TYSON FRESH MEATS, INC.
PASCO BEEF COMPLEX
DOMESTIC WASTEWATER SYSTEM IMPROVEMENTS
ENGINEERING REPORT

OCTOBER 2020

Prepared for
Tyson Fresh Meats, Inc.

anderson perry

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PASCO BEEF COMPLEX
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ENGINEERING REPORT

OCTOBER 2020

MICHAEL BLASY
STATE OF WASHINGTON
55489
REGISTERED
PROFESSIONAL ENGINEER
10/28/20

ANDERSON PERRY & ASSOCIATES, INC.
Walla Walla, Washington
La Grande, Redmond, and Hermiston, Oregon

In Association With

CASCADE EARTH SCIENCES, LTD
Spokane Valley, Washington

 Job No. 7008-719

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Section 1.0 - Introduction

1.1 Purpose

The purpose of this Engineering Report is to investigate the existing domestic wastewater system (System) serving the Tyson Fresh Meats, Inc. (Owner) Pasco Beef Complex (Facility) located at 13983 Dodd Road, Wallula, Washington 99363. Report contents include an assessment of existing conditions, evaluation of improvement alternatives, and design criteria for the selected improvement alternative of the domestic wastewater system.

1.2 Project Contacts

Project contacts are listed in Table 1-1.

TABLE 1-1
Summary of Project Contacts

Title	Name	Phone
Plant Manager (Authorized Representative)	Brad Anderson	(509) 543-4230
Environmental Compliance	Adam Konopasek	(605) 235-4801
Corporate Engineer	Ken Ritz	(605) 235-2037
Complex Engineer	Bill Noldner	(509) 543-4340
Maintenance Manager	Jose Caballero	(509) 543-4200
Consultant Engineer, Anderson Perry & Associates, Inc.	Michael Blasy, P.E.	(509) 529-9260

1.3 Scope

This Engineering Report provides information to satisfy Washington Administrative Code (WAC) 173-240-060 and will include specific design criteria for Alternative B – Land Treatment System, including:

- Geotechnical Evaluation
- Headworks Screening Requirements
- Wastewater Treatment and Storage Lagoon Cell Sizing
- Partial-Mix Aeration Treatment Requirements
- Disinfection System Sizing
- Land Application Site Soils
- Irrigation Requirements

The design criteria will be sufficiently developed to allow for design to proceed without major changes to the design criteria.

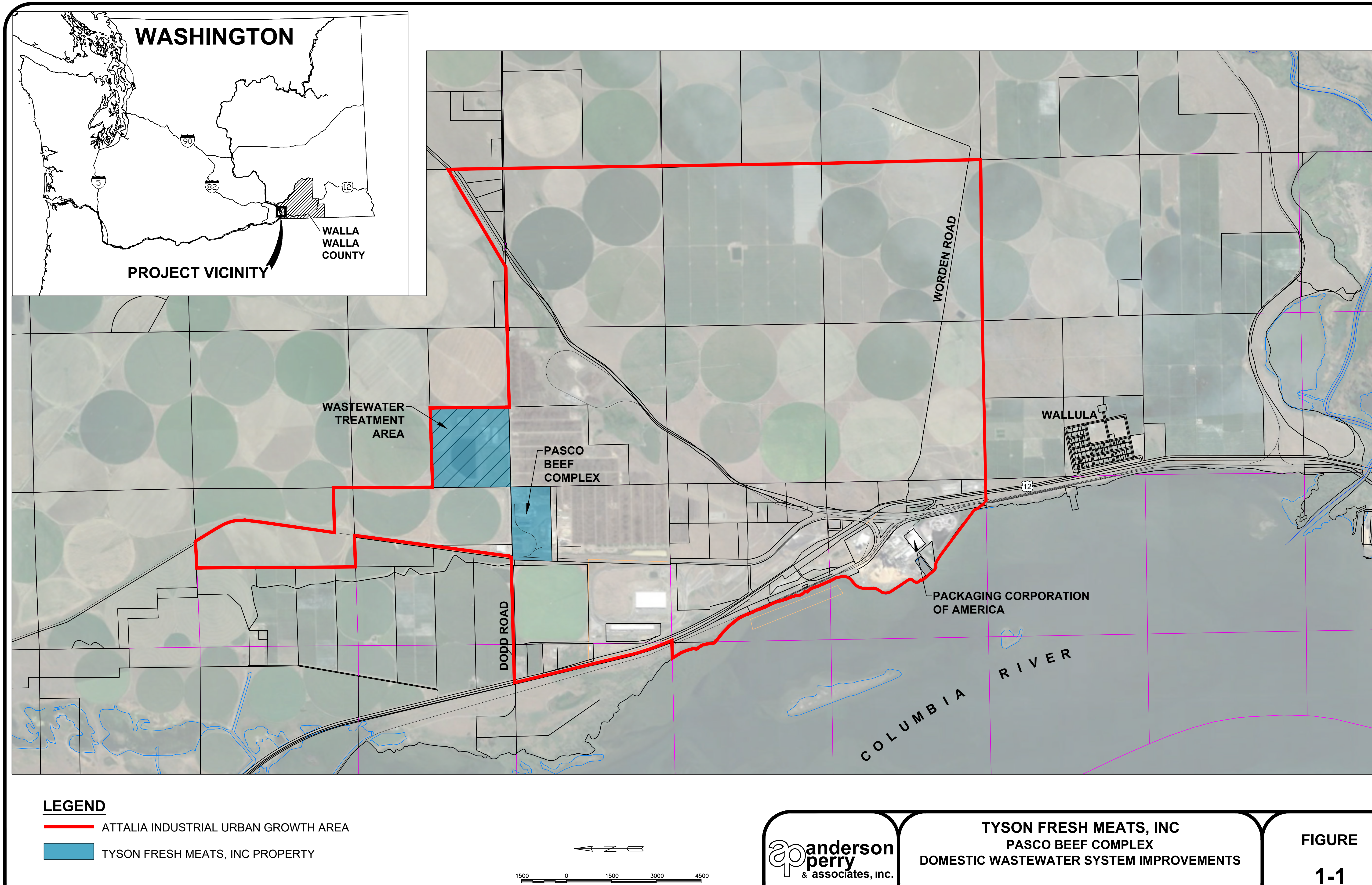
1.4 Background

The Facility is a beef slaughter operation that produces primal and subprimal cuts, as well as performing rendering and hide curing. Two wastewater systems serve the Facility; an industrial process wastewater system and a domestic wastewater system. The process wastewater system consists of anaerobic ponds, brine evaporation ponds, and a land treatment system completely separate from the System and is regulated under State Waste Discharge Permit No. ST0005335. See Figure 1-1 for a vicinity map.

The System is a large on-site sewage system (LOSS) constructed in 1993, and receives greywater and blackwater from Facility sinks, toilets, urinals, and showers from the existing domestic wastewater collection system. No Washington State Department of Health or Washington State Department of Ecology permits have been found for the existing System.

Facility staff have observed the presence of untreated wastewater on the ground surface over the existing absorption beds. On March 15, 2019, Anderson Perry & Associates, Inc. (AP) was hired as an independent consultant by Ray Poland & Sons, Inc., to complete a Preliminary Engineering Report on the existing System. The Preliminary Engineering Report presented existing system conditions and deficiencies, and an analysis of four (A, B, C, and D) improvement alternatives for the Owner's consideration. The Preliminary Engineering Report contents are described in Sections 2 and 3 of this Engineering Report.

On July 9, 2020, AP was hired as an independent consultant to plan, permit, and design improvements to the existing System based on Alternative B described in the Preliminary Engineering Report. This Engineering Report is a product of the Owner's purchase order for this work.



anderson perry & associates, inc.

TYSON FRESH MEATS, INC
PASCO BEEF COMPLEX
DOMESTIC WASTEWATER SYSTEM IMPROVEMENTS

VICINITY MAP

FIGURE 1-1

\\wwsvr5\drafting\Clients\Tyson Foods\7008-719 Dom WWS Improvements\020 Engineering Report\7008-719 Figure 1 Vicinity .dwg, 1-1, 10/1/2020 8:26:06 AM

Section 2.0 - Site Conditions and Existing Domestic Wastewater System

2.1 Site Conditions

A description of the site conditions in the vicinity of the Tyson Fresh Meats, Inc. (Owner) Pasco Beef Complex (Facility) is provided below.

2.1.1 *Climatic Data*

The Facility is located in the Columbia Basin in southeastern Washington, in an area surrounded by rolling hills covered with grasslands and desert vegetation. Farmland is typically required to be irrigated to be viable. The climate is semi-arid with annual average precipitation of 8.65 inches. Sixty to seventy percent of the precipitation occurs from October through March.

TABLE 2-1
Climate Data for Legrow, Washington

Parameter	Month												Yearly Average
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Temperature (Fahrenheit)[1]													
Average Maximum Temperature	41.9	48.5	58.4	65.5	74.5	80.8	89.5	88.2	79.3	64.7	49.6	40.5	**65.1**
Average Minimum Temperature	29.7	31.0	36.0	41.0	47.8	53.7	58.7	57.4	50.0	41.7	34.1	28.6	**42.5**
Average Temperature	35.6	39.2	46.9	53.0	60.9	67.0	73.8	72.0	63.5	52.3	41.6	34.5	**53.4**
Wind (Miles per Hour)[2]													
Daily Average Wind Speed	4.9	5.2	6.2	6.4	5.6	5.3	4.4	4.4	4.2	5.1	4.8	4.7	**5.1**
Precipitation (Inches)[3]													
Average Monthly	1.08	0.65	0.87	0.76	0.86	0.61	0.20	0.29	0.31	0.79	0.98	1.24	**8.65**

[1] Temperature Period of Record: October 1991 - December 2016
[2] Wind Speed Period of Record: October 1991 - December 2016
[3] Temperature Period of Record: January 1989 - December 2019

Table 2-2 summarizes pan evaporation data collected from Western Regional Climate Center weather stations near the Facility. The pan evaporation for the Facility is assumed to be equivalent to the Eltopia 8 WSW station with a value of 39.82 inches per year.

TABLE 2-2
Southeastern Washington Monthly Average Pan Evaporation in Inches

Location	Period of Record	Month												Year
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Connell 1 W	1960-2003	0	0	0	5.43	8.35	9.89	11.9	10.77	6.88	3	0	0	**56.22**
Eltopia 6 W	1954-1973	0	0	3.23	5.46	6.61	7.73	9.36	7.56	4.93	2.45	0.83	0	**48.16**
Eltopia 8 WSW	***1974-2005***	***0***	***0***	***0***	***4.44***	***6.1***	***7.05***	***8.07***	***7.04***	***4.44***	***2.06***	***0.62***	***0***	***39.82***
Lind 3 NE EXP STN	1931-2005	0	0	0	5.35	8.02	9.4	12.02	10.44	6.87	2.59	0	0	**54.69**
Moses Lake 3 E	1943-1979	0	0	0	5.51	7.5	8.78	10.29	8.1	5.53	2.79	0	0	**48.5**
Othello 6 ESE	1941-2002	0	0	0	5.4	7.6	9	10.77	9.14	6.12	2.92	0	0	**50.95**
Prosser 4 NE	1931-2005	0	0	2.49	4.86	6.57	7.5	8.61	7.09	4.73	2.48	0.8	0.69	**45.82**
Quincy 1 S	1941-2005	0	0	0	5.76	8.05	9	10.2	8.52	5.52	2.6	0	0	**49.65**
Walla Walla 3 W ENT LA	1931-1962	0	0	0	4.79	6.26	7.61	9.72	7.95	4.78	2.58	0	0	**43.69**
Whitman Mission	1962-2005	0	0	0	4.58	6.58	8.17	10.34	9.08	5.52	2.84	0	0	**47.11**
Yakima WSO AP	1946-2005	0	0	0	5.27	7.62	8.71	10.42	9.29	5.9	0	0	0	**47.21**

Table 2-3 summarizes evapotranspiration data collected from the Agrimet Legrow weather station near the Facility.

TABLE 2-3
Evapotranspiration for Legrow, Washington (1990 to 2015) in Inches

Crop	90	91	92	93	94	95	96	97	98	99	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	Average
Alfalfa (Mean)	40	40	40	39	42	40	39	37	40	40	39	40	40	43	43	42	43	42	43	42	39	42	41	40	44	47	41
Pasture	36	36	35	31	34	32	31	30	31	31	31	32	31	34	34	33	34	34	34	33	30	33	33	32	35	37	33
Lawn	--	--	--	38	41	38	37	36	38	38	37	38	38	41	40	40	39	41	41	40	37	39	39	39	42	45	39
Bluegrass Seed	--	--	--	--	--	--	--	--	16	16	17	17	16	16	17	15	18	19	18	19	17	15	17	18	20	20	17
Winter Grain	21	21	23	24	25	20	22	22	21	22	21	22	22	24	23	22	23	24	24	24	22	23	22	23	25	25	23
Spring Grain	23	25	24	27	28	23	26	25	24	24	23	26	26	29	28	27	25	26	24	29	25	23	25	25	25	25	25
Onions	--	--	24	29	--	--	--	25	29	27	27	29	27	32	31	31	29	29	31	28	26	27	30	30	30	32	29
Shepody Potatoes	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	25	25	31	28	25	24	25	18	30	33	26
Potatoes	25	26	25	24	28	25	24	22	25	24	25	25	26	27	26	27	26	26	27	26	25	26	26	26	26	28	26
Dry Beans	22	22	22	21	24	20	20	19	21	21	19	19	22	24	23	24	22	22	24	24	21	21	22	23	22	24	22
Field Corn	28	27	28	26	30	26	26	23	27	26	27	28	27	31	30	32	28	28	30	28	24	28	28	29	29	32	28
Sweet Corn	23	22	23	22	25	22	22	19	20	22	22	22	21	25	24	25	21	21	24	24	22	20	23	23	23	25	22
Asparagus	35	35	34	33	37	33	31	27	32	32	32	33	33	37	36	38	34	34	38	34	30	35	35	36	37	40	34
Peas	--	--	--	--	--	--	--	14	11	12	12	11	11	12	11	12	12	12	12	13	11	12	11	12	14	14	12
Peppermint	--	--	--	--	--	--	--	22	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	22
Apples	39	39	39	38	42	37	36	33	35	37	38	36	38	42	40	43	39	41	42	38	35	38	42	40	41	45	39
Concord Grapes	30	30	30	29	33	29	29	25	27	29	29	30	31	33	32	34	29	32	34	27	25	28	30	30	31	34	30
Wine Grapes	25	25	25	24	27	24	24	21	22	25	24	25	26	28	27	28	24	27	27	24	21	23	25	25	26	28	25

2.1.2 *Topography*

The existing ground at the proposed project site slopes along rolling hills and terraces to the west along the course of the Columbia River. According to Walla Walla County's 10-foot contour map, the surrounding hillside slopes vary from approximately 0 to 10 percent with elevations ranging from 550 to 400 feet (see Figure 2-1 for site topography).

2.1.3 *Soils*

Information on site soils is provided in Appendix B – Geotechnical Report and Appendix I – Land Treatment System Evaluation.

2.1.4 *Land Use*

The Facility property is located in the Attalia Industrial Urban Growth Area in Walla Walla County, and is zoned Industrial Agriculture Mixed (see Figure 2-2 for a local zoning map).

2.1.5 *Land Ownership*

The Owner owns Parcel Numbers 310834110006 and 310826310002. This encompasses the entire proposed project area.

2.1.6 *Geology*

Information on site geology is provided in Appendix I – Land Treatment System Evaluation.

2.2 Existing Wastewater Systems

The Facility has two separate wastewater systems; an industrial process wastewater system and a domestic wastewater system. No industrial process wastewater is directed to the domestic wastewater system. The industrial process wastewater is treated separately under State Waste Discharge Permit Number ST0005335.

The remainder of this section focuses on the existing domestic wastewater system.

2.2.1 *Existing Domestic Wastewater System Components*

The majority of the existing domestic wastewater system (System) was constructed in 1993 to separate industrial process and domestic wastewater originating from the Facility. The 1993 scope of work included a domestic wastewater collection system, septic tanks, pump chamber, pressure sewer, three pressure distribution systems, and three absorption beds (Absorption Beds No. 1, 2, and 4). A fourth absorption bed (Absorption Bed No. 3) was constructed in approximately 2007 (see Appendix A for as-built drawings and an Operation and Maintenance Manual from 1993 and an as-built drawing of Absorption Bed No. 3 from approximately 2007). During the construction of Absorption Bed No. 3, a flowmeter vault was also installed during the approximate time frame. The original effluent submersible sewer pumps and controls have been replaced, and these pumps are currently activated by an ultrasonic level sensor. Table 2-4 provides a summary of the existing System components.

TABLE 2-4
Summary of Existing Domestic Wastewater System Components

System Component	Description
Collection System	Approximately 3,150 feet of 8-inch polyvinyl chloride (PVC) gravity sewer pipe and seven sanitary sewer manholes.
Septic Tanks	Two 23,000-gallon dual-chamber reinforced concrete septic tanks.
Pump Chamber	12 foot wide by 10 foot long by 22 foot deep reinforced concrete pump station with duplex 1,000 gpm[1] effluent pumps and a flowmeter vault.
Pressure Sewer	Approximately 3,850 feet of 10-inch PVC pipe.
Pressure Distribution System	Four pressure distribution systems (one per absorption bed) each composed of a valve vault, 10- and 8-inch PVC transport pipe, 6-inch PVC pipe manifolds, and four pressurized drainfields with 2-inch PVC pipe laterals. The laterals have 3/16-inch diameter orifices spaced 3 feet apart. Pressure distribution systems in Absorption Beds No. 1 and 4 each contain 128 laterals. Pressure distribution systems in Absorption Beds No. 2 and 3 each contain 94 laterals.
Absorption Beds	Four absorption beds, each with pressure distribution system laterals placed in the center of a 1 foot thick, 2 inch minus washed rock bed. The native soil is classified as Soil Type 4. Each Absorption Bed covers approximately 0.5 acre.

[1]*gpm = gallons per minute*

The original System was designed to pump 28,000 gallons per day to two absorption beds. A total of eight doses at 3,500 gallon per dose were alternated between the two absorption beds. Under normal conditions, floats in the pump chamber connected to a pump control panel activated by one of two 50-horsepower sewage pumps to deliver 3,500 gallons to a single absorption bed. Each pressure distribution system started with a valve vault containing an 8-inch globe valve and an 8-inch ball valve with an electric actuator. The globe valves allowed the head to be manually adjusted into each pressure distribution system. The ball valves opened and closed after each dose based on a 3,500-gallon flow reading from the original flowmeter in the pump chamber. This operation alternated flow between two absorption beds to prevent hydraulic overloading.

See Figures 2-3, 2-4, and 2-5 for an existing site plan and existing System schematics. See Appendix B for information on soil test pits, soil textural classification, and sieve analysis test results.

2.3 Domestic Wastewater Characteristics

2.3.1 *Domestic Wastewater Flows*

Daily System wastewater flow data between May 2016 to April 2019 were provided by the Owner's Facility staff. From this data, the daily maximum, daily average, and estimated peak hourly wastewater flows were determined. See Table 2-5 for a summary of System flows. See Appendix C for daily flow data records.

TABLE 2-5
Summary of Domestic Wastewater Flows

	Flow[1]						
	Total Annual (gallons)	**Monthly Average (gallon per month)**	**Monthly Maximum (gallon per month)**	**Daily Average (gpd)**	**Daily Maximum (gpd)**	**Average Daily Weekday (gpd)**	**Average Daily Weekend (gpd)**
May 2016 to April 2017	3,798,640	316,553	376,070	10,500	23,000	12,700	5,000
May 2017 to April 2018	4,700,980	391,748	495,850	13,000	55,400	15,600	6,300
May 2018 to April 2019	3,803,091	316,924	421,240	10,800	29,700	13,000	5,200
Average	4,101,000	342,000	432,000	11,500	36,100	13,800	5,500

[1]*gpd = gallons per day*

For the purposes of this report, the May 2018 to April 2019 data is considered representative of the System wastewater flow. Therefore, the System flows are defined as a daily average flow of 13,000 gpd and a daily maximum flow of 55,000 gpd. These values are listed in Table 2-6 as part of the System's wastewater characteristics.

2.3.2 *Domestic Wastewater Quality*

On April 29, 2019, a wastewater sample was collected from the pump chamber. The sample was tested for carbonaceous biochemical oxygen demand (CBOD), five-day biochemical oxygen demand (BOD5), total suspended solids (TSS), fecal coliform, oil and grease (OG), nitrate, ammonia, and total Kjeldahl nitrogen (TKN) (see Appendix D for lab test results data).

The single wastewater sample laboratory analysis results indicated TSS and fecal coliform concentrations were lower than residential strength; nitrate levels equivalent to typical residential strength; and CBOD, BOD_5, OG, ammonia, and TKN were somewhat higher than typical residential strength. Overall, the Facility's domestic primary treated wastewater is stronger than medium strength raw residential wastewater.

Differences between the System wastewater quality and typical residential wastewater quality could be from sampling downstream of the existing septic tank in the effluent pump chamber. The existing septic tank is likely impacting System wastewater quality by increasing BOD5, ammonia and TKN values, and reducing TSS, fecal coliform, and OG values by retaining or digesting these parameters in the septic tanks. See Table 2-6 for a summary of the System's wastewater characteristics.

TABLE 2-6
Summary of Domestic Wastewater Characteristics

Characteristic	Typical Residential Strength Maximum Values[1]	Existing System Values
Flow	N/A	Average: 13,000 gpd Maximum: 55,000 gpd Peak: 2,000 gpm
CBOD, mg/L[3]	200	284
BOD_5, mg/L[3]	250	311
TSS, mg/L[3]	145	87
Fecal Coliform, MPN[4] per 100 mg/L[3]	10,000[2]	2,420
OG, mg/L[3]	150[2]	18.8
Nitrate, mg/L[3]	0[2]	Not Detected
Ammonia, mg/L[3]	40	96.9
TKN, mg/L[3]	70[2]	124

[1]*Proposed septic tank effluent values from Washington Department of Health Publication 337-105: Septic Tank Effluent Values unless otherwise noted*

[2]*Wastewater Engineering: Treatment and Resource Recovery, 5th Edition, Metcalf & Eddy| AECOM, Table 3-18, Medium Strength Untreated Domestic Wastewater*

[3]*mg/L = milligrams per liter*

[4]*MPN = most probable number*

2.4 Existing Wastewater System Deficiencies

On April 11, 2019, the Owner's Facility engineer staff, Ray Poland & Sons, Inc. (Contractor), and Anderson Perry & Associates, Inc. (AP) representatives met at the Facility to discuss the existing System. Facility staff indicated existing Drainfield Beds No. 1, 2, and 4 may have failed. The gravel infiltration material in these beds was found to be clogged with solids during previous System excavations and investigations. The septic tank received limited to no maintenance pumping from 1993 to 2007, which may have contributed to septage solids being pumped into the drainfield beds. Facility staff mentioned other system deficiencies, including deteriorating pump support rails and piping in the pump chamber and faulty 8-inch actuated drainfield isolation valves.

AP representatives and the Contractor conducted field visits to the System on April 11 and April 29, 2019. Based on field visit observations, Absorption Beds No. 1, 2, 3, and 4 have failed as defined by Washington Administrative Code 246-272B-07450 and as evidenced by excessive plant growth and partially treated sewage ponding on the ground surface. Piping corrosion in the pump chamber was also confirmed during the site visits. The electric actuated ball valves for each pressure system did not appear to operate as originally intended; therefore, functional alternating of absorption beds was not possible. Overall, the System appears to have reached the end of its expected design life and needs improvement.

2.4.1 *Existing Site Photos*

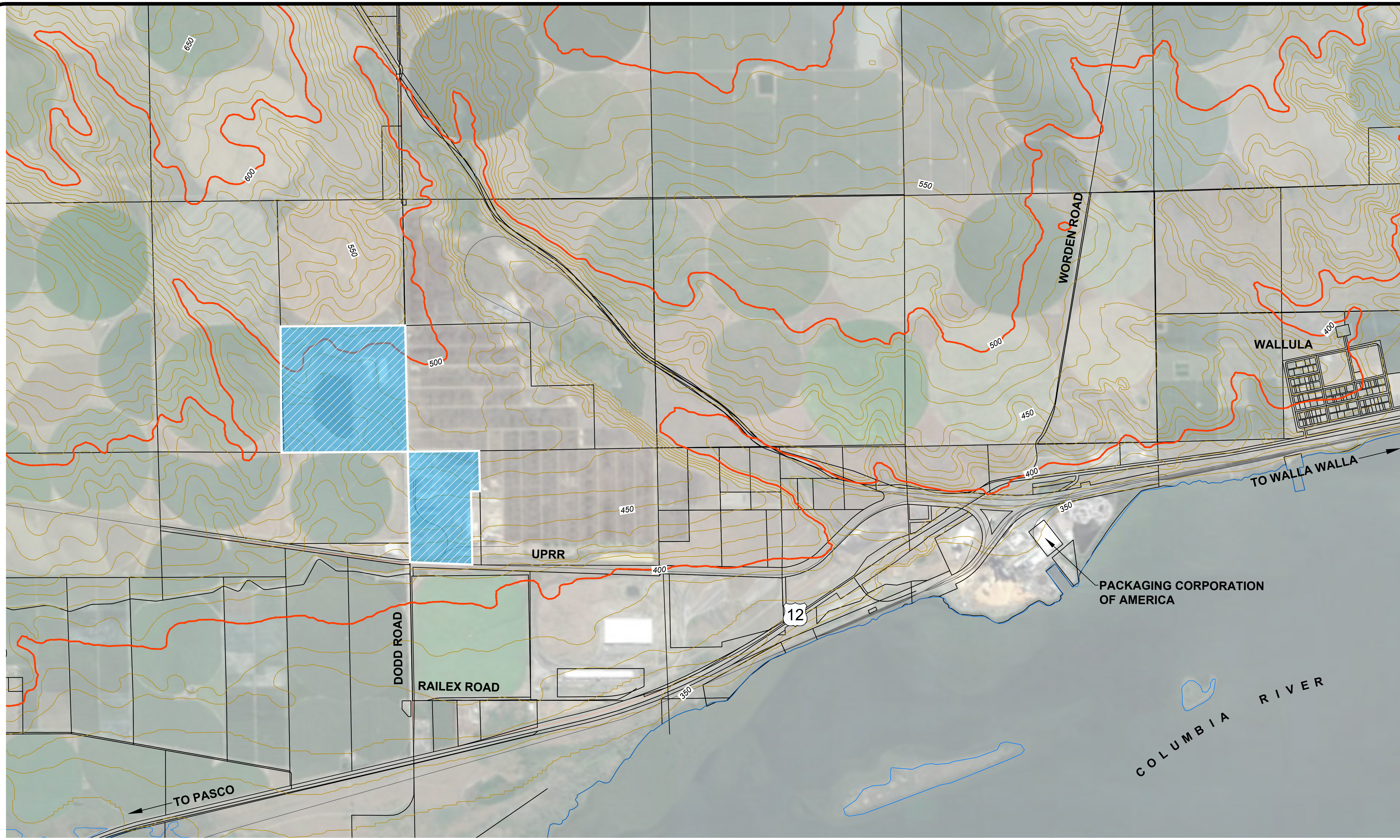
Photo No. 1: Piping corrosion in pump chamber (see Figure 2-4 for photo location).

Photo No. 2: Partially treated sewage on the ground and plant growth on the north side of Absorption Bed No. 1 (see Figure 2-5 for photo location).

Photo No. 3: Partially treated sewage on the ground and plant growth at the center of Absorption Bed No. 1 (see Figure 2-5 for photo location).

Photo No. 4: Partially treated sewage on the ground on the west side of Absorption Bed No. 2 (see Figure 2-5 for photo location).

Photo No. 5: Plant growth on Absorption Beds No. 3 and No. 4 (see Figure 2-5 for photo location).



LEGEND

- MAJOR CONTOURS (50' INTERVAL)
- MINOR COUNTOURS (10' INTERVAL)
- TYSON FRESH MEATS, INC. PROPERTY

N

1000 0 1000 2000 3000

SCALE IN FEET

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SITE TOPOGRAPHY

FIGURE

2-1

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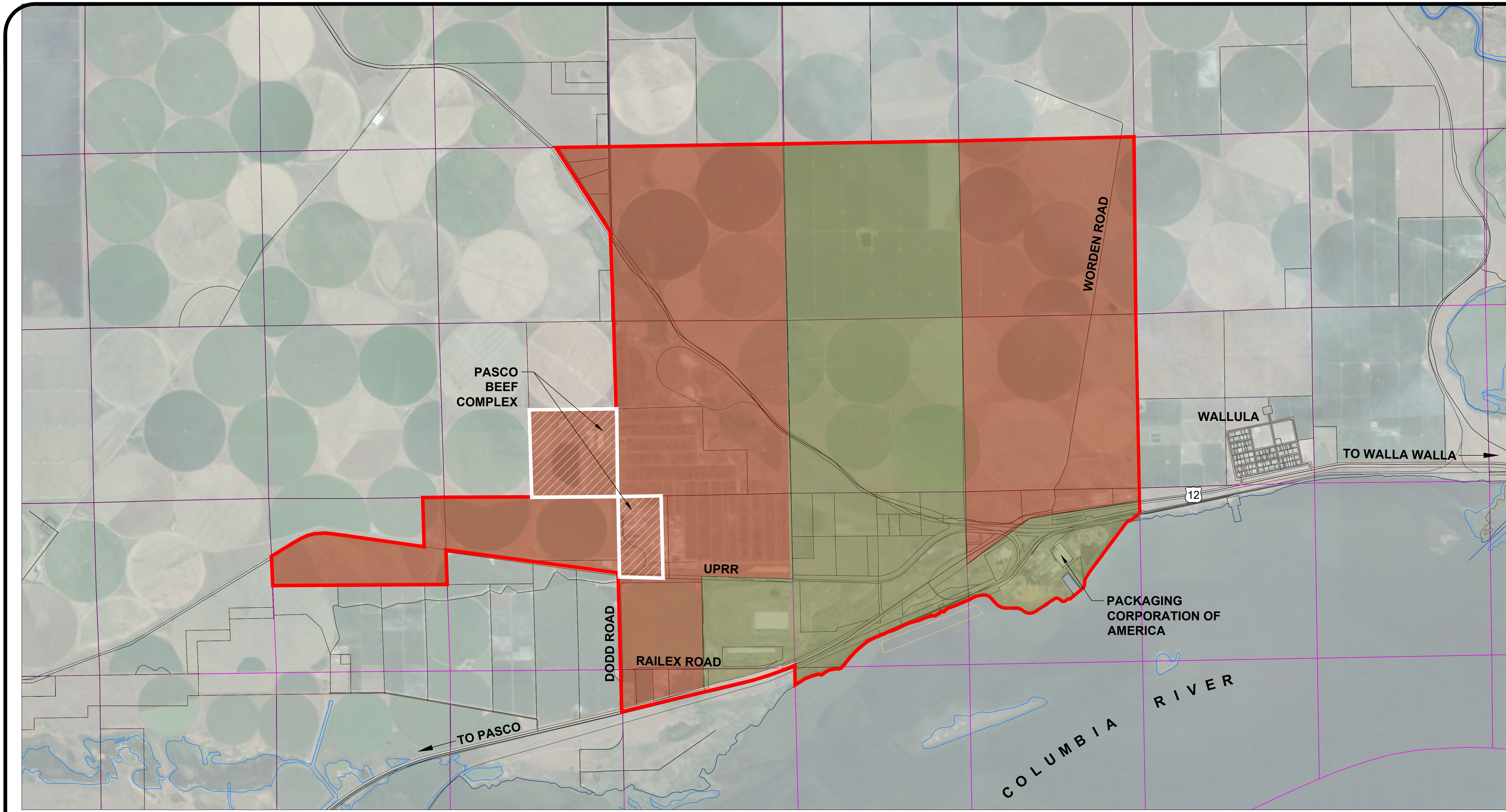

LEGEND

- ATTALIA INDUSTRIAL URBAN GROWTH AREA
- INDUSTRIAL AGRICULTURE MIXED ZONING
- INDUSTRIAL AGRICULTURE HEAVY ZONING
- TYSON FRESH MEATS, INC. PROPERTY

1500 0 1500 3000
SCALE IN FEET

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ZONING MAP

FIGURE 2-2

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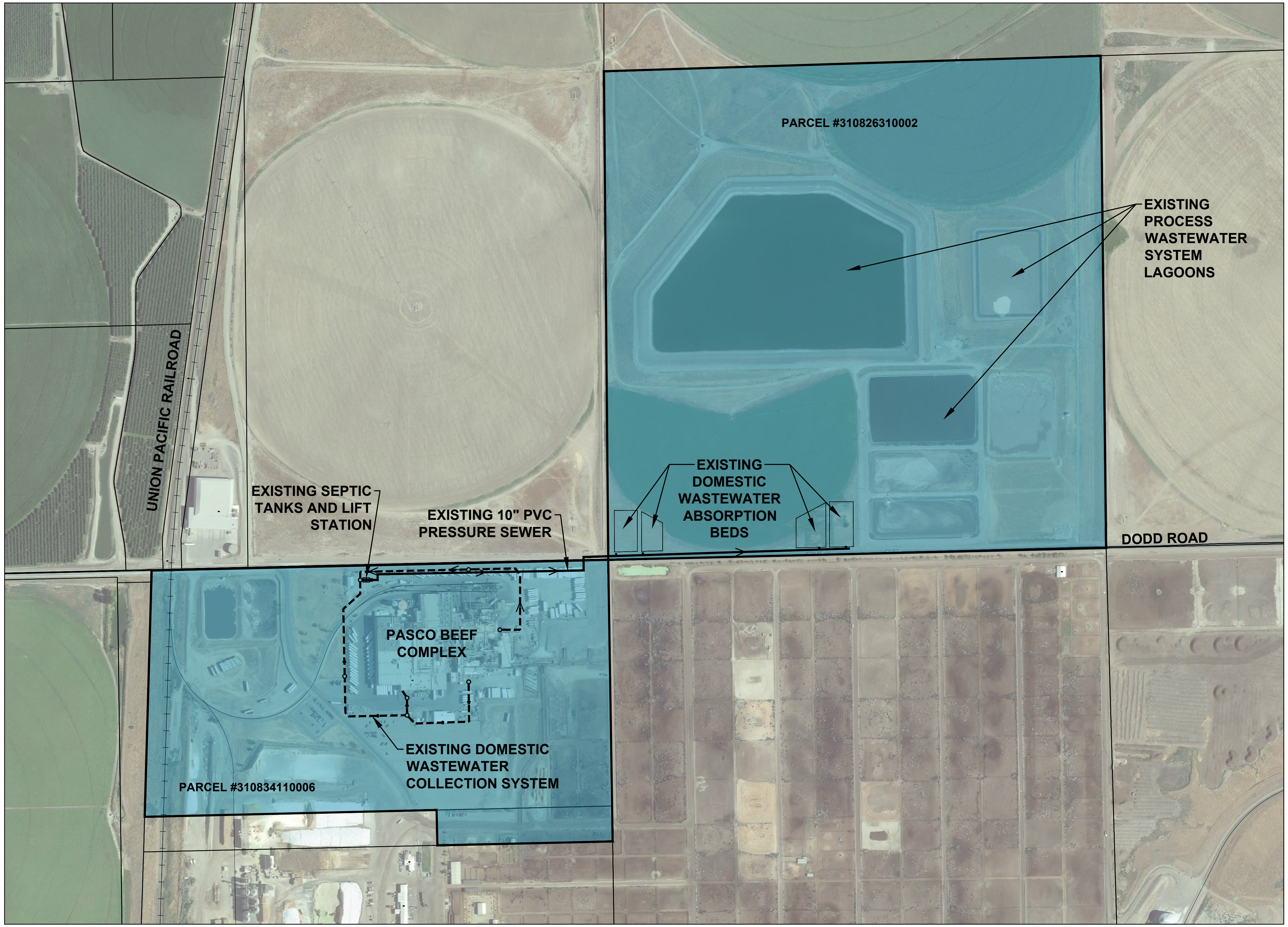

LEGEND

TYSON FRESH MEATS, INC PROPERTY

300 0 300 600 900
SCALE IN FEET

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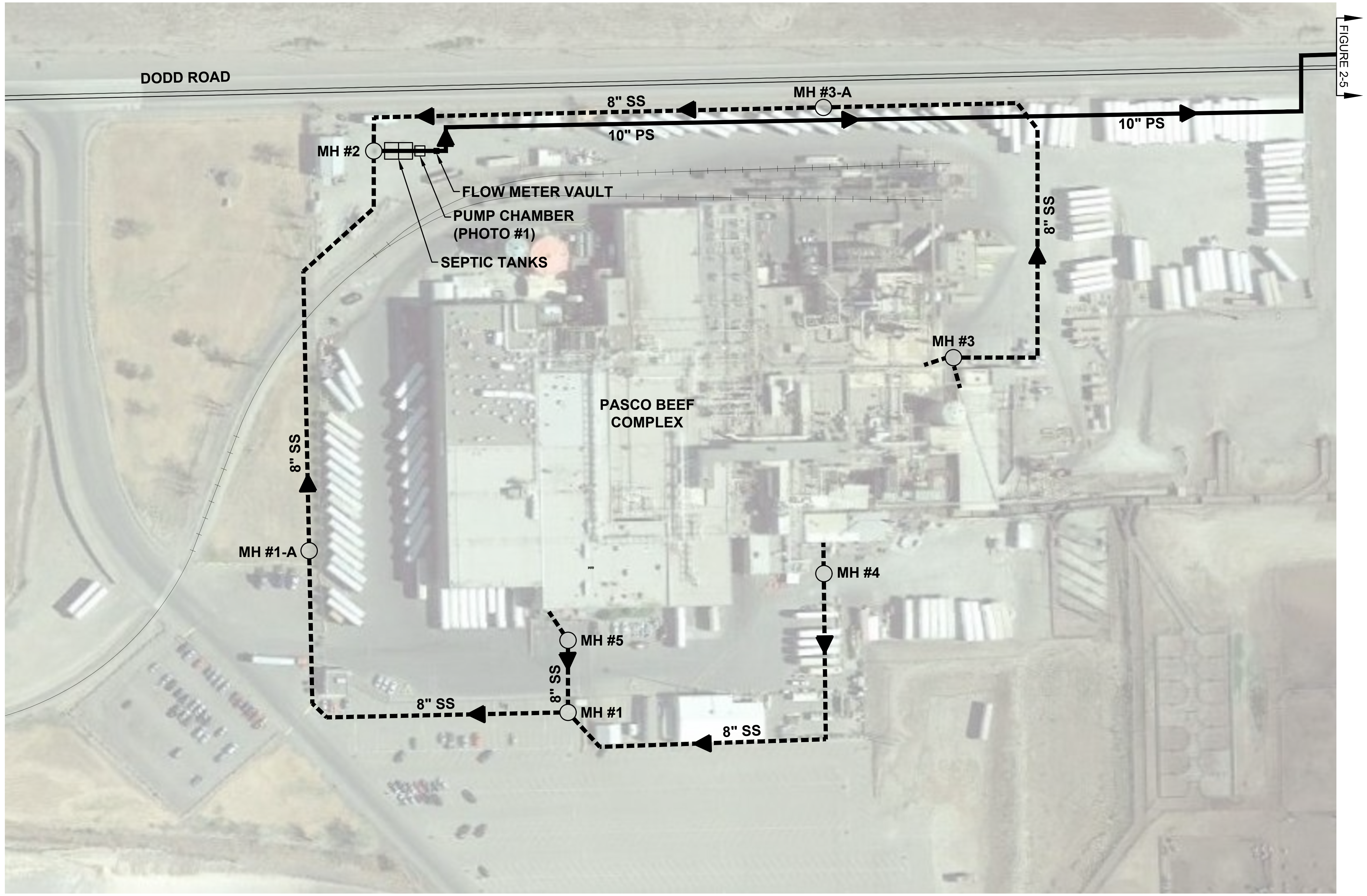
DOMESTIC WASTEWATER SYSTEM IMPROVEMENTS

EXISTING SITE PLAN

FIGURE 2-3



LEGEND

- DOMESTIC GRAVITY SEWER
- DOMESTIC PRESSURE SEWER
- DOMESTIC SEWER MANHOLE

ABBREVIATIONS

MH MANHOLE
SS SANITARY SEWER
PS PRESSURE SEWER

NOTE:
SEE SECTION 2.4.1 FOR REFERENCED PHOTOS.

75 0 75 150 225
SCALE IN FEET

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EXISTING COLLECTION SYSTEM

FIGURE 2-4

LEGEND

- DOMESTIC PRESSURE SEWER
- VALVE BOX
- PS — PRESSURE SEWER

NOTE:
SEE SECTION 2.4.1 FOR REFERENCED PHOTOS.

75 0 75 150 225
SCALE IN FEET

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EXISTING ABSORPTION BEDS

FIGURE 2-5

\\wwsvr5\drafting\Clients\Tyson Foods\7008-719 Dom WWS Improvements\020 Engineering Report\7008-719 Figure 2-5 Exist Loss Schematic.dwg, 2-5, 10/1/2020 8:29:11 AM

Section 3.0 - System Improvement Alternatives

3.1 System Improvement Alternative Introduction

Four system improvement alternatives were proposed and evaluated for Tyson Fresh Meats, Inc.'s (Owner) consideration. This section describes the alternatives and evaluation process.

3.2 Alternative Evaluation Criteria

Evaluation criteria are utilized to identify the alternative with the best value. The evaluation criteria are listed in Table 3-1.

TABLE 3-1
Alternative Evaluation Criteria

Evaluation Criteria	Basis of Evaluation	Evaluation Method	Relative Importance
Life-Cycle Cost	20-Year Present Worth Probable Capital	Rank Low to High	High (1.5 Importance Factor)
O&M[1] Burden	O&M Effort Required of Owner	Rank Low to High	No Importance Factor
Regulatory Burden	Reporting and Monitoring Effort Required of Owner	Rank Low to High	No Importance Factor

[1] O&M = Operation and Maintenance

Alternatives are ranked by assigning a rank score for each evaluation criterion and multiplying the rank score by a relative importance factor. The alternative with the lowest rank score offers the best value.

3.3 System Improvement Alternatives

The four alternatives are proposed and are described below.

3.3.1 *Alternative A - Repair Existing System*

Alternative A would be to obtain a permit to repair the existing domestic wastewater system (System) and implement an operating permit through the Washington State Department of Health (DOH). Repairs would include upgrading effluent screening in the existing septic tanks; renovating the existing pump chamber with new pumps, support rails, controls, and valving; replacing faulty drainfield isolation valves; and constructing new transport pipe, pressurized distribution systems, and absorption beds (see Figure 3-1 for a conceptual layout of Alternative A and Appendix E for a flowchart of the DOH permitting pathway).

The new operating permit application would be reviewed and approved by DOH. The operating permit may contain conditions including, but not limited to, inspection and evaluation of the existing system; wastewater monitoring requirements; updated system reports such as engineering reports, record drawings, and/or an O&M manual; and construction of system improvements. The Owner would be required to employ a system operator certified by the local health jurisdiction.

A challenge with Alternative A is potential nitrogen impacts to the local groundwater. DOH evaluates the nitrogen balance on large on-site sewage system (LOSS) project applications to identify LOSS systems that may have a moderate to significant impact in degrading groundwater. According to DOH, a moderate impact is considered 2 milligrams per liter (mg/L) above the background nitrate level. The existing groundwater in the project area has a background nitrogen level of 26.7 mg/L pursuant with the Facility's 2019 Irrigation and Crop Management Plan. The wastewater quality testing indicates a nitrogen level of 124 mg/L, or 97.3 mg/L above the background nitrogen level. Therefore, an approximate 80 percent nitrogen reduction would be required for a new LOSS to not have a moderate nitrogen impact on the local groundwater. A nitrate treatment system would be required to achieve this level of reduction. Table 3-2 provides a summary of Alternative A advantages and disadvantages.

TABLE 3-2
Alternative A Advantages and Disadvantages

Alternative A Advantages	Alternative A Disadvantages
• **Life-Cycle Cost:** Property is available for construction of replacement drainfields. • **Life-Cycle Cost:** Existing infrastructure can be reused or renovated for a new LOSS.	• **Life-Cycle Cost/O&M Burden/Regulatory Burden:** Ongoing monitoring and maintenance regulations would be established by an operating permit. The permit would be renewed annually. • **Life-Cycle Cost/O&M Burden/Regulatory Burden:** An approximate 80 percent nitrogen reduction will likely be required on the wastewater flow before entering the new absorption beds. A nitrate treatment system would be required to achieve this level of reduction. • **Life-Cycle Cost/O&M Burden:** Depending on the treatment level assigned by DOH, the LOSS may require imported sand bedding or pre-treatment. • **Life-Cycle Cost/O&M Burden:** Semi-annual septic tank pumping and disposal required. • **O&M Burden/Regulatory Burden:** Employment of a local health authority certified operator is required.

3.3.2 *Alternative B - Land Treatment System*

Alternative B would obtain a permit from the Washington State Department of Ecology (Ecology) to construct and operate a land treatment system. The proposed scope would consist of constructing a new headworks and lift station; modifying the alignment of the existing transport pipe; and constructing an aerated treatment lagoon, a winter storage lagoon, and a new pump station with piping to a land treatment site (see Figure 3-2 for a conceptual layout of Alternative B).

A State Waste Discharge Permit approved through Ecology is required for this alternative (see Appendix F for a flowchart of this permitting process). The Owner would be required to employ a Class I system operator certified by Ecology.

Table 3-3 provides a summary of Alternative B advantages and disadvantages.

TABLE 3-3
Alternative B Advantages and Disadvantages

Alternative B Advantages	Alternative B Disadvantages
• **Life-Cycle Cost:** Land space available for a land treatment system. • **Life-Cycle Cost:** Low maintenance system. Dredging of lagoon solids required approximately every 20 years. • **Life-Cycle Cost:** Existing infrastructure can be reused or renovated for a new land treatment system.	• **O&M Burden/Regulatory Burden:** Class I system operator required. • **O&M Burden:** Land treatment site separate from process wastewater land treatment system required. • **Regulatory Burden:** State Waste Discharge Permit required. This permit is renewed every five years, with annual reporting required

3.3.3 *Alternative C - Class B Reclamation System*

Alternative C would obtain approval from Ecology (as the lead agency) to construct and operate a reclamation system that would treat domestic wastewater to a Class B reclaimed water standard and would transport the reclaimed water to the existing process wastewater land treatment system (see Figure 3-3 for a conceptual layout of Alternative C).

Class B reclaimed wastewater requires a treatment system and a State Waste Discharge Permit from Ecology that is concurred by DOH. The permit would require monitoring and reporting on wastewater characteristics against defined permit levels. Class B reclaimed wastewater cannot be applied to certain food crops and would likely require adjustments to the current crop management plan.

Table 3-4 provides a summary of the advantages and disadvantages for Alternative C.

TABLE 3-4
Alternative C Advantages and Disadvantages

Alternative C Advantages	Alternative C Disadvantages
• **Life-Cycle Cost:** Existing infrastructure can be reused or renovated for a new Class B reclamation system.	• **Regulatory Burden:** Joint permitting required through DOH and Ecology. • **O&M Burden/Regulatory Burden:** Ongoing monitoring required to regulate Class B standards. • **O&M Burden:** Restrictions on irrigated crops with Class B. Reclaimed water may require altering crop management plan.

3.3.4 *Alternative D - Connect to Existing Sanitary Sewer System*

Alternative D would connect to the nearest sanitary sewer system, which would be the Port of Walla Walla Burbank Business Park sewer system. This entails obtaining approval from the Port of Walla Walla to connect to their wastewater collection system in Burbank, Washington. The Port of Walla Walla discharges to the City of Pasco's publicly owned treatment works (POTW) for final treatment and discharge. The Port of Walla Walla and City of Pasco wastewater systems have capacity for the additional wastewater load. The Port of Walla Walla requires capital facility charges for connection to the Burbank Business Park.

A pressure sewer would be constructed consisting of approximately 10 miles of pipeline, two lift stations, highway and railroad crossings, and various pipeline appurtenances. Depending on the pipe alignment selected, easement agreements from the Washington State Department of Transportation (WSDOT), Union Pacific Railroad (UPRR), and the federal government would be required (see Figure 3-4 for a conceptual layout of Alternative D).

Table 3-5 provides a summary of the advantages and disadvantages for Alternative D.

TABLE 3-5
Alternative D Advantages and Disadvantages

Alternative D Advantages	Alternative D Disadvantages
• **Regulatory Burden:** A State Waste Discharge Permit or operating permit are not required due to domestic wastewater discharge to a municipal sewer system. • **O&M Burden:** Low maintenance alternative with all wastewater delivered off site. • **Life-Cycle Cost:** Regional benefit may attract project funding partners to reduce Owner's construction costs.	• **Life-Cycle Cost:** High capital cost compared to other alternatives without project funding partners • **Life-Cycle Cost:** Depending on pipe alignment selected, easements from the UPRR, WSDOT, and federal government required. • **Life-Cycle Cost:** Monthly sewer bill and capital facilities charges would apply.

3.4 Alternative Scoring

The life-cycle cost, O&M burden, and regulatory burden scores for the four alternatives are described below.

3.4.1 *Life-Cycle Cost Ranking*

The life-cycle cost ranking is based on the 20-year present worth of each alternative. (see Appendix G for details on the life-cycle opinion of probable costs and ranking of the alternatives). Table 3-6 presents a summary of the life-cycle cost ranking.

TABLE 3-6
Life-Cycle Costs Ranking

Rank	Alternative	Explanation
1	B - Land Treatment System	Present Worth = $4,800,000
2	C - Class B Reclamation System	Present Worth = $5,400,000
3	A - Repair Existing System	Present Worth = $6,700,000
4	D - Connect to Existing Sanitary Sewer System	Present Worth = $7,450,000

3.4.2 *Operation and Maintenance Burden Ranking*

Table 3-7 presents a summary of the O&M burden ranking.

TABLE 3-7
O&M Burden Ranking

Rank	Alternative	Explanation
1	D - Connect to Existing Sanitary Sewer System	Low O&M burden due to connection to existing sanitary sewer. Certified operator not required.
2	B - Land Treatment System	No annual septic tank pumping due to solids stored in a lagoon. Routine wastewater quality sampling and testing, and a certified operator are required.
3	A - Repair Existing System	Annual septic tank pumping is a considerable O&M burden. Routine wastewater quality sampling and testing are required. DOH operating permit maintenance schedule required.
4	C - Class B Reclamation System	Semi-annual septic tank pumping, treatment system maintenance, and a certified operator are required. Routine wastewater quality sampling and testing are required. Class B reclaimed water status are high O&M burdens.

3.4.3 *Regulatory Burden Ranking*

Table 3-8 presents a summary of the regulatory burden ranking.

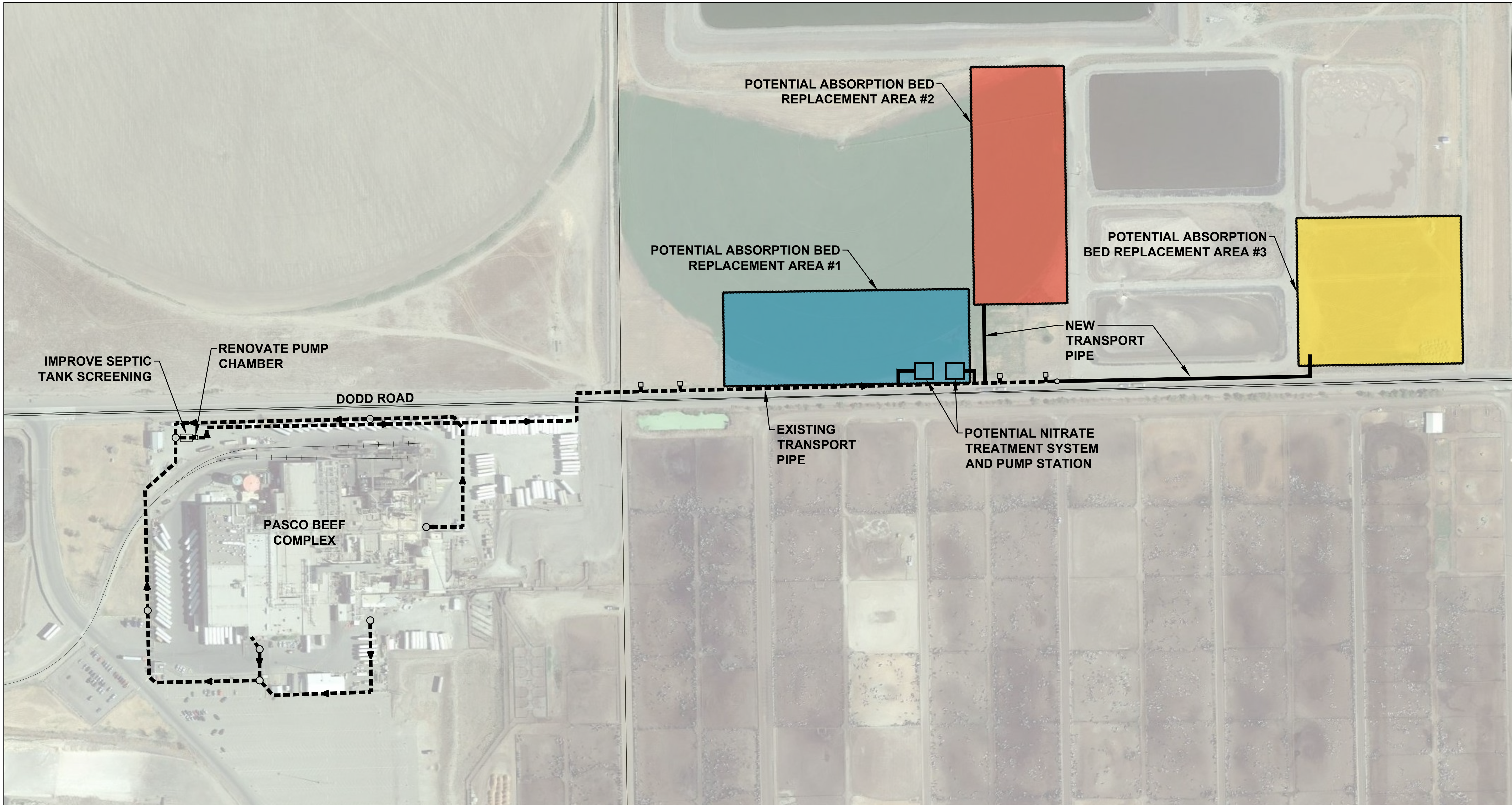
TABLE 3-8
Regulatory Burden Ranking

Rank	Alternative	Explanation
1	D - Connect to Existing Sanitary Sewer System	Low regulatory burden due to connection to existing sanitary sewer. Regulatory permit not required.
2	B - Land Treatment System	State Waste Discharge Permit required with renewal every five years.
3	A - Repair Existing System	DOH operating permit required with renewal each year.
4	C - Class B Reclamation System	State Waste Discharge Permit with concurrence from Ecology and DOH required. Reporting on Class B reclaimed water could be burdensome.

Table 3-9 presents a summary of the alternative ranks and scores.

TABLE 3-9
Summary of Alternative Ranks and Scores

Alternative	Life-Cycle Cost Rank	O&M Burden Rank	Regulatory Burden Rank	Total Score
Alternative B - Land Treatment System	1	2	2	5.5
Alternative D - Connect to Existing Sanitary Sewer System	4	1	1	8.0
Alternative A - Repair Existing System	3	3	3	10.5
Alternative C - Class B Reclamation System	2	4	4	11.0



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SCALE IN FEET

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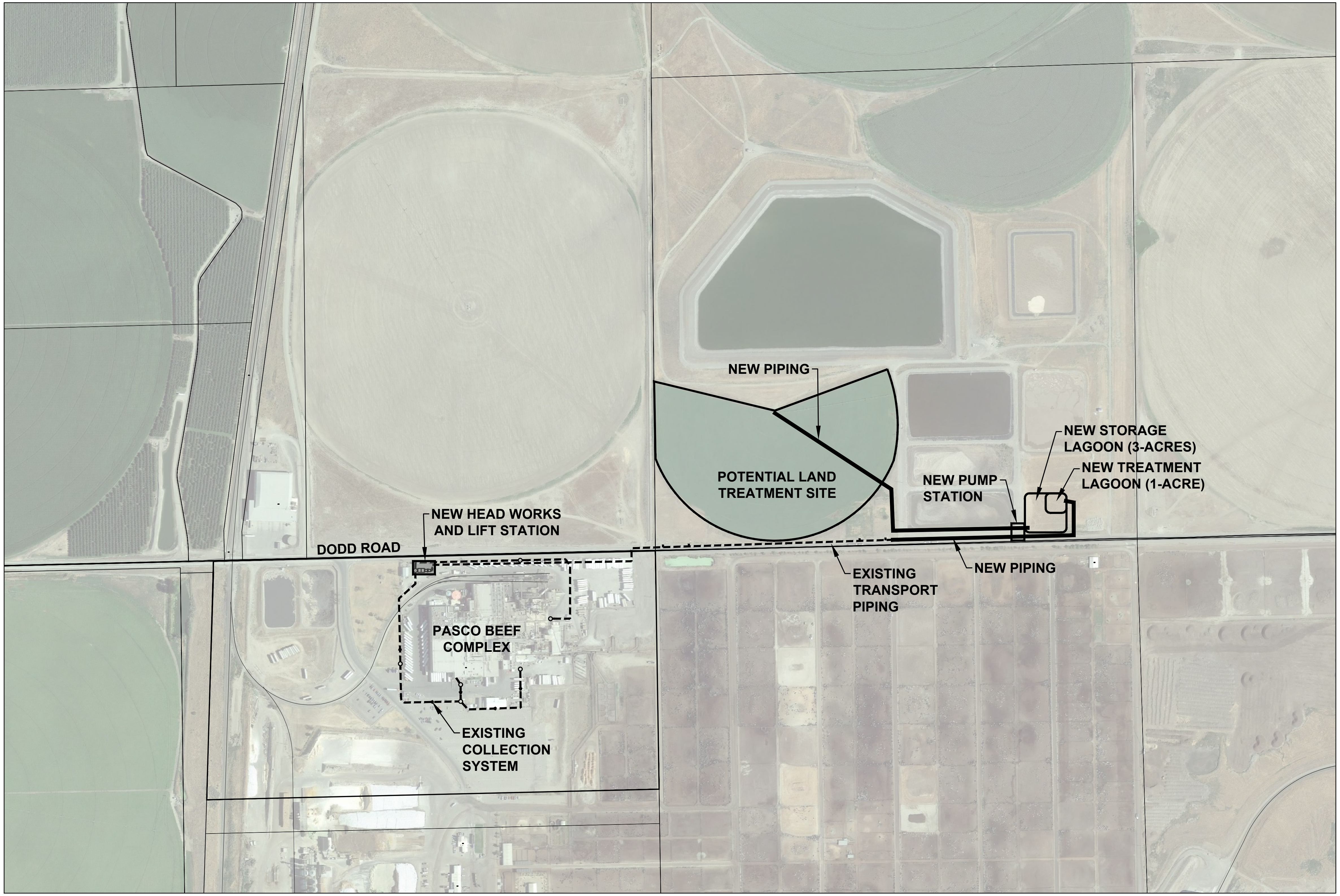
anderson perry & associates, inc.

TYSON FRESH MEATS, INC
PASCO BEEF COMPLEX
DOMESTIC WASTEWATER SYSTEM IMPROVEMENTS
ALTERNATIVE A:
REPAIR EXISTING SYSTEM

FIGURE
3-1



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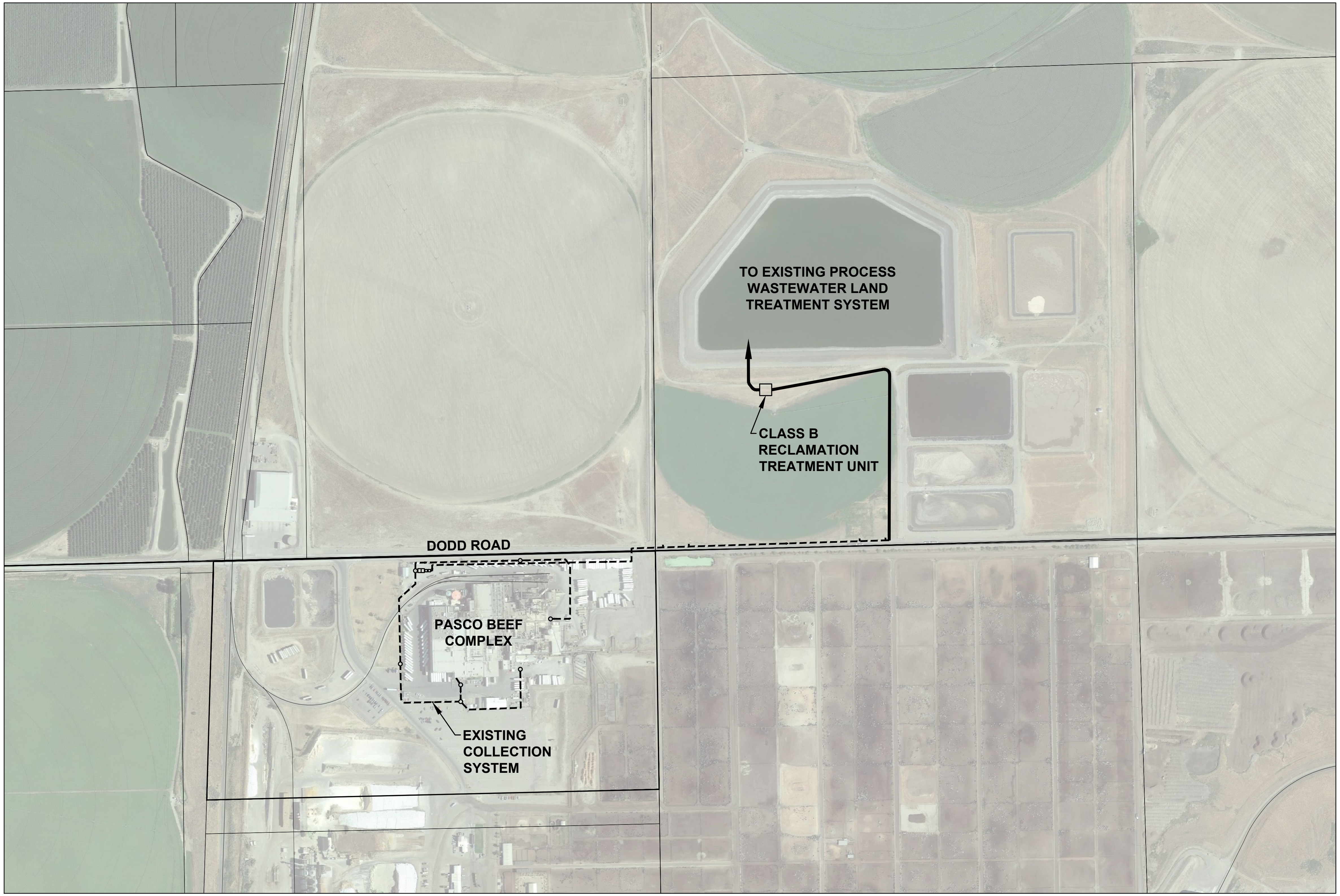
TYSON FRESH MEATS, INC
PASCO BEEF COMPLEX
DOMESTIC WASTEWATER SYSTEM IMPROVEMENTS

ALTERNATIVE B: LAND TREATMENT SYSTEM

FIGURE 3-2

\\wwsvr5\drafting\Clients\Tyson Foods\7008-719 Dom WWS Improvements\020 Engineering Report\7008-719 Figure 3-2 Long-Term Alt B.dwg, 3-2, 10/1/2020 8:29:56 AM



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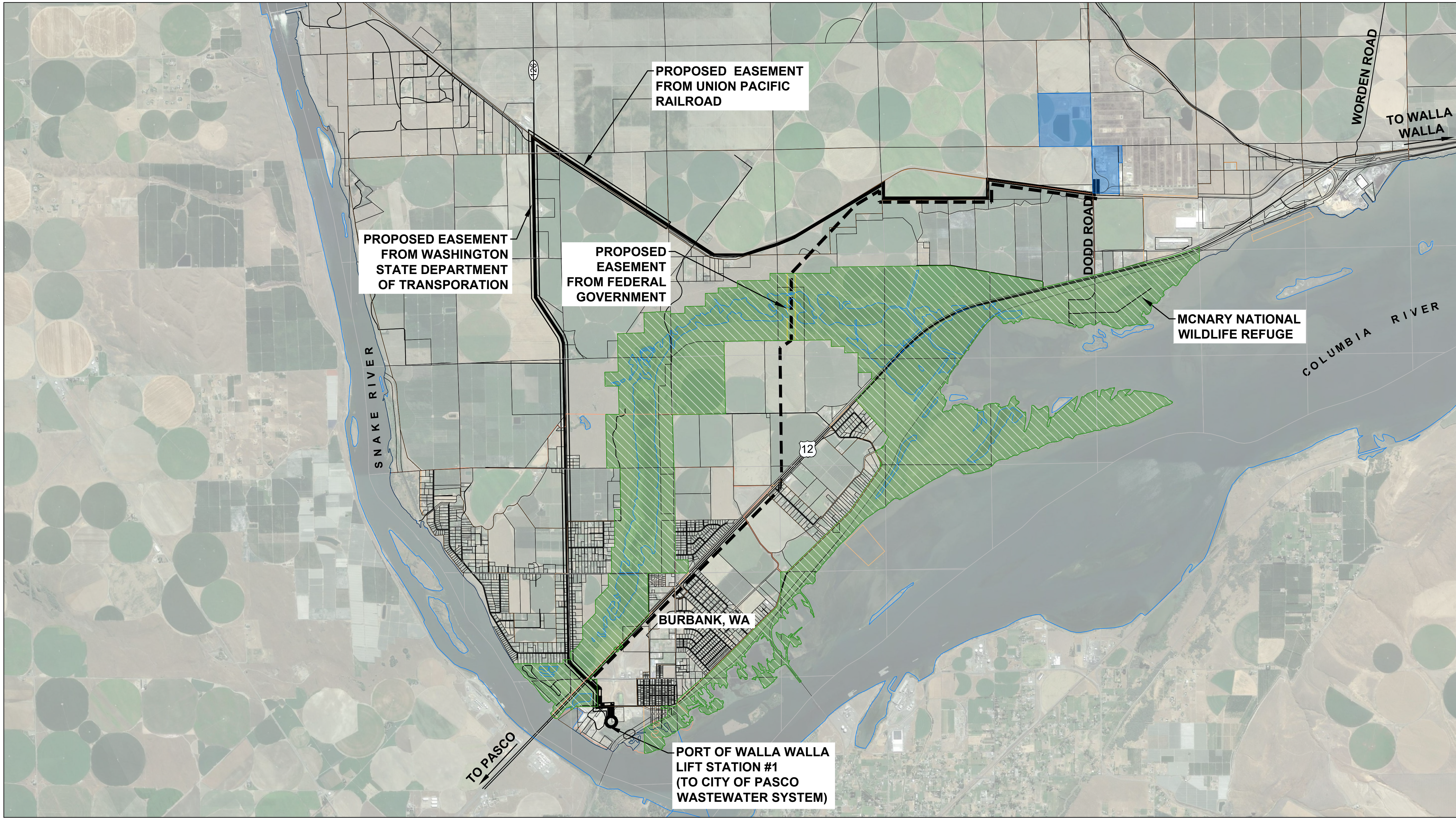
N

anderson perry & associates, inc.

TYSON FRESH MEATS, INC
PASCO BEEF COMPLEX
DOMESTIC WASTEWATER SYSTEM IMPROVEMENTS
ALTERNATIVE C:
CLASS B RECLAMATION SYSTEM

FIGURE
3-3



LEGEND

- TYSON FRESH MEATS, INC PROPERTY
- U.S. GOVERNMENT PROPERTY
- ALIGNMENT A, 6-INCH PRESSURE SEWER
- ALIGNMENT B, 6-INCH PRESSURE SEWER

N

2500 0 2500 5000 7500
SCALE IN FEET

anderson perry & associates, inc.

TYSON FRESH MEATS, INC
PASCO BEEF COMPLEX
DOMESTIC WASTEWATER SYSTEM IMPROVEMENTS
ALTERNATIVE D: CONNECT TO EXISTING SANITARY SEWER SYSTEM

FIGURE 3-4

\\wwsvr5\drafting\Clients\Tyson Foods\7008-719 Dom WWS Improvements\020 Engineering Report\7008-719 Figure 3-4 Long-Term Alt D.dwg, 3-4, 10/1/2020 8:30:39 AM

Section 4.0 - Selected Alternative

4.1 Selected Alternative Overview

Tyson Fresh Meats, Inc. (Owner) selected to proceed with Alternative B - Land Treatment System for the domestic wastewater treatment and disposal. Alternative B - Land Treatment System presents the best value with the lowest life-cycle cost and second to lowest O&M burden and regulatory burden of all alternatives.

4.1.1 *Selected Alternative Scope*

Land treatment system improvements consist of approximately 3,500 feet of additional conveyance piping, a new headworks mechanical screen, lift station renovations, one 710,000 gallon aeration treatment wastewater lagoon, one 4.1 million gallon storage wastewater lagoon, a disinfection building utilizing gas chlorination, connection to existing center pivot irrigation system, and appurtenances. The total area disturbed will be approximately 3.5 acres with approximately 30,000 cubic yards of cut/fill earthwork (see Figure 4-1 for a proposed system flow diagram and hydraulic profile of the selected alternative). See Figure 4-2 for the proposed System site plan.

4.2 Design Criteria

4.2.1 *Design Wastewater Flow and Quality*

Pursuant with discussions with the Owner, the proposed domestic wastewater system will be sized to accommodate future Facility expansions that double the current domestic wastewater flow. Therefore, the design flow is defined as 26,000 gpd average daily and 60,000 gpd maximum daily flows. A 55 gpm flow is defined as the peak hourly flow by applying a factor of 5 to the average daily flow and converting to gallons per minute.

After proposed improvements are made, the System wastewater quality is estimated to generally be equal to typical untreated medium strength domestic wastewater. Nitrogen values are anticipated to be equal to high strength untreated domestic wastewater. These estimates are based on removing the existing septic system from the system and installing the headworks screen. Additional wastewater sampling and laboratory analysis, as required by a State Waste Discharge Permit daily monitoring report, will establish representative characterization of the actual wastewater quality.

A summary of the design domestic wastewater characteristics is presented in Table 4-1.

TABLE 4-1
Summary of Design Domestic Wastewater Characteristics

Characteristic[1,2]	Design System Values
Flow[3]	Maximum Daily: 60,000 gpd Average Daily: 26,000 gpd Peak: 55 gpm
COD, mg/L	500
BOD_5, mg/L	200
TSS, mg/L	195
Fecal Coliform, MPN[4] per 100 mg/L	100,000
OG, mg/L	76
Total Nitrogen[4], mg/L	70
Free Ammonia[4], mg/L	41
Organic Nitrogen[4], mg/L	29

[1]*Characteristic values from Wastewater Engineering: Treatment and Resource Recovery, 5th Edition, Metcalf & Eddy| AECOM, Table 3-18, Medium Strength Untreated Domestic Wastewater unless otherwise stated.*

[2]*mg/L = milligrams per liter; MPN = most probable number*

[3]*Flow values determined through conversations with Owner to accommodate Facility expansion*

[4]*Nitrogen values are estimated to be equal to high strength untreated domestic wastewater quality. Values from Wastewater Engineering: Treatment and Resource Recovery, 5th Edition, Metcalf & Eddy| AECOM, Table 3-18, High Strength Untreated Domestic Wastewater*

4.2.2 *Headworks Screening*

The new headworks screen will be a spiral wastewater screen mounted vertically in a manhole. Influent from the collection system will enter the screening manhole and be screened by a perforated plate screen. Screenings larger than the perforated plate screen orifices will be collected, and smaller particles will continue through the wastewater system. As the screen becomes obstructed by solids, flow is backed up and the water level within the screen rises. Once the water level reaches a threshold height detected by an ultrasonic level sensor, an automatic cleaning cycle is initiated. The cleaning cycle energizes a screw conveyor with a cleaning brush that transports screenings out of the system. Screenings are washed, compacted, and discharged into a chute and bagger attachment. The washed and compacted screenings are bagged and stored in a front load garbage container to await garbage collection and transport service to a local landfill. After the cleaning cycle, the improved flow through the screen allows the water level upstream of the screen to lower (see Figure 4-3 for the proposed headworks plan).

4.2.3 *Lift Station No. 1*

A lift station is required to transport screened effluent to the wastewater lagoons. The existing lift station will be renovated and named Lift Station No. 1. Renovations include replacing the internal pumps, rails, and controls, and moving the pump valves and flowmeter to an exterior vault. Figure 4-2 shows the location of the proposed lift station renovations near the existing septic tanks.

Lift Station No. 1 will utilize two submersible sewer pumps. Additional discussions with pump manufacturers are needed to select the optimum pumping system. General design criteria for Lift Station No. 1 is shown in Table 4-2.

TABLE 4-2
Summary of Lift Station No. 1 Design Criteria

Criterion	Value
Static Lift	70 feet
Total Dynamic Head	100 feet
Flow, Per Pump	1,000 gpm
Pressure Sewer Diameter	10 inch
Pressure Sewer Length	3,500 feet
Continuous Air Vacuum Relief Valves	1
Lift Station Operation	Duplex
Pump Motor Horsepower (hp)	50 hp
Standby Generator	None

A flowmeter will be included downstream of Lift Station No. 1 to measure daily wastewater flows. The flowmeter will be an in-line, electromagnetic flowmeter located in discharge piping downstream of the pumps. The force main from Lift Station No. 1 will be connected to the existing 10-inch pressure sewer proceeding parallel to Dodd Road and then crossing Dodd Road and eventually reaching the aerated treatment lagoon.

Hydrogen sulfide generation may occur in the force mains. The pressure sewer would contain approximately 14,300 gallons, leading to a force main detention time of approximately 13 hours when pumping at the average design flow. However, the pump station would only pump approximately 26 minutes daily and the rest of the day the pump station would be idle. Pumping at a slower rate for a longer duration would tend to keep the septage more fresh rather than sitting in the pipeline for such a long duration. This application seems to fit well with a variable frequency drive.

Moderate hydrogen sulfide generation can occur with a force main detention time of as little as 30 minutes. The primary concern associated with hydrogen sulfide is odor. No hydrogen sulfide controls should be necessary on the force main between Lift Station No. 1 and the lagoon site since the force main will terminate in a large, aerated reservoir (Cell No. 1) where dilution and aeration will act to control odors. However, hydrogen sulfide control may be needed at Lift Station No. 1 to control odors. Air injection and hydrogen peroxide injection control methods will be investigated for use at Lift Station No. 1. A final decision on the need for hydrogen sulfide control will be made at a later date.

4.3 Transmission Pressure Sewer Extension

The existing 10-inch PVC pressure sewer transmission line would be reused and extended along Dodd Road to the east until reaching the Lagoon Cell No. 1 inlet.

4.4 Wastewater Lagoons

The wastewater lagoons will consist of one aerated treatment cell and one storage cell. Both aerated and storage lagoon cells will be lined with an exposed 60 mil high density polyethylene (HDPE) flexible membrane to limit seepage. A minimum 2 feet of freeboard is required to prevent lagoon embankment overtopping. Figure 4-4 shows the proposed lagoon site layout.

4.4.1 *Lagoon Cell No. 1 - Aeration Treatment*

Raw wastewater from Lift Station No. 1 will first flow into Cell 1, a 0.4 acre, 710,000 gallon aerated lagoon, for stabilization. Aeration serves only to provide oxygen transfer adequate to oxidize BOD_5 prior to storage in Lagoon Cell No. 2. Lagoon piping will be included to allow for the isolation of the aerated lagoon from the flow path. Lagoon piping and transfer structures will also allow for a normal operating depth in the aerated lagoon of 10 feet, regardless of the water level in storage cell.

An aerated lagoon kinetic design model with winter and summer temperatures was developed and is included in Appendix H. The model is based on a partial mix aeration lagoon model from the Principles of Design and Operations of Wastewater Treatment Pond Systems for Plant Operators, Engineers, and Managers (Environmental Protection Agency, August 2011). The proposed system is a partial mix aerated lagoon having the similar first order kinetics to a complete mix system. It is acceptable to model the partial mix facultative lagoon as a complete mix lagoon by carefully choosing reaction rate coefficients (USEPA). The model indicates a single 10 horsepower surface aspirating aerator is sufficient to maintain a minimum 2 mg/L oxygen concentration during average flows.

4.4.2 *Lagoon Cell No. 2 - Storage*

Storage capacity is directly related to crop selection and land application timing. Daily temperatures, runoff, humidity, wind, and solar radiation all determine the conditions under which crops begin to grow and consume water. A monthly lagoon water balance, assessing site evaporation, precipitation, and required irrigation, is required to estimate required storage capacity for the existing domestic wastewater system.

Table 4-3 presents a water balance for a system with an average daily flow of 26,000 gallons per day. This water balance indicates that minimum 3.9 million gallons (MG) of operational storage capacity is required to store effluent over the non-irrigation season for this system. Using minimum outputs and maximum inputs, this water balance maximizes the water storage required and is a conservative design approach. The water balance shows irrigation beginning in March, which would be the most likely start date for irrigation. Depending on the weather, crop irrigation could be needed as early as February, but this early irrigation quantity is not considered significant for storage calculations.

TABLE 4-3
Water Balance

Month	Influent[1] (MG)	Precipitation[2]		Evaporation[3]		Seepage[4] (MG)	Irrigation[5]		Monthly Net Water Balance Volume (+/-) (MG)[6]	Year 1 Cumulative Storage Volume (MG)	Year 2 Cumulative Storage Volume (MG)
							Crop: Acreage:	Alfalfa 18.0			
		(In)	(MG)	(In)	(MG)		(In)	(MG)			
January	0.81	1.08	0.08	0.00	0.00	0.00	-	0.00	0.89	0.89	2.65
February	0.75	0.65	0.05	0.00	0.00	0.00	-	0.00	0.80	1.69	3.46
March	0.81	0.87	0.07	0.00	0.00	0.00	0.91	0.44	0.43	2.12	3.89
April	0.78	0.76	0.06	4.44	0.16	0.00	5.95	2.91	-2.23	0.00	1.65
May	0.81	0.86	0.07	6.10	0.22	0.00	9.25	4.52	-3.87	0.00	0.00
June	0.78	0.61	0.05	7.05	0.25	0.00	11.48	5.61	-5.04	0.00	0.00
July	0.81	0.20	0.01	8.07	0.29	0.00	14.31	6.99	-6.46	0.00	0.00
August	0.81	0.29	0.02	7.04	0.25	0.00	11.93	5.83	-5.26	0.00	0.00
September	0.78	0.31	0.02	4.44	0.16	0.00	7.34	3.59	-2.94	0.00	0.00
October	0.81	0.79	0.06	2.06	0.07	0.00	1.56	0.76	0.03	0.03	0.03
November	0.78	0.98	0.07	0.62	0.02	0.00	-	0.00	0.83	0.86	0.86
December	0.81	1.24	0.09	0.00	0.00	0.00	-	0.00	0.90	1.76	1.76
TOTALS	**9.52**	**8.65**	**0.66**	**39.82**	**1.44**	**0.00**	**55.86**	**30.66**	**-21.92**		

MG = million gallons

In = inches

Notes:

[1]Influent - Influent flows are projected monthly flows based on a 26,000 gpd average daily flow.

[2]Precipitation data from U.S. Bureau of Reclamation Agrimet Legrow, WA (LEGW) Water Station from 1989 to 2019.

[3]Evaporation data from pan evaporation data obtained from the WRCC for the Eltopia 8 Wsw station.

[4]Seepage - Lagoon seepage assumed to be 0.

[5]Evapotranspiration - Based on data from AgriMet at the Legrow, Washington station.

[6]Net Water Balance = Influent + Precipitation – Evaporation – Seepage – Irrigation. Negative water balance figures indicate a need for supplemental irrigation to maintain crop water demand.

4.4.1 *Wastewater Lagoon Design Criteria Summary*

Design criteria for the lagoon cells are listed in Table 4-4.

TABLE 4-4
Summary of Lagoon Cells Design Criteria

Criterion	Aerated Treatment Cell No. 1	Storage Cell No. 2
Surface Area	0.40 acre	1.1 acre
Volume	710,000 gallons	4.1 MG
Typical Operating Depth	10 feet	Varies
Interior Dike Height	12 feet	14 feet
Freeboard	2 feet	2 feet
Maximum Dike Height Above Native Ground	3.5 feet	7.5 Feet
Access Road Width	15 feet	15 feet
Detention Time	29 days @ 26,000 gpd 12.5 days @ 60,000 gpd	158 days @ 26,000 gpd 68 days @ 60,000 gpd
Aerator Type	Surface Aspirator	None
Aerator Horsepower (total)	10 hp	None
Number of Aerators	1	None
BOD_5 Removal	89% Summer 82% Winter	Minimal
Liner Type	Double 60 mil HDPE with Leachate Collection	Double 60 mil HDPE with Leachate Collection
Interior Dike Slope	3H:1V	3H:1V
Exterior Dike Slope	3H:1V	3H:1V

4.4.1 *Sludge Production and Handling*

The bottom 2 feet of the storage lagoon will designated as sludge storage. Sludge will be allowed to accumulate in the bottom of the lagoons for approximately 30 years. A Biosolids Management Plan will be developed and implemented at the time the lagoons are cleaned in the future. At that time the sludge volume will be estimated, quality testing and final determination will be made for utilization of the sludge. It is likely the sludge will be land applied in the Wallula area as a soil amendment. Options for digesting or composting sludge might also be feasible. However, the evaluation of sludge utilization should be performed at some future time after sludge has accumulated and can be evaluated in a future Biosolids Management Plan.

4.5 Disinfection System

Chlorination is considered as the only feasible option for disinfection. Sprayfield setback requirements were discussed for both disinfected lagoon effluent and non-disinfected lagoon effluent. The capital cost of a larger land application site for no disinfection, the cost of maintaining the oversized buffer land was not considered. The buffers must be maintained and greater operation costs are consequently required to maintain the larger land area for the expanded buffer.

The disinfection system will be a gas chlorination system sized to deliver a maximum capacity of 10 mg/L or 22 pounds of chlorine per day.

4.5.1 *Chlorine Contact Time*

A reaction time of approximately 1 hour is desired to ensure that the chlorine solution has adequate time for disinfection of the stabilized effluent. The flow rate to the pivot is designed at 180 gallons per minute (gpm). Therefore, the volume necessary for the chlorine contact time is 180 gpm x 60 minutes = 10,800 gallons.

An oversized pipe will provide the volume necessary to achieve the required chlorine contact time. This chlorine contact pipe will be located between the disinfection building and the irrigation center pivot. This chlorine contact pipe is estimated to be 12-inch diameter for a length of 2,000 feet. This pipe would be sloped at a constant downward slope to facilitate cleaning the contact pipe if a buildup of sludge occurred over time. It is unlikely that sludge will build up since the pipe would be drained annually and left empty during the winter months.

4.6 Land Treatment System

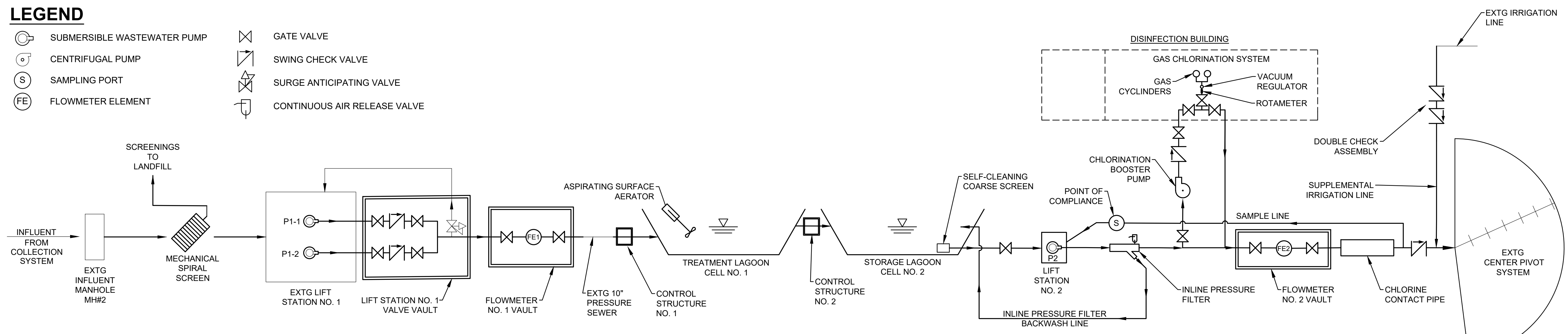
See Appendix I for a description and design criteria for the proposed land treatment system.

4.7 Permitting Next Steps

To proceed with Alternative B - Land Treatment System, a State Waste Discharge Permit application, Engineering Report, State Environmental Policy Act (SEPA) Checklist and environmental documentation, and fee are required to be submitted to the Washington State Department of Ecology. Permits from Walla Walla County are required as well. County Permit include a grading permit, building permit, stormwater construction permit, and Critical Area Permits.

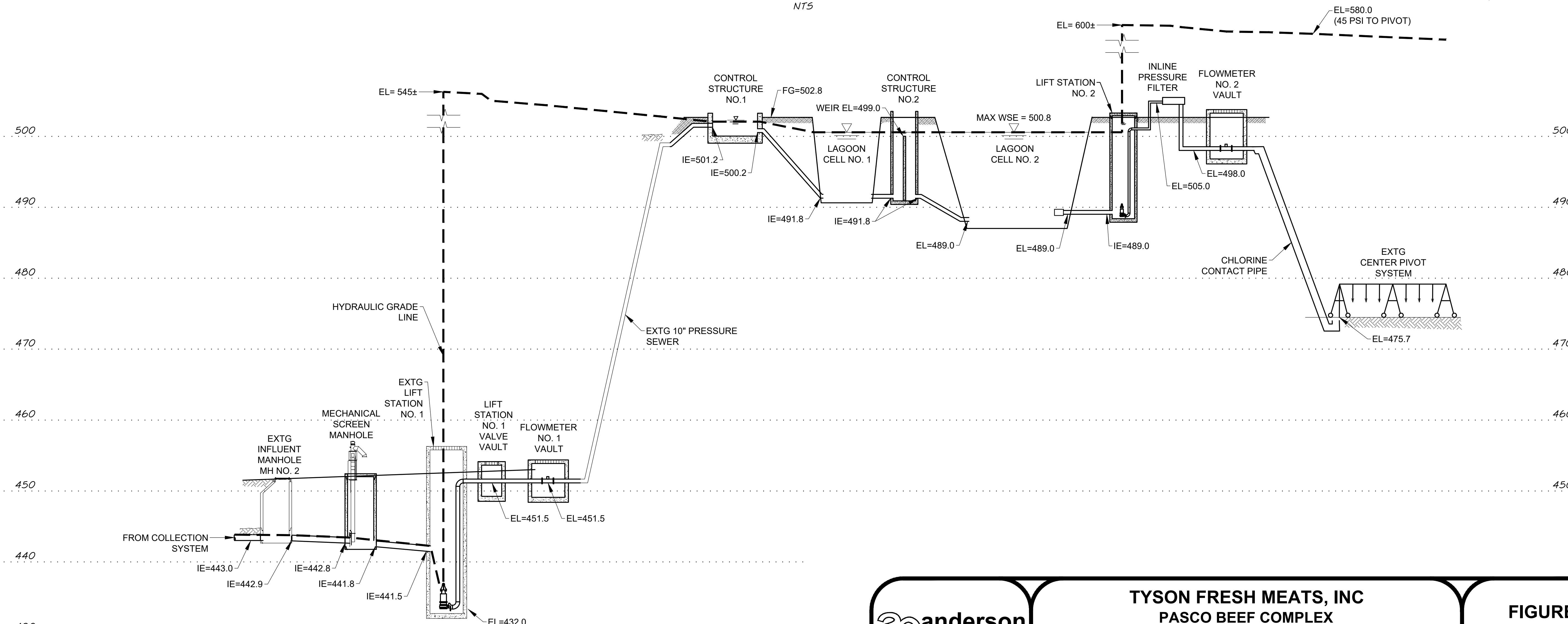
4.8 Staffing and Testing Requirements for the Facilities

Aerated lagoon systems with design flow less than 1 million gallons per day are classified as Class I wastewater treatment plants according to criteria found in Washington Administrative Code (WAC) 173-230-330, Table 4. The System will be simple to operate with periodic maintenance on three lift station pumps, aeration equipment, gas chlorination for disinfection, and irrigation pumps. The irrigation system will rotate automatically and will require periodic annual maintenance which may be provided by an irrigation equipment dealer. The minimum operator certification to operate the System shall be a Group I operator as defined by WAC 173-230-061. Shift work is not expected to be required.



