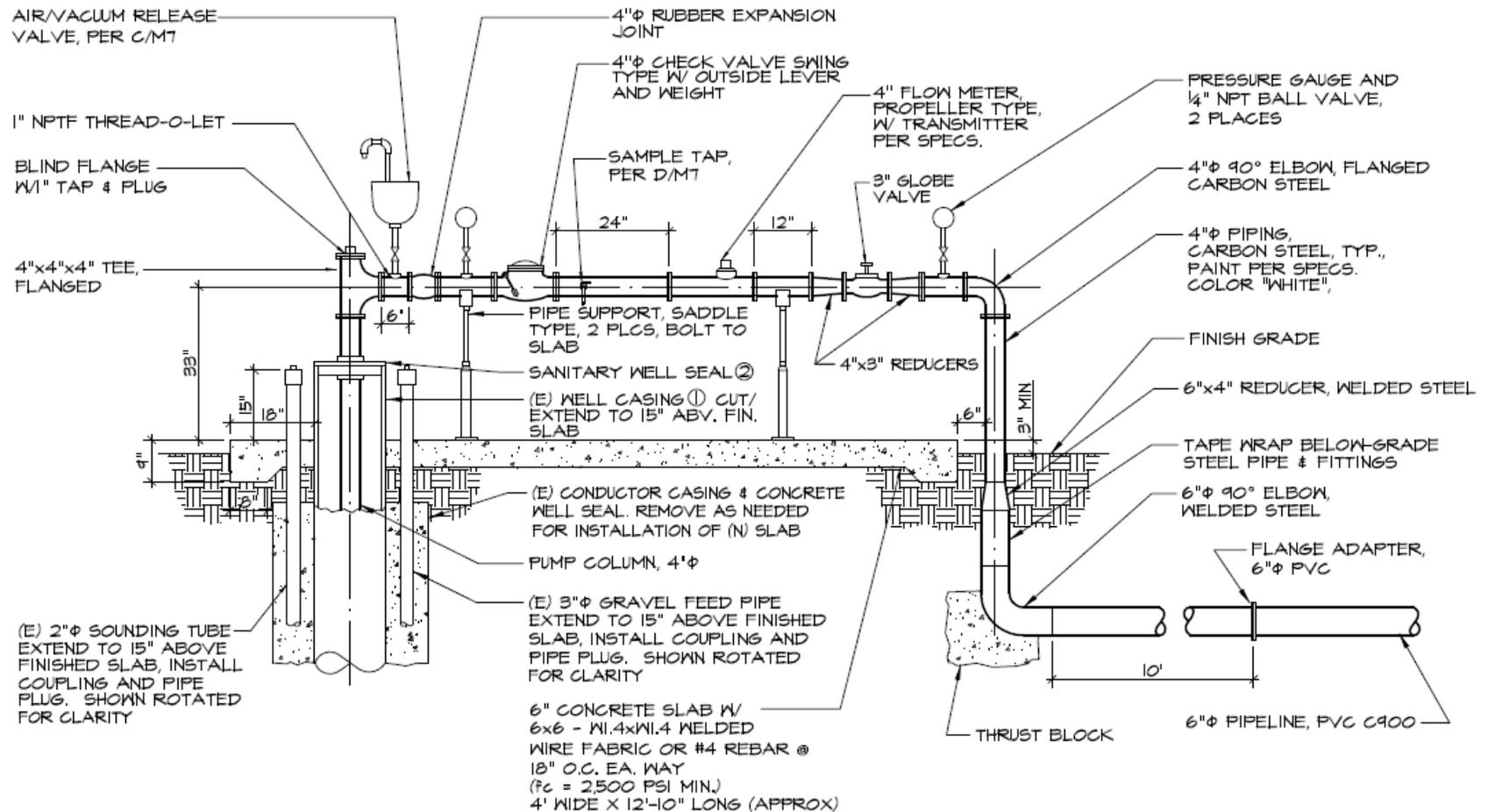


TABLE 3: CHECKLIST FOR EXTRACTION WELL 4060

Pre-Final Construction Inspection Report, Groundwater Extraction & Treatment System E-F,
Aerojet General Corporation, Rancho Cordova, California

Extraction Well 4060						
	Installed	Meets Plans & Specs	Not Compliant	Item to Correct	Estimated Time for Correction	Completed
Extraction Well 4060	√	√				
Concrete Slab	√	√				
Well Head Extension	√	√				
4-Inch by 4-Inch Tee	√	√				
Air/Vacuum Release Valve	√	√				
4-Inch Check Valve	√	√				
4-Inch Flow Meter	√	√				
4-Inch Rubber Expansion Joint	√	√				
3-Inch Globe Valve	√	√				
Pressure Gauge (2 such)	√	√				
¼-Inch Ball Valve	√	√				
Sample Station						
Eclipse 88 Sampling Station	√	√				
Aluminum Housing	√	√				
Copper Vent Tube	√	√				
2-Inch Sounding Tube	√	√				
3-Inch Gravel Feed Tube	√	√				
Electrical Panel	√	√				

FIGURE 6: PLAN & SECTION VIEWS OF WELL 4070

Pre-Final Construction Inspection Report, Groundwater Extraction & Treatment System E-F,
Aerojet General Corporation, Rancho Cordova, California

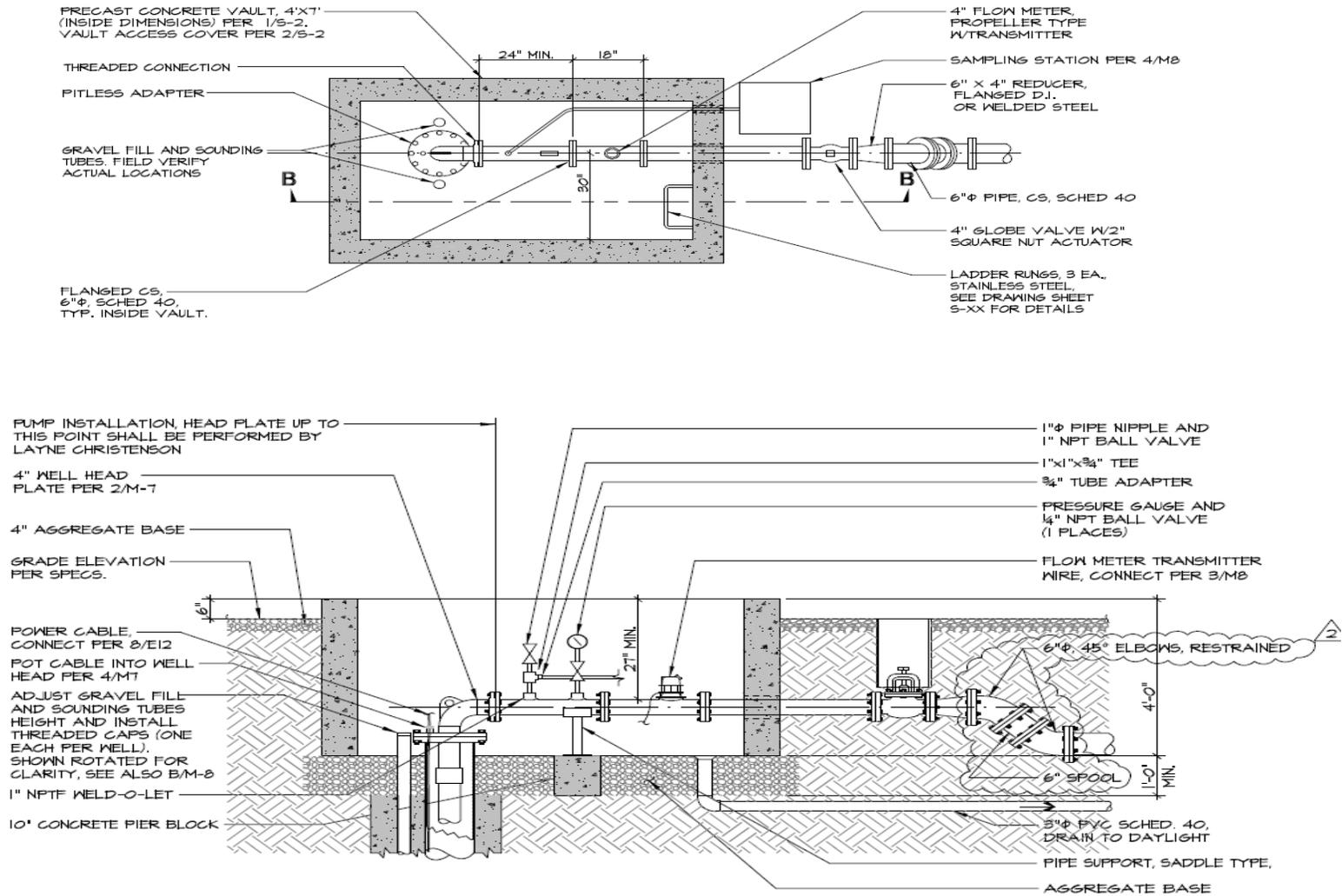


TABLE 4: CHECKLIST FOR EXTRACTION WELL 4070

Pre-Final Construction Inspection Report, Groundwater Extraction & Treatment System E-F,
Aerojet General Corporation, Rancho Cordova, California

Extraction Well 4070						
	Installed	Meets Plans & Specs	Not Compliant	Item to Correct	Estimated Time for Correction	Completed
Extraction Well 4070	√	√				
Concrete Vault	√	√				
Pump Well Head Plate	√	√				
4-Inch by 4-Inch Tee	√	√				
Air/Vacuum Release Valve	√	√				
4-Inch Globe Valve	√	√				
4-Inch Flow Meter	√	√				
Pressure Gauge	√	√				
1-Inch Ball Valve	√	√				
2-Inch Sounding Tube	√	√				
3-Inch Gravel Feed Tube	√	√				

FIGURE 7: PLAN & SECTION VIEWS OF WELL 4075

Pre-Final Construction Inspection Report, Groundwater Extraction & Treatment System E-F,
Aerojet General Corporation, Rancho Cordova, California

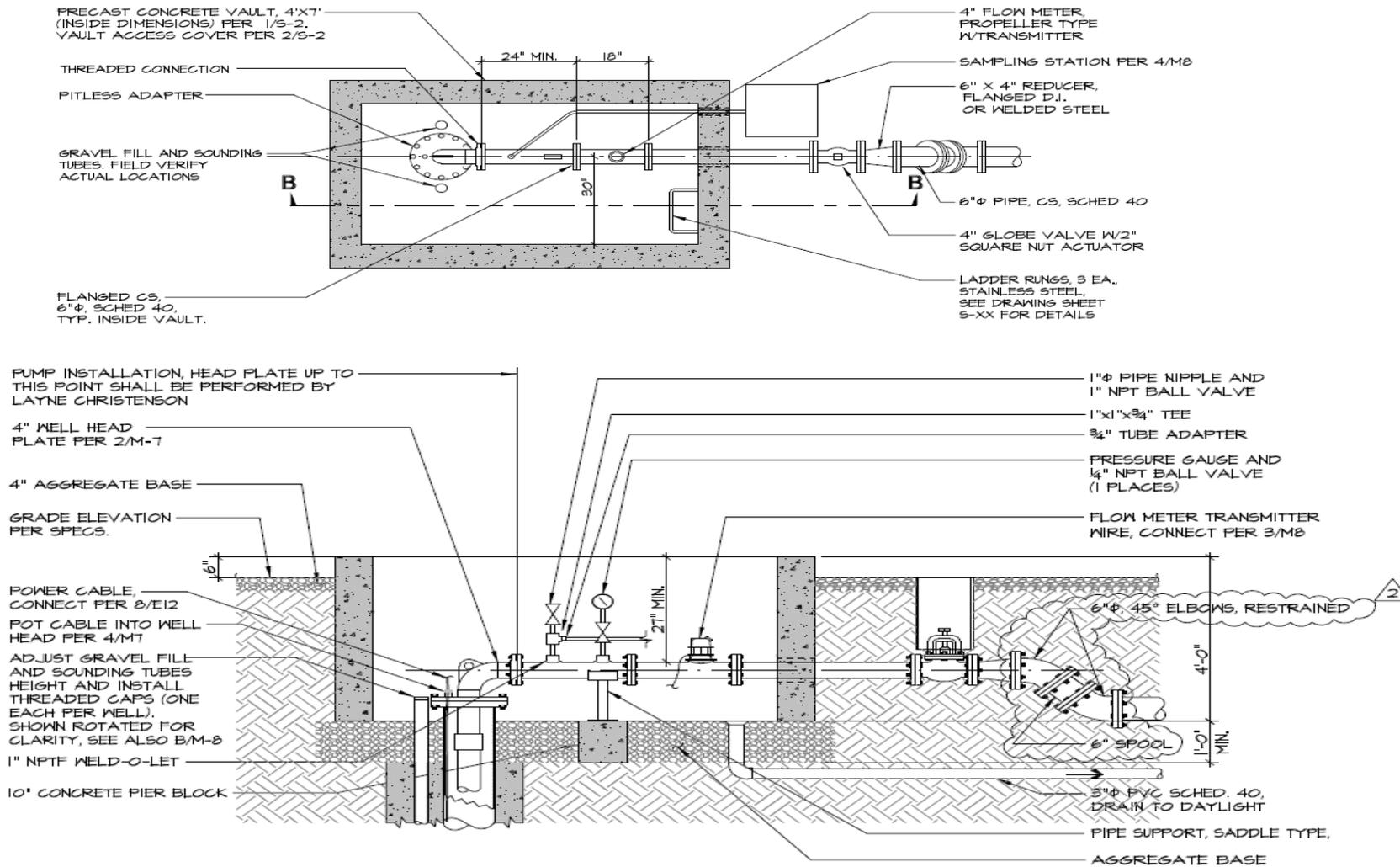


TABLE 5: CHECKLIST FOR EXTRACTION WELL 4075

Pre-Final Construction Inspection Report, Groundwater Extraction & Treatment System E-F,
Aerojet General Corporation, Rancho Cordova, California

Extraction Well 4075						
	Installed	Meets Plans & Specs	Not Compliant	Item to Correct	Estimated Time for Correction	Completed
Extraction Well 4075	√	√				
Concrete Vault	√	√				
Pump Well Head Plate	√	√				
4-Inch by 4-Inch Tee	√	√				
Air/Vacuum Release Valve	√	√				
4-Inch Globe Valve	√	√				
4-Inch Flow Meter	√	√				
Pressure Gauge	√	√				
1-Inch Ball Valve	√	√				
2-Inch Sounding Tube	√	√				
3-Inch Gravel Feed Tube	√	√				

FIGURE 8: SECTION VIEW OF WELL 4140

Pre-Final Construction Inspection Report, Groundwater Extraction & Treatment System E-F,
Aerojet General Corporation, Rancho Cordova, California

(Figure Not to Scale)

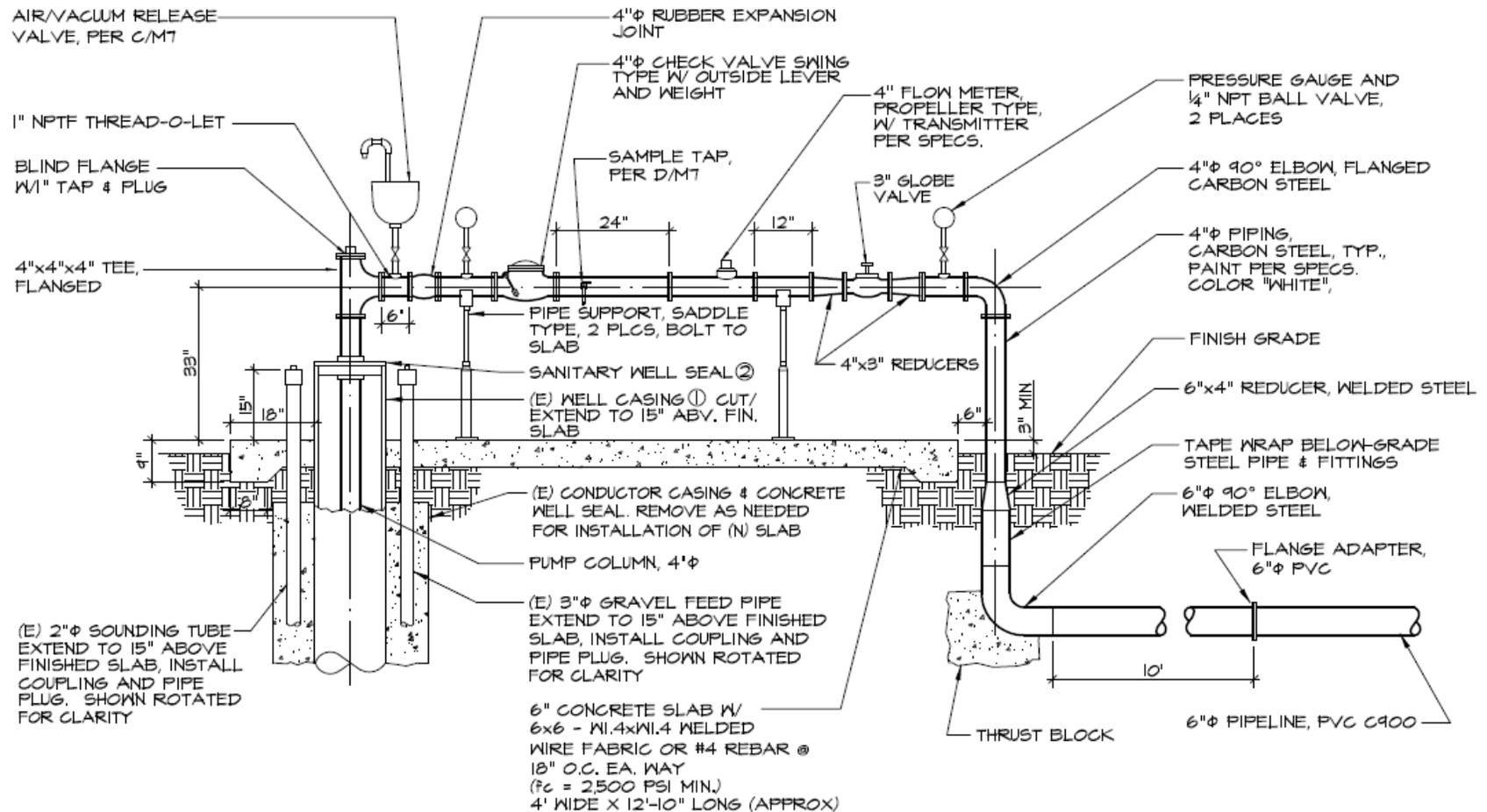


TABLE 6: CHECKLIST FOR EXTRACTION WELL 4140

Pre-Final Construction Inspection Report, Groundwater Extraction & Treatment System E-F,
 Aerojet General Corporation, Rancho Cordova, California

Extraction Well 4140						
	Installed	Meets Plans & Specs	Not Compliant	Item to Correct	Estimated Time for Correction	Completed
Extraction Well 4140	√	√				
Concrete Slab	√	√				
Well Head Extension	√	√				
4-Inch by 4-Inch Tee	√	√				
Air/Vacuum Release Valve	√	√				
4-Inch Check Valve	√	√				
4-Inch Flow Meter	√	√				
4-Inch Rubber Expansion Joint	√	√				
3-Inch Globe Valve	√	√				
Pressure Gauge (2 such)	√	√				
¼-Inch Ball Valve	√	√				
Sample Station						
Eclipse 88 Sampling Station	√	√				
Aluminum Housing	√	√				
Copper Vent Tube	√	√				
2-Inch Sounding Tube	√	√				
3-Inch Gravel Feed Tube	√	√				
Electrical Panel	√	√				

FIGURE 9: PLAN & SECTION VIEWS OF WELL 4145

Pre-Final Construction Inspection Report, Groundwater Extraction & Treatment System E-F,
Aerojet General Corporation, Rancho Cordova, California

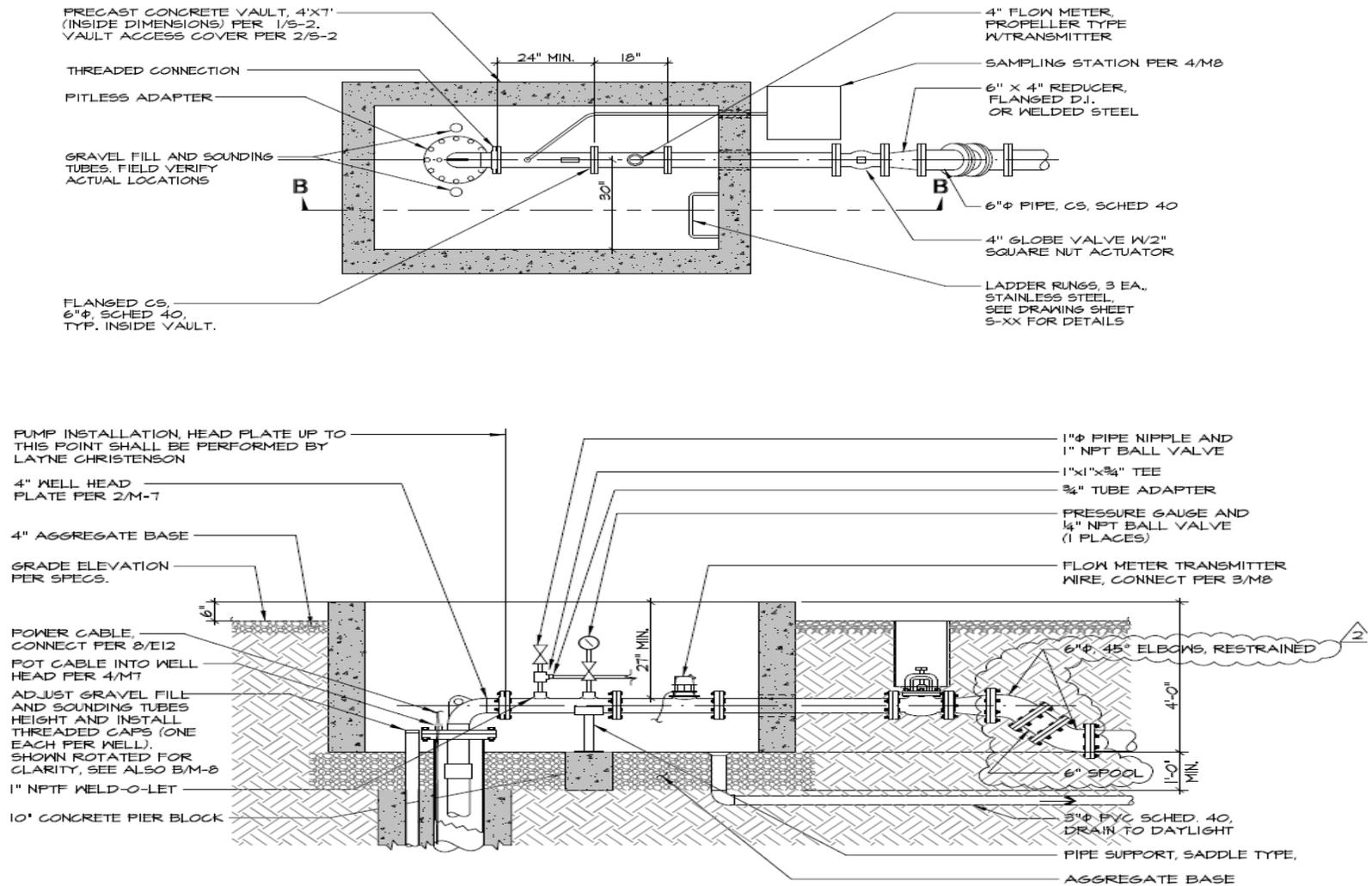


TABLE 7: CHECKLIST FOR EXTRACTION WELL 4145

Pre-Final Construction Inspection Report, Groundwater Extraction & Treatment System E-F,
Aerojet General Corporation, Rancho Cordova, California

Extraction Well 4145						
	Installed	Meets Plans & Specs	Not Compliant	Item to Correct	Estimated Time for Correction	Completed
Extraction Well 4145	√	√				
Concrete Vault	√	√				
Pump Well Head Plate	√	√				
4-Inch by 4-Inch Tee	√	√				
Air/Vacuum Release Valve	√	√				
4-Inch Globe Valve	√	√				
4-Inch Flow Meter	√	√				
Pressure Gauge	√	√				
1-Inch Ball Valve	√	√				
2-Inch Sounding Tube	√	√				
3-Inch Gravel Feed Tube	√	√				

FIGURE 10: PLAN & SECTION VIEWS OF WELL 4200

Pre-Final Construction Inspection Report, Groundwater Extraction & Treatment System E-F,
Aerojet General Corporation, Rancho Cordova, California