SYSTEM FLOW DIAGRAM

NTS



HYDRAULIC PROFILE

NTS

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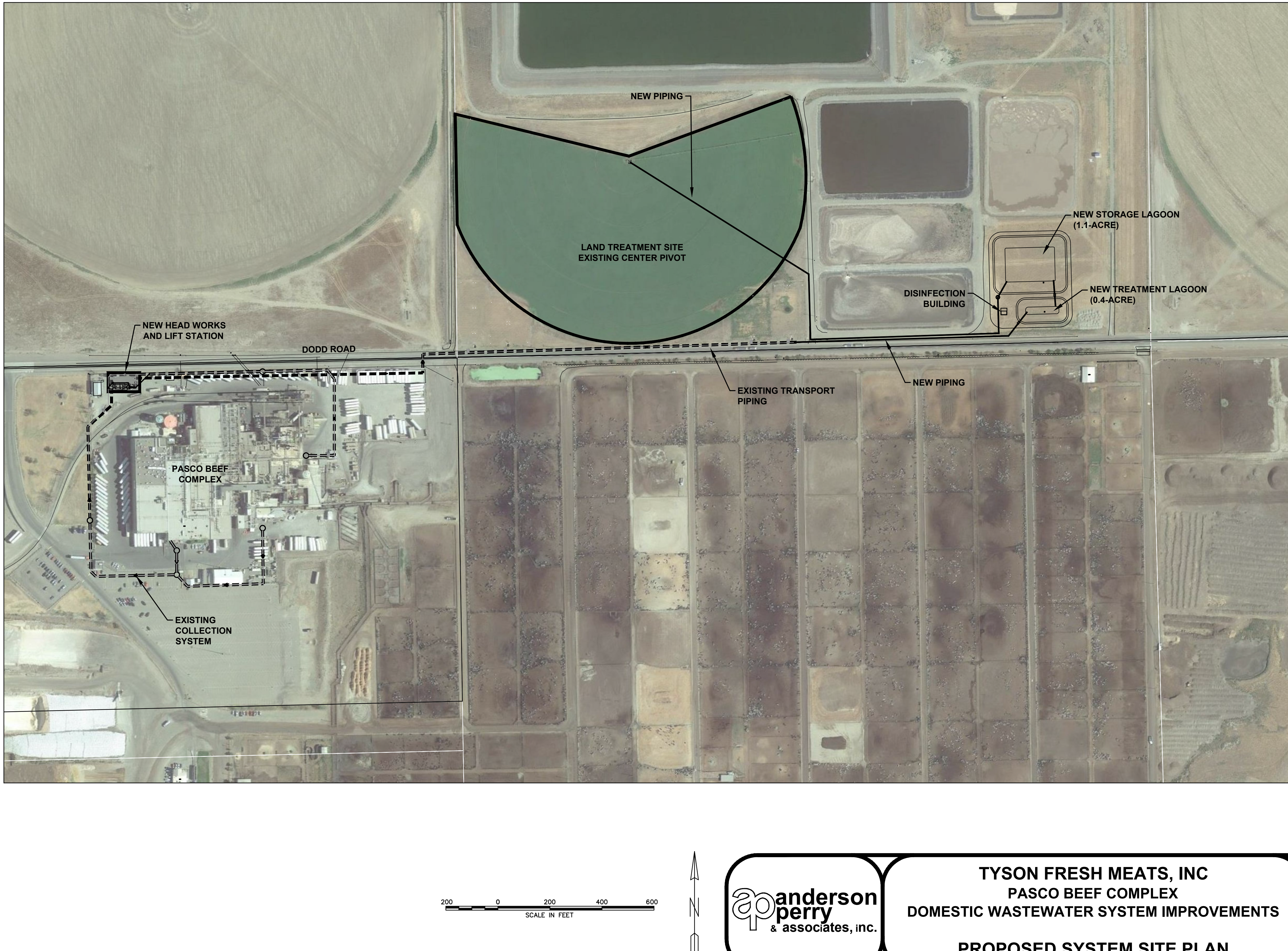
TYSON FRESH MEATS, INC

PASCO BEEF COMPLEX

DOMESTIC WASTEWATER SYSTEM IMPROVEMENTS

PROPOSED SYSTEM FLOW DIAGRAM AND HYDRAULIC PROFILE

FIGURE 4-1



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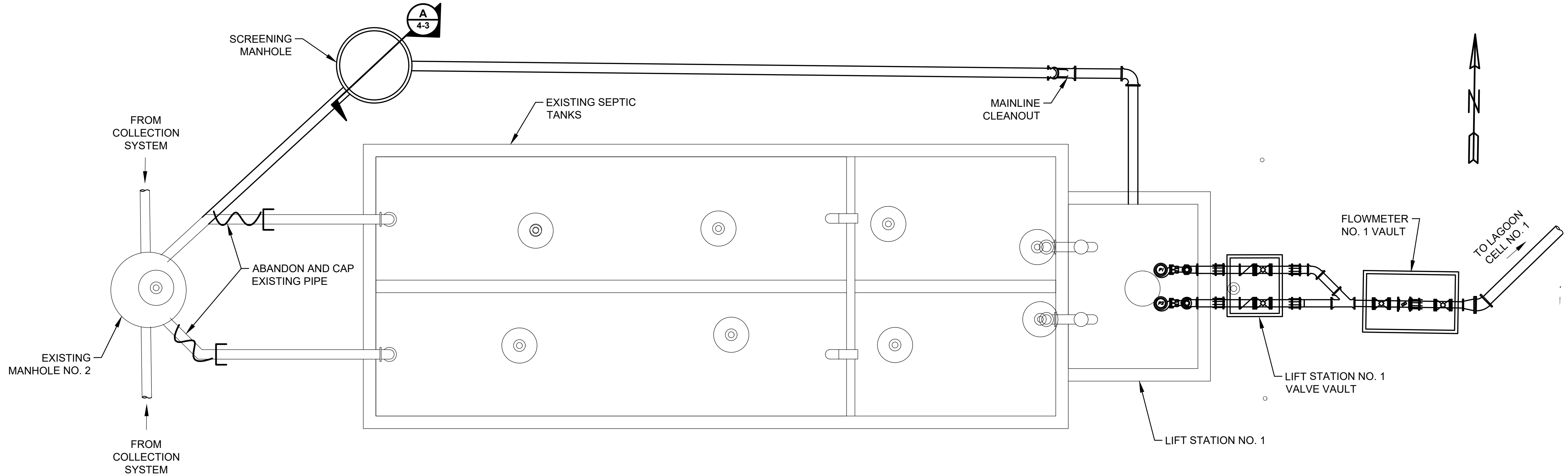
TYSON FRESH MEATS, INC
PASCO BEEF COMPLEX
DOMESTIC WASTEWATER SYSTEM IMPROVEMENTS

PROPOSED SYSTEM SITE PLAN

FIGURE 4-2

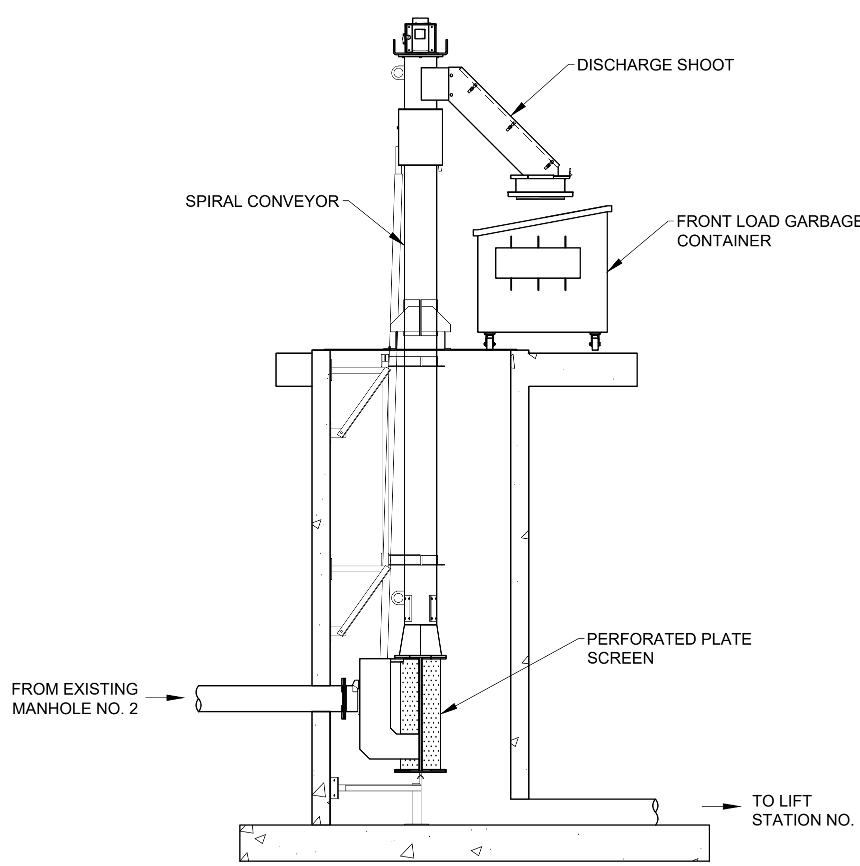
\\wwsvr5\drafting\Clients\Tyson Foods\7008-719 Dom WWS Improvements\020 Engineering Report\7008-719 Figure 4-2 Prop System Site.dwg, 4-2, 10/1/2020 8:31:07 AM



PLAN VIEW

5 0 5 10 15

SCALE IN FEET



A 4-3 **SECTION**

NTS

anderson perry & associates, inc.

TYSON FRESH MEATS, INC

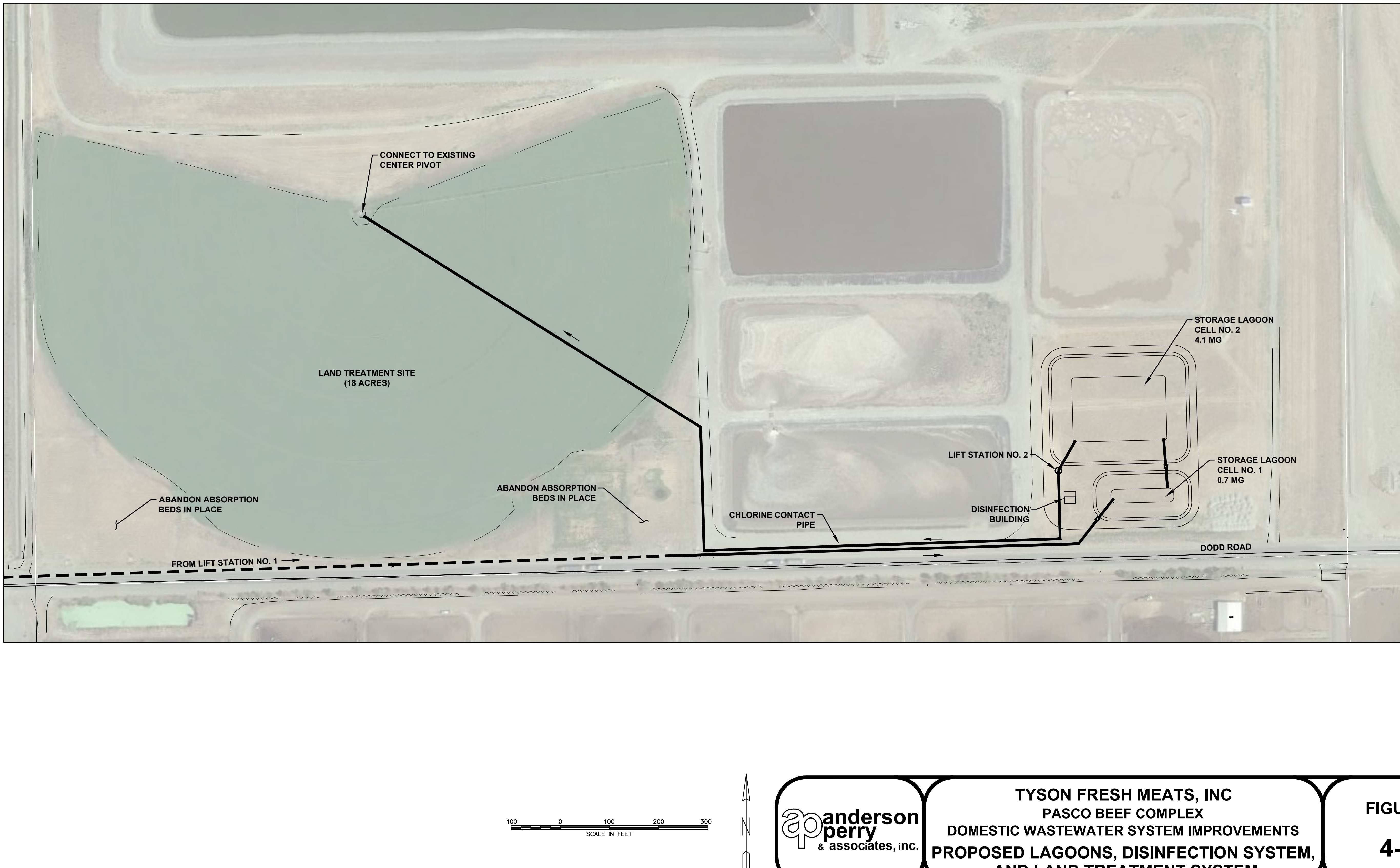
PASCO BEEF COMPLEX

DOMESTIC WASTEWATER SYSTEM IMPROVEMENTS

PROPOSED HEADWORKS

FIGURE

4-3



anderson perry & associates, inc.

TYSON FRESH MEATS, INC
PASCO BEEF COMPLEX
DOMESTIC WASTEWATER SYSTEM IMPROVEMENTS
PROPOSED LAGOONS, DISINFECTION SYSTEM, AND LAND TREATMENT SYSTEM

FIGURE 4-4

\\wwsvr5\drafting\Clients\Tyson Foods\7008-719 Dom WWS Improvements\020 Engineering Report\7008-719 Figure 4-4 Lagoons.dwg, 4-4, 10/1/2020 8:31:47 AM

APPENDIX A
Existing System As-Built Drawings and Operation and Maintenance Manual

ibp® INC.

SANITARY SEWER SEPARATION PROJECT

PROJECT TEAM

JIMMIE CHITTENDEN P.E.	IBP P.M.
LEE BACZWASKI	IBP, WALLULA CONTACT
BRUCE G. SCHWAN P.E.	SCM P.M.
EDWARD S. DeLORME	SCM TECHNICAL
STRATTON SURVEYING	MAPPING/SURVEYING

SHEETS INCLUDED

NOT IN PHASE TWO WORK

C1 – LOCATION / COVER
C2 – OVERALL LAYOUT
C3 – PROFILE STA.0+00–11+17
C4 – PROFILE STA.0+00–5+72
STA.0+00–1+20
C5 – PROFILE STA.0+00–12+53
C6 – PROFILE STA.11+72–25+00
C7 – PROFILE STA.25+00–37+33
C8 – SECTIONS
C9 – LIFT STATION DETAILS
C10 – ABSORPTION BED DETAILS
C11 – SECTIONS/DETAILS
E1 – ELECTRICAL
E2 – ELECTRICAL

GENERAL CONSTRUCTION NOTES

1. ALL WORK SHALL BE COORDINATED WITH IBP PLANT OFFICIAL TO MINIMIZE INTERRUPTIONS TO PRODUCTION, TRAFFIC, AND FREIGHT OPERATIONS.

2. ALL CONSTRUCTION SHALL BE IN ACCORDANCE WITH WASHINGTON STATE DEPARTMENT OF TRANSPORTATION – 1991 STANDARD SPECIFICATIONS FOR ROAD, BRIDGE, AND MUNICIPAL CONSTRUCTION: SECTIONS WHICH APPLY INCLUDE: 1–01; 2–09; 4–02; 5–04; 6–02; 7–05, 9, 10, 11, AND 12; 7–17 AND 19.

3. IN GENERAL, THIS PROJECT INCLUDES MAKING CONNECTION TO EXISTING SANITARY SEWERS JUST OUTSIDE THE EXISTING BUILDING WALLS; ROUTING OF GRAVITY PVC SANITARY SEWERS TO A LARGE CAPACITY SEPTIC TANK; PUMPING SEPTIC TANK EFFLUENT ~~IN A PVC FORCE MAIN TO REMOTELY LOCATED ABSORPTION BEDS.~~ CONSTRUCTION OF 3–50% CAPACITY ABSORPTION BED FACILITIES. CONTRACTOR SHALL DO TESTING AND DEMONSTRAT OPERATION OF THE ENTIRE SYSTEM USING CLEAN WATER. 2

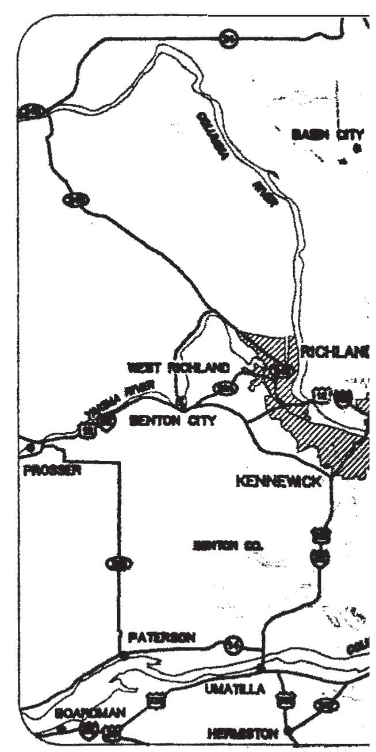
4. PRIOR TO MAKING FINAL CONNECTION TO EXISTING SANITARY SEWERS ON A SUNDAY PRODUCTION OUTAGE, CONTRACTOR SHALL VERIFY GRAVITY AND PRESSURE SEWER, PUMP, CONTROLS, AND ABSORPTION BED PIPING PERFORMANCE.

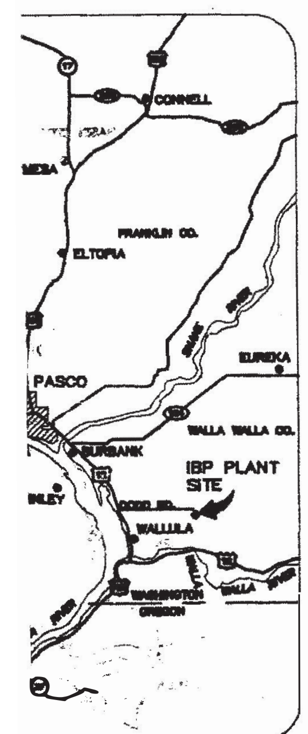
5. ALL EXISTING SURFACES, FENCES, SIGNS, ETC., SHALL BE RESTORED PRIOR TO COMPLETION OF CONSTRUCTION.

6. CONTRACTOR MUST COMPLY WITH ALL IBP SAFETY AND INSURANCE REQUIREMENTS. PROOF OF SUCH COMPLIANCE MUST BE FILED WITH IBP PRIOR TO BEGINNING WORK.

7. ALL AREAS OF WORK HAVE BEEN SURVEYED AND SUCH SURVEY DISTANCES HAVE BEEN SHOWN ON THESE PLANS, HOWEVER MINOR VARIANCES IN DISTANCES OF ACTUAL PIPE INSTALLATION SHALL BE ______________ TO THE TOTAL PROJECT.

8. THE CONTRACTOR WILL BE REQUIRED TO PROVIDE ALL SURVEYING FOR THE INSTALLATION OF THE SEWER MAIN. 1





CALL 2 WORKING DAYS
BEFORE YOU DIG
1–800–332–2344

ALL UNDERGROUND UTILITIES AND STRUCTURES ARE NOT SHOWN. THE LOCATION OF THOSE SHOWN ARE APPROXIMATE. THE CONTRACTOR IS RESPONSIBLE TO FIELD VERIFY BOTH UNDERGROUND & ABOVEGROUND EXISTING CONDITIONS. NOTIFY A/E FOR RESOLUTION & MAKE MINOR CHANGES TO NEW CONSTRUCTION AT NO COST TO OWNER.

BRUCE G. SCHWAN
STATE OF WASHINGTON
PROFESSIONAL ENGINEER
EXPIRES 1/2/

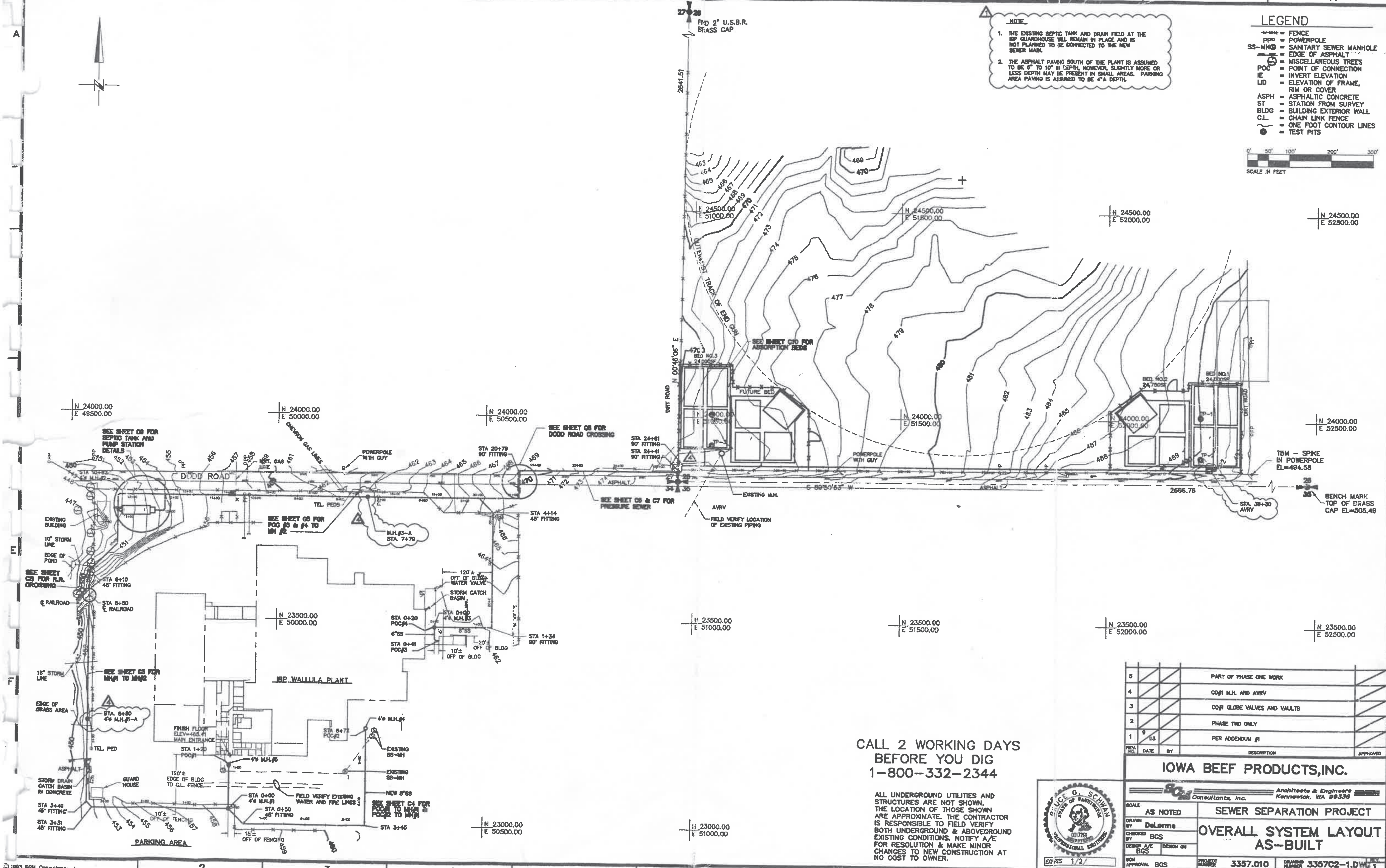
REV. NO.	DATE	BY	DESCRIPTION	APPROVED
5			PART OF PHASE ONE WORK	
4			CO#1 M.H. AND AVRV	
3			CO#1 GLOBE VALVES AND VAULTS	
2			PHASE TWO ONLY	
1	9/93		PER ADDENDUM #1	

IOWA BEEF PRODUCTS, INC.

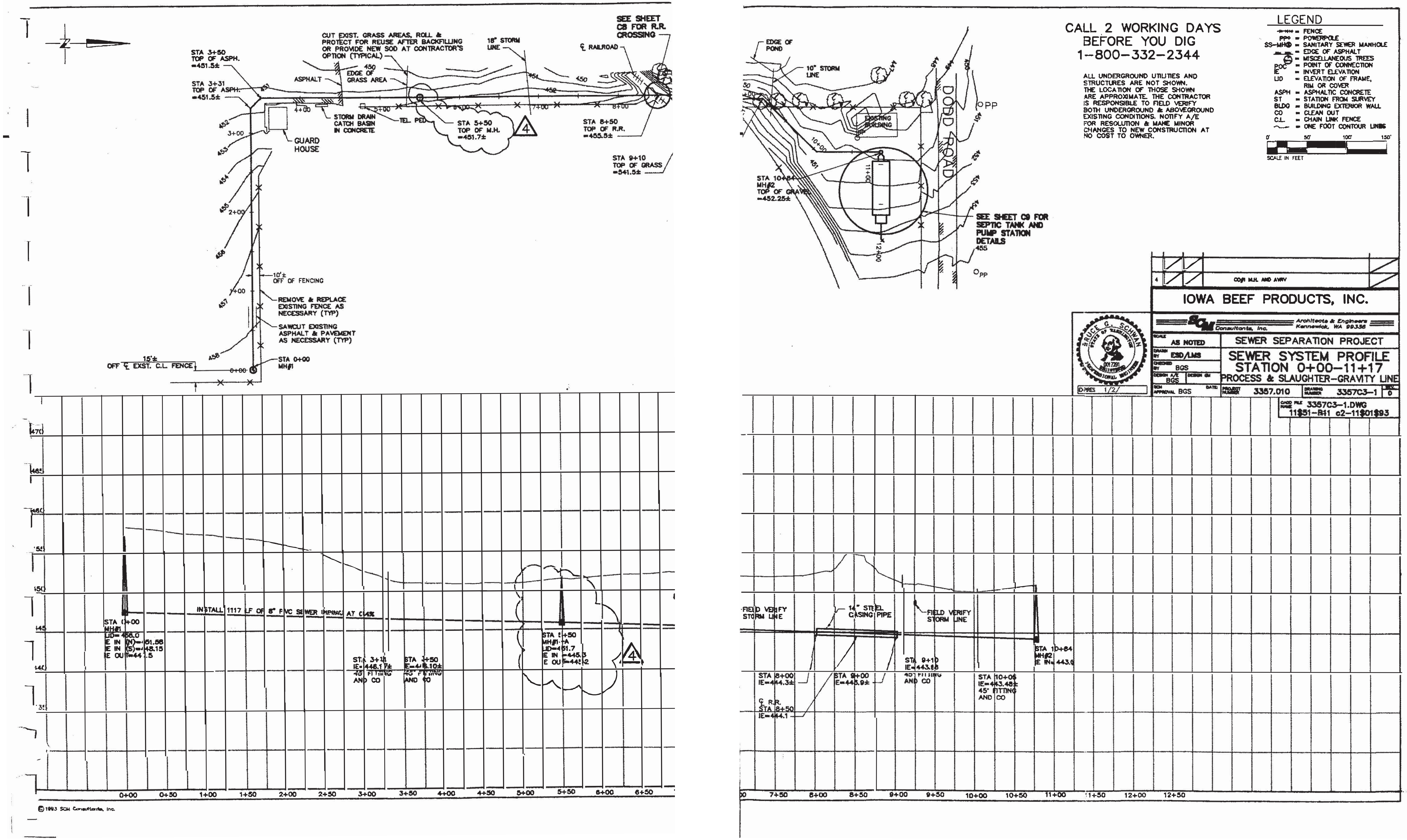
SCM Consultants, inc. Architects & Engineers Kennewick, WA 99336

SCALE NOT TO SCALE	SEWER SEPARATION PROJECT
DRAWN BY DeLorme	LOCATION / COVER
CHECKED BY BGS	
DESIGN A/E BGS	
SCM APPROVAL BGS	PROJECT NUMBER 3357.010 / DRAWING NUMBER 3357C1

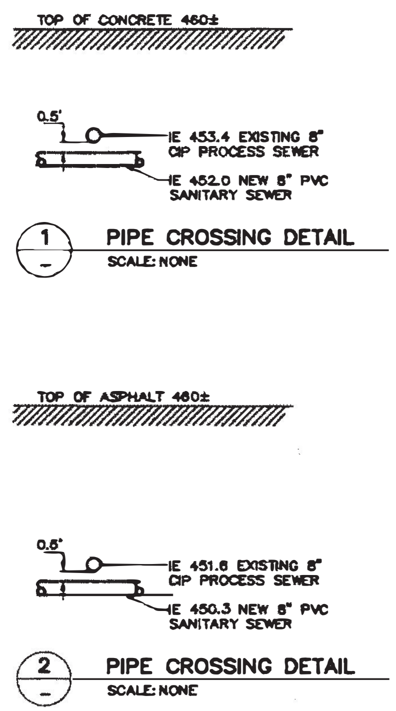
CADD FILE NAME 3357C1.DWG

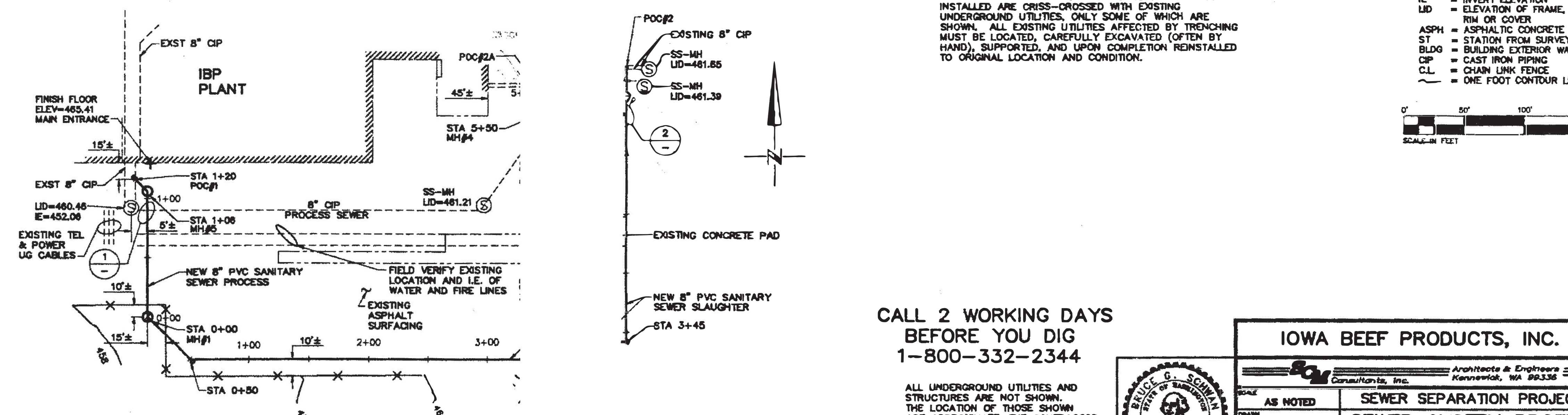


NOTE
1. THE EXISTING SEPTIC TANK AND DRAIN FIELD AT THE IBP GUARDHOUSE WILL REMAIN IN PLACE AND IS NOT PLANNED TO BE CONNECTED TO THE NEW SEWER MAIN.
2. THE ASPHALT PAVING SOUTH OF THE PLANT IS ASSUMED TO BE 6" TO 10" IN DEPTH, HOWEVER, SLIGHTLY MORE OR LESS DEPTH MAY BE PRESENT IN SMALL AREAS. PARKING AREA PAVING IS ASSUMED TO BE 4"± DEPTH.
LEGEND
= FENCE
PP = POWERPOLE
SS-MH = SANITARY SEWER MANHOLE
= EDGE OF ASPHALT
= MISCELLANEOUS TREES
POC = POINT OF CONNECTION
IE = INVERT ELEVATION
LID = ELEVATION OF FRAME, RIM OR COVER
ASPH = ASPHALTIC CONCRETE
ST = STATION FROM SURVEY
BLDG = BUILDING EXTERIOR WALL
C.L. = CHAIN LINK FENCE
= ONE FOOT CONTOUR LINES
= TEST PITS
0' 50' 100' 200' 300'
SCALE IN FEET
FND 2" U.S.B.R. BRASS CAP
SEE SHEET C10 FOR ABSORPTION BEDS
BED NO.3 24,000SF
FUTURE BED
BED NO.2 24,750SF
BED NO.1 24,000SF
DIRT ROAD
N 00°46'06" E
S 89°50'53" W
2641.51
2666.76
TBM - SPIKE IN POWERPOLE EL=494.58
BENCH MARK TOP OF BRASS CAP EL=505.49
STA. 36+30 AVRV
EXISTING M.H.
AVRV
FIELD VERIFY LOCATION OF EXISTING PIPING
SEE SHEET C6 & C7 FOR PRESSURE SEWER
SEE SHEET C8 FOR DODD ROAD CROSSING
STA 20+79 90° FITTING
STA 24+61 90° FITTING
STA 24+41 90° FITTING
STA 4+14 45° FITTING
SEE SHEET C9 FOR SEPTIC TANK AND PUMP STATION DETAILS
DODD ROAD
CHEVRON GAS LINES
POWERPOLE WITH GUY
TEL. PEDS
SEE SHEET C5 FOR POC #3 & #4 TO MH #2
M.H.#3-A STA. 7+70
EXISTING BUILDING
10" STORM LINE
EDGE OF POND
SEE SHEET C8 FOR R.R. CROSSING
STA 9+10 45° FITTING
℄ RAILROAD
STA 8+50 ℄ RAILROAD
18" STORM LINE
SEE SHEET C3 FOR MH#1 TO MH#2
EDGE OF GRASS AREA
STA. 5+50 4'ø M.H.#1-A
TEL. PED
ASPHALT
STORM DRAIN CATCH BASIN IN CONCRETE
STA 3+49 45° FITTING
STA 3+31 45° FITTING
GUARD HOUSE
PARKING AREA
IBP WALLULA PLANT
FINISH FLOOR ELEV=465.41 MAIN ENTRANCE
STA 1+20 POC#1
4'ø M.H.#5
120'± EDGE OF BLDG TO C.L. FENCE
STA 0+00 4'ø M.H.#1
STA 0+50 45° FITTING
FIELD VERIFY EXISTING WATER AND FIRE LINES
10'± OFF OF FENCING
15'± OFF OF FENCING
STA 5+72 POC#2
4'ø M.H.#4
EXISTING SS-MH
NEW 8"SS
SEE SHEET C4 FOR POC#1 TO MH#1 & POC#2 TO MH#1
STA 3+45
120'± OFF OF BLDG
WATER VALVE
STORM CATCH BASIN
STA 0+00 4'ø M.H.#3
STA 0+20 POC#4
6"SS
8"SS
STA 0+41 POC#3
20'± OFF OF BLDG
10'± OFF OF BLDG
STA 1+34 90° FITTING
N 24000.00 E 49500.00
N 24000.00 E 50000.00
N 24000.00 E 50500.00
N 24000.00 E 51000.00
N 24000.00 E 51500.00
N 24000.00 E 52000.00
N 24000.00 E 52500.00
N 24500.00 E 51000.00
N 24500.00 E 51500.00
N 24500.00 E 52000.00
N 24500.00 E 52500.00
N 23500.00 E 50000.00
N 23500.00 E 51000.00
N 23500.00 E 51500.00
N 23500.00 E 52000.00
N 23500.00 E 52500.00
N 23000.00 E 50500.00
N 23000.00 E 51000.00
CALL 2 WORKING DAYS BEFORE YOU DIG 1-800-332-2344
ALL UNDERGROUND UTILITIES AND STRUCTURES ARE NOT SHOWN. THE LOCATION OF THOSE SHOWN ARE APPROXIMATE. THE CONTRACTOR IS RESPONSIBLE TO FIELD VERIFY BOTH UNDERGROUND & ABOVEGROUND EXISTING CONDITIONS. NOTIFY A/E FOR RESOLUTION & MAKE MINOR CHANGES TO NEW CONSTRUCTION AT NO COST TO OWNER.
5 PART OF PHASE ONE WORK
4 CO#1 M.H. AND AVRV
3 CO#1 GLOBE VALVES AND VAULTS
2 PHASE TWO ONLY
1 9/93 PER ADDENDUM #1
REV. NO. DATE BY DESCRIPTION APPROVED
IOWA BEEF PRODUCTS,INC.
SCM Consultants, Inc. Architects & Engineers Kennewick, WA 99336
BRUCE G. SCHWAN STATE OF WASHINGTON PROFESSIONAL ENGINEER
EXPIRES 1/2/
SCALE AS NOTED
DRAWN BY DeLorme
CHECKED BY BGS
DESIGN A/E BGS
SCM APPROVAL BGS
SEWER SEPARATION PROJECT
OVERALL SYSTEM LAYOUT AS-BUILT
PROJECT NUMBER 3357.010
DRAWING NUMBER 3357C2-1.DWG
CADD FILE NAME 3357C2-1.DWG



SEE SHEET C8 FOR R.R. CROSSING
STA 3+50 TOP OF ASPH. =451.5±
STA 3+31 TOP OF ASPH. =451.5±
CUT EXIST. GRASS AREAS, ROLL & PROTECT FOR REUSE AFTER BACKFILLING OR PROVIDE NEW SOD AT CONTRACTOR'S OPTION (TYPICAL)
18" STORM LINE
℄ RAILROAD
ASPHALT
EDGE OF GRASS AREA
STORM DRAIN CATCH BASIN IN CONCRETE
TEL. PED.
GUARD HOUSE
STA 5+50 TOP OF M.H. =451.7±
STA 8+50 TOP OF R.R. =455.5±
STA 9+10 TOP OF GRASS =541.5±
10'± OFF OF FENCING
REMOVE & REPLACE EXISTING FENCE AS NECESSARY (TYP)
SAWCUT EXISTING ASPHALT & PAVEMENT AS NECESSARY (TYP)
STA 0+00 MH#1
15'± OFF ℄ EXST. C.L. FENCE
INSTALL 1117 LF OF 8" PVC SEWER PIPING AT 0.4%
STA 0+00 MH#1 LID=456.0 IE IN (N)=451.56 IE IN (S)=448.15 IE OUT=441.5
STA 3+31 IE=446.17± 45 FITTING AND CO
STA 3+50 IE=446.10± 45 FITTING AND CO
STA 5+50 MH#1-A LID=451.7 IE IN =445.3 IE OUT=445.2
0+00 0+50 1+00 1+50 2+00 2+50 3+00 3+50 4+00 4+50 5+00 5+50 6+00 6+50
© 1993 SCM Consultants, Inc.
EDGE OF POND
10" STORM LINE
EXISTING BUILDING
DODD ROAD
PP
STA 10+84 MH#2 TOP OF GRAVEL =452.25±
SEE SHEET C9 FOR SEPTIC TANK AND PUMP STATION DETAILS
CALL 2 WORKING DAYS BEFORE YOU DIG
1-800-332-2344
ALL UNDERGROUND UTILITIES AND STRUCTURES ARE NOT SHOWN. THE LOCATION OF THOSE SHOWN ARE APPROXIMATE. THE CONTRACTOR IS RESPONSIBLE TO FIELD VERIFY BOTH UNDERGROUND & ABOVEGROUND EXISTING CONDITIONS. NOTIFY A/E FOR RESOLUTION & MAKE MINOR CHANGES TO NEW CONSTRUCTION AT NO COST TO OWNER.
LEGEND
= FENCE
PP = POWERPOLE
SS-MH = SANITARY SEWER MANHOLE
= EDGE OF ASPHALT
= MISCELLANEOUS TREES
POC = POINT OF CONNECTION
IE = INVERT ELEVATION
LID = ELEVATION OF FRAME, RIM OR COVER
ASPH = ASPHALTIC CONCRETE
ST = STATION FROM SURVEY
BLDG = BUILDING EXTERIOR WALL
CO = CLEAN OUT
C.L. = CHAIN LINK FENCE
= ONE FOOT CONTOUR LINES
SCALE IN FEET
4 CO@ M.H. AND AWRV
IOWA BEEF PRODUCTS, INC.
SCM Consultants, Inc. Architects & Engineers Kennewick, WA 99336
AS NOTED
SEWER SEPARATION PROJECT
SEWER SYSTEM PROFILE STATION 0+00-11+17
PROCESS & SLAUGHTER-GRAVITY LINE
DRAWN BY ESD/LMS
CHECKED BY BGS
DESIGN A/E BGS
APPROVAL BGS
PROJECT NUMBER 3357.010
DRAWING NUMBER 3357C3-1
CADD FILE NAME 3357C3-1.DWG
BRUCE G. SCHWAN STATE OF WASHINGTON REGISTERED PROFESSIONAL ENGINEER
FIELD VERIFY STORM LINE
14" STEEL CASING PIPE
STA 10+84 MH#2 IE IN= 443.0
STA 8+00 IE=444.3±
STA 9+00 IE=443.9±
STA 9+10 IE=443.88 45 FITTING AND CO
STA 10+06 IE=443.48± 45° FITTING AND CO
℄ R.R. STA 8+50 IE=444.1
7+50 8+00 8+50 9+00 9+50 10+00 10+50 11+00 11+50 12+00 12+50





SPECIAL NOTE:
THE AREAS IN WHICH THESE NEW SEWERS ARE TO BE INSTALLED ARE CRISS-CROSSED WITH EXISTING UNDERGROUND UTILITIES. ONLY SOME OF WHICH ARE SHOWN. ALL EXISTING UTILITIES AFFECTED BY TRENCHING MUST BE LOCATED, CAREFULLY EXCAVATED (OFTEN BY HAND), SUPPORTED, AND UPON COMPLETION REINSTALLED TO ORIGINAL LOCATION AND CONDITION.

LEGEND

- FENCE
- PP = POWERPOLE
- SS-MH = SANITARY SEWER MANHOLE
- = EDGE OF ASPHALT
- = MISCELLANEOUS TREES
- POC = POINT OF CONNECTION
- IE = INVERT ELEVATION
- LID = ELEVATION OF FRAME, RIM OR COVER
- ASPH = ASPHALTIC CONCRETE
- ST = STATION FROM SURVEY
- BLDG = BUILDING EXTERIOR WALL
- CIP = CAST IRON PIPING
- C.L. = CHAIN LINK FENCE
- = ONE FOOT CONTOUR LINES

0' 50' 100' 150'
SCALE IN FEET

CALL 2 WORKING DAYS
BEFORE YOU DIG
1-800-332-2344

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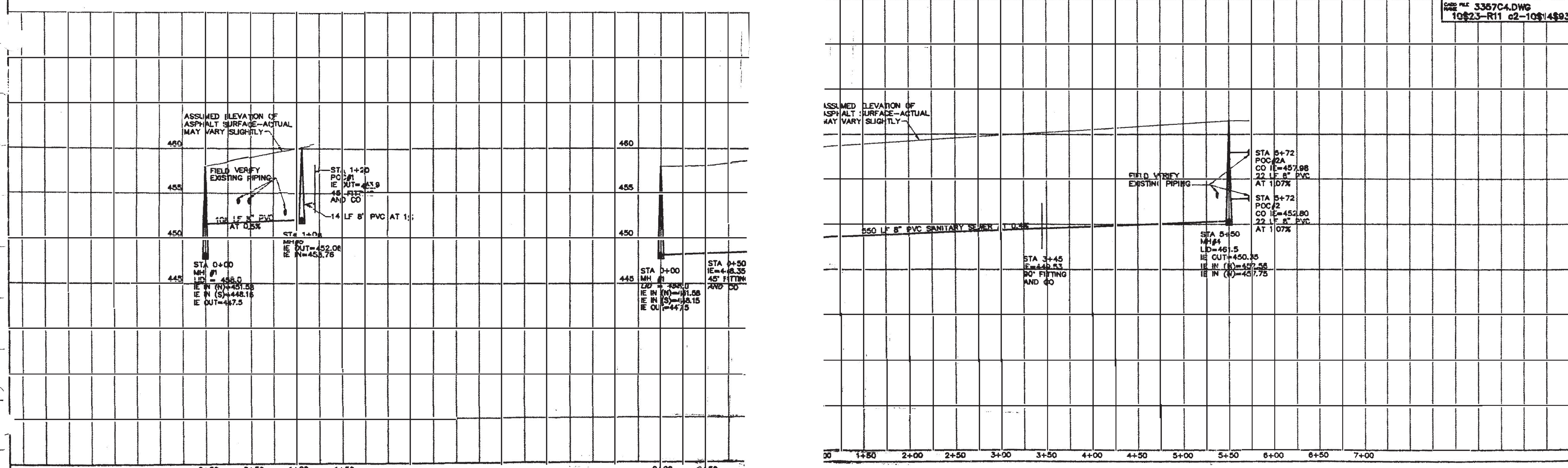
BRUCE G. SCHMAN, STATE OF WASHINGTON, PROFESSIONAL ENGINEER
EXPIRES 1/2/

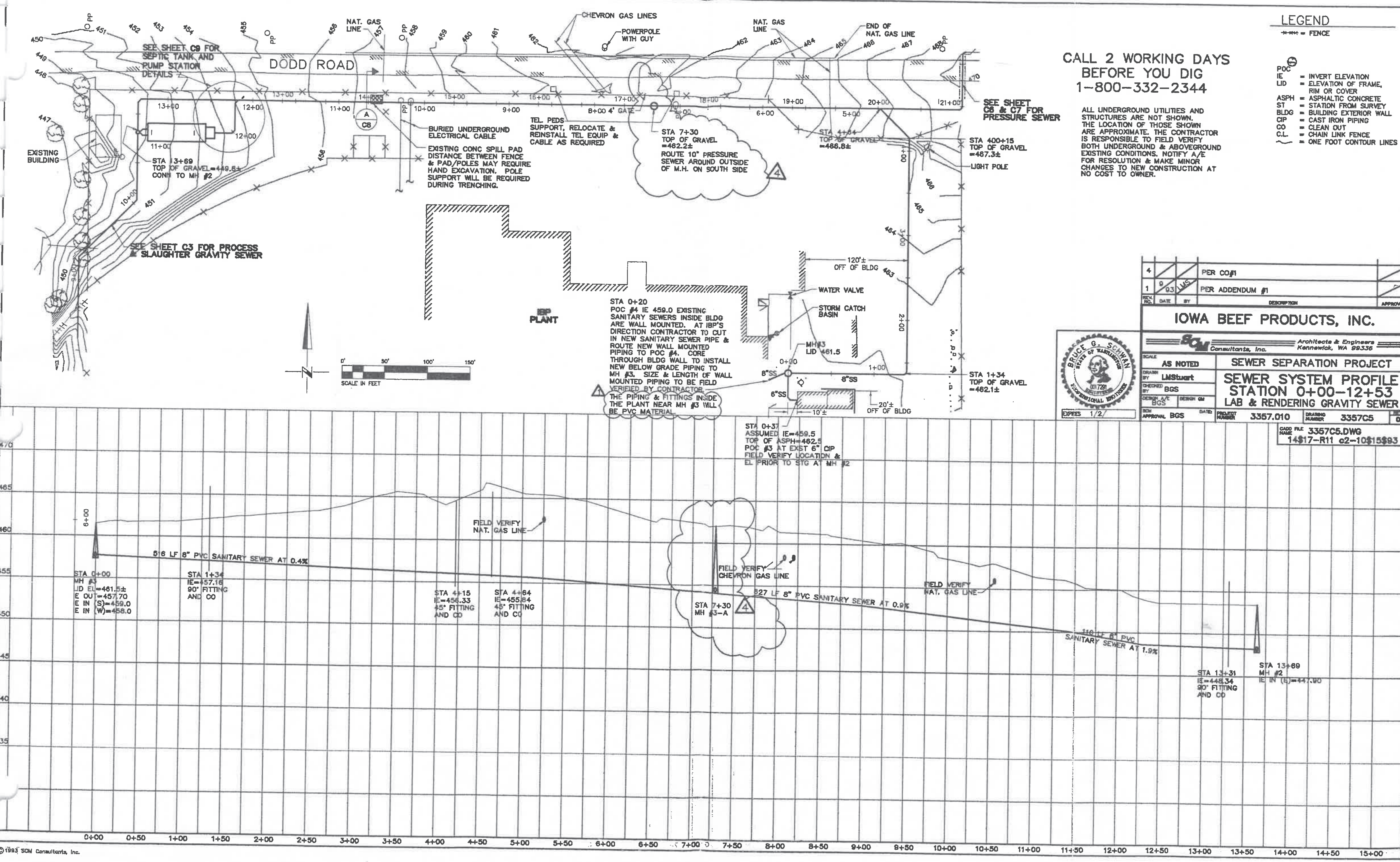
IOWA BEEF PRODUCTS, INC.

SCM Consultants, Inc. Architects & Engineers Kennewick, WA 99336

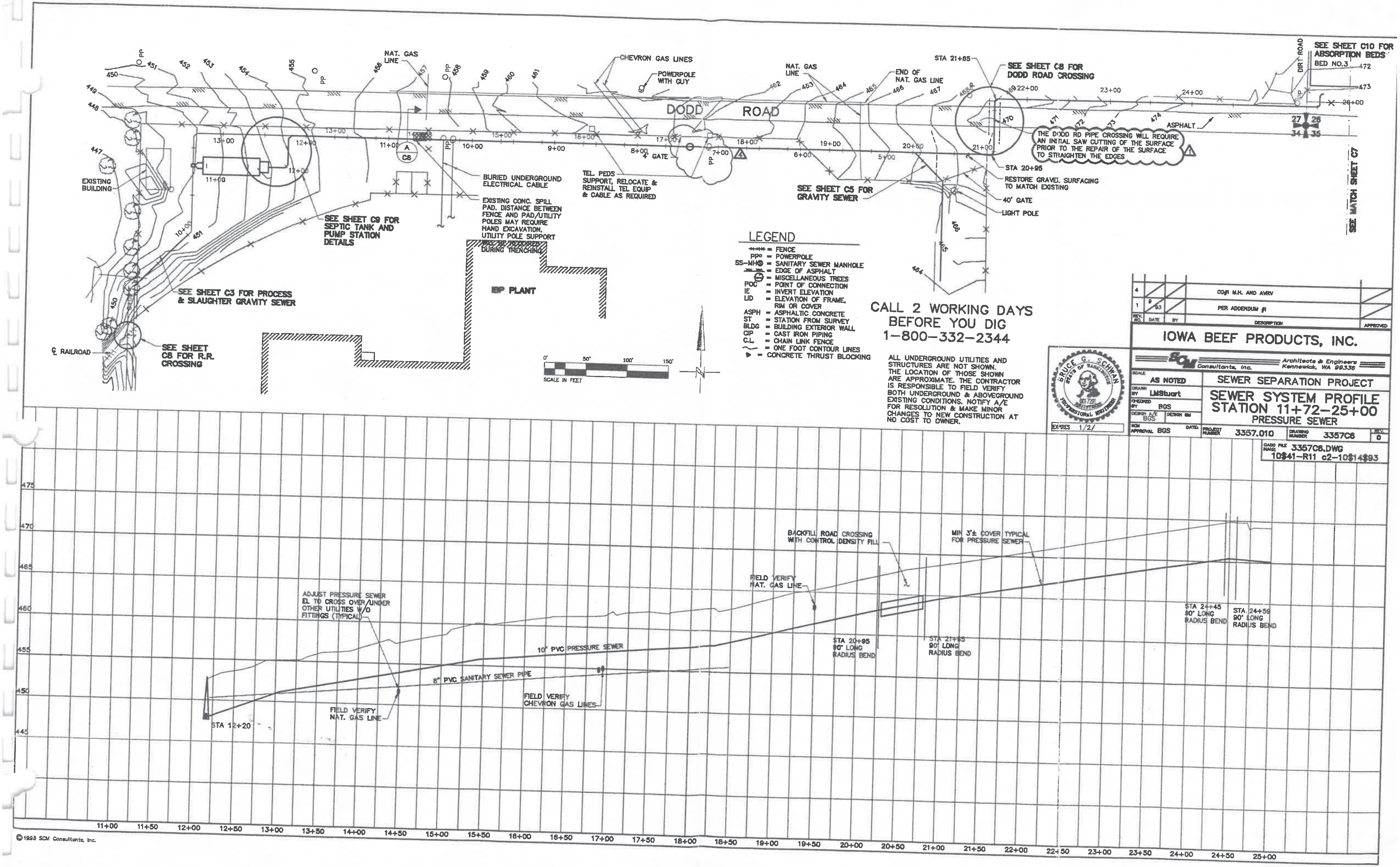
SCALE: AS NOTED	SEWER SEPARATION PROJECT
DRAWN BY: ESD/LMS	SEWER SYSTEM PROFILE STATION 0+00–5+72 GRAVITY SEWER 1.06.1
CHECKED BY: BGS	
DESIGN A/E: BGS	
SCM APPROVAL: BGS	PROJECT NUMBER: 3357.010 · DRAWING NUMBER: 3357C4 · REV: 0

CADD FILE NAME 3357C4.DWG
10$23-R11 c2-10$14$93

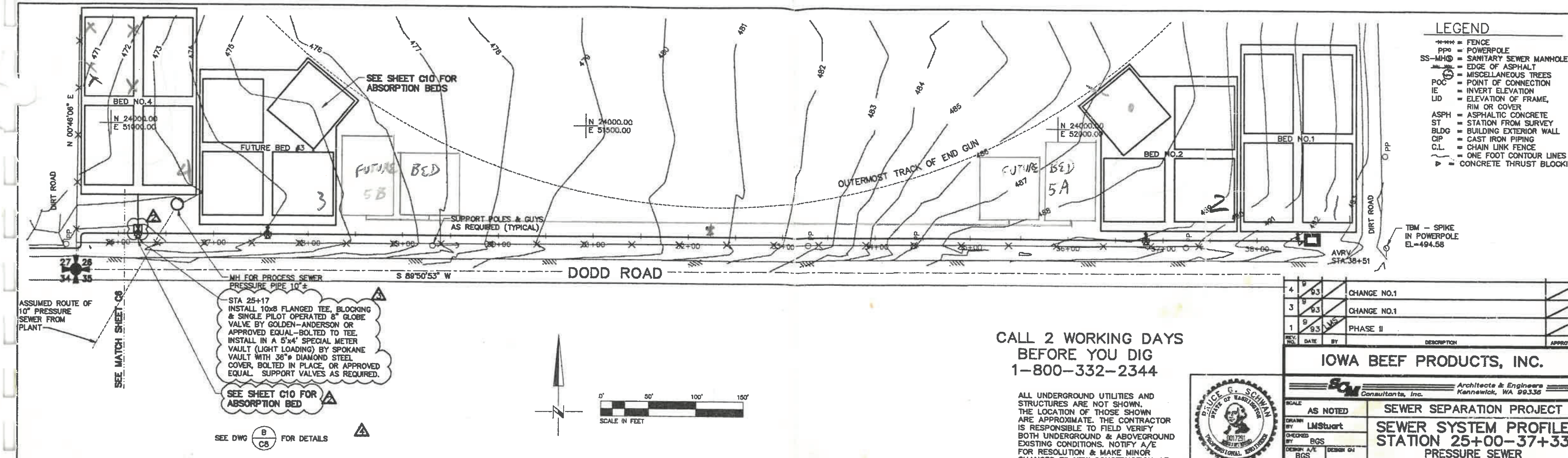




DODD ROAD
SEE SHEET C9 FOR SEPTIC TANK AND PUMP STATION DETAILS
EXISTING BUILDING
STA 13+69 TOP OF GRAVEL=449.8± CONN TO MH #2
SEE SHEET C3 FOR PROCESS & SLAUGHTER GRAVITY SEWER
NAT. GAS LINE
CHEVRON GAS LINES
POWERPOLE WITH GUY
BURIED UNDERGROUND ELECTRICAL CABLE
EXISTING CONC SPILL PAD DISTANCE BETWEEN FENCE & PAD/POLES MAY REQUIRE HAND EXCAVATION. POLE SUPPORT WILL BE REQUIRED DURING TRENCHING.
TEL PEDS SUPPORT, RELOCATE & REINSTALL TEL EQUIP & CABLE AS REQUIRED
8+00 4' GATE
STA 7+30 TOP OF GRAVEL =462.2± ROUTE 10" PRESSURE SEWER AROUND OUTSIDE OF M.H. ON SOUTH SIDE
END OF NAT. GAS LINE
STA 4+64 TOP OF GRAVEL =466.8±
SEE SHEET C6 & C7 FOR PRESSURE SEWER
STA 400+15 TOP OF GRAVEL =467.3±
LIGHT POLE
IBP PLANT
120'± OFF OF BLDG
WATER VALVE
STORM CATCH BASIN
MH #3 LID 461.5
STA 0+20 POC #4 IE 459.0 EXISTING SANITARY SEWERS INSIDE BLDG ARE WALL MOUNTED. AT IBP'S DIRECTION CONTRACTOR TO CUT IN NEW SANITARY SEWER PIPE & ROUTE NEW WALL MOUNTED PIPING TO POC #4. CORE THROUGH BLDG WALL TO INSTALL NEW BELOW GRADE PIPING TO MH #3. SIZE & LENGTH OF WALL MOUNTED PIPING TO BE FIELD VERIFIED BY CONTRACTOR.
THE PIPING & FITTINGS INSIDE THE PLANT NEAR MH #3 WILL BE PVC MATERIAL.
8"SS
6"SS
10'±
20'± OFF OF BLDG
STA 1+34 TOP OF GRAVEL =462.1±
STA 0+37 ASSUMED IE=459.5 TOP OF ASPH=462.5 POC #3 AT EXST 6" CIP FIELD VERIFY LOCATION & EL PRIOR TO STG AT MH #2
SCALE IN FEET
CALL 2 WORKING DAYS BEFORE YOU DIG 1-800-332-2344
ALL UNDERGROUND UTILITIES AND STRUCTURES ARE NOT SHOWN. THE LOCATION OF THOSE SHOWN ARE APPROXIMATE. THE CONTRACTOR IS RESPONSIBLE TO FIELD VERIFY BOTH UNDERGROUND & ABOVEGROUND EXISTING CONDITIONS. NOTIFY A/E FOR RESOLUTION & MAKE MINOR CHANGES TO NEW CONSTRUCTION AT NO COST TO OWNER.
LEGEND
= FENCE
POC
IE = INVERT ELEVATION
LID = ELEVATION OF FRAME, RIM OR COVER
ASPH = ASPHALTIC CONCRETE
ST = STATION FROM SURVEY
BLDG = BUILDING EXTERIOR WALL
CIP = CAST IRON PIPING
CO = CLEAN OUT
C.L. = CHAIN LINK FENCE
= ONE FOOT CONTOUR LINES
4 PER CO#1
1 9/93 LMS PER ADDENDUM #1
REV. NO. DATE BY DESCRIPTION APPROVED
IOWA BEEF PRODUCTS, INC.
SCM Consultants, Inc. Architects & Engineers Kennewick, WA 99336
BRUCE G. SCHWAN STATE OF WASHINGTON REGISTERED PROFESSIONAL ENGINEER
EXPIRES 1/2/
SCALE AS NOTED
DRAWN BY LMStuart
CHECKED BY BGS
DESIGN A/E BGS
DESIGN GM
SCM APPROVAL BGS
SEWER SEPARATION PROJECT
SEWER SYSTEM PROFILE STATION 0+00-12+53 LAB & RENDERING GRAVITY SEWER
PROJECT NUMBER 3357.010
DRAWING NUMBER 3357C5
REV. 0
CADD FILE NAME 3357C5.DWG
14$17-R11 c2-10$15$93
516 LF 8" PVC SANITARY SEWER AT 0.4%
STA 0+00 MH #3 LID EL=461.5± IE OUT=457.70 IE IN (S)=459.0 IE IN (W)=458.0
STA 1+34 IE=457.16 90° FITTING AND CO
STA 4+15 IE=456.33 45° FITTING AND CO
STA 4+64 IE=455.84 45° FITTING AND CO
FIELD VERIFY NAT. GAS LINE
FIELD VERIFY CHEVRON GAS LINE
STA 7+30 MH #3-A
327 LF 8" PVC SANITARY SEWER AT 0.9%
FIELD VERIFY NAT. GAS LINE
110 LF 8" PVC SANITARY SEWER AT 1.9%
STA 13+31 IE=448.34 90° FITTING AND CO
STA 13+69 MH #2 IE IN (E)=447.90
470 465 460 455 450 445 440 435
0+00 0+50 1+00 1+50 2+00 2+50 3+00 3+50 4+00 4+50 5+00 5+50 6+00 6+50 7+00 7+50 8+00 8+50 9+00 9+50 10+00 10+50 11+00 11+50 12+00 12+50 13+00 13+50 14+00 14+50 15+00



NAT. GAS LINE
CHEVRON GAS LINES
POWERPOLE WITH GUY
NAT. GAS LINE
END OF NAT. GAS LINE
STA 21+65
SEE SHEET C8 FOR DODD ROAD CROSSING
SEE SHEET C10 FOR ABSORPTION BEDS
BED NO.3
DIRT ROAD
DODD ROAD
ASPHALT
THE DODD RD PIPE CROSSING WILL REQUIRE AN INITIAL SAW CUTTING OF THE SURFACE PRIOR TO THE REPAIR OF THE SURFACE TO STRAIGHTEN THE EDGES
SEE MATCH SHEET C7
EXISTING BUILDING
BURIED UNDERGROUND ELECTRICAL CABLE
EXISTING CONC. SPILL PAD. DISTANCE BETWEEN FENCE AND PAD/UTILITY POLES MAY REQUIRE HAND EXCAVATION. UTILITY POLE SUPPORT WILL BE REQUIRED DURING TRENCHING
TEL. PEDS SUPPORT, RELOCATE & REINSTALL TEL EQUIP & CABLE AS REQUIRED
4' GATE
SEE SHEET C5 FOR GRAVITY SEWER
STA 20+95
RESTORE GRAVEL SURFACING TO MATCH EXISTING
40' GATE
LIGHT POLE
SEE SHEET C9 FOR SEPTIC TANK AND PUMP STATION DETAILS
SEE SHEET C3 FOR PROCESS & SLAUGHTER GRAVITY SEWER
IBP PLANT
℄ RAILROAD
SEE SHEET C8 FOR R.R. CROSSING
SCALE IN FEET
LEGEND
= FENCE
PP = POWERPOLE
SS-MH = SANITARY SEWER MANHOLE
= EDGE OF ASPHALT
= MISCELLANEOUS TREES
POC = POINT OF CONNECTION
IE = INVERT ELEVATION
LID = ELEVATION OF FRAME, RIM OR COVER
ASPH = ASPHALTIC CONCRETE
ST = STATION FROM SURVEY
BLDG = BUILDING EXTERIOR WALL
CIP = CAST IRON PIPING
C.L. = CHAIN LINK FENCE
= ONE FOOT CONTOUR LINES
= CONCRETE THRUST BLOCKING
CALL 2 WORKING DAYS BEFORE YOU DIG 1-800-332-2344
ALL UNDERGROUND UTILITIES AND STRUCTURES ARE NOT SHOWN. THE LOCATION OF THOSE SHOWN ARE APPROXIMATE. THE CONTRACTOR IS RESPONSIBLE TO FIELD VERIFY BOTH UNDERGROUND & ABOVEGROUND EXISTING CONDITIONS. NOTIFY A/E FOR RESOLUTION & MAKE MINOR CHANGES TO NEW CONSTRUCTION AT NO COST TO OWNER.
BRUCE G. SCHWAN
STATE OF WASHINGTON
PROFESSIONAL ENGINEER
EXPIRES 1/2/
CONF M.H. AND AVRV
PER ADDENDUM #1
REV. NO. DATE BY DESCRIPTION APPROVED
IOWA BEEF PRODUCTS, INC.
SCM Consultants, Inc. Architects & Engineers Kennewick, WA 99336
SCALE AS NOTED
DRAWN BY LMStuart
CHECKED BY BGS
DESIGN A/E BGS
SEWER SEPARATION PROJECT
SEWER SYSTEM PROFILE STATION 11+72–25+00 PRESSURE SEWER
SCM APPROVAL BGS
PROJECT NUMBER 3357.010
DRAWING NUMBER 3357C6
REV. 0
CADD FILE NAME 3357C6.DWG
BACKFILL ROAD CROSSING WITH CONTROL DENSITY FILL
MIN 3'± COVER TYPICAL FOR PRESSURE SEWER
FIELD VERIFY NAT. GAS LINE
ADJUST PRESSURE SEWER EL TO CROSS OVER/UNDER OTHER UTILITIES W/O FITTINGS (TYPICAL)
10" PVC PRESSURE SEWER
8" PVC SANITARY SEWER PIPE
FIELD VERIFY CHEVRON GAS LINES
FIELD VERIFY NAT. GAS LINE
STA 12+20
STA 20+95 90° LONG RADIUS BEND
STA 21+65 90° LONG RADIUS BEND
STA 24+45 90° LONG RADIUS BEND
STA 24+59 90° LONG RADIUS BEND
475
470
465
460
455
450
445
11+00 11+50 12+00 12+50 13+00 13+50 14+00 14+50 15+00 15+50 16+00 16+50 17+00 17+50 18+00 18+50 19+00 19+50 20+00 20+50 21+00 21+50 22+00 22+50 23+00 23+50 24+00 24+50 25+00
©1993 SCM Consultants, Inc.



CALL 2 WORKING DAYS
BEFORE YOU DIG
1-800-332-2344

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REV. NO.	DATE	BY	DESCRIPTION	APPROVED
4	9 93		CHANGE NO.1	
3	9 93		CHANGE NO.1	
1	9 93	LMS	PHASE II	

BRUCE G. SCHWAN — STATE OF WASHINGTON — REGISTERED PROFESSIONAL ENGINEER — EXPIRES 1/2/

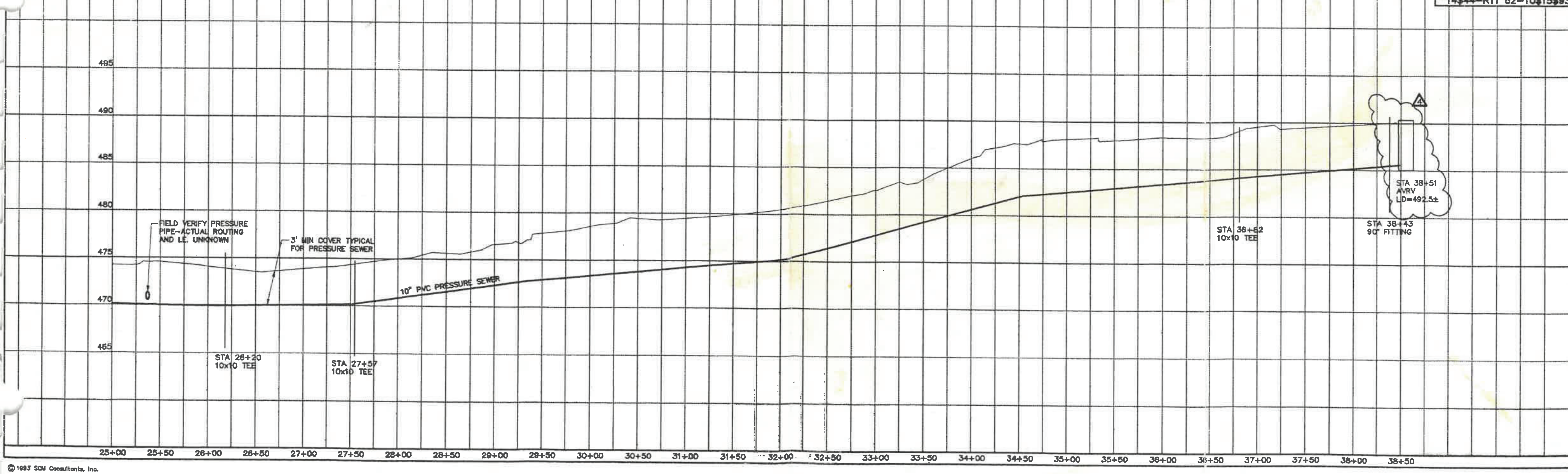
IOWA BEEF PRODUCTS, INC.

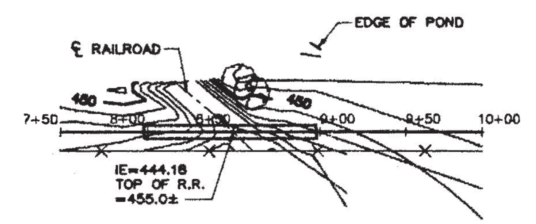
SCM Consultants, Inc. — Architects & Engineers, Kennewick, WA 99336

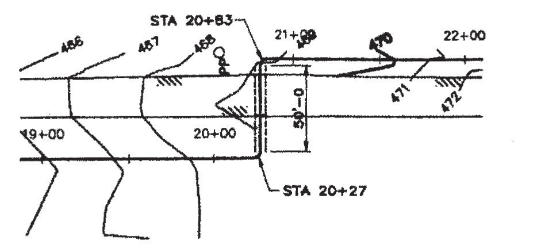
SEWER SEPARATION PROJECT

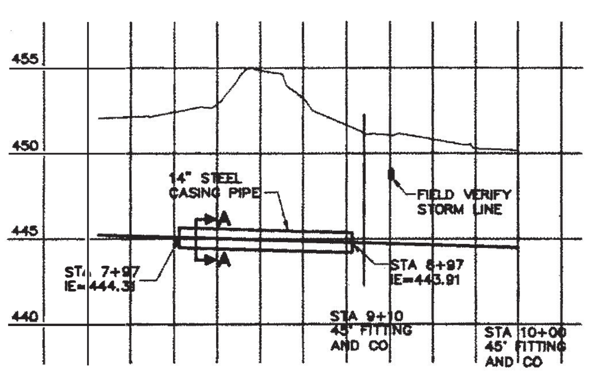
SEWER SYSTEM PROFILE
STATION 25+00-37+33
PRESSURE SEWER

SCALE	AS NOTED
DRAWN BY	LMStuart
CHECKED BY	BGS
DESIGN A/E	BGS
SCM APPROVAL	BGS
PROJECT NUMBER	3357.010
DRAWING NUMBER	3357C7-1
REV.	0
CADD FILE NAME	3357C7-1.DWG 14$44-R11 o2-10$15$93



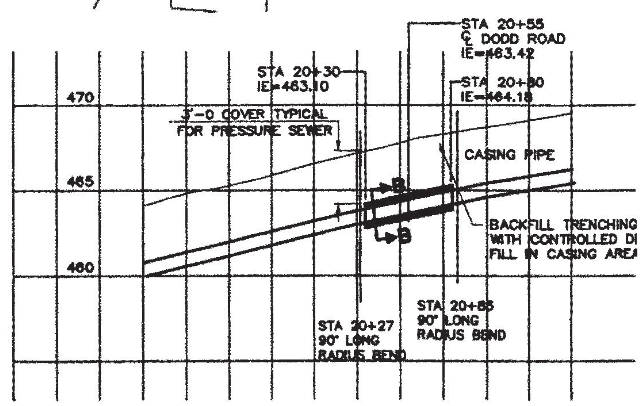






R.R CROSSING

SCALE: 1"=50'-0



DODD ROAD CROSSING

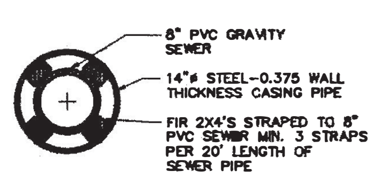
SCALE: 1"=50'-0

RAILROAD CROSSING NOTES

1. ALL WORK SHALL BE PER U. P. RR STANDARDS, RAILROAD PERMIT, EXHIBIT A IN BID DOCUMENT, AND PLANS.
2. CONSTRUCT JACKING PITS AS REQUIRED.
3. JACK CASING PIPE AT CARRIER PIPE GRADE.
4. INSTALL CARRIER PIPE IN CASING PIPE WITH FIR 2X4'S STRAPPED TO PIPE SECTIONS AND ADJUST GRADE AT ENDS OF CARRIER PIPE WITH SHIMS PRIOR TO SEALING AND BACKFILLING JACKING PITS.

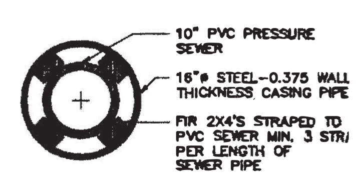
ROAD CROSSING NOTES

1. PROVIDE TRAFFIC CONTROL PER COUNTY AND WASHINGTON REQUIREMENTS.
2. ALL CROSSING WORK TO BE STARTED AND COMPLETED IN A DAY.
3. BACKFILL ROAD CROSSING TRENCH WITH CONTROL DENSITY
4. REPAIR EXISTING BST ROAD SURFACE WITH 2 INCH CLASS PAVING. SAW CUT NEW EDGE PRIOR TO PAVING.
5. CONDUIT UNDER ROAD SHALL BE BURRIED IN A MINIMUM D 24 INCHES.
6. INSTALL ELECTRICAL PULL BOXES AT BOTH ENDS OF THE R



SECTION A-A

SCALE: 1"=1'-0"

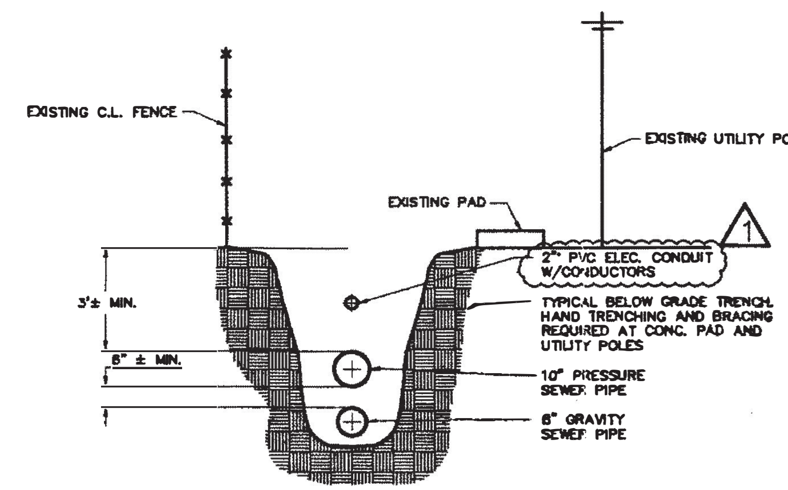


SECTION B-B

SCALE: 1"=1'-0"

LEGEND

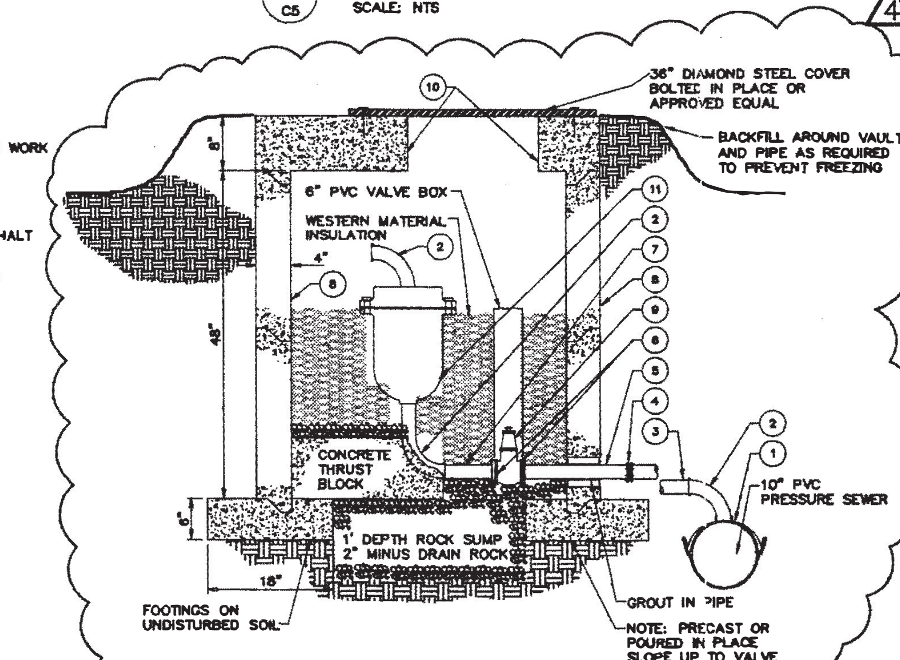
	= FENCE
PP	= POWERPOLE
SS-MH	= SANITARY SEWER MANHOLE
	= EDGE OF ASPHALT
	= MISCELLANEOUS TREES
POC	= POINT OF CONNECTION
IE	= INVERT ELEVATION
LID	= ELEVATION OF FRAME, RIM OR COVER
ASPH	= ASPHALTIC CONCRETE
ST	= STATION FROM SURVEY
BLDG	= BUILDING EXTERIOR WALL
CIP	= CAST IRON PIPING
C.L.	= CHAIN LINK FENCE
	= ONE FOOT CONTOUR LINES



A TYPICAL SECTION

C5

SCALE: NTS



B AIR VACUUM RELEASE VALVE

C5

SCALE: NTS

AIR VACUUM RELEASE VALVE NOTES:

1. 2" DOUBLE STRAP SADDLE OR TEE
2. 2" PVC 90° STREET ELBOW
3. 2" SCH 40 PVC PIPE TH x PE LENGTH AS REQUIRED
4. DRESSER COUPLING STYLE 38 OR EQUAL
5. 2" x 36" SCH 40 PVC PIPE TH x PE
6. 2" THREADED FLANGE
7. 2" x 2" SCH 40 PVC NIPPLE
8. 48" PRECAST MANHOLE SECTION
9. 2" GATE VALVE CLASS 150 W/2" SQ OPERATING NUT
10. 48" REINFORCED CONCRETE SLAB
11. 2" AIR VACUUM RELEASE VALVE APCO #144 OR EQUAL

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BEFORE YOU DIG
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REV. NO.	DATE	BY	DESCRIPTION	APPROVED
4			CORR M.H. AND AVRV	
1	9 93		PER ADDENDUM #1	

IOWA BEEF PRODUCTS, INC.

SCM Consultants, Inc. Architects & Engineers Kennewick, WA 99336

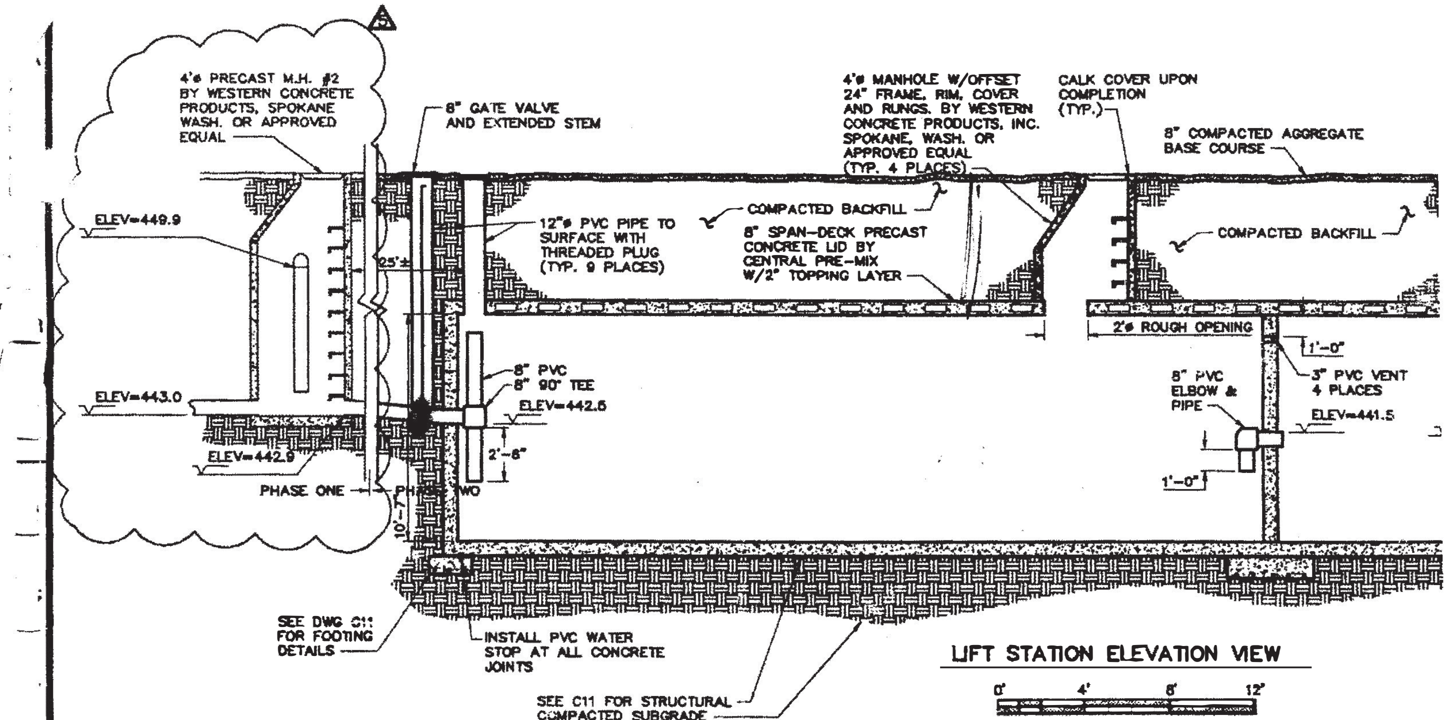
SCALE: AS NOTED
DRAWN BY: DeLorme/LMS
CHECKED BY: BGS
DESIGN A/E: BGS
SCM APPROVAL: BGS

SEWER SEPARATION PROJECT

SECTIONS & DETAILS

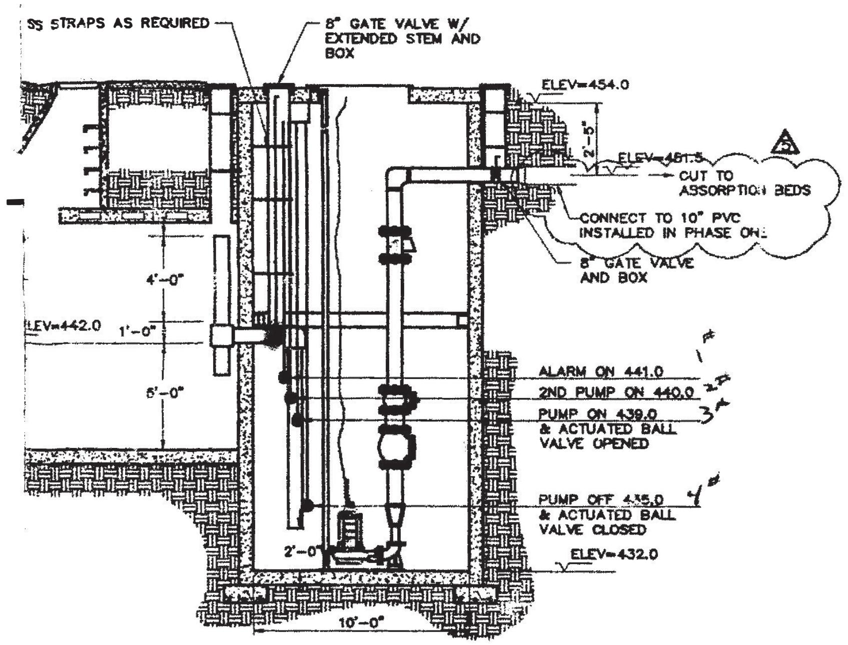
PROJECT NUMBER 3357.010
DRAWING NUMBER 3357C8.DWG
CADD FILE NAME 3357C8.DWG
09$26-R11 c2-10$26$93

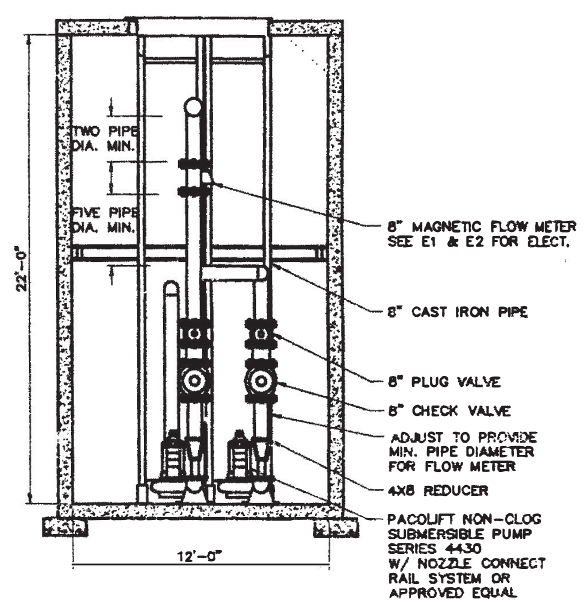
EXPIRES 1/2/



LIFT STATION ELEVATION VIEW

0' 4' 8' 12'



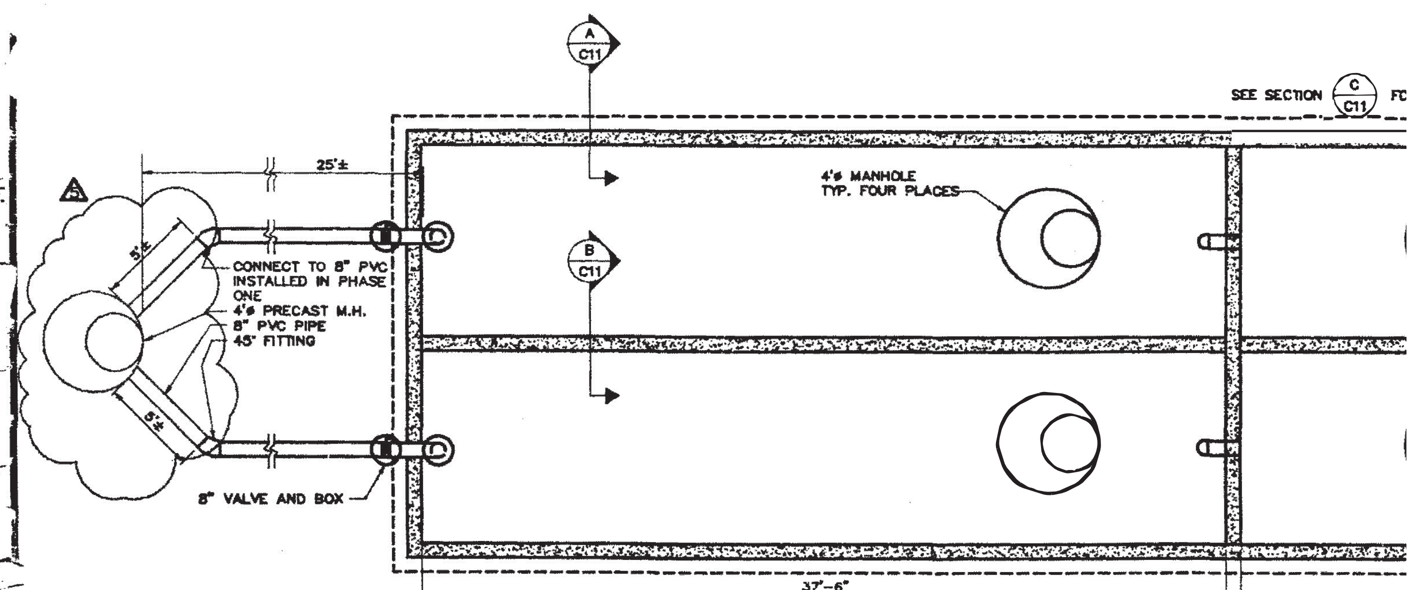


LIFT STATION END VIEW

0' 4' 8' 12'

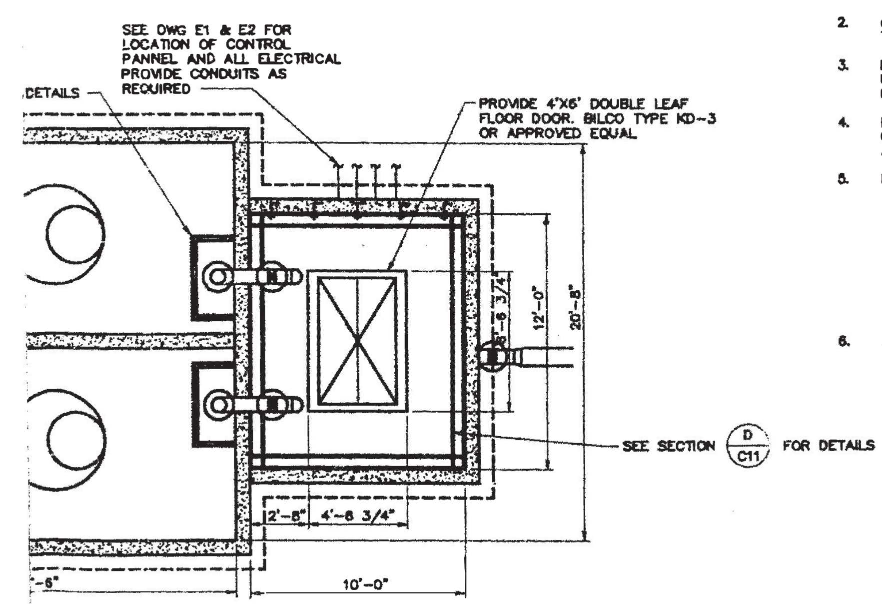
NOTES

1. ALL CONCRETE CONSTRUCTION SHALL BE ACCORDING TO WSDOT 1991 STANDARD SPECIFICATIONS FOR ROAD, BRIDGES, AND MUNICIPAL CONSTRUCTION SECTIONS.
2. COMPACT ALL SUBGRADE BEARING AND EXCAVATED BACKFILL SURFACES TO 95% MAXIMUM DENSITY.
3. HAUL EXCESS EXCAVATED MATERIAL TO ABSORPTION BED SITE, STOCKPILE AND USE TO SPREAD OVER BEDS; FINISH GRADE SURFACE TO MATCH NATURAL CONTOURS FOR DRAINAGE.
4. PUMP SYSTEM SHALL BE TESTED USING CLEAN WATER TO DEMONSTRATE OPERATION SEQUENCE AND 2 FEET MINIMUM EVENLY DISTRIBUTED HEAD AT ABSORPTION BED ORIFICES.
5. NORMAL PUMP AND BALL VALVE SEQUENCES SHALL BE SET AS FOLLOWS:
   A. WET WELL REACHES 439.0 – PUMP ON AND BALL VALVE ACTIVATED TO OPEN.
   B. MAG METER REGISTERS 3,500 GALLONS – PUMP OFF.
   C. WET WELL REACHES 435.0 – PUMP OFF.
   D. PUMP START-UP AND BALL VALVE OPERATION IS ALTERNATED. SEE E2 FOR CONTROLLS AND SEQUENCE OF OPERATION
6. AFTER CONSTRUCTION AND BACK FILL IS COMPLETE, COMPACT SUBGRADE AND PLACE 8" OF AGGERATE BASE COURSE AND GRADE FOR DRAINAGE AROUND SEPTIC TANK AND WET WELL.



LIFT STATION PLAN VIEW

0' 4' 8' 12'



REV. NO.	DATE	BY	DESCRIPTION	APPROVED
5	10/12		PART OF PHASE ONE WORK	

IOWA BEEF PRODUCTS, INC.

SCM Consultants, Inc. Architects & Engineers Kennewick, WA 99336

SCALE: AS NOTED — SEWER SEPERATION PROJECT

DRAWN BY: DeLorme — PUMP STATION

CHECKED BY:

DESIGN A/E / DESIGN BY

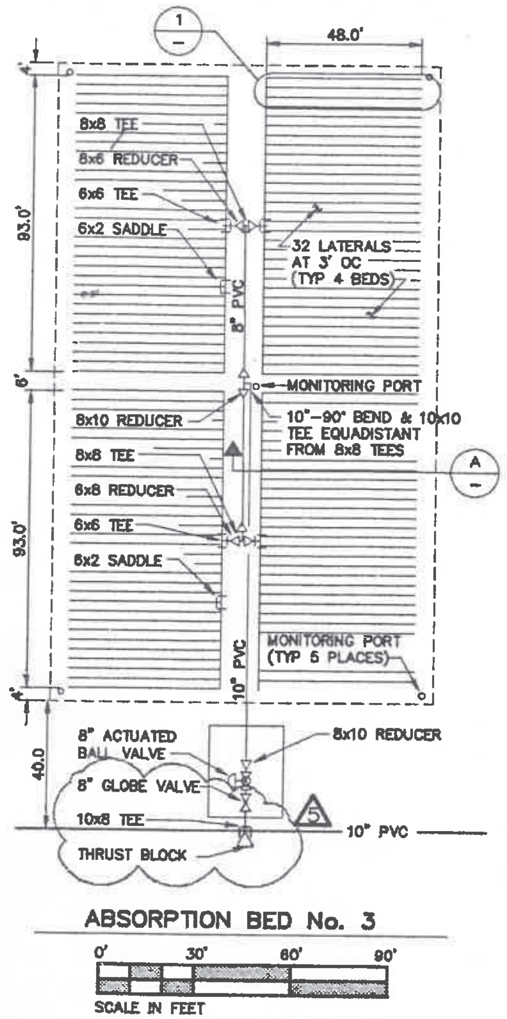
SCM APPROVAL

PROJECT NUMBER 3357.010 — DRAWING NUMBER 3357C9.DWG

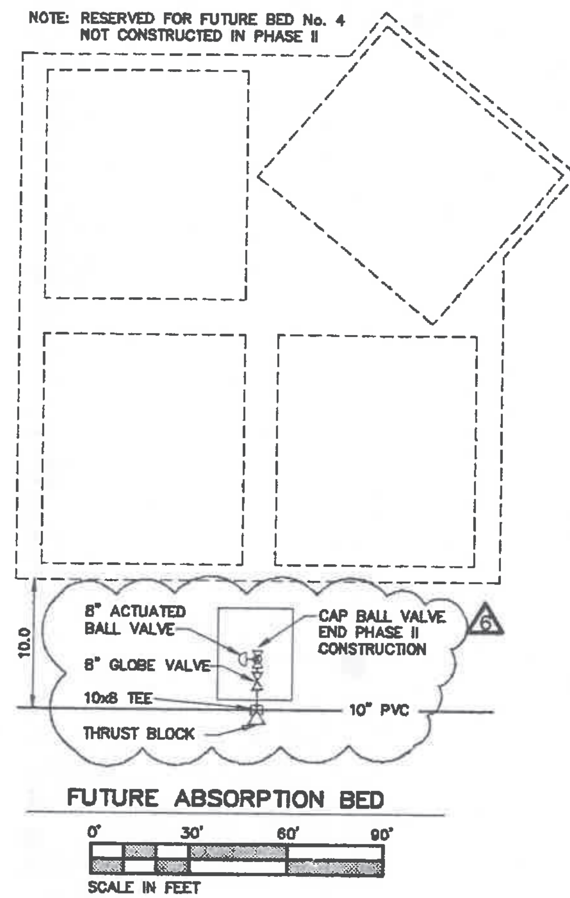
CADD FILE NAME 3357C9.DWG

11819-R11 a2-10814

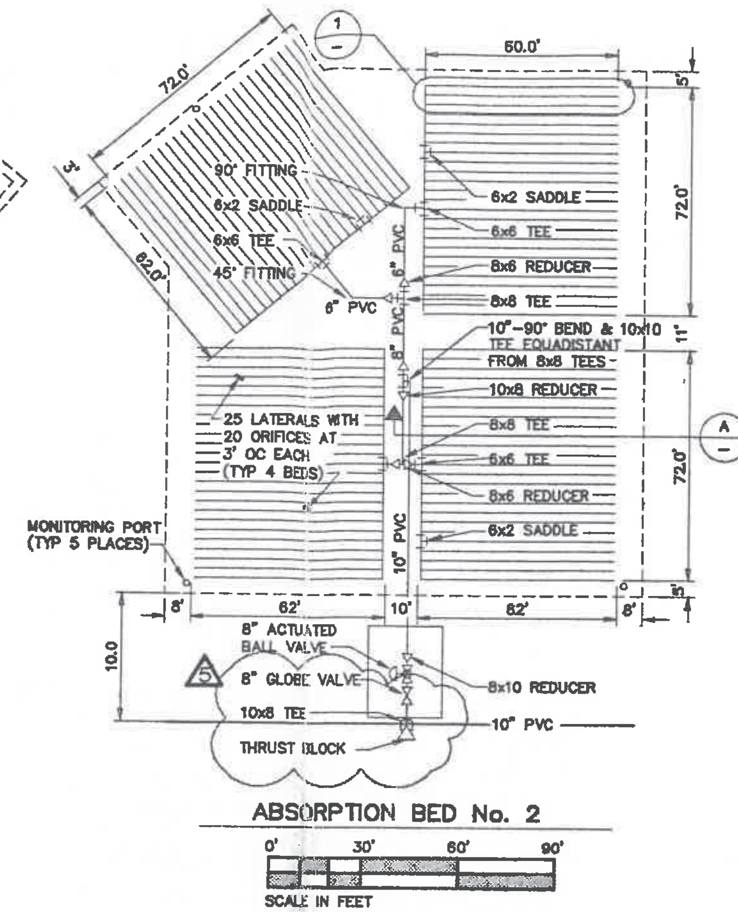
BRUCE G. SCHWAN, STATE OF WASHINGTON, 20172, PROFESSIONAL ENGINEER — EXPIRES 1/2/



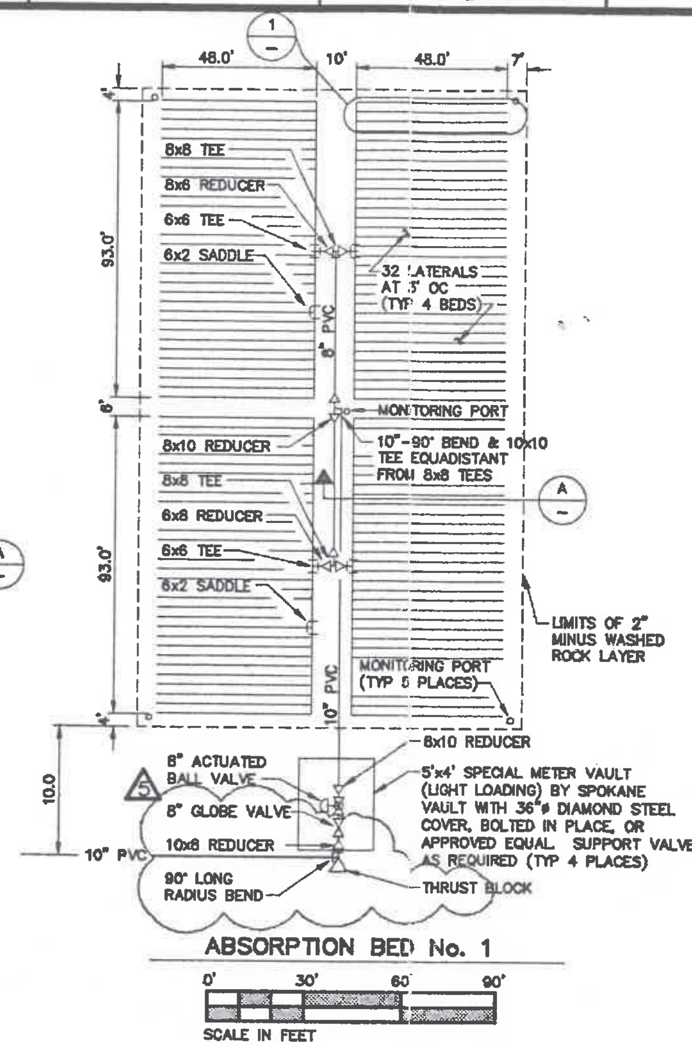
ABSORPTION BED No. 3



FUTURE ABSORPTION BED



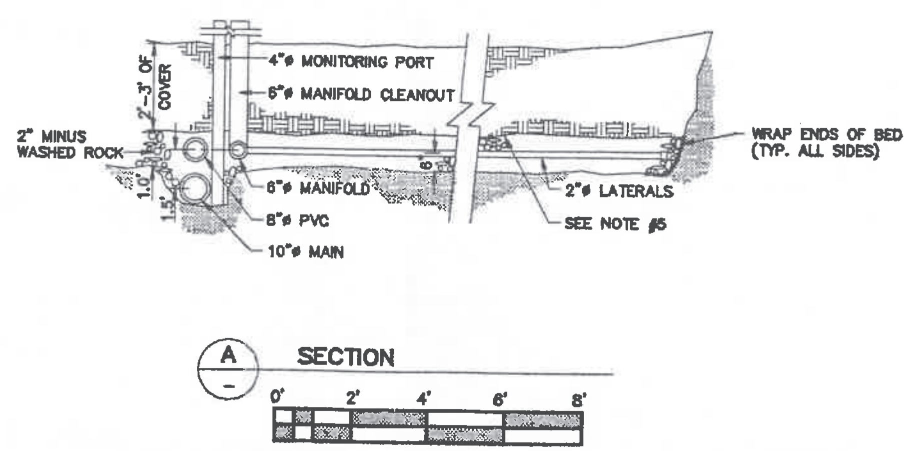
ABSORPTION BED No. 2



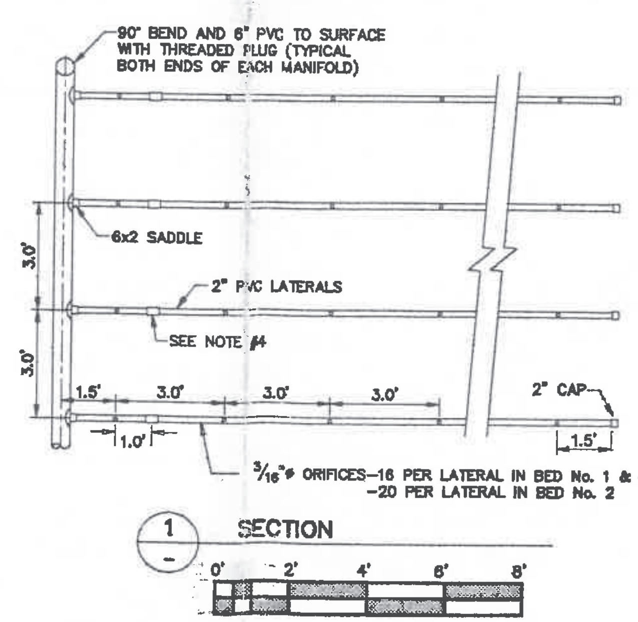
ABSORPTION BED No. 1

NOTES

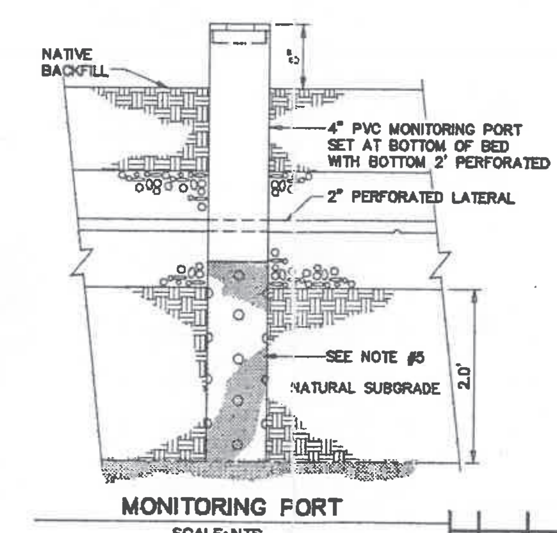
1. IBP HAS COMPLETED THE EXCAVATION AND ROUGH GRADING OF EACH BED'S SUBGRADE THE CONTRACTOR SHALL FINE GRADE PRIOR TO PLACEMENT OF THE WASHED ROCK AND LATERALS. ROCK OVER MAIN AREAS SHALL BE MOVED ASIDE PRIOR TO TRENCHING AND EXCESS TRENCH EXCAVATED SUBSOILS SPREAD OUTSIDE THE ROCK LIMITS.
2. AT THE COMPLETION OF THE CONSTRUCTION OF THE PRESSURE DISPOSAL SYSTEM PIPING, THE BEDS MUST BE TESTED BY THE CONTRACTOR WITH DOE REPRESENTATIVES PRESENT TO VERIFY A MINIMUM 2 1/2' WATER HEAD EVENLY OVER EACH 50% ABSORPTION BED USING CLEAN WATER. THE CONTRACTOR SHALL MAKE ALL ADJUSTMENTS AND DEMONSTRATE DOSING CYCLE WITH BED AND PUMP ALTERNATING FROM BED NO. 1 TO BED NO. 2, THEN BED NO. 1 TO BED NO. 3.
3. ALL PIPING BEYOND THE VAULT SHALL BE GLUED CONNECTIONS.
4. AFTER TESTING OF BEDS IS SUCCESSFULLY COMPLETED, EACH 2" LATERAL SHALL BE CUT BETWEEN THE FIRST AND SECOND ORIFICE AND THE LATERAL ROTATED TO 6 O'CLOCK AND SLEEVED TOGETHER AND THE ADDITIONAL 6" OF WASHED ROCK PLACED OVER THE BEDS.
5. INSTALL POLYPROPYLENE, CONTINUOUS FILAMENT, NEEDLE PUNCHED, NON-WOVEN GEOTEXTILES, FILTER FABRIC TS500 BY POLYFELT, OR APPROVED EQUAL.
6. STOCKPILED TOP SOIL SHALL BE PLACED OVER FILTER FABRIC WITHOUT DAMAGING FABRIC, ROCK OR PIPING SYSTEMS, AND THE SURFACE GRADE TO ALLOW STORM DRAINAGE OFF OF BED AREAS.
7. HYDRO-SEED BED SURFACE AREAS WITH NATURAL GRASS USING WSDOT RECOMMENDED FERTILIZERS AND BINDERS FOR SPRING 1994 GERMINATION.
8. FENCE EAST (1 & 2) AND WEST (3 & 4) BED AREAS WITH 4 STRAND BARB WIRE FENCE ON STEEL POSTS WITH TOP STRAND AT 48" PLUS OR MINUS AND AN 8' PULL-BACK GATE AREA FOR ACCESS.



A SECTION



1 SECTION



MONITORING PORT

SCALE: NTS

REV. NO.	DATE	BY	DESCRIPTION	APPROVED
6			NIC FUTURE CONSTRUCTION	
5			PART OF PHASE ONE WORK	

IOWA BEEF PRODUCTS, INC

SCM Consultants, Inc. Architects & Engineers Kennewick, WA 99336

BRUCE G. SCHWAN STATE OF WASHINGTON 00172?1 REGISTERED PROFESSIONAL ENGINEER

EXPIRES 1/2/

SCALE AS NOTED

DRAWN BY LMS/ESD

CHECKED BY

DESIGN A/E DESIGN SM

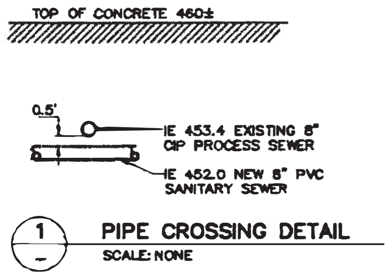
SCM APPROVAL

SANITARY SEWER PROJECT

ABSORPTION BED DETAILS

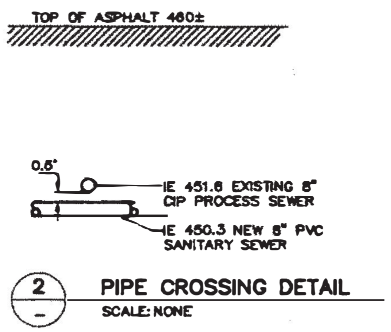
PROJECT NUMBER 3357.010 DRAWING NUMBER 3357C10.DWG REV. 0

CADD FILE NAME 3357C10.DWG 11$28—R11 c2—10$14$93



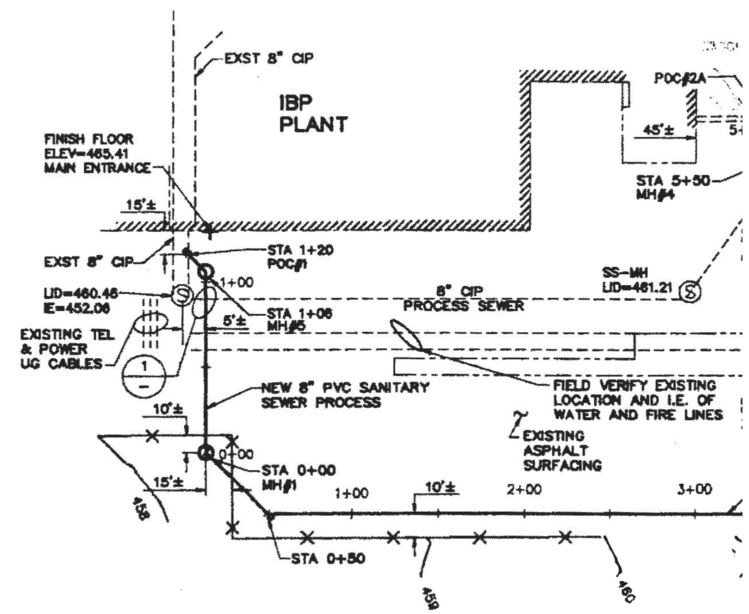
1 PIPE CROSSING DETAIL

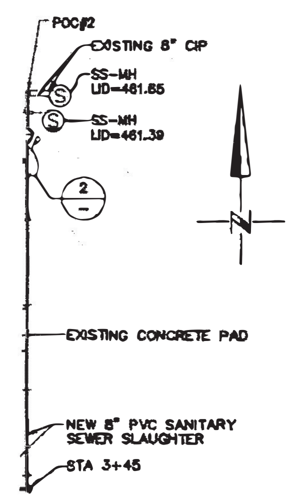
SCALE: NONE



2 PIPE CROSSING DETAIL

SCALE: NONE





SPECIAL NOTE:
THE AREAS IN WHICH THESE NEW SEWERS ARE TO BE INSTALLED ARE CRISS-CROSSED WITH EXISTING UNDERGROUND UTILITIES, ONLY SOME OF WHICH ARE SHOWN. ALL EXISTING UTILITIES AFFECTED BY TRENCHING MUST BE LOCATED, CAREFULLY EXCAVATED (OFTEN BY HAND), SUPPORTED, AND UPON COMPLETION REINSTALLED TO ORIGINAL LOCATION AND CONDITION.

LEGEND

	= FENCE
PP○	= POWERPOLE
SS-MH	= SANITARY SEWER MANHOLE
	= EDGE OF ASPHALT
	= MISCELLANEOUS TREES
POC	= POINT OF CONNECTION
IE	= INVERT ELEVATION
LID	= ELEVATION OF FRAME, RIM OR COVER
ASPH	= ASPHALTIC CONCRETE
ST	= STATION FROM SURVEY
BLDG	= BUILDING EXTERIOR WALL
CIP	= CAST IRON PIPING
C.L.	= CHAIN LINK FENCE
	= ONE FOOT CONTOUR LINES

0' 50' 100' 150'
SCALE IN FEET

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BEFORE YOU DIG
1-800-332-2344

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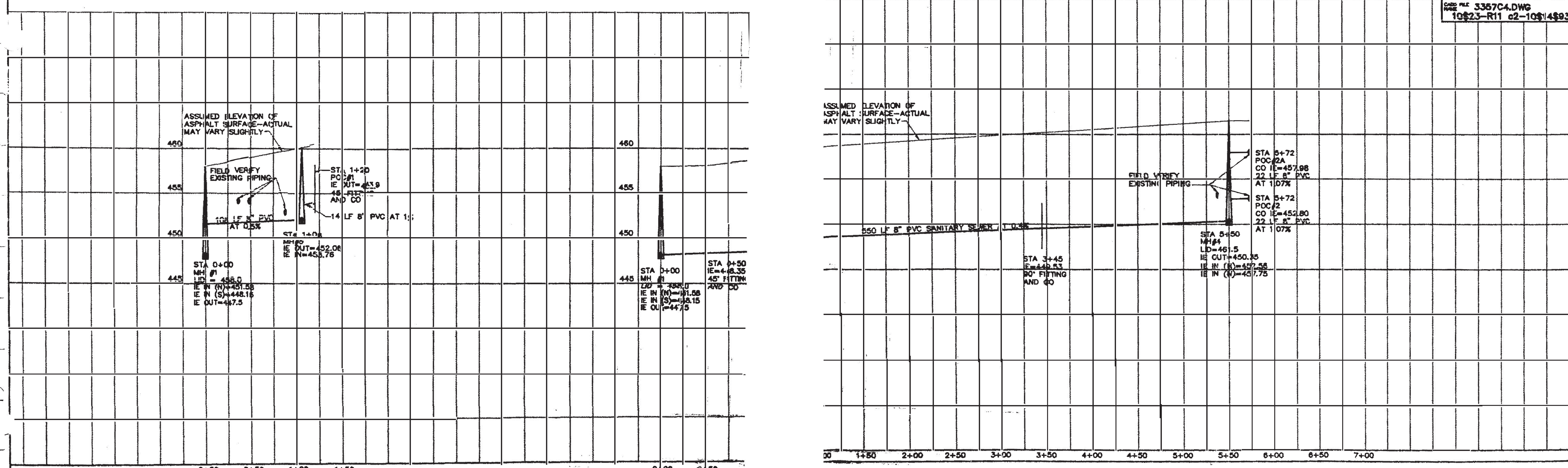
BRUCE G. SCHWAN
STATE OF WASHINGTON
PROFESSIONAL ENGINEER
EXPIRES 1/2/

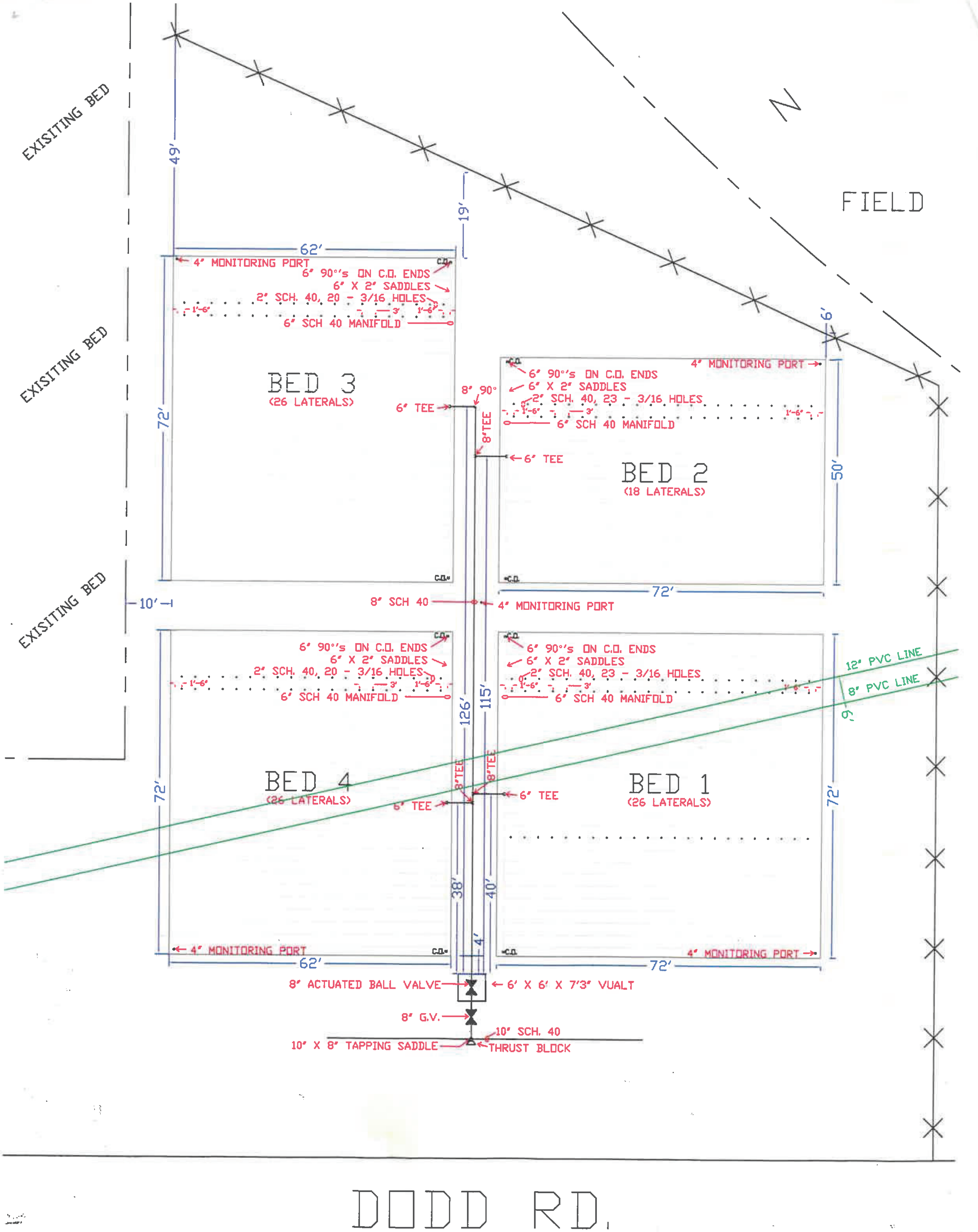
IOWA BEEF PRODUCTS, INC.

SCM Consultants, Inc. Architects & Engineers Kennewick, WA 99336

SCALE AS NOTED	SEWER SEPARATION PROJECT	
DRAWN BY ESD/LMS	SEWER SYSTEM PROFILE STATION 0+00–5+72 GRAVITY SEWER 1.06.1	
CHECKED BY BGS		
DESIGN A/E BGS	DESIGN OH	
SCM APPROVAL BGS	DATE:	PROJECT NUMBER 3357.010 · DRAWING NUMBER 3357C4 · REV. 0

CADD FILE NAME 3357C4.DWG
10$23-R11 c2-10$14$93




EXISITING BED
EXISITING BED
EXISITING BED
FIELD
N
49'
19'
6'
62'
4" MONITORING PORT
6" 90°'s ON C.O. ENDS
6" X 2" SADDLES
2" SCH. 40, 20 - 3/16 HOLES
6" SCH 40 MANIFOLD
BED 3
(26 LATERALS)
72'
6" TEE
8" 90°
8"TEE
4" MONITORING PORT
6" 90°'s ON C.O. ENDS
6" X 2" SADDLES
2" SCH. 40, 23 - 3/16 HOLES
6" SCH 40 MANIFOLD
6" TEE
BED 2
(18 LATERALS)
50'
72'
10'
8" SCH 40
4" MONITORING PORT
6" 90°'s ON C.O. ENDS
6" X 2" SADDLES
2" SCH. 40, 20 - 3/16 HOLES
6" SCH 40 MANIFOLD
6" 90°'s ON C.O. ENDS
6" X 2" SADDLES
2" SCH. 40, 23 - 3/16 HOLES
6" SCH 40 MANIFOLD
12" PVC LINE
8" PVC LINE
9'
126'
115'
BED 4
(26 LATERALS)
72'
6" TEE
8"TEE
8"TEE
6" TEE
BED 1
(26 LATERALS)
72'
38'
40'
4'
4" MONITORING PORT
4" MONITORING PORT
62'
72'
8" ACTUATED BALL VALVE
6' X 6' X 7'3" VUALT
8" G.V.
10" SCH. 40
10" X 8" TAPPING SADDLE
THRUST BLOCK
DODD RD.

IBP, INC.
DODD ROAD, WALLULA WASHINGTON
SANITARY SEWER SEPARATION PROJECT
OPERATION AND MAINTENANCE MANUAL

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Butch Dixon

IBP, INC.
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OPERATION AND MAINTENANCE SUMMARY

INTRODUCTION

This section is provided as a basic summary of the operation of the system and to the step-by-step actions needed to be taken by the operator of the new sanitary sewer system to ensure proper collection, treatment, and disposal.

◆ Prior to a sentence indicates a maintenance action item.

SYSTEM LAYOUT AND MAINTENANCE SUMMARY

GRAVITY MAINS:

The system consists of two separate gravity mains; one main feeds from the "PBX" side of the plant and the other main from the "production" side of the plant. Both gravity mains drain into the manhole in the "PBX" shop yard, then sewage flow is split prior to entering the septic tank.

◆ Maintenance checks on the PVC mains and concrete manholes include monthly checks for obstructions and should be pressure flushed annually.

SEPTIC TANK:

The septic tank has two side-by-side primary chambers followed by two sid-by-side secondary chambers. The primary and secondary are connected through a "TEE" baffle system. Effluent flows out of the secondary chamber through a screen and baffle system into the wet well.

◆ Maintenance checks on the septic tank include monthly testing of the floating scum and bottom solids depth plus checking the "TEE's" for obstruction.

WET WELL:

Sewage entering the wet well has been reduced to clear liquid with the consistency of tap water. The wet well contains two 50-horse pumps and four float switches which function as follows:

- The highest float turns on the second pump in an emergency.
- The next float down turns on the high-water alarm horn and light located outside the "PBX" shop building.
- The next float down starts a pump for normal operation of the system. The pump will automatically shut-off after 3,500 gallons has been pumped.

- The last float is an emergency shut-off for any pump operating.

  ◆ Maintenance checks on the pumps include monthly recording of the hours and flow meter readings and panel lights for indications of pump problems.

VALVE BOXES AND ABSORPTION BEDS

VALVE BOX:

Each absorption bed has a concrete valve box with bolted access cover. Each valve box contains two valves. The first is an 8" globe valve used to adjust the head on the absorption beds. The second valve is an 8" ball valve and is fitted with an electric actuator that automatically opens the valve to allow flow into the bed and closes after 3,500 gallons have been pumped.

ABSORPTION BEDS:

There are three absorption beds and an area reserved for a fourth bed for the future. The beds are not physically marked, but can be identified by the following:

- Bed No. 1 is the farthest east on Dodd Road.
- Bed No. 2 is just west of Bed No. 1.
- Bed No. 3 is not constructed, however, an empty concrete valve box is in place for future use.
- Bed No. 4 is the closest bed to the septic tank approximately 1,400 feet east of the septic tank across Dodd Road.

The absorption beds were constructed with feeds of 2" PVC laterals laid out in the east and west directions. The laterals have 3/16" holes on the bottom at 3′ on center.

◆ Maintenance checks include inspection of the valve pit for leaks and the inspection ports (identified as the smaller diameter piping that extends several feet above the finished grade and are capped with white push on caps) for standing water.

The sewer system has limited flow reserve capacity; therefore, it is imperative that a total system failure be given immediate attention. If there is a partial system failure the remaining pumps and corresponding infiltration beds can continue to function and prevent the sewer system from backing up. However, depending upon the nature of the failure some temporary modification to the system may be required to prevent the alarm from continually being activated. If this is necessary, the Plant Engineer should be consulted. If necessary, the SCM engineer can be consulted at 509/783-1625. Any extended period (more than one week) of operating the system on less than two infiltration beds should be avoided.

IBP, INC.
DODD ROAD, WALLULA WASHINGTON
SANITARY SEWER SEPARATION PROJECT
OPERATION AND MAINTENANCE MANUAL

INTRODUCTION

This manual is prepared for use by operators and maintenance personnel of the IBP, Inc (IBP) Sanitary Sewer Separation System located at the IBP plant in Wallula Washington. The manual was prepared in conjunction with the 1993/1994 modifications of the plants sanitary sewer system to separate, treat, and dispose of sanitary sewage separate from process sewage. It summarizes standard operating procedures and recommends routine system monitoring and maintenance procedures. Record keeping standards and logs are prescribed, and sample forms are located at the conclusion of this manual.

DESIGN SUMMARY

The sanitary system includes new gravity sewers, a two-chamber septic tank, wet well with effluent pumping equipment, and pressurized distribution system using three 50% infiltration beds with an additional area reserved for a future 50% bed. Two of the 50% beds are used at one time while one bed is rested.

Design Criteria - Septic Tank

Design Capacity = 28,000 gal/day
Design Flow = 3,500 gal/day/dose
Design Storage = 1.5 X Daily Design Flow = 42,000 gallons
Infiltration Design Loading Rate = 0.8 gal/day/ft^2
Infiltration Design Dosing Frequency = 4 doses/day

From Above

Design Daily Flow = 28,000 gal/day
Design Storage Volume = 42,000 gal/day
Infiltration Bed Area Required = 24,000 sq. ft. per bed

Operating Storage Volume Provided

42,000 gal. septic tank
3,500 gal. Wet Well
45,500 gal. total storage

Infiltration Bed Area Provided

Two absorption beds operated alternately, plus one reserve bed and one future area. Each bed consists of approximately 24,000 sq.ft. Each of any two beds receives up to 14,000 gal/day (1/2 of the daily design flow) with each bed dosed 4 times per day.

Pressure Distribution System

Each PVC pressure pipe distribution bed contains 1,944 3/16" diameter orifices able to discharge 1.8 gallons per dose for a total flow rate per bed of 14,000 gal/day.

Pumping Equipment and Wet Well

The distribution system has a duplex pump system designed to pump 900-1,000 gal/min. using a single pump. The pump control equipment is set to operate one pump during each dosing cycle and alternates pumps after each cycle.

The dosing volume/bed is 3,500 gallons; therefore, the dosing time is around four minutes/dosing.

OPERATION AND MAINTENANCE PROCEDURES

Sewer Mains

The new gravity sanitary sewer main is constructed of 6" and 8" PVC piping, concrete manholes, and PVC cleanouts. Maintenance should include monthly manhole inspections and high-pressure flushing to be completed annually.

Septic Tank

Two septic tanks are provided. Each tank is identical in size and shape and sized so that one tank can handle the entire plant sanitary wastes while the other tank is being cleaned. Each septic tank has two compartments and is constructed with a common center longitudinal dividing wall. A baffle arrangement between the compartments prevents floating and settled solids in the first compartment from entering the second compartment. The tank is located in the northwest corner of the IBP property commonly known as the PBX Shop Yard. All of the sanitary sewage enters each of the first compartments of the tank through an 8" gravity sewer line using a "Y" section to divide sewage flow. Sedimentation and primary treatment of the sewage occurs in the first compartment of the tank. Then sewage enters the second compartment of the tank through a PVC tee (baffle) arrangement installed in the septic tank partition wall. The tee is designed to pass clear sewage (the liquid between the scum and sludge layers) to the second compartment of the tank where additional treatment takes place. The tank outlet located in the second chamber is protected with a stainless steel screen assembly with 3/16" diameter holes. The second chamber screen is intended to assure that no particles larger than 3/16" diameter enter the infiltration bed. Screened effluent from each septic tank is discharged to a common wet well.

Both the inlet and outlet of the septic tank have 8" diameter PVC riser assemblies which allow access for clean-out, inspection, and pumping. The primary (inlet) chamber of the septic tank should be inspected monthly. The inlet tee should be checked to insure it is free of solids or other debris. The depth of the floating scum layer and the depth of the bottom sludge layer should be measured and recorded. The sludge layer in the bottom of the tank should be measured by forming a hole in the scum layer and inserting a measuring rod down through the opening to the bottom of the tank. The bottom two feet of the rod should be wrapped with cloth or some other material that will indicate the depth of the sludge when the rod is withdrawn and inspected. At no time should the depth of the sludge exceed two (2) feet, or the thickness of the scum layer exceed one (1) foot. When any of the above conditions exist, the half of the tank with this condition should be scheduled for immediate pumping. Prior to pumping, the gate valves on the inlet and outlet piping must be closed. The other half of the tank may be used temporarily for treatment of full plant flow.

The screen in the secondary chamber of the septic tank is a 16 gauge stainless steel perforated mesh with 3/16th inch openings. It is designed to prevent debris larger than 3/16th inch from entering the pumping chamber and being pumped to the infiltration beds. The 8" PVC discharge pipe is installed vertically within the confines of the screened-in area and tees into the wet well. The tee baffle arrangement and the 3/16" perforated screen allows only clean sewage effluent passage into the wet well.

The screen assembly should be inspected whenever the tanks are pumped. The depth of the clear water in the effluent discharge of the secondary compartment of the septic tank should be monitored as specified for the primary compartment. Visual inspection and rod testing should show no evidence of solids in the screened effluent area. If solids are detected, that half of the tank should be shut down, pumped, and the screens washed clear. The secondary compartment should be pumped each time the primary compartment is pumped and screens washed and inspected.

Pump Wet Well

The pump wet well system includes two 50-horsepower submersible sewage pumps. Under normal pumping operations, only one pump will operate. The pump discharges sewage effluent to a 10" pressure sewer line which serves as a header to the separate infiltration bed piping. The pumps are controlled by a duplex pump control panel including the motor starter for each pump which can be energized by a push button for manual operation. The pump will operate while the button is held in but will stop when the button is released. System controls automatically operate the pumps in an alternating mode, includes a high-water alarm system plus other pump failure alarms, and also auto switches the infiltration beds on an alternating basis.

Mercury activated float switches located within the wetwell are numbered 1 through 4 and are oriented from top to bottom.

STANDBY PUMP ON SWITCH

(Float switch No.1 at Elevation 441.0) This first switch activates the standby pump to allow for emergency draw-down of the wetwell should the "Active" pump malfunction for any reason.

HIGH WATER ALARM SWITCH

(Float switch No.2 at Elevation 440.0) This switch activates the high water alarms. The alarm (Audio and Visual) is located on the exterior of the "PBX" building. The AUDIO alarm may be temporarily silenced by depressing the remote button located on the exterior of the "PBX" building.

PUMP ON SWITCH

(Float switch No.3 at Elevation 439.0) This switch activates a single pump in alternating sequence, during normal operation of the system. The pumps are designed to shut off automatically after pumping 3,500 gallons.

LOW LEVEL SHUT OFF SWITCH

(Float switch No.4 at Elevation 435.0) This last switch, the lowest of the four switches is designed to deactivate any operating motor at this level. During normal operation of the system, this switch will not normally be utilized because the batchtrol will normally deactivate the pump after 3,500 gallons have been pumped.

Control System

The system control panel uses "on" and "off" float switches to automatically alternate the pumps and a batch controller to turn off pumps at 3,500 gallons of flow and automatically alternate the infiltration beds. The sequence of operations is as follows:

Sequence of Operations

A. Initial conditions

1. Pump pit is empty of water.
2. All float contacts are open.
3. The circuit breaker in the panelboard feeding the duplex controller and the relay control enclosure is open.
4. The circuit breakers for the motor starters in the duplex control panel are open.

B. Normal Operation

1. When the circuit breaker in the panelboard is closed manually, as well as the motor starter circuit breaker in the duplex pump controller, the batchtrol and converter are energized. At the same time, a time delay relay (TDR) is energized, sending a pulse to the batchtrol, causing the preset relay in the batchtrol to be energized, and enabling the motor starter circuits through the low-level float.

2. As the water rises in the pump pit, the low-level float contact at the 435.0 Foot level closes, allowing the motor starter circuits to be energized.

3. As the water continues to rise, the float contact at the 439.0 Foot level closes, causing a pump to run. Simultaneously a relay is energized, causing an infiltration bed valve to open.

4. When the batchtrol indicates that 3,500 gallons have been pumped, the batchtrol causes the pump to stop, and the infiltration bed valve to close.

5. When the water level rises to the 439.0 foot level again, the cycle starts over (B.2. to B.4.) but the alternate pump is energized and the alternate bed valve is opened.

6. The sequence will continue as above, with both the pumps and valves alternating in operation.

C. Abnormal operation

1. Should the water level in the pump pit rise to the 440.0 foot level, the alarm horn and light will operate. Momentarily pressing the reset button on the exterior of the building will silence the horn, but the warning light will continue flashing until the condition is remedied.

2. Should the water continue to rise to level 441.0, the second pump will operate and both pumps potentially will run until the batchtrol shuts them off or the water level falls to or below the 435.0 foot level.

In the "Hand" mode, the corresponding pump will operate regardless of the position of the float switches. This mode should normally be used only to manually test the operation of a pump.

If a high water alarm situation exists, the operator should manually operate the pumps by going to manual operation of the pumps to correct the situation unless both pumps are operating, then shut the pumps off and take steps to isolate and correct the problem as necessary.

There are two possible failure modes on the pumping system:

1. The bed valve fails to open:

   When the pump starts, the bed valve is closed. It takes 30 seconds for the bed valve to open. To correct the situation, a determination must be made as to why the bed valve did not open and corrective action must be taken. If for any reason the absorption bed valve fails to open within 60 seconds, a pressure switch will stop the pump and sound an alarm.

2. The pump malfunctions:

   If the upper level float (top float) fails to start the second pump, then the following should be determined:

   a. If the overloads are open, a light on the duplex pump panel face will operate. The condition can be corrected by pushing the reset button.

   b. If the over temperature switch in the pump motor opens because the pump motor becomes too hot, the pump will not run and a light will be activated at the duplex pump panel. The temperature switch will automatically close when the pump motor cools down.

Record Keeping

The operator should record the totalizer meter readings monthly. This will provide the operator a method to determine the sewage volume being discharged to the infiltration beds. A pump totalizer log is included in the Appendix of this report. The log has spaces to indicate the pump number, operator, date, time, and hour meter readings. There are also spaces to log the hours operated since the last reading, the time in days since the last reading, the average time operated per day, and the average daily flow. To calculate the average daily flow requires the previous totalizer meter reading to be subtracted from the present totalizer meter reading. The time in days between the readings is the number of days since the last reading.

The total system daily discharge (the sum of the daily discharges from each pump) should be compared to the system design daily flow (28,000 gallons per day). The actual values may vary from the design values. Significant discrepancies could result when pumps are not performing properly or the daily inflow to the system is not near the design volume. The operator should watch for and be concerned with unexplained significant differences between the present daily average flow amount and the historical values.

The hour readings will also establish a reference base for future use in verifying adequate performance of the effluent pumps. The monthly data should be compared to the design values and the historical data to identify potential problems.

The manual and automatic operation of the pumps should be verified and recorded every three months. This can be done by activating the float switches with a stick extended through the openings in the pump access vault.

The high-water alarm system should also be verified every three months. The same procedure described above can be used to activate the alarm float switch.

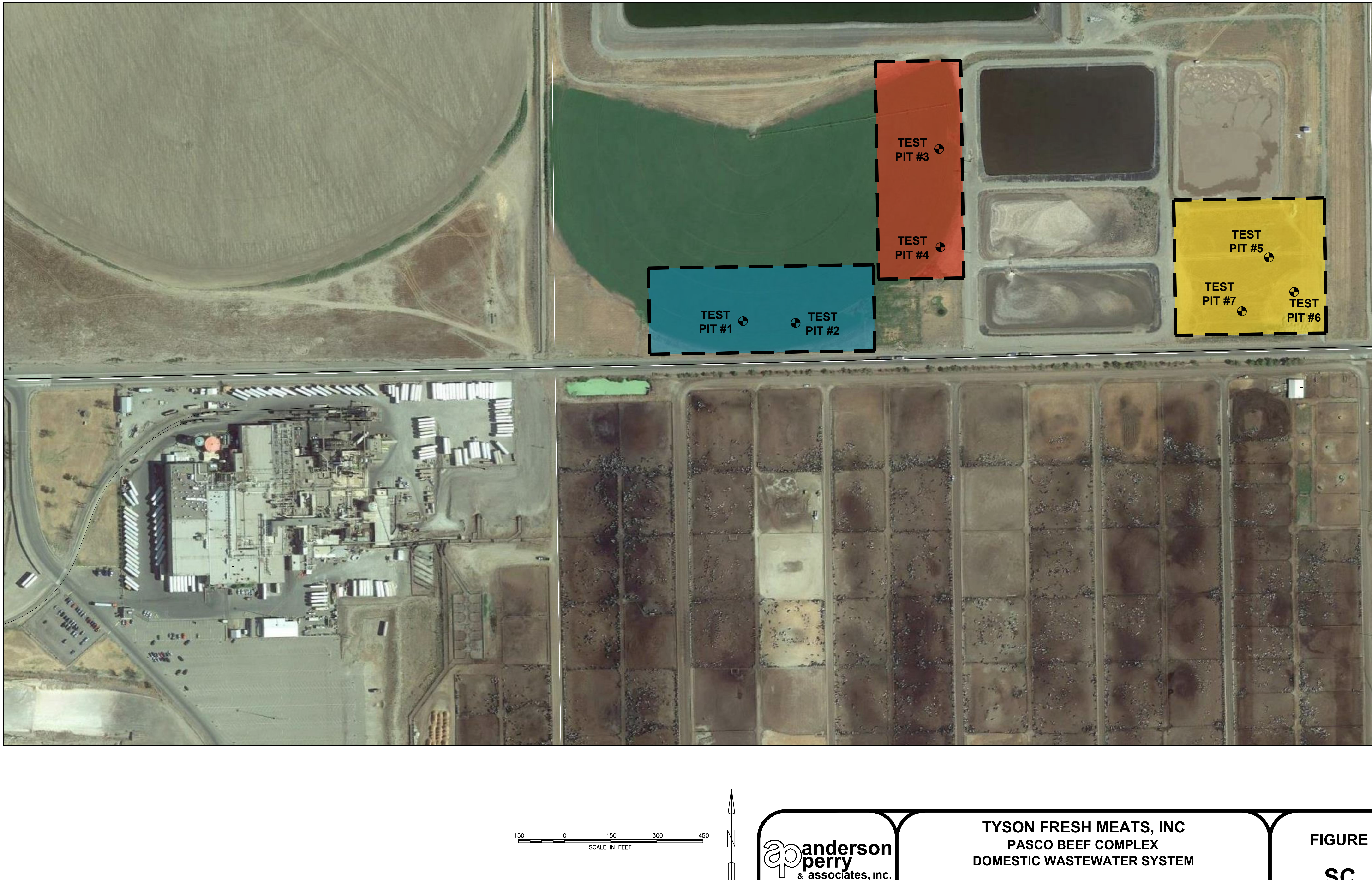
Infiltration Beds

The infiltration beds consist of buried pressurized PVC pipe distribution system constructed over a graded level natural soil area with the pipe sandwiched in the center of 12" of 2" minus washed rock covered with filter fabric. The outlet orifices of the system are sized at 3/16" diameter which is the same size of the effluent screen openings, therefore orifice plugging should not be a problem.

Under normal circumstances little, if any, maintenance of the infiltration beds should be required. A failure of the beds would most likely result in a saturated condition and be observed as a wet spot on the bed surface. A visual inspection for wet spots on the surface of the infiltration beds should be made every month. Inspection ports were installed as shown on drawings to monitor the condition of the beds beneath the surface. These should be inspected each month to verify the presence of standing water in the infiltration beds. This can be accomplished by removing the caps and using a flashlight to observe any standing water in the port chamber. Records should be made of each inspection.

If there is a system failure resulting in one or more of the infiltration beds being out of service for more than one week, a daily inspection of the inspection ports in the infiltration beds should be completed. The infiltration beds have been sized for 1/2 of the expected total daily flow (Four doses per day per bed in an alternating fashion). An extended period of over-applying effluent will result in a saturated condition and eventual infiltration bed failure.

APPENDIX B
Existing Absorption Bed Soil Textural Characterization and Sieve Test Results and Alternative B Geotechnical Report



anderson perry & associates, inc.

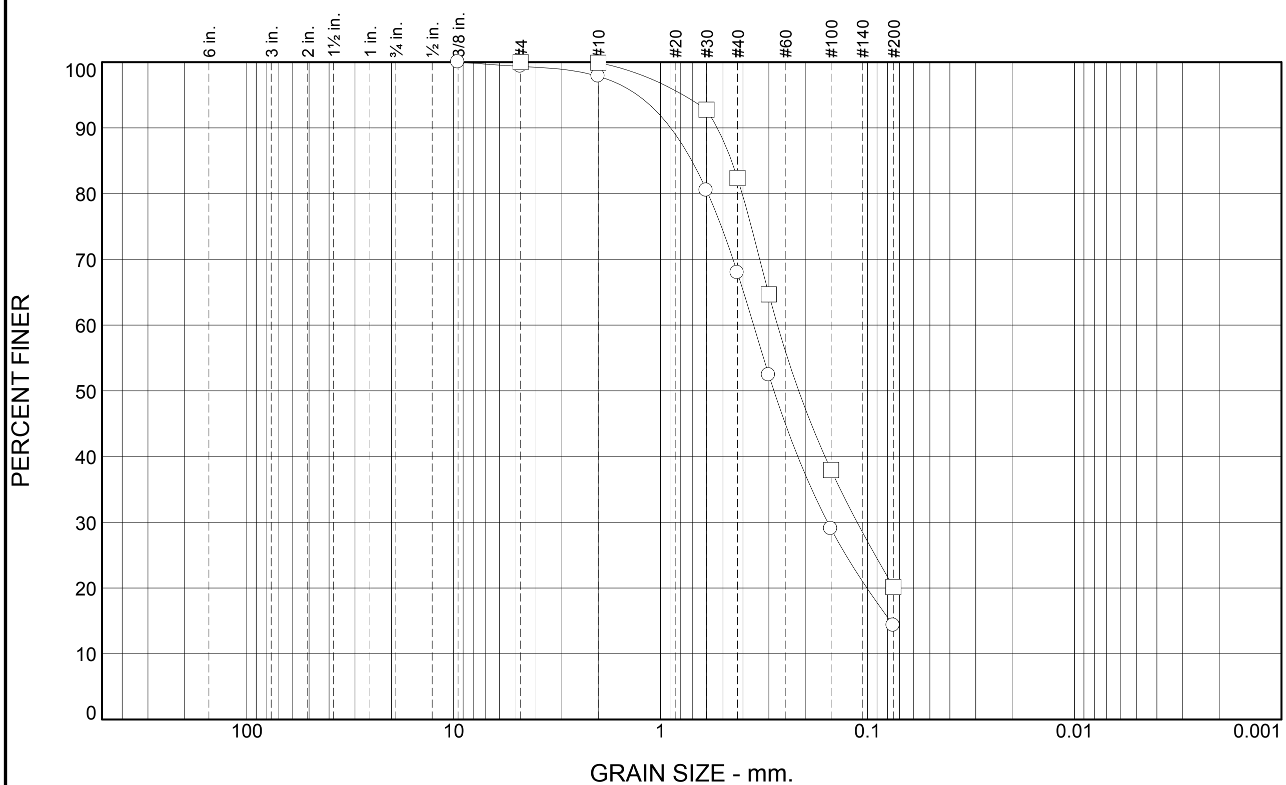
TYSON FRESH MEATS, INC
PASCO BEEF COMPLEX
DOMESTIC WASTEWATER SYSTEM

SOIL CLASSIFICATION TEST PIT MAP

FIGURE
SC

R:\Clients\Ray Poland and Sons\7008-657 Tyson Onsite Wastewater Report\Figures\7008-657 Figure SC .dwg, 5/9/2019 11:22:20 AM

Particle Size Distribution Report



	+3"	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
○	0.0	0.7	85.0	14.3					
□	0.0	0.0	79.8	20.2					

SIEVE inches size	PERCENT FINER ○	□	
3/8"	100.0		
	GRAIN SIZE		
D_{60}	0.3555	0.2726	
D_{30}	0.1559	0.1123	
D_{10}			
	COEFFICIENTS		
C_c			
C_u			

SIEVE number size	PERCENT FINER ○	□	
#4	99.3	100.0	
#10	97.8	99.9	
#30	80.5	92.8	
#40	67.9	82.4	
#50	52.4	64.7	
#100	29.0	37.9	
#200	14.3	20.2	

Material Description

○ Dark Grayish Brown Silty SAND

□ Dark Grayish Brown Silty SAND

REMARKS:

○ Sample contained a small amount of cemented aggregations that continued to break down during testing.

□ Sample contained a small amount of cemented aggregations that continued to break down during testing.

○ Source of Sample: TP-1 Depth: 8 Sample Number: S-1-2

□ Source of Sample: TP-3 Depth: 8 Sample Number: S-3-2

Benchmark Geolabs, LLC

Client: Anderson Perry

Project: Tyson Fresh Meats On-Site Wastewater System - 7008-657

Project No.: 033-003 Figure

Table 1: Soil types and Hydraulic Loading Rates

Soil Type	Soil Textural Classification	Maximum Hydraulic Loading Rate, for residential strength effluent, gpd/sf
1	Gravelly and very gravelly coarse sands, all extremely gravelly soils.	1.0
2	Coarse sands.	1.0
3	Medium sands, loamy coarse sands, loamy medium sands.	0.8
4	Fine sands, loamy fine sands, sandy loams, loams.	0.6
5	Very fine sands, very fine loamy sand, very fine sandy loams; or silt loams and sandy clay loams with a moderate or strong structure (excluding platy structure).	0.4
6	Other silt loams, sandy clay loams, clay loams, silty clay loams.	Not suitable
7	Sandy clay, clay, silty clay, strongly cemented or firm soils, soil with a moderate or strong platy structure, any soil with a massive structure, any soil with appreciable amounts of expanding clays. Soils greater than 90% rock.	Not suitable

Source: Washington Administrative Code 246-272B-03400 Soil Characterization

Table 8: Coarse Sand—Required Particle Size Distribution

Sieve	Particle Diameter, mm	Percent Passing by Weight
3/8 inch	9.50	100
No. 4	4.75	95 to 100
No. 8	2.36	80 to 100
No. 16	1.18	45 to 85
No. 30	0.6	15 to 60
No. 50	0.3	3 to 15
No. 100	0.15	0 to 4

Table 9: Fine Aggregate—ASTM C-33 Sand—Particle Size Distribution

Sieve	Particle Diameter, mm	Percent Passing by Weight
3/8 inch	9.50	100
No. 4	4.75	95 to 100
No. 8	2.36	80 to 100
No. 16	1.18	50 to 85
No. 30	0.6	25 to 60
No. 50	0.3	5 to 30
No. 100	0.15	0 to 10; prefer < 4
No. 200	0.075	0 - 3; prefer 0

Source: Washington Administrative Code 246-272B-06700 - Sand-Lined Trenches and Beds

Note: Native soil does not meet particle size distribution for coarse sand or fine aggregate.

TYSON FRESH MEATS, INC.
PASCO BEEF COMPLEX
DOMESTIC WASTEWATER SYSTEM IMPROVEMENTS
GEOTECHNICAL REPORT

OCTOBER 2020

Prepared for
Tyson Fresh Meats, Inc.

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TYSON FRESH MEATS, INC.
PASCO BEEF COMPLEX
DOMESTIC WASTEWATER SYSTEM IMPROVEMENTS
GEOTECHNICAL REPORT

OCTOBER 2020

ANDERSON PERRY & ASSOCIATES, INC.

Walla Walla, Washington
La Grande, Redmond, and Hermiston, Oregon

Job No. 7008-719

Table of Contents

Chapter 1 - Introduction and Scope of Work

This report provides an assessment of the on-site conditions for the proposed Tyson Fresh Meats, Inc. (Tyson) Domestic Wastewater System Improvements project located in Wallula, Washington. The information presented describes the in-situ soil conditions, observations of groundwater conditions, and slope considerations, and provides recommendations for site preparation and embankment design and construction. The design of the proposed liner for the wastewater lagoons is beyond the scope of this report.

This report has been prepared for the exclusive use of Tyson and the design team on the proposed Domestic Wastewater System Improvements project. The information was prepared in accordance with generally accepted geotechnical engineering practices. No other warranty, expressed or implied, is made. The recommendations presented are based on observed soil conditions in the field. In our opinion, the results of this investigation generally define the soil conditions, or the subsurface material, in a reasonable manner for the purpose intended.

Chapter 2 - Existing Site Conditions

The Domestic Wastewater System Improvements project will be conducted at the Tyson site located north of Dodd Road in Wallula, Washington, approximately 1.7 miles east of U.S. Route 12. A vicinity map showing the site's general location is included as Figure 1.

The existing wastewater treatment facilities consist of five wastewater lagoons. Gravel roadways surround the lagoons and provide access to the site. The proposed improvement site is in the southeast portion of the existing lagoon area.

The proposed improvement site slopes down toward a low depression in the northwest corner of the site with slopes ranging from approximately 1 to 4 percent slopes. A site plan showing the topography and several existing site features is included as Figure 2.

Chapter 3 - General Site Improvement Considerations

The proposed improvements include installation of a 560,000-gallon treatment lagoon and a 6-million gallon storage lagoon. The inside and outside slopes of the lagoons will be constructed with 3 horizontal to 1 vertical (3H:1V) slopes. The lagoons will generally be cut into the existing site, with the elevation of the top of the new lagoons' embankments approximately matching the top of the existing wastewater lagoons' elevation.

The maximum height of the lagoon embankments will be approximately 8 feet above the adjacent ground surface. The lagoons will have 2 feet of freeboard, and the crown width of the lagoon embankments will be 15 feet wide and support access roads.

A small single-story utility building may be constructed in the southwest portion of the proposed improvement site.

Chapter 4 - Local Geology and Seismicity

The proposed improvement site is located in the southeast region of the Pasco Basin and centrally within the Columbia Plateau Physiographic Province. The Pasco Basin is a structural depression in the underlying Columbia River Basalt. Geologic mapping (Schuster, 1994) indicates the site is overlain by Holocene-age dune sand (aeolian sand). The aeolian sand is underlain by Pleistocene-age gravel alluvium. The gravel alluvium is underlain by approximately 100 feet of the Miocene-age Ice Harbor Member of the Saddle Mountain Formation of the Columbia River Basalt Group. The Saddle Mountain Formation is over 800 feet thick, and the Columbia River Basalt extends at least another 4,000 feet below this depth.

Test pit logs provide records of the subsurface explorations and are included in Appendix A. Boring logs for a subsurface exploration conducted at an adjacent site and several well reports for wells in the regional vicinity were also reviewed. These well reports and boring logs (included in Appendix B) indicate the site is overlain by approximately 70 to 100 feet of aeolian (wind-blown) sand. The surface of the basalt formation is approximately 200 feet below the existing ground surface in the vicinity of the lagoon site. The formations encountered at the site are described in more detail in Chapter 5 - Characteristics of Subsurface Materials.

Faulting

Two potentially active Quaternary fault systems identified by the U.S. Geological Survey (USGS) are located in the general vicinity of the proposed site. These faults are the west to northwest trending Wallula fault and the northwest trending Horse Heaven Hills structure. Both faults have slip rates of less than 0.008 inches (0.2 millimeters) per year.

The Wallula fault is approximately 4.4 miles southwest of the site and the Horse Heaven Hills structure is approximately 8.8 miles southwest of the site. These faults have the potential to generate a crustal earthquake with a Moment Magnitude (M_W) of 6.42 within 4.4 miles of the site with a 2.0 percent probability in 50 years. In addition to a possible local crustal earthquake, an intraslab earthquake with an M_W of 7.5 approximately 180 miles from the site and an interface earthquake with an M_W of 8.5 approximately 285 miles from the site do not increase the spectral accelerations above the values mapped in the 2018 International Building Code (IBC). Seismic design parameters are discussed in Chapter 7 - Geotechnical Recommendations.

Ground Rupture

Due to the site's location relative to the faults in the site's general vicinity, the risk associated with a fault rupture is low.

Liquefaction and Lateral Spreading

Ideal soils for liquefaction include loose, saturated sands with little or no fines. The risk associated with liquefaction and lateral spreading at this site is very low due to the depth of groundwater and the anticipated relative densities of the saturated subsurface soils. The formation in the 50 feet below the existing ground surface is typically of interest for a liquefaction assessment. The anticipated seasonal high groundwater surface is expected below this depth.

Chapter 5 - Characteristics of Subsurface Materials

Subsurface Exploration

Test Pits

On April 26, 2019, seven test pits were excavated in the general vicinity of the new lagoon site. Three of these test pits were excavated at the new lagoon site to provide an assessment of the subsurface soils. The test pits were excavated with a Volvo ECR145CL Excavator. The locations for the three test pits applicable to this project are shown on Figure 2.

The material in each test pit was visually classified, and soil samples were obtained and retained for laboratory testing. The test pits were logged during the subsurface exploration, and the final logs (included in Appendix A) were prepared based on our review of the field logs and examination of the soil samples. The soils were classified according to the ASTM International (ASTM D2488) classification of soils for engineering purposes.

Soil Profile Summary

The site is overlain by approximately 70 to 100 feet of aeolian sand. This soil group encountered at the site is discussed below.

Aeolian Sand

The aeolian sand generally consists of silty sand to sand with silt. The sand is light brown to brown and non-plastic. The sand is generally fine to medium with occasional coarse fragments. The aeolian sand has trace fine to coarse gravel. The gravel is rounded to subrounded. Occasional organic material consisting of rootlets were encountered to a depth of approximately 3.5 feet. The apparent density of the sand is loose. During the exploration, the sand ranged from damp to moist. The aeolian sand encountered during the subsurface exploration may consist of fill material, especially near the existing surface. Occasional fragments of polyvinyl chloride (PVC) pipe were encountered in the material during the exploration.

Groundwater

Based on well logs for wells in the general vicinity of the site, groundwater is estimated at a depth of approximately 70 to 80 feet below the existing ground surface at the lagoon site.

Chapter 6 - Laboratory Testing

No laboratory testing was conducted as part of this phase of the project.

Chapter 7 - Geotechnical Recommendations

Site Preparation

To prepare the site for the proposed improvements, the improvement areas should be stripped and grubbed to remove all grass, roots, and organic soil.

Topsoil may be placed on the outside slopes of the proposed improvement areas but should not be used for fill material beneath the proposed lagoon or within the inside or middle third of the proposed embankments.

After the site has been stripped, the subgrade beneath the new embankments should be compacted to a minimum of 95 percent of the maximum dry density as determined by ASTM D698 (American Association of State Highway Transportation Officials [AASHTO] T99). The contractor should be prepared to spend substantial time compacting and adding water to the subgrade to achieve the optimum moisture content for compaction, as the subgrade appears to be loose for several feet below the existing ground surface. Preparation of a firm subgrade will facilitate embankment construction.

After the subgrade has been compacted, it should be proof-rolled with a loaded dump truck to reveal any soft or unsuitable areas existing in the subgrade. Any soft areas encountered during proof-rolling should be over-excavated and backfilled with structural fill.

Reusability of On-Site Soil

The on-site soil may be utilized as structural fill material, provided the soil is at or below optimum moisture content at the time of placement and is basically free of debris and organic material.

Structural Fill and Embankment Construction

Embankment construction or restoration of the grade in over-excavated areas beneath the proposed lagoons or other improvement areas will require the placement of structural fill.

If the on-site sand material is used as fill in the proposed improvement areas, it should be placed in 9-inch loose lifts and compacted to a minimum of 95 percent of the maximum density as determined by ASTM D698 (AASHTO T99).

Import material consisting of any combination of silt, sand, or gravel may be utilized for structural fill provided the material is at or below optimum moisture content at the time of placement and is free of debris or deleterious material. The import material may be naturally occurring or a manufactured product. The material should not exceed a maximum size of 4.0 inches in diameter unless it is being utilized for erosion protection on the outside slope of lagoon embankments.

The finer fill material should be placed in the middle third of the lagoon embankment cross section. Material placed adjacent to a lagoon liner should not exceed a maximum size of 3/4-inch in diameter.

Import material used as fill should be placed in 9-inch loose lifts and compacted to a minimum of 92 percent of the maximum dry density as determined by ASTM D1557 (AASHTO T180), or 95 percent of ASTM D698 (AASHTO T99), as applicable for the material being used. If the imported material is too coarse to be tested pursuant to the test procedures, it should be compacted to a uniform, non-yielding condition.

Based on various methods of conventional analysis, we estimate the new lagoon embankments could experience up to 2.2 inches of total settlement if the site is prepared as recommended herein. A significant portion of this settlement will occur during construction of the embankments. Up to 1.0 inch of total settlement may occur during lagoon filling after the lagoon embankments have been completed.

Any structural fill or backfill placed on site must be inspected and tested by a qualified materials testing laboratory to verify the specified compaction requirements are achieved.

Foundation Recommendations

Conventional continuous wall footings and spread footings may be used to support a new building. Footings should be founded on a minimum of 6 inches of compacted crushed aggregate, underlain by compacted aeolian sand. Prior to the placement of crushed aggregate, the subgrade at the bottom of footing excavations should be compacted to a minimum of 95 percent of the maximum density as determined by ASTM D698 (AASHTO T99).

To reduce the risk associated with potential differential settlement, continuous wall footings and spread footings should be founded on a minimum of 6 inches of compacted crushed aggregate. The crushed aggregate should be crushed surfacing top course meeting the current version of the Washington State Department of Transportation (WSDOT) Standard Specifications and compacted to a minimum of 92 percent of the maximum dry density as determined by WSDOT Test Method 606, or 92 percent of the maximum dry density as determined by ASTM D1557 (AASHTO T180). The crushed aggregate should extend at least 6 inches beyond the footing edges.

Anderson Perry & Associates, Inc. (AP) recommends using an allowable bearing pressure of 1,500 pounds per square foot (psf) for footings founded on compacted aeolian sand.

To provide reasonable frost protection and ensure adequate bearing capacities, AP recommends placing all footings at least 2.0 feet below finished grade and having at least 2.0 feet of vertical separation between the bottoms of the footings and any adjacent finished floor elevations. AP recommends all continuous wall footings have a minimum width of 18 inches.

Based on our experience and the results of the analysis, AP estimates the proposed new building could experience total and differential settlements of up to 0.75 and 0.50 inch, respectively, if the site is prepared as recommended herein.

Floor Slab Base

To provide a firm and uniform structural base, we recommend placing a minimum 6.0 inches of well-graded, crushed aggregate beneath new concrete slab-on-grade floors. The well-graded, crushed aggregate should be compacted to a minimum of 92 percent of the maximum dry density as determined by ASTM D1557 (AASHTO T180), using a vibratory, smooth, steel-wheeled roller.

A modulus of subgrade reaction, k_s, of 150 pounds per cubic inch may be used for floor slab design.

Temporary Slope Considerations

In our opinion, when applying Occupational Safety and Health Administration (OSHA) regulations, the soil encountered at the site is a Type C soil. OSHA recommends a maximum temporary slope inclination of 1.5H:1V for Type C soils. Sloughing of vertical trench and excavation walls should be expected.

Permanent Slope Considerations

The stability of the lagoon embankment slopes was calculated by dividing the forces resisting slope movement (soil strength) by the forces driving slope movement (soil weight, seismic loading, and water). XSTABL is a computer program used to perform slope stability analysis based on slope geometry, soil strength, and groundwater conditions. XSTABL was used to analyze the new embankment cross sections (see Appendix C for XSTABL Slope Stability Analysis).

The stability of the new embankments was evaluated based on the recommendations provided in this report and the soil conditions observed during the subsurface exploration. The analysis assumed slopes are in a fully drained condition. Seismic loading utilized an earthquake event with a 2.0 percent probability in 50 years (2,475-year return period).

A minimum factor of safety of 1.60 was calculated for static conditions and a minimum factor of safety of 1.12 was calculated for seismic loading conditions. These minimum factors of safety are based on the assumption that loose soil conditions encountered beneath lagoon embankments during construction will be mitigated.

If a significant leak develops, an initial minimum factor of safety of 1.01 was calculated for static conditions. This factor of safety would decrease if a leak causes piping and erosion within an embankment. To mitigate this concern, a lagoon should be emptied immediately if wastewater is seen flowing through the toe of any embankment. The risk associated with this scenario at the proposed improvement site is relatively low.

Based on the stability analysis, embankment slopes should be no steeper than 3H:1V.

Although the cut and fill slopes generally appear to remain stable during the various loading conditions, the on-site soils are still highly susceptible to erosion (wind and runoff) and should be stabilized with permanent vegetation or gravel surfacing.

Utility Trenches

Depending on the depths of utilities, all excavation sidewalls should be properly sloped or shored to conform to applicable OSHA regulations. The aeolian sand has very little silt material binding the formation, and caving should be expected if temporary slopes and trench walls are excavated steeper than recommended.

Trench backfill should be placed and compacted in general accordance with Section 7-08 of the current version of the WSDOT Standard Specifications.

The on-site soils should not be used as backfill in the pipe zone. Backfill placed and compacted in the pipe zone should consist of gravel backfill for pipe zone bedding material in accordance with

Section 9-03.12(3) of the WSDOT Standard Specifications or crushed aggregate in accordance with Section 9-03.9(3) of the WSDOT Standard Specifications.

The on-site soils may be utilized for general trench backfill above the pipe zone if the material meets the same criteria described for structural fill. If the on-site soils do not meet the criteria of structural fill they should be removed and replaced with gravel backfill for foundations in accordance with Section 9-03.12 of the current version of the WSDOT Standard Specifications.

Backfill placed 2.0 feet or more from the surface should be compacted to a minimum of 88 percent of the maximum dry density as determined by ASTM D1557 (AASHTO T180), 88 percent of WSDOT Test Method 606, or 90 percent of ASTM D698 (AASHTO T99), as applicable for the material being used. Backfill placed in the upper 2.0 feet beneath the proposed improvements should be compacted to a minimum of 92 percent of the maximum dry density as determined by ASTM D1557 (AASHTO T180), 92 percent of WSDOT Test Method 606, or 95 percent of ASTM D698 (AASHTO T99), as applicable for the material being used.

When hand-operated compaction equipment is used, the backfill should be placed in loose lifts less than 4.0 inches thick. If heavy compaction equipment is used, the loose lifts may be 9.0 inches thick. Heavy compaction equipment should not be used over the pipe until pipe zone bedding material and the trench backfill are at least 2.0 feet above the crown of the pipe.

Lateral Load Considerations

For retaining walls (including lift stations or manholes), if the backfill placed behind the retaining walls will consist of free-draining gravel, and if the finished grade behind the retaining walls will be relatively flat, the following design parameters for lateral earth pressures should be utilized. An active earth pressure coefficient, Ka = 0.28, may be used for non-restrained (yielding) retaining walls. This active earth pressure coefficient results in an equivalent fluid density of 36 pounds per cubic foot (pcf). An at-rest earth pressure coefficient, Ko = 0.44, may be used for restrained (non-yielding) retaining walls. This at-rest earth pressure coefficient results in an equivalent fluid density of 57 pcf.

If the on-site soils are utilized for backfill and the finished grade behind the retaining walls will be relatively flat, the following design parameters for lateral earth pressures should be utilized. An active earth pressure coefficient, Ka = 0.33, may be used for non-restrained (yielding) retaining walls. This active earth pressure coefficient results in an equivalent fluid density of 39 pcf. An at-rest earth pressure coefficient, Ko = 0.50, may be used for restrained (non-yielding) retaining walls. This at-rest earth pressure coefficient results in an equivalent fluid density of 60 pcf.

Lateral loads acting on the footings may be resisted by passive earth pressures acting against the sides of the footings and the friction forces along the bottoms of the footings. A passive earth pressure coefficient, Kp = 1.0, may be used for the on-site soil backfill. This passive earth pressure coefficient results in an equivalent fluid pressure of 115 pcf that may be used to calculate the passive resistance provided by the backfill. A friction coefficient (ultimate) of 0.55 may be used to calculate the sliding resistance on the bottoms of the footings against the compacted crushed aggregate. A summary of the lateral load design parameters is shown in Table 7-1.

TABLE 7-1
Lateral Load Design Parameters

Lateral Earth-Pressure Condition	Backfill	Value
Non-Restrained (Yielding) Retaining Walls		
Active Earth Pressure Coefficient, Ka	Free-Draining Gravel	0.28
Equivalent Fluid Density	Free-Draining Gravel	36 pcf
Active Earth Pressure Coefficient, Ka	On-Site Soil	0.33
Equivalent Fluid Density	On-Site Soil	39 pcf
Restrained (Non-Yielding) Retaining Walls		
At-Rest Earth Pressure Coefficient, Ko	Free-Draining Gravel	0.44
Equivalent Fluid Density	Free-Draining Gravel	57 pcf
At-Rest Earth Pressure Coefficient, Ko	On-Site Soil	0.50
Equivalent Fluid Density	On-Site Soil	60 pcf
Resistance to Sliding		
Passive Earth Pressure Coefficient, Kp	On-Site Soil	1.0
Equivalent Fluid Density	On-Site Soil	115 pcf
Ultimate Friction Coefficient Against Sliding, Crushed Aggregate	-	0.55

Site Drainage

The site should be graded to drain all construction and post-construction surface runoff away from the improvement areas. Runoff should be controlled to prevent erosion of the aeolian soils.

Inclement Weather Construction

If earthwork is scheduled during freezing conditions, care should be taken to prevent subgrade materials in the improvement areas from freezing. If subgrade materials freeze, they should be over-excavated and replaced with structural fill. Alternatively, frozen subgrade may be allowed to thaw and then be compacted to a minimum of 95 percent of the maximum density as determined by ASTM D698 (AASHTO T99).

Proof-rolling frozen subgrade material with a loaded dump truck will be ineffective at identifying soft areas or verifying non-yielding conditions. Proof-rolling should be conducted after compaction is complete and when the subgrade is not frozen.

Seismic Considerations

Spectral accelerations are mapped in the 2018 IBC and 2016 edition of American Society of Civil Engineers (ASCE) Minimum Design Loads and Associated Criteria for Buildings and Other Structures (ASCE 7-16). The mapped values of these accelerations are based on a 2 percent probability of exceedance in 50 years, or a 2,500-year return period for Site Class B. Site Class B is defined as a geologic profile of the upper 100 feet consisting of rock. For the proposed lagoon site, the mapped spectral bedrock acceleration for short periods (S_S) is 0.404 g and for 1-second period (S_1) is 0.149 g. The mapped Maximum Considered Earthquake Geometric Mean (MCE_G) value, also described as Peak Ground Acceleration (*PGA*) is 0.180 g.

Subsurface information obtained from the exploration and well reports was used to evaluate the site class for the proposed addition. Site Class D is defined as a geologic profile of the upper 100 feet consisting of a stiff soil profile with an average standard penetration resistance $\overline{N}$ value between 15 and 50 blows per foot. Site coefficient factors, F_A, F_V, and F_{PGA} are applied to the mapped spectral accelerations to calculate the maximum considered earthquake spectral response accelerations.

Based on Site Class D and the mapped spectral accelerations, the following site coefficients were calculated for the project site. The maximum considered earthquake spectral response acceleration for short period (S_{MS}) is 0.596 g and for a 1-second period (S_{M1}) is 0.344 g. The 5 percent damped design spectral response acceleration for short period (S_{DS}) is 0.397 g and for a 1-second period (S_{D1}) is 0.229 g. The site adjusted PGA (PGA_M) is 0.259 g. A summary of the seismic design parameters is shown in Table 7-2.

TABLE 7-2
Summary of 2018 IBC and ASCE 7-16 Seismic Design Parameters

Symbol	Definitions	Value (g)
S_S	Mapped spectral bedrock acceleration for short periods	0.404
S_1	Mapped spectral bedrock acceleration for 1-second period	0.149
PGA	Spectral bedrock acceleration for MCE_G	0.180
F_A	Site coefficient factor	1.477
F_V	Site coefficient factor	2.301
F_{PGA}	Site coefficient factor	1.440
S_{MS} ($S_{MS} = F_A S_S$)	Maximum considered earthquake spectral response acceleration for short period	0.596
S_{M1} ($S_{M1} = F_V S_1$)	Maximum considered earthquake spectral response acceleration for 1-second period	0.344
S_{DS} ($S_{DS} = 2/3\ S_{MS}$)	5 percent damped design spectral response acceleration for short period	0.397
S_{D1} ($S_{D1} = 2/3\ S_{M1}$)	5 percent damped design spectral response acceleration for 1-second period	0.229
PGA_M	Site-adjusted MCE_G	0.259

Chapter 8 - Conclusions

This report was prepared in a general manner and should provide adequate information for the design team to properly design and construct lagoon embankments, properly size footings for a new building, and design infrastructure facilities for the proposed Domestic Wastewater System Improvements project.

Should specific problems arise during the course of the project that may not be covered adequately in this report, if changes occur in any of the assumptions made, or if the site excavation reveals anything different than what is described herein, we recommend contacting the engineer so appropriate action can be taken. Any questions regarding this investigation should be directed to Andrew Robinson, P.E., with AP, 214 East Birch Street, Walla Walla, Washington 99362, telephone (509) 529-9260.

Chapter 9 - References

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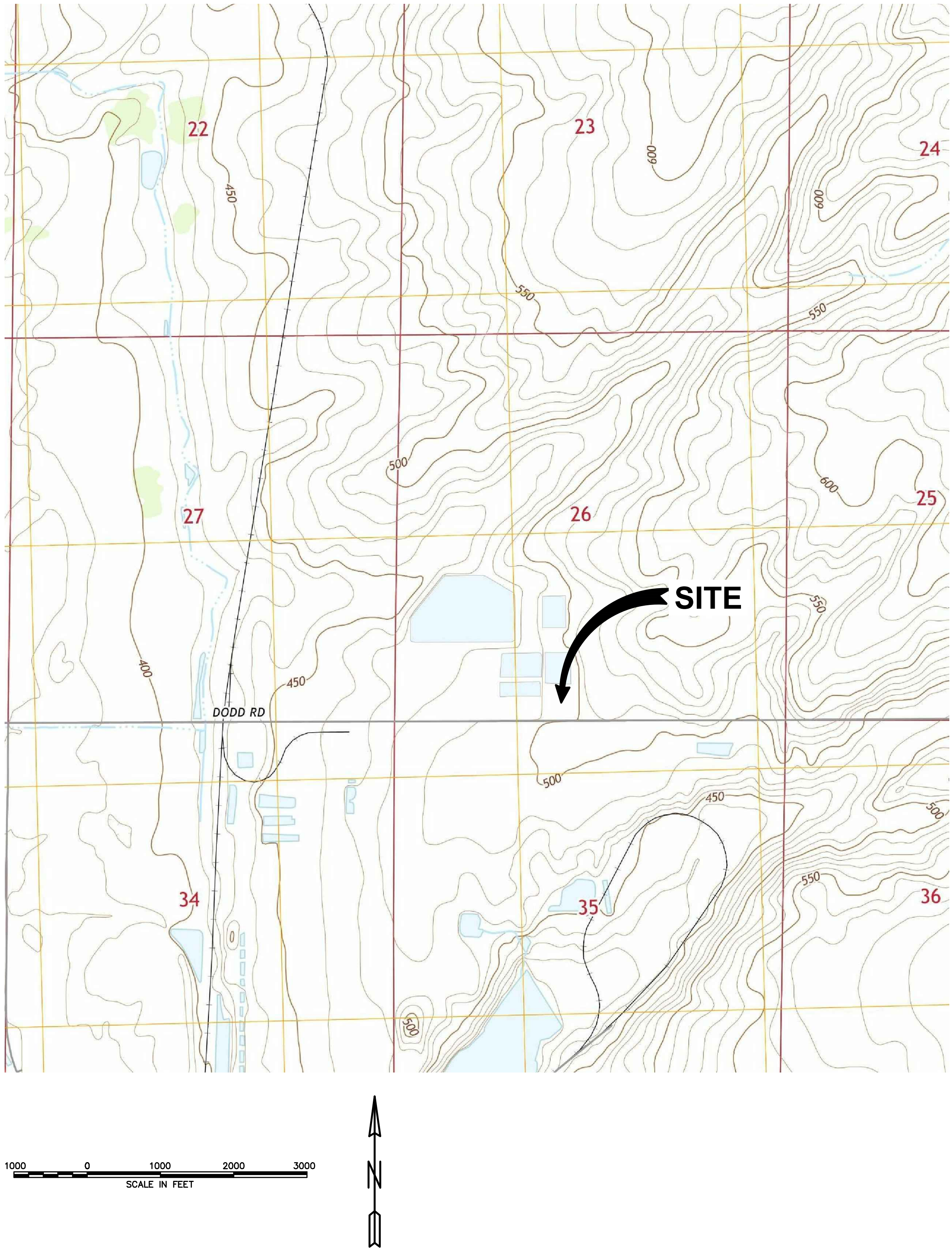
FIGURES



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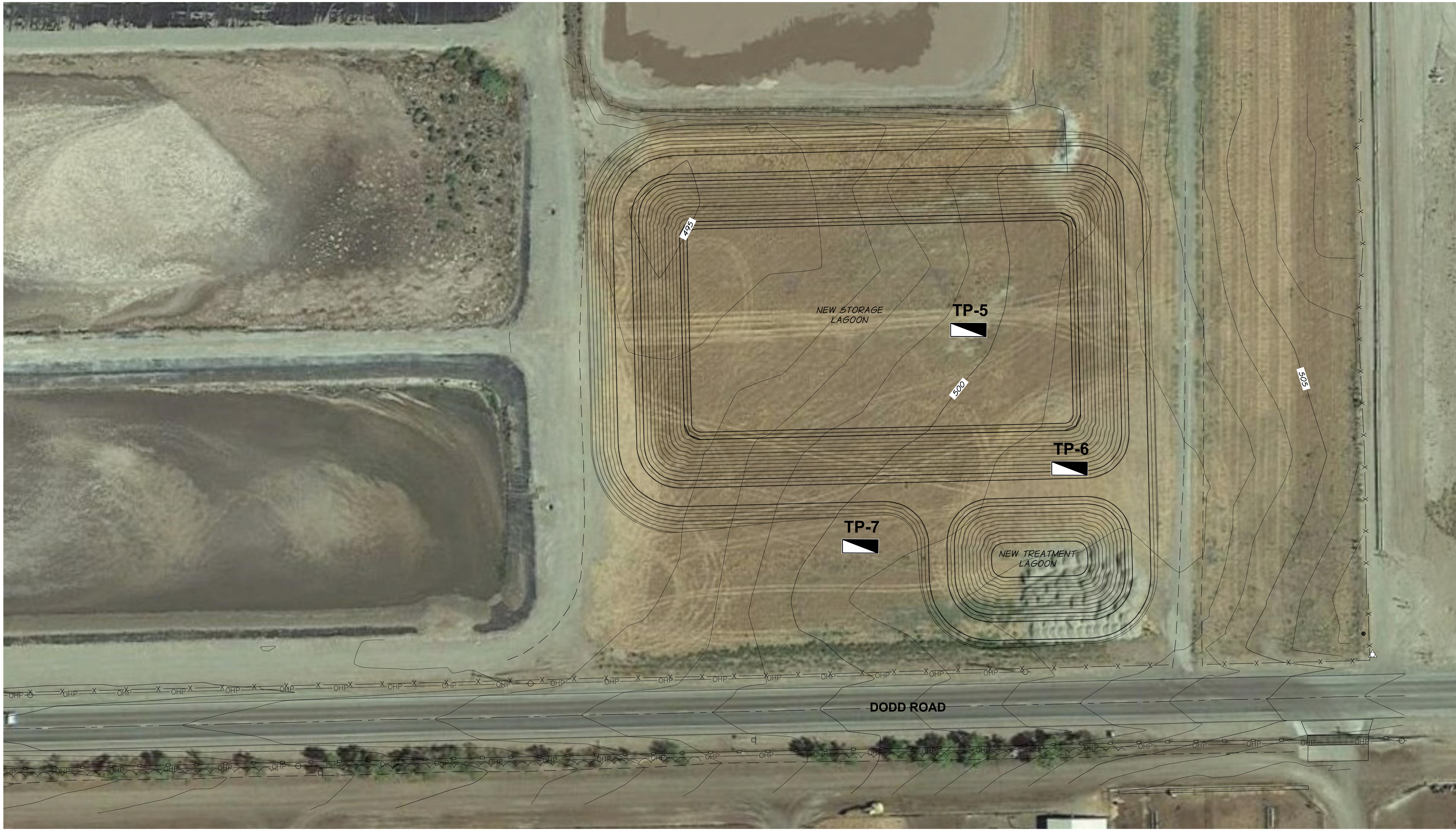
VICINITY MAP

FIGURE

1



SCALE IN FEET

N

LEGEND

TP-1 TEST PIT LOCATION

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SITE PLAN

FIGURE 2

APPENDIX A
Classification Format and Legend and Test Pit Logs

GENERAL SOIL DESCRIPTIVE SEQUENCE

1. CONSISTENCY (FINE-GRAINED SOILS) / APPARENT DENSITY (COARSE-GRAINED SOILS)
2. SOIL NAME
3. USCS DESIGNATION
4. COLOR
5. PLASTICITY
6. MOISTURE
7. GRAIN SIZE DISTRIBUTION
8. ANGULARITY
9. OTHER CHARACTERISTICS: CEMENTATION, TEXTURE, DILATANCY, STRUCTURE ETC.
10. ADDITIONAL CONSTITUENTS: FILL MATERIALS, DEBRIS, ORGANIC MATTER, ETC.
11. ORIGIN / FORMATION NAME

CONSISTENCY OF COHESIVE SOILS

TERM	UNDRAINED SHEAR STRENGTH	SPT N-VALUE
VERY SOFT	≤0.125 TSF	≤2 BLOWS/FT.
SOFT	0.125 - 0.25 TSF	2 - 4 BLOWS/FT.
MEDIUM STIFF	0.25 - 0.50 TSF	5 - 8 BLOWS/FT.
STIFF	0.5 - 1.0 TSF	9 - 15 BLOWS/FT.
VERY STIFF	1.0 - 2.0 TSF	16 - 30 BLOWS/FT.
HARD	2.0+ TSF	30+ BLOWS/FT.

APPARENT DENSITY (NON-COHESIVE) SOILS

TERM	SPT N-VALUE
VERY LOOSE	≤4 BLOWS/FT.
LOOSE	5 - 10 BLOWS/FT.
MEDIUM DENSE	11 - 30 BLOWS/FT.
DENSE	31 - 50 BLOWS/FT.
VERY DENSE	50+ BLOWS/FT.

SOIL CONSTITUENT DEFINITIONS
(BASED ON PARTICLE SIZE)

BOULDERS	RETAINED ON A 12-INCH OPENING.
COBBLES	PASSING A 12-INCH OPENING AND RETAINED ON THE 3.0-INCH SIEVE.
COARSE GRAVEL	PASSING THE 3.0-INCH SIEVE AND RETAINED ON THE 3/4-INCH SIEVE.
FINE GRAVEL	PASSING THE 3/4-INCH SIEVE AND RETAINED ON THE NO.4 SIEVE.
COARSE SAND	PASSING THE NO.4 SIEVE AND RETAINED ON THE NO.10 SIEVE.
MEDIUM SAND	PASSING THE NO.10 SIEVE AND RETAINED ON THE NO.40 SIEVE.
FINE SAND	PASSING THE NO.40 SIEVE AND RETAINED ON THE NO.200 SIEVE.
SILT	SOIL PASSING THE NO. 200 SIEVE. PLASTICITY INDEX (PI) PLOTS BELOW THE A-LINE ON THE PLASTICITY CHART.
CLAY	SOIL PASSING THE NO. 200 SIEVE. PI PLOTS ON OR ABOVE THE A-LINE ON THE PLASTICITY CHART.

SOIL COLOR

1. SOIL SAMPLES CHANGE COLOR AFTER THEY ARE REMOVED FROM THEIR IN-SITU ENVIRONMENT. SOIL COLORS ARE DESCRIBED AS SOON AS SAMPLES ARE TAKEN.
2. COMMON COLORS ARE UTILIZED: BROWN, YELLOW, GRAY, RED, GREEN, WHITE, ETC.
3. SECONDARY COLORS MAY BE UTILIZED TO PROVIDE MORE CLARIFICATION. FOR EXAMPLE, GRAY BROWN
4. ADDITIONAL ADJECTIVES MAY BE UTILIZED TO PROVIDE MORE DETAIL: DARK, LIGHT, MOTTLED, STREAKED, ETC.

MOISTURE

DRY	ABSENCE OF MOISTURE, DRY TO THE TOUCH. DUSTY.
DAMP	SLIGHT PRESENCE OF MOISTURE. MOISTURE CONTENT IS BELOW PLASTIC LIMIT FOR COHESIVE SOILS.
MOIST	SOIL IS DARKENED, BUT MOISTURE IS NOT VISIBLE. MOISTURE CONTENT IS NEAR OR SLIGHTLY ABOVE PLASTIC LIMIT FOR COHESIVE SOILS.
WET	VISIBLE FREE WATER. TYPICALLY SATURATED.

CEMENTATION

WEAK	SOIL CRUMBLES WITH HANDLING OR SLIGHT FINGER PRESSURE.
MODERATE	SOIL CRUMBLES WITH CONSIDERABLE FINGER PRESSURE.
STRONG	SOIL DOES NOT NOT CRUMBLE WITH CONSIDERABLE FINGER PRESSURE.

SOIL CLASSIFICATION (SOIL NAME)

1. PRIMARY AND SECONDARY SOIL CONSTITUENTS ARE UTILIZED TO SELECT A SOIL NAME IN ACCORDANCE WITH THE UNIFIED SOIL CLASSIFICATION SYSTEM (USCS) FLOW CHARTS PROVIDED ON FIGURES A2 AND A3.
2. ADDITIONAL SOIL CONSTITUENTS ARE UTILIZED IN THE SOIL NAME IN ACCORDANCE WITH THE USCS CHARTS.
3. THE FOLLOWING QUANTIFYING TERMS ARE OFTEN UTILIZED TO PROVIDE ADDITIONAL CLARITY:

TERM	PERCENTAGE BY WEIGHT	
TRACE	<5%	THESE TERMS ARE GENERALLY USED FOR SOIL CONSTITUENTS.
SOME	30% TO 50%	
MOSTLY	≥50%	
OCCASIONAL	<10%	THESE TERMS ARE USED FOR ADDITIONAL CONSTITUENTS INCLUDING: COBBLES, BOULDERS, FILL, DEBRIS AND ORGANIC MATTER.
SCATTERED	10 TO 20%	
NUMEROUS	≥20%	

PLASTICITY

NONPLASTIC	AN 1/8-INCH TREAD CANNOT BE ROLLED AT ANY MOISTURE CONTENT. VERY LOW DRY STRENGTH. (DRY SOIL CUBE FALLS APART).
LOW	AN 1/8-INCH TREAD CAN BARELY BE ROLLED. SOIL LUMP CANNOT BE FORMED WHEN DRIER THAN THE PLASTIC LIMIT. LOW DRY STRENGTH (EASY TO CRUSH DRY SOIL CUBE WITH FINGERS).
MEDIUM	AN 1/8-INCH TREAD CAN EASILY BE ROLLED IN A SHORT TIME. THE TREAD CANNOT BE RE-ROLLED AFTER REACHING PLASTIC LIMIT. SOIL LUMP CRUMBLES WHEN DRIER THAN THE PLASTIC LIMIT. MEDIUM DRY STRENGTH (DIFFICULT TO CRUSH DRY SOIL CUBE WITH FINGERS).
HIGH	A LONG TIME IS TAKEN IN ROLLING TO REACH THE PLASTIC LIMIT. THE THREAD CAN BE RE-ROLLED SEVERAL TIMES AFTER REACHING PLASTIC LIMIT. SOIL LUMP CAN BE FORMED WITHOUT CRUMBLING AFTER REACHING THE PLASTIC LIMIT. HIGH DRY STRENGTH (CAN NOT CRUSH DRY SOIL CUBE WITH FINGERS).