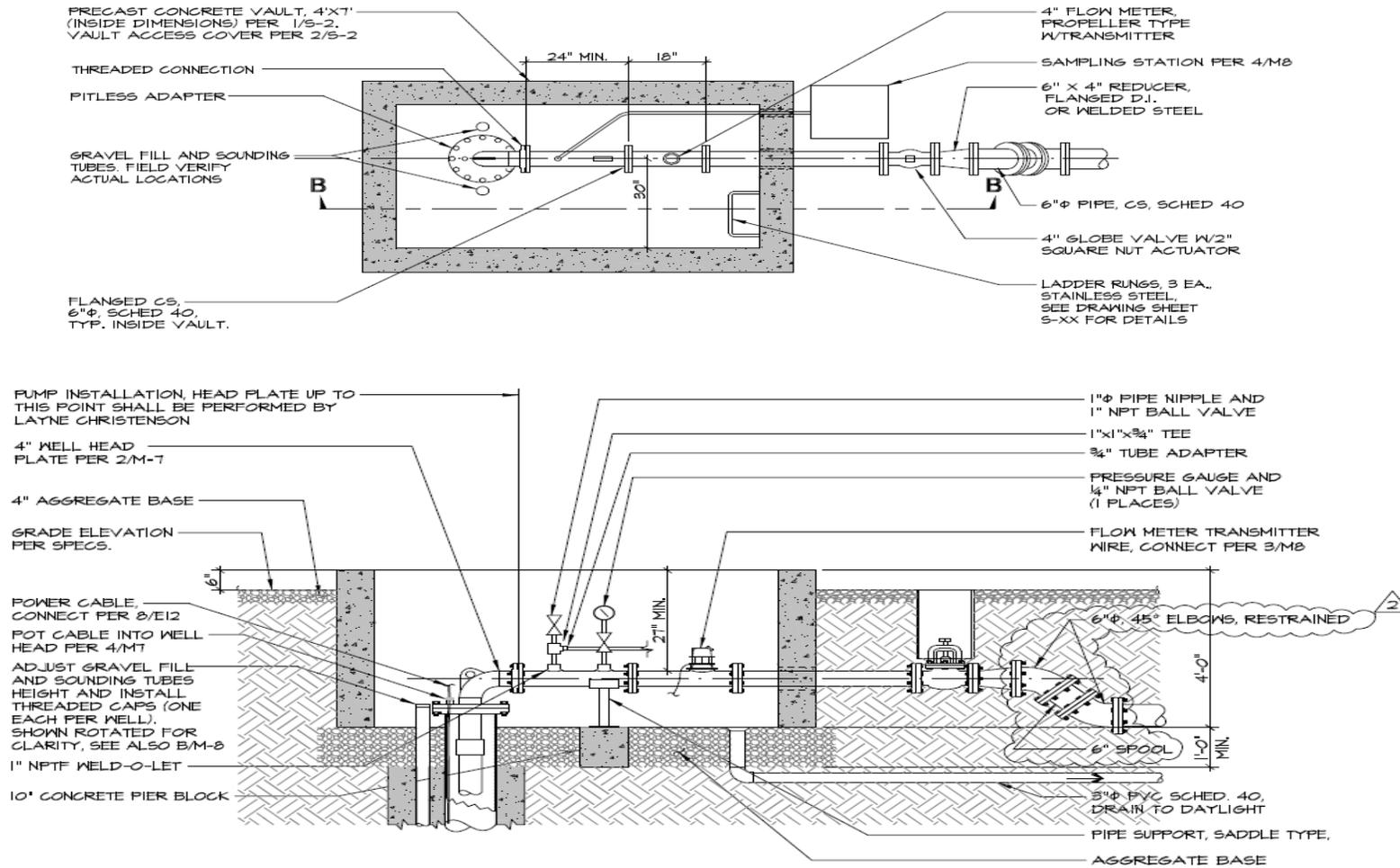


TABLE 8: CHECKLIST FOR EXTRACTION WELL 4200

Pre-Final Construction Inspection Report, Groundwater Extraction & Treatment System E-F,
Aerojet General Corporation, Rancho Cordova, California

Extraction Well 4200						
	Installed	Meets Plans & Specs	Not Compliant	Item to Correct	Estimated Time for Correction	Completed
Extraction Well 4200	√	√				
Concrete Vault	√	√				
Pump Well Head Plate	√	√				
4-Inch by 4-Inch Tee	√	√				
Air/Vacuum Release Valve	√	√				
4-Inch Globe Valve	√	√				
4-Inch Flow Meter	√	√				
Pressure Gauge	√	√				
1-Inch Ball Valve	√	√				
2-Inch Sounding Tube	√	√				
3-Inch Gravel Feed Tube	√	√				

FIGURE 11: PLAN & SECTION VIEWS OF WELL 4425

Pre-Final Construction Inspection Report, Groundwater Extraction & Treatment System E-F,
Aerojet General Corporation, Rancho Cordova, California

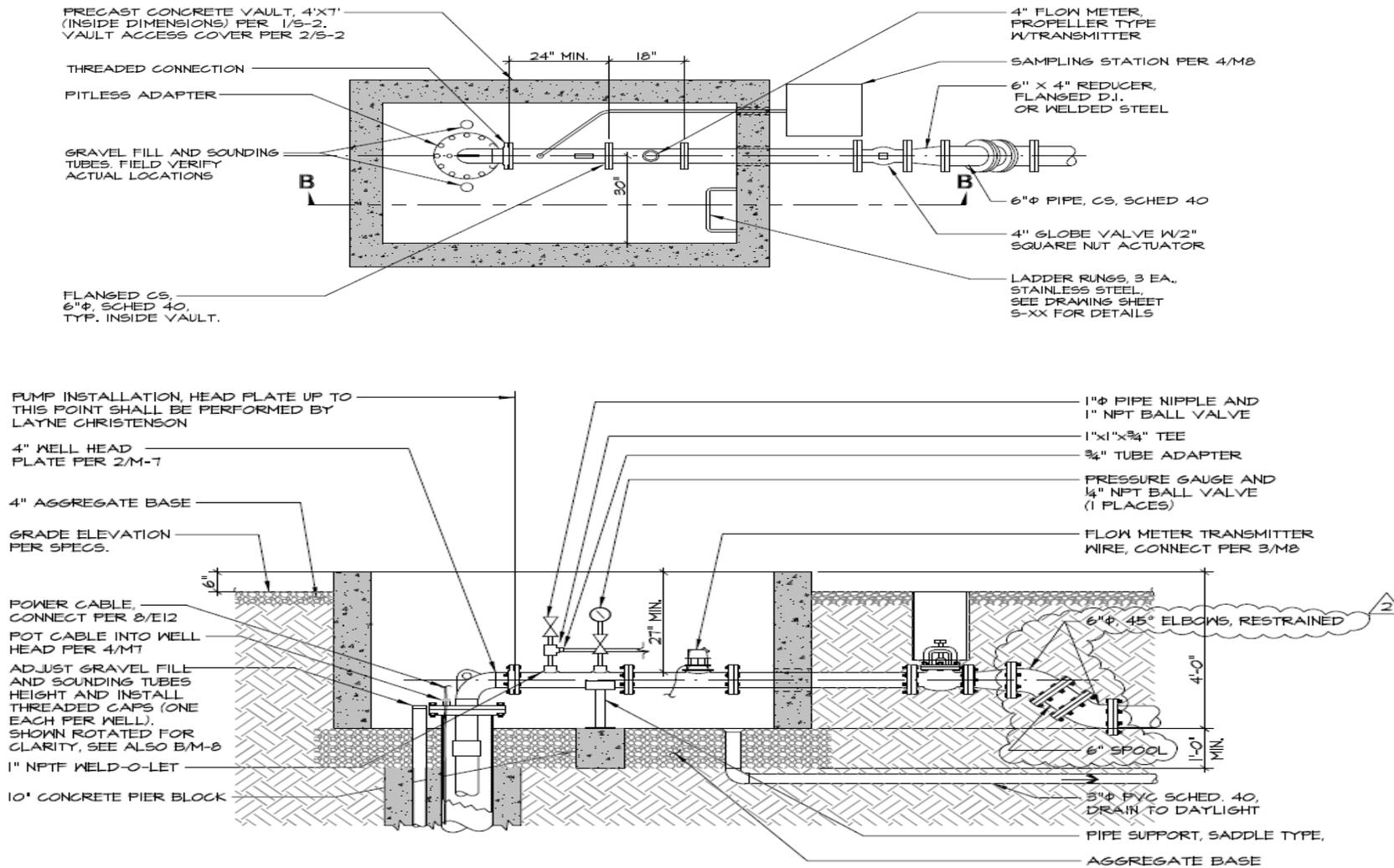


TABLE 9: CHECKLIST FOR EXTRACTION WELL 4425

Pre-Final Construction Inspection Report, Groundwater Extraction & Treatment System E-F,
Aerojet General Corporation, Rancho Cordova, California

Extraction Well 4425						
	Installed	Meets Plans & Specs	Not Compliant	Item to Correct	Estimated Time for Correction	Completed
Extraction Well 4425	√	√				
Concrete Vault	√	√				
Pump Well Head Plate	√	√				
4-Inch by 4-Inch Tee	√	√				
Air/Vacuum Release Valve	√	√				
4-Inch Globe Valve	√	√				
4-Inch Flow Meter	√	√				
Pressure Gauge	√	√				
1-Inch Ball Valve	√	√				
2-Inch Sounding Tube	√	√				
3-Inch Gravel Feed Tube	√	√				

FIGURE 12: PLAN & SECTION VIEWS OF WELL 4435

Pre-Final Construction Inspection Report, Groundwater Extraction & Treatment System E-F,
Aerojet General Corporation, Rancho Cordova, California

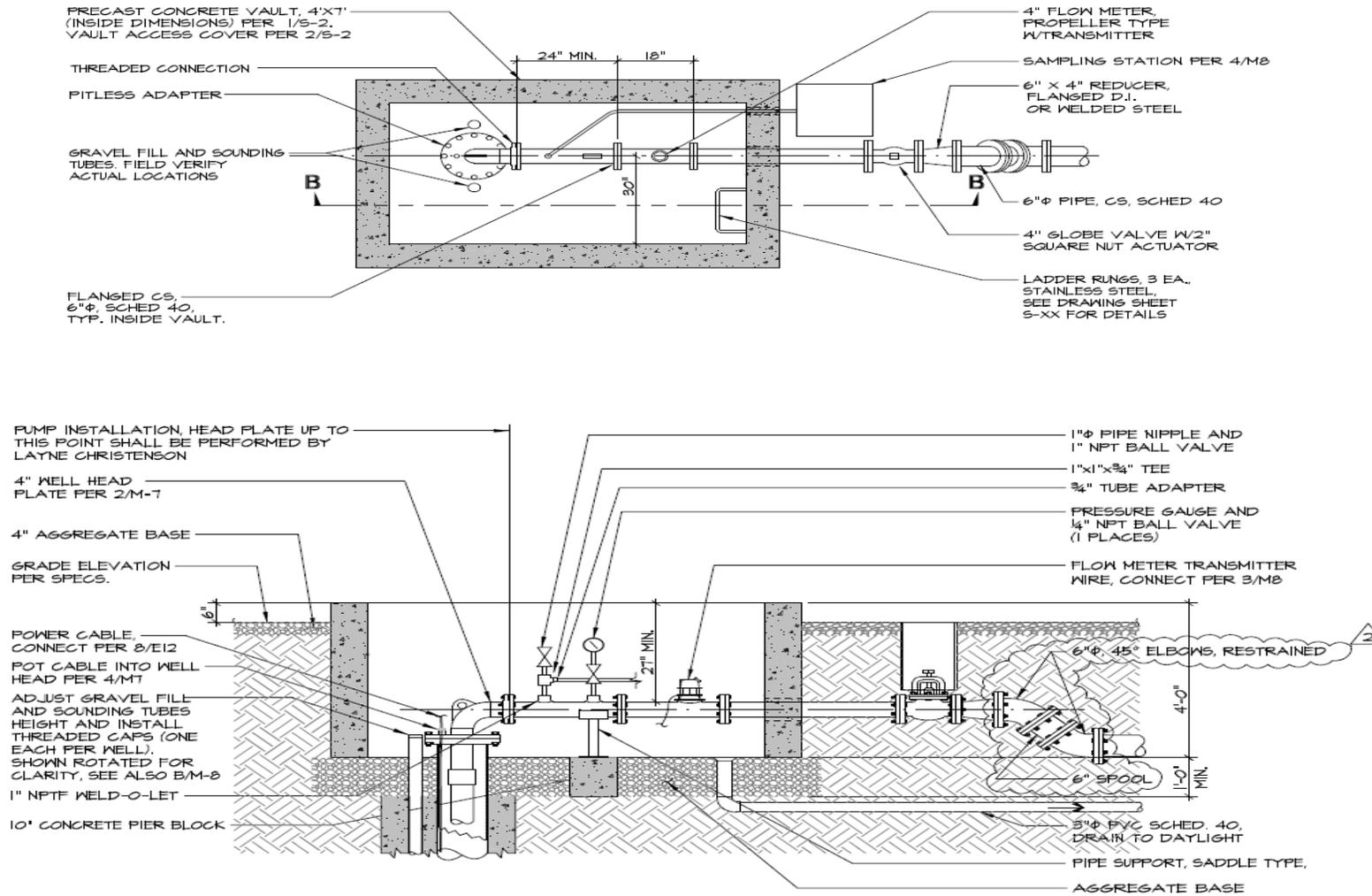


TABLE 10: CHECKLIST FOR EXTRACTION WELL 4435

Pre-Final Construction Inspection Report, Groundwater Extraction & Treatment System E-F,
Aerojet General Corporation, Rancho Cordova, California

Extraction Well 4435						
	Installed	Meets Plans & Specs	Not Compliant	Item to Correct	Estimated Time for Correction	Completed
Extraction Well 4435	√	√				
Concrete Vault	√	√				
Pump Well Head Plate	√	√				
4-Inch by 4-Inch Tee	√	√				
Air/Vacuum Release Valve	√	√				
4-Inch Globe Valve	√	√				
4-Inch Flow Meter	√	√				
Pressure Gauge	√	√				
1-Inch Ball Valve	√	√				
2-Inch Sounding Tube	√	√				
3-Inch Gravel Feed Tube	√	√				

FIGURE 13: SITE PLAN FOR WELLS 4530 & 4535

Pre-Final Construction Inspection Report, Groundwater Extraction & Treatment System E-F,
Aerojet General Corporation, Rancho Cordova, California

(Figure Not to Scale)