GRAIN SIZE DISTRIBUTION

1. GRAVEL IS DESCRIBED AS FINE AND/OR COARSE.
2. SAND IS DESCRIBED AS FINE, MEDIUM AND/OR COARSE.
3. COBBLES AND BOULDERS ARE DESCRIBED IN TERMS OF INCHES IN DIAMETER.

ANGULARITY (COARSE SAND TO BOULDER SIZE)

ANGULAR	PARTICLES HAVE SHARP EDGES, RELATIVELY FLAT SIDES AND UNPOLISHED SURFACES.
SUBANGULAR	SIMILAR TO ANGULAR PARTICLES BUT PARTICLES HAVE ROUNDED EDGES.
SUBROUNDED	PARTICLES HAVE NEARLY PLANE SIDE BUT WELL-ROUNDED EDGES AND CORNERS.
ROUNDED	PARTICLES HAVE SMOOTH CURVED SIDES AND NO EDGES.

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CALSSIFICATION FORMAT AND LEGEND

FIGURE A1

ORIGIN / SOIL FORMATION

FILL	SOIL HAS BEEN PLACED BY HUMAN MEANS.
ALLUVIUM	DEPOSITED BY FLOWING WATER (STREAM, RIVER, ETC.)
LACUSTRINE	DEPOSITED AT THE BOTTOM OF LAKES.
CALICHE	CEMENTED SOIL FORMATION (CALCIUM CARBONATE).
COLLUVIUM	ROCK DEPOSITED AT THE BASE OF STEEP SLOPE (TALUS).
AEOLIAN	WIND BLOW DEPOSIT (DUNE SAND, LOESS).
LOESS	WIND BLOW SILT.

FLOW CHART FOR IDENTIFYING COARSE-GRAINED SOILS

UNIFIED SOIL CLASSIFICATION SYSTEM (USCS)

> 50% RETAINED ON N0.200 SIEVE

			<15% SAND		≥15% SAND		USCS SYMBOL	
			SOIL NAME	**GRAPHIC SYMBOL**	**SOIL NAME**	**GRAPHIC SYMBOL**	**WELL-GRADED**	**POORLY-GRADED**
GRAVEL % GRAVEL > % SAND	≤5% FINES		GRAVEL		GRAVEL WITH SAND		GW	GP
	10% FINES	SILT FINES	GRAVEL WITH SILT		GRAVEL WITH SILT AND SAND		GW-GM	GP-GM
		CLAY FINES	GRAVEL WITH CLAY		GRAVEL WITH CLAY AND SAND		GW-GC	GP-GC
	≥15% FINES	SILT FINES	SILTY GRAVEL		SILTY GRAVEL WITH SAND		GM	
		CLAY FINES	CLAYEY GRAVEL		CLAYEY GRAVEL WITH SAND		GC	

			<15% GRAVEL		≥15% GRAVEL		USCS SYMBOL	
			SOIL NAME	**GRAPHIC SYMBOL**	**SOIL NAME**	**GRAPHIC SYMBOL**	**WELL-GRADED**	**POORLY-GRADED**
SAND % SAND ≥ % GRAVEL	≤5% FINES		SAND		SAND WITH GRAVEL		SW	SP
	10% FINES	SILT FINES	SAND WITH SILT		SAND WITH SILT AND GRAVEL		SW-SM	SP-SM
		CLAY FINES	SAND WITH CLAY		SAND WITH CLAY AND GRAVEL		SW-SC	SP-SC
	≥15% FINES	SILT FINES	SILTY SAND		SILTY SAND WITH GRAVEL		SM	
		CLAY FINES	CLAYEY SAND		CLAYEY SAND WITH GRAVEL		SC	

SOIL LOG LEGEND

SAMPLE TYPE

2.0-INCH O.D. SPLIT-SPOON SAMPLE

3.0-INCH O.D. THIN-WALLED SAMPLE

GRAB SAMPLE

IN-SITU & LABORATORY TESTING RESULTS

■ TORVANE READING

TSF TON PER SQUARE FEET

▲ SPT, N-VALUE

● MOISTURE CONTENT, %

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CLASSIFICATION FORMAT AND LEGEND

FIGURE A2

FLOW CHART FOR IDENTIFYING INORGANIC FINE-GRAINED SOIL

UNIFIED SOIL CLASSIFICATION SYSTEM (USCS)

≥ 50% PASSING THE NO.200 SIEVE

				SOIL NAME	LIQUID LIMIT LL < 50 USCS SYMBOL	LL < 50 GRAPHIC SYMBOL	LIQUID LIMIT LL ≥ 50 USCS SYMBOL	LL ≥ 50 GRAPHIC SYMBOL
SILT PLASTIC INDEX (PI) PLOTS BELOW A-LINE	<15% RETAINED ON NO. 200 SIEVE			SILT	ML		MH	
	15 TO 25% RETAINED ON NO. 200 SIEVE	% SAND ≥ % GRAVEL		SILT WITH SAND	ML		MH	
		% SAND < % GRAVEL		SILT WITH GRAVEL	ML		MH	
	≥30% RETAINED ON NO. 200 SIEVE	% SAND ≥ % GRAVEL	<15% GRAVEL	SANDY SILT	ML		MH	
			≥15% GRAVEL	SANDY SILT WITH GRAVEL	ML		MH	
		% SAND < % GRAVEL	<15% SAND	GRAVELLY SILT	ML		MH	
			≥15% SAND	GRAVELLY SILT WITH SAND	ML		MH	
CLAY PLASTIC INDEX (PI) PLOTS ON OR ABOVE A-LINE	<15% RETAINED ON NO. 200 SIEVE			CLAY	CL		CH	
	15 TO 25% RETAINED ON NO. 200 SIEVE	% SAND ≥ % GRAVEL		CLAY WITH SAND	CL		CH	
		% SAND < % GRAVEL		CLAY WITH GRAVEL	CL		CH	
	≥30% RETAINED ON NO. 200 SIEVE	% SAND ≥ % GRAVEL	<15% GRAVEL	SANDY CLAY	CL		CH	
			≥15% GRAVEL	SANDY CLAY WITH GRAVEL	CL		CH	
		% SAND < % GRAVEL	<15% SAND	GRAVELLY CLAY	CL		CH	
			≥15% SAND	GRAVELLY CLAY WITH SAND	CL		CH	

ADDITIONAL SOIL LOG GRAPHIC SYMBOLS

TOPSOIL

FILL

ASPHALT

CLAYEY SILT

WELL INSTALLATION & BACKFILL GRAPHIC SYMBOLS

GROUNDWATER LEVEL MEASURED ON DATE SHOWN

COLD PATCH ASPHALT

SILICA SAND BACKFILL

CONCRETE BACKFILL

PVC WELL CASING

GRAVEL BACKFILL

BENTONITE CHIP BACKFILL

FLUSH MOUNT MONUMENT

SLOTTED WELL SCREEN

TEST PIT TP-5

ELEVATION (DEPTH) FEET	CLASSIFICATION OF MATERIAL	LOG	SAMPLES	TESTS	COMMENTS
499.7 (0)	LOOSE SILTY SAND (SM); TRACE GRAVEL, LIGHT BROWN TO BROWN, DAMP TO MOIST, NONPLASTIC, FINE TO COARSE SAND, FINE TO COARSE GRAVEL, ROUNDED TO SUBROUNDED, (AEOLIAN DUNE SAND / POSSIBLE FILL)				
				■	0.20 TSF PP=1.25
			S-5-1		
				■	0.05 TSF PP=0.75
498.7 (5.0)					SLOUGHING BELOW 5.0 FEET
			S-5-2		NO GROUNDWATER OBSERVED ON 4/26/19
	BOTTOM OF TEST PIT AT 8.0 FEET				
496.7 (10.0)					

TEST PIT TP-6

ELEVATION (DEPTH) FEET	CLASSIFICATION OF MATERIAL	LOG	SAMPLES	TESTS	COMMENTS
501.4 (0)	LOOSE SILTY SAND (SM); TRACE GRAVEL, LIGHT BROWN TO BROWN, MOIST, NONPLASTIC, FINE TO COARSE SAND, FINE TO COARSE GRAVEL, ROUNDED TO SUBROUNDED, OCCASIONAL ORGANICS (ROOTS) DOWN TO 3.5 FEET, (AEOLIAN DUNE SAND / POSSIBLE FILL)				
				■	0.15 TSF PP=1.25
			S-6-1		
			S-6-2		
				■	0.15 TSF PP=1.0
496.4 (5.0)					
			S-6-3		NO GROUNDWATER OBSERVED ON 4/26/2019
	BOTTOM OF TEST PIT AT 8.0 FEET				
491.4 (10.0)					

anderson perry & associates, inc.

TYSON FOODS, INC.
DOMESTIC WASTEWATER SYSTEM IMPROVEMENTS
WALLULA, WASHINGTON

TEST PIT LOGS

FIGURE A4

TEST PIT TP-7

ELEVATION (DEPTH) FEET	CLASSIFICATION OF MATERIAL	LOG	SAMPLES	TESTS	COMMENTS
500.6 (0)	LOOSE SILTY SAND (SM); TRACE GRAVEL, LIGHT BROWN TO BROWN, DAMP TO MOIST, NONPLASTIC, FINE TO COARSE SAND, FINE TO COARSE GRAVEL, ROUNDED TO SUBROUNDED, OCCASIONAL ORGANICS (ROOTS) DOWN TO 3.5 FEET, (AEOLIAN DUNE SAND / POSSIBLE FILL)				
				■	0.15 TSF PP=1.50
			☒ S-7-1		
			☒ S-7-2	■	0.00 TSF PP=0.75
499.6 (5.0)					
			☒ S-7-3		NO GROUNDWATER OBSERVED ON 4/26/19
	BOTTOM OF TEST PIT AT 8.0 FEET				
497.6 (10.0)					

anderson perry & associates, inc.

TYSON FOODS, INC.
DOMESTIC WASTEWATER SYSTEM IMPROVEMENTS
WALLULA, WASHINGTON

TEST PIT LOGS

FIGURE

A5

APPENDIX B
Well Reports and Boring Logs

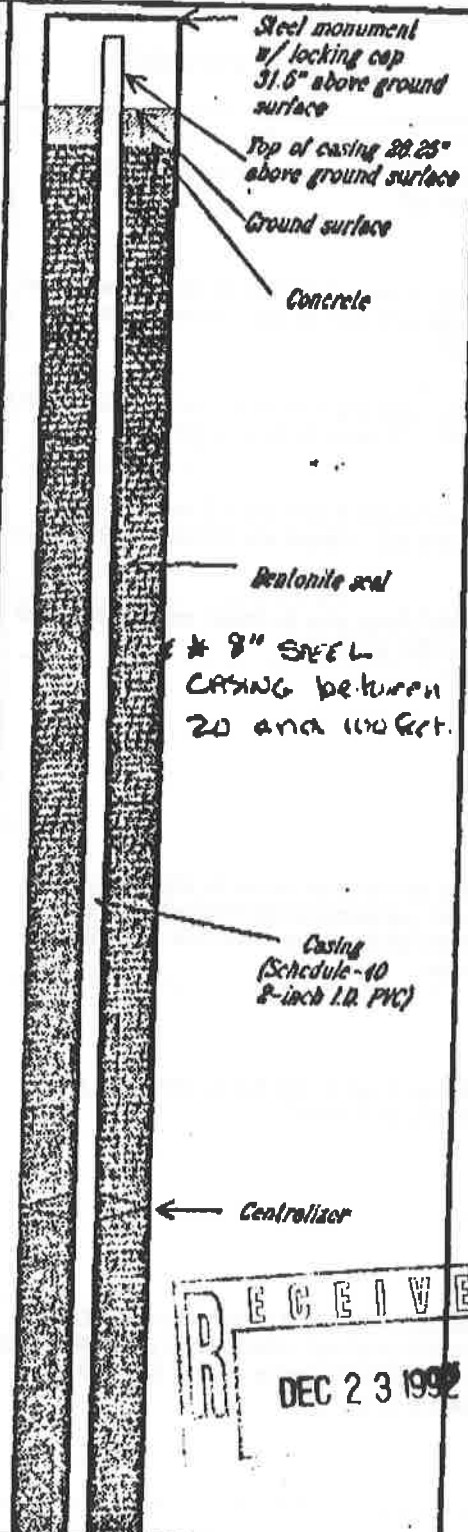
S26 T8 R31
.WALLA WALLA

PROJECT *IBP Wallula Plant* W.O. *S-1061* WELL NO. *MW-1(a)*

Elevation reference:
Ground surface elevation: Casing elevation:

DEPTH (feet)	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	BLOW COUNTS	OVM READING	GROUND WATER
0						
	(Medium stiff) dry, beige, SILT w/some coarse sand and fine gravel in places (Loess).					
10	*(Medium dense) dry, tan to light brown, silty fine SAND, micaceous in places.*					
	(Dense) dry, gray, fine to medium SAND w/some silt.					
20	*(Dense) dry, brown, fine SAND w/thin gray medium sand, w/silt interbeds.*					
	(Dense) dry, gray, medium to coarse SAND w/tan silt.					
	(Stiff) dry, tan, fine sandy SILT with trace coarse sand					
30	*(Dense) dry, dark gray to black, medium to coarse sand.*					
	(Stiff) dry, tan SILT (Loess).					
40						
	(Stiff) dry, tan to beige, fine sandy SILT to silty fine SAND w/trace fine gravel. Micaceous in places. Thin caliche layers at 42.0 feet.					
50	*(Very dense) dry, white, CALICHE with some thin tan silt interbeds*					
	(Dense) dry, tan to brown, SILT and silty fine SAND (Loess).					
60						

AS-BUILT DESIGN | TESTING



* 8" STEEL CASING between 20 and 100 feet.

RECEIVED
DEC 23 1992

RUEN DRILLING, INC.
BOX 267
CLARK FORK, ID 83811
(208) 266-1151
PERMIT # 066052

LEGEND

- - - Inferred stratigraphic contact
SWL elevation and date of measurement

Will [signature]
2085

RZA AGRA, Inc.
Engineering & Environmental Services
539 West Sharp, Suite D
Spokane, WA 99201

Drilling started: *4 August 1992* Drilling completed: *6 August 1992* Logged by: *EWS*

S 26 10 R 31 E.
WALLA WALLA

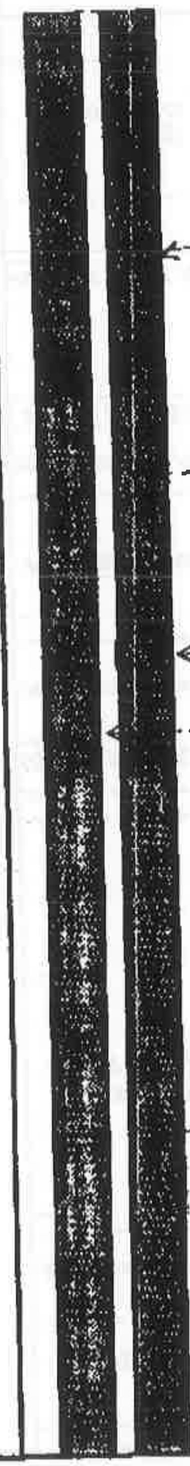
W.O. *S-1061* WELL NO. *MW-1(b)*

PROJECT *IBP Wallula Plant*

Elevation reference:
Ground surface elevation:
Casing elevation:

DEPTH (feet)	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	BLOW COUNTS	OVM READING	GROUND WATER
60	*(Dense dry, brown, fine to medium SAND with trace silt.*					
	(Dense to very dense) dry to damp, black basalt GRAVEL with gray to tan, micaceous, medium SAND.					
70	*(Dense) dry, tan and white, fine to medium silica SAND with some basalt fine gravels.*					
	(Dense) damp, brown, gravelly medium SAND w/trace silt. Gravels are subrounded to rounded.					
80	*(Dense) damp, gray to brown, medium SAND with some fine sandy SILT.*					
90	*(Very dense) damp, brown to gray, angular basalt and quartzite GRAVELS with interbeds of (dense) damp, brown, SAND with traces of fine gravel.*					
100	*(Dense) damp to wet, brown, SAND with fine gravel and trace silt.*					
110	*(Dense) damp, light brown, silty fine SAND with caliche near top. Grades down into a fine sandy SILT with trace coarse sands. Thin caliche interbeds at 113.2*					
120						

AS-BUILT DESIGN



TESTING

RECEIVED
DEC 2 3 1992

LEGEND

- - - Inferred stratigraphic contact

SWL elevation and date of measurement

RZA AGRA, Inc.
Engineering & Environmental Services

539 West Sharp, Suite D
Spokane, WA 99201

Drilling started: *4 August 1992* Drilling completed: *6 August 1992* Logged by: *ENJS*

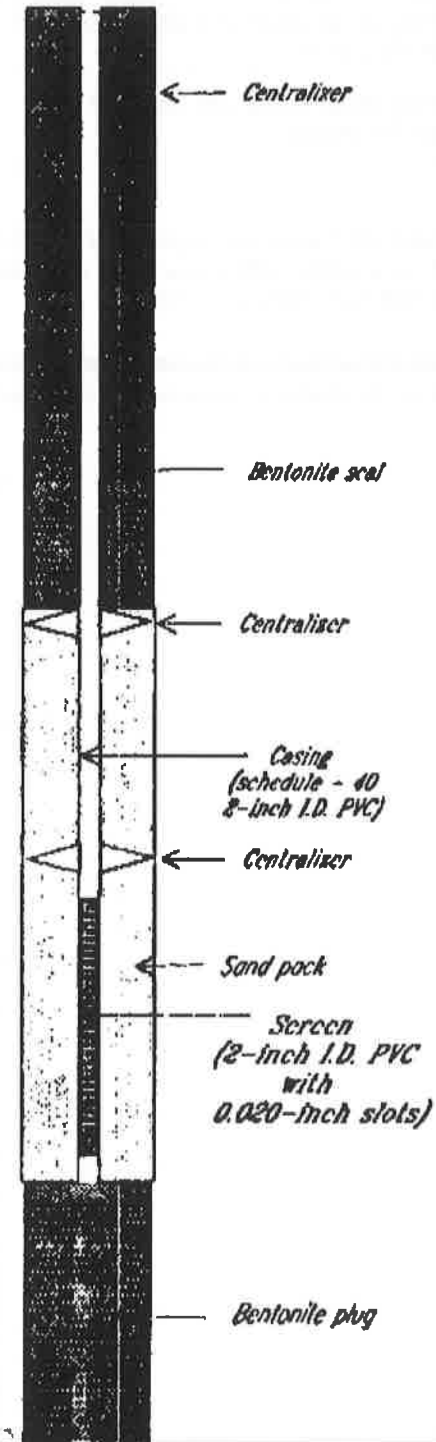
WALLA WALLA

PROJECT *IBP Wallula Plant* W.O. *S-1061* WELL NO. *MW-1(c)*

Elevation reference:
Ground surface elevation: Casing elevation:

DEPTH (feet)	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	BLOW COUNTS	OVM READING	GROUND WATER
120–144	*(Dense) damp to moist, brown, silty fine SAND with scattered fine gravels. Fine sandy silt interbeds 124.5 - 125.3 feet.*					
144–174	*(Dense) damp to moist, brown, SAND with gravels and trace silt. Silt becomes more abundant with depth.*					8/?/92
174–177	*(Stiff) damp, tan, SILT*					
180						

AS-BUILT DESIGN



TESTING

LEGEND

- - - Inferred stratigraphic contact

▼ DATE SWL elevation and date of measurement

RZA AGRA, Inc.
Engineering & Environmental Services
539 West Sharp, Suite D
Spokane, WA 99201

Drilling started: *4 August 1992* Drilling completed: *6 August 1992* Logged by: *EMS*

WALLA WALLA

PROJECT *IBP Wallula Plant* W.O. *S-10[illegible]1* WELL NO. *MW-1(d)*

Elevation reference:
Ground surface elevation: Casing elevation:

DEPTH (feet)	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	BLOW COUNTS	OVM READING	GROUND WATER	AS-BUILT DESIGN	TESTING
180	*(Dense) damp, brown very silty coarse SAND with fine gravels.*							
	(Dense) damp, brown, silty fine SAND with trace fine gravels.							
190	*(Medium stiff) moist, tan to gray, SILT and CLAY with some sands. Silty coarse SAND with gravel interbeds from 189.3 to 190.4 feet.*							
	Boring terminated at approximately 195.0 feet.							
200								
210								
220								
230								
240								

RECEIVED DEC 2 3 1992

LEGEND

- - - Inferred stratigraphic contact

▼ DATE SWL elevation and date of measurement

RZA AGRA, Inc.
Engineering & Environmental Services

539 West Sharp, Suite D
Spokane, WA 99201

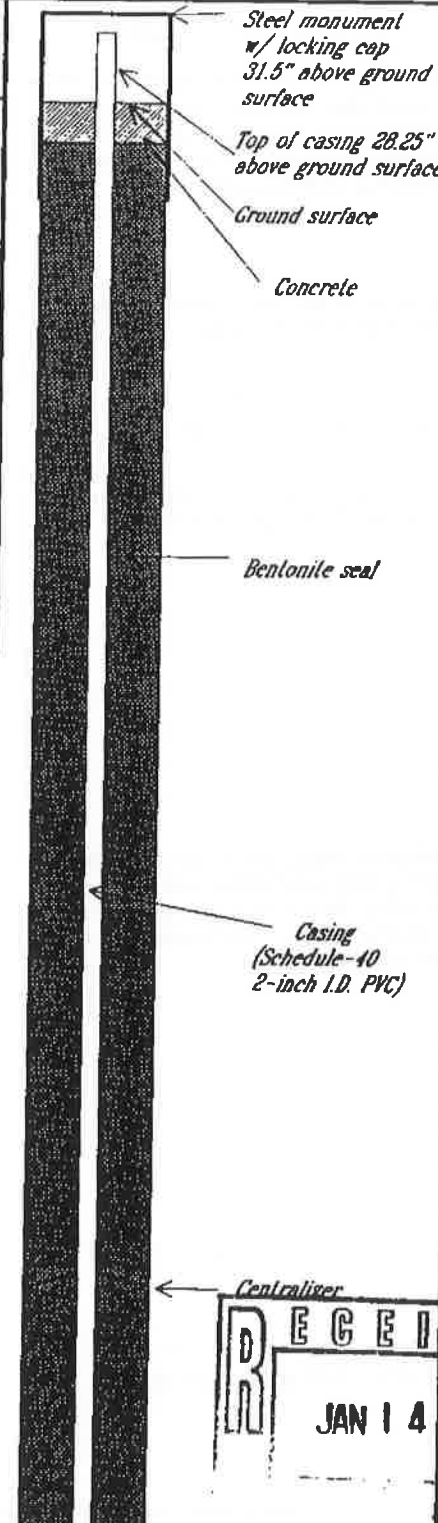
Drilling started: *4 August 1992* Drilling completed: *6 August 1992* Logged by: *ENJS*

PROJECT *IBP Wallula Plant* W.O. *S-1061* WELL NO. *MW-2*

Elevation reference:
Ground surface elevation: *512.4* Casing elevation: *514.52*

DEPTH (feet)	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	BLOW COUNTS	OVM READING	GROUND WATER
0	*(Medium stiff) dry, tan, silty fine SAND to brownvery silty fine SAND (Loess).*					
10	*(Dense) damp, brown, fine to medium SAND with some silt. Becoming siltier with depth.*					
20	*(Stiff) damp, brown, fine sandy SILT with clayey silty interbeds.*					
30	*(Medium dense to dense) damp, brown to tannish brown very silty fine SAND. Micaceous in places. Few thin blue clay interbeds upper 10 feet.*					
40	*(Stiff) damp, tan, fine sandy SILT. Clayey SILT interval from 46.8 to 49.8 feet. SILT becomes micaceous near 55 feet. Scattered coarse sand in SILT below 60 feet.*					
50						
60						

AS-BUILT DESIGN



TESTING

RECEIVED
JAN 1 4 1993

LEGEND

- - - Inferred stratigraphic contact

▼ SWL elevation and date of measurement

RZA AGRA, Inc.
Engineering & Environmental Services

539 West Sharp, Suite D
Spokane, WA 99201

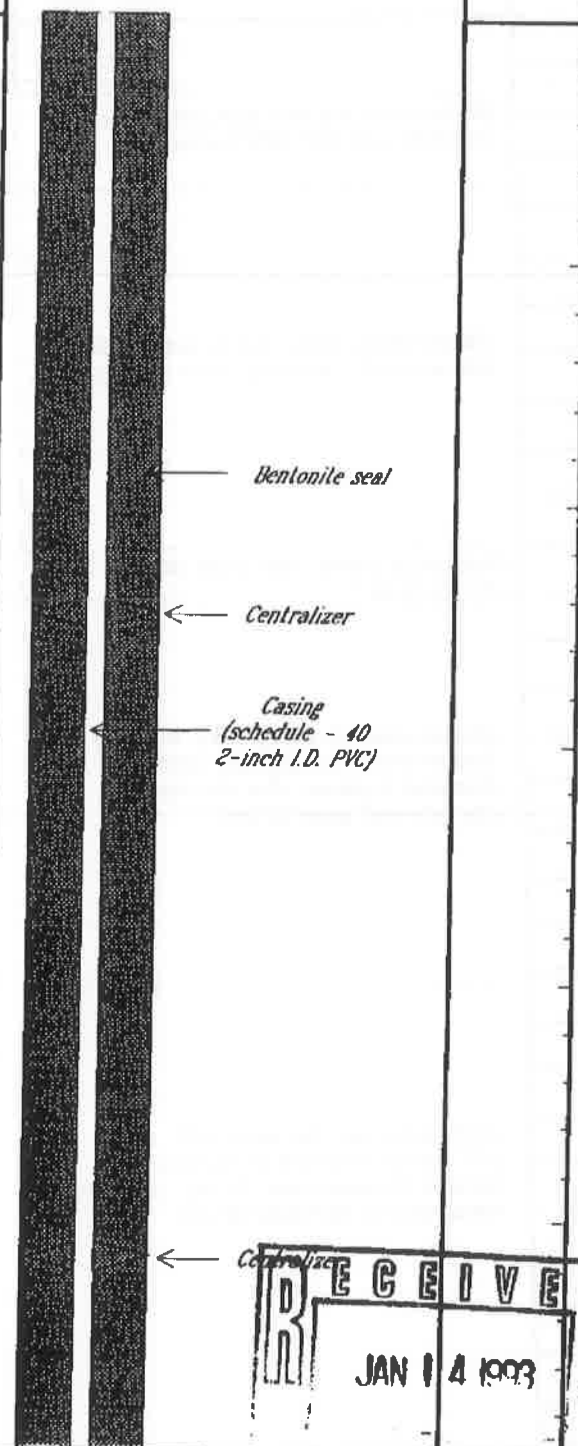
Drilling started: *4 August 1992* Drilling completed: *6 August 1992* Logged by: *ENJS*

PROJECT *IBP Wallula Plant* W.O. *S-1061* WELL NO. *MW-2*

Elevation reference:
Ground surface elevation: *512.4* Casing elevation: *514.52*

DEPTH (feet)	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	BLOW COUNTS	OVM READING	GROUND WATER
60	*(Stiff) damp, tan, fine sandy SILT. Clayey SILT interval from 46.8 to 49.8 feet. SILT becomes micaceous near 55 feet. Scattered coarse sand in SILT below 60 feet.*					
70	*(Dense) damp to wet, tan to brown, micaceous, silty fine SAND with trace gravel.*					
	(Very dense) dry, white CALICHE.					
80	*(Medium dense to stiff) damp, brown to tan silty very fine SAND and SILT with clay interbeds.*					
90						
	(Stiff) damp to moist, brown, fine sandy SILT with trace gravel interbedded with damp, brown, medium silicia SAND with some gravel. Thin caliche beds at 94 feet. SILT grades into a very fine sand near basal contact.					
100						
110						
	(Dense) damp, light brown to gray, fine to medium silicia SAND w/trace silt and fine gravels.					
120						

AS-BUILT DESIGN



TESTING

RECEIVED JAN 14 1993

LEGEND

- - - *Inferred stratigraphic contact*

SWL elevation and date of measurement

RZA AGRA, Inc.
Engineering & Environmental Services

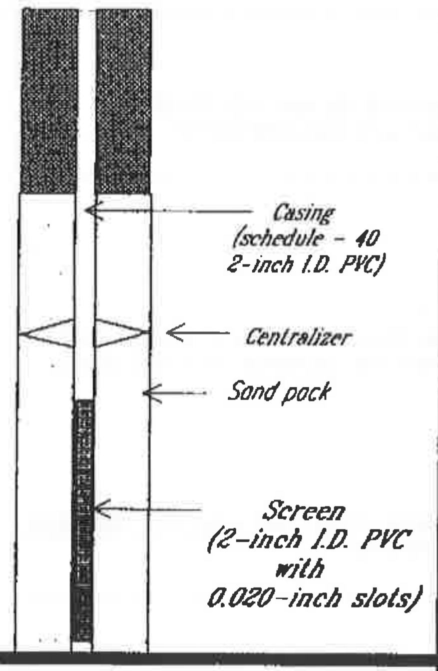
539 West Sharp, Suite D
Spokane, WA 99201

Drilling started: *4 August 1992* Drilling completed: *6 August 1992* Logged by: *ENJS*

PROJECT *IBP Wallula Plant* W.O. *S-1061* WELL NO. *MW-2*

Elevation reference:
Ground surface elevation: *512.4* Casing elevation: *514.52*

DEPTH (feet)	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	BLOW COUNTS	OVM READING	GROUND WATER	AS-BUILT DESIGN	TESTING
120						8/6/92		
130	*(Very dense) saturated, black to brown, subrounded GRAVEL with sand interbedded with gray (salt and pepper texture in areas), wet to saturated, gravelly SAND, some caliche on gravels. Some cobbles from 140 to 143 feet.*							
140	*(Dense) wet, light brown, fine to medium SAND with gravels.*							
	Boring terminated at approximately 147.2 feet.							
150								
160								
170								
180								



RECEIVED JAN 14 1993

LEGEND

- - - Inferred stratigraphic contact

▼ DATE SWL elevation and date of measurement

Start card info #056053
SE 1/4 SE 1/4 SW 1/4
Sec 26 T8N R31E

RZA AGRA, Inc.
Engineering & Environmental Services
539 West Sharp, Suite D
Spokane, WA 99201

Drilling started: *4 August 1992* Drilling completed: *6 August 1992* Logged by: *ENJS*

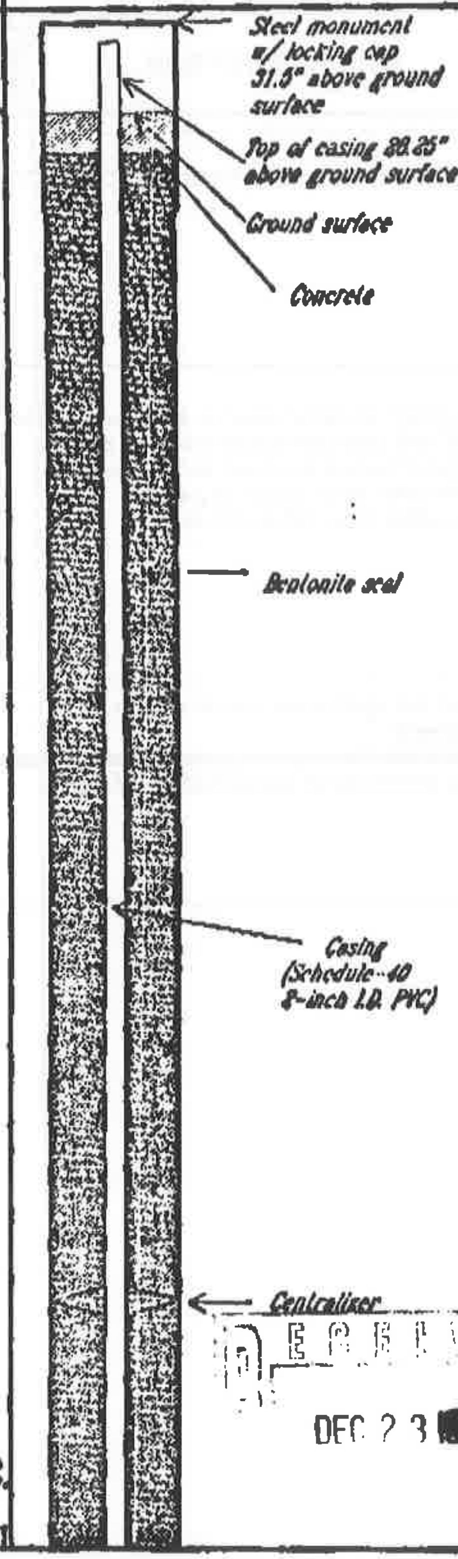
S26 T5 R31

PROJECT *IBP Wallula Plant* W.O. *S-1061* WELL NO. *MW-2(a)*

Elevation reference:
Ground surface elevation: Casing elevation:

DEPTH (feet)	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	BLOW COUNTS	OVM READING	GROUND WATER
0	*(Medium stiff) dry, tan, silty fine SAND to brownvery silty fine SAND (Loess)*					
10	*(Dense) damp, brown, fine to medium SAND with some silt. Becoming siltier with depth.*					
20	*(Stiff) damp, brown, fine sandy SILT with clayey silty interbeds.*					
30	*(Medium dense to dense) damp, brown to tannish brown very silty fine SAND. Micaceous in places. Few thin blue clay interbeds upper 10 feet.*					
40						
50	*(Stiff) damp, tan, fine sandy SILT. Clayey SILT interval from 46.8 to 49.8 feet. SILT becomes micaceous near 55 feet. Scattered coarse sand in SILT below 60 feet.*					
60						

AS-BUILT DESIGN



TESTING

RECEIVED
DEC 23 1992

RUEN DRILLING, INC.
BOX 267
CLARK FORK, ID 83811
(208) 266-1151
PERMIT # 056053

(signature)

2035

LEGEND

- - - Inferred stratigraphic contact

▼ SWL elevation and date of measurement

RZA AGRA, Inc.
Engineering & Environmental Services
539 West Sharp, Suite D
Spokane, WA 99201

Drilling started: *4 August 1992* Drilling completed: *6 August 1992* Logged by: *ENJS*

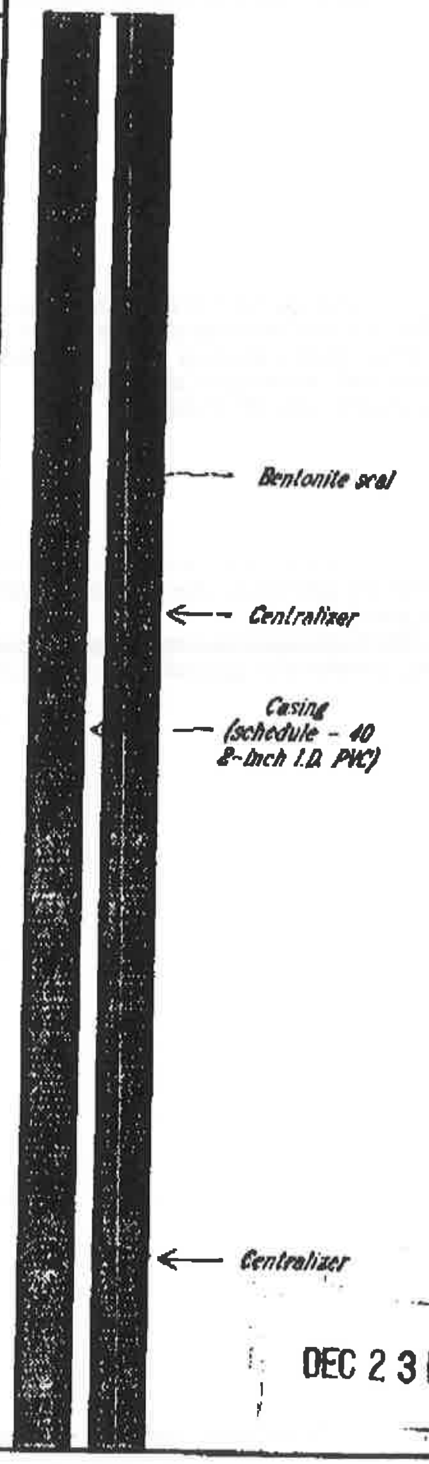
WALLA WALLA

PROJECT *IBP Wallula Plant* W.O. *S-1061* WELL NO. *MW-2(b)*

Elevation reference:
Ground surface elevation: Casing elevation:

DEPTH (feet)	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	BLOW COUNTS	OVM READING	GROUND WATER
60	*(Stiff) damp, tan, fine sandy SILT. Clayey SILT interval from 46.8 to 49.8 feet. SILT becomes micaceous near 55 fet. Scattered coarse sand in SILT below 60 feet.*					
70	*(Dense) damp to wet, tan to brown, micaceous silty fine SAND with trace gravel.*					
	(Very dense) dry, white CALICHE.					
80	*(Medium dense to stiff) damp, brown to tan silty very fine SAND and SILT with clay interbeds.*					
90–110	*(Stiff) damp to moist, brown, fine sandy SILT with trace gravel interbedded with damp, brown medium silicic SAND with some gravel. Thin caliche beds at 94 feet. SILT grades into a very fine sand near basal contact.*					
110–120	*(Dense) damp, light brown to gray, fine to medium silicic SAND w/trace silt and fine gravels.*					

AS-BUILT DESIGN



TESTING

DEC 2 3 1992

LEGEND

- - - *Inferred stratigraphic contact*

SWL elevation and date of measurement

RZA AGRA, Inc.
Engineering & Environmental Services
539 West Sharp, Suite D
Spokane, WA 99201

Drilling started: *4 August 1992* Drilling completed: *6 August 1992* Logged by: *ENJS*

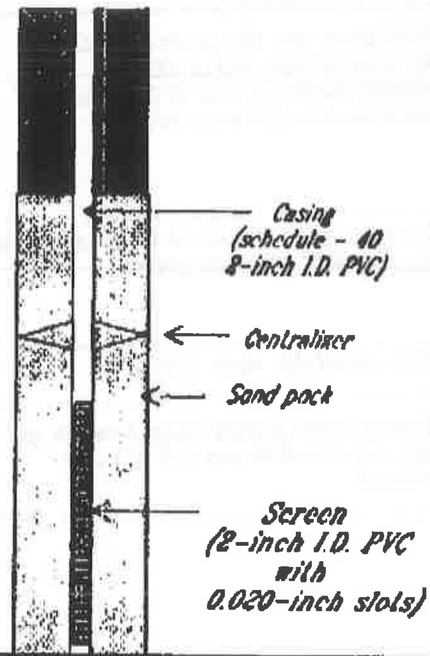
PROJECT *IBP Wallula Plant* W.O. *S-10611* WELL NO. *MW-2(c)*

Elevation reference:
Ground surface elevation: Casing elevation:

AS-BUILT DESIGN

TESTING

DEPTH (feet)	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	BLOW COUNTS	OVM READING	GROUND WATER
120						
						▼ 8/11/92
130	*(Very dense) damp, black to brown, subrounded GRAVEL with sand interbedded with gray (salt and pepper texture in areas), wet to saturated, gravelly SAND, some caliche on gravels. Some cobbles from 140 to 143 feet.*					
140						
	(Dense) wet, light brown, fine to medium SAND with gravels					
	Boring terminated at approximately 147.2 feet.					
150						
160						
170						
180						



DEC 2 3 1992

LEGEND

- - - Inferred stratigraphic contact

▼ DATE SWL elevation and date of measurement

RZA AGRA, Inc.
Engineering & Environmental Services
539 West Sharp, Suite D
Spokane, WA 99201

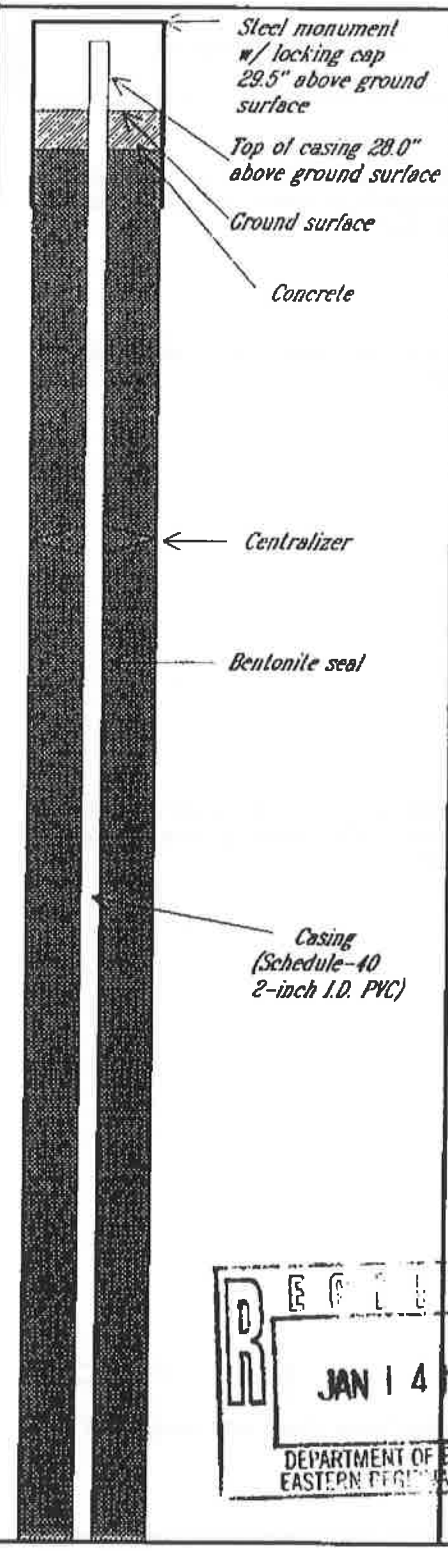
Drilling started: *4 August 1992* Drilling completed: *6 August 1992* Logged by: *ENJS*

PROJECT *IBP Wallula Plant* W.O. *S-1061* WELL NO. *MW-3*

Elevation reference:
Ground surface elevation: *486.1* Casing elevation: *488.50*

DEPTH (feet)	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	BLOW COUNTS	OVM READING	GROUND WATER
0						
	(Medium stiff to hard) dry, tan to light brown, SILT with fine sand and clay interbedded with hard, dry, white CALICHE.					
10						
	(Hard) dry, white CALICHE.					
20						
	(Medium stiff) damp, light brown, fine sandy SILT to clayey SILT.					
30						
	(Stiff) damp, tan, gravelly SILT w/caliche.					
	(Stiff) dry to damp, light brown SILT w/clay.					
40						
	(Hard to stiff) damp to moist, brown to oxidized brown CLAY with silt. Some bluish gray clay intervals.					
50						
	(Stiff) damp, light brown, SILT with some fine sand and scattered gravel. Few clay interbeds below 65 feet.					
60						

AS-BUILT DESIGN



TESTING

LEGEND

- - - Inferred stratigraphic contact
DATE SWL elevations and date of measurement

RZA AGRA, Inc.
Engineering & Environmental Services
539 West Sharp, Suite D
Spokane, WA 99201

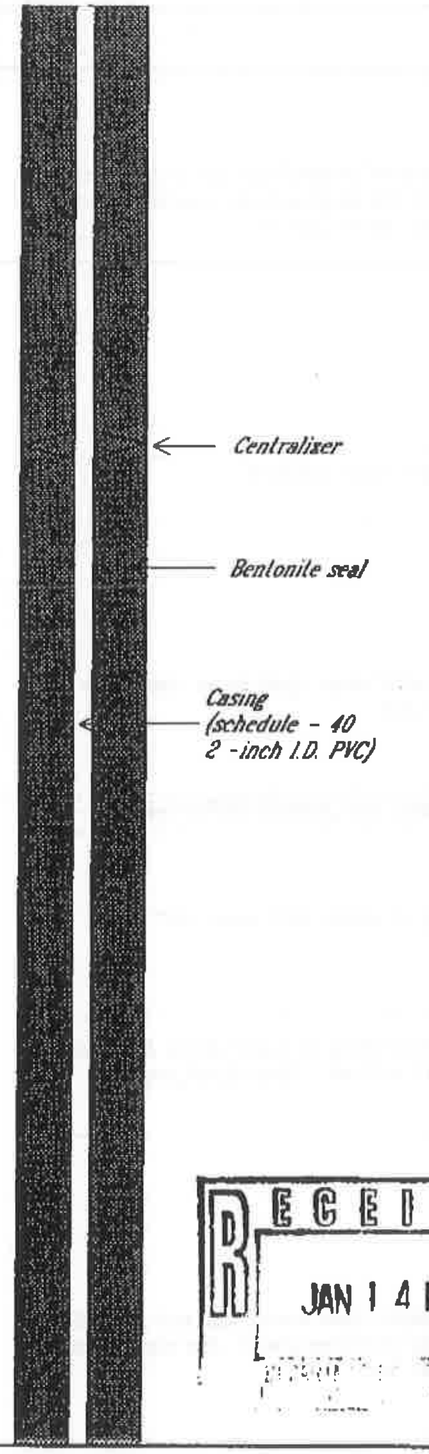
Drilling started: *4 August 1992* Drilling completed: *6 August 1992* Logged by: *ENJS*

PROJECT *IBP Wallula Plant* W.O. *S-1061* WELL NO. *MW-3*

Elevation reference:
Ground surface elevation: *486.1* Casing elevation: *488.50*

DEPTH (feet)	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	BLOW COUNTS	OVM READING	GROUND WATER
60	*(Stiff) damp, light brown, SILT with some fine sand and scattered gravel. Few clay interbeds below 65 feet.*					
70	*(Medium stiff-stiff) damp, grey-brown to bluish-brown CLAY*					
80						
90	*(Stiff) damp, light brown, fine sandy SILT with wet clay interbeds. CLAY becoming more abundant with depth.*					
100						
110	*(Dense) damp, brown, silty coarse SAND.*					
120						

AS-BUILT DESIGN



TESTING

LEGEND

--- Inferred stratigraphic contact

SWL elevations and date of measurement (DATE)

RZA AGRA, Inc.
Engineering & Environmental Services
539 West Sharp, Suite D
Spokane, WA 99201

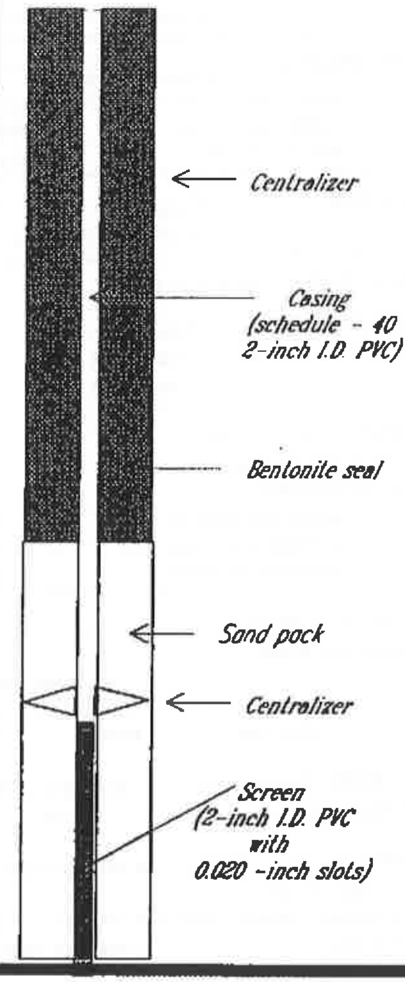
Drilling started: *4 August 1992* Drilling completed: *6 August 1992* Logged by: *ENJS*

PROJECT *IBP Wallula Plant* W.O. *S-1061* WELL NO. *MW-3*

Elevation reference:
Ground surface elevation: *486.1* Casing elevation: *488.5*

DEPTH (feet)	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	BLOW COUNTS	OVM READING	GROUND WATER
120						
	(Stiff) damp, blueish and brown CLAY					
						8/10/92
130	*(Stiff) damp, brown, CLAY and SILT with brown sandy GRAVEL lenses.*					
140						
150	*(Dense) saturated, brown silty coarse SAND with gravel and clay.*					
160	*Boring terminated at approximately 160 feet.*					
170						
180						

AS-BUILT DESIGN



TESTING

LEGEND

--- Inferred stratigraphic contact

▼ DATE SWL elevation and date of measurement

Start card Info #088011
NW 1/4 NW 1/4 NW 1/4
Sec 36 T8N R 31E

RZA AGRA, Inc.
Engineering & Environmental Services

539 West Sharp, Suite D
Spokane, WA 99201

Drilling started: *4 August 1992* Drilling completed: *6 August 1992* Logged by: *ENJS*

File Original and First Copy with Department of Ecology
Second Copy — Owner's Copy
Third Copy — Driller's Copy

WATER WELL REPORT

STATE OF WASHINGTON

Application No

Permit No

(1) OWNER: Name Iowa Beef Address Well # 3

(2) LOCATION OF WELL: County ¼ ¼ Sec T N., R. W.M.

Bearing and distance from section or subdivision corner

(3) PROPOSED USE: Domestic ☐ Industrial ☐ Municipal ☐ Irrigation ☐ Test Well ☐ Other ☐

(4) TYPE OF WORK: Owner's number of well (if more than one)

New well ☐ Method: Dug ☐ Bored ☐
Deepened ☐ Cable ☐ Driven ☐
Reconditioned ☐ Rotary ☐ Jetted ☐

(5) DIMENSIONS: Diameter of well inches.
Drilled ft. Depth of completed well ft.

(6) CONSTRUCTION DETAILS:

Casing installed: " Diam. from ft. to ft.
Threaded ☐ " Diam. from ft. to ft.
Welded ☐ " Diam. from ft. to ft.

Perforations: Yes ☐ No ☐
Type of perforator used
SIZE of perforations in. by in.
perforations from ft. to ft.
perforations from ft. to ft.
perforations from ft. to ft.

Screens: Yes ☐ No ☐
Manufacturer's Name
Type Model No.
Diam. Slot size from ft. to ft.
Diam. Slot size from ft. to ft.

Gravel packed: Yes ☐ No ☐ Size of gravel
Gravel placed from ft. to ft.

Surface seal: Yes ☐ No ☐ To what depth? ft.
Material used in seal
Did any strata contain unusable water? Yes ☐ No ☐
Type of water? Depth of strata
Method of sealing strata off

(7) PUMP: Manufacturer's Name
Type: H.P.

(8) WATER LEVELS: Land-surface elevation above mean sea level ft.
Static level ft. below top of well Date
Artesian pressure lbs. per square inch Date
Artesian water is controlled by (Cap, valve, etc.)

(9) WELL TESTS: Drawdown is amount water level is lowered below static level
Was a pump test made? Yes ☐ No ☐ If yes, by whom?
Yield: gal./min. with ft. drawdown after hrs.

Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level

Date of test
Bailer test gal./min. with ft. drawdown after hrs.
Artesian flow g.p.m. Date
Temperature of water Was a chemical analysis made? Yes ☐ No ☐

(10) WELL LOG: Page 2 of 2

Formation: Describe by color, character, size of material and structure, and show thickness of aquifers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of formation.

GRN Y.

MATERIAL	FROM	TO
GRN Yellow clay/w CRS Sand	92.5	105
Blue GRN. Clay	105	118
Blue Clay	118	130
Blue Clay & Weathered Bas	130	136
Blue clay & Multi colored Sand layers	136	160
Blue Clay	160	165
Blue Clay & gravel Congulum.	165	176
Dark Blue Clay (Hard)	176	183
Black clay	183	185
Blue clay w/green Congl	185	190
Dark BRN Clay	190	200

Work started 19 Completed 19

WELL DRILLER'S STATEMENT:

This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

NAME (Person, firm, or corporation) (Type or print)

Address

[Signed] (Well Driller)

License No. Date 19

8/18/80

(USE ADDITIONAL SHEETS IF NECESSARY)

File Original and First Copy with Department of Ecology
Second Copy — Owner's Copy
Third Copy — Driller's Copy

WATER WELL REPORT
STATE OF WASHINGTON

Application No. ....
Permit No. ....

(1) OWNER: Name Iowa Beef Processors, Inc. Address Wallula, Wa

(2) LOCATION OF WELL: County Walla Walla NW ¼ SE ¼ Sec 26 T 8 N., R 31 W.M.

Bearing and distance from section or subdivision corner

(3) PROPOSED USE: Domestic ☐ Industrial ☐ Municipal ☐ Irrigation ☐ Test Well ☐ Other ☒ observation

(4) TYPE OF WORK: Owner's number of well (if more than one) 1
New well ☐ Method: Dug ☐ Bored ☐
Deepened ☐ Cable ☐ Driven ☐
Reconditioned ☐ Rotary ☐ Jetted ☐

(5) DIMENSIONS: Diameter of well .... inches.
Drilled .... ft. Depth of completed well .... ft.

(6) CONSTRUCTION DETAILS:

Casing installed: ....." Diam. from ..... ft. to ..... ft.
Threaded ☐ ....." Diam. from ..... ft. to ..... ft.
Welded ☐ ....." Diam. from ..... ft. to ..... ft.

Perforations: Yes ☐ No ☐
Type of perforator used ....
SIZE of perforations ..... in. by ..... in.
..... perforations from ..... ft. to ..... ft.
..... perforations from ..... ft. to ..... ft.
..... perforations from ..... ft. to ..... ft.

Screens: Yes ☐ No ☐
Manufacturer's Name ....
Type .... Model No. ....
Diam. ..... Slot size ..... from ..... ft. to ..... ft.
Diam. ..... Slot size ..... from ..... ft. to ..... ft.

Gravel packed: Yes ☐ No ☐ Size of gravel: ....
Gravel placed from ..... ft. to ..... ft.

Surface seal: Yes ☐ No ☐ To what depth? ..... ft.
Material used in seal ....
Did any strata contain unusable water? Yes ☐ No ☐
Type of water? ..... Depth of strata .....
Method of sealing strata off ....

(7) PUMP: Manufacturer's Name ....
Type: .... H.P. .....

(8) WATER LEVELS: Land-surface elevation above mean sea level 540 ft.
Static level 140 ft. below top of well Date ....
Artesian pressure ..... lbs. per square inch Date ....
Artesian water is controlled by .... (Cap, valve, etc.)

(9) WELL TESTS: Drawdown is amount water level is lowered below static level
Was a pump test made? Yes ☐ No ☐ If yes, by whom? ....
Yield: ..... gal./min. with ..... ft. drawdown after ..... hrs.
" " " "
" " " "

Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level

Date of test ....
Bailer test ..... gal./min. with ..... ft. drawdown after ..... hrs.
Artesian flow ..... g.p.m. Date .....
Temperature of water ..... Was a chemical analysis made? Yes ☐ No ☐

(10) WELL LOG:

Formation: Describe by color, character, size of material and structure, and show thickness of aquifers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of formation.

MATERIAL	FROM	TO
Sand, brown silty	0	50
Silt, brown fine	50	60
Silty sand - Sm Gravel	60	64
" " - Caliche	64	67
Gravel	67	68
Sand & silt, brown	68	85
Sand & silt light brown	85	92
Silty sand, slightly moist, lenses caliche	92	109
Silty sand, brown	109	118
Sand & sm. Gravel	118	120.5
Sand & gravel, dense	120.5	130
Sandy gravel, fine brown sm. cobbles & boulders	130	144
Dense hard Ringold Gravels	144	170

Copied from sections submitted by Iowa Beef Processors Inc.
7/25/80

Work started ...., 19..... Completed ...., 19.....

WELL DRILLER'S STATEMENT:

This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

NAME .... (Person, firm, or corporation) (Type or print)

Address ....

[Signed] .... (Well Driller)

License No. .... Date ...., 19.....

7/25/80

(USE ADDITIONAL SHEETS IF NECESSARY)

ECY 050-1-20

File Original and First Copy with Department of Ecology
Second Copy — Owner's Copy
Third Copy — Driller's Copy

WATER WELL REPORT

STATE OF WASHINGTON

Application No. ....

Permit No. ....

(1) OWNER: Name Iowa Beef Processors, Inc. Address Wallula, Wa

(2) LOCATION OF WELL: County Walla Walla NW ¼ SW ¼ Sec 26 T 8 N., R 31 W.

Bearing and distance from section or subdivision corner 600' S. of W 1/4 Cor

(3) PROPOSED USE: Observation Well
Domestic ☐ Industrial ☐ Municipal ☐
Irrigation ☐ Test Well ☐ Other ☐

(4) TYPE OF WORK: Owner's number of well (if more than one) 3
New well ☐ Method: Dug ☐ Bored ☐
Deepened ☐ Cable ☐ Driven ☐
Reconditioned ☐ Rotary ☐ Jetted ☐

(5) DIMENSIONS: Diameter of well .... inches.
Drilled .... ft. Depth of completed well .... ft.

(6) CONSTRUCTION DETAILS:

Casing installed: ....” Diam. from .... ft. to .... ft.
Threaded ☐ ....” Diam. from .... ft. to .... ft.
Welded ☐ ....” Diam. from .... ft. to .... ft.

Perforations: Yes ☐ No ☐
Type of perforator used ....
SIZE of perforations .... in. by .... in.
.... perforations from .... ft. to .... ft.
.... perforations from .... ft. to .... ft.
.... perforations from .... ft. to .... ft.

Screens: Yes ☐ No ☐
Manufacturer's Name ....
Type .... Model No. ....
Diam. .... Slot size .... from .... ft. to .... ft.
Diam. .... Slot size .... from .... ft. to .... ft.

Gravel packed: Yes ☐ No ☐ Size of gravel: ....
Gravel placed from .... ft. to .... ft.

Surface seal: Yes ☐ No ☐ To what depth? .... ft.
Material used in seal ....
Did any strata contain unusable water? Yes ☐ No ☐
Type of water? .... Depth of strata ....
Method of sealing strata off ....

(7) PUMP: Manufacturer's Name ....
Type: .... H.P. ....

(8) WATER LEVELS: Land-surface elevation above mean sea level 460 ft.
Static level 75 ft. below top of well Date ....
Artesian pressure .... lbs. per square inch Date ....
Artesian water is controlled by .... (Cap, valve, etc.)

(9) WELL TESTS: Drawdown is amount water level is lowered below static level
Was a pump test made? Yes ☐ No ☐ If yes, by whom? ....
Yield: .... gal./min. with .... ft. drawdown after .... hrs.
" " " "
" " " "

Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level

Date of test ....
Bailer test .... gal./min. with .... ft. drawdown after .... hrs.
Artesian flow .... g.p.m. Date ....
Temperature of water .... Was a chemical analysis made? Yes ☐ No ☐

(10) WELL LOG:

Formation: Describe by color, character, size of material and structure, and show thickness of aquifers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of formation.

MATERIAL	FROM	TO
Sandy silt, brown	0	20
Consolidated sand	20	30
Medium Gravel		
Some Caliche		
Brown Silty sand		
Sand-silty brown	30	38
Sandstone	38	41
Silty sand	41	44
Decomposed rock	44	54
Blue Clay		
Sand		
Ringold Conglomerate	54	66
Brown Silty Sand	66	69
Ringold Conglomerate	69	75
Sand - gravel	75	82
Ringold Conglomerate	82	83
Sand - gravel	83	86
Ringold Conglomerate	86	92.5
Green yellow clay w coarse sand	92.5	105
Blue green clay	105	118
Blue clay	118	130
Blue Clay + weathered basalt	130	136
Blue Clay + multicolor sand layers	136	160
Blue Clay	160	165
Blue Clay + Conglomerat	165	176
Dark hard blue clay	176	183
Black clay	183	185
Blue clay, green conglomerate	185	190
Dark Brown Clay	190	200

Copied from sections submitted by Iowa Beef Processors, Inc.

Work started 7/25/80 19.. Completed .... 19....

WELL DRILLER'S STATEMENT:

This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

NAME .... (Person, firm, or corporation) (Type or print)

Address ....

[Signed] .... (Well Driller)

License No. .... Date ...., 19....

7/25/80

(USE ADDITIONAL SHEETS IF NECESSARY)

ECY 050-1-20

File Original and First Copy with
Department of Ecology
Second Copy — Owner's Copy
Third Copy — Driller's Copy

WATER WELL REPORT
STATE OF WASHINGTON

Application No.
Permit No.

(1) OWNER: Name Iowa Beef Address Well #3

(2) LOCATION OF WELL: County ¼ ¼ Sec. T. N., R. W.M.

Bearing and distance from section or subdivision corner

(3) PROPOSED USE: Domestic ☐ Industrial ☐ Municipal ☐ Irrigation ☐ Test Well ☐ Other ☐

(4) TYPE OF WORK: Owner's number of well (if more than one)
New well ☐ Method: Dug ☐ Bored ☐
Deepened ☐ Cable ☐ Driven ☐
Reconditioned ☐ Rotary ☐ Jetted ☐

(5) DIMENSIONS: Diameter of well inches.
Drilled ft. Depth of completed well ft.

(6) CONSTRUCTION DETAILS:

Casing installed: " Diam. from ft. to ft.
Threaded ☐ " Diam. from ft. to ft.
Welded ☐ " Diam. from ft. to ft.

Perforations: Yes ☐ No ☐
Type of perforator used
SIZE of perforations in. by in.
perforations from ft. to ft.
perforations from ft. to ft.
perforations from ft. to ft.

Screens: Yes ☐ No ☐
Manufacturer's Name
Type Model No.
Diam. Slot size from ft. to ft.
Diam. Slot size from ft. to ft.

Gravel packed: Yes ☐ No ☐ Size of gravel:
Gravel placed from ft. to ft.

Surface seal: Yes ☐ No ☐ To what depth? ft.
Material used in seal
Did any strata contain unusable water? Yes ☐ No ☐
Type of water? Depth of strata
Method of sealing strata off

(7) PUMP: Manufacturer's Name
Type: H.P.

(8) WATER LEVELS: Land-surface elevation above mean sea level ft.
Static level ft. below top of well Date
Artesian pressure lbs. per square inch Date
Artesian water is controlled by (Cap, valve, etc.)

(9) WELL TESTS: Drawdown is amount water level is lowered below static level
Was a pump test made? Yes ☐ No ☐ If yes, by whom?
Yield: gal./min. with ft. drawdown after hrs.
" " " "
" " " "

Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level

Date of test
Bailer test gal./min. with ft. drawdown after hrs.
Artesian flow g.p.m. Date
Temperature of water Was a chemical analysis made? Yes ☐ No ☐

(10) WELL LOG: Page 2 of 2

Formation: Describe by color, character, size of material and structure, and show thickness of aquifers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of formation.

MATERIAL	FROM	TO
Brn Y.		
Brn Yellow clay/w crs. Sand	92.5	105
Blue Brn. Clay	105	118
Blue Clay	118	130
Blue Clay & Weathered Bas	130	136
Blue clay & Multi colored ↙		
Sand layers	136	160
Blue Clay	160	165
Blue clay & gravel Conglum.	165	176
Dark Blue Clay (Hard)	176	183
Black clay	183	185
Blue clay w/green Congl	185	190
Dark BRN Clay	190	200

Work started , 19 Completed , 19

WELL DRILLER'S STATEMENT:

This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

NAME (Person, firm, or corporation) (Type or print)

Address

[Signed] (Well Driller)

License No. Date , 19

8/18/80

(USE ADDITIONAL SHEETS IF NECESSARY)

File Original and First Copy with Department of Ecology
Second Copy — Owner's Copy
Third Copy — Driller's Copy

WATER WELL REPORT

STATE OF WASHINGTON

Start Card No. 056011
UNIQUE WELL I.D. #
Water Right Permit No.

(1) OWNER: Name Iowa Beef Processors Address Dakota city, Nebraska

(2) LOCATION OF WELL: County Walla Walla NW 1/4 NW 1/4 Sec 35 T 8 N., R 31E W.M.

(2a) STREET ADDRESS OF WELL (or nearest address) Dodd Road, Wallula, Wa.

(3) PROPOSED USE: ☐ Domestic ☐ Irrigation ☐ DeWater Industrial ☐ Test Well ☒ Municipal ☐ Other ☐

(4) TYPE OF WORK: Owner's number of well (If more than one) MW-3
Abandoned ☒ New well ☐ Deepened ☐ Reconditioned ☐ Method: Dug ☐ Cable ☐ Rotary ☐ Bored ☐ Driven ☐ Jetted ☐

(5) DIMENSIONS: Diameter of well 2 inches.
Drilled 160 feet. Depth of completed well 160 ft.

(6) CONSTRUCTION DETAILS:
Casing installed: 2 " Diam. from +2.5 ft. to 160 ft.
Welded ☐ " Diam. from ft. to ft.
Liner installed ☐ " Diam. from ft. to ft.
Threaded ☒

Perforations: Yes ☐ No ☐
Type of perforator used
SIZE of perforations in. by in.
perforations from ft. to ft.
perforations from ft. to ft.
perforations from ft. to ft.

Screens: Yes ☒ No ☐
Manufacturer's Name
Type PVC Model No.
Diam. 2" Slot size .020 from 150 ft. to 160 ft.
Diam. Slot size from ft. to ft.

Gravel packed: Yes ☒ No ☐ Size of gravel 10/20 css
Gravel placed from 142 ft. to 160 ft.

Surface seal: Yes ☒ No ☐ To what depth? 142 ft.
Material used in seal Bentonite
Did any strata contain unusable water? Yes ☐ No ☐
Type of water? Depth of strata
Method of sealing strata off

(7) PUMP: Manufacturer's Name N/A
Type: H.P.

(8) WATER LEVELS: Land-surface elevation above mean sea level ft.
Static level 126 bgs ft. below top of well Date 8-10-92
Artesian pressure lbs. per square inch Date
Artesian water is controlled by (Cap, valve, etc.)

(9) WELL TESTS: Drawdown is amount water level is lowered below static level
Was a pump test made? Yes ☐ No ☒ If yes, by whom?
Yield: gal./min. with ft. drawdown after hrs.
" " " "
" " " "

Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level

Date of test
Bailer test gal./min. with ft. drawdown after hrs.
Airtest gal./min. with stem set at ft. for hrs.
Artesian flow g.p.m. Date
Temperature of water Was a chemical analysis made? Yes ☐ No ☐

(10) WELL LOG or ABANDONMENT PROCEDURE DESCRIPTION

Formation: Describe by color, character, size of material and structure, and show thickness of aquifers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of information.

MATERIAL	FROM	TO
Tremie grout with high		
solids bentonite grout.		
Cut off surface protection		
2 ft. B.G.S. pull guard posts.		
Recontour surface.		

RECEIVED 15

Work Started 12-6-95, 19. Completed 12-7-95, 19

WELL CONSTRUCTOR CERTIFICATION:

I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards. Materials used and the information reported above are true to my best knowledge and belief.

NAME RUEN DRILLING, INC. (PERSON, FIRM, OR CORPORATION) (TYPE OR PRINT)

Address PO BOX 267, CLARK FORK, ID 83811

(Signed) [signature] (WELL DRILLER) License No. 1724

Contractor's Registration No. RUENCDI175QM Date DEC 14, 19 95

(USE ADDITIONAL SHEETS IF NECESSARY)

ECL 050-1-20 (2/93)

WELL LOG.—Continued No........./..........-..........

CORRELATION	MATERIAL	From (feet)	To (feet)
	Depth forward	———	
	Basalt, black	395	400
	Casing: 10" from 0' to 93'		
	Pump test: 300 gpm with 195 DD after 8 hrs.		
	Recovery data: 1st 50' fast, balance very slow for 30 minutes.		

File Original and First Copy with Department of Ecology
Second Copy — Owner's Copy
Third Copy — Driller's Copy

WATER WELL REPORT

STATE OF WASHINGTON

Start Card No. 056011
UNIQUE WELL I.D. #
Water Right Permit No.

(1) OWNER: Name Iowa Beef Processors Address Dakota city, Nebraska

(2) LOCATION OF WELL: County Walla Walla - NW 1/4 NW 1/4 Sec 35 T. 8 N., R 31E W.M.

(2a) STREET ADDRESS OF WELL (or nearest address) Dodd Road, Wallula, Wa.

(3) PROPOSED USE: ☐ Domestic ☐ Irrigation ☐ DeWater Industrial ☐ Test Well ☒ Municipal ☐ Other ☐

(4) TYPE OF WORK: Owner's number of well (if more than one) MW-3
Abandoned ☒ New well ☐ Deepened ☐ Reconditioned ☐ Method: Dug ☐ Cable ☐ Rotary ☐ Bored ☐ Driven ☐ Jetted ☐

(5) DIMENSIONS: Diameter of well 2 inches.
Drilled 160 feet. Depth of completed well 160 ft.

(6) CONSTRUCTION DETAILS:
Casing installed: 2 " Diam. from +2.5 ft. to 160 ft.
Welded ☐ " Diam. from ft. to ft.
Liner installed ☐
Threaded ☒ " Diam. from ft. to ft.

Perforations: Yes ☐ No ☐
Type of perforator used
SIZE of perforations in. by in.
perforations from ft. to ft.
perforations from ft. to ft.
perforations from ft. to ft.

Screens: Yes ☒ No ☐
Manufacturer's Name
Type PVC Model No.
Diam. 2" Slot size .020 from 150 ft. to 160 ft.
Diam. Slot size from ft. to ft.

Gravel packed: Yes ☒ No ☐ Size of gravel 10/20 css
Gravel placed from 142 ft. to 160 ft.

Surface seal: Yes ☒ No ☐ To what depth? 142 ft.
Material used in seal Bentonite
Did any strata contain unusable water? Yes ☐ No ☐
Type of water? Depth of strata
Method of sealing strata off

(7) PUMP: Manufacturer's Name N/A
Type: H.P.

(8) WATER LEVELS: Land-surface elevation above mean sea level ft.
Static level 126 bgs ft. below top of well Date 8-10-92
Artesian pressure lbs. per square inch Date
Artesian water is controlled by (Cap, valve, etc.)

(9) WELL TESTS: Drawdown is amount water level is lowered below static level
Was a pump test made? Yes ☐ No ☒ If yes, by whom?
Yield: gal./min. with ft. drawdown after hrs.
" " " "
" " " "

Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level

Date of test
Bailer test gal./min. with ft. drawdown after hrs.
Airtest gal./min. with stem set at ft. for hrs.
Artesian flow g.p.m. Date
Temperature of water Was a chemical analysis made? Yes ☐ No ☐

(10) WELL LOG or ABANDONMENT PROCEDURE DESCRIPTION

Formation: Describe by color, character, size of material and structure, and show thickness of aquifers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of information.

MATERIAL	FROM	TO
Tremie grout with high		
solids bentonite grout.		
Cut off surface protection		
2 ft. B.G.S. pull guard posts.		
Recontour surface.		

RECEIVED
DEC 15 1995
DEPARTMENT OF ECOLOGY
EASTERN REGIONAL OFFICE

Work Started 12-6-95, 19. Completed 12-7-95, 19

WELL CONSTRUCTOR CERTIFICATION:

I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards. Materials used and the information reported above are true to my best knowledge and belief.

NAME RUEN DRILLING, INC. (PERSON, FIRM, OR CORPORATION) (TYPE OR PRINT)
Address PO BOX 267, CLARK FORK, ID 83811
(Signed) [signature] (WELL DRILLER) License No. 1724
Contractor's Registration No. RUENCDI175QM Date DEC 14, 1995

(USE ADDITIONAL SHEETS IF NECESSARY)

ECL 050-1-20 (2/93)

File Original and First Copy with Department of Ecology
Second Copy — Owner's Copy
Third Copy — Driller's Copy

WATER WELL REPORT

STATE OF WASHINGTON

Application No. ....

Permit No. ....

(1) OWNER: Name Iowa Beef Processors Inc. Address Wallula, Wa

(2) LOCATION OF WELL: County Walla Walla SW ¼ SW ¼ Sec. 26 T. 8 N., R. 31 W.M.

Bearing and distance from section or subdivision corner 600' N. of SW Corn.

(3) PROPOSED USE: observation Domestic ☐ Industrial ☐ Municipal ☐ Irrigation ☐ Test Well ☐ Other ☐

(4) TYPE OF WORK: Owner's number of well (if more than one) 2

New well ☐ Method: Dug ☐ Bored ☐
Deepened ☐ Cable ☐ Driven ☐
Reconditioned ☐ Rotary ☐ Jetted ☐

(5) DIMENSIONS: Diameter of well .... inches.
Drilled .... ft. Depth of completed well .... ft.

(6) CONSTRUCTION DETAILS:

Casing installed: ....” Diam. from .... ft. to .... ft.
Threaded ☐ ....” Diam. from .... ft. to .... ft.
Welded ☐ ....” Diam. from .... ft. to .... ft.

Perforations: Yes ☐ No ☐
Type of perforator used ....
SIZE of perforations .... in. by .... in.
.... perforations from .... ft. to .... ft.
.... perforations from .... ft. to .... ft.
.... perforations from .... ft. to .... ft.

Screens: Yes ☐ No ☐
Manufacturer's Name ....
Type .... Model No. ....
Diam. .... Slot size .... from .... ft. to .... ft.
Diam. .... Slot size .... from .... ft. to .... ft.

Gravel packed: Yes ☐ No ☐ Size of gravel: ....
Gravel placed from .... ft. to .... ft.

Surface seal: Yes ☐ No ☐ To what depth? .... ft.
Material used in seal ....
Did any strata contain unusable water? Yes ☐ No ☐
Type of water? .... Depth of strata ....
Method of sealing strata off ....

(7) PUMP: Manufacturer's Name ....
Type: .... H.P. ....

(8) WATER LEVELS: Land-surface elevation above mean sea level .... 490 ft.
Static level 119 ft. below top of well Date ....
Artesian pressure .... lbs. per square inch Date ....
Artesian water is controlled by .... (Cap, valve, etc.)

(9) WELL TESTS: Drawdown is amount water level is lowered below static level
Was a pump test made? Yes ☐ No ☐ If yes, by whom? ....
Yield: gal./min. with ft. drawdown after hrs.
" " " "
" " " "

Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level

Date of test ....
Bailer test .... gal./min. with .... ft. drawdown after .... hrs.
Artesian flow .... g.p.m. Date ....
Temperature of water .... Was a chemical analysis made? Yes ☐ No ☐

(10) WELL LOG:

Formation: *Describe by color, character, size of material and structure, and show thickness of aquifers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of formation.*

MATERIAL	FROM	TO
Silty sand, brown	0	15
Sand, black clean	15	28
Silty sand, brown	28	30
Sandy silt, brown	30	38
Silty sand, brown	38	55
Caliche, hard	55	64
Silty sand, brown	64	81
Silty sand, brown w 10% small gravel	81	95
Silty sand, brown w 50% small gravel	95	101
Conglomerate, Consoli-dated Ringold, dry	101	119
Sand + Gravel, soft	119	121
Silt, sand, gravel, sm. boulders - reworked Ringold	121	140
Conglomerate, Cemented Ringold	140	145
Sand, sm. gravel med. brown	145	154
Sandy silt, sm. gravel brown	154	168
Silty sand, brown	168	176
Clay, blue	176	186

Copied from sections submitted by Iowa Beef Processors, Inc.
7/25/80

Work started ...., 19.... Completed ...., 19....

WELL DRILLER'S STATEMENT:

This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

NAME .... (Person, firm, or corporation) (Type or print)

Address ....

[Signed] .... (Well Driller)

License No. .... Date ...., 19....

7/25/80 (USE ADDITIONAL SHEETS IF NECESSARY)

File Original and First Copy with the Division of Water Resources
Second Copy — Owner's Copy
Third Copy — Driller's Copy

WATER WELL REPORT
STATE OF WASHINGTON

Application No. ....
Permit No. G3-01075C

(1) OWNER: Name McGregor Feedlot ~~Feed Systems, Inc.~~ Address 607, Pasco, Con. ~~PO Bx 3105 Terminal Annex, Spokane, Wn~~

(2) LOCATION OF WELL: County Walla Walla NE¼ NE ¼ NW ¼ Sec. 35 T. 8 N., R. 31E W.M.
Bearing and distance from section or subdivision corner 100' South + 200' W of N¼ Cor. Sec. 35

(3) PROPOSED USE: Domestic ☐ Industrial ☒ Municipal ☐ Irrigation ☐ Test Well ☐ Other ☐

(4) TYPE OF WORK: Owner's number of well (if more than one) ....
New well ☒ Method: Dug ☐ Bored ☐
Deepened ☐ Cable ☐ Driven ☐
Reconditioned ☐ Rotary ☐ Jetted ☐

(5) DIMENSIONS: Diameter of well 10 inches.
Drilled 505 ft. Depth of completed well 505 ft.

(6) CONSTRUCTION DETAILS:
Casing installed: 10" Diam. from 0 ft. to 142 ft.
Threaded ☐ 8" Diam. from 0 ft. to 209 ft.
Welded ☒ ....." Diam. from ..... ft. to ..... ft.

Perforations: Yes ☐ No ☐
Type of perforator used ....
SIZE of perforations ..... in. by ..... in.
..... perforations from ..... ft. to ..... ft.
..... perforations from ..... ft. to ..... ft.
..... perforations from ..... ft. to ..... ft.

Screens: Yes ☐ No ☒
Manufacturer's Name ....
Type ..... Model No. .....
Diam. ..... Slot size ..... from ..... ft. to ..... ft.
Diam. ..... Slot size ..... from ..... ft. to ..... ft.

Gravel packed: Yes ☐ No ☒ Size of gravel: .....
Gravel placed from ..... ft. to ..... ft.

Surface seal: Yes ☒ No ☐ To what depth? 208 ft.
Material used in seal Cement Grout
Did any strata contain unusable water? Yes ☐ No ☒
Type of water? ..... Depth of strata .....
Method of sealing strata off .....

(7) PUMP: Manufacturer's Name ....
Type: ..... H.P. .....

(8) WATER LEVELS: Land-surface elevation above mean sea level.... 500 ft.
Static level 152 ft. below top of well Date 4/21/71
Artesian pressure ..... lbs. per square inch Date .....
Artesian water is controlled by ..... (Cap, valve, etc.)

(9) WELL TESTS: Drawdown is amount water level is lowered below static level
Was a pump test made? Yes ☐ No ☒ If yes, by whom? .....
..... gal./min. with ..... ft. drawdown after ..... hrs.
Air Test " 800-1,000gpm " "
" " "
Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Water Level	Time	Water Level	Time	Water Level

Bailer test ..... gal./min. with ..... ft. drawdown after ..... hrs.
Artesian flow ..... g.p.m. Date .....
Temperature of water 78° Was a chemical analysis made? Yes ☐ No ☒

(10) WELL LOG: First Water 320-360'

Formation: Describe by color, character, size of material and structure, and show thickness of aquifers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of formation.

MATERIAL	FROM	TO
Sand, Brownn	0	50
Clay, white	50	55
Clay, Brwn.w/Conglomerated Gravel, Streaks	55	89
Basalt, Gray	89	97
Clay, Brown	97	113
Gravel, Medium	113	170
Clay Brown and Blue	170	195
Gravel, Nedium	195	200
Basalt, Black, Hard	200	235
Basalt, Brown, Soft	235	255
Basalt, Black, Hard	255	275
Basalt, Gray, Hard	275	320
Basalt,Brwn.W/White Clay Water Bearing	320	360
Basalt, Gray, Hard	360	450
Basalt, W/Blue Clay	450	498
Basalt, Gravel, Large Water Bearing	498	505

RECEIVED
JUN 17 1971

500 gpm
438 AF
Stock

Work started 4/6/ 19 71 Completed 4/21/ 19 71

WELL DRILLER'S STATEMENT:

This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

NAME PROJECT:Corporation
(Person, firm, or corporation) (Type or print)

Address 24 North Second, Walla Walla, Wn. 9936

[Signed] Ernie Stut
(Well Driller)

License No Oreg. #698 Date 4/21/ 19 71

(USE ADDITIONAL SHEETS IF NECESSARY)

APPENDIX C
XSTABL Slope Stability Analysis

XSTABL File: TYSON1 8-17-20 12:18

```
****************************************
*          X S T A B L          *
*                               *
*    Slope Stability Analysis   *
*          using the            *
*       Method of Slices        *
*                               *
*    Copyright (C) 1992 - 2008  *
* Interactive Software Designs, Inc. *
*    Moscow, ID 83843, U.S.A.   *
*                               *
*      All Rights Reserved      *
*                               *
* Ver. 5.208        96 - 2044   *
****************************************
```

Problem Description : Tyson Lagoon – Static (Leaking)

SEGMENT BOUNDARY COORDINATES

----

5 SURFACE boundary segments

Segment No.	x-left (ft)	y-left (ft)	x-right (ft)	y-right (ft)	Soil Unit Below Segment
1	.0	40.0	50.0	40.0	1
2	50.0	40.0	74.7	49.0	1
3	74.7	49.0	89.7	49.0	1
4	89.7	49.0	127.2	36.6	1
5	127.2	36.6	150.0	36.6	1

ISOTROPIC Soil Parameters

----

1 Soil unit(s) specified

Soil Unit No.	Unit Weight Moist (pcf)	Unit Weight Sat. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Parameter Ru	Pore Pressure Constant (psf)	Water Surface No.
1	115.0	120.0	.0	30.00	.000	.0	1

1 Water surface(s) have been specified

Unit weight of water = 62.40 (pcf)

Water Surface No. 1 specified by 8 coordinate points

****

PHREATIC SURFACE,

****

Point No.	x-water (ft)	y-water (ft)
1	.00	35.00
2	50.00	40.00
3	59.00	43.00
4	65.00	43.10
5	74.70	44.80
6	89.70	47.00
7	94.20	47.30
8	150.00	47.30

A critical failure surface searching method, using a random

technique for generating CIRCULAR surfaces has been specified.

900 trial surfaces will be generated and analyzed.

30 Surfaces initiate from each of 30 points equally spaced

along the ground surface between x = 30.0 ft

and x = 60.0 ft

Each surface terminates between x = 60.0 ft

and x = 100.0 ft

Unless further limitations were imposed, the minimum elevation

at which a surface extends is y = 10.0 ft

3.0 ft line segments define each trial failure surface.

ANGULAR RESTRICTIONS

The first segment of each failure surface will be inclined

within the angular range defined by :

Lower angular limit := -45.0 degrees

Upper angular limit := (slope angle - 5.0) degrees

Factors of safety have been calculated by the :

* * * * * SIMPLIFIED BISHOP METHOD * * * * *

The most critical circular failure surface is specified by 6 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	48.62	40.00
2	51.61	39.72
3	54.57	40.17
4	57.35	41.31
5	59.77	43.08
6	60.35	43.77

**** Simplified BISHOP FOS = 1.011 ****

The following is a summary of the TEN most critical surfaces

Problem Description : Tyson Lagoon - Static

	FOS (BISHOP)	Circle Center x-coord (ft)	Circle Center y-coord (ft)	Radius (ft)	Initial x-coord (ft)	Terminal x-coord (ft)	Resisting Moment (ft-lb)
1.	1.011	51.25	52.19	12.47	48.62	60.35	5.063E+03
2.	1.036	51.95	53.32	13.13	50.69	61.23	4.693E+03
3.	1.054	50.67	57.20	17.47	47.59	62.71	1.000E+04
4.	1.126	50.34	61.58	21.91	46.55	65.21	1.842E+04
5.	1.129	53.76	50.03	10.25	50.69	62.24	6.934E+03
6.	1.146	53.86	53.09	13.22	50.69	64.46	1.182E+04
7.	1.151	53.13	57.23	17.57	49.66	66.62	2.156E+04
8.	1.165	54.46	51.24	10.96	51.72	63.22	7.020E+03
9.	1.186	50.54	54.50	15.34	45.52	62.08	1.200E+04
10.	1.188	53.50	49.60	10.77	48.62	62.99	1.234E+04

* * * END OF FILE * * *

XSTABL File: TYSON2   8-17-20   12:50

```
*****************************************
*            X S T A B L            *
*                                   *
*      Slope Stability Analysis      *
*             using the             *
*          Method of Slices          *
*                                   *
*      Copyright (C) 1992 - 2008      *
*   Interactive Software Designs, Inc.   *
*       Moscow, ID 83843, U.S.A.       *
*                                   *
*         All Rights Reserved         *
*                                   *
*  Ver. 5.208              96 - 2044  *
*****************************************
```

Problem Description : Tyson Lagoon - Seismic

SEGMENT BOUNDARY COORDINATES

----

5 SURFACE boundary segments

Segment No.	x-left (ft)	y-left (ft)	x-right (ft)	y-right (ft)	Soil Unit Below Segment
1	.0	40.0	50.0	40.0	1
2	50.0	40.0	74.7	49.0	1
3	74.7	49.0	89.7	49.0	1
4	89.7	49.0	127.2	36.6	1
5	127.2	36.6	150.0	36.6	1

ISOTROPIC Soil Parameters

----

1 Soil unit(s) specified

Soil Unit No.	Unit Weight Moist (pcf)	Sat. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Parameter Ru	Constant (psf)	Water Surface No.
1	115.0	120.0	.0	30.00	.000	.0	1

1 Water surface(s) have been specified

Unit weight of water = 62.40 (pcf)

Water Surface No. 1 specified by 8 coordinate points

****

PHREATIC SURFACE,

****

Point No.	x-water (ft)	y-water (ft)
1	.00	5.00
2	5.00	5.00
3	59.00	5.00
4	65.00	5.00
5	74.70	5.00
6	89.70	5.00
7	94.20	5.00
8	150.00	5.00

A horizontal earthquake loading coefficient of .130 has been assigned

A vertical earthquake loading coefficient of .052 has been assigned

A critical failure surface searching method, using a random

technique for generating CIRCULAR surfaces has been specified.

900 trial surfaces will be generated and analyzed.

30 Surfaces initiate from each of 30 points equally spaced

along the ground surface between x = 30.0 ft

and x = 60.0 ft

Each surface terminates between x = 60.0 ft

and x = 100.0 ft

Unless further limitations were imposed, the minimum elevation

at which a surface extends is y = 10.0 ft

3.0 ft line segments define each trial failure surface.

ANGULAR RESTRICTIONS

The first segment of each failure surface will be inclined

within the angular range defined by :

Lower angular limit := -45.0 degrees

Upper angular limit := (slope angle - 5.0) degrees

Factors of safety have been calculated by the :

* * * * * SIMPLIFIED BISHOP METHOD * * * * *

The most critical circular failure surface

is specified by 8 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	50.69	40.25
2	53.62	40.90
3	56.51	41.70
4	59.36	42.63
5	62.17	43.70
6	64.91	44.90
7	67.60	46.23
8	68.53	46.75

**** Simplified BISHOP FOS = 1.107 ****

The following is a summary of the TEN most critical surfaces

Problem Description : Tyson Lagoon - Seismic

	FOS (BISHOP)	Circle Center x-coord (ft)	Circle Center y-coord (ft)	Radius (ft)	Initial x-coord (ft)	Terminal x-coord (ft)	Resisting Moment (ft-lb)
1.	1.107	38.64	101.23	62.15	50.69	68.53	3.220E+04
2.	1.113	44.06	88.03	48.01	51.72	68.66	2.724E+04
3.	1.118	46.10	80.75	40.51	51.72	67.48	2.236E+04
4.	1.121	44.90	93.41	53.22	51.72	73.58	5.978E+04
5.	1.130	50.94	59.63	18.72	52.76	61.44	3.544E+03
6.	1.136	53.71	54.92	13.21	54.83	61.09	1.320E+03
7.	1.139	53.28	64.95	23.25	54.83	66.87	1.007E+04
8.	1.145	56.04	56.51	14.02	56.90	64.12	2.122E+03
9.	1.152	56.29	63.33	20.83	56.90	69.06	1.053E+04
10.	1.157	51.36	65.81	25.19	51.72	67.15	2.174E+04