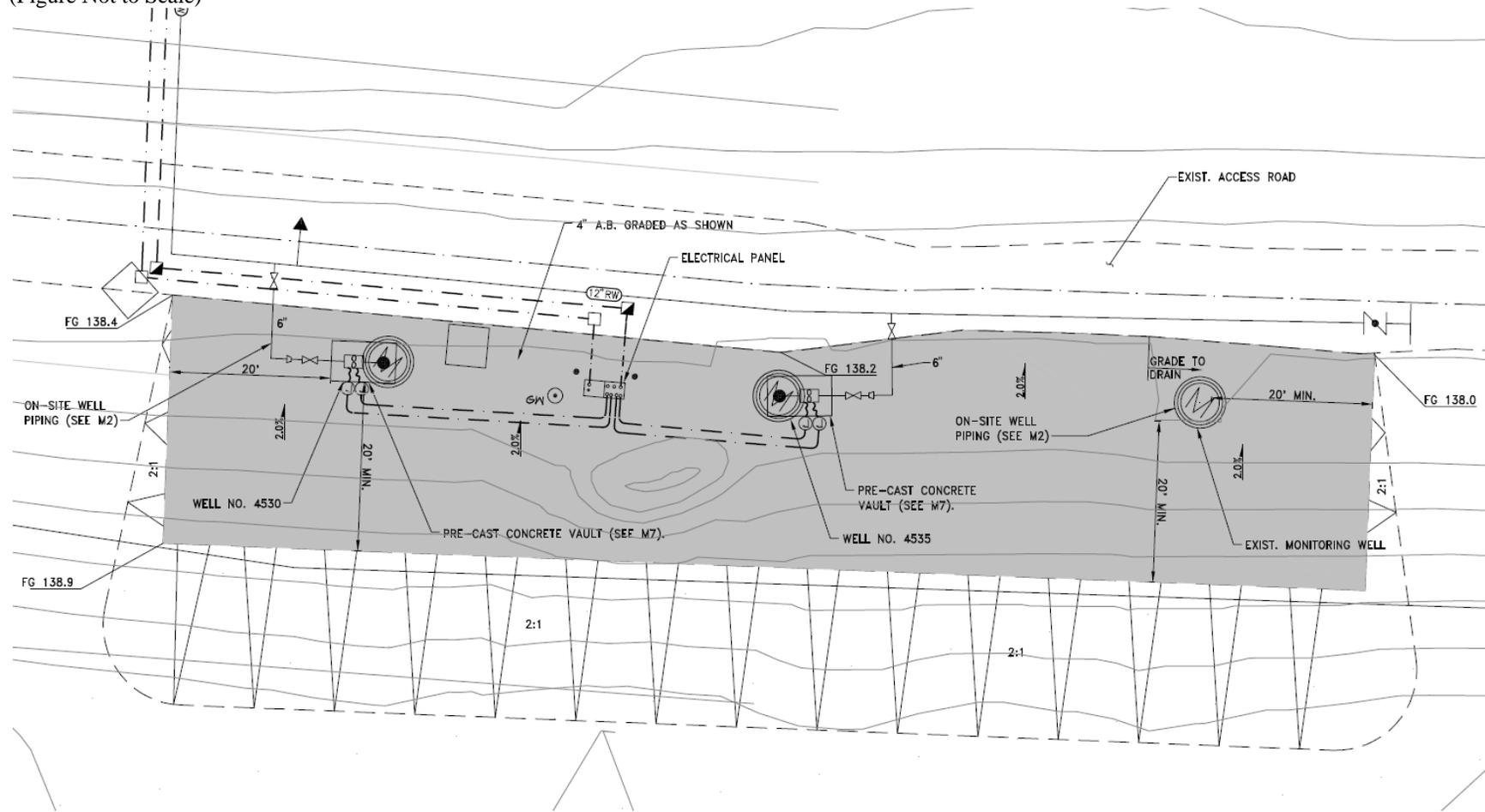
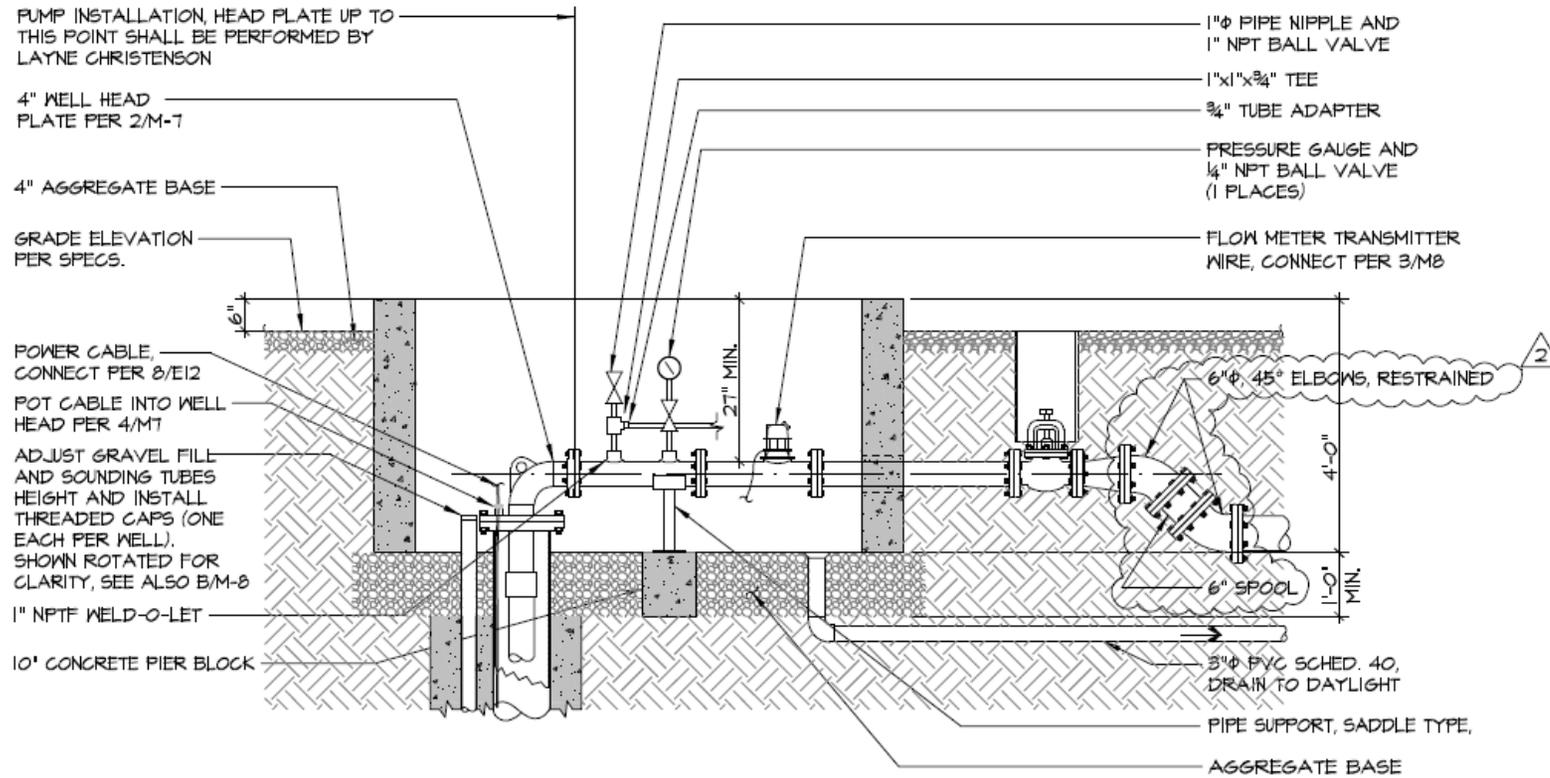


FIGURE 15: SECTION VIEW OF WELLS 4530 & 4535

Pre-Final Construction Inspection Report, Groundwater Extraction & Treatment System E-F,
Aerojet General Corporation, Rancho Cordova, California

(Figure Not to Scale)



SECTION B-B

TABLE 11: CHECKLIST FOR EXTRACTION WELLS 4530 & 4535

Pre-Final Construction Inspection Report, Groundwater Extraction & Treatment System E-F,
Aerojet General Corporation, Rancho Cordova, California

Well Installation – Extraction Wells 4530 & 4535						
	Installed	Meets Plans & Specs	Not Compliant	Item to Correct	Estimated Time for Correction	Completed
Extraction Wells 4530 & 4535	√	√				
Well Vault	√	√				
Access Hatch	√	√				
Ladder Rungs	√	√				
Drain	√	√				
Well	√	√				
Pump	√	√				
Sounding Tube	√	√				
4-Inch Globe Valve	√	√				
4-Inch Flow Meter	√	√				
Pressure Gauge	√	√				
1-Inch Ball Valve	√	√				
¼-Inch Ball Valve	√	√				
Sample Station	√	√				
Electrical Panel	√	√				

FIGURE 16: SITE PLAN FOR WELLS 4540, 4545, & 4550

Pre-Final Construction Inspection Report, Groundwater Extraction & Treatment System E-F,
Aerojet General Corporation, Rancho Cordova, California

(Figure Not to Scale)

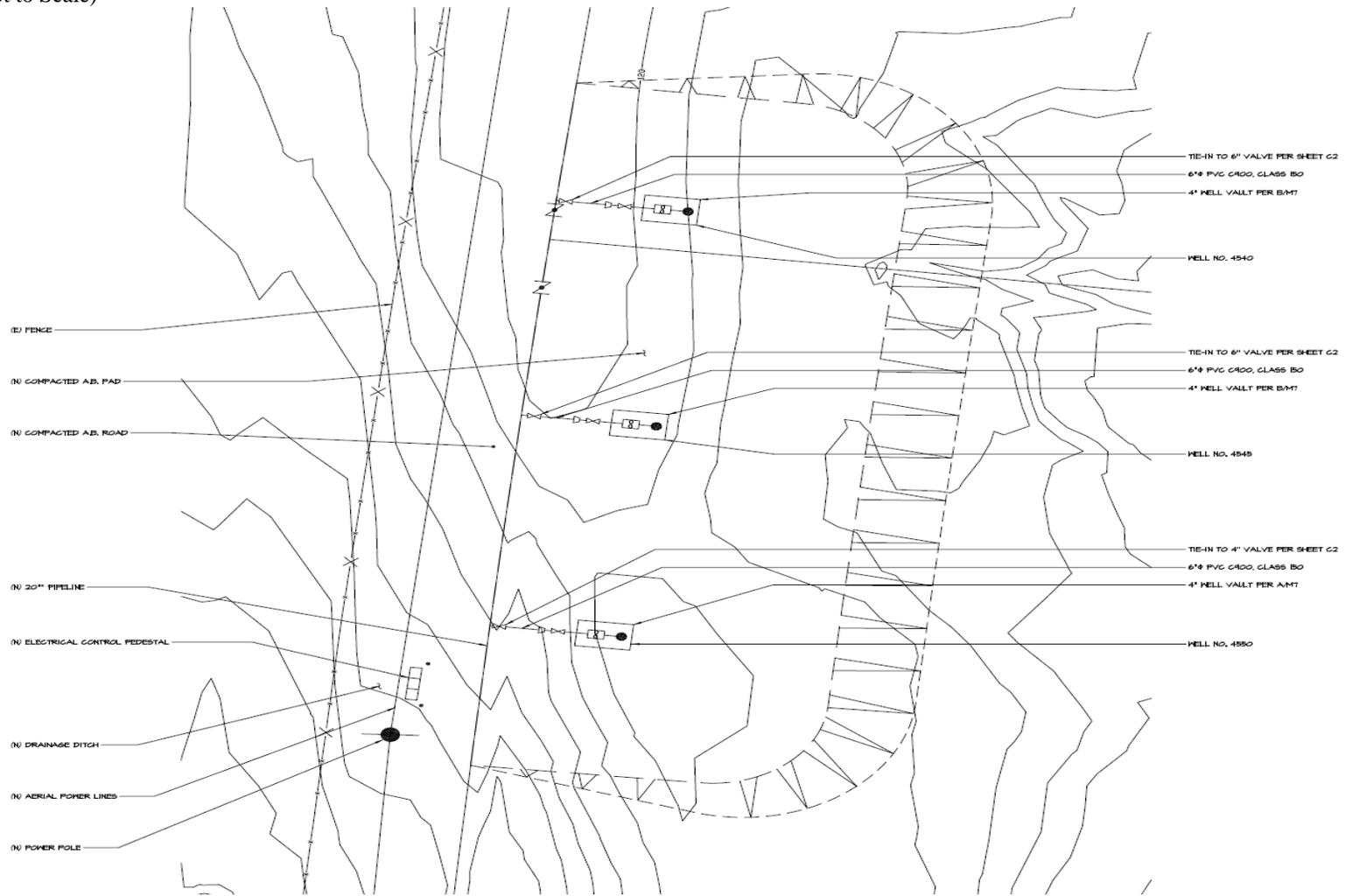


TABLE 12: CHECKLIST FOR EXTRACTION WELLS 4540, 4545 & 4550

Pre-Final Construction Inspection Report, Groundwater Extraction & Treatment System E-F,
Aerojet General Corporation, Rancho Cordova, California

Well Installation – Extraction Wells 4540, 4545 & 4550						
	Installed	Meets Plans & Specs	Not Compliant	Item to Correct	Estimated Time for Correction	Completed
Extraction Wells 4540, 4545 & 4550	√	√				
Well Vault	√	√				
Access Hatch	√	√				
Ladder Rungs	√	√				
Drain	√	√				
Well	√	√				
Pump	√	√				
Sounding Tube	√	√				
4-Inch Globe Valve	√	√				
4-Inch Flow Meter	√	√				
Pressure Gauge	√	√				
1-Inch Ball Valve	√	√				
¼-Inch Ball Valve	√	√				
Sample Station	√	√				
Electrical Panel	√	√				

FIGURE 19: SITE PLAN FOR WELL 4555

Pre-Final Construction Inspection Report, Groundwater Extraction & Treatment System E-F,
Aerojet General Corporation, Rancho Cordova, California

(Figure Not to Scale)

Drawing is incorrectly labeled Well 4560.