* * * END OF FILE * * *

XSTABL File: TYSON3 8-17-20 12:53

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****************************************
*           X S T A B L           *
*                                 *
*     Slope Stability Analysis    *
*            using the            *
*         Method of Slices        *
*                                 *
*     Copyright (C) 1992 - 2008   *
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*                                 *
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*                                 *
* Ver. 5.208           96 - 2044  *
****************************************
```

Problem Description : Tyson Lagoon - Static

SEGMENT BOUNDARY COORDINATES

----

5 SURFACE boundary segments

Segment No.	x-left (ft)	y-left (ft)	x-right (ft)	y-right (ft)	Soil Unit Below Segment
1	.0	40.0	50.0	40.0	1
2	50.0	40.0	74.7	49.0	1
3	74.7	49.0	89.7	49.0	1
4	89.7	49.0	127.2	36.6	1
5	127.2	36.6	150.0	36.6	1

ISOTROPIC Soil Parameters

----

1 Soil unit(s) specified

Soil Unit No.	Unit Weight Moist (pcf)	Unit Weight Sat. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Parameter Ru	Pore Pressure Constant (psf)	Water Surface No.
1	115.0	120.0	.0	30.00	.000	.0	1

1 Water surface(s) have been specified

Unit weight of water = 62.40 (pcf)

Water Surface No. 1 specified by 8 coordinate points

****

PHREATIC SURFACE,

****

Point No.	x-water (ft)	y-water (ft)
1	.00	5.00
2	5.00	5.00
3	59.00	5.00
4	65.00	5.00
5	74.70	5.00
6	89.70	5.00
7	94.20	5.00
8	150.00	5.00

A critical failure surface searching method, using a random technique for generating CIRCULAR surfaces has been specified.

900 trial surfaces will be generated and analyzed.

30 Surfaces initiate from each of 30 points equally spaced

along the ground surface between x = 30.0 ft

and x = 60.0 ft

Each surface terminates between x = 60.0 ft

and x = 100.0 ft

Unless further limitations were imposed, the minimum elevation

at which a surface extends is y = 10.0 ft

3.0 ft line segments define each trial failure surface.

ANGULAR RESTRICTIONS

The first segment of each failure surface will be inclined

within the angular range defined by :

Lower angular limit := -45.0 degrees

Upper angular limit := (slope angle - 5.0) degrees

Factors of safety have been calculated by the :

* * * * * SIMPLIFIED BISHOP METHOD * * * * *

The most critical circular failure surface is specified by 8 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	50.69	40.25
2	53.62	40.90
3	56.51	41.70
4	59.36	42.63
5	62.17	43.70
6	64.91	44.90
7	67.60	46.23
8	68.53	46.75

**** Simplified BISHOP FOS = 1.602 ****

The following is a summary of the TEN most critical surfaces

Problem Description : Tyson Lagoon - Static

	FOS (BISHOP)	Circle Center x-coord (ft)	Circle Center y-coord (ft)	Radius (ft)	Initial x-coord (ft)	Terminal x-coord (ft)	Resisting Moment (ft-lb)
1.	1.602	38.64	101.23	62.15	50.69	68.53	3.572E+04
2.	1.611	44.06	88.03	48.01	51.72	68.66	3.020E+04
3.	1.618	46.10	80.75	40.51	51.72	67.48	2.478E+04
4.	1.621	44.90	93.41	53.22	51.72	73.58	6.625E+04
5.	1.635	50.94	59.63	18.72	52.76	61.44	3.926E+03
6.	1.645	53.71	54.92	13.21	54.83	61.09	1.462E+03
7.	1.646	53.28	64.95	23.25	54.83	66.87	1.115E+04
8.	1.657	56.04	56.51	14.02	56.90	64.12	2.349E+03
9.	1.664	56.29	63.33	20.83	56.90	69.06	1.165E+04
10.	1.670	51.36	65.81	25.19	51.72	67.15	2.403E+04

* * * END OF FILE * * *

APPENDIX C
Domestic Wastewater Flows
May 2016 to April 2019

2016-2017

	May-16	Jun-16	Jul-16	Aug-16	Sep-16	Oct-16	Nov-16	Dec-16	Jan-17	Feb-17	Mar-17	Apr-17
1	3,280	12,790	12,920	4,060	8,030	16,130	3,110	15,640	1,060	6,730	460	2,000
2	17,420	-	11,550	14,310	16,950	3,530	19,160	15,020	8,100	4,790	16,390	2,000
3	9,890	22,960	1,560	9,070	8,060	17,090	14,570	2,090	9,860	5,770	-	12,220
4	6,740	13,390	1,890	11,120	2,290	15,910	16,430	3,260	11,110	10,920	-	14,240
5	13,860	11,100	17,280	8,720	2,300	16,340	16,130	13,820	7,020	11,970	-	14,110
6	7,960	3,880	15,660	2,330	17,510	15,430	22,130	16,010	6,830	14,080	1,080	11,160
7	3,320	12,000	17,250	1,920	16,910	16,240	15,090	12,080	9,920	6,250	21,700	11,140
8	3,340	13,630	16,920	17,870	11,950	3,320	4,080	10,020	12,970	6,830	9,310	6,220
9	9,800	16,780	16,030	3,050	17,050	2,180	3,160	15,000	9,990	3,870	13,910	2,010
10	9,890	17,800	-	17,780	17,920	16,280	16,120	2,060	9,980	3,930	14,120	12,230
11	13,870	2,320	11,060	9,680	2,200	16,930	16,100	1,140	8,840	11,970	3,930	12,420
12	10,940	2,110	10,140	8,300	4,000	16,290	12,130	16,930	7,080	11,060	2,000	18,780
13	9,000	15,600	14,030	8,190	12,270	17,180	13,140	9,030	9,780	12,620	16,210	14,140
14	7,660	16,000	16,880	2,240	10,750	16,210	15,030	14,940	1,930	13,260	16,080	14,390
15	5,080	16,810	18,090	15,640	6,900	3,230	5,680	9,790	2,010	7,820	14,120	1,980
16	10,470	17,630	2,340	8,360	13,420	2,140	7,160	13,920	9,790	13,750	14,060	3,980
17	11,230	16,190	-	9,750	11,490	17,250	15,250	2,040	8,920	6,220	13,970	17,290
18	10,170	18,200	16,320	9,900	2,270	16,200	16,010	3,060	14,050	8,760	3,970	12,060
19	19,980	2,900	15,520	11,110	3,550	17,250	12,110	16,010	6,950	3,590	5,640	14,620
20	10,080	16,220	17,600	2,480	7,530	15,180	11,130	19,000	5,110	-	10,380	12,090
21	6,610	16,000	18,120	3,190	8,060	16,170	16,150	13,130	2,120	8,750	15,960	14,120
22	6,610	15,350	16,240	17,650	17,950	2,130	15,030	15,010	1,980	13,850	8,750	3,260
23	17,750	17,010	2,200	12,870	22,860	2,130	3,100	15,960	6,030	16,370	18,810	2,000
24	16,730	14,940	1,470	8,420	2,620	16,170	2,160	2,060	8,940	19,550	14,800	10,150
25	17,850	4,940	14,130	14,940	3,580	16,180	15,050	2,090	6,990	-	2,860	16,440
26	22,650	-	17,850	9,810	11,590	12,530	-	19,130	9,850	13,910	5,760	12,030
27	19,380	18,400	16,180	9,980	9,300	11,520	-	16,060	16,010	14,920	5,810	16,310
28	2,220	17,090	16,320	2,730	9,290	9,070	22,510	14,010	3,160	13,030	8,680	14,080
29	2,220	12,980	16,860	16,730	7,950	3,120	-	10,000	2,000		15,370	3,960
30	3,230	11,050	3,490	16,960	7,930	3,200	21,010	16,020	9,380		14,380	2,000
31	6,790		3,600	8,970		7,070		2,020	11,340		14,150	
Total	316,020	376,070	359,500	298,130	294,480	359,600	348,730	336,350	239,100	264,570	302,660	303,430
Max (gpd)	22,650	22,960	18,120	17,870	22,860	17,250	22,510	19,130	16,010	19,550	21,700	18,780
Avg (gpd)	10,194	12,536	11,597	9,617	9,816	11,600	11,624	10,850	7,713	9,449	9,763	10,114

2017-2018

	May-17	Jun-17	Jul-17	Aug-17	Sep-17	Oct-17	Nov-17	Dec-17	Jan-18	Feb-18	Mar-18	Apr-18
1	16,080	16,190	4,300	17,850	12,630	7,180	13,710	13,440	5,760	15,580	15,710	6,330
2	14,120	16,150	4,340	15,750	8,420	16,610	15,640	5,690	13,550	7,660	13,530	10,200
3	16,230	2,000	11,160	16,370	1,490	13,700	17,530	5,740	8,560	3,820	11,500	9,590
4	14,230	5,970	4,060	16,490	3,890	16,170	11,720	24,540	20,580	7,710	3,780	-
5	14,070	16,490	11,590	6,150	14,170	14,600	5,750	15,580	11,600	15,560	4,330	16,090
6	1,990	14,350	11,890	3,970	15,320	16,960	9,670	15,560	3,830	17,630	13,090	5,590
7	5,640	20,500	14,290	16,560	14,580	1,910	19,690	13,630	3,940	17,570	14,590	660
8	16,400	15,670	5,650	17,490	17,070	6,150	15,570	17,770	13,610	17,510	16,320	2,550
9	18,300	11,820	1,960	18,170	10,920	15,230	13,560	3,810	17,610	15,470	13,370	55,380
10	16,790	6,480	29,860	14,860	7,580	15,680	15,540	3,930	13,570	7,630	5,780	16,730
11	16,170	4,010	51,920	1,260	15,410	15,600	3,820	17,720	15,580	11,510	5,690	16,140
12	14,070	19,200	28,750	17,240	18,330	15,540	38,270	18,230	11,640	15,340	19,710	14,560
13	3,940	18,370	14,170	-	11,140	13,580	16,870	7,380	1,910	18,520	15,530	13,300
14	3,960	16,350	13,280	12,540	21,400	5,730	15,610	-	3,850	11,600	11,650	5,540
15	16,210	14,290	-	17,060	13,900	3,810	15,630	17,500	13,710	13,390	-	8,520
16	14,150	16,260	6,450	9,820	-	12,310	15,650	3,820	14,990	13,640	38,120	15,040
17	16,180	7,710	12,130	16,830	100	11,800	13,800	5,750	15,650	45,680	5,970	17,160
18	14,200	4,010	14,920	13,260	13,740	2,300	3,880	29,610	13,670	5,650	7,640	12,440
19	14,290	20,040	15,580	4,480	13,750	12,270	5,760	21,460	13,590	5,920	13,440	16,250
20	3,950	14,440	13,830	5,270	15,590	17,150	13,570	29,270	2,480	50,250	15,310	13,060
21	2,040	14,420	24,290	15,880	18,530	15,640	13,710	29,100	2,260	52,250	14,340	13,740
22	16,200	16,960	1,070	16,660	11,770	-	10,360	21,370	-	45,480	17,270	7,000
23	14,330	16,970	4,490	14,480	7,730	22,410	1,000	15,400	33,680	17,680	14,430	13,670
24	14,330	6,010	9,090	19,830	3,880	15,470	-	15,410	15,670	7,780	5,620	15,300
25	16,150	3,870	14,890	13,090	15,850	5,890	2,150	17,410	13,600	9,720	7,630	16,620
26	16,200	16,360	16,260	7,430	13,940	32,360	3,810	19,490	7,690	15,700	15,510	13,480
27	4,040	16,890	13,710	7,120	17,020	3,900	13,560	27,470	1,910	15,640	15,400	13,120
28	3,990	10,380	12,050	15,300	13,190	13,020	15,420	27,300	5,800	13,960	11,330	4,010
29	6,100	15,760	4,140	15,380	15,250	2,370	13,580	17,490	15,540		-	7,040
30	14,650	10,390	5,420	15,420	3,870	7,690	15,390	5,750	15,580		34,310	13,730
31	16,210		1,250	15,550		11,610		3,820	15,580		10,770	
Total	375,210	388,310	376,790	397,560	350,460	364,640	370,220	470,440	346,990	495,850	391,670	372,840
Max (gpd)	18,300	20,500	51,920	19,830	21,400	32,360	38,270	29,610	33,680	52,250	38,120	55,380
Avg (gpd)	12,104	12,944	12,155	12,825	11,682	11,763	12,341	15,175	11,193	17,709	12,635	12,428

2018-2019

	May-18	Jun-18	Jul-18	Aug-18	Sep-18	Oct-18	Nov-18	Dec-18	Jan-19	Feb-19	Mar-19	Apr-19
1	16,160	12,120	7,270	15,610	-	12,840	12,810	1,760	1,780	12,670	12,580	14,660
2	18,200	5,460	16,650	16,300	3,640	12,920	9,130	1,770	12,740	1,780	3,550	12,840
3	16,350	3,640	12,960	14,980	3,610	11,000	1,790	14,790	10,890	1,800	1,760	14,640
4	17,610	9,120	5,450	11,240	14,780	11,000	3,610	12,620	10,930	14,330	14,330	13,280
5	8,640	15,030	15,000	5,550	13,050	13,090	9,160	12,680	1,770	12,600	14,330	12,810
6	7,410	14,930	14,910	15,040	13,110	10,640	10,950	10,820	13,610	12,620	16,230	3,000
7	15,710	14,890	12,940	15,070	13,100	5,500	10,890	10,390	25,640	12,620	14,540	4,200
8	18,120	13,000	7,370	15,080	9,220	14,640	10,890	1,770	29,670	14,410	14,500	14,610
9	12,780	5,390	15,090	15,150	5,530	12,790	8,830	1,770	17,980	5,330	3,550	12,770
10	23,730	7,340	15,110	13,160	12,980	11,010	1,760	14,690	10,930	7,110	3,570	12,750
11	17,120	12,930	15,050	7,470	12,960	9,170	3,550	10,070	10,900	5,750	12,630	12,760
12	9,240	16,650	15,140	5,500	14,770	11,040	10,810	11,710	1,790	13,910	14,450	10,940
13	9,380	15,220	15,130	14,940	11,080	7,310	12,690	10,180	1,780	12,610	12,740	3,580
14	18,810	13,590	11,320	14,940	12,940	3,570	12,710	9,880	12,670	12,650	12,700	1,800
15	15,420	14,240	5,550	13,130	3,620	5,420	12,760	1,750	10,870	12,720	14,510	7,300
16	15,030	4,240	17,240	13,140	3,640	5,230	12,740	2,390	12,690	14,460	1,810	9,090
17	13,080	5,680	15,040	13,050	12,920	11,150	1,770	9,750	14,570	6,790	3,560	14,730
18	13,050	14,120	13,990	3,680	11,090	12,790	17,900	12,800	12,710	-	12,760	12,930
19	5,510	17,110	16,070	5,530	14,390	11,030	14,430	9,070	1,790	14,480	12,740	
20	3,690	15,020	13,150	12,970	12,930	9,150	12,590	12,780	5,400	12,640	12,750	
21	16,700	13,070	5,540	14,890	11,040	1,790	12,660	10,940	6,600	14,450	12,780	
22	15,000	14,950	7,430	13,150	3,640	10,960	3,550	1,790	10,640	12,640	12,890	
23	17,040	13,180	15,080	13,000	5,480	10,970	14,540	1,780	12,760	12,610	3,570	
24	15,360	5,540	15,280	14,880	12,850	11,000	-	-	14,560	3,560	1,800	
25	15,130	14,870	11,380	12,950	14,730	10,980	9,230	3,600	10,920	12,580	12,700	
26	12,870	12,950	16,960	5,520	12,950	10,940	14,410	10,880	1,790	14,400	14,600	
27	5,440	14,470	13,180	22,620	12,900	1,780	12,740	10,880	490	14,400	10,870	
28	5,540	13,350	5,570	14,950	11,100	1,790	14,500	12,660	13,910	12,730	14,620	
29	14,830	13,140	6,510	11,130	3,610	10,930	10,910	1,780	14,510		12,790	
30	15,440	11,050	651	13,050	5,400	10,900	14,600	-	12,640		5,400	
31	12,850		15,080	14,780		10,930		10,890	12,660		3,610	
Total	421,240	356,290	373,091	392,450	293,060	294,260	298,910	238,640	332,590	298,650	315,220	188,690
Max (gpd)	23,730	17,110	17,240	22,620	14,780	14,640	17,900	14,790	29,670	14,480	16,230	14,730
Avg (gpd)	13,588	11,876	12,035	12,660	9,769	9,492	9,964	7,698	10,729	10,666	10,168	10,483

APPENDIX D
Domestic Wastewater Strength Test Results

Main Office: 337 S. 1st Avenue Othello, WA 99344
Tel: (509) 488-0112 Fax (509) 488-0118
Oregon: 1300 6th Street, Umatilla, OR 97822
Tel: (541) 922-6435 Fax (541) 922-6436

CERT#4084-001

Water Report

Client: Anderson Perry & Associates Inc.
P.O. 1687
Walla Walla, WA 99362

Work Order: 1904248
Project Number:

Date Collected: 04/29/2019
Date Received: 04/30/2019
Date Reported: 05/14/2019

Analysis	Result	Flag	Units	Method	Analyst
1904248-01: Pump Chamber (Non-Potable)					
OIL AND GREASE	18.8		mg/L	EPA1664	AJW
Ammonia as Nitrogen	96.9		mg/L	SM 4500 NH3-D-97	DC
BOD	311		mg/L	SM 5210 B	BFHD
C-BOD	284		mg/L	SM 5210 B	BFHD
Fecal Coliform	2420		MPN/100 mL	SM 9223B	MM
Nitrate as Nitrogen	<0.100	U	mg/L	SM 4500 NO3-F-00	MM
TKN	124		mg/L	EPA 351.2	EH
Total Suspended Solids	87.0		mg/L	SM 2540 D-97	DC

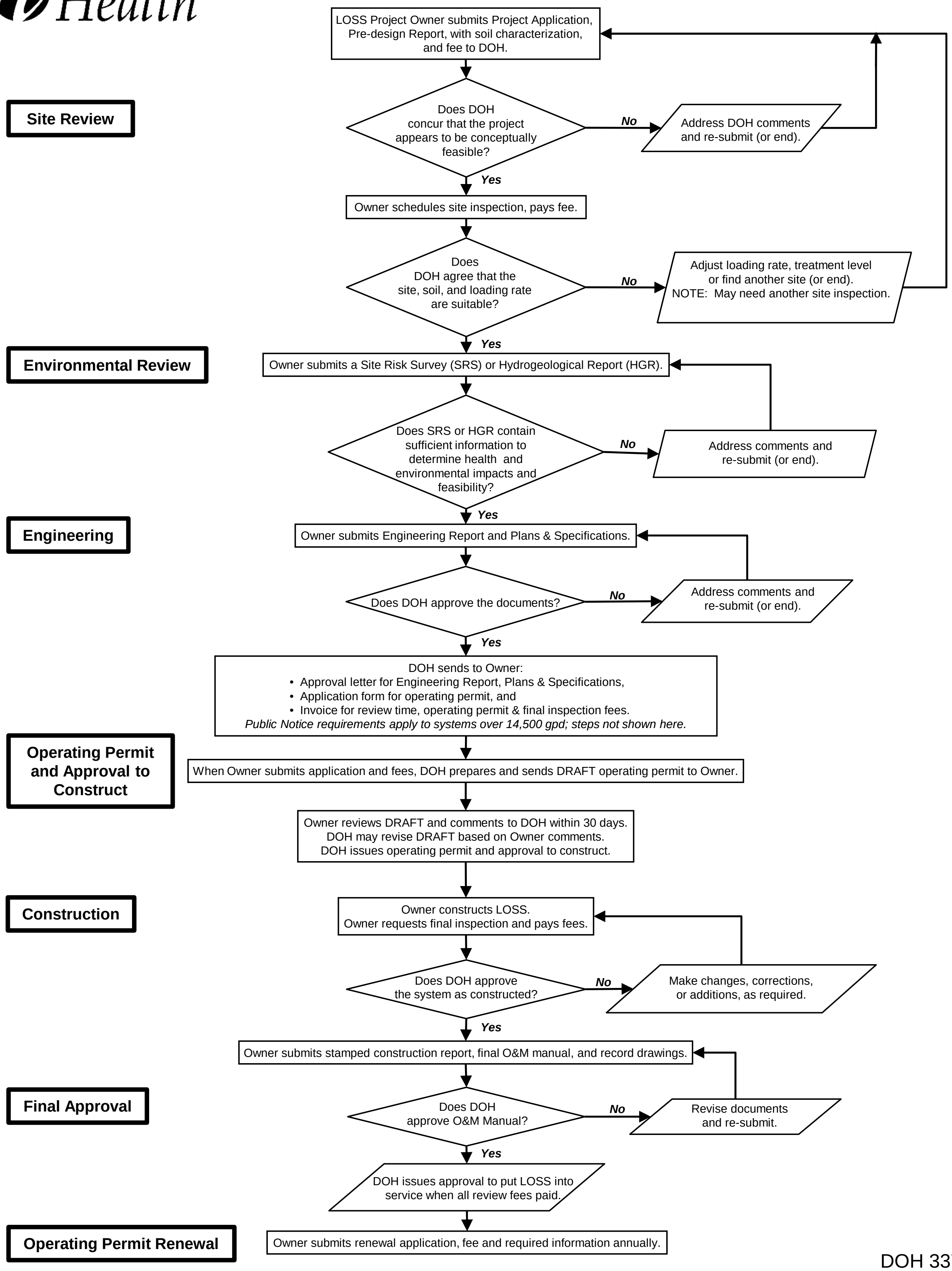
Notes and Definitions

Item	Description
U	Analyte included in the analysis, but not detected

APPENDIX E
Washington State Department of Health Large On-Site Sewer System Permitting Flowchart

Large On-site Sewage System (LOSS)
New Project Review & Approval Process Flowchart

Washington State Department of Health



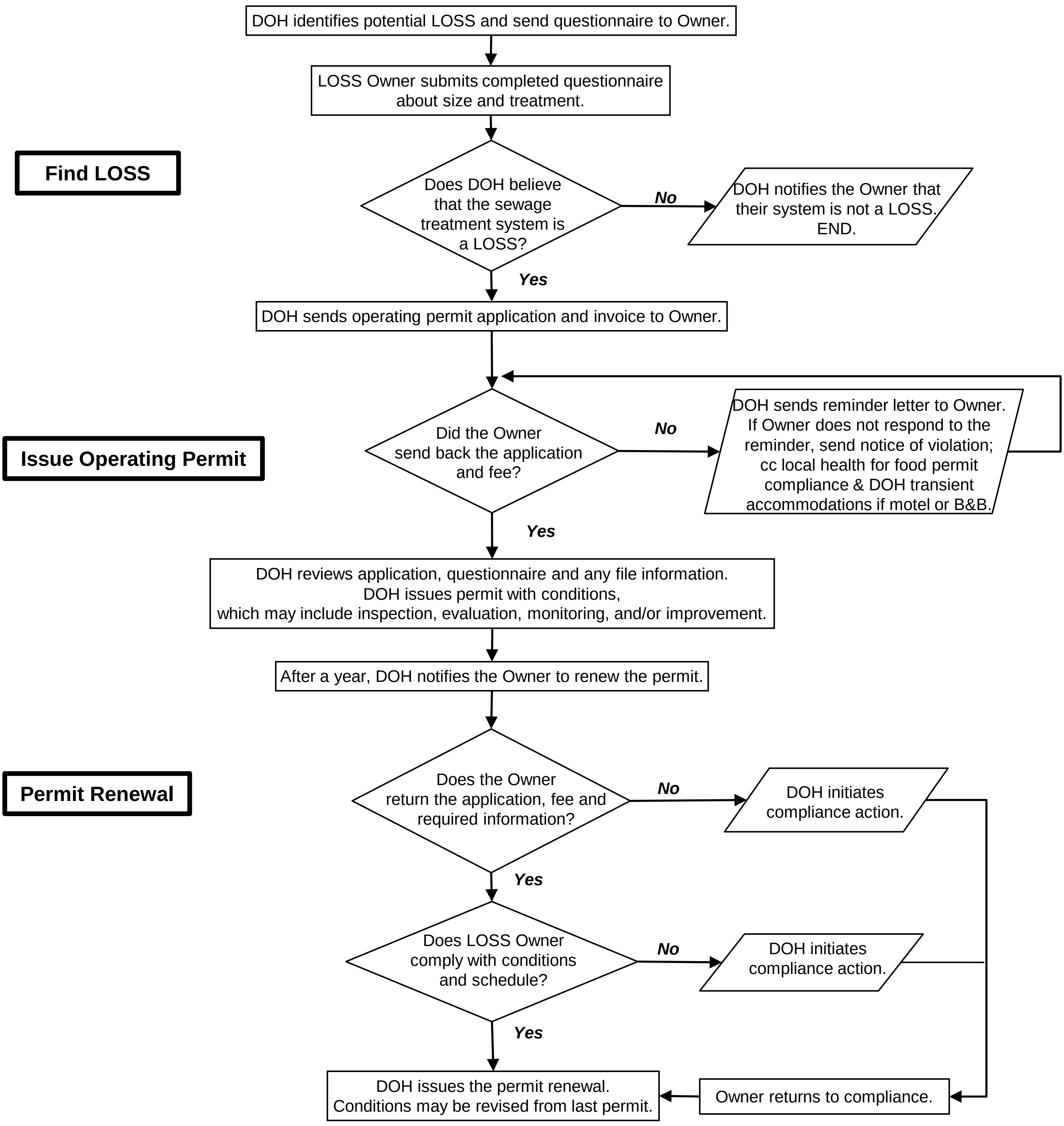
Large On-site Sewage System (LOSS) Program Offices and Contact Information

Washington State Department of Health
Division of Environmental Health
Office of Shellfish and Water Protection

Eastside LOSS Office	Serving
LOSS Program Washington Department of Health 16201 E Indiana Ave, Suite 1500 Spokane Valley, WA 99216 Physical Address: 16201 E Indiana Ave, Suite 1500 Spokane Valley, WA 99216 Phone: (509) 329-2100 Fax: (509)-329-2142 Email: wastewatermgmt@doh.wa.gov	Adams, Asotin, Benton, Chelan, Columbia, Douglas, Franklin, Ferry, Garfield, Grant, Kittitas, Klickitat, Lincoln, Okanogan, Pend Oreille, Spokane, Stevens, Walla Walla, Whitman, and Yakima Counties
Westside LOSS Office	**Serving**
LOSS Program Washington Department of Health PO Box 47824 Olympia, WA 98504-7824 Physical Address: 243 Israel Road Tumwater, WA Phone: (360) 236-3330 Fax: (360) 236-2257 Email: wastewatermgmt@doh.wa.gov	Clallam, Clark, Cowlitz, Grays Harbor, Island, Jefferson, King, Kitsap, Lewis, Mason, Pierce, Pacific, San Juan, Skagit, Skamania, Snohomish, Thurston, Wahkiakum, and Whatcom Counties
ACCOUNTS RECEIVABLE	**Serving**
Accounts Receivable – LOSS Washington Department of Health PO Box 1099 Olympia, WA 98507-1099	All LOSS across Washington State

DOH Pub 337-047
REVISED June 2017

Large On-site Sewage System (LOSS)
EXISTING SYSTEM
Review & Operating Permit Process Flowchart



Washington State Department of Health

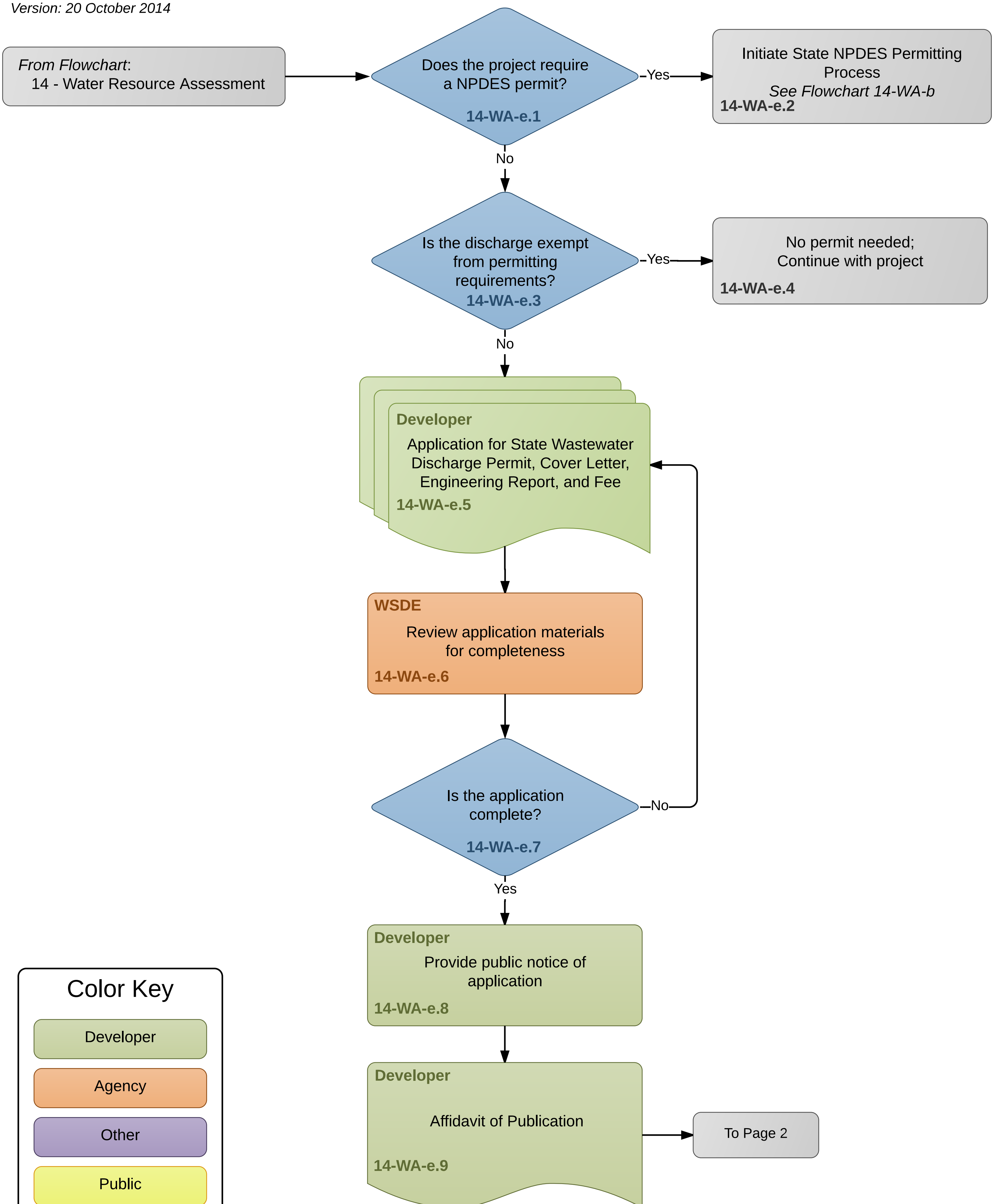
Large On-site Sewage System (LOSS) Program Offices and Contact Information

Eastside LOSS Office	Serving
LOSS Program Washington Department of Health 16201 E Indiana Ave, Suite 1500 Spokane Valley, WA 99216 <u>Physical Address</u>: 16201 E Indiana Ave, Suite 1500 Spokane Valley, WA 99216 Phone: (509) 329-2100 Fax: (509)-329-2142 Email: wastewatermgmt@doh.wa.gov	Adams, Asotin, Benton, Chelan, Columbia, Douglas, Franklin, Ferry, Garfield, Grant, Kittitas, Klickitat, Lincoln, Okanogan, Pend Oreille, Spokane, Stevens, Walla Walla, Whitman, and Yakima Counties
Westside LOSS Office	**Serving**
LOSS Program Washington Department of Health PO Box 47824 Olympia, WA 98504-7824 <u>Physical Address</u>: 243 Israel Road Tumwater, WA Phone: (360) 236-3330 Fax: (360) 236-2257 Email: wastewatermgmt@doh.wa.gov	Clallam, Clark, Cowlitz, Grays Harbor, Island, Jefferson, King, Kitsap, Lewis, Mason, Pierce, Pacific, San Juan, Skagit, Skamania, Snohomish, Thurston, Wahkiakum, and Whatcom Counties
ACCOUNTS RECEIVABLE	**Serving**
Accounts Receivable – LOSS Washington Department of Health PO Box 1099 Olympia, WA 98507-1099	All LOSS across Washington State

APPENDIX F
Washington State Department of Ecology State Waste Discharge Permit Flowchart

Flowchart 14-WA-e:
State Wastewater Discharge Permit

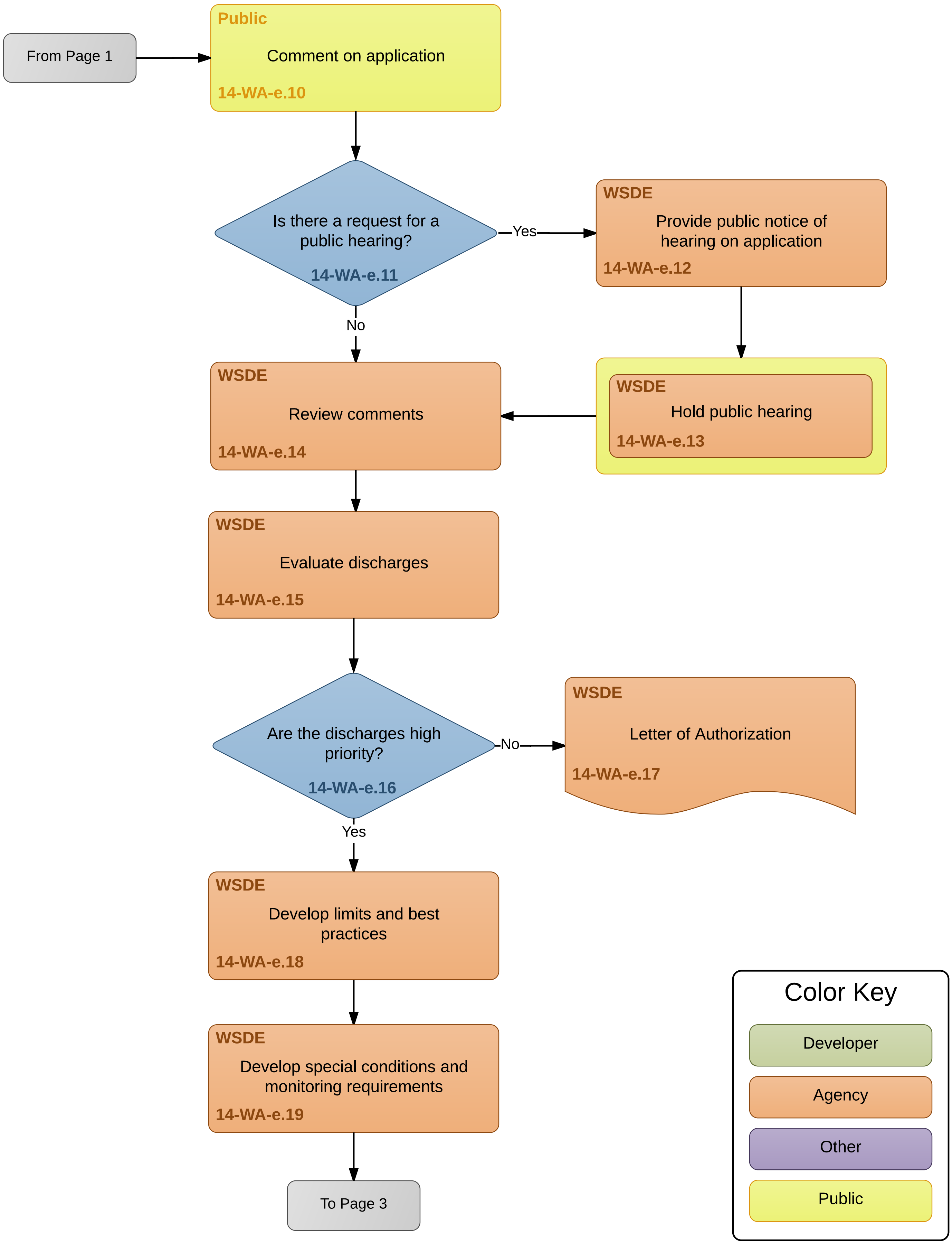
Version: 20 October 2014



Developed by the National Renewable Energy Laboratory for the DOE Geothermal Technologies Program

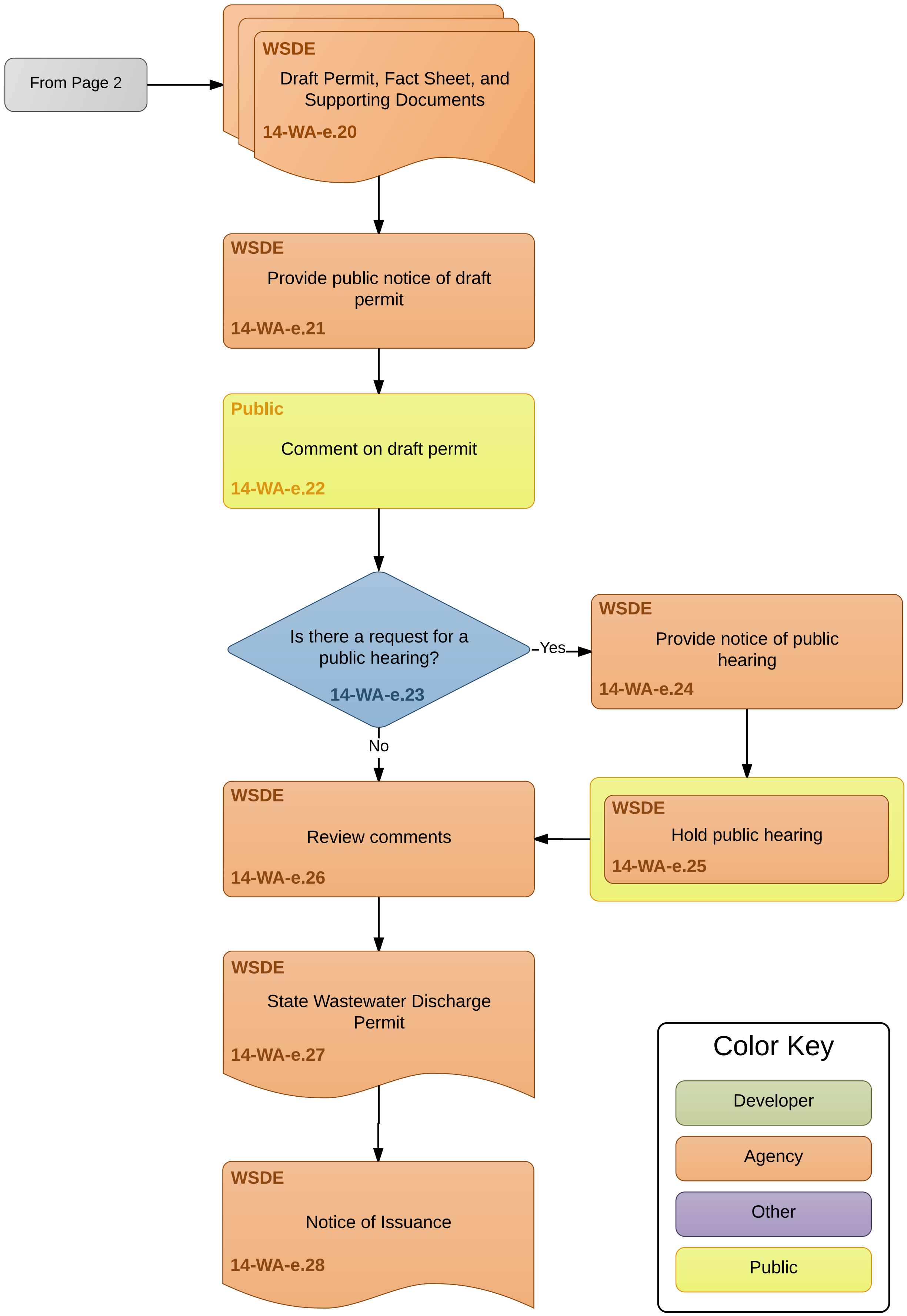
Flowchart 14-WA-e (continued):
State Wastewater Discharge Permit

Approximate Time Frame:



Flowchart 14-WA-e (continued):
State Wastewater Discharge Permit

Approximate Time Frame:



Application for a State Waste Discharge Permit to Discharge Domestic Wastewater to Ground Water by Land Treatment or Application

DEPARTMENT OF ECOLOGY
State of Washington

This application is for a state waste discharge permit as required by Chapter 90.48 RCW and Chapter 173-216 WAC. Permit applications provide Ecology with information on pollutants in the waste stream, materials that may enter the waste stream, the flow characteristics of the discharge, and site characteristics at the point of discharge.

Ecology may request additional information to clarify the conditions of this discharge. The applicant should reference information previously submitted to Ecology that applies to this application in the appropriate section.

SECTION A. GENERAL INFORMATION

1. Applicant Name:

2. Facility Name:
(if different from applicant)

3. Applicant Address:
Street

City/State Zip

4. Facility Location Address:
(if different from above) Street

City/State Zip

5. Latitude/longitude of the processing facility as decimal degrees (NAD83/WGS84):
_____ / _____

6. Latitude/longitude of sprayfield/infiltration site discharge location (approximate center) as decimal degrees (NAD83/WGS84):
_______/ _____

7. Person to contact who is familiar with the information contained in this application:

Name Title

Telephone Number Fax Number Email

FOR ECOLOGY USE ONLY	**Check One**	New/Renewal ☐	Modification ☐
Date Application Received _____		Application/Permit No. _____	
Date Application Accepted _____		Date Fee Paid _____	

8. Check One:

☐ **Permit Renewal** (including renewal of temporary permits)

Does this application request a greater amount of wastewater discharge, a greater amount of pollutant discharge, or a discharge of different pollutants than specified in the last permit application for this facility? ☐ YES ☐ NO

For permit renewals, the current permit is an attachment, by reference, to this application.

☐ **Permit Modification**

☐ **Existing Unpermitted Discharge**

☐ **Proposed Discharge**

Anticipated date of discharge:

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of a fine and/or imprisonment for knowing violations.

Signature* Date Title

Printed Name

*Applications must be signed by either a principal executive officer or a ranking elected official. If these titles do not apply to your organization, the person who makes budget decisions for this facility must sign the application. For state facilities, this is typically a program manager.

The application signatory may delegate signature authority for submittals required by the permit, such as monthly reports, to a suitable employee. You can delegate this authority to a qualified individual or to a position, which you expect to fill with a qualified individual. If you wish to delegate signature authority, please complete the following:

Signature of delegated employee Date Title or function at the facility

Printed name

SECTION B. TREATMENT PLANT INFORMATION

1. Identify all industries, commercial facilities or communities discharging to this publicly owned treatment works (POTW) by name, type of industry, address, telephone number and contact name. Attach extra sheet(s) if needed and label as attachment B1.

	INDUSTRY #1	INDUSTRY #2
NAME:		
INDUSTRY:		
ADDRESS:		
TELEPHONE:		
CONTACT NAME:		
INDUSTRIAL PRODUCT(S):		

2. POTW design and operation manuals available for this treatment facility:

Type of Manual	Date	Is there a copy at the POTW?
☐ Engineering Report		☐ YES ☐ NO
☐ Operation and Maintenance Manual		☐ YES ☐ NO
☐ Crop Management Plan		☐ YES ☐ NO
☐ Sprayfield Management Plan		☐ YES ☐ NO

3. POTW Design Data:
   a. Average Influent Flow for Maximum Month (MGD):
   b. Influent BOD Load (lbs/day):
   c. Influent SS Load (lbs/day):
   d. Began Operation (year):
   e. Last Major Upgrade (year):
   f. Planned Upgrades (year):
   g. Design Population:
   h. Actual Population:
   i. Sprayfield loading - attach copy of the irrigation schedule if schedule if available

4. Are there plans to modify this facility within the next five years? If so, briefly describe what and when.

5. Attach a simple schematic drawing of the POTW. *(Label as attachment B.5. Attachments should be 11 x 17"or smaller)*. The schematic should show all treatment processes (from B.6 below), flow direction and flow quantities in million gallons per day (MGD) or gallons per day (GPD).

6. Identify the type and number of unit processes at this facility.

Treatment	Unit Process	Number of Units
Lift stations	In collection system	
	At head of plant	
Preliminary treatment	Manually operated bar screens	
	Mechanically operated bar screens	
	Grit removal	
	Pre-aeration	
	Comminutors/grinders	
	Other *(specify)*	
Primary Treatment	Primary Sedimentation Tank/Clarifiers	
	Septic tanks	
	Other *(specify)*	
Secondary Treatment	Oxidation Ditch	
	Package Plant - Activated Sludge	
	Package Plant - Physical/Chemical	
	Aerated Lagoon	
	Non-aerated Lagoon/Facultative Lagoon	
	Rotating Biological Contact	
	Secondary Clarifiers	
	Trickling Filter	
	Polishing Ponds	
	Other *(specify)*	
Additional Treatment	Coagulation	
	Filtration	
	Storage (Lined Lagoon)	
	Storage (Unlined Lagoon)	
	Other *(specify)*	
Land Treatment or Application	Drainfield	
	Rapid Infiltration/Infiltration Lagoon	
	Constructed Wetland	
	Sprinkler Irrigation	
	Flood Irrigation	
	Ridge and Furrow Irrigation	
	Subsurface Irrigation	
	Other *(specify)*	
Disinfection	Chlorination	
	Ultraviolet	
	Other	

SECTION C. WASTEWATER INFORMATION

1. The average influent flow to the plant for the maximum month for at least the last 12 months: gallons/day

2. The maximum daily flow applied to the land treatment/application site for the last 12 months: gallons/day inches/acre/month

3. Describe how the influent and effluent flow are measured?

4. Attach flow records for at least the last 12 months. *(Label as attachment C.4.)*

5. Describe the collection method for the samples analyzed below (*i.e.*, grab, 24-hour composite). Applicants must collect grab samples (not composites) for analysis of pH, temperature, cyanide, total phenols, residual chlorine, oil and grease, fecal coliform (including E. coli), and Enterococci (previously known as fecal streptococcus at § 122.26 (d)(2)(iii)(A)(3)),or volatile organics.

6. Provide measurement values or range of measurements for treated wastewater prior to land treatment/application for the parameters with an "X" in the left column of the table below. If you obtain the application from the Internet, contact Ecology's regional office to see if testing for a subset of these parameters is permissible. All analyses (except pH) must be conducted by a laboratory registered or accredited by Ecology (WAC 173-216-125). If this is an application for permit renewal, provide data for the last year for parameters that are routinely measured. For parameters measured only for this application, place the values under "Maximum." Report the values with units as specified in the parameter name or in the detection level.

   The Permittee must use the specified analytical methods, detection limits (DLs) and quantitation levels (QLs) in the following table unless Ecology approves an alternate method or the method used produces measurable results in the sample and EPA has listed it as an EPA approved method in 40 CFR Part 136. If the Permittee uses an alternative method as allowed above, it must report the test method, DL, and QL on the discharge monitoring report or in the required report.

X	Parameter	Measurement Values Minimum	Maximum	Average	Number of Analyses	Analytical Method Std. Methods 19th, 20th edition or EPA	Detection Limit/Quantitation Level
	BOD (5 day)					SM 5210 B	/2 mg/l
	COD					SM 5220 D	/10 mg/l
	Total suspended solids					SM 2540 D	/5 mg/l
	Total dissolved solids					SM 2540 C	
	Conductivity (micromhos/cm)					SM 2510 B	
	Ammonia-N as N					SM 4500-NH_3 C	/0.3 mg/L
	pH					SM 4500-H	0.1 standard units
	Total Residual Chlorine					SM4500-Cl G	50/ µg/L L
	Fecal coliform (organisms/100 mL)					SM 9221 E or 9222 D	
	Total coliform (organisms/100 mL)					SM 9221 B or 9222 B	
	Dissolved oxygen					SM 4500-O C/G	
	Nitrate + nitrite-N as N					SM 4500-NO_3 E	100 µg/L
	Total kjeldahl N as N					SM 4500-N_{org} C/E/FG	300 µg/l
	Ortho-phosphate-P as P					SM 4500-P E/F	10 µg/l
	Total-phosphorous-P as P					SM 4500-P E/P/F	10 µg/l
	Total Oil & grease					EPA 1664A	1.4/5 mg/l
	NWTPH - Dx					Ecology NWTPH Dx	250/250 µg/l
	NWTPH - Gx					Ecology NWTPH Gx	250/250 µg/l
	Calcium					EPA 200.7	10 µg/l
	Chloride					SM 4500-Cl C	0.15 µg/l
	Fluoride					SM 4500-F E	.025/0.1 mg/l
	Magnesium					EPA 200.7	10/50 µg/l
	Potassium					EPA 200.7	700/ µg/l
	Sodium					EPA 200.7	29/ µg/l
	Sulfate					SM 4500-SO_4 C/D	/200 µg/l
	Alkalinity mg/L as $CaCO_3$					SM 2320 B	/5 mg/L as $CaCO_3$

X	Parameter	Measurement Values			Number of Analyses	Analytical Method Std. Methods 19th, 20th edition or EPA	Detection Limit/Quantitation Level
		Minimum	Maximum	Average			
	Arsenic(total)					EPA 200.8	0.1/0.5 µg/l
	Barium (total)					EPA 200.8	0.5/2 µg/l
	Cadmium (total)					EPA 200.8	.05/.25 µg/l
	Chromium (total)					EPA 200.8	0.2/1 µg/l
	Copper (total)					EPA 200.8	0.4/2 µg/l
	Iron (total)					EPA 200.7	12.5/50 µg/l
	Lead (total)					EPA 200.8	0.1/0.5 µg/l
	Manganese (total)					EPA 200.8	0.1/0.5 µg/l
	Mercury (total) pg/L					EPA 1631E	0.2/.5 pg/l
	Molybdenum(total)					EPA 200.8	0.1/0.5 µg/l
	Nickel(total)					EPA 200.8	0.1/0.5 µg/l
	Selenium (total)					EPA 200.8	1/1 µg/l
	Silver (total)					EPA 200.8	.04/.2 µg/l
	Zinc (total)					EPA 200.8	0.5/2.5 µg/l

Detection level (DL) or detection limit means the minimum concentration of an analyte (substance) that can be measured and reported with a 99% confidence that the analyte concentration is greater than zero as determined by the procedure given in 40 CFR part 136, Appendix B.

Quantitation Level (QL) also known as Minimum Level of Quantitation (ML) – The lowest level at which the entire analytical system must give a recognizable signal and acceptable calibration point for the analyte. It is equivalent to the concentration of the lowest calibration standard, assuming that the lab has used all method-specified sample weights, volumes, and cleanup procedures. The QL is calculated by multiplying the MDL by 3.18 and rounding the result to the number nearest to (1, 2, or 5) x 10^n, where n is an integer. (64 FR 30417).
ALSO GIVEN AS:
The smallest detectable concentration of analyte greater than the Detection Limit (DL) where the accuracy (precision & bias) achieves the objectives of the intended purpose. (Report of the Federal Advisory Committee on Detection and Quantitation Approaches and Uses in Clean Water Act Programs Submitted to the US Environmental Protection Agency December 2007).

7. Has the effluent been analyzed for any other parameters than those identified in question C.6, or are there other pollutants that you know of or believe to be present?

☐ YES ☐ NO

If yes, specify the pollutants and their concentration if known (*attach laboratory analyses if available and label as Attachment C.6*). *(Note: Ecology may require additional testing.)*

SECTION D. GROUNDWATER INFORMATON

Provide available data measurements or range of measurements from monitoring wells or supply wells in the area of discharge. Provide the analytical method and detection limit, if known. Provide the location of each well on the map required in E.3 below. Attach well logs when available (*label as Attachment D*). Copy this page as necessary for each well (*label as Attachment D*). Provide the latitude and longitude in decimal format.

Ecology Well Tag ID # _____ *(exampleAAB123)* Well ID # _______ *(example MW-1)*

Latitude: _____ Longitude: _____

Well Elevation (to the nearest 0.01 feet) _____ Check the appropriate box; the elevation measurement is relative to: the NAVD88 standard ☐ mean sea level ☐

Parameter	Units	Range of Measurements	Number of Analyses	Analytical Method	Detection Limit
BOD (5 day)	mg/L				
COD	mg/L				
Total organic carbon	mg/L				
Dissolved Fixed Solids	mg/L				
Total dissolved solids	mg/L				
pH	Standard units				
Conductivity	(micromhos/cm)				
Alkalinity	mg/L as $CaCO_3$				
Total hardness	mg/L				
Fecal coliform	organisms/100mL				
Total coliform	organisms/100mL				
Dissolved oxygen	mg/L				
Ammonia-N as N	mg/L				
Nitrate + nitrite-N, as N	mg/L				
Total kjeldahl N as N	mg/L				
Ortho-phosphate-P as P	mg/L				
Total-phosphorus-P as P	mg/L				
Total Oil & Grease	mg/L				
Total petroleum hydrocarbon	☐mg/L ☐ µg/l				
Calcium	☐mg/L ☐ µg/l				
Chloride	☐mg/L ☐ µg/l				
Fluoride	☐mg/L ☐ µg/l				
Magnesium	☐mg/L ☐ µg/l				
Potassium	☐mg/L ☐ µg/l				
Sodium	☐mg/L ☐ µg/l				
Sulfate	☐mg/L ☐ µg/l				
Barium	☐mg/L ☐ µg/l				
Cadmium	☐mg/L ☐ µg/l				
Chromium	☐mg/L ☐ µg/l				
Copper	☐mg/L ☐ µg/l				
Iron	☐mg/L ☐ µg/l				
Lead	☐mg/L ☐ µg/l				
Manganese	☐mg/L ☐ µg/l				
Mercury	☐mg/L ☐ µg/l				
Selenium	☐mg/L ☐ µg/l				
Silver	☐mg/L ☐ µg/l				
Zinc	☐mg/L ☐ µg/l				
Depth to water level (to the nearest .01 feet)					

SECTION E. SITE ASSESSMENT

Note: The Department of Ecology Water Resources Section can be consulted for identifying wells within one mile of your site. The local library and local city or county planning offices may be helpful in providing the information required in this section.

1. Give the legal description of the land treatment/application site(s) by section/township/range and latitude/longitude (approximate center of the site; NAD83/WGS84 reference datum). Indicate the owner for each site. Give the acreage of each land treatment/application site(s). Attach a copy of the contract(s) authorizing use of(s) used land for treatment/application. *(Label as attachment E.1)*

2. If this is a new discharge, list all environmental control permits or approvals needed for this project; for example, SEPA review, engineering reports, hydrogeologic reports, , biosolids permits, or air emissions permits.

3. Attach an original United States Geological Survey (USGS) 7.5 minute topographic map or aerial photograph that shows the POTW and the land treatment/application site(s).
   USGS topographical maps are available from the Department of Natural Resources (360-902-1234), Metsker Maps (206-588-5222), and some local bookstores and internet sites.
   Show the following on this map: *(Label as attachment E.3.)*

   a. Location and name of internal and adjacent streets.
   b. Surface water drainage systems within ¼ mile of the site.
   c. All wells within 1 mile of the site.
   d. Wastewater discharge points.
   e. Land uses and zoning adjacent to the wastewater application site.
   f. Ground water gradient.

4. Describe the soils on the site using information from local soil survey reports. **Soils information is available from your county conservation district or from information contained in the sites hydrogeologic report.**.
   (Label as attachment E.4.)

5. Describe the local geology and hydrogeology within one mile of the site. Include any ground water quality data. **The local library, the sites hydrogeologic report, or soil conservation service may have this information**.
   (Label as attachment E.5.)

6. List the names and addresses of contractors or consultants who provided information, and cite sources of information by title and author.

SECTION F. SLUDGE/BIOSOLIDS MANAGEMENT AND DISPOSAL

1. If your wastewater treatment is by lagoon:

   Has the depth of the sludge been measured in the last five years?

   ☐ YES ☐ NO (IF yes, include the measurements and a map that shows the approximate measurement sites)

   Will sludge be removed from the lagoon(s) in the next five years? If so, describe the sludge, stabilization, utilization, and disposal methods. Attach extra sheets as necessary.

2. If your wastewater treatment is by methods other than lagoon:

   Do you have a Sludge Management Plan? ☐ YES ☐ NO

   Is the Plan approved by:

   ☐ Local health district? Date approved:

   ☐ Department of Ecology? Date approved:

3. Does your facility have a biosolids permit issued by Ecology? If so, please provide the permit's number and expiration date.

   Biosolids Permit number Permit expiration Date

Summary of Attachments That May be Required for This Application:
(Please check attachments that are included)

- ☐ B.5 Schematic drawing of POTW
- ☐ C.4 Flow records
- ☐ C.6 Additional effluent analysis
- ☐ D. Additional ground water data
- ☐ E.1 Copies of contracts authorizing use of land for treatment
- ☐ E.3 USGS topographic map
- ☐ E.4 Soil information
- ☐ E.5 Local geology and hydrogeology

If you need this document in a format for the visually impaired, call the Water Quality Program at 360-407-6600. Persons with hearing loss can call 711 for Washington Relay Service. Persons with a speech disability can call 877-833-6341.

APPENDIX G
Alternative Life-Cycle Opinion of Probable Cost and Ranking

Alternative	Description	20-Yr Present Worth	Life-Cycle Cost Rank
B	Land Treatment System	$ 4,800,000.00	1
C	Class B Reclamation System	$ 5,400,000.00	2
A	Repair Existing System	$ 6,700,000.00	3
D	Connect to Existing Sanitary Sewer System	$ 7,450,000.00	4

Opinion of Probable Cost
Tyson Fresh Meats, Inc. Pasco Beef Complex
Domestic Wastewater System Improvement Alternatives
ALTERNATIVE A: REPAIR EXISTING SYSTEM

SCOPE	DESCRIPTION	SIZE/CAPACITY	ESTIMATED COST	SYSTEM COST ESTIMATE
Septic Tank/Pump Chamber Improvements	Effluent Screens and Access Vaults	32,000 gpd (four 8,000 gpd filters per septic tank)	$15,000	
	Effluent Pumps and Supports	Two 1,000 gpm	$15,000	
	Electrical and Controls		$15,000	
	Shut Off Valve and vault		$5,000	
	Pump Septic Tanks		$20,000	
				$70,000
Drainfield Replacement	Four Pressurized Drainfield Beds	28,000 gpd	$1,000,000	
	Automatic Valves	Four 8-inch	$50,000	
				$1,050,000
Nitrate Treatment System	Nitrate Treatment System	28,000 gpd	$550,000	
	Construction Costs		$150,000	
	Additional Septic Tanks	48,000 gallons	$150,000	
				$850,000
			Subtotal	**$1,970,000**
			Mobilization/Demobilization	**$100,000**
			Sales Tax (8.3%)	**$180,000**
			Subtotal	**$2,250,000**
			Permitting (15%)	**$350,000**
			Contingency (30%)	**$680,000**
			Administrative, Legal, and Engineering (20%)	**$420,000**
			TOTAL CONSTRUCTION OPINION OF PROBABLE COST	**$3,700,000**

PRESENT WORTH ANALYSIS (2019 DOLLARS)

Item	Description		Annual Cost
ANNUAL OPERATION, MAINTENANCE (O&M)			
1	Operator Wage and Fringe	$	100,000.00
2	Semi-Annual Septic Tank Pumping	$	50,000.00
3	Dept. of Health Operating Permit	$	10,000.00
4	Electricity	$	20,000.00
5	Replacement Parts	$	5,000.00
6	Consumable Materials and Testing	$	25,000.00
	Total Annual O&M	$	210,000
	Present Worth O&M (3.5%, 20 years)		3,000,000
	20-Year O&M Total		3,000,000
	PRESENT WORTH COST (2019 DOLLARS)	**$**	**6,700,000**

Opinion of Probable Cost
Tyson Fresh Meats, Inc. Pasco Beef Complex
Domestic Wastewater System Improvement Alternatives
ALTERNATIVE B: LAND TREATMENT SYSTEM

SCOPE	DESCRIPTION	SIZE/CAPACITY	ESTIMATED COST	SYSTEM COST ESTIMATE
Lift Station	Precast Concrete	28,000 gpd	$100,000	
	Pumps, Controls, and Electrical		70,000	
				$170,000
Lagoons	Treatment Lagoon Earthwork and Liner		$200,000	
	Storage Lagoon Earthwork and Liner		500,000	
	Piping		50,000	
	Control Building		150,000	
				$900,000
Miscellaneous	Yard Piping		$50,000	
	Site Work		75,000	
	Electrical and Lighting		50,000	
				$175,000
			Subtotal	**$1,070,000**
			Mobilization/Demobilization	**$100,000**
			Sales Tax (8.3%)	**$100,000**
			Subtotal	**$1,270,000**
			Permitting (15%)	**$200,000**
			Contingency (30%)	**$390,000**
			Administrative, Legal, and Engineering (20%)	**$240,000**
			TOTAL CONSTRUCTION OPINION OF PROBABLE COST	**$2,100,000**

PRESENT WORTH ANALYSIS (2019 DOLLARS)

Item	Description		Annual Cost
ANNUAL OPERATION AND MAINTENANCE (O&M)			
1	Operator Wage and Fringe	$	100,000.00
2	Ecology Permit	$	15,000.00
3	Crop Management Plan	$	20,000.00
4	Electricity	$	35,000.00
5	Replacement Parts	$	7,500.00
6	Consumable Materials and Testing	$	5,000.00
	Total Annual O&M	$	182,500
	Present Worth O&M (3.5%, 20 years)	$	2,600,000
	Lagoon Sludge Dredging (1x every 20 years)		100,000
	20-Year O&M Total		2,700,000
	PRESENT WORTH COST (2019 DOLLARS)	**$**	**4,800,000**

Opinion of Probable Cost
Tyson Fresh Meats, Inc. Pasco Beef Complex
Domestic Wastewater System Improvement Alternatives
ALTERNATIVE C: CLASS B RECLAMATION

SCOPE	DESCRIPTION	SIZE/CAPACITY	ESTIMATED COST	SYSTEM COST ESTIMATE
Septic Tank/Pump Chamber Improvements	Effluent Screens and Access Vaults	32,000 gpd (four 8,000 gpd filters per septic tank)	$15,000	
	Effluent Pumps and Supports	Two 1,000 gpm	$15,000	
	Electrical and Controls		$15,000	
	Shut Off Valve and vault		$5,000	
	Pump Septic Tanks		$20,000	
				$70,000
Treatment System	Membrane Bioreactor	28,000 gpd	$1,000,000	
	Controls		50,000	
	Electrical		80,000	
				$1,130,000
Misc	Site Work		$100,000	
				$100,000
			Subtotal	**$1,300,000**
			Mobilization/Demobilization	**$70,000**
			Sales Tax (8.3%)	**$120,000**
			Subtotal	**$1,490,000**
			Permitting (15%)	**$230,000**
			Contingency (30%)	**$450,000**
			Administrative, Legal, and Engineering (20%)	**$280,000**
			TOTAL CONSTRUCTION OPINION OF PROBABLE COST	**$2,450,000**

PRESENT WORTH ANALYSIS (2017 DOLLARS)

Item	Description		Annual Cost
ANNUAL OPERATION, MAINTENANCE, AND REPLACEMENT (OM&R)			
1	Operator Wage and Fringe	$	100,000.00
2	Semi-Annual Septic Tank Pumping	$	50,000.00
3	Ecology Permit	$	10,000.00
4	Electricity	$	12,000.00
5	Replacement Parts	$	5,000.00
6	Consumable Materials and Testing	$	30,000.00
	Total Annual OM&R	$	207,000
	Present Worth OM&R (3.5%, 20 years)		2,950,000
	PRESENT WORTH COST (2017 DOLLARS)	**$**	**5,400,000**

Opinion of Probable Cost
Tyson Fresh Meats, Inc. Pasco Beef Complex
Domestic Wastewater System Improvement Alternatives
ALTERNATIVE D: CONNECT TO EXISTING SANITARY SEWER SYSTEM

SCOPE	DESCRIPTION	SIZE/CAPACITY	ESTIMATED COST	SYSTEM COST ESTIMATE
Lift Station	Precast Concrete	28,000 gpd	$250,000	
	Pumps, Controls, and Electrical		100,000	
				$350,000
Pressure Sewer	6-inch HDPE Pressure Sewer	64,000 ft	$3,200,000	
	Railroad Crossing		30,000	
	State Highway Crossing		60,000	
	Connection to Existing System		15,000	
	Miscellanous Appurtenances		25,000	
				$3,330,000
			Subtotal	**$3,680,000**
			Mobilization/Demobilization	**$200,000**
			Sales Tax (8.3%)	**$330,000**
			Subtotal	**$4,210,000**
			Permitting (15%)	**$640,000**
			Contingency (30%)	**$1,270,000**
			Administrative, Legal, and Engineering (20%)	**$780,000**
			TOTAL CONSTRUCTION OPINION OF PROBABLE COST	**$6,900,000**

PRESENT WORTH ANALYSIS (2017 DOLLARS)

Item	Description		Annual Cost
ANNUAL OPERATION, MAINTENANCE, AND REPLACEMENT (OM&R)			
1	Sewer Fees	$	16,000.00
2	Electricity	$	12,500.00
3	Replacement Parts	$	5,000.00
4	Consumable Materials and Testing	$	5,000.00
	Total Annual OM&R	$	38,500
	Present Worth OM&R (3.5%, 20 years)		550,000
	PRESENT WORTH COST (2017 DOLLARS)	**$**	**7,450,000**

APPENDIX H
Cell No. 1 Partial-Mix Aerated Lagoon Kinetic Design Model

Cell No. 1 Partial-Mix Aerated Lagoon Kinetic Design Model

Summary

BOD Effluent Goal	30	mg/L, summer		
	45	mg/L, winter		
Design BOD Influent	200	mg/L		
BOD Effluent	22.0	mg/L, ADF summer	89%	Removal
	35.5	mg/L, ADF winter	82%	Removal
Oxygen Requirement	5.3	lbs O2/hr, ADF		
	12.2	lbs O2/hr, MDF		

Given

Q (ADF) =	0.026	MGD =	98.42	m3/d		
Q (MDF) =	0.060	MGD =	227.12	m3/d		
Co =	200	mg/L =	0.2	kg/m3 =	139	lbs/d
Organic Loading =	43.37	lbs/day (ADF)				
	100.08	lbs/day (MDF)				
k20 =	0.28	d				
Ta,winter =	2	deg C				
Ta,summer =	22	deg C				
Site Elevation =	500	ft =	152.40	m		
Depth =	12	ft =	3.66	m		
Minimum DO =	2	mg/L				
Length-Width Ratio =	3					
Side Slope (H:V) =	3	:1				
Surface Area	16,544	sf =	1536.99	m^2		

Series Operation

Q =	98.42	m3/d (ADF)				
	227.12	m3/d (MDF)				
n =	1					
Assume Ti,winter =	12	deg C				
Assume Ti,summer =	14	deg C				
HRT in Cell 1 =	10.00	days				
Minimum Volume =	2271.25	m3 =	600,000	gallons =	0.60	MG
Design HRT =	28.95	days (ADF)				
	12.55	days (MDF)				
Design Volume =	752,787	gallons =	0.75	MG		
Surface Area	16,544	sf =	1536.99	m		
f =	0.5					
Tw, winter =	4.3	deg C				
Tw, summer =	20.2	deg C				
kwinter =	0.16	/day				
ksummer =	0.28	/day				

ADF Results

Ce1(ADF), winter =	35.5	mg/L BOD	82%	Removal
Ce1(ADF), summer =	22.0	mg/L BOD	89%	Removal

MDF Results

Ce1(MDF), winter =	66.5	mg/L BOD	67%	Removal
Ce1(MDF), summer =	52.6	mg/L BOD	74%	Removal

Oxygen Requirements

Series Operation

Tw,1 winter =	4.3	deg C
Tw,1 summer =	20.2	deg C

Organic Load, ADF = Co * Q,ADF = 200 mg/L BOD 0.026 MGD = 43.37 lbs/day

Organic Load, MDF = Co * Q,MDF = 200 mg/L BOD 0.06 MGD = 100.08 lbs/day

N,ADF = OL * 2 = 86.74 lbs O2/day = 3.6 lbs O2/hr

N,MDF = OL * 2 = 200.16 lbs O2/day = 8.3 lbs O2/hr

Equation 3-9 is used to estimate O_2 transfer rates.

$$N = \frac{N_a}{\alpha\left[\frac{(C_{sw} - C_L)}{C_s}\right](1.025)^{(T_w - 20)}} \quad (3\text{-}9)$$

N = equivalent O_2 transfer to tap water at standard conditions, kg/hr
N_a = O_2 required to treat the wastewater, kg/hr (usually taken as 1.5 x the organic loading entering the cell)
a = (O_2 transfer in wastewater)/(O_2 transfer in tap water) = 0.9
C_L = minimum DO concentration to be maintained in the wastewater, assume 2 mg/L
C_s = O_2 saturation value of tap water at 20 °C and one atmosphere pressure = 9.17 mg/L
T_w = wastewater temperature, °C
C_{sw} = β(C_{ss})P = O_2 saturation value of the waste, mg/L
β = (wastewater saturation value)/(tap water O_2 saturation value)
C_{ss} = tap water O_2 saturation value at temperature T_w
P = ratio of barometric pressure at the pond site to barometric pressure at sea level, assume 1.0 for an elevation of 100 m

https://www.epa.gov/sites/production/files/2014-09/documents/lagoon-pond-treatment-2011.pdf Page 3-

Tw (summer) =	20.2	deg C =	68.36	deg F
C_L =	2	mg/L	https://pentairaes.com/oxygen-calculator	
Cs =	9.17			
α =	0.90			
β =	1.00			
Site Elevation	500			
Psite =	14.44	psi	https://www.mide.com/air-pressure-at-altitude-calculator	
Psl =	14.7	psi		
P = Psite/Psl=		0.98		
Css =	8.92		https://pentairaes.com/oxygen-calculator	
θ =	1.06			
Na/N =	0.68			
N,ADF =	127.4	lbs O2/day =	5.3	lbs O2/hr, ADF
N,MDF =	293.90	lbs O2/day =	12.2	lbs O2/hr, MDF

APPENDIX I
Land Treatment System Evaluation by Cascade Earth Sciences, Ltd.

Synergy of Water and Science™

Land Treatment System Evaluation

Pasco Beef Complex Domestic Wastewater System

Tyson Fresh Meats, Inc.
Pasco, Washington

12720 E Nora Avenue, Suite A
Spokane Valley, Washington 99216
Ph. (509) 921-0290
Fax (509) 921-1788
cascade-earth.com

Engineering Report Addendum
Pasco Beef Complex Domestic Wastewater System
Tyson Fresh Meats, Inc. – Pasco, Washington

Prepared For:	Tyson Fresh Meats, Inc. P.O. Box 4239 Pasco, Washington 99302
Prepared By:	Cascade Earth Sciences 12720 E Nora Avenue, Suite A Spokane Valley, Washington 99216 (509) 921-0290
Author(s):	David Sullivan, CCA, Staff Soil Scientist Douglas R. Wanta, LHG, Senior Geologist
Reviewed By:	Steve L. Venner, CCA, Managing Soil Scientist Daniel J. Burgard, CPSS, Principal Soil Scientist
Report Date:	October 26, 2020
Project Number:	2020210038
Submitted By:	Steven L. Venner, CCA, Managing Soil Scientist

Engineering Report Addendum
Pasco Beef Complex Domestic Wastewater System
Tyson Fresh Meats, Inc. – Pasco, Washington

This report, sealed by a Professional Engineer registered in the State of Washington and a certified Professional Soil Scientist, contains information and data developed by a team of professionals including soil scientists, geologists, engineers, testing laboratories, and other professionals. This report does not contain design plans and specifications.

Submitted By:

Exp. 8-30-21

Douglas R. Wanta

Douglas R. Wanta, LHG, Senior Geologist

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CONTENTS (continued)

TABLES

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FIGURES

CHARTS

APPENDICES

1.0 PURPOSE

The purpose of this Engineering Report Addendum B is to describe the proposed domestic wastewater land treatment site including: site considerations, climate, geology, hydrogeology, soils, and design considerations for land treatment. This Engineering Report is to support the application for a State Waste Discharge Permit by describing how Tyson Fresh Meats, Inc. (Tyson) will manage the domestic wastewater in a manner that maintains the highest quality of the state's groundwater and protects existing and future beneficial groundwater uses. This report does not provide detailed final design drawings for construction of improvements, but rather describes the design considerations, features, and parameters to meet the stated objectives.

1.1 Domestic Wastewater Land Treatment System Description

The domestic wastewater land treatment system would consist of constructing a new 30,000 gallons per day (gpd)-rated headworks and lift station, modifying the alignment of the existing transport pipe, disinfection using gas chlorination, constructing an aerated treatment lagoon, a winter storage lagoon, a new pump station, and a pipeline approximately 2,000 feet long to the 18-acre land treatment site. See Figure 4-2 for a conceptual layout of the proposed domestic wastewater land treatment system. All domestic wastewater generated by the Facility will continue to be handled in a dedicated drainage and piping system separate from the process wastewater system. Domestic wastewater will only be discharged to the Field 11 land treatment site.

1.1.1 Flow measurement

Irrigation flow to the land treatment site will be monitored prior to the chlorine contact pipe near the disinfection building. The irrigation flows will be used with domestic wastewater and supplemental fresh water constituent concentrations, respectively, to determine land treatment site constituent loads and water balance.

1.1.2 Land Treatment Site

The land treatment site consists of one existing center-pivot irrigated agricultural field, Field 11, encompassing 18 acres. The field is located about 0.15 miles northeast of the Facility in Section 26 of Township 8 North, Range 31 East of the Willamette Meridian (Figures 1-1 and 4-2, and Table 1). The land treatment site is bounded on the north and east by Tyson process wastewater storage lagoons, on the west by agricultural fields, and on the south by Dodd road and feedlots. The Columbia River is located approximately 2 miles to the west of the land treatment site.

1.1.3 Setback and Mitigation Measures

The standard recommended Washington Department of Health setback distance for disinfected wastewater is 100 feet, although setbacks may be reduced by mitigation measures approved by review agencies (Washington State Department of Health, 1994). The southern edge of the center pivot spray irrigated area will be approximately 83 feet from the edge of Dodd Road. Mitigation measures are used when an existing or proposed land treatment site cannot meet the design elements or site characteristics needed for public health protection. The intent of mitigation measures is to limit aerosol exposure or potential contact with the wastewater (Washington State Department of Health, 1994). Two mitigation measures will be incorporated into the irrigation system design to limit aerosol exposure. The center pivot unit will be equipped with a low elevation sprinkler application system so that irrigation has a lowered potential of wind drift. In addition, low drift nozzles will be installed to limit the generation of aerosols as well as direct irrigation in a more downward trajectory. Only low trajectory irrigation will be used at the site and the center pivot end gun will not be operated.

1.2 Source Water

Fresh water is supplied to the Facility from a collector station on the Columbia River and through the Port of Walla Walla. This fresh water is used to operate the domestic wastewater system. The LeGrow Irrigation Project provides fresh water from the Columbia River to the land treatment site. The LeGrow Irrigation Project does not provide fresh water to the Facility or the domestic wastewater system.

1.3 Stormwater

Stormwater discharge from the Facility infiltrates into the surrounding ground surface or is directed into the process water land treatment system. Stormwater will not be directed to the domestic wastewater system. The stormwater systems at the Tyson facility are designed to divert stormwater away from materials storage areas to avoid contamination. A Stormwater Pollution Prevention Plan, updated August 2015, is located on file at the Facility.

1.4 Solids Handling

The septic tank will be routinely pumped by a private contractor to remove accumulated solids, as needed. The removed septage will continue to be disposed of by the contractor according to applicable rules and regulations.

2.0 SITE AND USE CONSIDERATIONS

This section provides a review of the various considerations for the proposed land treatment site. The land treatment site will consist of field 11, which is located at the southern edge of the West Parcel of Tyson's process wastewater land treatment system (Figures 1 and 2).

2.1 Climate

Climate conditions including air temperature, precipitation, and crop evapotranspiration (ET) are important considerations of a land treatment site. Precipitation and ET rates are important for irrigation scheduling and determining hydraulic capacity as used in the crop water balances discussed later.

The Facility and land treatment site are located in southeastern Washington state about 9.5 miles north of the Oregon border, 2 miles northeast of the Columbia River, and 3.5 miles north of Wallula, Washington. The Wallula area is within the rain shadow of the Cascade Mountains and, as a result, is relatively dry. The climate of Walla Walla County has characteristics of both continental and marine climate types due to influences from the Pacific Ocean and Cascade Mountains to the west. The summers are dry and hot, but the winters are relatively mild compared to areas east of the Rocky Mountains at a similar latitude.

The average monthly and annual precipitation recorded at the U.S. Bureau of Reclamation AgriMet Legrow, Washington weather station (Bureau of Reclamation, n.d.) are shown in Table 2. The Legrow weather station is the nearest public weather station and is located at an elevation of 508 feet above mean sea level (ft amsl), about 4.6 miles north west of Field 11. The long-term (20-year) average annual precipitation for Legrow is 8.52 inches (1995-2014, Table 2). The annual precipitation with a

10-year return frequency (precipitation with a probability of recurring every 10 years) is 12.59 inches and has been derived from the second highest precipitation year in the last 20 years of recorded data (Table 2 and Appendix A). The 10-year return frequency total annual precipitation has been normalized by month in this report, for planning purposes, to create monthly rainfall totals in proportion to the average monthly rainfall of the most recent 20 years.

2.2 Topography and Surface Hydrology

The land treatment site is located in an area that ranges from nearly level to gently sloping. The elevation ranges from about 490 ft above mean sea level (amsl) along the east edge of Field 11 to about 460 ft amsl along the western edge of the field and generally slopes to the west and south. The distance between the highest and lowest points of Field 11 is about 1,350 feet with an average slope of 3%. Runoff from the land treatment site is not generally expected due to the high permeability of the soils. However, if runoff were to occur it would generally follow the surface relief to the west toward the Columbia River.

2.3 Soil Characterization

The land treatment site was included in the original Soil Survey of Walla Walla County, Washington (Soil Survey Staff, Natural Resources Conservation Service, 1967) and is currently shown in the U.S. Department of Agriculture Natural Resources Conservation Service (NRCS) Web Soil Survey (Appendix B; Soil Survey Staff, Natural Resources Conservation Service, n.d.). Two soil map units are identified across the land treatment site (Tables 3 and 4 and Appendix B). The soils consist of eolian deposits, colluvium, and reworked eolian sands, some of which occur over lacustrine deposits and basalt. The soil textures at the surface are predominately loamy fine sands and fine sand. The hazard for wind erosion is high for all the soils mapped on the site and crop management practices must limit the time during crop rotations between tillage operations and establishment of the next crop.

The map units and key characteristics are summarized below. Details are provided in Tables 3 and 4, and Appendix B.

- Map Unit Qd –Quincy-Duneland complex (approximately 19% of the irrigated area). This map unit consists of blowouts, small dunes, and areas of significantly eroded Quincy soils. The areas mapped within this site have been stabilized and successfully cultivated with irrigation.
- Map Unit QmB2 – Quincy loamy fine sand, moderately deep over coarse sand, 0 to 8% slopes, eroded (approximately 81% of the irrigated area). This map unit consists of Quincy soils that are underlain by a thick layer of dark, coarse basaltic sand below a depth of 3 to 4 feet. The abrupt textural change has the potential to increase the amount of water held in the loamy fine sand above the layer of coarse sand.

These soils are commonly managed for the production of a wide variety of irrigated commercial crops, including various grasses (primarily for hay), alfalfa, wheat and other grains, potatoes, peas, and corn. The crops selected for the proposed domestic wastewater land treatment system will consist of non-food crops such as alfalfa and grass hay. Cropping is discussed in section 5.3.

2.3.1 Water Holding Capacity

Total soil water holding capacity (field capacity) is the water content of the soil after the drainage of excess water, by gravity, has ceased. In other words, field capacity is the amount of water the soil can hold. Available soil water holding capacity is the amount of water available to plants between field capacity and the permanent wilting point. At permanent wilting point, any remaining water in the soil is held too tightly to be available to most plants.

The field capacity of each soil profile is shown for each soil map unit in Table 3. Field capacity ranges from 6.04 inches (soil map unit QmB2) to 7.46 inches (soil map unit Qd). Available water content ranges from 5.05 inches (soil map unit QmB2) to 5.93 inches (soil map unit Qd). These soil water holding capacity values will be used as the basis to compute the field-specific soil water hydraulic budget. The acreage of each soil type within the field, as measured using the Web Soil Survey, was used in conjunction with the soil water holding capacity values published in the Web Soil Survey to estimate the average soil profile water capacity characteristics for the field (Table 4).

Average field capacity and available water holding capacity is 6.31 and 5.21 inches, respectively (Table 4). These values will be used in the soil water hydraulic budgets to help determine the hydraulic capacity of the land treatment site for precipitation, domestic wastewater, and supplemental fresh water irrigation.

2.3.2 Expected Infiltration Rates and Permeability

The soils found at the land treatment site are described as being excessively drained. The saturated hydraulic conductivity of the most limiting soil horizon for each soil (surface) ranges is high (13.0 inches per hour) and is not considered design limiting (Soil Survey Staff, Natural Resources Conservation Service, n.d.). The risk of erosion by water is low.

2.3.3 Soil Fertility

Soil fertility is important in maintaining soil and crop-growth conditions favorable for land treatment system use and uptake (treatment) of the domestic water hydraulic and nutrient loadings. The information presented is based on the soil conditions in 2018 (Table 5).

The Oregon State University Extension Service has published a Soil Test Interpretation Guide (Horneck, Sullivan, Owen, & Hart, 2011) that provides a consistent reference for evaluating soil test results and guiding general fertility recommendations in Oregon and Washington. This document was used to evaluate the soil test results presented in the following paragraphs.

Soil pH is important to soil nutrient availability and crop growth. Soil pH during the fall of 2018 ranged was 7.2 in the top one-foot of soil. Soils with a pH of 7.2 is considered in an ideal range soil nutrient availability and crop growth. The exchangeable sodium percentage (ESP) in the fall of 2018 was low at all depth intervals. When ESP values are greater than 10%, water infiltration in soils could decrease substantially, particularly where soils are high in shrink-swell clays. However, this threshold value will vary for different soil conditions and is dependent on other soil properties such as EC and soil texture (clay type and content). Since these soils typically have very low clay content, and all ESP values below 2%, soil ESP is not a limiting concern for water infiltration and drainage at the land treatment site.

Soil organic matter (OM) is important in soil chemical reactions, structural stability, and soil-water relations. Maintaining or increasing soil OM is beneficial in sandy soils, such as those found at the land treatment site. The land treatment site OM levels are at or within the published ranges for these soils. Soil OM in the surface one-foot of soil at the land treatment site was 0.67% in the fall of 2018.

Test results indicate that available soil nitrogen is present at varying concentrations with depth. The soil ammonium-nitrogen (NH_4-N) plus nitrate-nitrogen (available soil nitrogen) ranged from 5.0 to milligrams per kilogram (mg/kg) in the top one-foot of soil. The NH_4-N concentration ranged from 2.1 mg/kg in the top foot of soil to 0.8 mg/kg at the fourth foot depth interval. Concentrations of NH_4-N between 2 and 10 mg/kg are considered typical. Concentrations of TKN correspond to the much less available, organic form of nitrogen. The TKN concentrations along with soil OM represents a sink for nitrogen storage over time. Extractable potassium concentrations in the surface foot measured 64 mg/kg. Concentrations less than 150 mg/kg are considered low. Field 11 could benefit from potassium fertilization. For the secondary nutrients, magnesium concentrations in the top foot are medium, sulfate-sulfur concentrations are low, and calcium concentrations are considered adequate.

Monitoring soil salinity is important for maintaining soil productivity and structure. Soil salinity is commonly determined as the electrical conductivity of the soil saturation paste extract (ECe). A soil ECe of 2 to 4 millimhos per centimeter (mmhos/cm) can result in reduction in the yields of sensitive crops (Bohn, McNeal, & O'Connor, 1979). Soil salinity can also be measured by the electrical conductivity of a 1:1 soil to water ratio ($EC_{1:1}$). For these land treatment site soils, values less than 1.2 millimhos per centimeter (mmhos/cm) are considered low and suitable for the production of crops (Smith, J.L., J.W. Doran, 1996). For the soils identified at this land treatment site, $EC_{1:1}$ values above 1.3 have the potential of restricting alfalfa seed germination and reducing yield (Smith, J.L., J.W. Doran, 1996; Bohn, McNeal, & O'Connor, 1979) The $EC_{1:1}$ in the surface one-foot of Field 11 during the fall of 2018 was 0.18 mmhos/cm, with lower values occurring at all other depths. Soil salinity is not a limiting concern for crop growth at the land treatment site. Since soluble salts by their nature move with water, $EC_{1:1}$ values can fluctuate rather quickly in response to variables such as irrigation water quality and movement of water within the soil, and should monitored annually.

2.3.4 Summary

According to this soil characterization analysis, the soils at the land treatment site are suitable for receiving the domestic wastewater for land treatment purposes. Irrigation management practices, including soil moisture monitoring and irrigation scheduling, are important considerations for these soils with relatively low water holding capacities across the land treatment site. Irrigation amount (i.e., depth of water applied per irrigation pass) should be managed to supply enough irrigation to meet the crop water use requirements, avoid runoff, and limit deep percolation to the estimated leaching requirement to maintain soluble salts at acceptable levels in the roots zone.

3.0 GEOLOGY AND HYDROGEOLOGY

The land treatment site lies within the Columbia Plateau physiographic province. The Columbia Plateau comprises a series of flood basalts that cover most of eastern Washington, northeastern Oregon, and western Idaho occupying approximately 70,000 square miles. An intermountain area, the Columbia Plateau is bounded to the west by the Cascade Range, while the Okanogan Highlands form the northern boundary. The Rocky Mountains form the eastern boundary, with the Blue Mountains serving as the southern boundary (Lane & Whiteman, 1989).

The basalt flows of the Columbia River Basalt Group are Miocene in age, created 6 to 17 million years ago (mya). They form an extensive volcanic plateau (Alt & Hyndman, 1984). The thick sequence of basalt flows are overlain by sedimentary rock derived from sedimentary deposits from the ancestral floods that blanketed the Columbia Basin near the end of the most recent ice age (Schuster, 2005). Recent and smaller deposits of windblown loess as well as sand dunes mantle the higher slopes throughout the plateau. Alluvium and mass-wasting deposits are present near streams and river margins. Regional and local geology and hydrogeologic characteristics are summarized in the following sections.

3.1 Regional Geology

The land treatment site lies within the Yakima Fold Belt Subprovince near the juncture with the Palouse Subprovince to the east. The Yakima Fold Belt Subprovince is a series of anticlinal ridges and synclinal valleys to the south and west of Wallula, Washington that has predominantly an east-west structural trend in the south and a southeast to northwest trend in the west. The Palouse Subprovince shows little deformation with only a few faults and low amplitude long folds with a dip to the southwest (Drost & Whiteman, 1986). The dip of the altitude of the basalt surface is to the southwest up to 1% (Foundation Sciences, Inc., 1980). A regional geologic map is shown on Figure 1.

A sequence of Miocene age basalt flows of the Columbia River Basalt Group covers the region. The basalt flows are generally dark gray, fine-grained, and dense. The numerous basalt flows are subdivided into 4 formations, starting with oldest to youngest: Imnaha Basalt, Grande Ronde Basalt, Wanapum Basalt, and Saddle Mountains Basalt (Drost & Whiteman, 1986). All 4 of the formations are believed to be below or near the site. The basalts at the land treatment site dip (slope) gently to the southeast (Grolier & Bingham, 1978).

Sedimentary rocks of the Ellensburg Formation deposited between the Saddle Mountain Basalt and Wanapum Basalt inter-finger with the basalts of the plateau. The rocks of this formation consist of fluvial (stream) and lacustrine (lake) sediments and layers of volcaniclastic sediments (volcanic ash). The members of this formation interbedded with the basalts is not mapped below the land treatment site, but mapped to the north in the direction of the Snake River (Drost & Whiteman, 1986). The depth to the basalt below land surface is shallower to the south and east in the higher elevations.

The unconsolidated Pleistocene and Holocene fluvial, glaciofluvial, and volcaniclastic sediments make up the other major geologic unit of the plateau. The Ringold Formation is the oldest geologic layer overlying the basalt sequence (Schuster, J.E, C.W. Gulick, S.P. Reidel, K.R. Fecht, S. Zurenko, 1997) . The Ringold Formation is composed of weakly to moderately cemented silt and sand, with occasional conglomerate layers. This formation is present near Wallula near the Columbia River (Lane & Whiteman, 1989). These Ringold deposits presently occupy most of the land surface at the North Parcel. Windblown dune sand, which occurs throughout much of the Columbia Plateau, is present on higher ground near Wallula and occupies most of the land surface below the West Parcel. This dune sand generally does not yield water.

3.2 Local Geology

The local geology was evaluated using the *Hydrogeologic Study - East Irrigation IBP, Inc. Wallula, Washington* (URS, 2003) and the *Hydrogeologic Study and Irrigation Proposal - Tyson, Inc. Pasco, Washington* (URS, 2008) that include the land treatment site monitoring well information, published literature, and water well reports for wells within one-mile of the 3 existing land treatment site parcels (North, West, and East). The land treatment site monitoring well log details are summarized in Table 6, while copies of the monitoring well logs are located in Appendix C. The water well reports inventory summary is presented in Appendix D, while copies of the water well reports for wells within one-mile of the land treatment site are located in Appendix E and shown in Figure 2.

There are 6 geologic units previously mapped near or at the proposed land treatment site including, from youngest to oldest, dune sand (Qd), alluvium (Qa), fluvial gravel (Qfg), Saddle Mountain (Mv_{S}), Wanapum (Mv_{W}), and Grande Ronde (Mv_{g}) basalt units (Schuster, J.E, C.W. Gulick, S.P. Reidel, K.R. Fecht, S. Zurenko, 1997). Three of the youngest geologic units that are at the surface are shown on the local geologic map in Figure 1. The 3 basalt units are present at the land treatment site parcels, below the surficial units. Descriptions of these units are provided below.

<u>Dune Sand (Qd)</u> – Dune Sand (Quaternary Period – present to 2 mya) is an eolian deposit, medium to fine sand and silt; composed of quartz, basalt, and/or feldspar grains; volcanic ash, commonly Mazama tephra, present locally; includes both active and stabilized dunes. This unit is present at the site, primarily below the West Parcel.

<u>Alluvium (Qa)</u> - Silt, sand, and gravel on modern floodplains and alluvial fans: includes some older alluvial deposits that form narrow terraces adjacent to modern streams: locally includes loess, peat, lacustrine deposits, or volcanic ash. This unit is not mapped as being present at the land treatment site. The nearest deposit is adjacent to the major rivers (Columbia River, Snake River, and Walla Walla River) located to the west, north, and east of the land treatment site, respectively.

<u>Gravel (Qfg)</u> – Unconsolidated, poorly sorted fluvial gravel, ranging from boulders to fine sand, chiefly of rounded basalt fragments but locally containing clasts of granitic and metamorphic rocks, Ringold Formation sediments, and caliche. The gravel was deposited by glacial outburst floodwaters surging into the Quincy basin from the Grand Coulee and upper Crab Creek channels and includes components of glacial outwash derived from the Okanogan lobe of the Cordilleran ice sheet. The age of the deposit is Pleistocene Epoch of the Quaternary Period (2 mya). This unit is present at the site, primarily below the North Parcel.

<u>Saddle Mountain Basalt (Mv_{S})</u> - Basalt flows; predominately fine to medium grained, with some coarse grained and glassy parts; most phenocrysts consisting of plagioclase, and lesser amounts of olivine phenocrysts and microphenocrysts; commonly includes undivided sedimentary interbeds and undivided flow invasive into sedimentary interbeds. The diverse basalt flows are Middle to Upper Miocene Epoch of the Tertiary Period flows that erupted between 13.5 and 6 mya. The top of this unit is mapped as present at depth ranging from ~2 to 234 feet below ground surface (ft bgs) in the vicinity of the land treatment site (Department of Ecology, 2015) and outcrops to the north along the Snake River and to the south along the Walla Walla River (not shown). The base of this unit is estimated to extend to 550 to 950 ft bgs.

Wanapum Basalt (Mv_w) - Basalt flows; fine to coarse grained; microphenocrysts, phenocrysts, and glomerocrysts consisting variously of plagioclase, olivine, or rarely, augite; commonly includes undivided sedimentary interbeds and undivided flows invasive into sedimentary interbeds. The diverse basalt flows are Middle Miocene Epoch of the Tertiary Period flows that erupted between 15.6 and 13.5 mya. The top of this unit is mapped as present at depth ranging from ~550 to 950 ft bgs below the land treatment site and outcrops to the north along the Snake River and to the south along the Walla Walla River (not shown).

Grand Ronde Basalt (Mv_g) – At least 120 flows making up 87% of the Columbia River Basalt Group; generally aphyric and fine grained; groundmass contains plagioclase, augite, and pigeonite; plagioclase phenocrysts are sparse, microphenocrysts of orthopyroxene, pigeonite, and olivine are rare; altered glass locally constitutes as much as 75% of flow but is typically less than 50%. The unit is divided into 17 informal units on the basis of magnetic polarity, stratigraphic position, physical characteristics, and geochemistry. The basalt unit is Late Miocene Epoch of the Tertiary Period that erupted between 15.6 and 17 mya. The top of this unit is mapped as present at depth (ranging from ~1,550 to 1,950 ft bgs) below the land treatment site and outcrops along faulted areas in the higher elevations to the south (not shown).

3.3 Hydrogeology

Two groundwater systems are present in the region: a shallow localized unconfined aquifer in areas with high recharge from infiltration of irrigation water and precipitation or in areas adjacent to perennial bodies of surface water; and a deep, generally confined basalt aquifer. Based on registered water well reports (Department of Ecology, 2015) and groundwater monitoring at the land treatment site, an unconfined aquifer is present in the unconsolidated sediments and in the underlying basalt bedrock. A discussion of regional and local groundwater conditions is summarized below.

3.3.1 Regional Groundwater Conditions

As previously discussed, basalts of the Columbia River Basalt Group occur at depth beneath the land treatment site. Individual flows range from a few feet to as much as 300 feet thick, with total basalt thickness estimated at 10,000 feet or more near Pasco, Washington (Drost, Whiteman, & Gonthier, 1990). Typically, these flows exhibit a dense center with vertical jointing and a scoriaceous or brecciated zone at the top and bottom. The flow tops and bottoms are called interflow zones and are often highly transmissive as a result of the jointing, breccia, etc. (Bauer & Hansen, Jr, 2000). In addition, where sufficient time lapses occurred between individual eruptive events, sediments comprising eolian silt and sands and fluvial or glaciofluvial sands and gravels were deposited. These deposits are sometimes referred to as interbeds and range from a few feet to more than 200 feet in thickness. They create an important source of groundwater where they occur as aerially extensive deposits of sands and gravels. According to published reports (Bauer, Vaccaro, & Lane, 1985; Lane & Whiteman, 1989), groundwater within the Saddle Mountain, Wanapum, and Grande Ronde basalt units flows in a southwesterly direction in the vicinity of the land treatment site. Due to the generally confined nature of basalt aquifers, impacts from activities on land to this groundwater are much less of a risk compared to groundwater in unconfined deposits near land surface.

Prior to the implementation of irrigated agriculture in the area, groundwater primarily existed only in the basalt formations with relatively scarce resources present in the shallower sedimentary formations. Over the past 50 years, the Columbia Basin Irrigation Project (Williamson, et al., 1998) has dramatically changed the hydrogeology of the area. Water level records indicate that the depth to groundwater has risen tens to hundreds of feet within the unconsolidated sediments since the project was completed. Canal leakage and irrigation drainage from agricultural fields has recharged the aquifer (Whiteman, Vaccaro, Gonthier, & Bauer, 1994). In many drainages, shallow groundwater created by canal leakage flows down local topographic gradients and discharges into stream drainages. Irrigation water flows in canals generally from mid- to late-March through late-October, with some losses to seepage, which causes groundwater to rise and stream flows to increase. Groundwater elevations and stream flows decline after the canals are emptied and irrigation ceases.

Rising groundwater levels have saturated lower portions of sedimentary deposits that were formerly dry. Since these sedimentary deposits fill eroded depressions in the basalt surface, the saturated portions of the deposits may form long and narrow localized aquifers separated by uplifts in the basalt. Where the glaciofluvial sand and gravels are saturated, they form conductive zones that can transmit water to, or drain water from, areas of depression along the basalt's surface. In cases where basalt fracturing is present at the top of the basalt, water that drains into or from the depressions can be considered hydraulically connected with shallow basalt aquifer systems (Whiteman, Vaccaro, Gonthier, & Bauer, 1994).

3.3.2 Local Groundwater Conditions

Locally, groundwater is known to exist below the land treatment site in the unconsolidated sediments overlying the basalt and aquifers within the massive basalt flows based on the review of water well reports obtained from the Ecology (Department of Ecology, 2015). There were 80 registered water wells within one-mile of the North and West Parcels (Figure 2). The wells and key data are summarized in Appendix D, while copies of the logs containing other information are included in Appendix E.

3.3.3 Local Basalt Aquifer

Based on published data, groundwater is found in the Saddle Mountain, Wanapum, and Grande Ronde basalt aquifers near the land treatment site (Drost & Whiteman, 1986; Department of Ecology, 2015). Registered water well logs within 1-mile of the land treatment site indicate there are 21 wells completed in the basalt aquifer (Appendices B and C). Based on the estimated depths of the basalt formations below grade, the majority of the basalt wells (17) are completed in the Saddle Mountain basalt aquifer and a small number (3) may be completed deep enough to be in the Wanapum basalt aquifer. Groundwater within the deeper Saddle Mountain, Wanapum, and Grande Ronde basalt aquifers generally flows in a southwesterly direction in the vicinity of the land treatment site. Because groundwater in deep basalt formations is confined, the potential for impacts from land activities to the local basalt aquifer are considered very low when compared to the unconfined aquifer which is closer to land activities. A discussion on the local unconfined aquifer is presented below.

3.3.4 Local Unconfined Aquifer

Based on published data and previous hydrogeologic reports for the site, groundwater is found in the unconfined sediments (overburden) overlying the Saddle Mountain basalt below the West Parcel (Drost & Whiteman, 1986; Department of Ecology, 2015; URS, 2003; URS, 2008).

3.3.5 Hydrogeologic Parameters of Unconfined Aquifer

Details on hydrogeologic parameters of the unconfined aquifer at the West Parcel are described below. Per the requirement of WAC 173-200-080(4)(c) (Water Quality Standards for Groundwaters of the State of Washington, 173 WAC § 200, 1990), these parameters are provided to characterize the rate of contaminant movement in the aquifer and assess the area potentially impacted by the Tyson land treatment activities.

Depth to Groundwater

The depth to groundwater below the land treatment site was estimated by reviewing depth to water data from 2009 to 2015 (Appendix F). The depth to groundwater at the West Parcel ranges from 58 to 120 ft bgs, with an average of 94 ft bgs.

Saturated Thickness

Saturated thickness in an unconfined aquifer is the distance between the water table and the base of the aquifer. The base of the aquifer is the top of the basalt bedrock. The average depth to groundwater at the West Parcel is 94 ft bgs and the average depth to the basalt bedrock is 104 ft bgs, making the saturated thickness 10 feet.

Groundwater Flow

Groundwater flow is the movement of groundwater in the zone of saturation. Depth to water measurements in monitoring wells at the West Parcel (Figure 1) were subtracted from the elevations of the top of the wells to determine the elevation of groundwater and prepare flow maps for the 4 quarters starting from the second quarter of 2014 to the first quarter of 2015 (Figures 3-6).

Groundwater in the unconfined aquifer generally flows to the southwest at the West Parcel. Groundwater water flow gradient and direction do not appear to change appreciably during the seasons.

Seasonal Water Level Variations

Groundwater levels were reviewed in the monitoring wells at the West Parcel (Figures 3-6). Average quarterly elevation data from the first quarter of 2009 to the third quarter of 2019 (43 quarters) were reviewed to assess variations between quarters. Generally, average quarterly elevations do not indicate a seasonal pattern or vary more than a foot between quarters. All of the monitoring wells indicated a visual trend upward in water levels for that period of time (Chart 1). While all the monitoring wells indicated a visual trend upward, RZA-1 in the northeast corner indicated the greatest upward trend. Upward trends in water levels indicates an increase in recharge to the aquifer through natural precipitation or irrigation water.

Groundwater Recharge

The primary source of groundwater recharge is seepage from irrigation water with contributions from precipitation and seepage from the surface streams (Newcomb, R.C., 1965).

Hydraulic Gradient

The hydraulic gradient is the slope of a water table or potentiometric surface. The hydraulic gradient influences the direction and rate of groundwater flow and is generally expressed as feet of vertical drop per foot of horizontal distance (feet per foot). The average hydraulic gradient for the West Parcel is 0.020 feet per foot. The hydraulic gradient does not change much throughout the seasons (Figures 3-6).

Hydraulic Conductivity

Hydraulic conductivity is a measure of a rock's or sediment's ability to transmit water in a specified direction. Assuming that the hydraulic conductivity is uniform in all directions, the hydraulic conductivity was estimated for saturated lithologies described on the geologic logs of monitoring wells constructed at the West and North Parcels (Appendix C). Based on these data, the unconfined aquifer formation is generally described as silty sand to sand and fine gravel mixtures. The unconfined aquifer formation is estimated to have a hydraulic conductivity ranging from 0.05 feet per day (ft/day) for silty sand to 24 ft/day for sand and gravel mixtures (URS, 2008).

Specific Yield and Specific Retention

The specific yield is the fractional amount of water that would drain freely from rocks or sediments due to gravity. The volume of the groundwater that is retained either as a film on grains or in small pore spaces after drainage is called specific retention. Specific retention increases with decreasing grain sizes. The parameters are unitless. Based on the monitoring well logs for wells at the West Parcel (Appendix C), the grain sizes of sediments in the unconfined aquifer range from silty sand to sand and gravel mixtures. Specific yield for the silty sand is expected to average 0.18 and 0.25 for sand and gravel mixtures. Specific retention for the silty sand is estimated to be 0.02 and 0.06 for sand and gravel mixtures (Fetter, 1994).

Storage Coefficient or Storativity

The storage coefficient, or storativity, is the volume of water that a permeable unit will absorb or expel from storage per unit surface area per unit change in head, that quantity is dimensionless. As mentioned above, the aquifer at the West Parcel is unconfined. For an unconfined aquifer, the storativity is usually taken to be equal to the specific yield (Fetter, 1994). As mentioned previously, the specific yield (and storage coefficient) for the upper unconfined aquifer is estimated to range from 0.18 to 0.25 for the sediments.

Porosity

Porosity is the ratio of voids in a rock or sediment to the total volume of material. Total porosity of a porous medium is the ratio of the pore volume to the total volume of a representative sample of the medium. Effective porosity is the part of the pore volume that is available for fluid flow (Fetter, 1994). Effective porosity equals the sum of specific yield and specific retention of the aquifer material. The arithmetic mean effective porosity for silty sand is 0.20 and for sandy and gravel mixtures is 0.31 (McWorder, D.B. & D.K. Sunada, 1977).

Transmissivity

Transmissivity is a measure of the amount of water that can be transmitted horizontally through a unit width by the full saturated thickness of the aquifer under a hydraulic gradient of one (Fetter, 1994). The transmissivity for groundwater at the land treatment site is a product of the hydraulic conductivity and the saturated thickness of the aquifer and is expressed as gallons per day per foot.

Based on an estimated saturated aquifer thickness of 10 feet for the West Parcel and an average hydraulic conductivity ranging from 0.05 ft/day for silty sand to 24 ft/day for sand and gravel mixtures, transmissivity of the unconfined groundwater in the unconsolidated sediments could range from 0.50 to 240 gallons per day per foot for the West Parcel.

Calculated Groundwater Flow Velocity

The velocity of groundwater is a measurement of the rate of a volume of water through a cross sectional area of a porous medium. It provides a rough estimate of travel time for dissolved constituents to be transported through groundwater given no other variables (i.e., degradation, dispersion, etc.). For this study, groundwater velocity was calculated using Darcy's velocity equation. It is expressed as ft/day or feet per year.

$$v = (K \times i)/n,$$

where: K = hydraulic conductivity;
i = the horizontal hydraulic gradient; and
n = the effective porosity.

Using the values above for each of the parameters resulted in a velocity for the parcels ranging from 4.5×10^{-3} ft/day or 1.6 feet per year in the silty sand to 1.6 ft/day or 589 feet per year in the sand and gravel mixtures. The actual velocity for the site would likely be in the higher end of the range because, with the exception of the areas near wells NP-1, NP-2, and RZA-1, the sediments of the saturated zone are primarily sand and gravel mixtures. Based on the higher end of the range of velocity, it would take a minimum of 10 years for groundwater to travel the 5,782 feet from upgradient well RZA-1 to downgradient well MW-4 at the West Parcel

3.4 Groundwater Monitoring Network

The groundwater monitoring system is designed to identify impacts to groundwater quality from activities associated with operation of the land treatment site. The monitoring network provides hydrologic and water quality data at upgradient and downgradient locations in the uppermost alluvial groundwater system.

The proposed land treatment site is within the current groundwater monitoring network at the West Parcel and consists of 6 existing monitoring wells MW-1, MW-2, MW-4, RZA-1, RZA-2, and NP-1 (Figures 3-6).

The monitoring wells were constructed in five drilling events beginning in 1980 with the last one occurring in 2007. Monitoring wells MW-1, and MW-2 were constructed by Hatch Drilling Company in July 1980 and MW-4 was constructed by Ponderosa Drilling & Development, Inc. in October 1986 (Department of Ecology, 2015). Monitoring wells RZA-1 and RZA-2 were constructed in August 1992 under the oversight of RZA AGRA, Inc. (RZA-AGRA Engineering & Environmental Services, 1992).

All monitoring wells at the West Parcel were completed in the unconfined aquifer. Monitoring well construction data for the wells is shown on Table 6 and the logs are included in Appendix E. The location, purpose, and recommended use of each existing monitoring well are as follows:

Well	Location	Purpose of Monitoring Point
MW-1	Downgradient of West Parcel and Upgradient of Pond Area and Proposed Land Treatment Site.	Downgradient water quality for West Parcel and Background water quality for Pond Area and Proposed Land Treatment Site.
MW-2	Downgradient West Parcel and Pond Area; Cross Gradient of Proposed Land Treatment Site.	Downgradient water quality for West Parcel and Pond Area; Cross Gradient water quality for the Proposed Land Treatment Site.
MW-4	Downgradient of West Parcel and Cross Gradient of Pond Area and Proposed Land Treatment Site.	Downgradient water quality for West Parcel and Cross Gradient water quality for the Proposed Land Treatment Site.
RZA-1	Upgradient of West Parcel.	Upgradient/Background water quality for West Parcel.
RZA-2	Downgradient of West Parcel and Cross Gradient of Pond Area and Proposed Land Treatment Site.	Downgradient water quality for West Parcel and Cross Gradient water quality for the Pond Area and Proposed Land Treatment Site.

Based on the location of the proposed land treatment site, it lacks an adequate monitoring well downgradient of Field 11 to evaluate groundwater quality leaving the land treatment site (Figures 3-6). The discussion of groundwater quality in Section 4.5 below provides an overview of groundwater quality at the West Parcel that would provide some perspective of current upgradient and cross gradient conditions.

3.5 Groundwater Quality

Groundwater quality was evaluated using groundwater data collected from the West Parcel land treatment site monitoring wells. Quarterly groundwater samples are collected in March, June, September, and November on monitoring wells MW-1, MW-2, MW-4, RZA-1, and RZA-2. The samples are analyzed in accordance with Permit Special Condition S2.F (Department of Ecology, 2014). The groundwater quality is discussed below for each of the 3 Parcels.

A summary of the mean groundwater data from the most recent 4 quarters comprises the fourth quarter of 2018 through the third quarter of 2019 and is presented in Table 7 while individual data from the first quarter of 2009 to the third quarter of 2019 is shown in Appendix F. Charts 2-6 illustrate quarterly concentrations versus time for parameters of interest, NO_3 + NO_2-N, TDS, chloride, sodium, and sulfate, from the first quarter of 2009 through the third quarter of 2019 for the West Parcel. Visual observations of Charts 2-6 are summarized below with no confirmation from statistical analysis.

Well RZA-1 is the upgradient well that represents background groundwater quality. Monitoring wells MW-1, MW-2, MW-4, and RZA-2 are downgradient. All wells are completed in the unconfined aquifer. Average concentrations from the fourth quarter of 2018 through the third quarter of 2019 are shown on Table 7 with quarterly concentrations over time illustrated in Charts 2-6. Highlights and trends notes are as follows:

- Average nitrate at the West Parcel monitoring wells ranged from 12.8 to 41.6 mg/L. For the fourth quarter of 2018 through the third quarter of 2019, the combined average nitrate in downgradient wells MW-1, MW-2, MW-4, and RZA-2 was 30.2 mg/L, and is above the 19.2 mg/L in upgradient well RZA-1 (Table 7). Since 2009, nitrate concentrations in all downgradient wells indicate decreasing visual trend for nitrate, with the greatest decreases in MW-4 (Chart 2). Nitrate concentrations in upgradient well RZA-1 indicate a slight decreasing visual trend.
- Average TDS at the West Parcel monitoring wells ranged from 431 to 1,230 mg/L. For the fourth quarter of 2018 through the third quarter of 2019, the combined average TDS in downgradient wells MW-1, MW-2, MW-4, and RZA-2 was 970 mg/L, and is above the 431 mg/L in upgradient well RZA-1 (Table 7). Since 2009, TDS concentrations in all downgradient wells indicate a decreasing visual trend and TDS concentrations in upgradient well RZA-1 indicate slight decreasing visual trend (Chart 3).
- Average chloride at the West Parcel monitoring wells ranged from 33 to 238 mg/L. For the fourth quarter of 2018 through the third quarter of 2019, the combined average chloride in downgradient wells MW-1, MW-2, MW-4, and RZA-2 was 150 mg/L, and is above the 33 mg/L in upgradient well RZA-1 (Table 7) Since 2009, Chloride concentrations in all downgradient wells indicate a decreasing visual trend. Chloride concentrations in upgradient well RZA-1 indicate a slight decreasing visual trend (Chart 4).
- Average sodium at the West Parcel monitoring wells ranged from 18.5 to 123 mg/L. For the fourth quarter of 2018 through the third quarter of 2019, the combined average sodium in downgradient wells MW-1, MW-2, MW-4, and RZA-2 was 76.7 mg/L, and is above the 18.5 mg/L in upgradient well RZA-1 (Table 7). Sodium concentrations in all downgradient wells indicate a decreasing visual trend. Sodium concentrations in upgradient well RZA-1 indicate a slight decreasing visual trend (Chart 5).
- Average sulfate at the West Parcel monitoring wells ranged from 51 to 240 mg/L. For the fourth quarter of 2018 through the third quarter of 2019, the combined average sulfate in downgradient wells MW-1, MW-2, MW-4, and RZA-2 was 157 mg/L, and is above the 51 mg/L in upgradient well RZA-1 (Table 7). Since 2009, sulfate concentrations in MW-2, MW-4, and RZA-2 indicate an increasing visual trend, while sulfate in MW-1 indicates a decreasing visual trend. Sulfate concentrations in upgradient well RZA-1 indicate a slightly decreasing visual trend (Chart 6).

Overall, groundwater concentrations are higher in the downgradient wells on the West Parcel for nitrate, TDS, chloride, sodium, and sulfate. Decreasing visual trends were evident in all downgradient wells and the upgradient well for nitrate, TDS, chloride, sodium, and sulfate (only in MW-1 and RZA-1) indicating improvement in groundwater quality at the West Parcel. Increasing visual trends for sulfate concentration were evident for downgradient wells MW-2, MW-4, and RZA-2. As mentioned above, groundwater quality downgradient of the proposed land treatment Site cannot be not known with certainty until a well has been placed in the southwest direction from the field.

3.6 Beneficial Use of Groundwater

A survey of local water wells was conducted by CES to determine the use of groundwater and evaluate its beneficial use in the vicinity. Records of all registered water wells within a one-mile radius of the West and North Parcel boundaries were obtained from Ecology (Department of Ecology, 2015). For this survey, CES researched Sections 14-16, 21-28, 33-36, and Portions of 9-11, 13, 17, and 20 of Township 8 North, Range 31East of the Willamette Meridian. Appendix D summarizes the water well construction, location, selected hydrogeologic data, and ownership information used for this report.

Water well locations are shown on a vicinity topographic map (Figure 2). The water wells are assigned numbers for easier reference on Figure 2, in Appendix D, and on the well logs included in Appendix E. Wells that could be located to the quarter of a quarter-section are identified with a circle, wells located only to a quarter-section are indicated with a triangle, and wells only located to the section are shown with a square.

The survey identified 80 water wells in the search query. A breakdown of the distribution of wells by type is as follows:

Type of Well	Number of Wells	Percentage of Total
Test	30	38%
Geotechnical	20	25%
Domestic	11	14%
Irrigation	6	8%
Industrial	5	6%
Abandoned	5	6%
Domestic and Test	1	1%
Irrigation and Test	1	1%
Not Reported	1	1%
Total	**80**	**100%**

The majority of the wells are listed as test and geotechnical. “Test” means that the well is used for groundwater testing. Geotechnical were borings used for structural investigations and abandoned. Domestic means that the wells are used for drinking water, irrigation is used to water crops, industrial is used for industrial production purposes, but might also be used for drinking water, and abandoned means that the well was sealed off and is no longer used to draw water. There are 21 wells completed in basalt aquifers and 48 wells completed in the unconfined aquifer, and 11 that did not have information about the aquifer.

There are 6 wells identified as domestic and industrial (Wells 43, 45, 58, 59, 63, and 64) that are completed in the unconfined aquifer. Assuming a southwesterly groundwater flow direction, one well (Well 43) is in the downgradient direction of the West Parcel (Figure 2).

3.7 Conclusions and Recommendations

Based on the hydrogeology and groundwater review, the following conclusions are provided.

- Groundwater in the unconfined aquifer flows to the southwest at the West Parcel. Groundwater water flow does not appear to change appreciably during the seasons.
- Groundwater is estimated to take a minimum of 10 years to travel the 5,782 feet from upgradient well RZA-1 to downgradient well MW-4 at West Parcel.
- Groundwater concentrations are higher in the downgradient wells of the West Parcel for nitrate, TDS, chloride, sodium, and sulfate. Decreasing visual trends were evident in all downgradient wells and the upgradient well for nitrate, TDS, chloride, sodium, and sulfate (only in MW-1 and RZA-1) indicating improvement in groundwater quality beneath the West Parcel. Increasing visual trends were evident for sulfate concentration in downgradient wells MW-2, MW-4, and RZA-2.
- Based on the location of the proposed land treatment site and the location of the existing West Parcel monitoring wells, there is no adequate downgradient monitoring well for evaluating groundwater quality leaving the land treatment site.
- One well indicated as domestic or a use that could include domestic purposes (industrial) is completed in the unconfined aquifer in the downgradient direction of West Parcel.

4.0 LAND TREATMENT SYSTEM MANAGEMENT

The success of a domestic wastewater land treatment system depends on the domestic wastewater hydraulic and constituent loads, cropping, climate conditions, and management. Cropping, soils, and climate determine the nutrient and hydraulic capacities of the land treatment site. The crop rotation tolerance to salinity influences the leaching requirement.

This section presents:

- design loads and cropping information
- agronomic constituent and hydraulic capacities
- constituent management
- irrigation management of the land treatment site

4.1 Domestic Wastewater

This section discusses the design water quality and loads of domestic wastewater and supplemental fresh water irrigation. Irrigation of domestic wastewater and/or supplemental fresh water is projected during February through October. Irrigation is not projected during November, December, January, or February.

4.1.1 Domestic Wastewater Quantity

The domestic wastewater daily design flow is 13,000 gpd. This design flow results in a monthly wastewater discharge of 0.364 to 0.403 million gallons (MG) for a total of 4.745 MG during the 12-month period (Table 8).

4.1.2 Domestic Wastewater Quality

The expected domestic wastewater quality is presented in Table 9. These parameters were determined based on analyses of samples collected from the existing domestic wastewater system.

The design domestic wastewater constituents reviewed include pH, electrical conductivity (EC), total Kjeldahl nitrogen, nitrate-nitrogen (NO_3-N), total nitrogen, five-day biochemical oxygen demand (BOD_5), fixed dissolved solids (FDS), and total suspended solids (TSS). As shown, the total nitrogen (TKN + NO_3-N) was measured at 124 milligrams per liter (mg/L) while the fixed dissolved solids (i.e., salts) is estimated at approximately 400 mg/L. Wastewater will be disinfected using gas chlorination to meet the Washington Department of Health standards for disinfected wastewater (Washington State Department of Health, 1994)

4.1.3 Odor Potential

The design concentration of BOD_5 is 311 mg/L, which is unlikely to significantly contribute to odor. The concentrations of oxygen demand and other potential odor causing constituents that may occur during spray irrigation can be managed by blending supplemental fresh irrigation water with the domestic wastewater, if needed.

To minimize the potential for odor from the domestic wastewater storage pond, the stored volume of the domestic wastewater will be minimized during the warm cropping season months through timely irrigation. In the unlikely event that an official odor complaint arises, Tyson will take immediate action to fully investigate the nature of the complaint, and the potential cause, then will communicate in a clear and timely manner with all appropriate people, including Ecology.

4.1.4 Nitrogen

The design total nitrogen (TKN + NO_3-N) concentration is 124 mg/L. Based on the flow of 4.745 MG per year, described previously, this results in a design load of 4,907 pounds of nitrogen annually applied across the land treatment site. This represents an estimated annual nitrogen load of 273 pounds per acre across the 18 acre land treatment site before accounting for any losses by volatilization or denitrification.

4.1.5 Fixed Dissolved Solids and Electrical Conductivity

The FDS is made up of the dissolved mineral elements in the water including cations (calcium, magnesium, sodium, potassium), and anions (carbonate, bicarbonate, nitrate, sulfate, chloride). The design FDS concentration is 400 mg/L.

The EC of water is an indirect measure of the salinity (i.e., FDS concentration, salts) and is important for computing the leaching requirement for planning management practices needed to control the buildup of salts in the soil. The design EC of the domestic wastewater is 625 micromhos per centimeter (μmhos/cm), which is acceptable for crop irrigation (U.S. Department of Agriculture - Soil Conservation Service and Washington State University Cooperative Extension Service, 1990; US Salinity Lab Staff, 1954).

Since the fresh water source has a low salinity (EC less than 100 μmhos/cm; Table 10) and will make up about 78% of the irrigation water over the entire season, the overall salinity of the seasonal irrigation is an estimated weighted average EC of 191 μmhos/cm, resulting in little chance for increased soil salinity to develop. The relative concentrations of salts indicate that the application of the domestic wastewater will not be limited provided the land treatment site is agronomically managed.

4.1.6 pH

The domestic wastewater pH must be considered for land treatment. A pH range of 3 to 11 standard units has been applied successfully to land treatment systems (U.S. Environmental Protection Agency, 2006). The design domestic wastewater quality is estimated at 7.0 standard units (Table 9), which is adequate for irrigation of agricultural crops.

4.2 Supplemental Fresh Water Quality

Supplemental fresh water from the Columbia River will be provided to help meet the crop water requirements of crops at the land treatment site. Fresh water quality is an important design consideration because it contributes to the constituent loadings on the land treatment site and can influence management practices to achieve proper land treatment operations. The quality of the fresh water is considered good for irrigation purposes (Table 10). It is low in salts and has a low total nitrogen concentration of 0.7 mg/L. The fresh water quality will not limit domestic wastewater treatment at the land treatment site. The fresh water nitrogen load contribution is discussed below.

4.3 Cropping

Crop management plays a critical role in using domestic wastewater on farmland. Beneficial use of domestic wastewater nutrients is achieved by harvest and removal of plant material. Higher crop yields increase land treatment site capacity for domestic wastewater loads. The crops chosen for the land treatment site will grow well in the local area and under the domestic wastewater and soil conditions at the land treatment site. Perennial crops such as alfalfa have been successfully grown at the land treatment site. Perennial crops consume water and nutrients throughout the extent of the growing season, from early spring to late fall, which coincides with early and late season domestic wastewater application as needed. Only suitable fodder, fiber, or seed crops appropriate for disinfected domestic wastewater will be grown at the land treatment site and will only be used for animal feed or fiber end uses.

The perennial crops may be maintained in place for several years until productivity begins to decline. They are re-established after rotation to another crop for one or more crop growing seasons. Rotation to another crop before re-establishment is an agronomic best management practice. As a system best management practice, an established crop or cover crop should be maintained in the fall to take up nutrients and increase ET. Maintaining a crop or cover crop helps to remove nitrogen that may be available in the soil profile ahead of the winter precipitation period. This practice limits the potential for migration of nitrogen beyond the root zone during winter precipitation events. The established crops also provide soil protection against wind and water erosion during winter and early spring.

4.3.1 Crop Rotation

Table 11 presents an example crop rotation for the land treatment site, as well as the design basis limiting crop rotation used to calculate the land treatment site hydraulic, nitrogen, and oxygen demand capacities in Section 6.4. The design basis rotation represents the minimum nitrogen capacity of the example crop mix at the land treatment site. Where 2 or more crops are listed for one field, the second and third crop will be planted following harvest of the previous crop and after any necessary cultivation for seedbed preparation.

The example land treatment site cropping is a 5-year rotation using alfalfa as the primary crop. This shows alfalfa for 4 years with the 5th year entailing an initial spring alfalfa harvest followed by a planting of grain corn for silage harvest before rotating back to alfalfa in the fall (Table 11). The alfalfa would be planted in September through early October. This will allow good establishment of the young stand and provide a healthy cover over the winter. During the years with alfalfa only, harvest would include up to 4 cuttings occurring on roughly 6-week intervals throughout the growing season. During the fifth year the alfalfa would be terminated (by tillage or herbicide spray) after the first cutting in the spring followed by a planting of corn. The corn would be harvested by early fall, after which the alfalfa would be re-planted and allowed to grow ahead of the winter season. All corn harvested will be used for animal feed.

Alfalfa is the primary element in the rotation as a perennial crop with a deep rooting system, a moderate salt tolerance, and high water and nutrient removal/uptake potential (Tables 11 and 12). Once established, perennial crops, such as alfalfa, are an excellent crop choice for land treatment and have been used successfully in many similar systems within the local area. Keeping the land treatment site in a perennial crop maintains hydraulic and nitrogen capacity. Established cover crops help maintain hydraulic capacity during late fall and winter months.

The combined crop water and nutrient uptake of any alternate crops or rotations on the land treatment site must be adequate to properly utilize the domestic wastewater and nutrients. The loading and cropping plan will be determined and shown each year in the annual Irrigation and Crop Management Plan (ICMP).

4.3.2 Planting, Cultivation, Harvest, and Crop Nitrogen Capacity

Example planting and harvest months, yields, crop nitrogen removal, and crop nitrogen capacity by crop type are included in Table 12. Alfalfa and corn yield and nitrogen removal estimates are based on historical cropping records from the Tyson Fresh Meats domestic water land treatment system.

Crops will be planted using accepted agronomic seeding rates and methods, and established crops (e.g., alfalfa) will not require planting until they are rotated, as discussed above. Alfalfa will be harvested for hay (cut, cured, baled, or possibly green-chopped for haylage). Any other crops that may be grown at the land treatment site will be harvested according to local and industry standard means. The actual crop harvest schedule will vary depending on weather and crop growth.

4.3.3 Fertilizer, Herbicide, and Pesticides Application

Commercial fertilizer will be applied, as needed, for the specific field and crop to maintain healthy, viable land treatment system crops for maximum nutrient uptake under domestic wastewater treatment conditions. The term viable may be defined as capable of living, developing, or germinating under maximum favorable conditions. Domestic wastewater nitrogen availability will be considered in any decision to apply fertilizer. Fertilizer application will be according to soil test results, tissue test results, and recommended nutrient levels from state and local extension service and consultants. Nitrogen may be applied at recommended starter rates for legume crops (i.e., alfalfa). Nitrogen may also be applied to non-legume crops (e.g., corn) if a deficiency is identified between the recommended amount and the amount that will be applied in the domestic wastewater.

Pesticides, including herbicides, insecticides, and fungicides, will be used, as necessary. Herbicides for weed control are planned for use. Insecticides or fungicides will be used only if needed to treat specific problems. Herbicide use will vary depending on the weed problem, crop, time of year, and product availability from year to year. Aerial application or ground sprayer can apply pesticides with dependence on time, weather, soil wetness, price, suitability, and availability. All pesticides will be managed according to product labels and applicable state and federal guidelines.

4.4 Design Basis Capacity

The capacity of a land treatment site for nutrient and hydraulic loading is an important consideration for good management and design of a system that is protective of groundwater. Proper design and good management of domestic wastewater application and nutrients encompasses the requirements of all known, available, and reasonable methods of prevention, control and treatment while farming for land treatment. The term agronomic capacity is defined in the *Implementation Guidance for the Ground Water Quality Standards* as the "rate at which a viable crop can be maintained and there is minimal leaching of chemical downwards below the root zone. Crops should be managed for maximum nutrient uptake when used for wastewater treatment" (Department of Ecology, 2005, p. 121). Therefore, agronomic rates can be used in combination with the design basis crop rotation to establish the design basis capacity of the land treatment site for both irrigation and nutrients.

The purpose of this section is to define the nutrient and hydraulic load capacities of the land treatment site and evaluate the nutrient and hydraulic balances. This section also defines the capacities of other important parameters for land treatment design. The design basis for the land treatment capacity defined in this Engineering Report is the most nitrogen limiting crop rotation presented in Table 11. This design basis crop rotation will be used to determine the minimum nutrient and hydraulic capacities of the land treatment site as represented by the lower limit of crop nitrogen removal from the land treatment site in future operational years. As the crop rotation changes, hydraulic and nutrient capacities may increase and be greater than the limiting rotation in some years.

The agronomic capacities, within which the land treatment site must be managed by Tyson, will be established and reported each year in the annual ICMP. The total nitrogen and water applied to the land treatment site cannot exceed the crop requirements as determined by the ICMP. The design basis capacity defined in this Engineering Report can be considered the potential minimum agronomic capacity for the land treatment site.

4.4.1 Hydraulic Capacity

The hydraulic capacity of the land treatment site depends on the crop water needs (ET), precipitation, soil water holding capacity, leaching requirements, and nitrogen capacity. A soil hydraulic budget was developed to determine the hydraulic capacity of the land treatment site using these variables (Table 13).

It is important to keep in mind that the capacity for domestic wastewater and fresh water is dependent on the crop nitrogen capacity. The soil hydraulic budgets were developed as examples using the design basis (limiting) crop rotation (Table 11) to demonstrate the minimum potential nitrogen capacity rotational year.

The hydraulic budget take into account the normalized 10-year return precipitation and ET (Table 2) and total water content at field capacity (Table 4). It was constructed with the initial soil water content of 90% of field capacity. The budget was based on higher than expected (conservative) estimate of moisture stored in the soil and were prepared with maximum domestic wastewater and supplemental fresh water irrigation loads that result in estimated percolate loss (leaching fraction) at or less than the calculated leaching requirement. The gross irrigation inputs into the soil hydraulic budget illustrate an example of the potential hydraulic capacity of the land treatment site.

A leaching requirement was determined based on the average EC of the domestic wastewater and supplemental fresh water with the desired equilibrium soil salinity of 2 mmhos/cm. The domestic wastewater has an estimated EC of 625 μmhos/cm and the supplemental fresh water has an EC of 84 μmhos/cm (Tables 9 and 10, respectively). The calculated leaching requirement for the combined domestic wastewater and supplemental fresh water averages 1.5% of the hydraulic load to the land treatment site (Table 13). Additional supplemental fresh water irrigation may be scheduled during the late fall or early months of the irrigation season to achieve a leaching fraction equivalent to the leaching requirement (Table 13). The actual practice of irrigating extra supplemental fresh water for leaching will depend on the need to decrease soil salts if indicated by the annual soil test results.

The sum of the gross domestic wastewater and supplemental fresh water inputs represent the total irrigation capacity of the land treatment site since they were balanced with the precipitation, ET, soil water holding capacity, leaching fractions, and nitrogen capacity. Monthly total domestic wastewater loads are scheduled based on the design basis flow from the domestic wastewater system, with increased irrigation during the months of March and April attributed to the domestic wastewater stored during non-growing season months of November, December, January, and February. The maximum hydraulic capacity was achieved using supplemental fresh water without excess leaching beyond the leaching requirement.

Table 13 presents a summary of the monthly and annual totals of the soil hydraulic budget including precipitation, gross domestic wastewater and supplemental fresh water irrigation, ET, and leaching. Gross domestic wastewater irrigation totals 9.7 inches, while gross supplemental fresh water irrigation totals 39.0 inches and estimated ET totals 48.3 inches. In this example, the land treatment site gross domestic wastewater irrigation ranges from 0.39 to 1.53 MG per month (Table 14). Supplemental fresh water loads based on supplementing the domestic wastewater to meet crop water requirements, range from 0.24 MG in October to 6.35 MG in July (Table 14). The total irrigation capacity in this example is 24.05 MG per year during the irrigation season (i.e., March through October).

The annual example hydraulic capacities in Table 14 were used with the domestic wastewater quality (Table 9) and supplemental fresh water quality (Table 10) to calculate constituent mass loads from the domestic wastewater and supplemental fresh water irrigation for comparison to the land treatment site capacities discussed in the following section.

4.4.2 Nitrogen Capacity

There are 2 mechanisms of nitrogen treatment in a land treatment system. The first and largest is uptake by the crops growing and removal in the harvested plant matter. As the crop type changes, nutrient capacities also change. Based on the example crop rotation presented in Table 11, the total nitrogen removal capacity for each year of the 5-year rotation were calculated to determine the most limiting year. The most limiting crop nitrogen uptake year would be in “Year 5” (alfalfa/ corn/alfalfa) with a total nitrogen crop removal rate of 5,100 pounds per year (lb/yr, Table 15). The lower removal rate under the 5-year rotation is due to the lower nitrogen uptake from a single cutting of alfalfa and the harvested corn silage compared to four cuttings of alfalfa in other years.

The second nitrogen treatment mechanism in land treatment systems is denitrification and volatilization (i.e., gaseous losses). The domestic wastewater nitrogen is primarily in organic and ammonia forms. The slight to moderate alkaline pH of the soils and broadcast nature of sprinkler irrigation promotes a limited amount of volatilization of ammonia-nitrogen. Following irrigation, the organic nitrogen will be biologically mineralized to ammonia then nitrate before being consumed by the crops. Although nitrate was not detected in the domestic wastewater samples (Table 9), denitrification of nitrate is typically promoted by the dose and rest cycles of the irrigation systems in conjunction with the labile carbon content represented by the BOD_5 load (U.S. Environmental Protection Agency, 2006; Smith, J.L., J.W. Doran, 1996). The low BOD_5 concentration of the domestic wastewater will be sufficient to drive this denitrification reaction for any small amount of nitrate present in the domestic water, so not all of the domestic wastewater NO_3-N is considered available to the crop-soil systems. Likewise, not all of the organic nitrogen is considered available because it may not be easily mineralized following irrigation (Overcash & Pal, 1979).

Denitrification and ammonia volatilization must be considered as part of the treatment and removal process for estimating nitrogen capacity. Based on the following equation, accounting for gaseous nitrogen losses, the remaining available nitrogen load from applied fertilizer in a conventional agriculture situation is conservatively expected to be 88% of the total nitrogen applied (Meisinger & Randall, 1991) :

Equation:

$$\text{Available Nitrogen \%} = [((\text{TKN - ammonia-nitrogen}) + (\text{ammonia-nitrogen} \times 0.85) + (NO_3\text{-N})) \times 0.96] \div (\text{TKN} + NO_3\text{-N}) \times 100\%$$

Using the design domestic wastewater quality from Table 9, the calculated available nitrogen is determined as:

$$\text{Available Nitrogen \%} = [((124 \text{ mg/L} - 70 \text{ mg/L}) + (70 \text{ mg/L} \times 0.85) + (0 \text{ mg/L})) \times 0.96] \div (124 \text{ mg/L} + 0 \text{ mg/L}) \times 100\% = 88\%$$

The gross annual nitrogen capacity is therefore calculated as the expected crop removal rate divided by 88%. The total gross nitrogen capacity of the land treatment site ranges from 5,800 lb/yr in “Year 5” to 10,500 lb/yr in “Years 1-4” (Table 15).

Design Basis Nitrogen Load

Table 16 presents the total annual nitrogen loading to the land treatment site from domestic wastewater and supplemental fresh water in comparison to the design gross nitrogen uptake capacity on a per field basis. The total annual nitrogen loading from domestic wastewater and supplemental fresh water for each field is based on the hydraulic capacity analysis described above and water quality information provided in Tables 9 and 10.

In the example operational load scenario presented in Table 16, the combined domestic wastewater and supplemental fresh water nitrogen load is 4,900 lb nitrogen (lb-N). This loading rate is less than the capacity of the land treatment site capacity in the most limiting crop rotation (i.e., 272 lb-N per acre compared to a design capacity of capacity of 322 lb-N per acre). Unmet crop nitrogen requirements in any given year will therefore need to be augmented using commercial nitrogen fertilizer as determined by the annual ICMP.

4.4.3 Biochemical Oxygen Demand Capacity

The treatment capacity for oxygen demand depends on soil, temperature, and irrigation practices. Sufficient oxygen transfer is required in soils for treatment of oxygen demand, while soil temperatures affect the rate of microbial digestion of the organic components. Proper irrigation practices are required to provide sufficient water to maintain microbial function without extended periods of soil saturation that would prevent sufficient oxygen transfer. The oxygen demand capacity is most influenced by soil texture and drainage rate as it relates to oxygen diffusion into the soil. Sandier soils, such as those described for the site, have larger soil pores with better oxygen diffusion potential, and thus, have a higher capacity for oxygen demand treatment than finer textured soils such as silt loams.
Crop root systems require oxygenated soil. If the oxygen demand load is too great, the soil will become anaerobic and the crops will become stressed resulting in reduced productivity, nutrient uptake, and yield. Table 17 presents a potential annual domestic wastewater BOD_5 load of 12,300 pounds based on a design BOD_5 concentration of 311 mg/L and domestic wastewater flow of 4.745 MG. Based 18 acres and 245 growing season days, the average annual BOD_5 loading rate is expected to be approximately 3 pounds per acre per day (lb/ac/day). This BOD_5 load is below the commonly referenced 45 to 450 lb/ac/day BOD_5 range given for land treatment of wastewater by the U.S. Environmental Protection Agency (2006).

4.4.4 Mineral Salts and Salinity Management

The FDS are a measure of the mineral salts present in the domestic wastewater and used to evaluate the salinity and mass of salts discharged to the land treatment site. The FDS that make up the domestic wastewater salinity include calcium, magnesium, sodium, potassium, sulfate, chloride, and bicarbonate ions. The annual domestic wastewater FDS load is 15,800 pounds while the supplemental freshwater FDS load is expected to average 7,200 pounds (Table 17). The FDS load monitoring and management is important to manage accumulation of salts in the soil profile to prevent reductions in crop yields. The FDS load from domestic wastewater and supplemental fresh water determines the leaching requirements for each field. The land treatment site soil and crop FDS capacity is the calculated leaching requirement for the land treatment site (Table 13). The EC of the water irrigated onto the land treatment site is an indirect measure of the FDS (salinity) of the water and used for computing the leaching requirement. Annual leaching fractions will not exceed calculated leaching requirements to limit the impact on groundwater quality. Soil salts will be monitored through annual soil sampling to determine effectiveness of scheduled leaching.

Leaching Requirement

The leaching requirement is the fraction of the total crop water supply from all sources that should percolate through the crop rooting zone to control salt build-up in the soil profile. Leaching can prevent excessive amounts of salts from accumulating in the root zone. If not monitored and agronomically managed salts from irrigation water, including fresh water, can build up in the soil profile to levels that could inhibit crop production. The salinity in the root zone should be maintained at or below the point of yield decline. A soil ECe of 2 mmhos/cm or less, which is suitable for nearly all irrigated crops, was used to generate the leaching requirements. Given the limited precipitation in the region, it may be necessary to irrigate some supplemental fresh water in the non-growing season to meet the leaching requirement. At the same time, irrigation should minimize deep percolation losses so that FDS losses from the soil are managed to control the potential for impacts to groundwater. The percolation rate (leaching fraction) should be equal to or less than the leaching requirement.

The leaching requirement, presented as a percentage of total irrigation, depends on the average EC of the total water supply to the crop for the year. The leaching requirement is calculated as follows (Canessa & Hermanson, 1994):

$$LR = \frac{EC_{iw}}{((5 \times ECe) - EC_{iw})}$$

Where:

LR	=	Fraction of the applied irrigation water that should become deep percolation
EC_{iw}	=	EC of the irrigation water (µmhos/cm)
ECe	=	Desired ECe of soil (mmhos/cm)

Leaching requirements can be computed each year in the hydraulic budget calculation of the annual ICMP based on the actual irrigation water quality and hydraulic load. Soil hydraulic budget calculations can also be used each year to compare the leaching requirement to the calculated leaching fraction as a check on agronomic irrigation management.

During the winter when leaching may occur from rainfall, there is low potential for nitrate to be leached if it has been adequately consumed by the crops. Cropping and loading rates should be managed to maintain a healthy crop to consume the available soil nitrate-nitrogen and reduce nitrate concentrations in the soil before entering the winter months when leaching is more likely to occur.

4.5 Design Limiting Parameter

Based on the comparison of potential nitrogen loading to potential nitrogen removal and treatment, nitrogen is the design limiting constituent. Nitrogen application rate must be managed first within the nitrogen capacity of the land treatment site. When the domestic water nitrogen is applied at the appropriate rate, all other parameters will be loaded at less than their respective capacities.

4.6 Irrigation System Operation

Proper irrigation system operation is important for optimum domestic wastewater treatment and agronomic capacity. The irrigation system is operated to distribute the water across the field for optimum control on irrigation depth and timing. Standard best management practices will include:

- visual observations of field for runoff or ponding,
- routine soil profile moisture and nutrient monitoring,
- application rate monitoring, and
- leak and mechanical repair.

5.0 COMPLIANCE WITH STATE ENVIRONMENTAL POLICY ACT

A State Environmental Policy Act (SEPA) Checklist and a Determination of Non-Significance have been completed demonstrating compliance with the SEPA requirements.

6.0 SUMMARY

The purpose of this Engineering Report is to provide Ecology with information on the design, operation, performance, and agronomic capacity of the domestic wastewater land treatment system to maintain the highest quality of the state's groundwater and protect existing and future beneficial uses. The soils at the land treatment site are suitable for receiving the domestic wastewater for land treatment purposes and the design nitrogen and hydraulic loads are well within the agronomic capacity of the land treatment site. The agronomic capacity, within which the land treatment site must be managed, will be established and reported each year in the annual ICMP.

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TABLES

Table 1. Land Treatment Field and Acreage

Field Name	Township-Range-Section	Parcel	Acres
11	8N 31E S26	West	18
Total			**18**

NOTE:
Field information is from Tyson Fresh Meats, Inc. records.

Table 2. Climate Summary

Month	Daily Temperature			Precipitation [1]		Potential Crops and Evapotranspiration [2]	
	Avg Max	Avg Min	Avg	Avg	Normalized 10-Year Return	Alfalfa	Alfalfa / Silage Corn / Alfalfa
	degrees Fahrenheit			inches			
Nov	50	33	41	1.02	1.51	1.7	1.7
Dec	39	27	33	1.37	2.02	0.9	0.9
Jan	41	29	35	1.07	1.58	1.2	1.2
Feb	48	30	38	0.64	0.95	1.8	1.8
Mar	58	36	47	0.75	1.11	4.0	4.0
Apr	65	40	52	0.69	1.02	5.4	5.4
May	74	47	60	0.85	1.26	7.1	7.1
Jun	80	53	66	0.73	1.08	7.8	4.3
Jul	90	59	74	0.16	0.24	9.3	10.0
Aug	88	58	72	0.16	0.24	8.2	8.2
Sep	79	50	64	0.37	0.55	5.5	2.5
Oct	65	42	52	0.71	1.05	3.2	2.5
Total				**8.52**	**12.59**	**56.0**	**49.5**

NOTES:

All data obtained from the US Department of the Interior Bureau of Reclamation AgriMet LEGW weather station in Legrow, Washington (Bureau of Reclamation, n.d.).

Abbreviations: Avg = average, Max = maximum, Min = minimum.

1 The average precipitation is based on actual monthly precipitation from the years with sufficient data from 1995 through 2014 at the AgriMet LEGW weather station in Legrow, Washington. The 2nd highest total annual precipitation (12.59 inches in 2005-06) out of 20 years with sufficient data were normalized in relation to the long term average for each month to create the 10-year return precipitation data.

2 The average evapotranspiration is the average of available data from 2004 through 2014 at the AgriMet LEGW weather station in Legrow, Washington for example crops that are grown or may be grown at the land application area.

Table 3. Published Soil Types and Physical Properties

Soil Unit	Soil Unit Name	Texture	Proportion of Land Treatment Site	Depth	Bulk Density	Perm [1]	Average Soil Available Water Holding Capacity [2]			Water Content at Permanent Wilting Point [3]	Total Water Content at Field Capacity	Organic Matter
				inch	g/cc	in/hr	in/in	Thickness (inch)	inch	inch		%
Qd	Quincy-Duneland complex	fine sand	19%	0-15	1.45-1.60	13.0	0.08-0.11	15	1.43	0.28	1.71	0.5-1.0
		fine sand, loamy fine sand, sand		15-60	1.50-1.70	13.0	0.08-0.12	45	4.50	1.26	5.76	0.0-0.5
							Total	**60**	**5.93**	**1.54**	**7.46**	
QmB2	Quincy loamy fine sand, moderately deep over coarse sand, 0 to 8 percent, eroded	loamy fine sand	81%	0-34	1.30-1.45	13.0	0.09-0.10	34	3.23	0.68	3.91	0.8-1.0
		gravelly fine sand, loamy fine sand, sand		34-60	1.45-1.60	13.0	0.05-0.09	26	1.82	0.31	2.13	0.0-0.1
							Total	**60**	**5.05**	**0.99**	**6.04**	

NOTES:

Summary of Natural Resource Conservation Service Web Soil Survey of area of interest (Soil Survey Staff, Natural Resources Conservation Service, n.d.).

Abbreviations: g/cc = grams per centimeter cubed, in/hr = inches per hour, in/in = inches per inch, Perm = permeability.

1 Permeability is the same as saturated hydraulic conductivity (Ksat), which is substantially lower than the infiltration rate.

2 The average soil available water holding capacity was calculated using the average of the range of values times the thickness of the horizon.

3 Estimated using estimates of sand, silt, organic matter, and gravel content to match the average soil available water holding capacity for each horizon using the Soil-Plant-Air-Water model (Saxton & Rawls, 2006).

Table 4. Field Soil Water Storage Capacity

Summary of Soil Units Water Capacity				Field Capacity	AWHC
Soil Unit		Qd	QmB2		
Depth	inches	60	60		
Field Capacity	inches	7.46	6.04		
AWHC	inches	5.93	5.05		
Wilting Point	inches	1.54	0.99		
Field	acres	percent of area		average inches [1]	
11	18	19	81	6.31	5.21

NOTES:

Summary of Natural Resource Conservation Service Web Soil Survey of area of interest (Soil Survey Staff, Natural Resources Conservation Service, n.d.).

Abbreviation: AWHC = available water holding capacity.

1 The average inches of field capacity and AWHC were calculated by multiplying the percent field capacity and AWHC of each soil unit by their respective percentages of the total land treatment system acreage.

Table 5. Soil Analytical Results - Fall 2018

Field	Sample Date	Depth Interval	H_2O	OM	pH	$EC_{1:1}$	NO_3 + NO_2-N	NH_4-N	TKN	K	Cl	SO_4-S	Na	Ca	Mg	ESP
		feet	%		s.u.	mmhos/cm	mg/kg		%	mg/kg			meq/100g			%
11	11/19/18	1	8.83	0.57	7.2	0.18	2.9	2.1	0.087	64	2	4	0.11	6.5	1.2	0.3
		2	7.19	0.24	8.1	0.13	0.6	1.3	0.051	72	0	3	0.08	7.7	1.1	0.4
		3	6.92	0.18	8.4	0.13	1.6	1.2	0.054	82	4	2	0.08	7.4	1.1	0.3
		4	3.93	0.02	8.1	0.11	0.8	0.8	0.044	74	0	2	0.07	8.3	1.2	0.3
		5	4.34	0.05	8.7	0.15	1.9	0.9	0.040	70	2	3	0.13	10.9	1.2	0.4
		8	5.05	0.01	8.9	0.15	3.0	1.2	0.041	97	5	2	0.28	8.6	2.0	1.8

NOTES:

Soil samples were collected by Tyson Fresh Meats, Inc. personnel and analyzed by Kuo Testing Labs in Othello, Washington.

Abbreviations: Ca = calcium, Cl = chloride, $EC_{1:1}$ = electrical conductivity of 1:1 soil: water, ESP = exchangeable sodium percentage, H_2O = moisture, K = potassium, meq/100g = milliequivalents of charge per 100 grams of soil, Mg = magnesium, mg/kg = milligrams per kilogram, mmhos/cm = millimhos per centimeter, Na = sodium, NH_4-N = ammonium-nitrogen, NO_3 + NO_2-N = nitrate + nitrite as nitrogen, OM = organic matter, s.u. = standard units, SO_4-S = sulfate as sulfur, TKN = total Kjeldahl nitrogen.

Table 6. Summary of Monitoring Well Construction Details

Well Name	Date of Construction	Public Land Survey System Location	Elevation of PVC Casing	Ground-water Depth [1]	Well Depth	Cased Interval [2]	Screened or Perforated Interval	Sealed Interval	Filter Pack Interval	Borehole Size	Screen Slot Type or Size	Filter Pack Porosity
			ft msl	ft	feet below ground surface					inches		
MW-1	7/25/1980	T8N R31E Sec 26 NW NW	522.29	139.14	244	0-185 (6) 182-244 (5)	130-150 (Perf)	0-30	None	6.00	Mill Knife - 6 per ft	--
MW-2	7/25/1980	T8N R31E Sec 26 NW NW	500.53	113.73	186	+2-186 (6)	110-154 (Perf)	0-30	None	6.00	Mill Knife - 6 per ft	--
MW-4	10/21/1986	T8N R31E Sec 26 NW NW	486.15	113.18	159	+2.0-160 (6)	120-140 (Perf)	0-120	None	6.00	Mill Knife - total of 62 - 0.25 inch by 2 inch	--
RZA-1	8/7/1992	T8N R31E Sec 26 NE SW	584.78	75.75	167	+2.4-157 (2)	157-167 (2)	0-144	144-168	NR	Machine - 0.02 inch	10/20
RZA-2	8/8/1992	T8N R31E Sec 26 SW SW	514.58	118.33	146	+2.6-136 (2)	136-127 (2)	0-127	127-146	NR	Machine - 0.02 inch	10/20

NOTES:
Abbreviations: E = east, ft = feet, msl = above mean sea level, N = north, NE = northeast, NR = not recorded, NW = northwest, Perf = perforated, PVC = polyvinyl chloride, R = range, Sec = section, SW = southwest, T = township.
1 Groundwater depth is the depth from first Quarter of 2015.
2 Numbers in parenthasis are the diameter of the casing in inches. The plus sign indicates the amount of casing above ground suface.

Table 7. Groundwater Monitoring Data: Averages - 4th Quarter 2018 through 3rd Quarter 2019

Well Name	Position [1]	pH	EC	TKN	NO_3 + NO_2-N	NH_3-N	TDS	TOC	Na	Ca	Mg	K	Cl	SO_4	HCO_3
		s.u.	µmhos/cm	milligrams per liter											
West Parcel															
RZA-1	Upgradient of West Parcel	7.1	602	0.78	19.2	<1.0	431	0.8	18.5	51	27.4	3.2	33	51	125
MW-1	Downgradient of West Parcel and Upgradient of Pond Area and Proposed Land Treatment Site.	7.6	923	1.07	12.8	<1.0	618	1.2	73.3	72	27.4	3.6	93	146	159
MW-2	Downgradient West Parcel and Pond Area; Cross Gradient of Proposed Land Treatment Site.	7.1	1,305	2.40	31.3	<2.5	892	2.8	45.2	140	43.9	5.1	122	163	215
MW-4	Downgradient of West Parcel and Cross Gradient of Pond Area and Proposed Land Treatment Site.	7.0	1,528	1.04	41.6	<1.0	1,230	1.0	65.5	129	53.2	5.7	238	81	139
RZA-2	Downgradient of West Parcel and Cross Gradient of Pond Area and Proposed Land Treatment Site.	7.1	1,189	1.11	34.9	<1.0	1,139	2.6	123	140	47.3	6.2	149	240	252
Upgradient Average		**7.1**	**602**	**0.78**	**19.2**	**<1.0**	**431**	**0.8**	**18.5**	**51**	**27.4**	**3.2**	**33**	**51**	**125**
Downgradient Average [2]		**7.2**	**1,236**	**1.40**	**30.2**	**<1.4**	**970**	**1.9**	**76.7**	**120**	**42.9**	**5.2**	**150**	**157**	**191**

NOTES:

The values shown in this table are an average of the 4 quarterly test results obtained during the 4th quarter of 2018 and the 1st, 2nd, and 3rd quarters of 2019 reported to the State of Washington Department of Ecology by Tyson Fresh Meats, Inc.

Shaded values indicate the average water quality data that are highest.

Abbreviations: < = less than method detection limit, Ca = calcium, Cl = chloride, EC = electrical conductivity, HCO_3 = bicarbonate, K = potassium, Mg = magnesium, Na = sodium, NH_3-N = ammonia-nitrogen, NO_3+NO_2-N = nitrate + nitrite-nitrogen, s.u. = standard units, SO_4 = sulfate, TDS = total dissolved solids, TKN = total Kjeldahl nitrogen, TOC = total organic carbon, and µmhos/cm = micromhos per centimeter.

1 Position is based on the groundwater elevation between the monitoring wells within the land application area.

2 Downgradient average does not include data for groundwater quality downgradient of the proposed land treatment site due the absence of a monitoring well downgradient well from the field.

Table 8. Design Domestic Wastewater Discharge

Month [1]	Design Domestic Wastewater Flow [2]
	million gallons
Nov	0.390
Dec	0.403
Jan	0.403
Feb	0.364
Mar	0.403
Apr	0.390
May	0.403
Jun	0.390
Jul	0.403
Aug	0.403
Sep	0.390
Oct	0.403
Total	**4.745**

NOTES:

1 The operational year is considered November through October based on crop planting and harvest cycles.

2 Design domestic wastewater discharge from the domestic wastewater system is based on 13,000 gallons per day, and 7 operating days per week.

Table 9. Design Domestic Wastewater Quality

pH	EC [1]	TKN	NH_3-N	NO_3-N	Total N	BOD_5	FDS (Salts) [2]	TSS
s.u.	µmhos/cm	milligrams per liter						
7.0	625	124	69.9	ND	124	311	400	87

NOTES:
Domestic wastewater constituent values based on samples collected from the existing Tyson Fresh Meats, Inc. Pasco beef complex domestic wastewater system, with the exception of pH, EC, and FDS, which are estimates based on typical reclaimed water quality concentrations (Asano, T. 2007; Tchobanoglous, G. & Metcalf & Eddy, Inc. 2014).
Abbreviations: BOD_5 = five-day biochemical oxygen demand, EC = electric conductivity, FDS = fixed dissolved solids, ND = not detected, NH_3-N = ammonia as nitrogen, NO_3-N = nitrate as nitrogen, s.u. = standard units, TKN = total Kjeldahl nitrogen, Total N = TKN + NO_3-N, TSS = total suspended solids, µmhos/cm = micromhos per centimeter.
1 Estimated as follows: EC = FDS ÷ 0.64 assuming the standard relationship of EC = TDS ÷ 0.64 (U.S. Salinity Laboratory Staff, 1954).
2 Represents the mineral salts concentration.

Table 10. Fresh Water Quality

Source	TKN	FDS	$NO_3 + NO_2$-N	EC [1]
	milligrams per liter			µmhos/cm
Fresh Water	0.6	45	< 0.1	84

NOTES:

Supplemental irrigation water (fresh water) as sampled from the Legrow Irrigation District pump station (Cascade Earth Sciences, 2015).

Abbreviations: EC = conductivity, FDS = fixed dissolved solids, $NO_3 + NO_2$-N = nitrate + nitrite-nitrogen, TKN = total Kjeldahl nitrogen, µmhos/cm = micromhos per centimeter.

1 EC = FDS × 1.2 ÷ 0.64 assuming FDS is 80% of total dissolved solids and the standard relationship of EC = TDS ÷ 0.64.

Table 11. Example Crop Rotations

Field Name	Acres	5-Year Crop Rotation Showing Annual Crop Mix Acreage				
		Year 1	Year 2	Year 3	Year 4	Year 5 (Design Basis Rotation)
11	18	Alfalfa	Alfalfa	Alfalfa	Alfalfa	Alfalfa / Silage Corn / Alfalfa

NOTES:

The design basis rotation is the most nitrogen limiting example crop rotation mixture, which was used to determine the most limiting design basis capacity for the land treatment site. Where two crops are listed together, the first crop is grown and harvested followed by planting, but not harvest of the second crop until the following growing season.

Table 12. Example Crop Planting, Harvest, and Nitrogen Management

Crop	Planting Months	Harvest Stage	Harvest Month	Expected Yield [1]	Potential Nutrient Uptake [2]									
					N		P	K	Ca	Mg	Na	Cl	S	Ash [3]
Alfalfa	Aug-Oct	Early Bud	28-30 Day Cycle	8.7 tons/yr	59 lb/ton	512 lb/ac	10 lb/ton	60 lb/ton	30 lb/ton	7.0 lb/ton	5.0 lb/ton	14 lb/ton	5.0 lb/ton	115 lb/ton
Silage Corn [4]	Apr-Jun	Full Ear	Sep-Oct	6.5 ton/ac	27 lb/ton	177 lb/ac	6.6 lb/ton	5.3 lb/ton	NA	NA	NA	NA	NA	30 lb/ton
		Stover		15 ton/ac	6.7 lb/ton	101 lb/ac	1.9 lb/ton	29 lb/ton	NA	1.4 lb/ton	NA	NA	9.0 lb/ton	171 lb/ton

NOTES:

Planting and harvest months, expected yield, and nitrogen need are based on Tyson Fresh Meats, Inc. records (Cascade Earth Sciences, 2015).

Abbreviations: Ca = calcium, Cl = chloride, K = potassium, lb/ac = pounds per acre, lb/ton = pounds per ton, Mg = magnesium, N = nitrogen, NA = not available, Na = sodium, P = phosphorus, S = sulfur, tons/ac = tons per acre, tons/yr = tons per year.

1 Yield data based on actual yields of Gauntt Farms and documented yields achieved at other process wastewater managed sites in the same region.

2 These values reflect nutrient removal rates in plant parts and may not represent that required for growth and full crop production. Values derived from review of historical crop content at Gauntt Farms and monitoring data from other similar sites.

3 Ash uptake included to approximate total dissolved inorganic solids.

4 Silage corn used for animal feed.

Table 13. Example Monthly Soil Hydraulic Budget

Field: 11 **Acres:** 18 **Soil Water Content at Field Capacity** [7]**:** 6.3

Crop: Alfalfa / Silage Corn / Alfalfa **Rooting Depth** [3]**:** 60 **Initial Soil Water Content** [8]**:** 5.7

Month	Precipitation [1]	Gross Irrigation [2]		Net Irrigation [4]		Total Input [5]	Evapotranspiration [6]		Soil Water Content [9]	Percolate Loss [10]
		Wastewater	Fresh	Wastewater	Fresh		Potential	Estimate		
		inches								
Nov	1.5	0.0	0.0	0.0	0.0	1.5	1.7	1.6	5.6	0.0
Dec	2.0	0.0	0.0	0.0	0.0	2.0	0.9	0.9	6.3	0.4
Jan	1.6	0.0	0.0	0.0	0.0	1.6	1.2	1.2	6.3	0.4
Feb	0.9	0.0	0.0	0.0	0.0	0.9	1.8	1.8	5.5	0.0
Mar	1.1	1.7	2.0	1.5	1.8	4.4	4.0	3.7	6.2	0.0
Apr	1.0	3.1	2.0	2.5	1.6	5.1	5.4	5.3	6.0	0.0
May	1.3	0.8	6.0	0.7	4.8	6.7	7.1	6.9	5.8	0.0
Jun	1.1	0.8	4.0	0.6	2.8	4.4	4.3	4.1	6.1	0.0
Jul	0.2	0.8	13.0	0.6	9.1	9.9	10.0	9.9	6.2	0.0
Aug	0.2	0.8	10.0	0.6	7.0	7.8	8.2	8.1	5.8	0.0
Sep	0.5	0.8	2.0	0.6	1.6	2.8	2.5	2.4	6.2	0.0
Oct	1.0	0.8	0.5	0.7	0.5	2.2	2.5	2.5	6.0	0.0
Total	12.6	9.7	39.5	7.8	29.2	49.5	49.5	48.3		0.8

Leaching Fraction [11]	1.4%
Leaching Requirement [12]	1.5%

NOTES:

Data obtained from the US Department of the Interior Bureau of Recalamation AgriMet LEGW weather station in Legrow, Washington (Bureau of Reclamation, n.d.).

1 Precipitation is the normalized 10-year return values.

2 Gross irrigation = inches of domestic wastewater and fresh water delivered at sprinkler heads.

3 Assumed minimum rooting depth (approximate) from which soil water would be utilized during the crop rotational sequence.

4 Net irrigation = gross irrigation × irrigation efficiency (assumes: 90% for Mar and Oct; 80% for Apr, May and Sep; and 70% for Jun-Aug).

5 Total input = net process water + net fresh water + precipitation (assumes: 90% for Nov-Mar and Oct; 80% for Apr, May and Sep; and 70% for Jun-Aug).

6 Potential evapotranspiration is the average of available data from 2004 through 2014. Estimated evapotranspiration = potential evapotranspiration × (previous month's soil water content ÷ soil water content at field capacity)$^{1/2}$.

7 Total soil water content at field capacity is based on the acreage-weighted average available water capacity plus the acreage-weighted estimate of the water content at permanent wilting point for the assumed rooting depth as determined using the Soil-Plant-Air-Water model (Saxton & Rawls, 2006).

8 Initial soil water content estimated at 90% of the total soil water holding capacity at field capacity.

9 Soil water content predicted = previous month's soil water content + total input - evapotranspiration estimate. Cannot exceed soil water content at field capacity.

10 Percolate loss estimate = soil water in excess of the soil water content at field capacity, which percolates (drains) out of the root zone.
Percolate loss estimate = previous month's soil water content + total water input - evapotranspiration estimate - current month's soil water content.

11 Leaching fraction = percent of gross input estimated to percolate the beyond root zone (total percolate loss ÷ [precipitation + gross irrigation]).

12 Leaching requirement = percolate loss as a percentage of gross input required to manage soil salts to levels that do not impede crop productivity.

Table 14. Design Basis Hydraulic Capacity

Month	Wastewater	Fresh Water	Total
	million gallons		
Nov	0	0	0
Dec	0	0	0
Jan	0	0	0
Feb	0	0	0
Mar	0.82	0.98	1.80
Apr	1.53	0.98	2.51
May	0.40	2.93	3.34
Jun	0.39	1.96	2.35
Jul	0.40	6.35	6.76
Aug	0.40	4.89	5.29
Sep	0.39	0.98	1.37
Oct	0.40	0.24	0.65
Total	**4.75**	**19.31**	**24.05**

NOTES:
Million gallons calculated from the inches of domestic wastewater and fresh water scheduled to all fields within the monthly soil hydraulic budgets based on the design basis crop rotation.
Hydraulic capacity was developed considering crop irrigation and nitrogen requirements.

Table 15. Crop Nitrogen Removal and Capacity

Year	Year 1	Year 2	Year 3	Year 4	Year 5	Design Basis Crop Rotation [1]
	pounds per year					
Crop Nitrogen Removal [2]						
Crop Removal	9,200	9,200	9,200	9,200	5,100	5,100
Site Gross Nitrogen Capacity [3]						
Gross Capacity	10,500	10,500	10,500	10,500	5,800	5,800

NOTES:

All values rounded to the nearest hundred.

1 Design basis crop rotation is the most nitrogen limiting projected crop mixture resulting in the limiting design basis capacity for the land treatment site.

2 Crop nitrogen removal calculated from estimated crop yield and crop tissue nitrogen concentration.

3 Site gross nitrogen capacity is crop nitrogen removal plus the estimated volatilization and denitrification losses.
Site gross nitrogen capacity = crop nitrogen removal ÷ 0.88. Available nitrogen of 88% is calculated using rates based on recommendations in Meisinger and Randall (1991). Formula: [((TKN - ammonia-nitrogen) + (ammonia-nitrogen × 0.85) + (nitrate-nitrogen)) × 0.96] ÷ (TKN + nitrate-nitrogen).
Calculation: [((124 mg/L - 70 mg/L) + (70 mg/L × 0.85) + (0 mg/L)) × 0.80] ÷ (124 mg/L + 0 mg/L).

Table 16. Design Basis Nitrogen Capacity and Operational Analysis

Field	Domestic Wastewater	Fresh Water [1]	Total Load [2]	Minimum N Capacity [3]
pounds nitrogen per year				
11	4,900	10	4,900	5,800
pounds nitrogen per acre per year				
11	**272**	**0.6**	**272**	**322**

NOTES:

All values, except "fresh water", are rounded to the nearest hundred.

Pounds of nitrogen calculated from the inches of domestic wastewater and fresh water scheduled to the land treatment site within monthly soil hydraulic budgets based on the design nitrogen concentration of the domestic wastewater and supplemental fresh irrigation water.

Abbreviations: lb/ac = pounds per acre, mg/L = milligrams per liter, TKN = total Kjeldahl nitrogen.

1 Fresh water nitrogen load accounts for an assumed gaseous losses of 20% due to denitrification.

2 Example total operational load is less than capacity due to crop-dependent agronomic irrigation management considerations such as crop dry-down and harvest periods.

3 Minimum nitrogen capacity is the design basis crop nitrogen removal increased to account for net available domestic wastewater nitrogen after volatilization and denitrification losses. Nitrogen capacity = crop nitrogen removal ÷ 0.88. Available nitrogen of 88% is calculated using rates based on recommendations in Meisinger and Randall (1991).
Formula: [((TKN - ammonia-nitrogen) + (ammonia-nitrogen × 0.85) + (nitrate-nitrogen)) × 0.96] ÷ (TKN + nitrate-nitrogen).
Calculation: [((124 mg/L - 70 mg/L) + (70 mg/L × 0.85) + (0 mg/L)) × 0.80] ÷ (124 mg/L + 0 mg/L).

Table 17. Design Basis Annual Mass Loads

Source	Flow	Total Nitrogen	BOD_5	FDS
	million gallons	pounds		
Domestic Wastewater [1]	4.75	4,900	12,300	15,800
Fresh Water [2]	19.31	10	--	7,200
Total	**24.05**	**4,910**	**12,300**	**23,000**

NOTES:

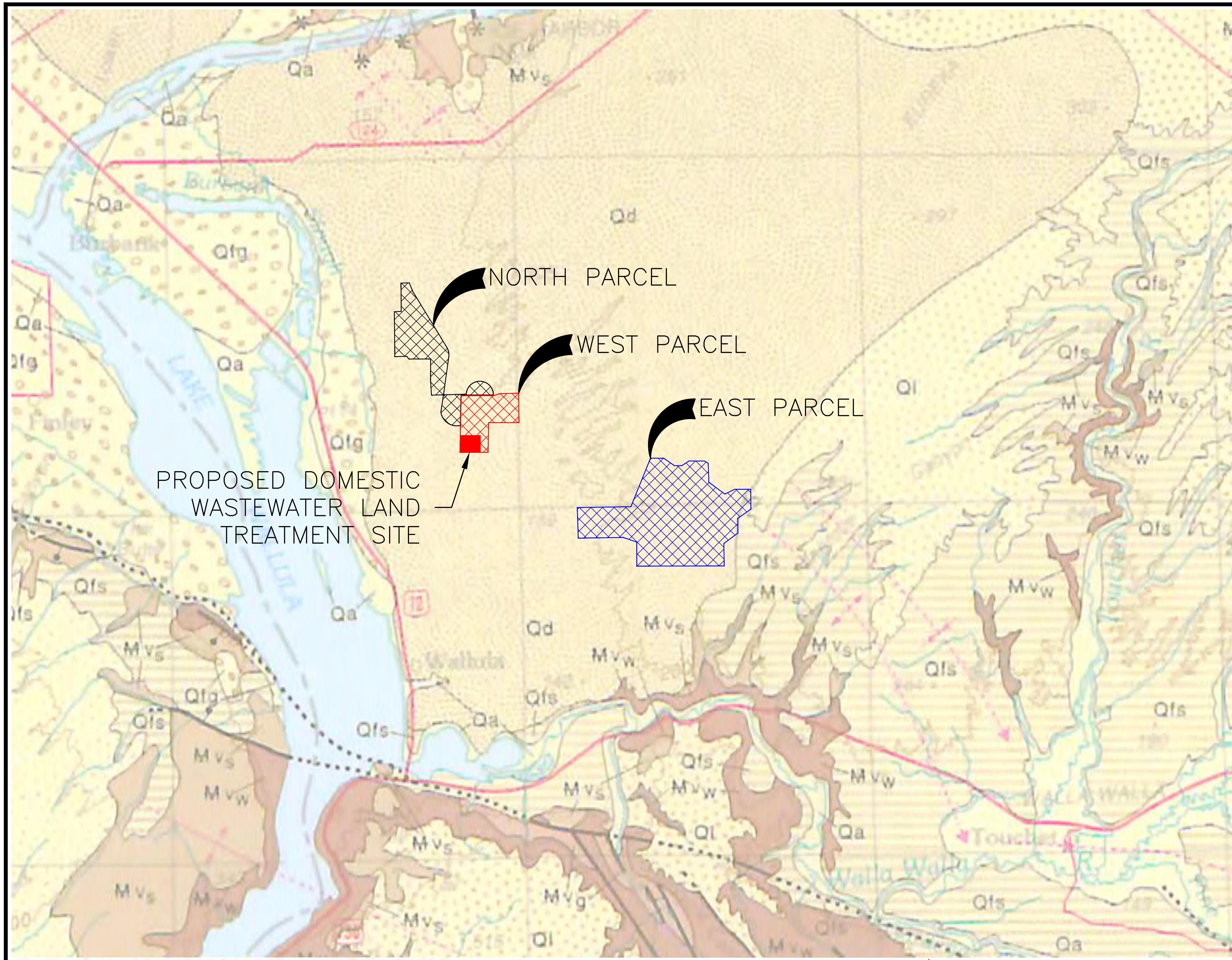
Values rounded to the nearest hundred pounds, except flow.

Abbreviations: "--" = not calculated, BOD_5 = five-day biochemical oxygen demand, FDS = fixed dissolved solids, total nitrogen = (total Kjeldahl nitrogen + nitrite-nitrogen + nitrate-nitrogen).

1 Annual mass loads calculated using the projected average domestic wastewater constitutent concentrations for total nitrogen (124 mg/L), BOD_5 (311 mg/L), FDS (400 mg/L), and flow scheduled to the land treatment site from the monthly soil hydraulic budget.

2 Fresh water mass loads calculated using constitutent concentrations for total nitrogen (0.7 mg/L) and FDS (45 mg/L).

FIGURES



Base compiled from U.S. Geological Survey 1:100,000-scale topographic quadrangles dated 1975-1984
Projection and 10,000 meter grid, zone 11, Universal Transverse Mercator
250,000-foot grid ticks based on Washington coordinate system, south zone
1927 North American Datum

Cartographic design and production by Carl F. T. Harris, Keith G. Ikerd, and Nancy A. Eberle

Geologic Map GM-45
Washington Division of Geology and Earth Resources
Raymond Lasmanis, State Geologist

J. Eric Schuster, Assistant State Geologist and State Geologic Map Project Manager

UNCONSOLIDATED SEDIMENTS

Quaternary Sediments

Periglacial Deposits

Ql — **Loess**—Eolian silt and fine sand; locally includes clay, multiple caliche (pedogenic carbonate, petrocalcic) horizons (stages I to IV of Machette, 1985), paleosols, tephra beds, silcrete, and cambic horizons; predominantly composed of angular quartz grains with lesser amounts of feldspar, mica, and hornblende; in its upper parts the loess displays weakly developed soil profiles and lacks petrocalcic horizons; pale orange, gray-tan, light-brown, tan, yellowish brown, brown, buff, or reddish yellow; massive; typical geomorphic expression is a complex of dunes; dune formation by southwesterly winds is indicated by long, gentle southwest sides and steep northeast sides, by strong northeast alignment of dune long axes, and by uniformly decreasing grain size to the northeast; thickness as much as 75 m near St. John (Rosalia 1:100,000 quadrangle) and Wilcox (Pullman 1:100,000 quadrangle) (Ringe, 1970). Ql/Qfs contact placed arbitrarily at about 900 ft (274 m) elevation in the central and south-central parts of the Walla Walla 1:100,000 quadrangle.

Includes the Palouse Formation.

Qfs — **Outburst flood deposits, silt and sand**—Lacustrine silt and fine sand and fluvial fine to coarse sand; predominantly quartz and feldspar, with basalt grains in coarser sections; discrete tephra layers common; locally contains clastic dikes; stringers of coarse sand and gravel, small-scale cross-bedding, ice-rafted diamicton, and ice-melt structures present locally; locally contains interbedded alluvium, colluvium, and pedogenic horizons; rhythmically bedded; sand-dominated facies typically planar laminated and includes sporadic channel fill sequences; silt-dominated facies planar laminated and ripple cross-laminated, commonly displaying normal graded rhythmites; deposited by relatively low energy slack waters of outburst floods from glacial Lake Missoula and other ice-margin lakes; maximum thickness is more than 20 m in the south-central part of the Priest Rapids 1:100,000 quadrangle on a glacial outburst flood bar; unit is widely distributed in the western part of the map area, particularly in coulees and major river courses at elevations below 1,200 ft (366 m); generally not extensive above about 900 ft (274 m); Ql/Qfs contact placed arbitrarily at about 900 ft (274 m) elevation in the central and south-central parts of the Walla Walla 1:100,000 quadrangle.

Includes flood deposits of glacial Lake Missoula (Bretz and others, 1956; Baker and Bunker, 1985), Touchet Beds, and part of the Hanford formation (Carson and others, 1987).

VOLCANIC ROCKS

M v_s — **Saddle Mountains Basalt**—Basalt flows; predominantly fine- to medium-grained, with some coarse-grained and glassy parts; most phenocrysts consisting of plagioclase, and lesser amounts of olivine phenocrysts and microphenocrysts; lower members and uppermost member normally magnetized, with two of the upper units reversely magnetized; feeder dikes, where known, in west-central Walla Walla and southeastern Priest Rapids 1:100,000 quadrangles (an upper member) or in eastern and (or) southeastern Clarkston 1:100,000 quadrangle (two of the lower members); commonly includes undivided sedimentary interbeds of the Ellensburg Formation (unit Mc) and undivided flows invasive into sedimentary interbeds. See the pamphlet for additional descriptive information.

Consists of the Lower Monumental, Buford, Elephant Mountain, Pomona, Esquatzel, Weissenfels Ridge, Asotin, Wilbur Creek, and Umatilla Members.

M v_w — **Wanapum Basalt**—Basalt flows; fine- to coarse-grained; microphenocrysts, phenocrysts, and glomerocrysts consisting variously of plagioclase, olivine, or, rarely, augite; lower flows of normal magnetic polarity, upper flows reversely magnetized, and middle flows excursional or transitional; feeder dikes in the Clarkston, Connell, Pullman, and Walla Walla 1:100,000 quadrangles and in western Idaho and northeastern Oregon; commonly includes undivided sedimentary interbeds of the Ellensburg Formation (unit Mc) and undivided flows invasive into sedimentary interbeds. See the pamphlet for additional descriptive information.

Consists of the Priest Rapids, Roza, Frenchman Springs, and Eckler Mountain Members.

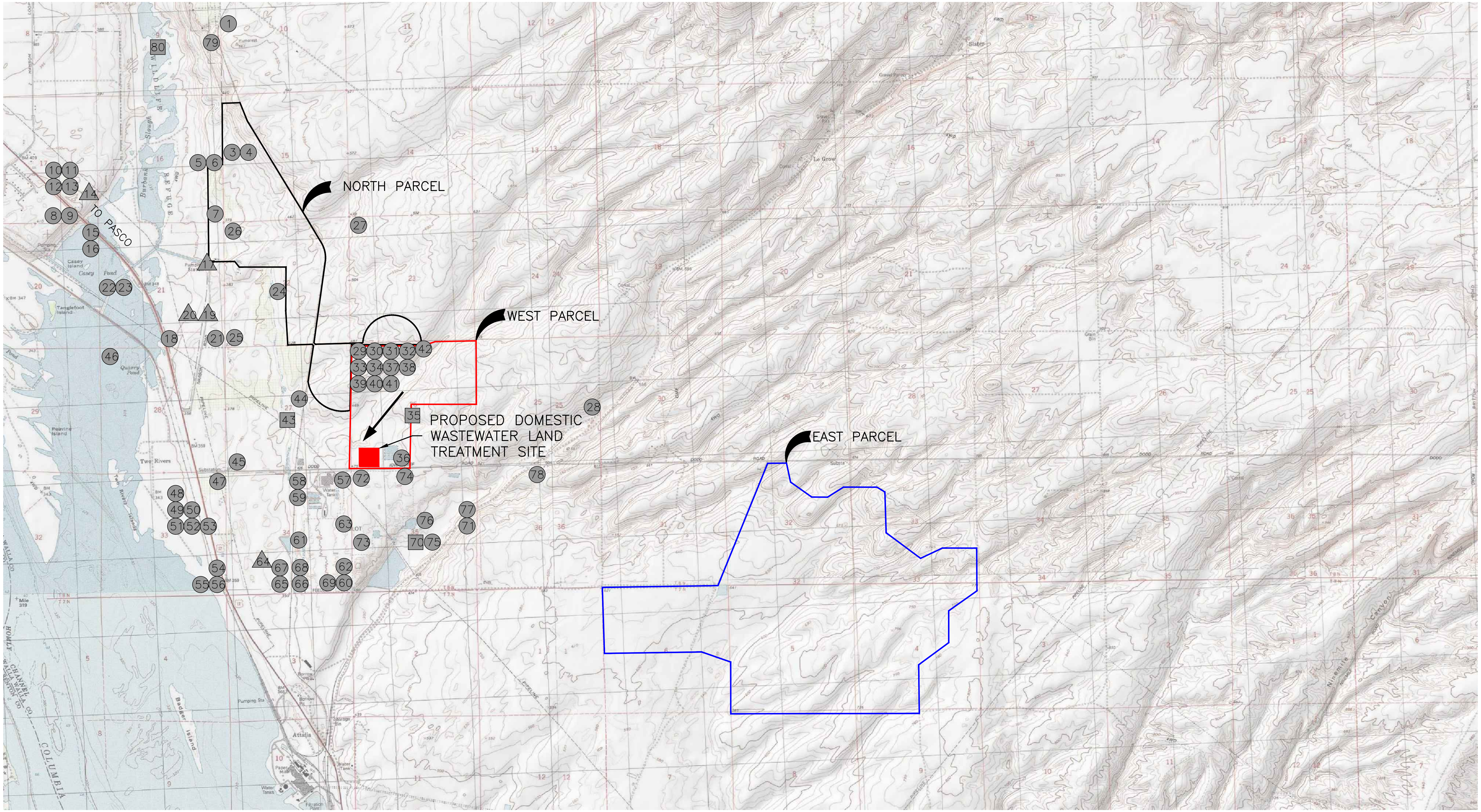
N

0 10,000'
1" = 10,000'
(SCALE AND LOCATIONS ARE APPROXIMATE)

Figure 1. Regional Geologic Map

PROJECT NUMBER: 2020210038	Engineering Report Pasco Beef Complex Domestic Wastewater System
DATE: 8/31/2020	
DWG NO: 2020210038 F1.dwg	Tyson Fresh Meats, Inc. Pasco, Washington
DWG BY: 6NSG / PROJECT MANAGER: 6SLV	
REVISED:	CASCADE EARTH SCIENCES A Valmont Industries Company

S:\[Working Drafting]\2020210038 Anderson Perry\DWG\2020210038 F1.dwg September 24, 2020 NG711452



EXPLANATION:

- WELL LOCATION TO 1/4 – 1/4 OF SECTION
- WELL LOCATION TO 1/4 SECTION
- WELL LOCATION TO SECTION
- GROUNDWATER FLOW DIRECTION

0 4000'
1" = 4000'
(SCALE AND LOCATIONS ARE APPROXIMATE)

N

(SOURCE: USGS 7.5 min Topographic Map 2013 National Geographic Society, i-cubed)

Figure 2. Registered Wells Within 1-Mile of Site

PROJECT NUMBER: 2020210038	Engineering Report Pasco Beef Complex Domestic Wastewater System
DATE: 9/3/2020	
DWG NO: 2020210038 F2.dwg	Tyson Fresh Meats, Inc. Pasco, Washington
DWG BY: 6NSG PROJECT MANAGER: 6SLV	
REVISED:	CES CASCADE EARTH SCIENCES A Valmont Industries Company

S:\[Working Drafting]\2020210038 Anderson Perry\DWG\2020210038 F2.dwg September 3, 2020 NG711452

EXPLANATION:

MW1 382.67 — Monitoring Well Location Static Groundwater Elevation

420 — Groundwater Contour Interval = 20 feet (Dashed where inferred)

Average Hydraulic Gradient = 0.0196 ft/ft

← Groundwater Flow Direction

0 3000'

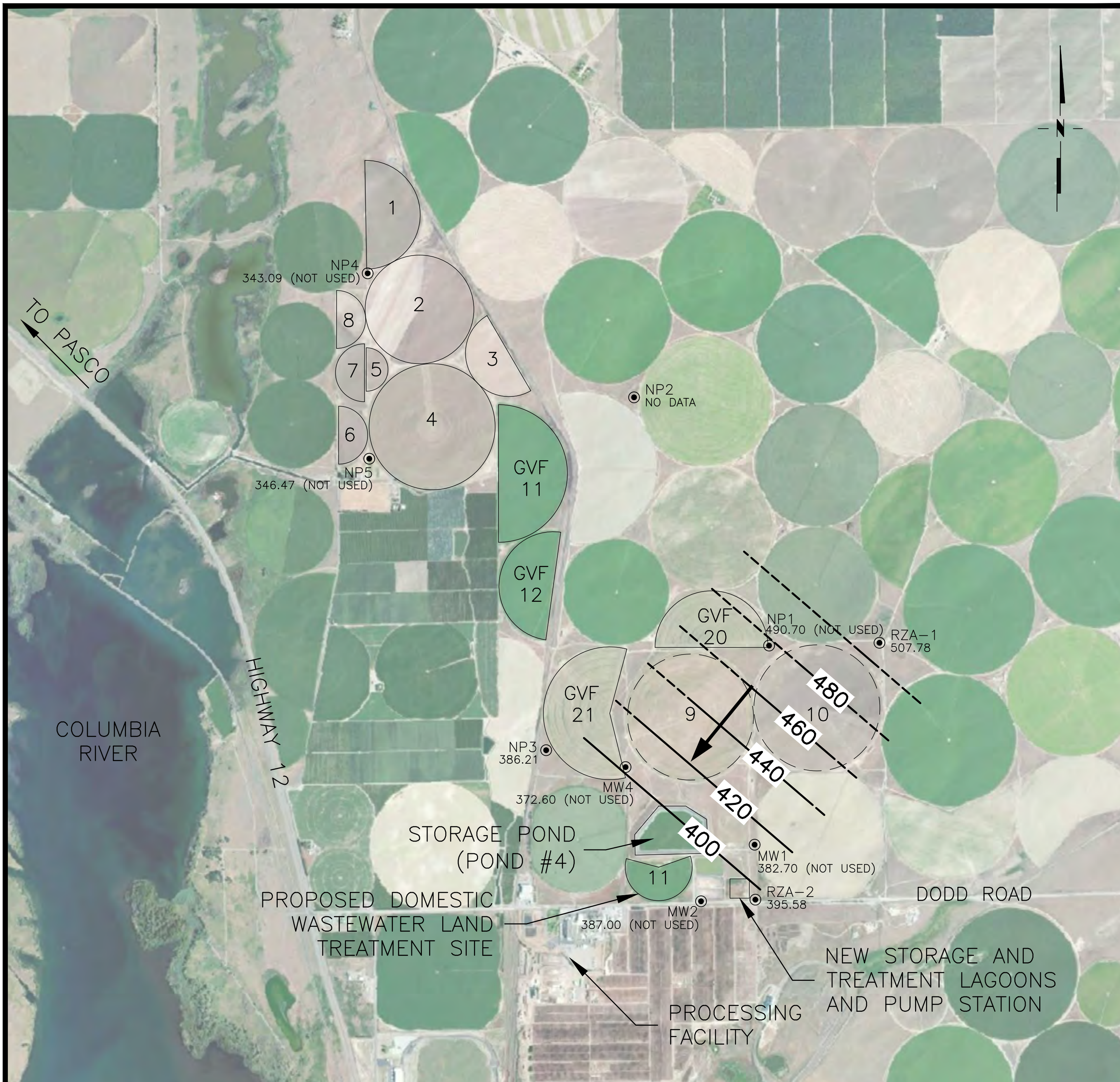
1" = 3000'

(SCALE AND LOCATIONS ARE APPROXIMATE)

Figure 3. Groundwater Flow Map West Parcel – 2nd Quarter 2014

(SOURCE: USGS EARTHSTAR GRAPHICS SIO 2014 MICROSOFT CORPORATION)

PROJECT NUMBER: 2020210038	Engineering Report Pasco Beef Complex Domestic Wastewater System
DATE: 8/31/2020	
DWG NO: 2020210038 F3.dwg	Tyson Fresh Meats, Inc. Pasco, Washington
DWG BY: 6NSG / PROJECT MANAGER: 6SLV	
REVISED:	CES CASCADE EARTH SCIENCES A Valmont Industries Company



EXPLANATION:

MW1 382.70 — Monitoring Well Location Static Groundwater Elevation

—420— Groundwater Contour Interval = 20 feet (Dashed where inferred)

Average Hydraulic Gradient = 0.0197 ft/ft

Groundwater Flow Direction

0 3000'

1" = 3000'

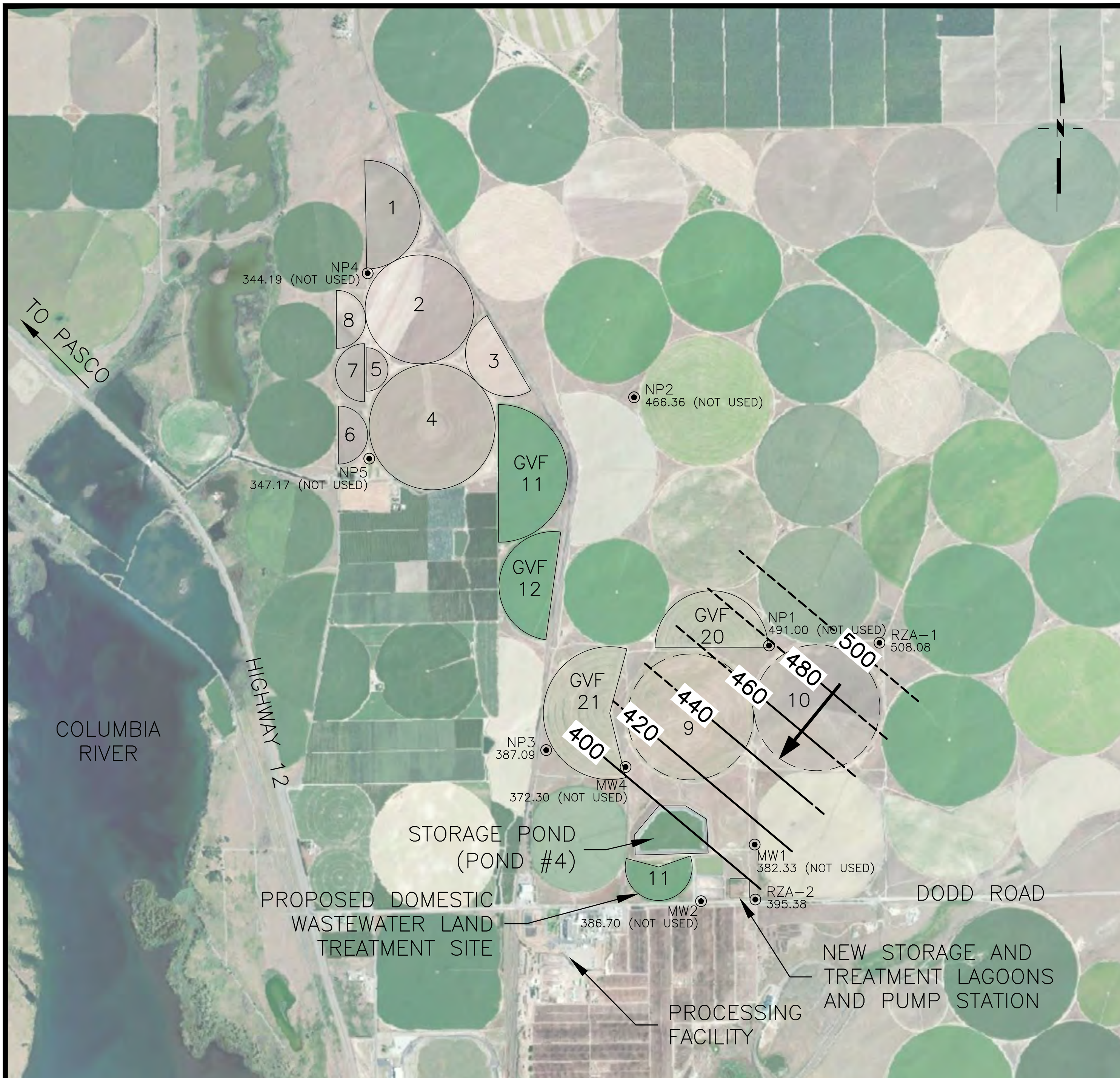
(SCALE AND LOCATIONS ARE APPROXIMATE)

Figure 4. Groundwater Flow Map West Parcel – 3rd Quarter 2014

PROJECT NUMBER: 2020210038	Engineering Report Pasco Beef Complex Domestic Wastewater System
DATE: 8/31/2020	
DWG NO: 2020210038 F4.dwg	Tyson Fresh Meats, Inc. Pasco, Washington
DWG BY: 6NSG / PROJECT MANAGER: 6SLV	
REVISED:	CES CASCADE EARTH SCIENCES A Valmont Industries Company

(SOURCE: USGS EARTHSTAR GRAPHICS SIO 2014 MICROSOFT CORPORATION)

S:\[Working Drafting]\2020210038 Anderson Perry\DWG\2020210038 F4.dwg September 24, 2020 NG711452



EXPLANATION:

MW1 382.33	Monitoring Well Location Static Groundwater Elevation
—420—	Groundwater Contour Interval = 20 feet (Dashed where inferred) Average Hydraulic Gradient = 0.0197 ft/ft
←	Groundwater Flow Direction

0 3000'

1" = 3000'

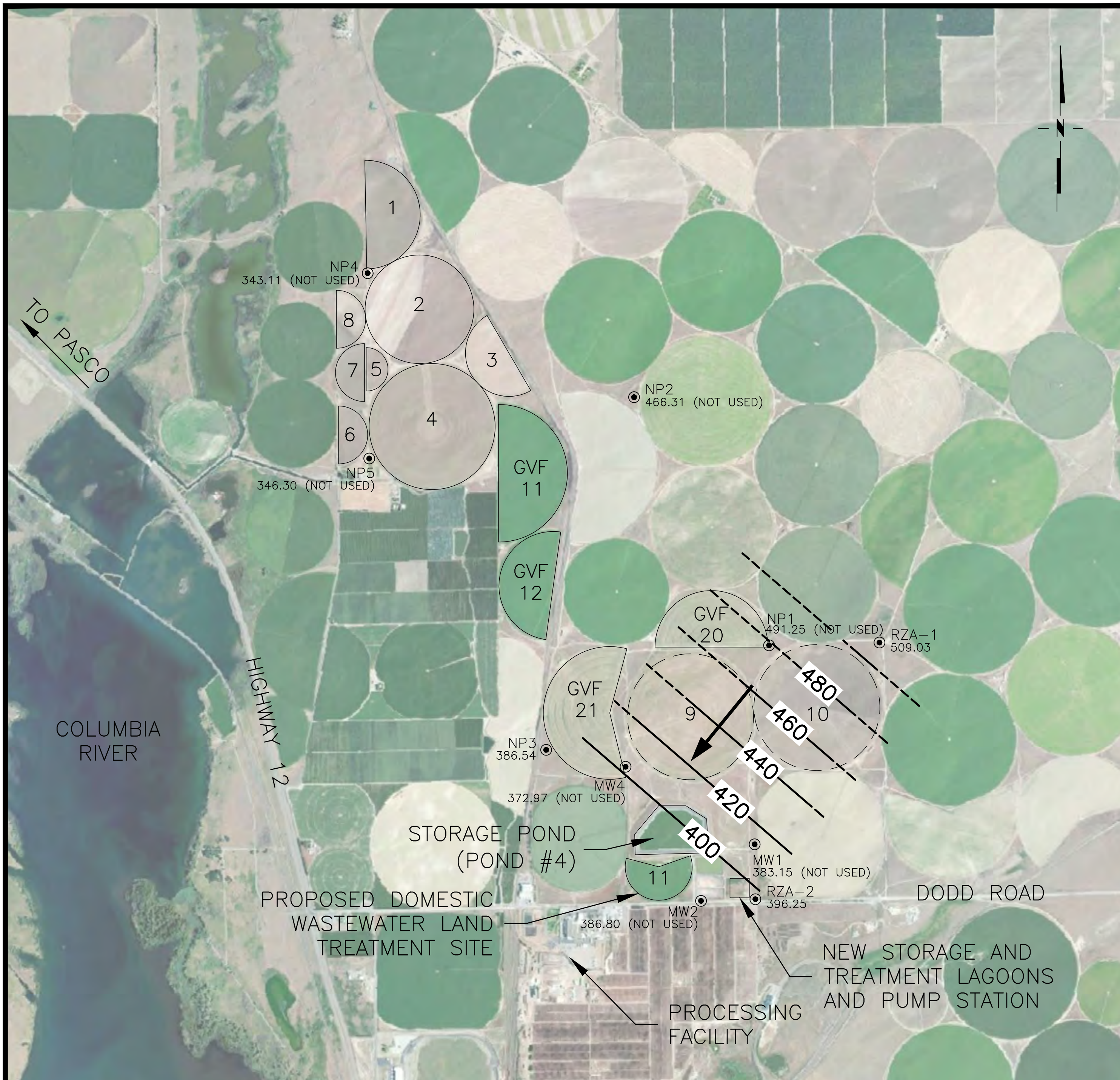
(SCALE AND LOCATIONS ARE APPROXIMATE)

Figure 5. Groundwater Flow Map West Parcel – 4th Quarter 2014

(SOURCE: USGS EARTHSTAR GRAPHICS SIO 2014 MICROSOFT CORPORATION)

PROJECT NUMBER: 2020210038	Engineering Report Pasco Beef Complex Domestic Wastewater System
DATE: 8/31/2020	
DWG NO: 2020210038 F5.dwg	Tyson Fresh Meats, Inc. Pasco, Washington
DWG BY: 6NSG PROJECT MANAGER: 6SLV	
REVISED:	CES CASCADE EARTH SCIENCES A Valmont Industries Company

S:\[Working Drafting]\2020210038 Anderson Perry\DWG\2020210038 F5.dwg September 24, 2020 NG711452



EXPLANATION:

MW1 383.15 — Monitoring Well Location Static Groundwater Elevation

—420— Groundwater Contour Interval = 20 feet (Dashed where inferred)

Average Hydraulic Gradient = 0.0198 ft/ft

← Groundwater Flow Direction

0 3000'

1" = 3000'

(SCALE AND LOCATIONS ARE APPROXIMATE)

Figure 6. Groundwater Flow Map West Parcel – 1st Quarter 2015

(SOURCE: USGS EARTHSTAR GRAPHICS SIO 2014 MICROSOFT CORPORATION)

PROJECT NUMBER: 2020210038	Engineering Report
DATE: 8/31/2020	Pasco Beef Complex Domestic Wastewater System
DWG NO: 2020210038 F6.dwg	Tyson Fresh Meats, Inc.
DWG BY: 6NSG / PROJECT MANAGER: 6SLV	Pasco, Washington
REVISED:	CES CASCADE EARTH SCIENCES A Valmont Industries Company

S:\[Working Drafting]\2020210038 Anderson Perry\DWG\2020210038 F6.dwg September 3, 2020 NG711452

CHARTS

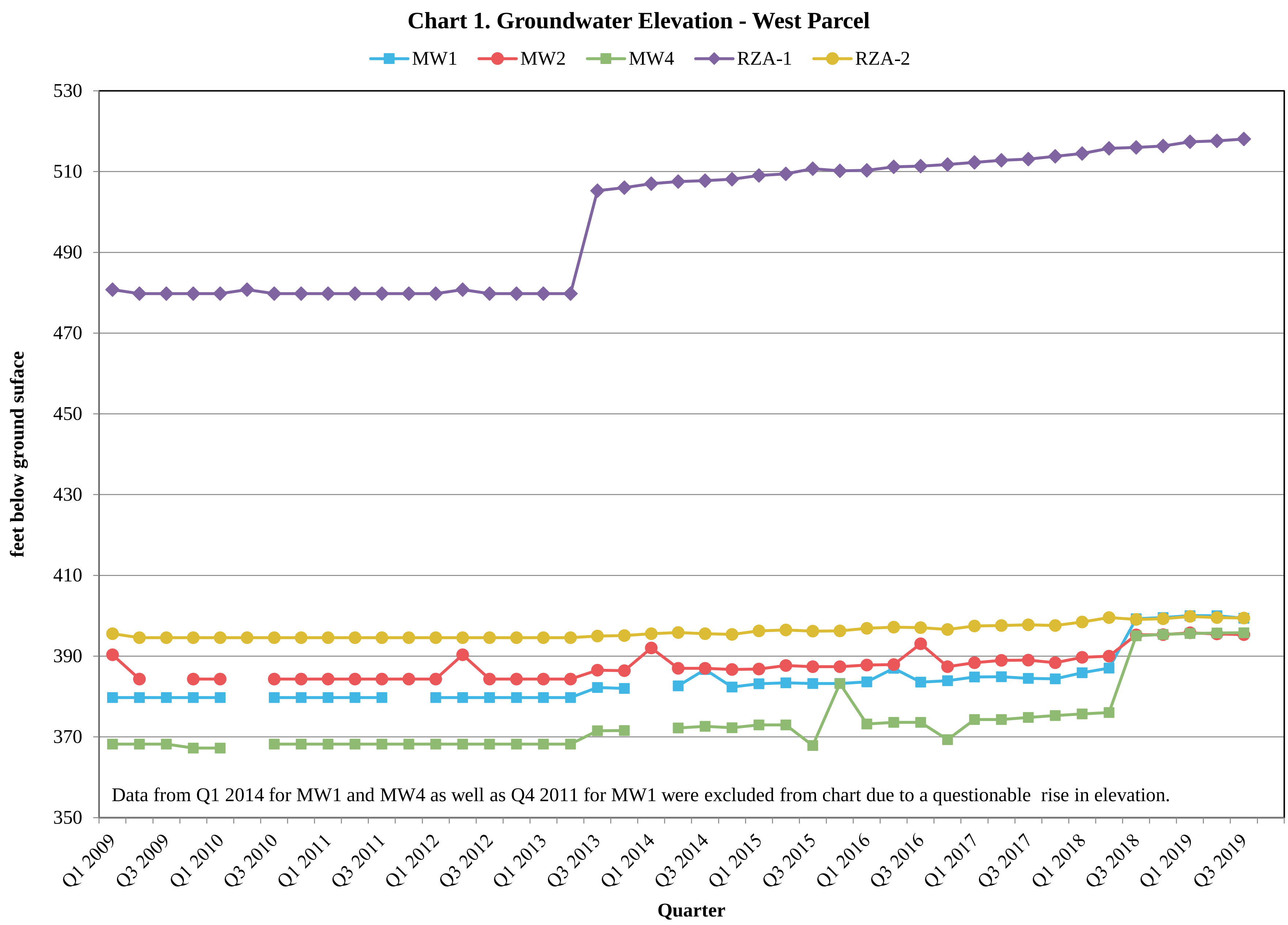


Chart 1. Groundwater Elevation - West Parcel
MW1
MW2
MW4
RZA-1
RZA-2
530
510
490
470
450
430
410
390
370
350
feet below ground suface
Data from Q1 2014 for MW1 and MW4 as well as Q4 2011 for MW1 were excluded from chart due to a questionable rise in elevation.
Q1 2009
Q3 2009
Q1 2010
Q3 2010
Q1 2011
Q3 2011
Q1 2012
Q3 2012
Q1 2013
Q3 2013
Q1 2014
Q3 2014
Q1 2015
Q3 2015
Q1 2016
Q3 2016
Q1 2017
Q3 2017
Q1 2018
Q3 2018
Q1 2019
Q3 2019
Quarter

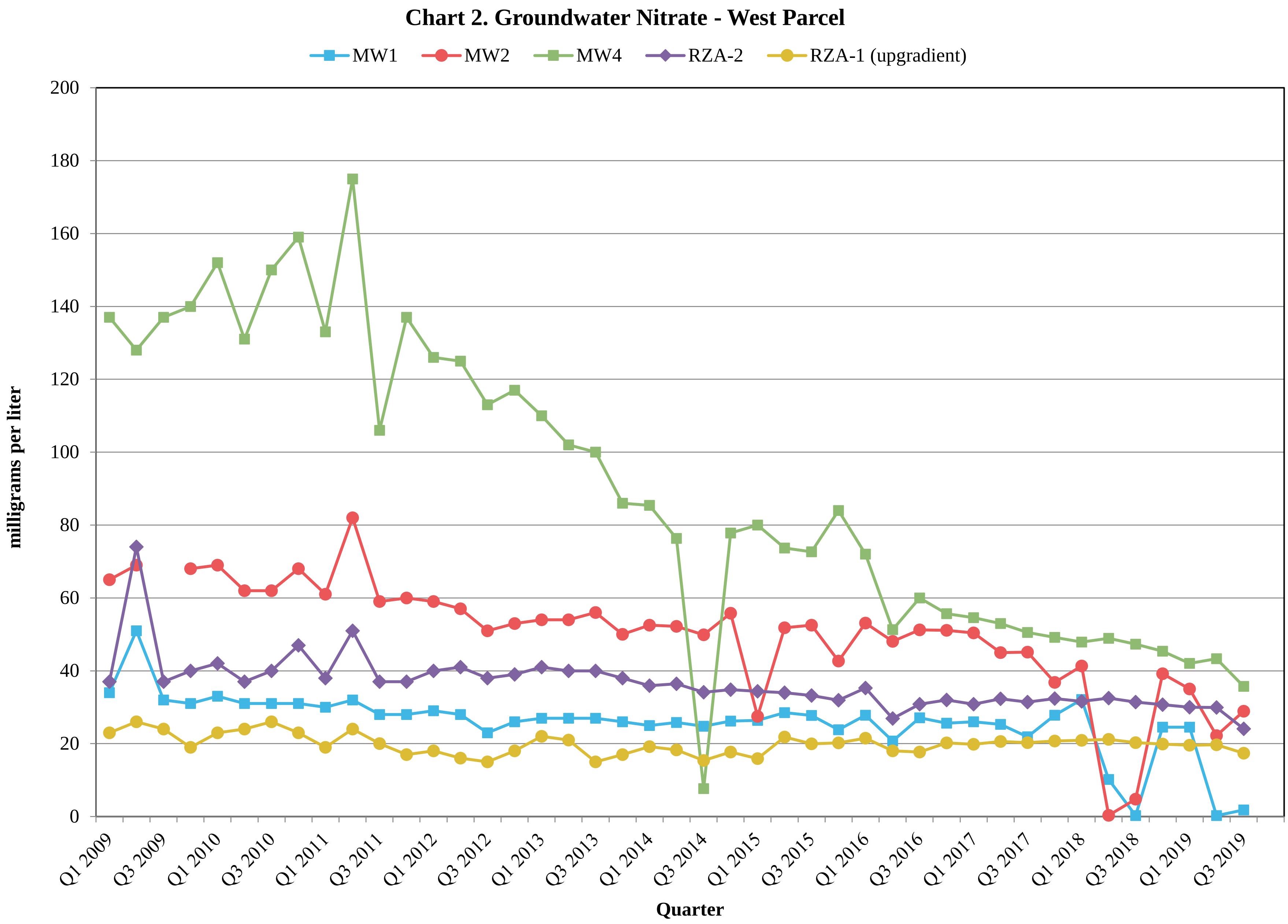
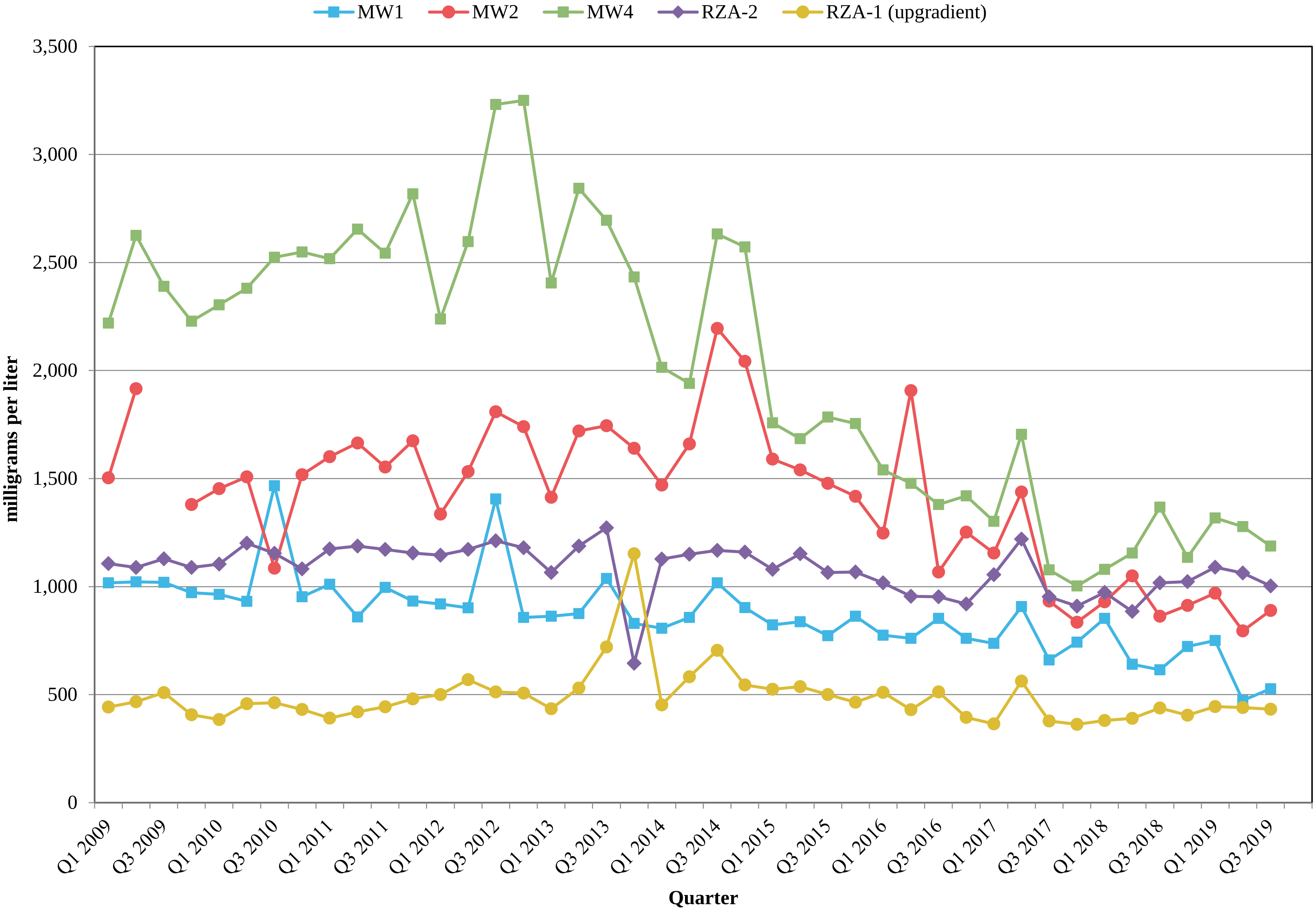


Chart 2. Groundwater Nitrate - West Parcel
MW1
MW2
MW4
RZA-2
RZA-1 (upgradient)
milligrams per liter
0
20
40
60
80
100
120
140
160
180
200
Q1 2009
Q3 2009
Q1 2010
Q3 2010
Q1 2011
Q3 2011
Q1 2012
Q3 2012
Q1 2013
Q3 2013
Q1 2014
Q3 2014
Q1 2015
Q3 2015
Q1 2016
Q3 2016
Q1 2017
Q3 2017
Q1 2018
Q3 2018
Q1 2019
Q3 2019
Quarter

Chart 3. Groundwater Total Dissolved Solids - West Parcel



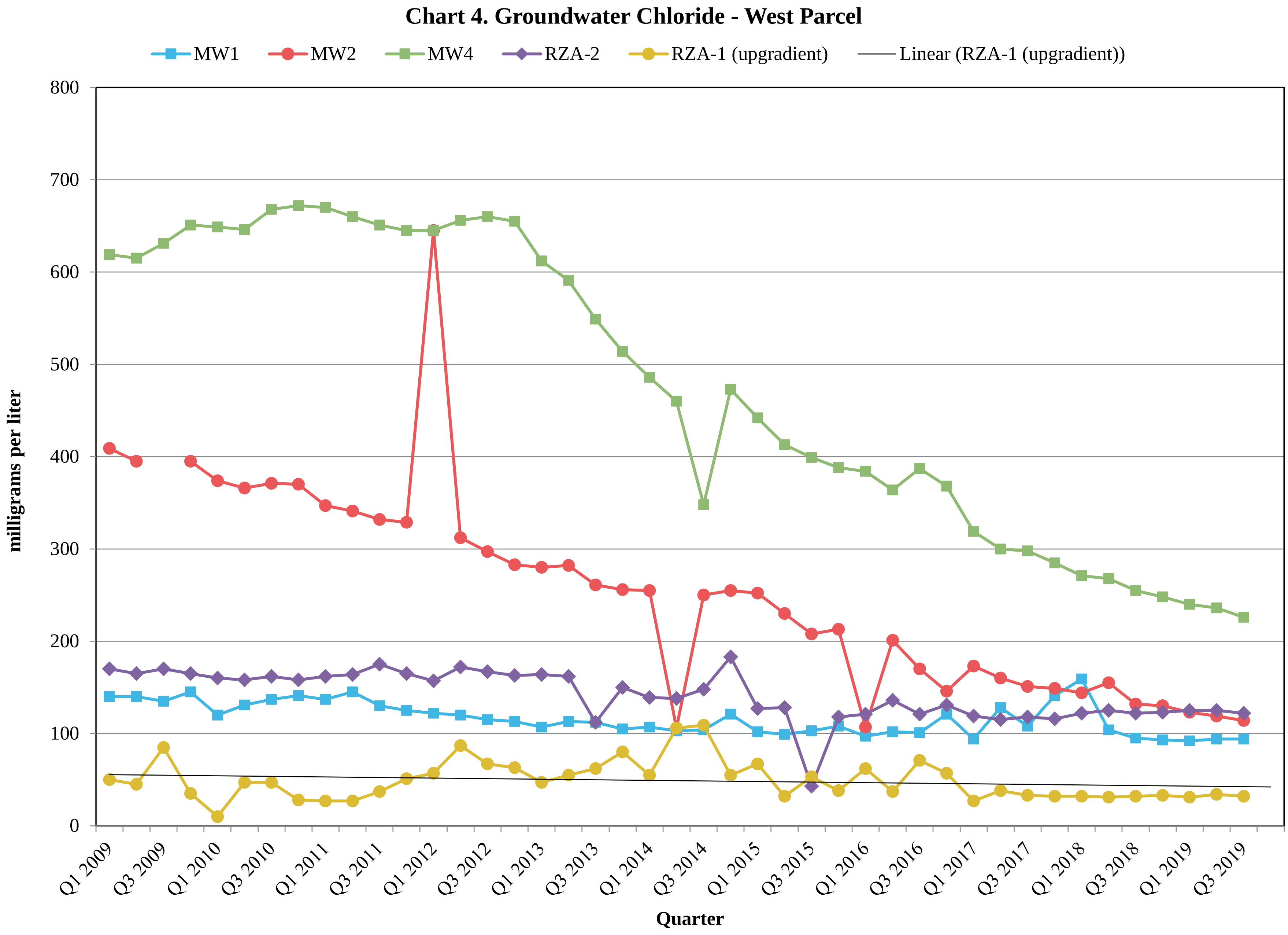


Chart 4. Groundwater Chloride - West Parcel
MW1
MW2
MW4
RZA-2
RZA-1 (upgradient)
Linear (RZA-1 (upgradient))
800
700
600
500
400
300
200
100
0
milligrams per liter
Q1 2009
Q3 2009
Q1 2010
Q3 2010
Q1 2011
Q3 2011
Q1 2012
Q3 2012
Q1 2013
Q3 2013
Q1 2014
Q3 2014
Q1 2015
Q3 2015
Q1 2016
Q3 2016
Q1 2017
Q3 2017
Q1 2018
Q3 2018
Q1 2019
Q3 2019
Quarter

Chart 5. Groundwater Sodium - West Parcel

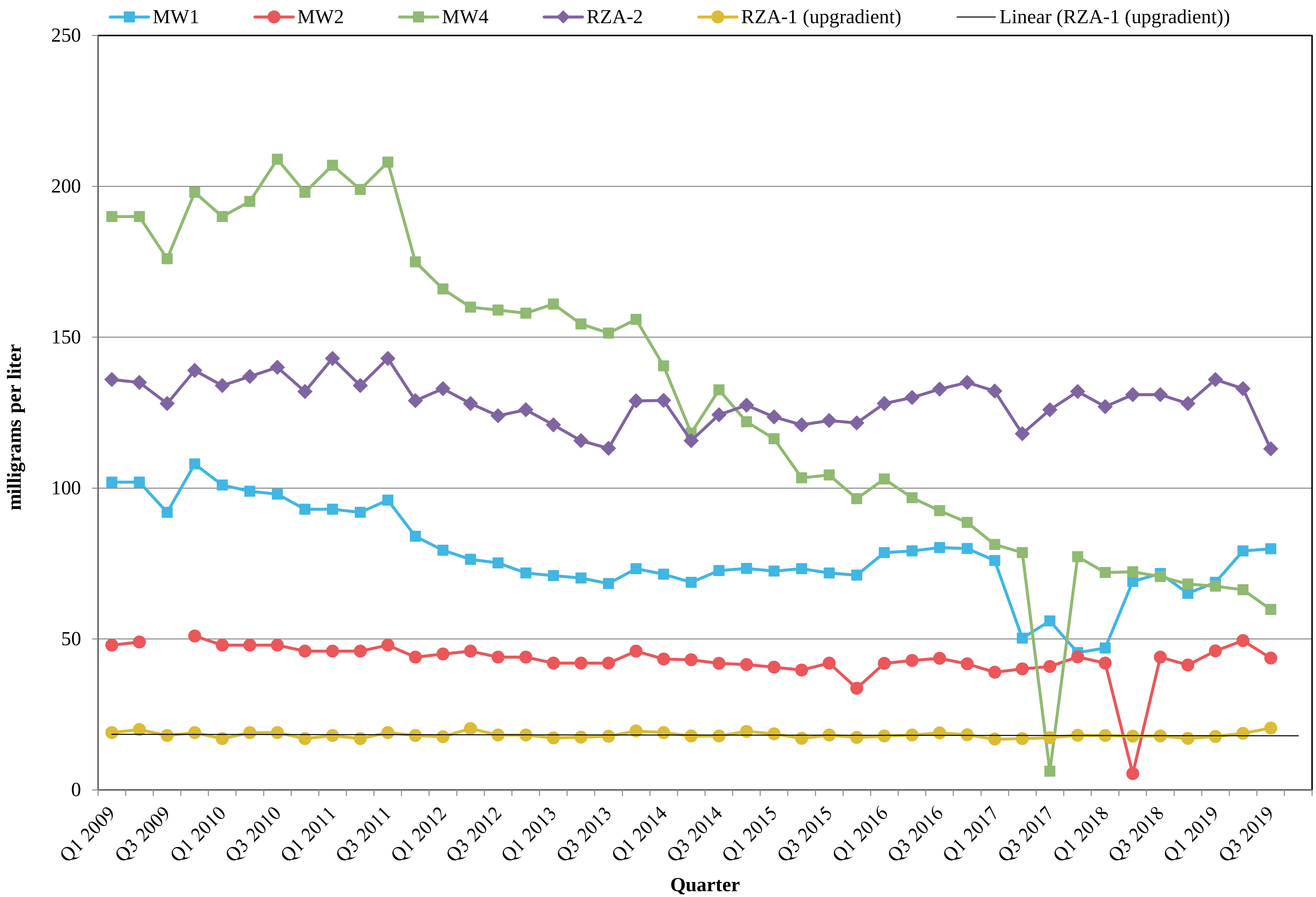
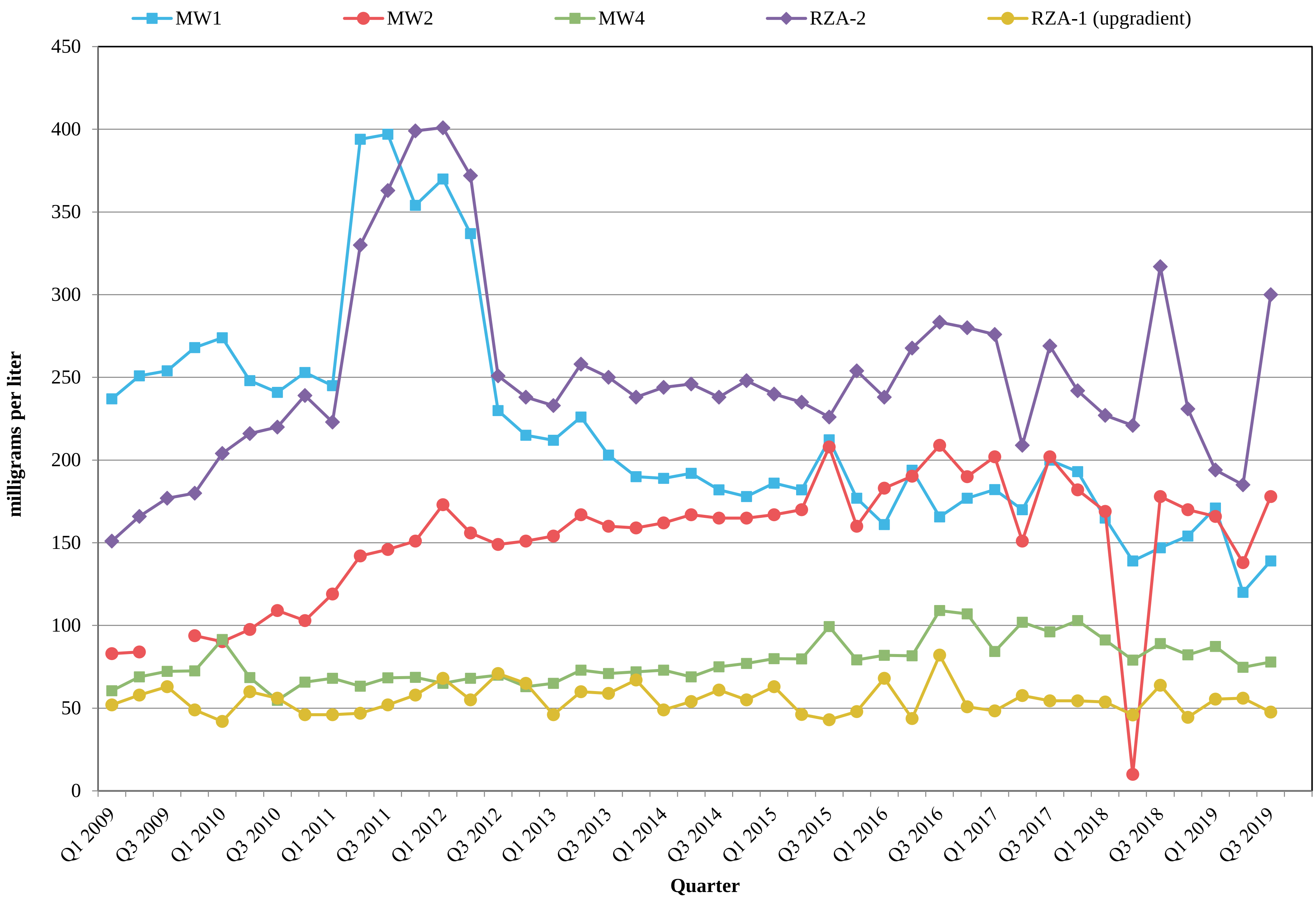


Chart 6. Groundwater Sulfate - West Parcel



APPENDICES

Appendix A.

Design Precipitation with the Ten Wettest Years – 1995 through 2014

Appendix A. Design Precipitation with the Ten Wettest Years - 1995 through 2014

Month	1994-95	2005-06	1995-96	2009-10	1996-97	2011-12	2003-04	2008-09	1999-00	2010-11	Average [1]	Normalized Return Precipitation (Design) [2]
	inches											
Nov	2.75	**0.89**	1.15	0.30	2.58	0.27	0.46	0.89	0.38	0.78	1.02	1.51
Dec	5.21	**2.76**	1.94	0.86	2.11	0.09	1.63	0.92	0.19	2.41	1.37	2.02
Jan	1.39	**1.90**	0.76	1.74	1.41	0.65	1.79	1.23	1.27	0.62	1.07	1.58
Feb	0.47	**0.30**	1.54	0.53	0.30	0.61	0.83	0.85	1.44	0.45	0.64	0.95
Mar	1.37	**0.72**	1.34	0.32	0.69	1.29	0.17	1.94	1.12	1.13	0.75	1.11
Apr	1.73	**1.60**	0.59	0.84	0.86	1.34	0.51	0.51	0.30	0.39	0.69	1.02
May	0.64	**2.45**	1.33	1.33	0.50	0.58	1.07	0.64	0.97	1.71	0.85	1.26
Jun	1.48	**1.25**	0.72	1.41	0.45	1.98	1.26	0.40	0.68	0.18	0.73	1.08
Jul	0.39	**0.01**	0.34	0.28	0.27	0.81	0.00	0.17	0.08	0.00	0.16	0.24
Aug	0.19	**0.00**	0.00	0.28	0.05	0.09	0.58	0.11	0.00	0.10	0.16	0.24
Sep	0.53	**0.29**	0.22	1.44	0.49	0.00	0.26	0.13	0.74	0.01	0.37	0.55
Oct	0.91	**0.42**	1.25	1.47	1.07	1.48	0.46	1.16	1.42	0.63	0.71	1.05
Winter [3]	11.19	**6.57**	6.73	3.75	7.09	2.91	4.88	5.83	4.40	5.39	4.85	5.66
Annual [4]	17.06	**12.59**	11.18	10.80	10.78	9.19	9.02	8.95	8.59	8.41	8.52	12.59

NOTES:

All data obtained from the US Department of the Interior Bureau of Reclamation AgriMet LEGW weather station in Legrow, Washington for 1995-2014. (Bureau of Reclamation, n.d.).

1 Average precipitation by month for 1995 through 2014 at the LEGW weather station in Legrow, Washington.

2 The average precipitation is based on actual monthly precipitation from the years with sufficient data from 1995 through 2014 at the LEGW weather station in Legrow, Washington. The 2nd highest total annual precipitation out of 20 years with sufficient data were normalized in relation to the long term average for each month to create the 10-year return precipitation data for planning purposes.

3 Winter period assumes December through February.

4 Annual precipitation is based on land treatment operating year November through October.

Appendix B.

Web Soil Survey Results

United States Department of Agriculture

NRCS

Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for

Walla Walla County Area, Washington

September 1, 2020

Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (https://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

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Contents

How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

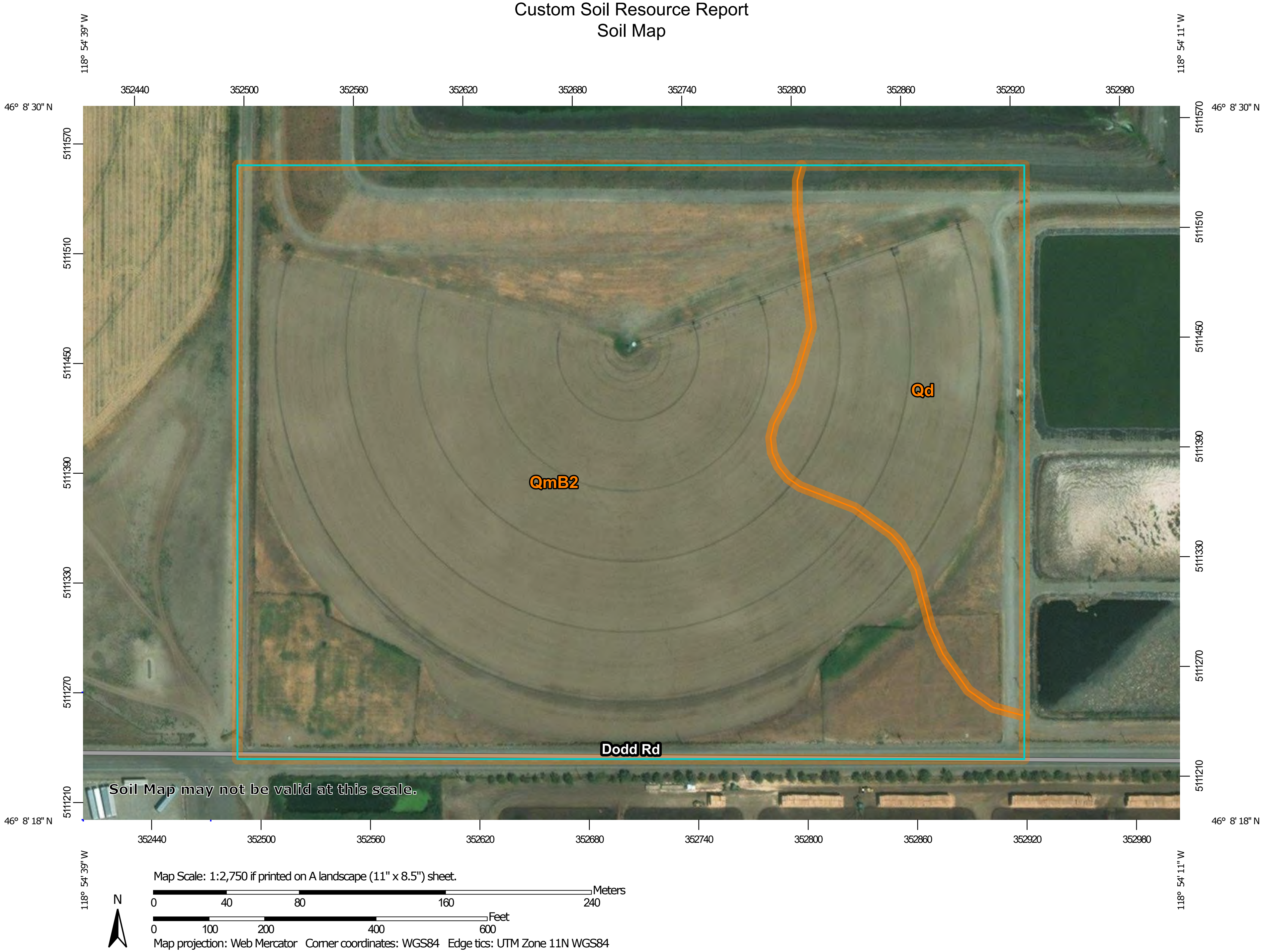
Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Custom Soil Resource Report
Soil Map



MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features

- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features

- Streams and Canals

Transportation

- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background

- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:31,700.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Walla Walla County Area, Washington
Survey Area Data: Version 5, Jun 4, 2020

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Jun 28, 2014—Sep 11, 2016

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
Qd	Quincy-Duneland complex	7.2	20.8%
QmB2	Quincy loamy fine sand, moderately deep over coarse sand, 0 to 8 percent, eroded	27.5	79.2%
Totals for Area of Interest		**34.8**	**100.0%**

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Walla Walla County Area, Washington

Qd—Quincy-Duneland complex

Map Unit Setting

National map unit symbol: 2d8s
Elevation: 200 to 4,500 feet
Mean annual precipitation: 6 to 12 inches
Mean annual air temperature: 46 to 54 degrees F
Frost-free period: 100 to 200 days
Farmland classification: Not prime farmland

Map Unit Composition

Quincy and similar soils: 60 percent
Quincy and similar soils: 30 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Quincy

Setting

Landform: Terraces
Landform position (three-dimensional): Tread
Parent material: Granite and basalt reworked eolian sands

Typical profile

H1 - 0 to 15 inches: fine sand
H2 - 15 to 60 inches: loamy fine sand, fine sand
H2 - 15 to 60 inches:

Properties and qualities

Slope: 0 to 10 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Excessively drained
Capacity of the most limiting layer to transmit water (Ksat): High to very high (5.95 to 19.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 5 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water capacity: High (about 10.5 inches)

Interpretive groups

Land capability classification (irrigated): 4s
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: A
Ecological site: R007XY502WA - SANDS 6-10 PZ
Hydric soil rating: No

Description of Quincy

Setting

Landform: Terraces
Landform position (three-dimensional): Tread
Parent material: Granite and basalt reworked eolian sands

Typical profile

H1 - 0 to 4 inches: sand
H2 - 4 to 60 inches: loamy fine sand, fine sand, sand
H2 - 4 to 60 inches:
H2 - 4 to 60 inches:

Properties and qualities

Slope: 0 to 10 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Excessively drained
Capacity of the most limiting layer to transmit water (Ksat): High to very high (5.95 to 19.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 5 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water capacity: Very high (about 17.2 inches)

Interpretive groups

Land capability classification (irrigated): 4s
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: A
Ecological site: R007XY502WA - SANDS 6-10 PZ
Hydric soil rating: No

QmB2—Quincy loamy fine sand, moderately deep over coarse sand, 0 to 8 percent, eroded

Map Unit Setting

National map unit symbol: 2d8w
Elevation: 300 to 1,100 feet
Mean annual precipitation: 6 to 10 inches
Mean annual air temperature: 46 to 54 degrees F
Frost-free period: 160 to 200 days
Farmland classification: Not prime farmland

Map Unit Composition

Quincy and similar soils: 100 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Quincy

Setting

Landform: Terraces
Landform position (three-dimensional): Tread
Parent material: Granite and basalt reworked eolian sands

Typical profile

H1 - 0 to 34 inches: loamy fine sand

H2 - 34 to 60 inches: loamy fine sand

Properties and qualities

Slope: 0 to 8 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Excessively drained
Capacity of the most limiting layer to transmit water (Ksat): High to very high (5.95 to 19.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 10 percent
Available water capacity: Low (about 5.2 inches)

Interpretive groups

Land capability classification (irrigated): 4s
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: A
Ecological site: R007XY502WA - SANDS 6-10 PZ
Hydric soil rating: No

Soil Information for All Uses

Soil Reports

The Soil Reports section includes various formatted tabular and narrative reports (tables) containing data for each selected soil map unit and each component of each unit. No aggregation of data has occurred as is done in reports in the Soil Properties and Qualities and Suitabilities and Limitations sections.

The reports contain soil interpretive information as well as basic soil properties and qualities. A description of each report (table) is included.

Soil Physical Properties

This folder contains a collection of tabular reports that present soil physical properties. The reports (tables) include all selected map units and components for each map unit. Soil physical properties are measured or inferred from direct observations in the field or laboratory. Examples of soil physical properties include percent clay, organic matter, saturated hydraulic conductivity, available water capacity, and bulk density.

Physical Soil Properties

This table shows estimates of some physical characteristics and features that affect soil behavior. These estimates are given for the layers of each soil in the survey area. The estimates are based on field observations and on test data for these and similar soils.

Depth to the upper and lower boundaries of each layer is indicated.

Particle size is the effective diameter of a soil particle as measured by sedimentation, sieving, or micrometric methods. Particle sizes are expressed as classes with specific effective diameter class limits. The broad classes are sand, silt, and clay, ranging from the larger to the smaller.

Sand as a soil separate consists of mineral soil particles that are 0.05 millimeter to 2 millimeters in diameter. In this table, the estimated sand content of each soil layer is given as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

Silt as a soil separate consists of mineral soil particles that are 0.002 to 0.05 millimeter in diameter. In this table, the estimated silt content of each soil layer is given as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

Clay as a soil separate consists of mineral soil particles that are less than 0.002 millimeter in diameter. In this table, the estimated clay content of each soil layer is given as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The content of sand, silt, and clay affects the physical behavior of a soil. Particle size is important for engineering and agronomic interpretations, for determination of soil hydrologic qualities, and for soil classification.

The amount and kind of clay affect the fertility and physical condition of the soil and the ability of the soil to adsorb cations and to retain moisture. They influence shrink-swell potential, saturated hydraulic conductivity (Ksat), plasticity, the ease of soil dispersion, and other soil properties. The amount and kind of clay in a soil also affect tillage and earthmoving operations.

Moist bulk density is the weight of soil (ovendry) per unit volume. Volume is measured when the soil is at field moisture capacity, that is, the moisture content at 1/3- or 1/10-bar (33kPa or 10kPa) moisture tension. Weight is determined after the soil is dried at 105 degrees C. In the table, the estimated moist bulk density of each soil horizon is expressed in grams per cubic centimeter of soil material that is less than 2 millimeters in diameter. Bulk density data are used to compute linear extensibility, shrink-swell potential, available water capacity, total pore space, and other soil properties. The moist bulk density of a soil indicates the pore space available for water and roots. Depending on soil texture, a bulk density of more than 1.4 can restrict water storage and root penetration. Moist bulk density is influenced by texture, kind of clay, content of organic matter, and soil structure.