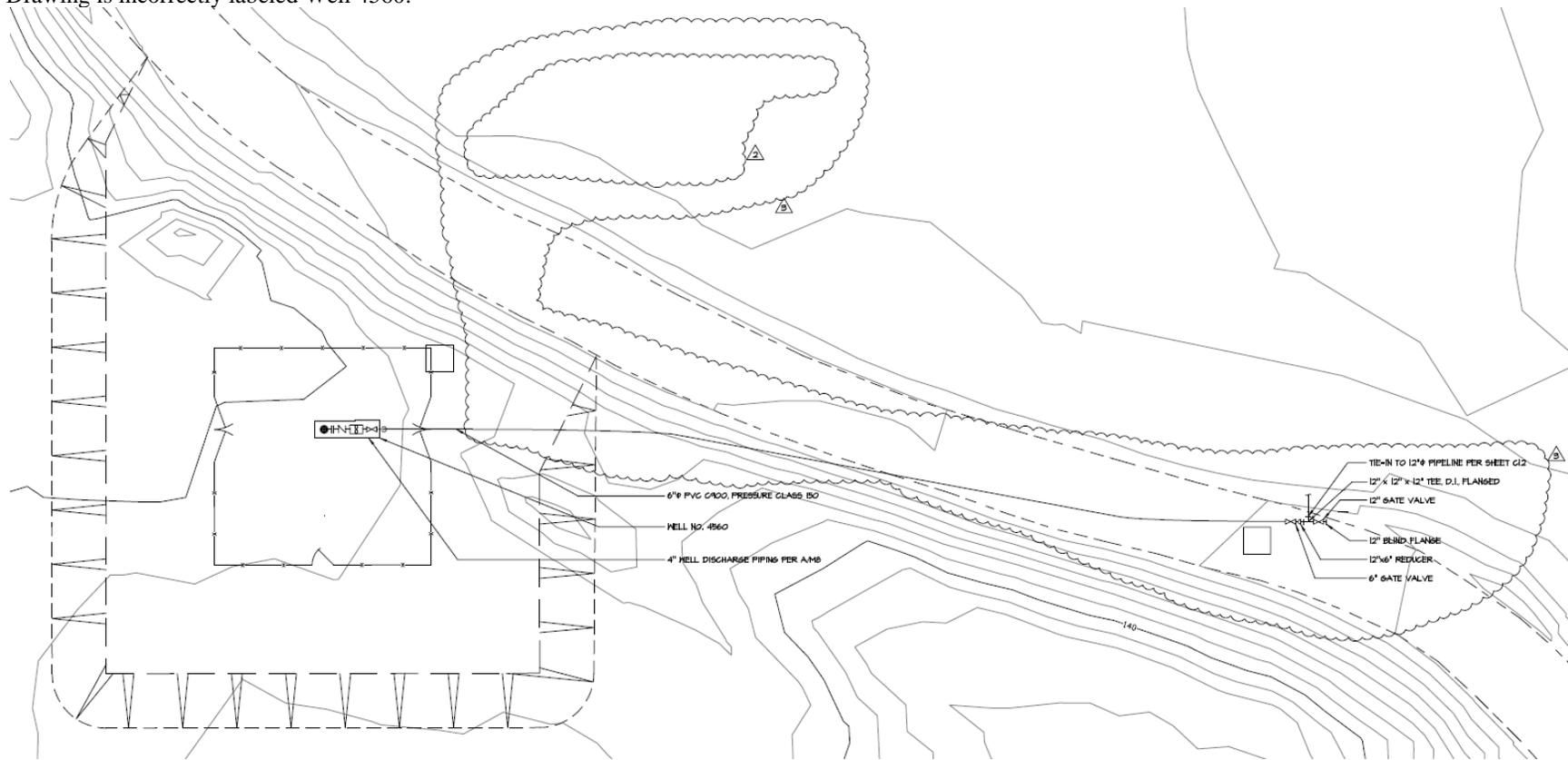


TABLE 13: CHECKLIST FOR EXTRACTION WELL 4555

Pre-Final Construction Inspection Report, Groundwater Extraction & Treatment System E-F,
Aerojet General Corporation, Rancho Cordova, California

Extraction Well 4555						
	Installed	Meets Plans & Specs	Not Compliant	Item to Correct	Estimated Time for Correction	Completed
Extraction Well 4555						
Concrete Slab	√	√				
Well Head Extension	√	√				
4-Inch by 4-Inch Tee	√	√				
Air/Vacuum Release Valve	√	√				
4-Inch Check Valve	√	√				
4-Inch Flow Meter	√	√				
4-Inch Rubber Expansion Joint	√	√				
3-Inch Globe Valve	√	√				
Pressure Gauge (2 such)	√	√				
¼-Inch Ball Valve	√	√				
Sample Station						
Eclipse 88 Sampling Station	√	√				
Aluminum Housing	√	√				
Copper Vent Tube	√	√				
2-Inch Sounding Tube	√	√				
3-Inch Gravel Feed Tube	√	√				
Electrical Panel	√	√				

FIGURE 21: SITE PLAN FOR WELLS 4590, 4595 & 4600
 Pre-Final Construction Inspection Report, Groundwater Extraction & Treatment System E-F,
 Aerojet General Corporation, Rancho Cordova, California

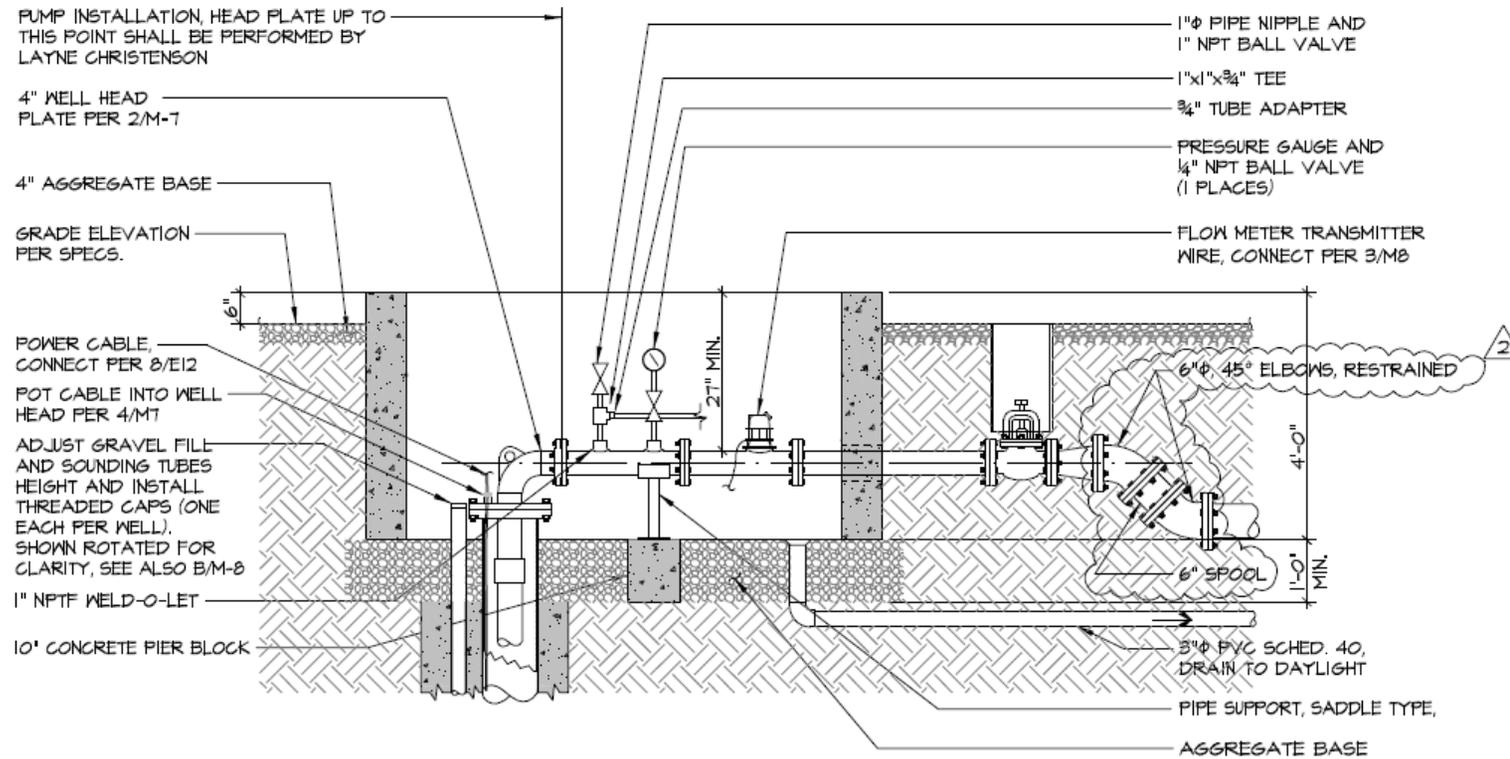
(Figure Not to Scale)



FIGURE 23: SECTION VIEW OF WELLS 4590 & 4595

Pre-Final Construction Inspection Report, Groundwater Extraction & Treatment System E-F,
Aerojet General Corporation, Rancho Cordova, California

(Figure Not to Scale)



SECTION B-B

FIGURE 24: PLAN VIEW OF WELL 4600

Pre-Final Construction Inspection Report, Groundwater Extraction & Treatment System E-F,
Aerojet General Corporation, Rancho Cordova, California

(Figure Not to Scale)

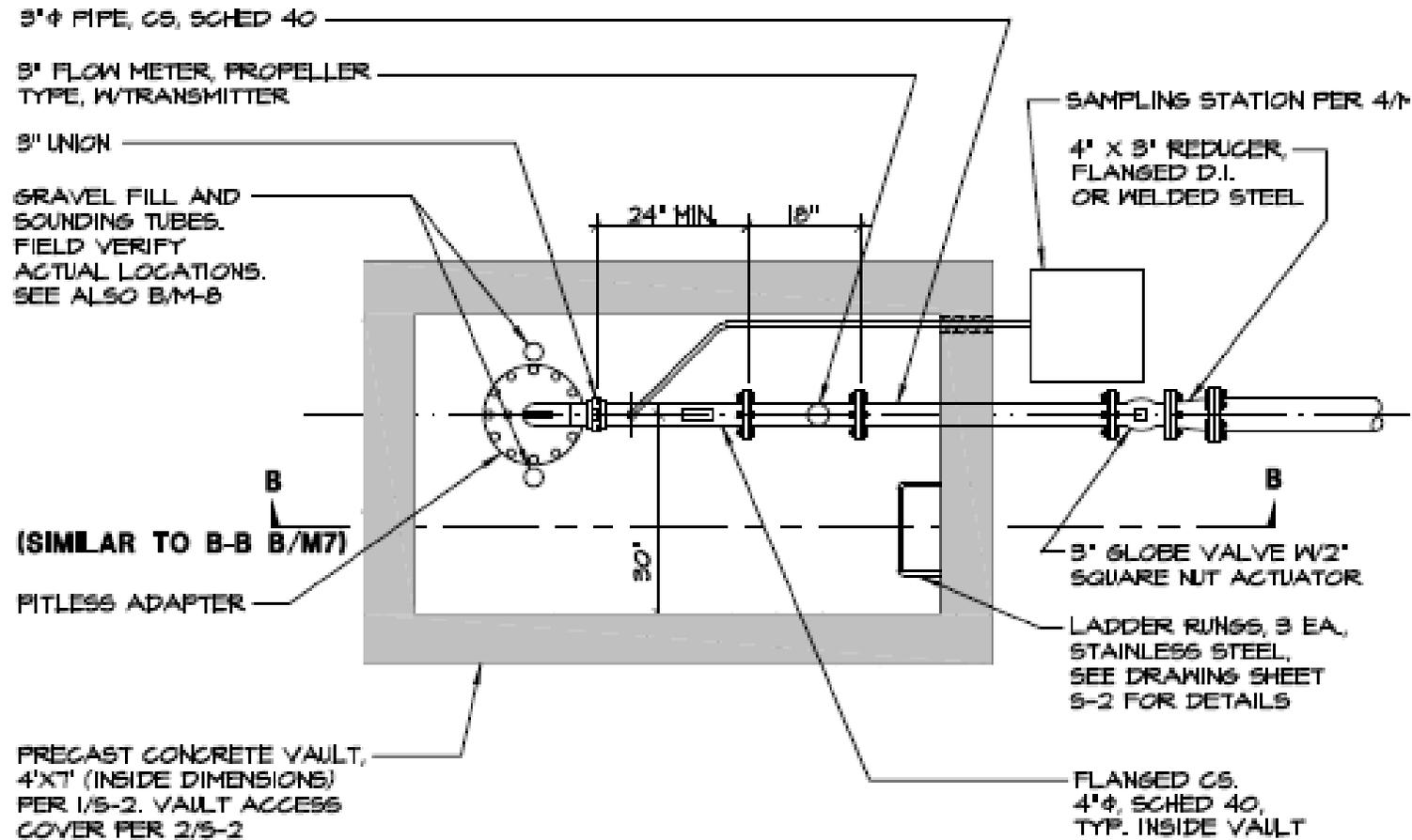
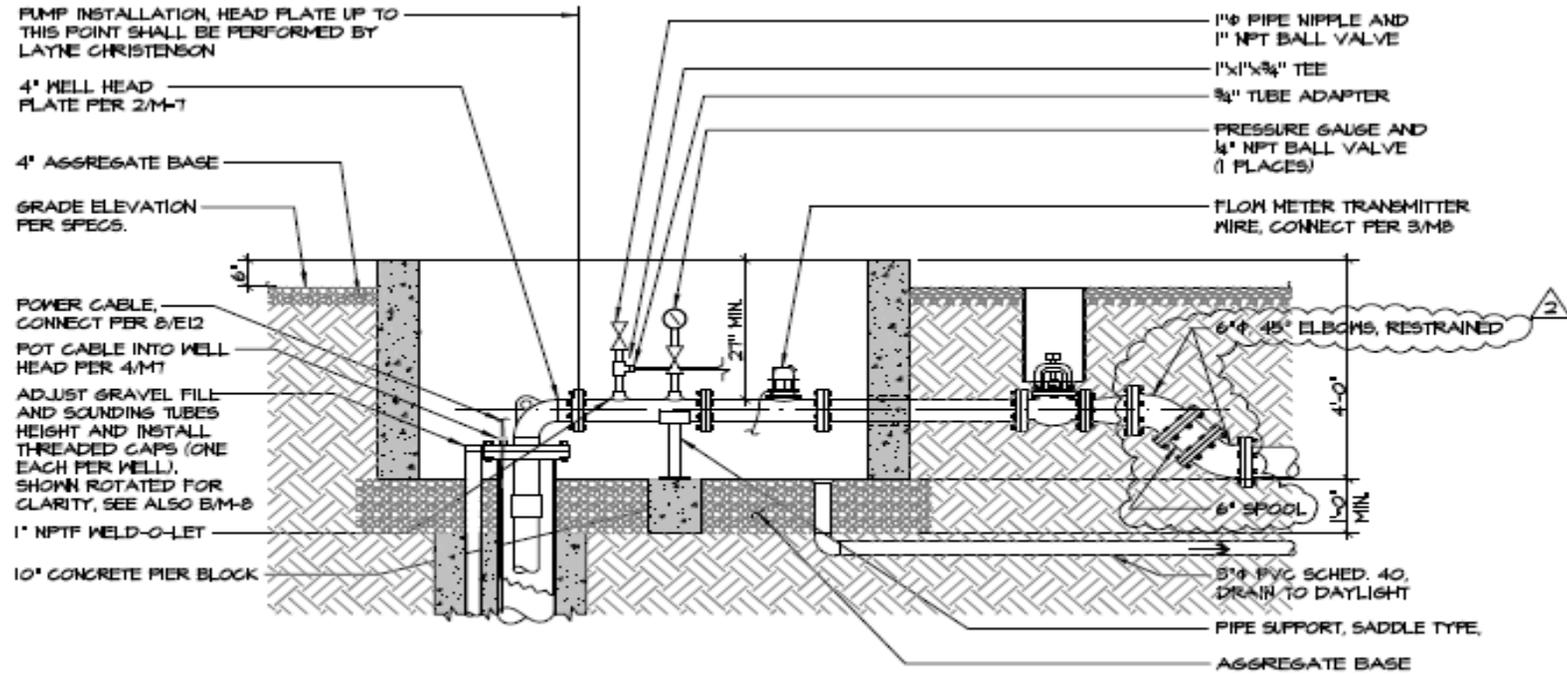


FIGURE 25: SECTION VIEW OF WELL 4600

Pre-Final Construction Inspection Report, Groundwater Extraction & Treatment System E-F,
Aerojet General Corporation, Rancho Cordova, California

(Figure Not to Scale)

(See [Figure 19](#) for correct sizing of well-head, fittings, valves, and piping.)



SECTION B-B

TABLE 14: CHECKLIST FOR EXTRACTION WELLS 4590 & 4595

Pre-Final Construction Inspection Report, Groundwater Extraction & Treatment System E-F,
Aerojet General Corporation, Rancho Cordova, California

Well Installation – Extraction Wells 4590 & 4595						
	Installed	Meets Plans & Specs	Not Compliant	Item to Correct	Estimated Time for Correction	Completed
Extraction Wells 4590 & 4595	√	√				
Well Vault	√	√				
Access Hatch	√	√				
Ladder Rungs	√	√				
Drain	√	√				
Well	√	√				
Pump	√	√				
Sounding Tube	√	√				
4-Inch Globe Valve	√	√				
4-Inch Flow Meter	√	√				
Pressure Gauge	√	√				
1-Inch Ball Valve	√	√				
¼-Inch Ball Valve	√	√				
Sample Station	√	√				
Electrical Panel	√	√				

TABLE 15: CHECKLIST FOR EXTRACTION WELL 4600

Pre-Final Construction Inspection Report, Groundwater Extraction & Treatment System E-F,
Aerojet General Corporation, Rancho Cordova, California

Well Installation – Extraction Well 4600						
	Installed	Meets Plans & Specs	Not Compliant	Item to Correct	Estimated Time for Correction	Completed
Extraction Well 4600	√	√				
Well Vault	√	√				
Access Hatch	√	√				
Ladder Rungs	√	√				
Drain	√	√				
Well	√	√				
Pump	√	√				
Sounding Tube	√	√				
3-Inch Globe Valve	√	√				
3-Inch Flow Meter	√	√				
Pressure Gauge	√	√				
1-Inch Ball Valve	√	√				
¼-Inch Ball Valve	√	√				
Sample Station	√	√				
Electrical Panel	√	√				

FIGURE 26: SITE PLAN FOR WELLS 4605, 4610 & 4615

Pre-Final Construction Inspection Report, Groundwater Extraction & Treatment System E-F,
Aerojet General Corporation, Rancho Cordova, California

(Figure Not to Scale)

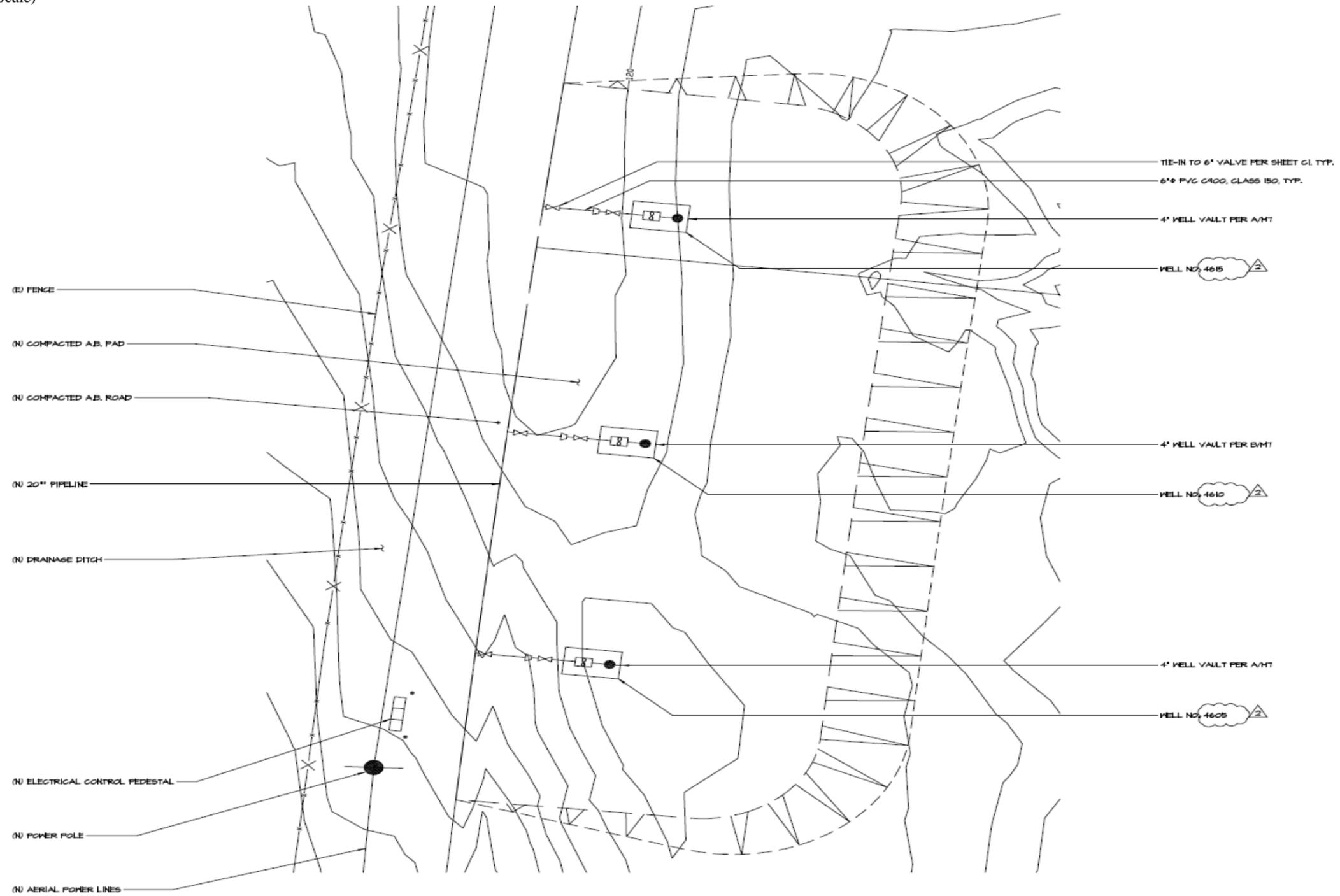
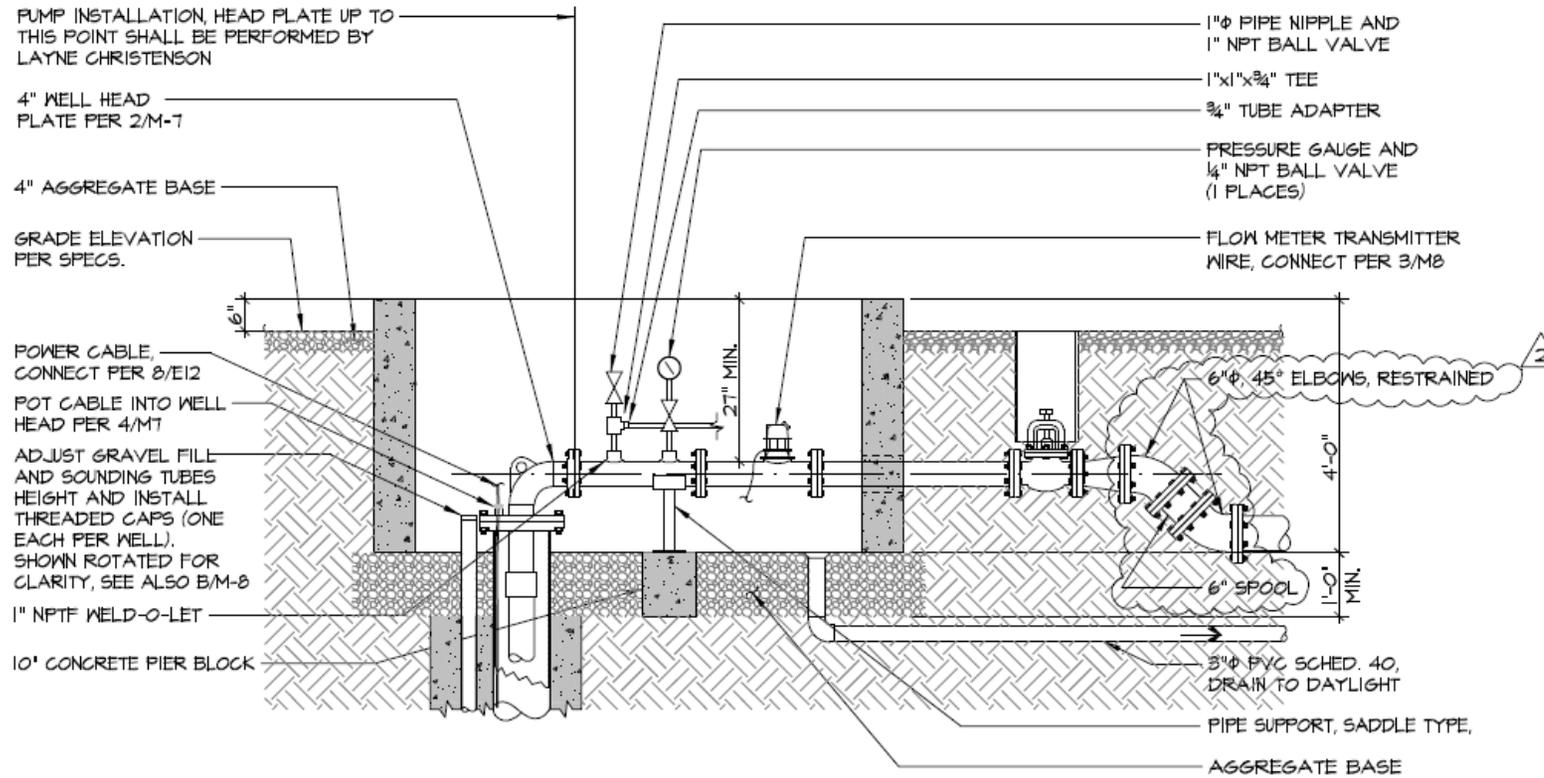


FIGURE 28: SECTION VIEW OF WELLS 4605, 4610 & 4615

Pre-Final Construction Inspection Report, Groundwater Extraction & Treatment System E-F,
Aerojet General Corporation, Rancho Cordova, California

(Figure Not to Scale)



SECTION B-B

TABLE 16: CHECKLIST FOR EXTRACTION WELLS 4605, 4610 & 4615

Pre-Final Construction Inspection Report, Groundwater Extraction & Treatment System E-F,
Aerojet General Corporation, Rancho Cordova, California

Well Installation – Extraction Wells 4605, 4610 & 4615						
	Installed	Meets Plans & Specs	Not Compliant	Item to Correct	Estimated Time for Correction	Completed
Extraction Wells 4605, 4610 & 4615	√	√				
Well Vault	√	√				
Access Hatch	√	√				
Ladder Rungs	√	√				
Drain	√	√				
Well	√	√				
Pump	√	√				
Sounding Tube	√	√				
4-Inch Globe Valve	√	√				
4-Inch Flow Meter	√	√				
Pressure Gauge	√	√				
1-Inch Ball Valve	√	√				
¼-Inch Ball Valve	√	√				
Sample Station	√	√				
Electrical Panel	√	√				

2.2 TREATMENT FACILITY CONSTRUCTION INSPECTION AND VERIFICATION

Physical inspection and verification of the GET System E-F treatment facility ([Section 1.3](#)) was conducted in June 2011 by comparing the installed equipment and material to the record drawings provided by Aerojet representing the “as constructed” state of the treatment system equipment. An overall plan view of the installed treatment equipment ([Figure 29](#)) and more detailed plan views ([Figures 30A](#) and [30B](#)) are provided for orientation. The completed GET System E-F treatment facility was built in stages, with area anticipated for additional capacity and/or treatment methodologies. Therefore, the PFCI checklist ([Table 17](#)) lists the major components of treatment and does not detail individual valves, pumps, piping or other similar components.

FIGURE 29: PLAN VIEW OF GET E-F TREATMENT FACILITY
 Pre-Final Construction Inspection Report, Groundwater Extraction & Treatment System E-F,
 Aerojet General Corporation, Rancho Cordova, California

(Figure Not to Scale)

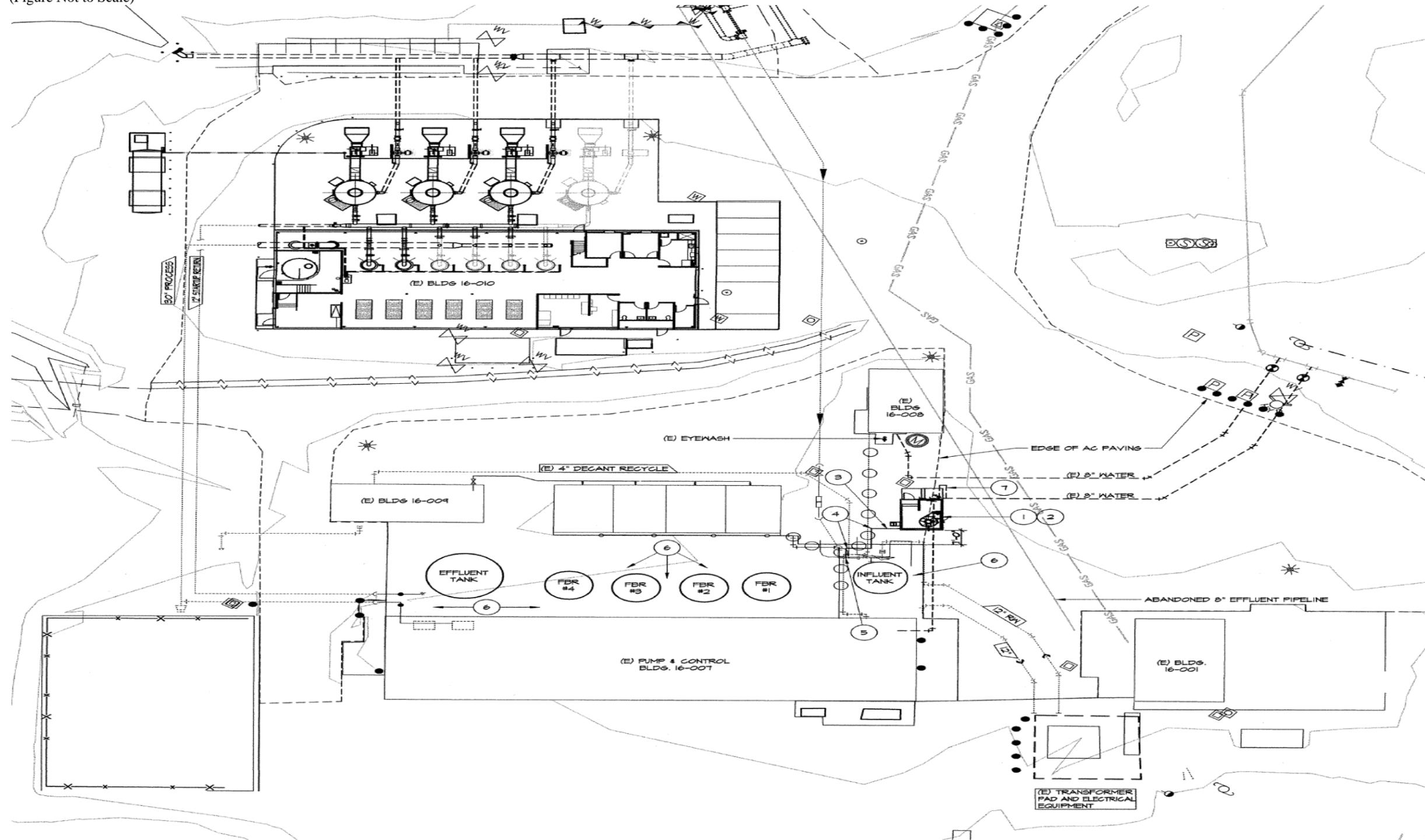


FIGURE 30A: SCHEMATIC VIEW OF GET E-F TREATMENT FACILITY – FLUID BED REACTORS, SAND FILTERS, DE-NATURED ALCOHOL SYSTEM

Pre-Final Construction Inspection Report, Groundwater Extraction & Treatment System E-F,
Aerojet General Corporation, Rancho Cordova, California

(Figure Not to Scale)

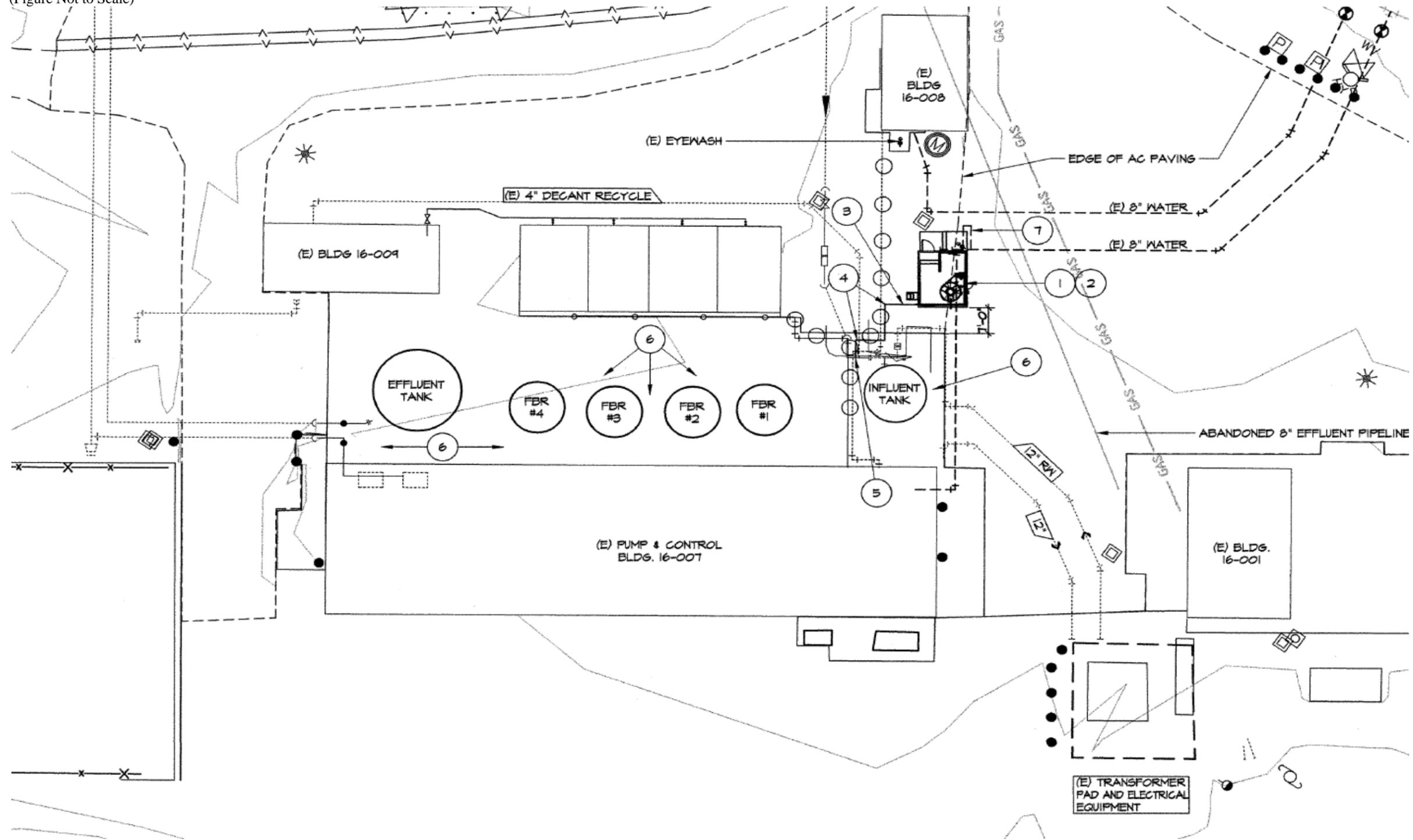


FIGURE 30B: SCHEMATIC VIEW OF GET E-F TREATMENT FACILITY – ULTRAVIOLET UNITS, AIR STRIPPERS, PEROXIDE SYSTEM
Pre-Final Construction Inspection Report, Groundwater Extraction & Treatment System E-F,
Aerojet General Corporation, Rancho Cordova, California

(Figure Not to Scale)

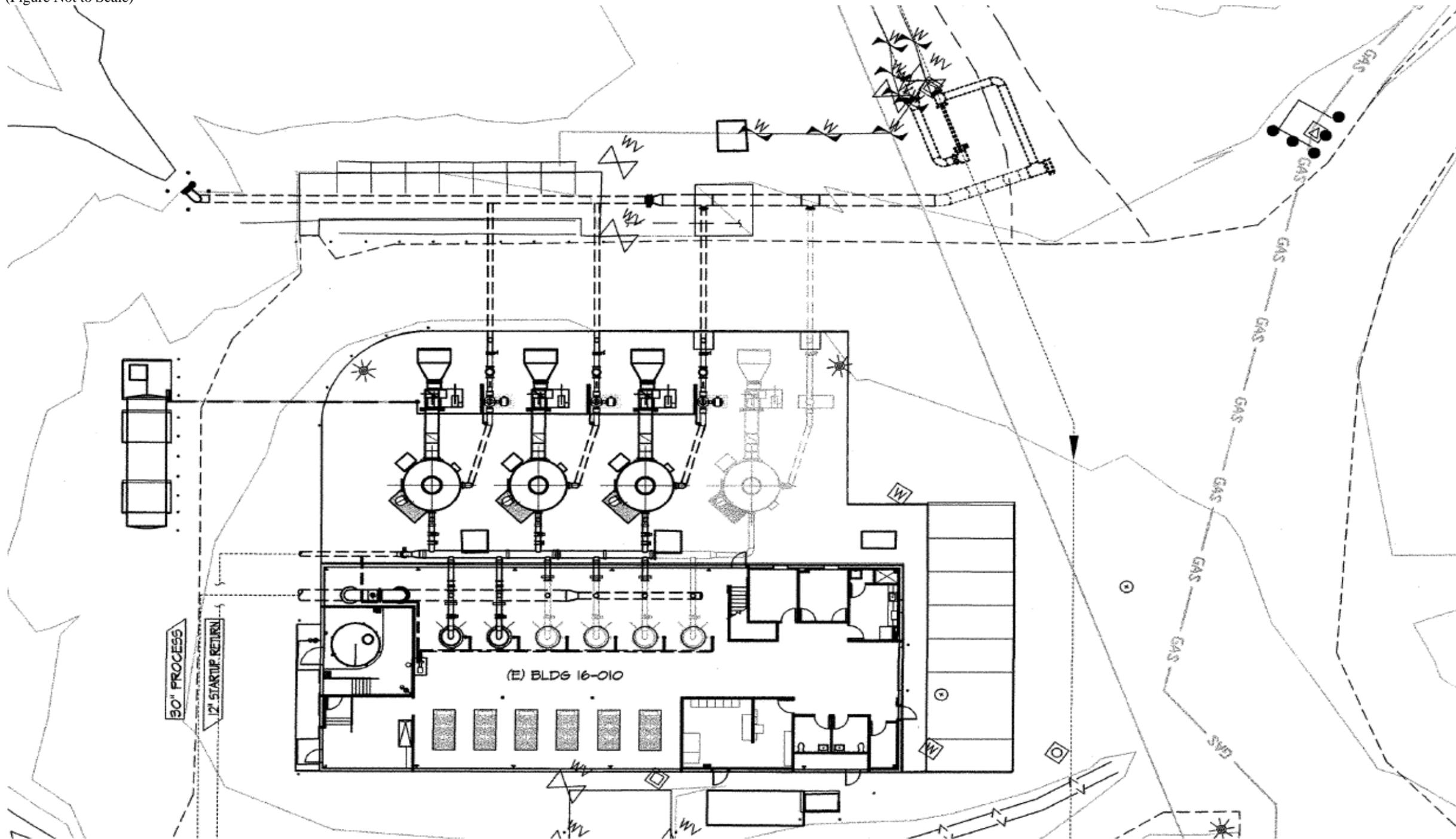


TABLE 17: CHECKLIST FOR GET E-F TREATMENT FACILITY

Pre-Final Construction Inspection Report, Groundwater Extraction & Treatment System E-F,
Aerojet General Corporation, Rancho Cordova, California

GET E-F Treatment Facility						
	Installed	Meets Plans & Specs	Not Compliant	Item to Correct	Estimated Time for Correction	Completed
GET E-F Treatment Facility						
42,000-Gal. Influent Equalization Tank	√	√				
Fluid Bed Feed Pumps (4)	√	√				
Fluid Bed Reactors (4)	√	√				
8000-Gal. Denatured Alcohol Tank	√	√				
Alcohol Transfer Pumps (2)	√	√				
Alcohol Metering Pumps (5)	√	√				
Nutrient Solution Storage Tank	√	√				
Nutrient Transfer Pumps (2)	√	√				
Nutrient Feed Pumps (5)	√	√				
Sand Filters (4)	√	√				
Waste Biomass Pumps (2)	√	√				
Decant Recycle Pumps (2)	√	√				
40,000-Gal. Holding Tank	√	√				
6,000-Gal. Peroxide Tank	√	√				
30-Inch Static Mixer	√	√				
Peroxide Metering System (2)	√	√				
UV Reactor (2)	√	√				
Transfer Pumps (2)	√	√				
CO ₂ Receiver	√	√				
Air Strippers (2)	√	√				
Effluent Pumps (2)	√	√				
Effluent Bag Filters (6)	√	√				
Clarifier	√	√				

3.0 CONCLUSIONS

As stated previously, the objectives of the inspection were to confirm whether construction is complete and the GET System E-F Remedial Action (or the inspected portion) is operational and functional.

Construction: No outstanding construction items were discovered during the inspection and, therefore, no final construction inspection will be required. Because the extraction well, groundwater collection piping systems, sampling systems, and other appurtenances had been installed and were operational prior to this PFCI inspection, the inspection verified the equipment, its size, and its materials to the extent feasible.

Operation: Operational efficiency of the treatment system is monitored through the results of samples collected from the treated effluent and sent to EPA, California Central Valley Regional Water Quality Control Board, and California Department of Toxic Substances Control for review.

APPENDIX A
SITE PHOTOGRAPHS



Photograph 1: GET E-F flotation reactors, sand filters, and influent tank.



Photograph 2: GET E-F Ultraviolet (UV) unit.



Photograph 3: GET E-F air strippers.



Photograph 4: GET E-F sand filter.



Photograph 5: GET E-F clarifier.

ATTACHMENT 1
OU-3 STATEMENT OF WORK PAGES 17 TO 20

Major Deliverables and Other Tasks) of this SOW. The Prefinal Design shall fully address all Agencies' comments provided by the EPA on the Conceptual/Preliminary Design Report, and if not previously addressed, be accompanied by a memorandum indicating how the comments were incorporated into the Prefinal Design. The Prefinal Design documents shall be certified by a Professional Engineer registered in the State of California.

The Prefinal Remedial Design shall serve as the Final Remedial Design if the Agencies have no further comments and EPA provides its approval. The Prefinal Remedial Design submittals shall include a capital and operation and maintenance cost estimate; reproducible drawings and specifications; and a complete set of construction drawings in full and one-half size reduction. The Final Remedial Design should also include a schedule for completion of construction including inspection certifications to establish Construction Criteria of this SOW are met.

3. GET E/F Modification

Respondents is proceeding to modify the existing GET E/F Facility to achieve on-property groundwater boundary containment needed for the OU-3 remedy under the existing Partial Consent Decree in Civil Action No. CIVS-86-0063-EJG and CIVS-86-0064-EJG consolidated. If the GET E/F modifications have been completed prior to entry of this Administrative Order and meet the provisions of this SOW, Respondents shall only be obligated to provide each of the Agencies with a set of reproduceable as-built drawings, a hard copy of the as-built drawing signed and stamped by a Professional Engineer, and an electronic PDF file of the Final Design documents for the GET E/F facility modification. Any completed GET E/F modifications which do not meet the Performance Standards of this SOW shall be modified as needed to meet the Performance Standards.

F. Remedial Action

Respondents shall implement the Remedial Action. During the design period, in preparation for implementation of the Remedial Action and in accordance with Section IV(M) (Supporting Plans) and Section V (Schedule for Major Deliverables and Other Tasks) of this SOW, Respondents shall submit to the Agencies for review a Construction SAP with Field Sampling Plan and QAPP; Construction Quality Assurance Program Plan; Construction Health and Safety Plan; Construction Contingency Plan; and any needed updates to the RD/RA Work Plan.

Unless otherwise approved by the EPA, Respondents shall not begin any phase of the construction until after the EPA has approved its Final Remedial Design, Construction Contingency Plan, and Construction SAP. Field changes to the Remedial Action, as set forth in the RD/RA Work Plan and Final Design, shall not be undertaken without review by the Agencies and the EPA's approval. All Work on the Remedial Action shall be documented in enough detail to produce as-built construction drawings after the Remedial Action is complete. Review by the Agencies and/or EPA's approval of submittals does not guarantee

that the Remedial Action, when constructed, will meet the Performance Standards of this SOW.

1. Remedial Action Work Plan

Respondents shall not be required to submit a separate Remedial Action Work Plan. Instead, Respondents shall provide supplemental information as necessary to update the RD/RA Work Plan.

2. Pre-Construction Meeting

A pre-construction meeting shall be held after selection of the construction contractor but before initiation of construction in accordance with the schedule contained in Section V (Schedule of Major Deliverables and Other Tasks) of this SOW. The meeting shall include Respondents's representatives and interested federal, state and local regulatory agency personnel. At the meeting, Respondents shall describe the roles, relationships, and responsibilities of all parties; review the work area security and safety protocols; review any access issues; review the construction schedule; and review the construction quality assurance procedures.

Respondents shall document the meeting results in a Pre-Construction Meeting Report and submit the report in accordance with the schedule contained in Section V (Schedule of Major Deliverables and Other Tasks) of this SOW. Respondents shall submit the report to all parties in attendance, and shall include the names of people in attendance, issues discussed, clarifications made, and action items and due dates.

Respondents shall provide the Agencies with a Start of Construction Notice in accordance with the schedule contained in Section V (Schedule of Major Deliverables and Other Tasks) of this SOW.

3. Remedial Action Construction

Respondents shall implement the Remedial Action as detailed in the approved RD/RA Work Plan (as updated) and approved Final Design.

4. Prefinal Construction Inspection

A Prefinal Construction Inspection shall be scheduled in accordance with the schedule contained in Section V (Schedule of Major Deliverables and Other Tasks) of this SOW after Respondents determine that construction is complete and the Remedial Action, or a discrete portion of the Remedial Action, is operational and functional meeting the Performance Standards of Section III (Performance Standards) of this SOW. Respondents shall notify the Agencies so that a prefinal inspection can be conducted and attended by the Agencies, Respondents, and other participants including the Project Coordinators and other federal, state, and local regulatory Agencies with a jurisdictional

interest. If a Prefinal Construction Inspection is held for a portion of the Remedial Action, one or more additional inspections shall be conducted so that the entire Remedial Action shall have been inspected.

The objective of the inspection/s is to determine whether construction is complete and the Remedial Action (or the inspected portion) is operational and functional. Any outstanding construction items discovered during the inspection shall be identified and noted on a bullet list. Respondents shall certify that the equipment is effectively meeting the purpose and intent of the specifications. Retesting shall be completed where deficiencies are revealed. A Prefinal Construction Inspection Report shall be submitted by Respondents which outlines the outstanding construction items, actions required to resolve the items, completion date for the items, and an anticipated date for a Final Inspection. The Prefinal Inspection Report can be in the form of a bullet list or letter.

5. Final Construction Inspection

If required by the EPA, a Final Construction Inspection shall be conducted after completion of any work identified in the prefinal inspection report in accordance with the schedule contained in Section V (Schedule of Major Deliverables and Other Tasks) of this SOW. Respondents shall notify the Agencies and coordinate the schedule for any final inspection. The final inspection shall consist of a walk-through inspection by the Agencies and Respondents. The prefinal inspection report shall be used as a checklist, with the final inspection focusing on the outstanding construction items identified in the prefinal inspection. Confirmation shall be made that outstanding items have been resolved for all items, including any items which may have been found after the checklist has been developed.

Any outstanding construction items discovered by Respondents or the Agencies during the inspection, whether or not identified on the prefinal inspection, to still require correction shall be identified and noted on a punch list. If any items are still unresolved, the inspection shall be considered to be a Prefinal Construction Inspection requiring another Prefinal Construction Inspection Report and subsequent Final Construction Inspection. After all items are resolved, Respondents shall issue a Final Construction Inspection Report in accordance with the schedule contained in Section V (Schedule of Major Deliverables and Other Tasks) of this SOW.

6. Remedial Action Construction Complete Report

As specified in the approved schedule included in Section V (Schedule for Major Deliverables and Other Tasks) of this SOW, after construction is completed on the entire Remedial Action and the systems are operational and functional as intended and Contaminated Groundwater is contained in all layers of the aquifer, Respondents shall submit a Remedial Action Construction Complete Report. In the Report, a registered Professional Engineer and Respondents' Project Coordinator shall state that the construction of the Remedial Action has been completed in accordance with the RD/RA

Work Plan submitted under this SOW. The written Report shall provide a synopsis of the Work defined in this SOW, describe deviations from the RD/RA Work Plan, include reproduceable and PDF electronic file version of as-built drawings signed and stamped by a Professional Engineer, provide actual costs of the Remedial Action, O&M to date, and a summary of the results of operational and performance monitoring completed to date. The Report shall contain the following statement, signed by a responsible corporate official of Respondents or Respondents' Project Coordinator:

“To the best of our knowledge, after thorough investigation, we certify that the information contained in or accompanying this submission is true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.”

7. Remedial Action Report

As specified in the approved schedule included in Section V (Schedule for Major Deliverables and Other Tasks) of this SOW, after Respondents has determined that the Performance Standards of the Remedial Action are being met and all phases of the work including Operation and Maintenance (O&M), Respondents shall submit an Remedial Action Report. In the Report, a registered Professional Engineer and Respondents' Project Coordinator shall certify that the Remedial Action is operating and functioning as intended and that Performance Standards listed in Section III (Performance Standards) of this SOW are being met. The written Report shall provide a summary of the results of operational and performance monitoring completed to date and shall provide documentation to substantiate Respondents' certification in full compliance with Sections IV(K) (Performance Evaluation Reports) and IV(L) (Quarterly Compliance Monitoring Reports) of this SOW. The Remedial Action Report shall contain the following statement, signed by a responsible corporate official of Respondents or Respondents' Project Coordinator:

“To the best of our knowledge, after thorough investigation, we certify that the information contained in or accompanying this submission is true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.”

G. Operation and Maintenance

O&M shall be performed in accordance with the approved O&M Manual.

1. Operation and Maintenance Plan

An Operation and Maintenance (O&M) Plan is not required. O&M-related information shall be provided by Respondents in Section IV(G)(2) (Operations and Maintenance Manual) of this SOW.

2. Operation and Maintenance Manual