Saturated hydraulic conductivity (Ksat) refers to the ease with which pores in a saturated soil transmit water. The estimates in the table are expressed in terms of micrometers per second. They are based on soil characteristics observed in the field, particularly structure, porosity, and texture. Saturated hydraulic conductivity (Ksat) is considered in the design of soil drainage systems and septic tank absorption fields.

Available water capacity refers to the quantity of water that the soil is capable of storing for use by plants. The capacity for water storage is given in inches of water per inch of soil for each soil layer. The capacity varies, depending on soil properties that affect retention of water. The most important properties are the content of organic matter, soil texture, bulk density, and soil structure. Available water capacity is an important factor in the choice of plants or crops to be grown and in the design and management of irrigation systems. Available water capacity is not an estimate of the quantity of water actually available to plants at any given time.

Linear extensibility refers to the change in length of an unconfined clod as moisture content is decreased from a moist to a dry state. It is an expression of the volume change between the water content of the clod at 1/3- or 1/10-bar tension (33kPa or 10kPa tension) and oven dryness. The volume change is reported in the table as percent change for the whole soil. The amount and type of clay minerals in the soil influence volume change.

Linear extensibility is used to determine the shrink-swell potential of soils. The shrink-swell potential is low if the soil has a linear extensibility of less than 3 percent; moderate if 3 to 6 percent; high if 6 to 9 percent; and very high if more than 9 percent. If the linear extensibility is more than 3, shrinking and swelling can cause damage to buildings, roads, and other structures and to plant roots. Special design commonly is needed.

Organic matter is the plant and animal residue in the soil at various stages of decomposition. In this table, the estimated content of organic matter is expressed as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter. The content of organic matter in a soil can be maintained by returning crop residue to the soil.

Organic matter has a positive effect on available water capacity, water infiltration, soil organism activity, and tilth. It is a source of nitrogen and other nutrients for crops and soil organisms.

Erosion factors are shown in the table as the K factor (Kw and Kf) and the T factor. Erosion factor K indicates the susceptibility of a soil to sheet and rill erosion by water. Factor K is one of six factors used in the Universal Soil Loss Equation (USLE) and the Revised Universal Soil Loss Equation (RUSLE) to predict the average annual rate of soil loss by sheet and rill erosion in tons per acre per year. The estimates are based primarily on percentage of silt, sand, and organic matter and on soil structure and Ksat. Values of K range from 0.02 to 0.69. Other factors being equal, the higher the value, the more susceptible the soil is to sheet and rill erosion by water.

Erosion factor Kw indicates the erodibility of the whole soil. The estimates are modified by the presence of rock fragments.

Erosion factor Kf indicates the erodibility of the fine-earth fraction, or the material less than 2 millimeters in size.

Erosion factor T is an estimate of the maximum average annual rate of soil erosion by wind and/or water that can occur without affecting crop productivity over a sustained period. The rate is in tons per acre per year.

Wind erodibility groups are made up of soils that have similar properties affecting their susceptibility to wind erosion in cultivated areas. The soils assigned to group 1 are the most susceptible to wind erosion, and those assigned to group 8 are the least susceptible. The groups are described in the "National Soil Survey Handbook."

Wind erodibility index is a numerical value indicating the susceptibility of soil to wind erosion, or the tons per acre per year that can be expected to be lost to wind erosion. There is a close correlation between wind erosion and the texture of the surface layer, the size and durability of surface clods, rock fragments, organic matter, and a calcareous reaction. Soil moisture and frozen soil layers also influence wind erosion.

Reference:
United States Department of Agriculture, Natural Resources Conservation Service. National soil survey handbook, title 430-VI. (http://soils.usda.gov)

Three values are provided to identify the expected Low (L), Representative Value (R), and High (H).

Physical Soil Properties–Walla Walla County Area, Washington														
Map symbol and soil name	Depth	Sand	Silt	Clay	Moist bulk density	Saturated hydraulic conductivity	Available water capacity	Linear extensibility	Organic matter	Erosion factors			Wind erodibility group	Wind erodibility index
										Kw	Kf	T		
	In	*Pct*	*Pct*	*Pct*	*g/cc*	*micro m/sec*	*In/In*	*Pct*	*Pct*					
Qd—Quincy-Duneland complex														
Quincy	0-15	-96-	- 1-	1- 4- 6	1.45-1.53-1.60	42.00-92.00-141.00	0.08-0.10-0.11	0.0- 1.5- 2.9	0.5- 0.8-1.0	.02	.02	5	1	250
	15-60	-79-	-17-	1- 4- 7	1.50-1.60-1.70	42.00-92.00-141.00	0.08-0.10-0.12	0.0- 1.5- 2.9	0.0- 0.3-0.5	.32	.32			
Quincy	0-4	-95-	- 2-	1- 4- 6	1.45-1.53-1.60	42.00-92.00-141.00	0.08-0.10-0.11	0.0- 1.5- 2.9	0.5- 0.8-1.0	.02	.02	5	1	220
	4-60	-79-	-17-	1- 4- 7	1.50-1.60-1.70	42.00-92.00-141.00	0.08-0.10-0.12	0.0- 1.5- 2.9	0.0- 0.3-0.5	.32	.32			
QmB2—Quincy loamy fine sand, moderately deep over coarse sand, 0 to 8 percent, eroded														
Quincy	0-34	-81-	-17-	0- 3- 5	1.30-1.38-1.45	42.00-92.00-141.00	0.09-0.10-0.10	0.0- 1.5- 2.9	0.8- 0.9-1.0	.24	.24	5	2	134
	34-60	-81-	-17-	0- 3- 5	1.45-1.53-1.60	42.00-92.00-141.00	0.05-0.07-0.09	0.0- 1.5- 2.9	0.0- 0.1-0.1	.20	.37			

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Appendix C.

Monitoring Well Logs

File Original and First Copy with Department of Ecology
Second Copy — Owner's Copy
Third Copy — Driller's Copy

WATER WELL REPORT
STATE OF WASHINGTON

Application No. ....
Permit No. ....

(1) OWNER: Name IOWA Beef Address Wallula WA

(2) LOCATION OF WELL: County Walla Walla — NW¼ NW¼ Sec. 26 T. 8 N., R. 31 W.M.
Bearing and distance from section or subdivision corner Well #1

(3) PROPOSED USE: Domestic ☐ Industrial ☐ Municipal ☐ Irrigation ☐ Test Well ☒ Other ☐

(4) TYPE OF WORK: Owner's number of well (if more than one) 1
New well ☒ Deepened ☐ Reconditioned ☐
Method: Dug ☐ Cable ☒ Rotary ☐ Bored ☐ Driven ☐ Jetted ☐

(5) DIMENSIONS: Diameter of well 6 inches.
Drilled 244 ft. Depth of completed well 244 ft.

(6) CONSTRUCTION DETAILS:

Casing installed: 6" Diam. from 0 ft. to 185½ ft.
Threaded ☐ 5" Diam. from 182 ft. to 244 ft.
Welded ☒ ......" Diam. from ...... ft. to ...... ft.

Perforations: Yes ☒ No ☐
Type of perforator used Mills Knife
SIZE of perforations ...... in. by ...... in.
6 perf/ft perforations from 130 ft. to 150 ft.
...... perforations from ...... ft. to ...... ft.
...... perforations from ...... ft. to ...... ft.

Screens: Yes ☐ No ☒
Manufacturer's Name ......
Type ...... Model No. ......
Diam. ...... Slot size ...... from ...... ft. to ...... ft.
Diam. ...... Slot size ...... from ...... ft. to ...... ft.

Gravel packed: Yes ☐ No ☒ Size of gravel: ......
Gravel placed from ...... ft. to ...... ft.

Surface seal: Yes ☒ No ☐ To what depth? 30 ft.
Material used in seal Bentonite (cement top 2 ft)
Did any strata contain unusable water? Yes ☐ No ☒
Type of water? ...... Depth of strata ......
Method of sealing strata off ......

(7) PUMP: Manufacturer's Name ......
Type: ...... H.P. ......

(8) WATER LEVELS: Land-surface elevation above mean sea level 487 ft.
Static level 135 ft. below top of well Date 7-25-80
Artesian pressure ...... lbs. per square inch Date ......
Artesian water is controlled by ...... (Cap, valve, etc.)

(9) WELL TESTS: Drawdown is amount water level is lowered below static level
Was a pump test made? Yes ☐ No ☒ If yes, by whom? ......
Yield: ...... gal./min. with ...... ft. drawdown after ...... hrs.
" " " "
" " " "

Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level

Date of test ......
Bailer test ...... gal./min. with ...... ft. drawdown after ...... hrs.
Artesian flow ...... g.p.m. Date ......
Temperature of water ...... Was a chemical analysis made? Yes ☐ No ☒

(10) WELL LOG:

Formation: *Describe by color, character, size of material and structure, and show thickness of aquifers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of formation.*

MATERIAL	FROM	TO
Silty Brown Sand	0	64
Silty Brown Sand with thin layers of caliche	64	67
Silt, gravels ½" minus	67	70
Silt, thin layers of caliche	70	75
Silt	75	85
Silty Sand (brown)	85	92
Silt, sand, thin layers of caliche	92	95
Silty Brown Sand	95	118
Sand (Brown) gravel and cobbels 5 inch minus	118	123
gravel, cobbels 5 inch minus	123	135
Ringold gravel	135	180
black sand	180	185
basalt boulders	185	195
basalt sand + gravel	195	234
basalt	234	244

RECEIVED
AUG 13 1980
DEPARTMENT OF ECOLOGY
CENTRAL REGIONAL OFFICE

Work started ...... 19...... Completed 7-25 1980

WELL DRILLER'S STATEMENT:

This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

NAME Hatch Drilling Co.
(Person, firm, or corporation) (Type or print)

Address 6417 W. Court Pasco, WA.

[Signed] [signature]
(Well Driller)

License No. 065 Date 8-11 1980

8/15/80

(USE ADDITIONAL SHEETS IF NECESSARY)

File Original and First Copy with Department of Ecology
Second Copy — Owner's Copy
Third Copy — Driller's Copy

WATER WELL REPORT
STATE OF WASHINGTON

Application No. ....
Permit No. ....

(1) OWNER: Name [illegible] Address [illegible]

(2) LOCATION OF WELL: County [illegible] — [illegible] ¼ [illegible] ¼ Sec 26 T. 8 N., R. 31 W.M.
Bearing and distance from section or subdivision corner — Well #2

(3) PROPOSED USE: Domestic ☐ Industrial ☐ Municipal ☐ Irrigation ☐ Test Well ☒ Other ☐

(4) TYPE OF WORK: Owner's number of well (if more than one) 2
New well ☒ Method: Dug ☐ Bored ☐
Deepened ☐ Cable ☒ Driven ☐
Reconditioned ☐ Rotary ☐ Jetted ☐

(5) DIMENSIONS: Diameter of well 6 inches.
Drilled 186 ft. Depth of completed well 186 ft.

(6) CONSTRUCTION DETAILS:
Casing installed: 6" Diam. from +2 ft. to 186 ft.
Threaded ☐ ......" Diam. from ...... ft. to ...... ft.
Welded ☒ ......" Diam. from ...... ft. to ...... ft.

Perforations: Yes ☒ No ☐
Type of perforator used milk knife
SIZE of perforations ...... in. by ...... in.
6 per ft perforations from 110 ft. to 154 ft.
...... perforations from ...... ft. to ...... ft.
...... perforations from ...... ft. to ...... ft.

Screens: Yes ☐ No ☒
Manufacturer's Name ......
Type ...... Model No. ......
Diam. ...... Slot size ...... from ...... ft. to ...... ft.
Diam. ...... Slot size ...... from ...... ft. to ...... ft.

Gravel packed: Yes ☐ No ☒ Size of gravel: ......
Gravel placed from ...... ft. to ...... ft.

Surface seal: Yes ☒ No ☐ To what depth? 30 ft.
Material used in seal Bentonite
Did any strata contain unusable water? Yes ☐ No ☒
Type of water? ...... Depth of strata ......
Method of sealing strata off ......

(7) PUMP: Manufacturer's Name ......
Type: ...... H.P. ......

(8) WATER LEVELS: Land-surface elevation above mean sea level ...... ft.
Static level 118 ft. below top of well Date ......
Artesian pressure ...... lbs. per square inch Date ......
Artesian water is controlled by ...... (Cap, valve, etc.)

(9) WELL TESTS: Drawdown is amount water level is lowered below static level
Was a pump test made? Yes ☐ No ☐ If yes, by whom? ......
Yield: ...... gal./min. with ...... ft. drawdown after ...... hrs.
" " " "
" " " "

Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level

Date of test ......
Bailer test ...... gal./min. with ...... ft. drawdown after ...... hrs.
Artesian flow ...... g.p.m. Date ......
Temperature of water ...... Was a chemical analysis made? Yes ☐ No ☐

(10) WELL LOG:
Formation: Describe by color, character, size of material and structure, and show thickness of aquifers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of formation.

MATERIAL	FROM	TO
Brown silty sand	0	15
clean black sand	16	23
Brown silty sand	23	30
Brown sandy silt	30	38
Brown silty sand	38	55
Hard Caliche	55	64
Brown silty sand	64	81
Brown silty sand 10% small gravel	81	95
Brown silty sand 50% small gravel	95	101
silt-sand gravel cobble conglomerate	101	119
sand + gravel (water)	119	121
silt sand gravel cobbles conglomerate	121	145
Brown sand 10% small gravel	145	154
Brown sandy silt with small gravel	154	168
Brown silty sand	168	176
Blue clay	176	186

AUG 13 1980
DEPARTMENT ... CENTRAL ...

Work started ......, 19...... Completed 7/25, 1980

WELL DRILLER'S STATEMENT:
This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

NAME Hatch Drilling Co. Inc. (Person, firm, or corporation) (Type or print)
Address 641 W. Court
[Signed] Dale Bigham (Well Driller)
License No. 0036 Date 8/12, 1980

8/15/80

(USE ADDITIONAL SHEETS IF NECESSARY)

ECY 050-1-20

File Original and First Copy with Department of Ecology
Second Copy — Owner's Copy
Third Copy — Driller's Copy

WATER WELL REPORT

STATE OF WASHINGTON

Application No. ....

Permit No. ....

(1) OWNER: Name Iowa Beef Address Wallula Wa

(2) LOCATION OF WELL: County Walla Walla — NW ¼ NW ¼ Sec 26 T 8 N., R 31 W.M.

Bearing and distance from section or subdivision corner W end of centerline of NWNW Sec 26 Well #3

(3) PROPOSED USE: Domestic ☐ Industrial ☐ Municipal ☐ Irrigation ☐ Test Well ☒ Other ☐

(4) TYPE OF WORK: Owner's number of well (if more than one) #3
New well ☒ Method: Dug ☐ Bored ☐
Deepened ☐ Cable ☒ Driven ☐
Reconditioned ☐ Rotary ☐ Jetted ☐

(5) DIMENSIONS: Diameter of well 6 inches.
Drilled 200 ft. Depth of completed well 200 ft.

(6) CONSTRUCTION DETAILS:

Casing installed: 10 " Diam. from 0 ft. to 29.5 ft.
Threaded ☐ 6 " Diam. from +2 ft. to 200 ft.
Welded ☐ ...." Diam. from .... ft. to .... ft.

Perforations: Yes ☒ No ☐
Type of perforator used Equiv. of Mills Knife
SIZE of perforations 1/4 in. by 2 in.
.... perforations from 70 ft. to 90 ft.
.... perforations from .... ft. to .... ft.
.... perforations from .... ft. to .... ft.

Screens: Yes ☐ No ☒
Manufacturer's Name ....
Type .... Model No. ....
Diam. .... Slot size .... from .... ft. to .... ft.
Diam. .... Slot size .... from .... ft. to .... ft.

Gravel packed: Yes ☐ No ☐ Size of gravel: ....
Gravel placed from .... ft. to .... ft.

Surface seal: Yes ☒ No ☐ To what depth? 30 ft.
Material used in seal Bentonite
Did any strata contain unusable water? Yes ☐ No ☒
Type of water? - - - Depth of strata ....
Method of sealing strata off ....

(7) PUMP: Manufacturer's Name DNA.
Type: .... H.P. ....

(8) WATER LEVELS: Land-surface elevation above mean sea level = 450 ft.
Static level 75 ft. below top of well Date 6/23/80
Artesian pressure .... lbs. per square inch Date ....
Artesian water is controlled by .... (Cap, valve, etc.)

(9) WELL TESTS: Drawdown is amount water level is lowered below static level
Was a pump test made? Yes ☐ No ☒ If yes, by whom? ....
Yield: .... gal./min. with .... ft. drawdown after .... hrs.
" " " "
" " " "

Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level

Date of test 6/24/80
Bailer test .... gal./min. with .... ft. drawdown after .... hrs.
Artesian flow .... g.p.m. Date ....
Temperature of water 60° Was a chemical analysis made? Yes ☒ No ☐

(10) WELL LOG: PAGE 1 of 2

Formation: *Describe by color, character, size of material and structure, and show thickness of aquifers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of formation.*

MATERIAL	FROM	TO
Brown Sand	0	5
Brown Sandy Silt	5	14
Caliche	14	14.1
Brown Sand	14.1	14.7
Brown Sandy Silt	14.7	20
Consolid. SAND-med Gravel	20	22
Med. Gravel	22	25.5
Caliche	25.5	26
Brown Silty Sand	26	29
Sandy - med gravel	29	30.5
Caliche	30.5	31
Brown Sandy Silt	31	35
Brown Silty Sand	35	38.5
Silty Sand/Sandstone	38.5	41
Assume Floater Stone	41	41
Silty Sand	41	44
Decomp. Rock, Blue Clay, Sands	44	48.5
" " " " "	48.5	48.5
" " " " "	48.5	54
Ringold Conglomerate	54	60
" "	60	60
" "	60	66
Brown Silty sand, 15% Very Coarse S	66	68
" " " " " "	68	68
Brown Fine Sand	68	69
Ringold Conglomerate	69	75
Brown Fine Sand	75	77
Loose Sand + gravel	77	82
Ringold Congl.	82	83
Brown Fine gravel + sand	84	86
Harder Cons. Sand + gravel	86	86
Loose S+G. / Layers of Ring.	86	92
Hard Ringold	92	92.5

Work started 6/6 1980 Completed 7/25 1980

WELL DRILLER'S STATEMENT:

This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

NAME Hatch Drilling Co. INC (Person, firm, or corporation) (Type or print)

Address 647 W. COURT

[Signed] Dale Bigham (Well Driller)

License No. 0036 Date 8/12, 1980

8/13/80

(USE ADDITIONAL SHEETS IF NECESSARY)

File Original and First Copy with Department of Ecology
Second Copy — Owner's Copy
Third Copy — Driller's Copy

WATER WELL REPORT

STATE OF WASHINGTON

Application No

Permit No

(1) OWNER: Name Iowa Beef Address Well # 3

(2) LOCATION OF WELL: County ¼ ¼ Sec T. N., R. W.M.

Bearing and distance from section or subdivision corner

(3) PROPOSED USE: Domestic ☐ Industrial ☐ Municipal ☐ Irrigation ☐ Test Well ☐ Other ☐

(4) TYPE OF WORK: Owner's number of well (if more than one)

New well ☐ Method: Dug ☐ Bored ☐
Deepened ☐ Cable ☐ Driven ☐
Reconditioned ☐ Rotary ☐ Jetted ☐

(5) DIMENSIONS: Diameter of well inches.
Drilled ft. Depth of completed well ft.

(6) CONSTRUCTION DETAILS:

Casing installed: " Diam. from ft. to ft.
Threaded ☐ " Diam. from ft. to ft.
Welded ☐ " Diam. from ft. to ft.

Perforations: Yes ☐ No ☐
Type of perforator used
SIZE of perforations in. by in.
perforations from ft. to ft.
perforations from ft. to ft.
perforations from ft. to ft.

Screens: Yes ☐ No ☐
Manufacturer's Name
Type Model No
Diam Slot size from ft. to ft.
Diam Slot size from ft. to ft.

Gravel packed: Yes ☐ No ☐ Size of gravel
Gravel placed from ft. to ft.

Surface seal: Yes ☐ No ☐ To what depth? ft.
Material used in seal
Did any strata contain unusable water? Yes ☐ No ☐
Type of water? Depth of strata
Method of sealing strata off

(7) PUMP: Manufacturer's Name
Type: H.P.

(8) WATER LEVELS: Land-surface elevation above mean sea level ft.
Static level ft. below top of well Date
Artesian pressure lbs. per square inch Date
Artesian water is controlled by (Cap, valve, etc.)

(9) WELL TESTS: Drawdown is amount water level is lowered below static level
Was a pump test made? Yes ☐ No ☐ If yes, by whom?
Yield gal./min. with ft. drawdown after hrs.

Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level

Date of test
Bailer test gal./min. with ft. drawdown after hrs.
Artesian flow g.p.m. Date
Temperature of water Was a chemical analysis made? Yes ☐ No ☐

(10) WELL LOG: Page 2 of 2

Formation: Describe by color, character, size of material and structure, and show thickness of aquifers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of formation.

MATERIAL	FROM	TO
Grn Y.		
Grn Yellow clay/w crs Sand	92.5	105
Blue Grn. Clay	105	118
Blue Clay	118	130
Blue Clay & weathered Bas	130	136
Blue clay & Multi Colored & Sand layers	136	160
Blue Clay	160	165
Blue Clay & gravel Congulum.	165	176
Dark Blue Clay (Hard)	176	183
Black clay	183	185
Blue clay w/green Congl	185	190
Dark Brn Clay	190	200

Work started , 19 Completed , 19

WELL DRILLER'S STATEMENT:

This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

NAME (Person, firm, or corporation) (Type or print)

Address

[Signed] (Well Driller)

License No. Date , 19

8/18/80

(USE ADDITIONAL SHEETS IF NECESSARY)

File Original and First Copy with Department of Ecology
Second Copy — Owner's Copy
Third Copy -- Driller's Copy

WATER WELL REPORT
STATE OF WASHINGTON

Application No.
Permit No.

(1) OWNER: Name Iowa Beef Address P.O. Box 515, Dakota City, NE 68731

(2) LOCATION OF WELL: County WALLA WALLA NW ¼ NW ¼ Sec. 26 T. 8 N., R. 3E W.M.
Bearing and distance from section or subdivision corner 31

(3) PROPOSED USE: Domestic ☐ Industrial ☐ Municipal ☐ Irrigation ☐ Test Well ☐ Other ☒

(4) TYPE OF WORK: Owner's number of well (if more than one) 4
New well ☒ Method: Dug ☐ Bored ☐
Deepened ☐ Cable ☐ Driven ☐
Reconditioned ☐ Rotary ☒ Jetted ☐

(5) DIMENSIONS: Diameter of well 6 inches.
Drilled 160 ft. Depth of completed well 159 ft.

(6) CONSTRUCTION DETAILS:
Casing installed: 6 " Diam. from +2 ft. to 160 ft.
Threaded ☐ " Diam. from ft. to ft.
Welded ☒ " Diam. from ft. to ft.

Perforations: Yes ☒ No ☐
Type of perforator used air
SIZE of perforations 1/4 in. by 2 in.
62 perforations from 120 ft. to 140 ft.
perforations from ft. to ft.
perforations from ft. to ft.

Screens: Yes ☐ No ☒
Manufacturer's Name
Type Model No.
Diam. Slot size from ft. to ft.
Diam. Slot size from ft. to ft.

Gravel packed: Yes ☐ No ☒ Size of gravel:
Gravel placed from ft. to ft.

Surface seal: Yes XX No ☐ To what depth? 52 ft.
Material used in seal bentonite
Did any strata contain unusable water? Yes ☐ No ☒
Type of water? Depth of strata
Method of sealing strata off

(7) PUMP: Manufacturer's Name
Type: H.P.

(8) WATER LEVELS: Land-surface elevation above mean sea level ft.
Static level 90 ft. below top of well Date 10/21/86
Artesian pressure lbs. per square inch Date
Artesian water is controlled by (Cap, valve, etc.)

(9) WELL TESTS: Drawdown is amount water level is lowered below static level
Was a pump test made? Yes ☐ No ☒ If yes, by whom?
Yield 7-10 gal./min. with ft. drawdown after hrs.
ESTIMATED AIRLIFT

Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level

Date of test
Bailer test gal./min. with ft. drawdown after hrs.
Artesian flow g.p.m. Date
Temperature of water Was a chemical analysis made? Yes ☐ No ☐

11/24/86

(10) WELL LOG:

Formation: *Describe by color, character, size of material and structure, and show thickness of aquifers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of formation.*

MATERIAL	FROM	TO
Sand w/clay mixed	0	45
Sand w/gravel seams	45	65
Sand & Gravel	65	100
Sand & Gravel, coarse w/trace of water	100	110
Sand & clay, gray	110	120
Sand & gravel w/cobble w/water	120	127
Ringold formation w/water	127	140
Ringold formation	140	155
Clay, blue	155	160
1' of cement placed in bottom of well		
THIS IS A MONITORING WELL Not intended for use as a water well		

RECEIVED
NOV 24 1986

Work started 10/20 19 86 Completed 10/21 19 86

WELL DRILLER'S STATEMENT:

This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

NAME PONDEROSA DRILLING & DEVELOPMENT INC. (Person, firm, or corporation) (Type or print)

Address E. 6010 Broadway, Spokane, WA 99212

[Signed] W. Joseph Close Jr. (Well Driller)

License No. 1040 Date 10/21, 19 86

(USE ADDITIONAL SHEETS IF NECESSARY)

S26 T8 R31
WALLA WALLA

PROJECT *IBP Wallula Plant* W.O. *S-1061* WELL NO. *MW-1(a)*

Elevation reference:
Ground surface elevation: Casing elevation:

DEPTH (feet)	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	BLOW COUNTS	OVM READING	GROUND WATER
0–8	(Medium stiff) dry, beige, SILT w/some coarse sand and fine gravel in places (Loess)					
8–16	(Medium dense) dry, tan to light brown, silty fine SAND, micaceous in places					
16–18	(Dense) dry, gray, fine to medium SAND w/some silt					
18–20	(Dense) dry, brown, fine SAND w/thin gray medium sand w/silt interbeds					
20–26	(Dense) dry, gray, medium to coarse SAND w/tan silt					
26–30	(Stiff) dry, tan, fine sandy SILT with trace coarse sand					
30–31	(Dense) dry, dark gray to black, medium to coarse sand					
31–32	(Stiff) dry, tan SILT (Loess)					
32–51	(Stiff) dry, tan to beige, fine sandy SILT to silty fine SAND w/trace fine gravel. Micaceous in places. Thin caliche layers at 42.0 feet.					
51–55	(Very dense) dry, white, CALICHE with some thin tan silt interbeds					
55–60	(Dense) dry, tan to brown, SILT and silty fine SAND (Loess)					

AS-BUILT DESIGN

Steel monument w/ locking cap 31.6" above ground surface
Top of casing 28.25" above ground surface
Ground surface
Concrete
Bentonite seal
* 8" STEEL CASING between 20 and 100 feet.
Casing (Schedule-40 8-inch I.D. PVC)
Centralizer

TESTING

RECEIVED
DEC 23 1992

RUEN DRILLING, INC.
BOX 267
CLARK FORK, ID 83811
(208) 266-1151
PERMIT # 066052

Will Haugen
2085

LEGEND

- - - Inferred stratigraphic contact
SWL elevation and date of measurement

RZA AGRA, Inc.
Engineering & Environmental Services
539 West Sharp, Suite D
Spokane, WA 99201

Drilling started: *4 August 1992* Drilling completed: *6 August 1992* Logged by: *EWS*

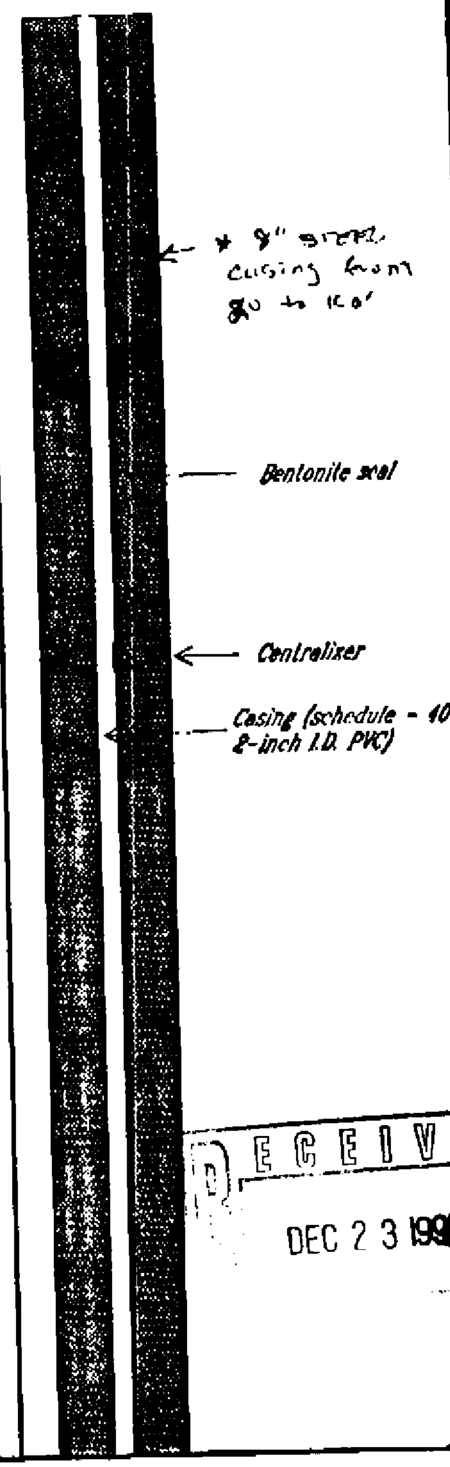
S26 T8 R31E
WALLA WALLA

PROJECT *IBP Wallula Plant* **W.O.** *S-1061* **WELL NO.** *MW-1(b)*

Elevation reference:
Ground surface elevation: Casing elevation:

DEPTH (feet)	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	BLOW COUNTS	OVM READING	GROUND WATER
60	*(Dense) dry, brown, fine to medium SAND with trace silt.*					
	(Dense to very dense) dry to damp, black basalt GRAVEL with gray to tan, micaceous, medium SAND.					
70	*(Dense) dry, tan and white, fine to medium silica SAND with some basalt fine gravels.*					
	(Dense) damp, brown, gravelly medium SAND w/trace silt. Gravels are subrounded to rounded.					
80	*(Dense) damp, grey to brown, medium SAND with some fine sandy SILT.*					
90	*(Very dense) damp, brown to gray, angular basalt and quartzite GRAVELS with interbeds of (dense) damp, brown, SAND with traces of fine gravel.*					
100	*(Dense) damp to wet, brown, SAND with fine gravel and trace silt.*					
110	*(Dense) damp, light brown, silty fine SAND with caliche near top. Grades down into a fine sandy SILT with trace coarse sands. Thin caliche interbeds at 113.2*					
120						

AS-BUILT DESIGN



TESTING

LEGEND

- - - Inferred stratigraphic contact

▼ SWL elevation and date of measurement
DATE

RZA AGRA, Inc.
Engineering & Environmental Services

539 West Sharp, Suite D
Spokane, WA 99201

Drilling started: *4 August 1992* Drilling completed: *6 August 1992* Logged by: *ENJS*

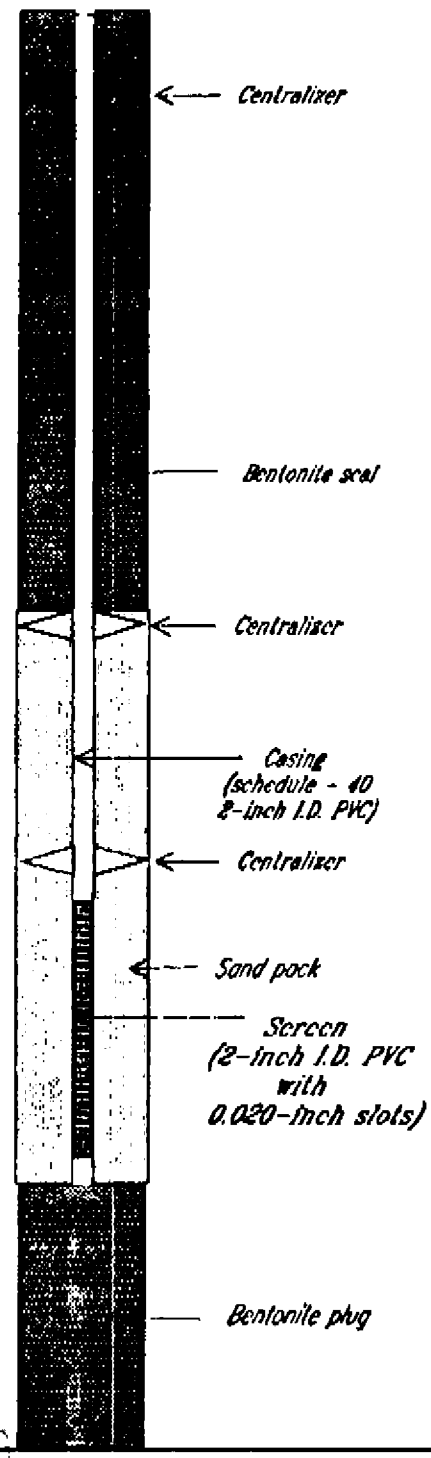
WALLA WALLA

PROJECT *IBP Wallula Plant* W.O. S-1061 WELL NO. MW-1(c)

Elevation reference:
Ground surface elevation: Casing elevation:

DEPTH (feet)	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	BLOW COUNTS	OVM READING	GROUND WATER
120						
130	*(Dense) damp to moist, brown, silty fine SAND with scattered fine gravels. Fine sandy silt interbeds 124.5 - 125.3 feet.*					
140						
	- - - - - - - -					8/7/92
150						
	(Dense) damp to moist, brown, SAND with gravels and trace silt. Silt becomes more abundant with depth.					
160						
170						
	- - - - - - - -					
	(Stiff) damp, tan, SILT					
	- - - - - - - -					
180						

AS-BUILT DESIGN



TESTING

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▼ DATE SWL elevation and date of measurement

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RZA AGRA, Inc.
Engineering & Environmental Services

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Spokane, WA 99201

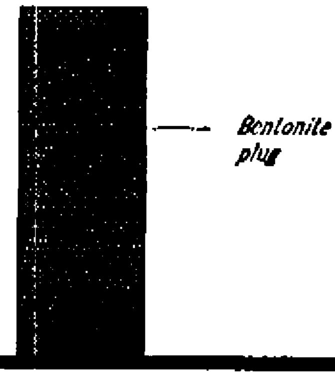
Drilling started: *4 August 1992* Drilling completed: *6 August 1992* Logged by: *ENJS*

PROJECT *IBP Wallula Plant* W.O. S-1011 WELL NO. *MW-1(d)*

Elevation reference:
Ground surface elevation: Casing elevation:

DEPTH (feet)	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	BLOW COUNTS	OVM READING	GROUND WATER
180	*(Dense) damp, brown very silty coarse SAND with fine gravels.*					
	(Dense) damp, brown, silty fine SAND with trace fine gravels.					
190	*(Medium stiff) moist, tan to gray, SILT and CLAY with some sands. Silty coarse SAND with gravel interbeds from 189.3 to 190.4 feet.*					
	Boring terminated at approximately 195.0 feet.					
200						
210						
220						
230						
240						

AS-BUILT DESIGN



TESTING

LEGEND

- - - Inferred stratigraphic contact

▼ DATE SWL elevation and date of measurement

RZA AGRA, Inc.
Engineering & Environmental Services
539 West Sharp, Suite D
Spokane, WA 99201

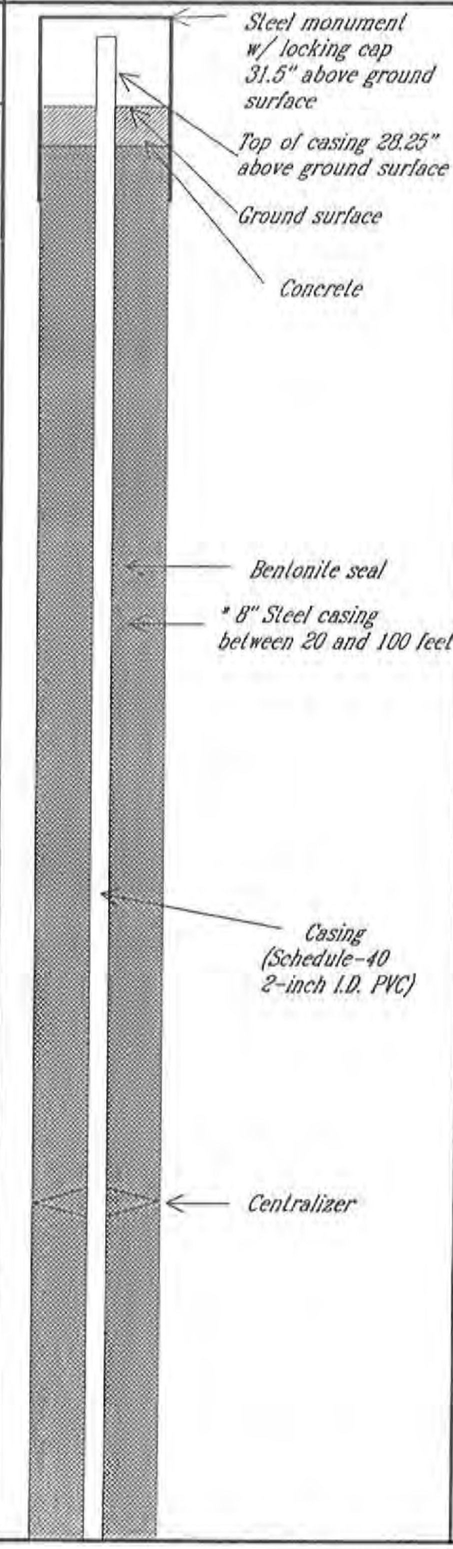
Drilling started: *4 August 1992* Drilling completed: *6 August 1992* Logged by: *ENJS*

PROJECT *IBP Wallula Plant* W.O. *S-1061* WELL NO. *MW-1*

Elevation reference:
Ground surface elevation: *582.4* Casing elevation: *584.72*

DEPTH (feet)	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	BLOW COUNTS	OVM READING	GROUND WATER
0						
	(Medium stiff) dry, beige, SILT w/some coarse sand and fine gravel in places (Loess)					
10	*(Medium dense) dry, tan to light brown, silty fine SAND, micaceous in places.*					
	(Dense) dry, gray, fine to medium SAND w/some silt					
20	*(Dense) dry, brown, fine SAND w/thin gray medium sand w/silt interbeds.*					
	(Dense) dry, gray, medium to coarse SAND w/tan silt.					
	(Stiff) dry, tan, fine sandy SILT with trace coarse sand					
30	*(Dense) dry, dark gray to black, medium to coarse sand.*					
	(Stiff) dry, tan SILT (Loess).					
40	*(Stiff) dry, tan to beige, fine sandy SILT to silty fine SAND w/trace fine gravel. Micaceous in places. Thin caliche layers at 42.0 feet.*					
50	*(Very dense) dry, white, CALICHE with some thin tan silt interbeds*					
	(Dense) dry, tan to brown, SILT and silty fine SAND (Loess)					
60						

AS-BUILT DESIGN



TESTING

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▼ DATE SWL elevation and date of measurement

RZA AGRA, Inc.
Engineering & Environmental Services
539 West Sharp, Suite D
Spokane, WA 99201

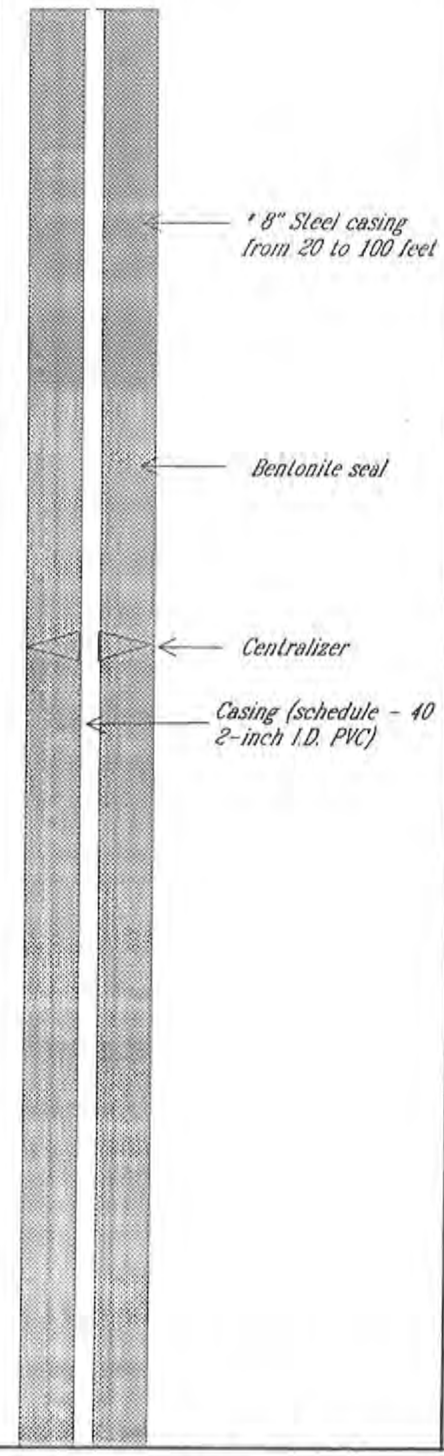
Drilling started: *4 August 1992* Drilling completed: *6 August 1992* Logged by: *ENJS*

PROJECT *IBP Wallula Plant* W.O. *S-1061* WELL NO. *MW-1*

Elevation reference:
Ground surface elevation: *582.4* Casing elevation: *584.72*

DEPTH (feet)	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	BLOW COUNTS	OVM READING	GROUND WATER
60	*(Dense dry, brown, fine to medium SAND with trace silt.*					
	(Dense to very dense) dry to damp, black basalt GRAVEL with gray to tan, micaceous, medium SAND.					
70	*(Dense) dry, tan and white, fine to medium silica SAND with some basalt fine gravels.*					
	(Dense) damp, brown, gravelly medium SAND w/trace silt. Gravels are subrounded to rounded.					
80	*(Dense) damp, gray to brown, medium SAND with some fine sandy SILT.*					
90	*(Very dense) damp, brown to gray, angular basalt and quartzite GRAVELS with interbeds of (dense) damp, brown, SAND with traces of fine gravel.*					
100	*(Dense) damp to wet, brown, SAND with fine gravel and trace silt.*					
110	*(Dense) damp, light brown, silty fine SAND with caliche near top. Grades down into a fine sandy SILT with trace coarse sands. Thin caliche interbeds at 113.2*					
120						

AS-BUILT DESIGN



TESTING

LEGEND

- - - Inferred stratigraphic contact

DATE SWL elevation and date of measurement

RZA AGRA, Inc.
Engineering & Environmental Services
West Sharp, Suite D
pokane, WA 99201

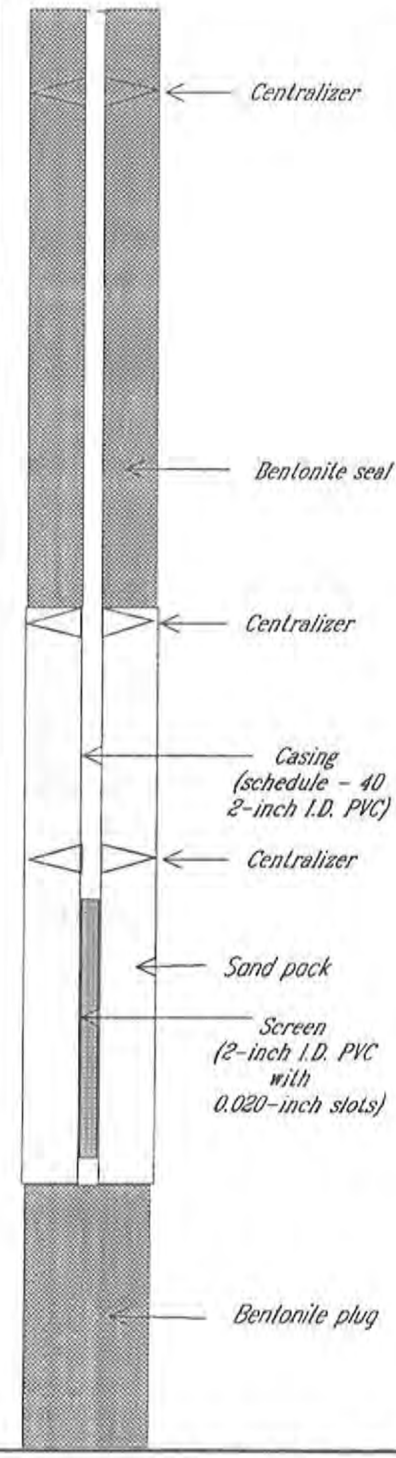
Drilling started: *4 August 1992* Drilling completed: *6 August 1992* Logged by: *ENJS*

PROJECT *IBP Wallula Plant* W.O. *S–1061* WELL NO. *MW–1*

Elevation reference:
Ground surface elevation: *582.4* Casing elevation: *584.72*

DEPTH (feet)	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	BLOW COUNTS	OVM READING	GROUND WATER
120						
130	*(Dense) damp to moist, brown, silty fine SAND with scattered fine gravels. Fine sandy silt interbeds 124.5 – 125.3 feet.*					
140						
	- - - - - - - - - - - - - - - -					8/7/92
150						
	(Dense) saturated, brown, SAND with gravels and trace silt. Silt becomes more abundant with depth.					
160						
170						
	- - - - - - - - - - - - - - - -					
	(Stiff) damp, tan, SILT					
	- - - - - - - - - - - - - - - -					
180						

AS–BUILT DESIGN



TESTING

LEGEND

- - - Inferred stratigraphic contact

▼ DATE SWL elevation and date of measurement

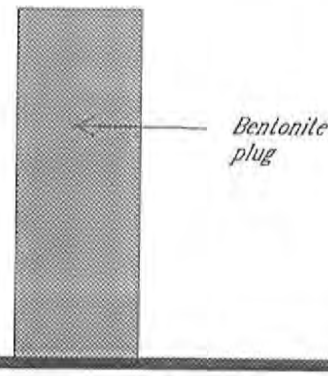
RZA AGRA, Inc.
Engineering & Environmental Services
539 West Sharp, Suite D
Spokane, WA 99201

Drilling started: *4 August 1992* Drilling completed: *6 August 1992* Logged by: *ENJS*

PROJECT *IBP Wallula Plant* W.O. *S-1061* WELL NO. *MW-1*

Elevation reference:
Ground surface elevation: *528.4* Casing elevation: *584.72*

DEPTH (feet)	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	BLOW COUNTS	OVM READING	GROUND WATER	AS-BUILT DESIGN	TESTING
180	*(Dense) damp, brown very silty coarse SAND with fine gravels.*							
	(Dense) damp, brown, silty fine SAND with trace fine gravels.							
190	*(Medium stiff) moist, tan to gray, SILT and CLAY with some sands. Silty coarse SAND with gravel interbeds from 189.3 to 190.4 feet.*							
	Boring terminated at approximately 195.0 feet.							
200								
210								
220								
230								
240								



LEGEND

- - - Inferred stratigraphic contact

DATE SWL elevation and date of measurement

RZA AGRA, Inc.
Engineering & Environmental Services
539 West Sharp, Suite D
Spokane, WA 99201

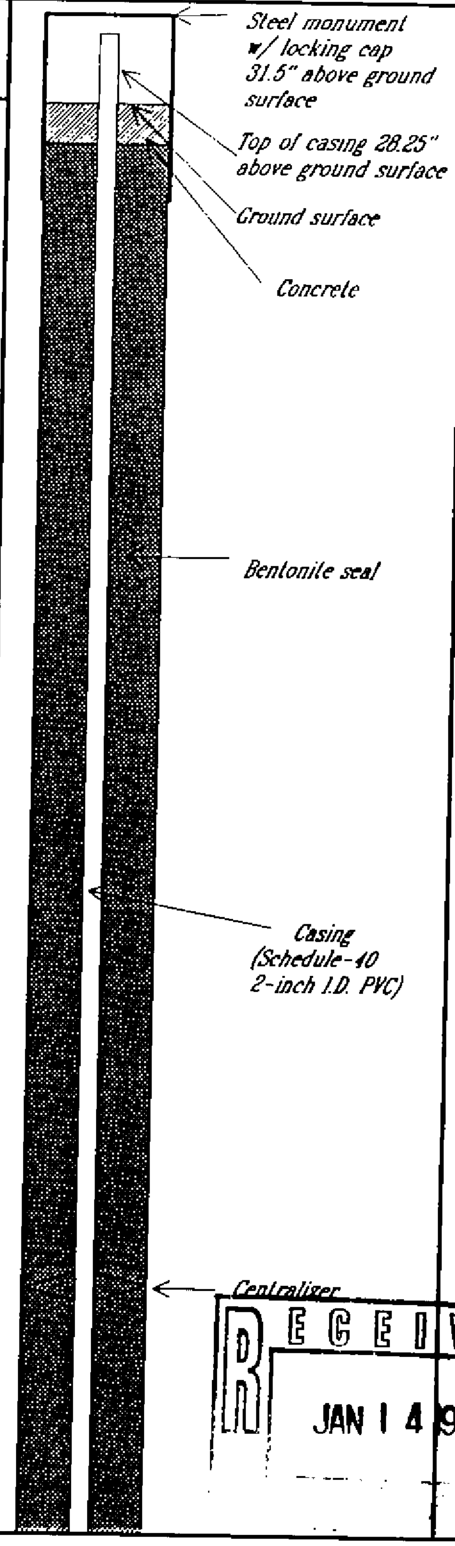
Drilling started: *4 August 1992* Drilling completed: *6 August 1992* Logged by: *ENJS*

PROJECT *IBP Wallula Plant* W.O. *S-1061* WELL NO. *MW-2*

Elevation reference:
Ground surface elevation: *512.4* Casing elevation: *514.52*

DEPTH (feet)	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	BLOW COUNTS	OVM READING	GROUND WATER
0–7	*(Medium stiff) dry, tan, silty fine SAND to brown very silty fine SAND (Loess).*					
7–22	*(Dense) damp, brown, fine to medium SAND with some silt. Becoming siltier with depth.*					
22–25	*(Stiff) damp, brown, fine sandy SILT with clayey silty interbeds.*					
25–40	*(Medium dense to dense) damp, brown to tannish brown very silty fine SAND. Micaceous in places. Few thin blue clay interbeds upper 10 feet.*					
40–60	*(Stiff) damp, tan, fine sandy SILT. Clayey SILT interval from 46.8 to 49.8 feet. SILT becomes micaceous near 55 feet. Scattered coarse sand in SILT below 60 feet.*					

AS-BUILT DESIGN



TESTING

LEGEND

- - - Inferred stratigraphic contact

▼ SWL elevation and date of measurement

RZA AGRA, Inc.
Engineering & Environmental Services

539 West Sharp, Suite D
Spokane, WA 99201

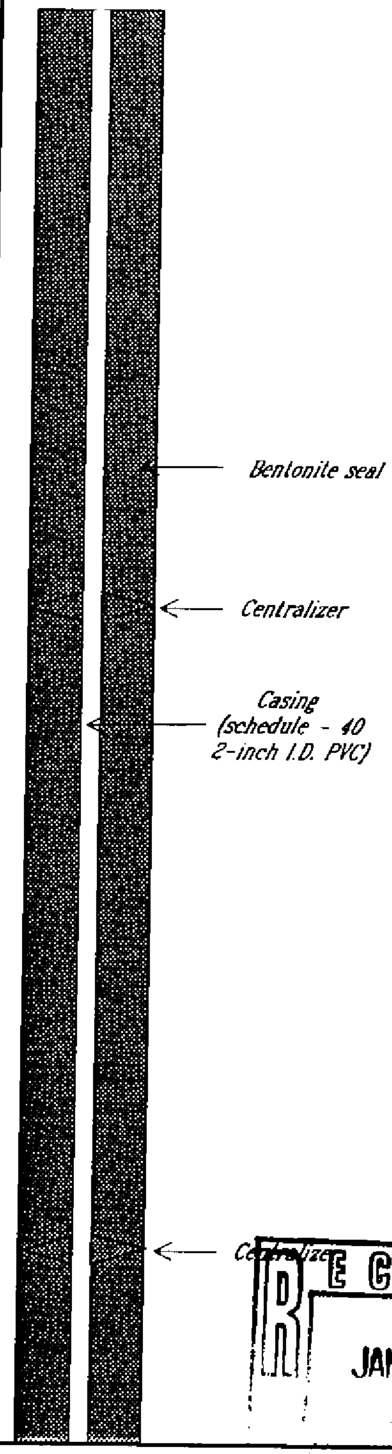
Drilling started: *4 August 1992* Drilling completed: *6 August 1992* Logged by: *ENJS*

PROJECT *IBP Wallula Plant* W.O. *S-1061* WELL NO. *MW-2*

Elevation reference:
Ground surface elevation: *512.4* Casing elevation: *514.52*

DEPTH (feet)	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	BLOW COUNTS	OVM READING	GROUND WATER
60	*(Stiff) damp, tan, fine sandy SILT. Clayey SILT interval from 46.8 to 49.8 feet. SILT becomes micaceous near 55 feet. Scattered coarse sand in SILT below 60 feet.*					
70	*(Dense) damp to wet, tan to brown, micaceous, silty fine SAND with trace gravel.*					
	(Very dense) dry, white CALICHE.					
80	*(Medium dense to stiff) damp, brown to tan silty very fine SAND and SILT with clay interbeds.*					
90						
	(Stiff) damp to moist, brown, fine sandy SILT with trace gravel interbedded with damp, brown, medium silicia SAND with some gravel. Thin caliche beds at 94 feet. SILT grades into a very fine sand near basal contact.					
100						
110	*(Dense) damp, light brown to gray, fine to medium silicia SAND w/trace silt and fine gravels.*					
120						

AS-BUILT DESIGN



TESTING

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LEGEND

- - - *Inferred stratigraphic contact*

▼ DATE SWL elevation and date of measurement

RZA AGRA, Inc.
Engineering & Environmental Services

539 West Sharp, Suite D
Spokane, WA 99201

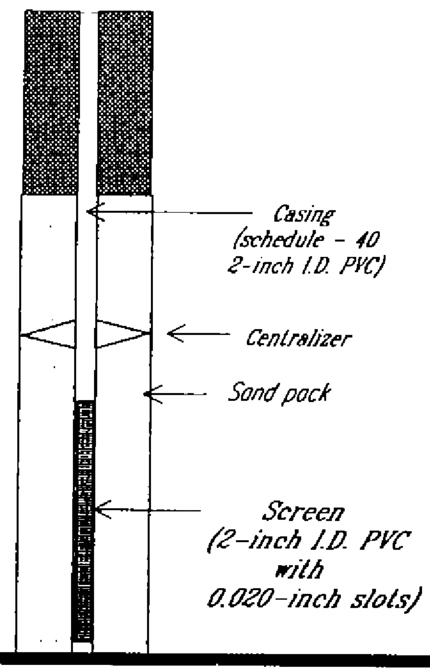
Drilling started: *4 August 1992* Drilling completed: *6 August 1992* Logged by: *ENJS*

PROJECT *IBP Wallula Plant* W.O. *S-1061* WELL NO. *MW-2*

Elevation reference:
Ground surface elevation: *512.4* Casing elevation: *514.52*

DEPTH (feet)	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	BLOW COUNTS	OVM READINGS	GROUND WATER
120						▼ 8/8/92
130	*(Very dense) saturated, black to brown, subrounded GRAVEL with sand interbedded with gray (salt and pepper texture in areas), wet to saturated, gravelly SAND, some caliche on gravels. Some cobbles from 140 to 143 feet.*					
140	*(Dense) wet, light brown, fine to medium SAND with gravels.*					
	Boring terminated at approximately 147.2 feet.					
150						
160						
170						
180						

AS-BUILT DESIGN



TESTING

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JAN 14 1993

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▼ DATE SWL elevation and date of measurement

Start card info #056053
SE 1/4 SE 1/4 SW 1/4
Sec 26 T8N R31E

RZA AGRA, Inc.
Engineering & Environmental Services
539 West Sharp, Suite D
Spokane, WA 99201

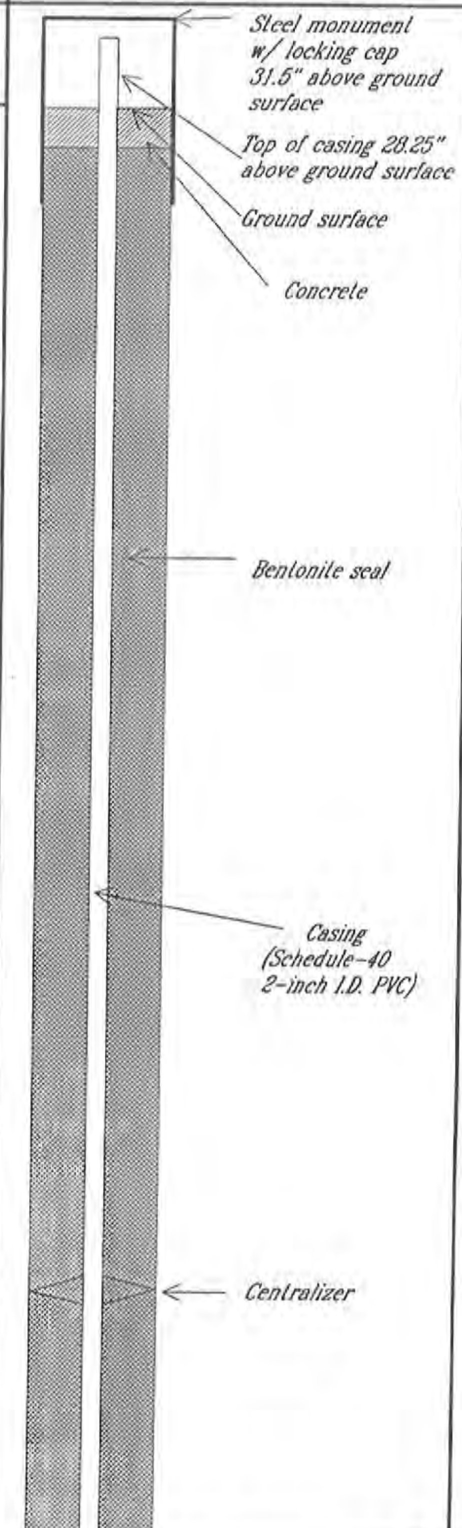
Drilling started: *4 August 1992* Drilling completed: *6 August 1992* Logged by: *ENJS*

PROJECT *IBP Wallula Plant* W.O. *S-1061* WELL NO. *MW-2*

Elevation reference:
Ground surface elevation: *512.4* Casing elevation: *514.52*

DEPTH (feet)	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	BLOW COUNTS	OVM READING	GROUND WATER	TESTING
0	*(Medium stiff) dry, tan, silty fine SAND to brownvery silty fine SAND (Loess).*						
10	*(Dense) damp, brown, fine to medium SAND with some silt. Becoming siltier with depth.*						
20	*(Stiff) damp, brown, fine sandy SILT with clayey silty interbeds.*						
30	*(Medium dense to dense) damp, brown to tannish brown very silty fine SAND. Micaceous in places. Few thin blue clay interbeds upper 10 feet.*						
40	*(Stiff) damp, tan, fine sandy SILT. Clayey SILT interval from 46.8 to 49.8 feet. SILT becomes micaceous near 55 feet. Scattered coarse sand in SILT below 60 feet.*						
50							
60							

AS-BUILT DESIGN



LEGEND

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▼ SWL elevation and date of measurement

RZA AGRA, Inc.
Engineering & Environmental Services
539 West Sharp, Suite D
Spokane, WA 99201

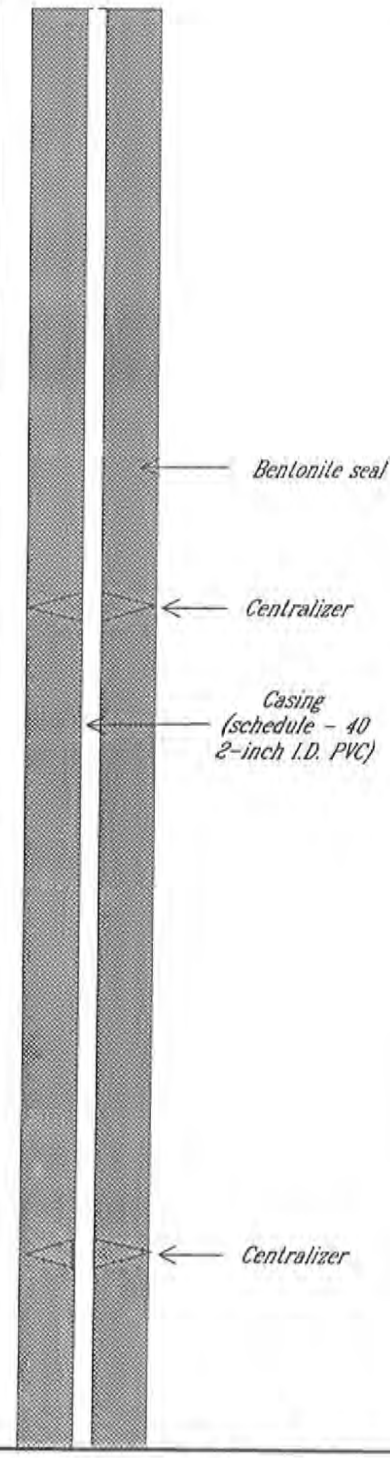
Drilling started: *4 August 1992* Drilling completed: *6 August 1992* Logged by: *ENJS*

PROJECT *IBP Wallula Plant* W.O. *S-1061* WELL NO. *MW-2*

Elevation reference:
Ground surface elevation: *512.4* Casing elevation: *514.52*

DEPTH (feet)	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	BLOW COUNTS	OVM READING	GROUND WATER
60	*(Stiff) damp, tan, fine sandy SILT. Clayey SILT interval from 46.8 to 49.8 feet. SILT becomes micaceous near 55 feet. Scattered coarse sand in SILT below 60 feet.*					
70	*(Dense) damp to wet, tan to brown, micaceous, silty fine SAND with trace gravel.*					
	(Very dense) dry, white CALICHE.					
80	*(Medium dense to stiff) damp, brown to tan silty very fine SAND and SILT with clay interbeds.*					
90–100	*(Stiff) damp to moist, brown, fine sandy SILT with trace gravel interbedded with damp, brown, medium silicia SAND with some gravel. Thin caliche beds at 94 feet. SILT grades into a very fine sand near basal contact.*					
110–120	*(Dense) damp, light brown to gray, fine to medium silicia SAND w/trace silt and fine gravels.*					

AS-BUILT DESIGN



TESTING

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- - - *Inferred stratigraphic contact*

DATE SWL elevation and date of measurement

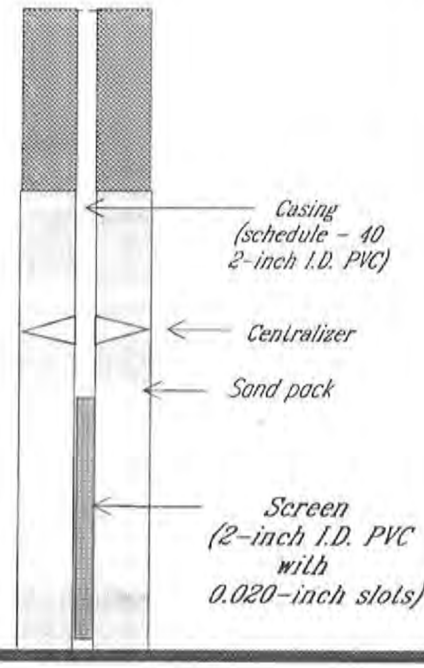
RZA AGRA, Inc.
Engineering & Environmental Services
539 West Sharp, Suite D
Spokane, WA 99201

Drilling started: *4 August 1992* Drilling completed: *6 August 1992* Logged by: *ENJS*

PROJECT *IBP Wallula Plant* W.O. *S-1061* WELL NO. *MW-2*

Elevation reference:
Ground surface elevation: *512.4* Casing elevation: *514.52*

DEPTH (feet)	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	BLOW COUNTS	OVM READING	GROUND WATER	AS-BUILT DESIGN	TESTING
120								
						8/8/92		
130	*(Very dense) saturated, black to brown, subrounded GRAVEL with sand interbedded with gray (salt and pepper texture in areas), wet to saturated, gravelly SAND, some caliche on gravels. Some cobbles from 140 to 143 feet.*							
140	*(Dense) wet, light brown, fine to medium SAND with gravels.*							
	Boring terminated at approximately 147.2 feet.							
150								
160								
170								
180								



LEGEND

- - - Inferred stratigraphic contact

▼ DATE SWL elevation and date of measurement

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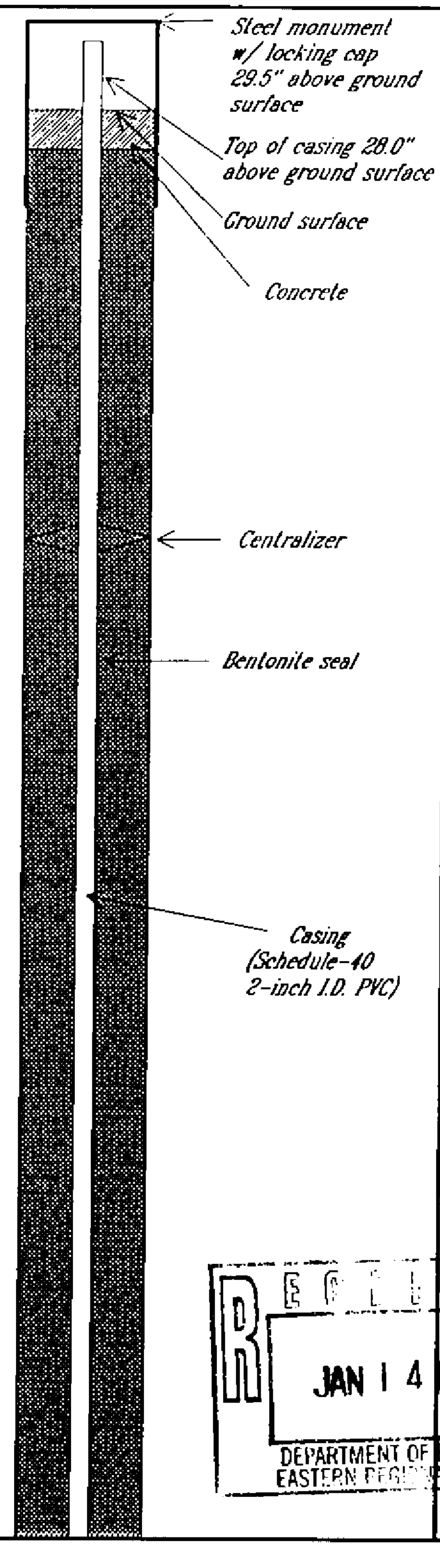
Drilling started: *4 August 1992* Drilling completed: *6 August 1992* Logged by: *ENJS*

PROJECT *IBP Wallula Plant* W.O. *S-1061* WELL NO. *MW-3*

Elevation reference:
Ground surface elevation: *486.1* Casing elevation: *488.50*

DEPTH (feet)	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	BLOW COUNTS	OVM READING	GROUND WATER
0–19	*(Medium stiff to hard) dry, tan to light brown, SILT with fine sand and clay interbedded with hard, dry, white CALICHE.*					
19–21.5	*(Hard) dry, white CALICHE.*					
21.5–33	*(Medium stiff) damp, light brown, fine sandy SILT to clayey SILT.*					
33–34.5	*(Stiff) damp, tan, gravelly SILT w/caliche.*					
34.5–42	*(Stiff) dry to damp, light brown SILT w/clay.*					
42–47	*(Hard to stiff) damp to moist, brown to oxidized brown CLAY with silt. Some bluish gray clay intervals.*					
47–60	*(Stiff) damp, light brown, SILT with some fine sand and scattered gravel. Few clay interbeds below 65 feet.*					

AS-BUILT DESIGN



TESTING

LEGEND

- - - Inferred stratigraphic contact
SWL elevations and date of measurement

RZA AGRA, Inc.
Engineering & Environmental Services
539 West Sharp, Suite D
Spokane, WA 99201

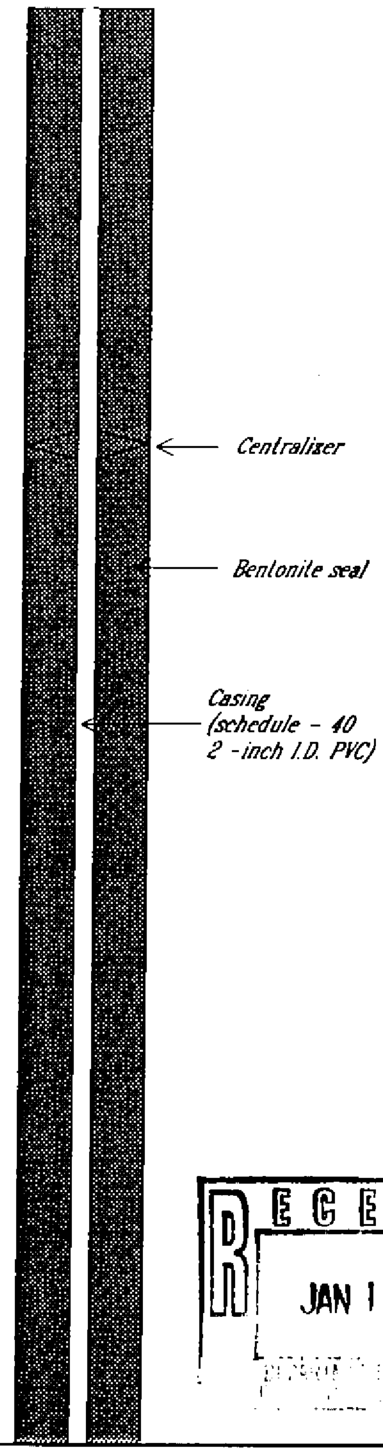
Drilling started: *4 August 1992* Drilling completed: *6 August 1992* Logged by: *ENJS*

PROJECT *IBP Wallula Plant* W.O. *S-1061* WELL NO. *MW-3*

Elevation reference:
Ground surface elevation: *486.1* Casing elevation: *488.50*

DEPTH (feet)	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	BLOW COUNTS	OVM READING	GROUND WATER
60						
	(Stiff) damp, light brown, SILT with some fine sand and scattered gravel. Few clay interbeds below 65 feet.					
70	*(Medium stiff-stiff) damp, gray-brown to bluish-brown CLAY*					
80						
90	*(Stiff) damp, light brown, fine sandy SILT with wet clay interbeds. CLAY becoming more abundant with depth.*					
100						
110						
	(Dense) damp, brown, silty coarse SAND.					
120						

AS-BUILT DESIGN



TESTING

LEGEND

- - - Inferred stratigraphic contact

DATE SWL elevations and date of measurement

RZA AGRA, Inc.
Engineering & Environmental Services

539 West Sharp, Suite D
Spokane, WA 99201

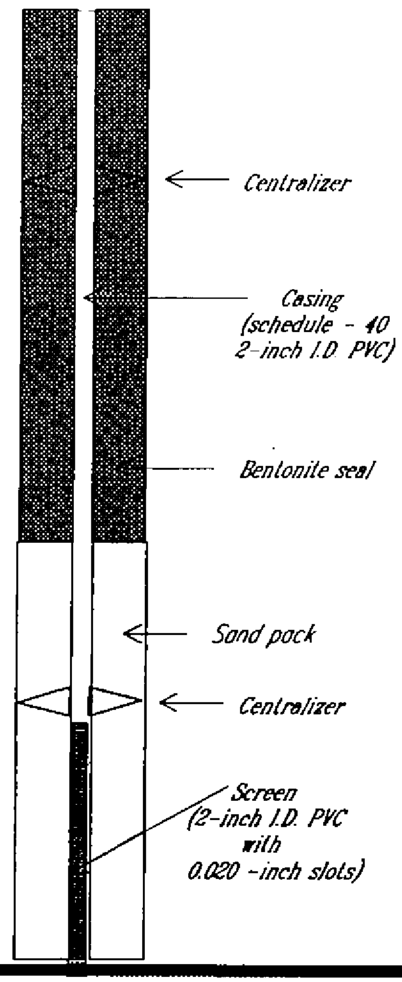
Drilling started: *4 August 1992* Drilling completed: *6 August 1992* Logged by: *ENJS*

PROJECT *IBP Wallula Plant* W.O. *S-1061* WELL NO. *MW-3*

Elevation reference:
Ground surface elevation: *486.1* Casing elevation: *488.5*

DEPTH (feet)	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	BLOW COUNTS	OVM READING	GROUND WATER
120						
	(Stiff) damp, blueish and brown CLAY					
						8/10/92
130	*(Stiff) damp, brown, CLAY and SILT with brown sandy GRAVEL lenses.*					
140						
150	*(Dense) saturated, brown silty coarse SAND with gravel and clay.*					
160	*Boring terminated at approximately 160 feet.*					
170						
180						

AS-BUILT DESIGN



TESTING

LEGEND

- - - Inferred stratigraphic contact

▼ DATE SWL elevation and date of measurement

Start card info #080011
NW 1/4 NW 1/4 NW 1/4
Sec 36 T8N R 31E

RZA AGRA, Inc.
Engineering & Environmental Services
539 West Sharp, Suite D
Spokane, WA 99201

Drilling started: *4 August 1992* Drilling completed: *6 August 1992* Logged by: *ENJS*

File Original and First Copy with Department of Ecology
Second Copy — Owner's Copy
Third Copy — Driller's Copy

WATER WELL REPORT

STATE OF WASHINGTON

Start Card No. 056011
UNIQUE WELL I.D. #
Water Right Permit No.

(1) OWNER: Name Iowa Beef Processors Address Dakota city, Nebraska

LOCATION OF WELL: County Walla Walla NW 1/4 NW 1/4 Sec 35 T 8 N., R 31E W.M.

(2a) STREET ADDRESS OF WELL (or nearest address) Dodd Road, Wallula, Wa.

(3) PROPOSED USE: ☐ Domestic ☐ Irrigation ☐ DeWater Industrial ☐ Test Well ☒ Municipal ☐ Other ☐

(4) TYPE OF WORK: Owner's number of well (if more than one) MW-3
Abandoned ☒ New well ☐ Deepened ☐ Reconditioned ☐ Method: Dug ☐ Cable ☐ Rotary ☐ Bored ☐ Driven ☐ Jetted ☐

(5) DIMENSIONS: Diameter of well 2 inches.
Drilled 160 feet. Depth of completed well 160 ft.

(6) CONSTRUCTION DETAILS:
Casing installed: 2 " Diam. from +2.5 ft. to 160 ft.
Welded ☐ " Diam. from ft. to ft.
Liner installed ☐
Threaded ☒ " Diam. from ft. to ft.

Perforations: Yes ☐ No ☐
Type of perforator used
SIZE of perforations in. by in.
perforations from ft. to ft.
perforations from ft. to ft.
perforations from ft. to ft.

Screens: Yes ☒ No ☐
Manufacturer's Name
Type PVC Model No.
Diam. 2" Slot size .020 from 150 ft. to 160 ft.
Diam. Slot size from ft. to ft.

Gravel packed: Yes ☒ No ☐ Size of gravel 10/20 css
Gravel placed from 142 ft. to 160 ft.

Surface seal: Yes ☒ No ☐ To what depth? 142 ft.
Material used in seal Bentonite
Did any strata contain unusable water? Yes ☐ No ☐
Type of water? Depth of strata
Method of sealing strata off

(7) PUMP: Manufacturer's Name N/A
Type: H.P.

(8) WATER LEVELS: Land-surface elevation above mean sea level ft.
Static level 126 bgs ft. below top of well Date 8-10-92
Artesian pressure lbs. per square inch Date
Artesian water is controlled by (Cap, valve, etc.)

(9) WELL TESTS: Drawdown is amount water level is lowered below static level
Was a pump test made? Yes ☐ No ☒ If yes, by whom?
Yield: gal./min. with ft. drawdown after hrs.
" " " "
" " " "

Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level

Date of test
Bailer test gal./min. with ft. drawdown after hrs.
Airtest gal./min. with stem set at ft. for hrs.
Artesian flow g.p.m. Date
Temperature of water Was a chemical analysis made? Yes ☐ No ☐

(10) WELL LOG or ABANDONMENT PROCEDURE DESCRIPTION

Formation: Describe by color, character, size of material and structure, and show thickness of aquifers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of information.

MATERIAL	FROM	TO
Tremie grout with high		
solids bentonite grout.		
Cut off surface protection		
2 ft. B.G.S. pull guard posts.		
Recontour surface.		

RECEIVED 15

Work Started 12-6-95, 19. Completed 12-7-95, 19

WELL CONSTRUCTOR CERTIFICATION:

I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards. Materials used and the information reported above are true to my best knowledge and belief.

NAME RUEN DRILLING, INC. (PERSON, FIRM, OR CORPORATION) (TYPE OR PRINT)
Address PO BOX 267, CLARK FORK, ID 83811
(Signed) [signature] (WELL DRILLER) License No. 1724
Contractor's Registration No. RUENCDI175QM Date DEC 14, 1995

(USE ADDITIONAL SHEETS IF NECESSARY)

ECL 050-1-20 (2/93)

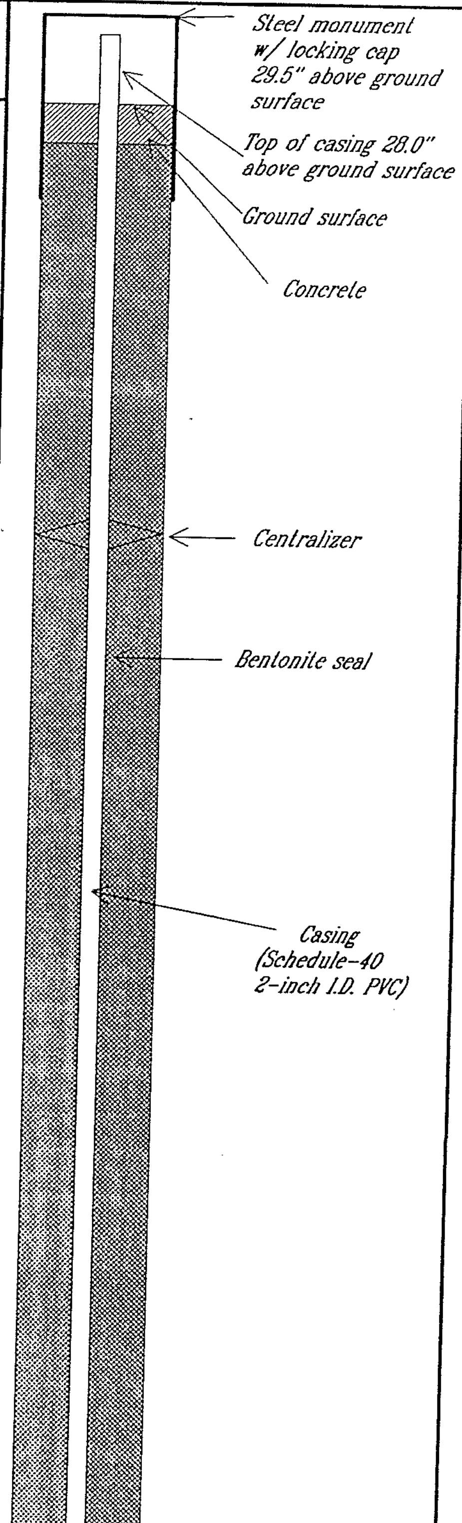
The Department of Ecology does NOT Warranty the Data and/or the Information on this Well Report.

PROJECT *IBP Wallula Plant* W.O. *S-1061* WELL NO. *MW-3*

Elevation reference:
Ground surface elevation: *486.1* Casing elevation: *488.50*

DEPTH (feet)	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	BLOW COUNTS	OVM READING	GROUND WATER
0–17	*(Medium stiff to hard) dry, tan to light brown, SILT with fine sand and clay interbedded with hard, dry, white CALICHE.*					
17–20	*(Hard) dry, white CALICHE.*					
20–33	*(Medium stiff) damp, light brown, fine sandy SILT to clayey SILT.*					
33–35	*(Stiff) damp, tan, gravelly SILT w/caliche.*					
35–43	*(Stiff) dry to damp, light brown SILT w/clay.*					
43–48	*(Hard to stiff) damp to moist, brown to oxidized brown CLAY with silt. Some bluish gray clay intervals.*					
48–60	*(Stiff) damp, light brown, SILT with some fine sand and scattered gravel. Few clay interbeds below 65 feet.*					

AS-BUILT DESIGN



TESTING

LEGEND

- - - Inferred stratigraphic contact
DATE SWL elevations and date of measurement

RZA AGRA, Inc.
Engineering & Environmental Services
539 West Sharp, Suite D
Spokane, WA 99201

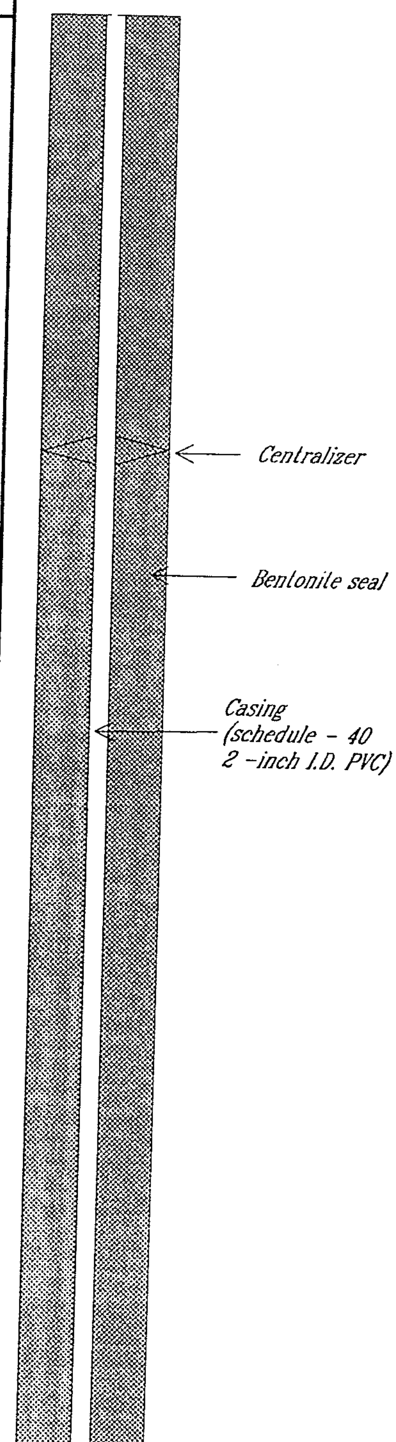
Drilling started: *4 August 1992* Drilling completed: *6 August 1992* Logged by: *ENJS*

PROJECT *IBP Wallula Plant* W.O. *S-1061* WELL NO. *MW-3*

Elevation reference:
Ground surface elevation: *486.1* Casing elevation: *488.50*

DEPTH (feet)	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	BLOW COUNTS	OVM READING	GROUND WATER
60						
	(Stiff) damp, light brown, SILT with some fine sand and scattered gravel. Few clay interbeds below 65 feet.					
70	*(Medium stiff-stiff) damp, gray-brown to bluish-brown CLAY*					
80						
90	*(Stiff) damp, light brown, fine sandy SILT with wet clay interbeds. CLAY becoming more abundant with depth.*					
100						
110						
	(Dense) damp, brown, silty coarse SAND.					
120						

AS-BUILT DESIGN



TESTING

LEGEND

- - - Inferred stratigraphic contact

SWL elevations and date of measurement

RZA AGRA, Inc.
Engineering & Environmental Services
539 West Sharp, Suite D
Spokane, WA 99201

Drilling started: *4 August 1992* Drilling completed: *6 August 1992* Logged by: *ENJS*

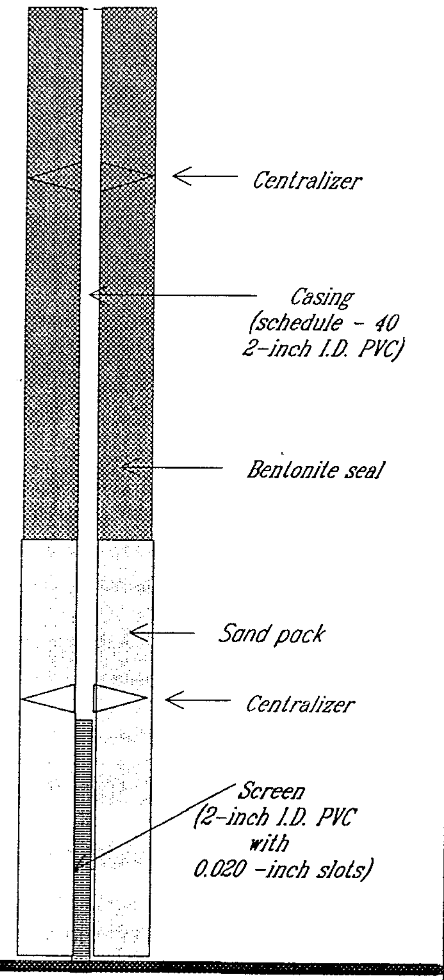
PROJECT *IBP Wallula Plant* W.O. *S-1061* WELL NO. *MW-3*

Elevation reference:
Ground surface elevation: *486.1* Casing elevation: *488.5*

AS-BUILT DESIGN

TESTING

DEPTH (feet)	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	BLOW COUNTS	OVM READING	GROUND WATER
120						
	(Stiff) damp, blueish and brown CLAY					
						8/10/92
130	*(Stiff) damp, brown, CLAY and SILT with brown sandy GRAVEL lenses.*					
140						
150	*(Dense) saturated, brown silty coarse SAND with gravel and clay.*					
160	*Boring terminated at approximately 160 feet.*					
170						
180						



LEGEND

- - - Inferred stratigraphic contact

DATE SWL elevation and date of measurement

RZA AGRA, Inc.
Engineering & Environmental Services
539 West Sharp, Suite D
Spokane, WA 99201

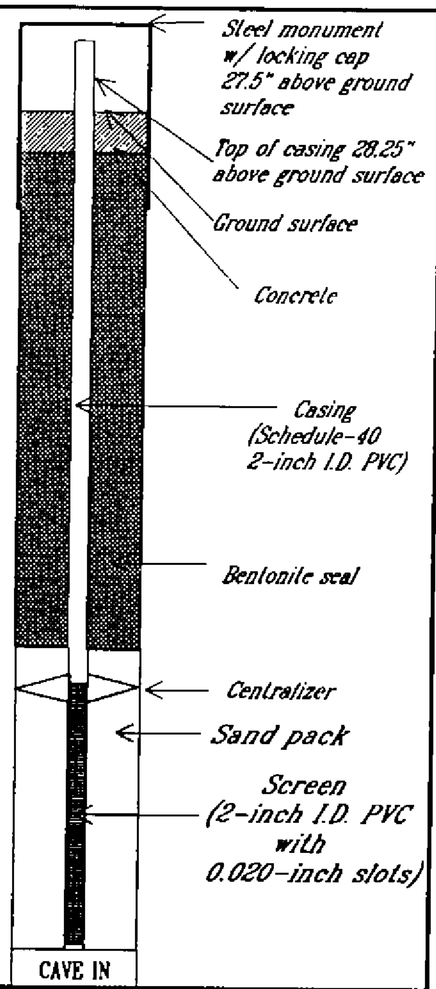
Drilling started: *4 August 1992* Drilling completed: *6 August 1992* Logged by: *ENJS*

PROJECT *IBP Wallula Plant* W.O. *S-1061* WELL NO. *MW-4*

Elevation reference:
round surface elevation: *411.5* Casing elevation: *413.62*

DEPTH (feet)	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	BLOW COUNTS	OVM READINGS	GROUND WATER
0	*(Loose) dry, tan SILT (Loess)*					
	(Dense) damp, brown, silty SAND with gravel					
	(Dense) moist, dark brown, fine to medium SAND with some silt and gravel. Some caliche on gravels.					
10	*(Dense to Very Dense) moist, brown to dark brown SAND with gravel and cobbles.*					
	(Dense) moist, brown, gravelly, medium to coarse SAND with silt. Few thin clay interbeds from 14.0 to 15.5 feet.					
	(Dense) damp, brown, micaceous, fine SAND with silt.					
20	*(Dense to Very Dense) damp to wet, brown, gravelly SAND*					
	(Very Dense) wet, brown, sandy GRAVELS and COBBLES					▼ 8/11/92
30	*(Dense) saturated, dark brown to black, sandy GRAVEL with silt. Interbedded brown, wet, gravelly SANDS from 30.0 to 33.0 feet.*					
	Boring terminated at approximately 37.8 feet.					
40						
50						
60						

AS-BUILT DESIGN



TESTING

LEGEND

- - - Inferred stratigraphic contact

▼ DATE SWL elevations and date of measurement

Start card info #056010
SE 1/4 NE 1/4 SW 1/4
Sec 35 T8N R31E

RZA AGRA, Inc.
Engineering & Environmental Services

539 West Sharp, Suite 0
Spokane, WA 99201

Drilling started: *4 August 1992* Drilling completed: *6 August 1992* Logged by: *ENJS*

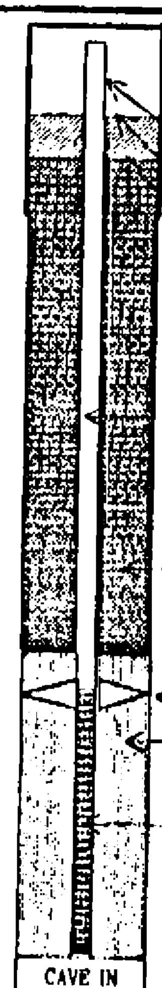
535 T8 R31

PROJECT *IBP Wallula Plant* W.O. *S-1061* WELL NO. *MW-4*

Elevation reference:
Ground surface elevation: Casing elevation:

DEPTH (feet)	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	BLOW COUNTS	OVM READING	GROUND WATER
0	(Loose) dry, tan SILT (Loess)					
	(Dense) damp, brown, silty SAND with gravel					
	(Dense) moist, dark brown, fine to medium SAND with some silt and gravel. Some caliche on gravels					
10	(Dense to Very Dense) moist, brown to dark brown, SAND with gravel and cobbles					
	(Dense) moist, brown, gravelly, medium to coarse SAND with silt. Few thin clay interbeds from 14.0 to 15.5 feet					
	(Dense) damp, brown, micaceous, fine SAND with silt					
20	(Dense to Very Dense) damp to wet, brown, gravelly SAND					
	(Very Dense) wet, brown, sandy GRAVELS and COBBLES					8/6/92
30	(Dense) wet, dark brown to black, sandy GRAVEL with silt. Interbedded brown, wet, gravelly SANDS from 30.0 to 33.0 feet.					
	Boring terminated at approximately 37.8 feet					
40						
50						
60						

AS-BUILT DESIGN



TESTING

RUEN DRILLING, INC.
BOX 267
CLARK FORK, ID 83811
(208) 266-1151

LEGEND

PERMIT # 050010

- - - Inferred stratigraphic contact

▼ DATE SWL elevations and date of measurement

Will Dayer

Gene St Godard 2035

RZA AGRA, Inc.
Engineering & Environmental Services
(509) 325-0104
539 West Sharp, Suite D
Spokane, WA 99201

John Sondegaard

Drilling started: *4 August 1992* Drilling completed: *6 August 1992* Logged by: *ENJS*

The Department of Ecology does NOT Warranty the Data and/or the Information on this Well Report.

File Original and First Copy with Department of Ecology
Second Copy — Owner's Copy
Third Copy — Driller's Copy

WATER WELL REPORT

STATE OF WASHINGTON

Start Card No. 056010
UNIQUE WELL I.D. #
Water Right Permit No.

(1) OWNER: Name Iowa Beef Processors Address Dakota City, Nebraska

(2) LOCATION OF WELL: County Walla Walla - NW 1/4 SW 1/4 Sec 35 T. 8 N., R 31E W.M.

(2a) STREET ADDRESS OF WELL (or nearest address) Dodd Road, Wallula, WA

(3) PROPOSED USE: ☐ Domestic ☐ Irrigation ☐ DeWater Industrial ☐ Test Well ☒ Municipal ☐ Other ☐

(4) TYPE OF WORK: Owner's number of well (If more than one) MW-4
Abandoned ☒ New well ☐ Deepened ☐ Reconditioned ☐ Method: Dug ☐ Cable ☐ Rotary ☐ Bored ☐ Driven ☐ Jetted ☐

(5) DIMENSIONS: Diameter of well 2" inches.
Drilled 37.8 feet. Depth of completed well 37.5 ft.

(6) CONSTRUCTION DETAILS:
Casing installed: 2 " Diam. from +2.5 ft. to 37.5 ft.
Welded ☐ " Diam. from ft. to ft.
Liner installed ☐
Threaded ☒ " Diam. from ft. to ft.

Perforations: Yes ☐ No ☒
Type of perforator used
SIZE of perforations in. by in.
perforations from ft. to ft.
perforations from ft. to ft.
perforations from ft. to ft.

Screens: Yes ☒ No ☐
Manufacturer's Name
Type PVC Model No.
Diam. 2 Slot size 0.020 from 27.5 ft. to 37.5 ft.
Diam. Slot size from ft. to ft.

Gravel packed: Yes ☒ No ☐ Size of gravel 10/20 css.
Gravel placed from 23 ft. to 37.5 ft.

Surface seal: Yes ☒ No ☐ To what depth? 23 ft.
Material used in seal Bentonite
Did any strata contain unusable water? Yes ☐ No ☒
Type of water? Depth of strata
Method of sealing strata off

(7) PUMP: Manufacturer's Name N/A
Type: H.P.

(8) WATER LEVELS: Land-surface elevation above mean sea level ft.
Static level 24.2 bgs ft. below top of well Date 8.9.92
Artesian pressure lbs. per square inch Date
Artesian water is controlled by (Cap, valve, etc.)

(9) WELL TESTS: Drawdown is amount water level is lowered below static level
Was a pump test made? Yes ☐ No ☒ If yes, by whom?
Yield: gal./min. with ft. drawdown after hrs.
" " " "
" " " "

Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level

Date of test
Bailer test gal./min. with ft. drawdown after hrs.
Airtest gal./min. with stem set at ft. for hrs.
Artesian flow g.p.m. Date
Temperature of water Was a chemical analysis made? Yes ☐ No ☐

(10) WELL LOG or ABANDONMENT PROCEDURE DESCRIPTION

Formation: Describe by color, character, size of material and structure, and show thickness of aquifers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of information.

MATERIAL	FROM	TO
Tremie grout with high solids		
bentonite grout.		
Pull surface protection and		
guard posts. recontour ground		
surface.		

RECEIVED
DEC 15 1995
DEPARTMENT OF ECOLOGY
EASTERN REGIONAL OFFICE

Work Started 12-6-95, 19. Completed 12-7-95, 19

WELL CONSTRUCTOR CERTIFICATION:

I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards. Materials used and the information reported above are true to my best knowledge and belief.

NAME Ruen Drilling, Inc (PERSON, FIRM, OR CORPORATION) (TYPE OR PRINT)
Address P.O. Box 267, Clark Fork, Id 83811
(Signed) [signature] (WELL DRILLER) License No. 1724
Contractor's Registration No. RUENCDI175QM Date DEC 14, 19 95

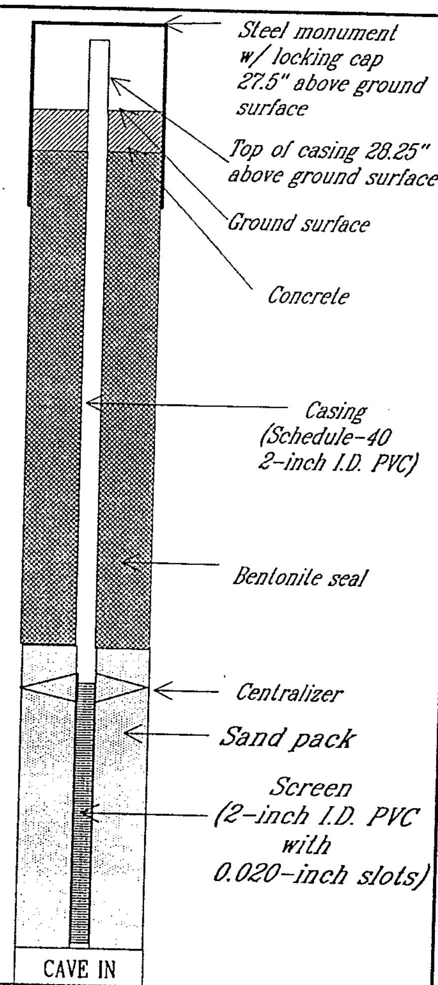
(USE ADDITIONAL SHEETS IF NECESSARY)

PROJECT *IBP Wallula Plant* W.O. *S-1061* WELL NO. *MW-4*

Elevation reference:
Ground surface elevation: *411.5* Casing elevation: *413.62*

DEPTH (feet)	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	BLOW COUNTS	OVM READING	GROUND WATER
0	*(Loose) dry, tan SILT (Loess).*					
	(Dense) damp, brown, silty SAND with gravel.					
	(Dense) moist, dark brown, fine to medium SAND with some silt and gravel. Some caliche on gravels.					
10	*(Dense to Very Dense) moist, brown to dark brown, SAND with gravel and cobbles.*					
	(Dense) moist, brown, gravelly, medium to coarse SAND with silt. Few thin clay interbeds from 14.0 to 15.5 feet.					
	(Dense) damp, brown, micaceous, fine SAND with silt.					
20	*(Dense to Very Dense) damp to wet, brown, gravelly SAND.*					
	(Very Dense) wet, brown, sandy GRAVELS and COBBLES.					8/9/92
30	*(Dense) saturated, dark brown to black, sandy GRAVEL with silt. Interbedded brown, wet, gravelly SANDS from 30.0 to 33.0 feet.*					
	Boring terminated at approximately 37.8 feet.					
40						
50						
60						

AS-BUILT DESIGN



TESTING

LEGEND

- - - Inferred stratigraphic contact

DATE — SWL elevations and date of measurement

RZA AGRA, Inc.
Engineering & Environmental Services
539 West Sharp, Suite D
Spokane, WA 99201

Drilling started: *4 August 1992* Drilling completed: *6 August 1992* Logged by: *ENJS*

Appendix D.

Water Well Reports Inventory Summary

Appendix D. Water Well Reports Inventory Summary

Well Inventory Number [1]	Township, Range, Section Well Log ID Number Well Tag ID	Owner	Well Completion Date	Well Location	Use [2]	Total Well Depth	Yield [3]	Casing [4]	Screened Interval [5]	Static Water Level [6]	Formation/ Screened Aquifer
						feet	gpm	feet below ground surface			
T8N R31E Section 10 - USGS 7.5 Minute Quadrangle											
1	8N/31E-10 AET541	Kyle Hadley Walla Walla, WA	4/16/2001	SW of NW	D	303	50+ 5 hr Air	+1.5-245 (6)	None	163	Basalt
2	8N/31E-10	Union Pacific Railroad Walla Walla, WA	6/2/1993	NW of NW	O, A	380	NR	NR (6)	NR	NR	NR
T8N R31E Section 15 - USGS 7.5 Minute Quadrangle											
3	8N/31E-15	Charles Hughes Walla Walla, WA	2/13/1981	SW of NW	T	88	4 Air	+1-86 (8)	None	76	Basalt
4	8N/31E-15 APL084/NP-4	Tyson Foods Wallula, WA	9/11/2007	SW of NW	T	90	NR	+2.5-70 (2)	70-90 (2)(0.01)	80.7	Basalt
T8N R31E Section 16 - USGS 7.5 Minute Quadrangle											
5	8N/31E-16 Well #1	Charles Hughes Walla Walla, WA	11/22/1997	NE of SE	T, A	78	NR	NR	NR	NR	UCA
6	8N/31E-16 Well #2	Charles Hughes Walla Walla, WA	11/22/1991	NE of SE	D, T	55	50 2 hr Air	+2-55 (6)	None	30	UCA
7	8N/31E-16	Charles Hughes Walla Walla, WA	10/3/1992	SE of SE	I	58.5	2000 4 hr Pump	+1-58.5 (16)	42.5-54.5 (16) 54.5-58.5 (14)	30	UCA
T8N R31E Section 17 - USGS 7.5 Minute Quadrangle											
8	8N/31E-17	Dave Jonker Walla Walla, WA	6/21/1995	SW of SE	D	90	25 4 hr Air	+1-90 (6)	NR	70	Basalt
9	8N/31E-17	Jerry Wright 1215 Lindon Dr. Pasco, WA	8/29/1992	SW of SE	D	93	30 3 hr Air	+2-88 (6)	88-93 (5)(0.01)	63	UCA
10	8N/31E-17 H-3-03	Dave Nelson Walla Walla, WA	9/30/2003	NW of SE	GT	29.5	None	None	None	None	UCA
11	8N/31E-17 AHP978	Washington State Dept of Trans Walla Walla, WA	8/21/2004	NW of SE	GT	29.5	None	None	None	None	NR
12	8N/31E-17 AHP977	Washington State Dept of Trans Walla Walla, WA	8/21/2004	NW of SE	GT	34.5	None	None	None	None	NR
13	8N/31E-17 AHP976	Washington State Dept of Trans Walla Walla, WA	8/21/2004	NW of SE	GT	28	None	None	None	None	NR
14	8N/31E-17 AFH028	Walten Bogart 291 Westborne Loop Walla Walla, WA	6/19/2000	W of SE	D	85	25 2 hr Air	+1-85 (6)	None	71	UCA

Appendix D. Water Well Reports Inventory Summary

Well Inventory Number [1]	Township, Range, Section Well Log ID Number Well Tag ID	Owner	Well Completion Date	Well Location	Use [2]	Total Well Depth	Yield [3]	Casing [4]	Screened Interval [5]	Static Water Level [6]	Formation/ Screened Aquifer
						feet	gpm	feet below ground surface			
T8N R31E Section 20 - USGS 7.5 Minute Quadrangle											
15	8N/31E-20 H-2-00	Washington State Dept of Trans Walla Walla, WA	10/5/2000	NE of NE	GT	19	None	None	None	None	NR
16	8N/31E-20 H-4-00	Washington State Dept of Trans Walla Walla, WA	9/29/2000	NE of NE	GT	30	None	None	None	None	NR
T8N R31E Section 21 - USGS 7.5 Minute Quadrangle											
17	8N/31E-21	Charles Hughes Walla Walla, WA	9/27/1991	E of NE	I, T	57.5	420 4 hr Pump	+1.3-46.76 (16) 53-57.5 (14) 33-46.5 (1)	49-53 (14)	33	UCA
18	8N/31E-21	Elmer Iverson East Humorist Rd Pasco, WA	11/22/1974	SW of SE	T	20	None	NR (16)	Perf (3/8)	NR	UCA
19	8N/31E-21	Flat Top Ranch Star Route Box K Prescott, WA	7/1/1989	E of SE	I	28	None	NR	Perf (3")	22	UCA
20	8N/31E-21	Flat Top Ranch Star Route Box K Prescott, WA	8/25/1989	SE	T	32	NR	+1-31 (12)	None	19	Basalt
21	8N/31E-21	Ken Ireland PO Box 823 Pasco, WA	5/16/1978	SE of SE	D	125	None	+1-40 (6)	None	25	Basalt
22	8N/31E-21 TH 8-01	Washington State Dept of Trans Walla Walla, WA	9/26/2001	SW of NW	GT	35	None	None	None	NR	NR
23	8N/31E-21 TH 7-01	Washington State Dept of Trans Walla Walla, WA	9/27/2001	SW of NW	GT	30	None	None	None	NR	NR
T8N R31E Section 22 - USGS 7.5 Minute Quadrangle											
24	8N/31E-22	Charles Hughes Route 9 Box 280 Pasco, WA	8/26/1991	NE of SW	D	51.5	45 NR Air	+1-51.5 (6)	None	33	UCA
25	8N/31E-22	Kenneth Ireland 1704 N. 19th Pasco, WA	2/27/1978	SW of SW	D	177	None	+1-143 (6)	None	60	Basalt
26	8N/31E-22 NP-5	Tyson Foods Walla Walla, WA	9/11/2007	NW of NW	T	55	NR	+2.5-35 (2)	35-55 (0.01)	34	UCA
T8N R31E Section 23 - USGS 7.5 Minute Quadrangle											
27	8N/31E-23 APL087/NP-2	Simplot Walla Walla, WA	9/13/2007	NW of NW	T	60	NR	+2.5-40 (2)	40-60 (0.01)	40	UCA

Appendix D. Water Well Reports Inventory Summary

Well Inventory Number [1]	Township, Range, Section Well Log ID Number Well Tag ID	Owner	Well Completion Date	Well Location	Use [2]	Total Well Depth	Yield [3]	Casing [4]	Screened Interval [5]	Static Water Level [6]	Formation/ Screened Aquifer
						feet	gpm	feet below ground surface			
T8N R31E Section 25 - USGS 7.5 Minute Quadrangle											
28	8N/31E-25	Simplot Walla Walla, WA	11/6/2014	NE of SE	GT	25	None	None	NR	21.1	NR
T8N R31E Section 26 - USGS 7.5 Minute Quadrangle											
29	8N/31E-26 MW-1	Boise Cascade Paper Group PO Box 500 Wallula, WA	4/1/1987	NW of NW	T	29	None	+2-4 (6) +1-29 (2)	19-29 (10)	19	UCA
30	8N/31E-26 MW-4	Boise Cascade Paper Group PO Box 500 Wallula, WA	4/2/1987	NW of NW	T	29	None	+2-4 (6) +1-29 (2)	19-29 (10)	19	UCA
31	8N/31E-26 MW-2	Boise Cascade Paper Group PO Box 500 Wallula, WA	4/1/1987	NW of NW	T	33	None	+3-19 (6) +2-33 (2)	23-33 (10)	24	UCA
32	8N/31E-26 MW-3	Boise Cascade Paper Group PO Box 500 Wallula, WA	4/2/1987	NW of NW	T	38	None	+2-4 (6) +1-38 (2)	28-38 (10)	28	UCA
33	8N/31E-26 MW-6	Boise Cascade Paper Group PO Box 500 Wallula, WA	3/31/1987	NW of NW	T	45	None	+2-4 (6) +1-45 (2)	35-45 (10)	35	Basalt
34	8N/31E-26 MW-5	Boise Cascade Paper Group PO Box 500 Wallula, WA	4/3/1987	NW of NW	T	62	None	+2-4 (6) +1-62 (2)	52-65 (10)	54	UCA
35	8N/31E-26 MW-1	IBP Wallula Plant	8/6/1992	NR	T	195	NR	+2.5-157 (2)	157-168 (2,0.20)	144	UCA
36	8N/31E-26 MW-2	IBP Wallula Plant	8/6/1992	SE of SW	T	147.2	NR	+2.5-137 (2)	137-146 (2,0.20)	125	UCA
37	8N/31E-26 MW-3	IBP Wallula Plant	8/6/1992	NW of NW	T	160	NR	+2.3-149 (2)	149-160 (2,0.20)	126	UCA
38	8N/31E-26 Well #3	Iowa Beef Walla Walla, WA	8/12/1989	NW of NW	T	200	None	0-29.5 (10) +2-200 (6)	Perf 70-90 (6,0.25)	75	UCA
39	8N/31E-26 Well #2	Iowa Beef Walla Walla, WA	7/25/1980	NW of NW	T	186	NR	+2-186 (6)	Perf 110-154 (6)	118	UCA
40	8N/31E-26 Well #1	Iowa Beef Walla Walla, WA	7/25/1980	NW of NW	T	244	None	0-185.5 (6) 182-244 (5)	Perf 130-150 (6)	135	UCA
41	8N/31E-26 Well #4	Iowa Beef Walla Walla, WA	10/21/1986	NW of NW	T	160	7-10 NR Air	+2-160 (6)	Perf 120-140 (6,0.25)	90	UCA

Appendix D. Water Well Reports Inventory Summary

Well Inventory Number [1]	Township, Range, Section Well Log ID Number Well Tag ID	Owner	Well Completion Date	Well Location	Use [2]	Total Well Depth	Yield [3]	Casing [4]	Screened Interval [5]	Static Water Level [6]	Formation/ Screened Aquifer
						feet	gpm	feet below ground surface			
42	8N/31E-26 APL085/NP-1	Tyson Foods Walla Walla, WA	9/12/2007	NW of NE	T	95	NR	+2.5-75 (2)	75-95 (2,0.01)	77	UCA
T8N R31E Section 27 - USGS 7.5 Minute Quadrangle											
43	8N/31E-27 NP-3	Judeh Farms 6010 Sheffield Rd Basin City, WA	7/5/2000	NR	D	145	15 NR Air	+2-45 (6) 45-145 (4)	Perf 100-145 (4,0.25)	58	UCA
44	8N/31E-27 APL086	Simplot Walla Walla, WA	9/13/2007	SW of NE	T	97	NR	+2.5-77 (2)	77-97 (2,0.01)	77	UCA
45	8N/31E-27	Whane Buchanon Walla Walla, WA	2/29/1984	SW of SW	D	127	30 1 hr Air	-1-79 (6)	None	42	Basalt
T8N R31E Section 28 - USGS 7.5 Minute Quadrangle											
46	8N/31E-28 H-6-00	Washington State Dept of Trans Walla Walla, WA	10/3/2000	NW of NW	GT	25.5	None	None	None	7	Basalt
T8N R31E Section 33 - USGS 7.5 Minute Quadrangle											
47	8N/31E-33	Bob Harvey 2027 W. Canal Drive Kennewick, WA	1/14/1977 4/3/1978	NE of NE	I, R	165	500 NR Air	+1-19 (10)	None	23	Basalt
48	8N/31E-33 AGT607	US Army Corp of Engineers Dodd Relt Hwy 12 Kennewick, WA	2/6/2002	SW of NE	T	13	NR	-1-3 (3/4)	3-13 (3/4,0.01)	NR	UCA
49	8N/31E-33 AGT608	US Army Corp of Engineers Dodd Relt Hwy 12 Kennewick, WA	2/6/2002	SW of NE	T	14	NR	-1-4 (3/4)	4-14 (3/4,0.01)	NR	UCA
50	8N/31E-33 AGT610	US Army Corp of Engineers Dodd Relt Hwy 12 Kennewick, WA	2/6/2002	SW of NE	T	20	NR	-1-8.5 (3/4)	8.5-20 (3/4,0.01)	NR	UCA
51	8N/31E-33 AGT609	US Army Corp of Engineers Dodd Relt Hwy 12 Kennewick, WA	2/6/2002	SW of NE	T	21	NR	-1-11 (3/4)	11-21 (3/4,0.01)	NR	UCA
52	8N/31E-33 AGT611	US Army Corp of Engineers Dodd Relt Hwy 12 Kennewick, WA	2/6/2002	SW of NE	T	15	NR	-1-5 (3/4)	5-15 (3/4,0.01)	NR	UCA
53	8N/31E-33 AGT612	US Army Corp of Engineers Dodd Relt Hwy 12 Kennewick, WA	2/6/2002	SW of NE	T	9	NR	-1-4 (3/4)	4-9 (3/4,0.01)	NR	UCA
54	8N/31E-33 PH3-1-05	Washington State Dept of Trans Walla Walla, WA	4/6/2005	SE of SE	GT	20.5	None	None	None	NR	NR
55	8N/31E-33 PH3-2-05	Washington State Dept of Trans Walla Walla, WA	4/6/2005	SE of SE	GT	20.5	None	None	None	3	UCA

Appendix D. Water Well Reports Inventory Summary

Well Inventory Number [1]	Township, Range, Section Well Log ID Number Well Tag ID	Owner	Well Completion Date	Well Location	Use [2]	Total Well Depth	Yield [3]	Casing [4]	Screened Interval [5]	Static Water Level [6]	Formation/ Screened Aquifer
						feet	gpm	feet below ground surface			
56	8N/31E-33 PH3-3-05	Washington State Dept of Trans Walla Walla, WA	4/7/2005	SE of SE	GT	23.5	None	None	None	1	UCA
57	8N/31E-33 PH3-4-05	Washington State Dept of Trans Walla Walla, WA	4/1/2005	SE of SE	GT	13.5	None	None	None	NR	NR
T8N R31E Section 34 - USGS 7.5 Minute Quadrangle											
58	8N/31E-34	Atlantic Richfield Hanford Co PO Box 769 Richland, WA	10/21/1968	NE of NE	In	489	NR	0-385(10)	NR	203	Basalt
59	8N/31E-34 ABR647/Well 1	IBP Inc. Box 315 Dakota City, ME	3/10/1990	NW of NE	In	700	NR	+2-138 (12) +2-417 (10) 405-700 (8)	645-695 (100)	111	Basalt
60	8N/31E-34	IBP Inc. 13983 Dodd Rd. Wallula, WA	6/3/2002	NW of NE	GT	25	NR	None	None	Dry	UCA
61	8N/31E-34	L&M Feedlot Inc. PO Box 2403 Pasco, WA	1/14/1988	SE of SE	I, R	410	65 NR Pump	+1-400 (8)	Perf 165-390 (3/8)	NR	Basalt
62	8N/31E-34	Louis Jaussaud Walla Walla, WA	5/12/1952	NW of SE	NR	240	100 NR Pump	0-103 (8)	NR	95	Basalt
63	8N/31E-34	McGregor Land & Livestock Box 607 Pasco, WA	1/30/1969	SE of SE	In	395	300 8 hr Pump	0-93 (10)	NR	105	UCA
64	8N/31E-34	McGregor Land & Livestock Box 607 Pasco, WA	9/5/1968	SE of NE	In	480	375 2 hr	0-97 (10)	NR	NR	Basalt
65	8N/31E-34	Port of Walla Walla 310 A Street Walla Walla, WA	5/9/2001	SW	O, A	107	15 1 hr Air	None	None	13	Basalt
66	8N/31E-34 Dodd Rd Ind Park #1	Port of Walla Walla 310 A Street Walla Walla, WA	5/9/2001	SE of SW	I	861	2200 17 Hr Pump	+3-497 (16) 482-859 (12)	753-774 (0.15) Perf 528-548 (3/16) Perf 588-753 (3/16) Perf 774-858 (3/16)	57	Basalt
67	8N/31E-34	Port of Walla Walla 310 A Street Walla Walla, WA	4/30/2013	SW of SE	GT	70	None	None	None	Dry	UCA
68	8N/31E-34	Port of Walla Walla 310 A Street Walla Walla, WA	4/30/2013	SE of SW	GT	25	None	None	None	13	UCA
69	8N/31E-34 ACP719/MW #5	Simplot Feeders 20876 Wagner Road Caldwell, ID	6/18/1997	SW of SE	T	47	None	+2.5-32 (4)	32-47 (4,0.02)	29	UCA

Appendix D. Water Well Reports Inventory Summary

Well Inventory Number [1]	Township, Range, Section Well Log ID Number Well Tag ID	Owner	Well Completion Date	Well Location	Use [2]	Total Well Depth	Yield [3]	Casing [4]	Screened Interval [5]	Static Water Level [6]	Formation/ Screened Aquifer
						feet	gpm	feet below ground surface			
70	8N/31E-34 AAP536/Rplcmt Well #2	Simplot Feeders 20876 Wagner Road Caldwell, ID	5/16/2000	SE of SE	In	915	800 NR Air	+2-632 (16) 625-915 (12)	Perf 625-915 (3/16)	128	Basalt
T8N R31E Section 35 - USGS 7.5 Minute Quadrangle											
71	8N/31E-35 MW-3	IBP Wallula Plant	8/6/1992	NR	T	160	NR	+2.3-149 (2)	149-160 (2,0.02)	125	UCA
72	8N/31E-35 MW-4	IBP Wallula Plant	8/6/1992	SE of NE	T	37.8	NR	+2.3-25 (2)	25-37.8 (2,0.02)	25	UCA
73	8N/31E-35 MW-3	Iowa Beef Processors Dakota City, NE	12/7/1995	NW of NW	T, A	160	None	+2.5-160 (2)	150-160 (0.02)	126	UCA
74	8N/31E-35 MW-4	Iowa Beef Processors Dakota City, NE	12/4/1995	NW of SW	T, A	37.5	None	+2.5-37.5 (2)	27.5-37.5 (2,0.02)	24.2	UCA
75	8N/31E-35	McGregor Feedlot PO Box 607 Pasco, WA	4/21/1971	NE of NW	I	505	800-1000 NR Air	0-142 (10) 0-208 (8)	None	152	Basalt
76	8N/31E-35	Port of Walla Walla Walla Walla, WA	11/6/2014	NW of SE	GT	25	None	None	None	Dry	UCA
77	8N/31E-35	Simplot Feeders Walla Walla, WA	11/6/2014	SE of NE	GT	25	None	None	None	Dry	UCA
T8N R31E Section 36 - USGS 7.5 Minute Quadrangle											
78	8N/31E-36	Washington Dept of Nat Resources Walla Walla, WA	11/6/2014	NE of NW	GT	25	None	None	None	Dry	UCA
T8N R31E Section 9 - USGS 7.5 Minute Quadrangle											
79	8N/31E-9	Frank Hutchinson 4012 W. Livingston Pasco, WA	4/18/1974	NE of SE	D	170	25 2 hr Air	0-170 (6)	None	110	Basalt
80	8N/31E-9	Iverson Walla Walla, WA	2/15/1974	NR	D	190	20 1 hr	+1-185 (6)	185-190 (0.012)	168	UCA

NOTES:

All information based on original Washington State Department of Ecology well log data. Field verification of location and current use status was not done. Registered Water Well Reports for Wells in Township 8N, Range 31E, and Sections 9-11, 13-16, 20-28 and 33-36 (Washington State Department of Ecology, 2015).

Abbreviations: gpm = gallons per minute, ID = identification number, NR = not reported, SCA = semi-confined aquifer, UCA = unconfined aquifer.

1 Well inventory numbers assigned for the purpose of this report and correspond to text and/or figure and appendix references within this report.

2 Well type codes: A = abandoned, D = domestic, GT = geotechnical soil boring, I = irrigation, In = industrial, DW = dewater, O = other (stock), R = recondition (e.g., deepening), T = test well.

3 Yield information is presented in sequence as follows: gallons per minute, test duration, and test method (e.g., "Air").

4 Casing length (e.g., "0 to 107") reported in feet and diameter (e.g., "(2)") reported in inches.

5 Screened interval is the portion of the well open to the formation. If no screen or perforations, then open borehole is assumed below the casing.

6 Static water level at the time of drilling.

Appendix E.

Water Well Reports for Wells within One-mile of the Land Treatment Site

File Original with Department of Ecology
Second Copy - Owners Copy
Third Copy - Drillers Copy

102398

WATER WELL REPORT

STATE OF WASHINGTON

Notice of Intent W 183921
UNIQUE WELL I D # AET-541
Water Right Permit No

(1) OWNER Name Kyle Hadley Address 407 S. Fillmore Kenn Wa 99336

(2) LOCATION OF WELL: County Walla Walla SW 1/4 NW 1/4 Sec 10 T 8N N R 31 EWM

(2a) STREET ADDRESS OF WELL: (or nearest address) McWhirt Ridge Rd

TAX PARCEL NO.

(3) PROPOSED USE: ☑ Domestic ☐ Industrial ☐ Municipal ☐ Irrigation ☐ Test Well ☐ Other ☐ DeWater

(4) TYPE OF WORK: Owner's number of well (if more than one)
☑ New Well ☐ Deepened ☐ Reconditioned ☐ Decommission
Method ☐ Dug ☐ Cable ☑ Rotary ☐ Bored ☐ Driven ☐ Jetted

(5) DIMENSIONS. Diameter of well 6" inches
Drilled 305 feet Depth of completed well 305 ft

(6) CONSTRUCTION DETAILS
Casing Installed: Welded 6" Diam from +1.5 ft to 245 ft
Liner installed " Diam from ft to ft
Threaded " Diam from ft to ft

Perforations ☐ Yes ☑ No
Type of perforator used
SIZE of perforations in by in
perforations from ft to ft

Screens ☐ Yes ☑ No ☐ K-Pac Location
Manufacturers Name
Type Model No
Diam Slot Size from ft to ft
Diam Slot Size from ft to ft

Gravel/Filter packed: ☐ Yes ☑ No ☐ Size of gravel/sand
Material placed from ft to ft

Surface seal ☑ Yes ☐ No To what depth? 20+ ft
Material used in seal Bentonite
Did any strata contain unusable water? ☐ Yes ☑ No
Type of water? Depth of strata
Method of sealing strata off

(7) PUMP Manufacturer's Name
Type H P

(8) WATER LEVELS: Land-surface elevation above mean sea level ft
Static level 16.3 ft below top of well Date 4-16-01
Artesian pressure lbs per square inch Date
Artesian water is controlled by (Cap. valve etc)

(9) WELL TESTS Drawdown is amount water level is lowered below static level
Was a pump test made? ☐ Yes ☐ No If yes, by whom?
Yield gal/min with ft drawdown after hrs
Yield gal/min with ft drawdown after hrs
Yield gal/min with ft drawdown after hrs
Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level

Date of test
Bailer test gal/min with ft drawdown after hrs
Airtest 50+ gal/min with ft drawdown after 3 hrs
Artesian flow g p m Date
Temperature of water Was a chemical analysis made? ☐ Yes ☑ No

(10) WELL LOG or DECOMMISSIONING PROCEDURE DESCRIPTION
Formation Describe by color character, size of material and structure, and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of information Indicate all water encountered

MATERIAL	FROM	TO
Sand	0	32
Black Sand & Gravel	32	173
Fractured Basalt & Clay	173	225
Black Clay	225	242
Black Basalt	242	250
Red & Black Porous Basalt	250	296
Water Bearing 50 GPM	"	"
Black Basalt	296	305

RECEIVED
APR 2 6 2001
DEPARTMENT OF ECOLOGY
WELL DRILLING UNIT

DEPARTMENT OF ECOLOGY
EASTERN REGIONAL OFFICE

Work Started 4-6 01 Completed 4-16 01

WELL CONSTRUCTION CERTIFICATION:
I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards Materials used and the information reported above are true to my best knowledge and belief

Type or Print Name Leon Haney License No 2343
(Licensed Driller/Engineer)
Trainee Name License No
Drilling Company Statewide Well Drilling
(Signed) License No 2343
(Licensed Driller/Engineer)
Address 101 Kahlotus Trail Rd Pasco Wa 99301
Contractor's Registration No STATEWD015L2 Date 2-14 02

(USE ADDITIONAL SHEETS IF NECESSARY)

Ecology is an Equal Opportunity and Affirmative Action employer For special accommodation needs contact the Water Resources Program at (360) 407-6600 The TDD number is (360) 407-6006

ECY 050-1-20 (11/98)

The Department of Ecology does NOT Warranty the Data and/or the Information on this Well Report.

The Department of Ecology does NOT Warranty the Data and/or the Information on this Well Report.

2

File Original and First Copy with Department of Ecology
Second Copy—Owner's Copy
Third Copy—Driller's Copy

WATER WELL REPORT
STATE OF WASHINGTON

Start Card No. 056545
UNIQUE WELL I.D. #
Water Right Permit No.

(1) OWNER: Name UNION PACIFIC RAILROAD Address 1416 DODGE STREET OMAHA, NE 68179

(2) LOCATION OF WELL: County WALLA WALLA NW ¼ NW ¼ Sec 10 T. 8 N., R 31E W.M.

(2a) STREET ADDDRESS OF WELL (or nearest address) HUMORIST RD. & UP RAIL LINE

(3) PROPOSED USE: ☐ Domestic ☐ Irrigation ☐ DeWater Industrial ☐ Test Well ☐ Municipal ☐ Other ☒

(4) TYPE OF WORK: Owner's number of well (if more than one)
Abandoned ☒ New well ☐ Deepened ☐ Reconditioned ☐ Method: Dug ☐ Cable ☐ Rotary ☐ Bored ☐ Driven ☐ Jetted ☐

(5) DIMENSIONS: Diameter of well 6" inches.
Drilled ____ feet. Depth of completed well 380 ft.

(6) CONSTRUCTION DETAILS:
Casing installed: ____" Diam. from ____ ft. to ____ ft.
Welded ☐ ____" Diam. from ____ ft. to ____ ft.
Liner installed ☐
Threaded ☐ ____" Diam. from ____ ft. to ____ ft.

Perforations: Yes ☐ No ☐
Type of perforator used
SIZE of perforations ____ in. by ____ in.
____ perforations from ____ ft. to ____ ft.
____ perforations from ____ ft. to ____ ft.
____ perforations from ____ ft. to ____ ft.

Screens: Yes ☐ No ☐
Manufacturer's Name
Type ____ Model No.
Diam. ____ Slot size ____ from ____ ft. to ____ ft.
Diam. ____ Slot size ____ from ____ ft. to ____ ft.

Gravel packed: Yes ☐ No ☐ Size of gravel
Gravel placed from ____ ft. to ____ ft.

Surface seal: Yes ☐ No ☐ To what depth? ____ ft.
Material used in seal
Did any strata contain unusable water? Yes ☐ No ☐
Type of water? ____ Depth of strata
Method of sealing strata off

(7) PUMP: Manufacturer's Name
Type: ____ H.P.

(8) WATER LEVELS: Land-surface elevation above mean sea level ____ ft.
Static level ____ ft. below top of well Date
Artesian pressure ____ lbs. per square inch Date
Artesian water is controlled by ____ (Cap, valve, etc.)

(9) WELL TESTS: Drawdown is amount water level is lowered below static level
Was a pump test made? Yes ☐ No ☐ If yes, by whom?
Yield: ____ gal./min. with ____ ft. drawdown after ____ hrs.
" " " "
" " " "

Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level

Date of test
Bailer test ____ gal./min. with ____ ft. drawdown after ____ hrs.
Airtest ____ gal./min. with stem set at ____ ft. for ____ hrs.
Artesian flow ____ g.p.m. Date
Temperature of water ____ Was a chemical analysis made? Yes ☐ No ☐

(10) WELL LOG or ABANDONMENT PROCEDURE DESCRIPTION

Formation: Describe by color, character, size of material and structure, and show thickness of aquifers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of information.

MATERIAL	FROM	TO
WELL ABANDONMENT		
PRESSURE GROUTED WELL WITH 121 BAGS OF CEMENT		
SLURRY, CUT CASING OFF BELOW GROUND LEVEL,		
POURED CEMENT CAP OVER WELL HEAD AND BACK -		
FILLED WELL VAULT WITH NATIVE MATERIALS.		

RECEIVED
JUN 15 1993
DEPARTMENT OF ECOLOGY
... REGIONAL OFFICE

Work started 6/1/93, 19. Completed 6/2, 19 93

WELL CONSTRUCTOR CERTIFICATION:
I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards. Materials used and the information reported above are true to my best knowledge and belief.

NAME PONDEROSA DRILLING & DEVELOPMENT, INC.
(PERSON, FIRM, OR CORPORATION) (TYPE OR PRINT)
Address E. 6010 BROADWAY SPOKANE, WA 99212
(Signed) ____ License No. 2092
(WELL DRILLER) (RON LINNEMON)
Contractor's Registration No. PO-ND-EI*248JE Date 6/8, 19 93

(USE ADDITIONAL SHEETS IF NECESSARY)

ECY 050-1-20 (10/87) -1329- 18

3

File Original and First Copy with Department of Ecology
Second Copy—Owner's Copy
Third Copy—Driller's Copy

WATER WELL REPORT

STATE OF WASHINGTON

Start Card No. [redacted]

Water Right Permit No. ______

(1) **OWNER:** Name Charles Hughes Address Rt 8 Box 280 Pasco

(2) **LOCATION OF WELL:** County Walla Walla SW ¼ NW ¼ Sec 15 T. 8 N., R. 31 W.M.

(2a) **STREET ADDDRESS OF WELL** (or nearest address) ______

(3) **PROPOSED USE:** ☐ Domestic ☐ Irrigation ☐ DeWater Industrial ☐ Test Well ☒ Municipal ☐ Other ☐

(4) **TYPE OF WORK:** Owner's number of well (if more than one) ______
Abandoned ☐ New well ☒ Deepened ☐ Reconditioned ☐
Method: Dug ☐ Cable ☐ Rotary ☒ Bored ☐ Driven ☐ Jetted ☐

(5) **DIMENSIONS:** Diameter of well 8 inches.
Drilled 88 feet. Depth of completed well 88 ft.

(6) **CONSTRUCTION DETAILS:**
Casing installed: 8 " Diam. from +1 ft. to 86 ft.
Welded ☐ ____ " Diam. from ____ ft. to ____ ft.
Liner installed ☐
Threaded ☐ ____ " Diam. from ____ ft. to ____ ft.

Perforations: Yes ☐ No ☒
Type of perforator used ______
SIZE of perforations ______ in. by ______ in.
______ perforations from ______ ft. to ______ ft.
______ perforations from ______ ft. to ______ ft.
______ perforations from ______ ft. to ______ ft.

Screens: Yes ☐ No ☒
Manufacturer's Name ______
Type ______ Model No. ______
Diam. ______ Slot size ______ from ______ ft. to ______ ft.
Diam. ______ Slot size ______ from ______ ft. to ______ ft.

Gravel packed: Yes ☐ No ☒ Size of gravel ______
Gravel placed from ______ ft. to ______ ft.

Surface seal: Yes ☒ No ☐ To what depth? 25 ft.
Material used in seal Bentonite
Did any strata contain unusable water? Yes ☐ No ☒
Type of water? ______ Depth of strata ______
Method of sealing strata off ______

(7) **PUMP:** Manufacturer's Name ______
Type: ______ H.P. ______

(8) **WATER LEVELS:** Land-surface elevation above mean sea level ______ ft.
Static level 26 ft. below top of well Date 2-13-91
Artesian pressure ______ lbs. per square inch Date ______
Artesian water is controlled by ______ (Cap, valve, etc.)

(9) **WELL TESTS:** Drawdown is amount water level is lowered below static level
Was a pump test made? Yes ☐ No ☐ If yes, by whom? ______
Yield: ______ gal./min. with ______ ft. drawdown after ______ hrs.
" " " "
" " " "

Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level

Date of test ______
Bailer test ______ gal./min. with ______ ft. drawdown after ______ hrs.
Airtest 4 gal./min. with stem set at 86 ft. for ______ hrs.
Artesian flow ______ g.p.m. Date ______
Temperature of water ______ Was a chemical analysis made? Yes ☐ No ☐

(10) **WELL LOG or ABANDONMENT PROCEDURE DESCRIPTION**

Formation: Describe by color, character, size of material and structure, and show thickness of aquifers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of information.

MATERIAL	FROM	TO
Sand Tan	0	33
Sand Black Silty	33	48
Sand Tan	48	52
Sand Gray	52	63
Gravel & Sand Black	63	82
Water Bearing @ 86 feet		
Sand Black Silty	82	86
Basalt Black	86	88

MONITORING WELL

RECEIVED FEB 21 1991 DEPARTMENT OF ECOLOGY SPOKANE REGIONAL OFFICE

Work started 2-13, 19__. Completed 2-13, 1991

WELL CONSTRUCTOR CERTIFICATION:

I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards. Materials used and the information reported above are true to my best knowledge and belief.

NAME Nelson Well Drilling Inc (PERSON, FIRM, OR CORPORATION) (TYPE OR PRINT)
Address 10036 W Argent Pasco
(Signed) James Nelson (WELL DRILLER) License No. 361
Contractor's Registration No. NELSOWD148CQ Date 2-19, 1991

(USE ADDITIONAL SHEETS IF NECESSARY)

275183 Please print, sign and return by mail to Department of Ecology

4

RESOURCE PROTECTION WELL REPORT

CURRENT Notice of Intent No. R71632

(SUBMIT ONE WELL REPORT PER WELL INSTALLED)

Construction/Decommission *(select one)*
- [x] Construction
- [ ] Decommission *ORIGINAL INSTALLATION Notice of Intent Number* ________

Type of Well *(select one)*
- [x] Resource Protection
- [ ] Geotech Soil Boring

Consulting Firm: URS Corporation

Unique Ecology Well ID Tag No.: APL084 NP-4

Property Owner: Tyson Foods

Site Address: Between 13983 & 14813 Dodd Rd

City: Wallula County: Walla Walla

Location SW 1/4-1/4 NW 1/4 Sec 15 Twn 8 R 31 Select One [x] EWM [ ] WWM

Lat/Long (s, t, r still REQUIRED) Lat Deg ______ Lat Min/Sec ______ Long Deg ______ Long Min/Sec ______

Tax Parcel No. 000000002341

Cased or Uncased Diameter 6" Static Level 80.7'

Work/Decommission Start Date 9/11/07

Work/Decommission Completed Date 9/11/07

WELL CONSTRUCTION CERTIFICATION: I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards. Materials used and the information reported above are true to my best knowledge and belief.

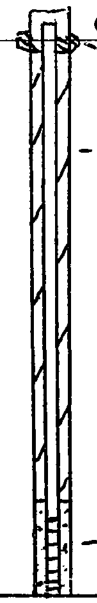
[x] Driller [ ] Engineer [ ] Trainee Name (Print) Ronald Sink

Driller/Engineer /Trainee Signature [signature]

Driller or Trainee License No. 2661

If trainee, licensed driller's Signature and License No. ________

Construction/Design



Well Data

Drill Method: Air Rotary
Screen: 2" sch 40 PVC .010 70' to 90'
Casing: 2" sch 40 PVC +2.5' to 70'
Sand: 10/20 66.5' to 90'
Seal: Bentonite Chips 2' to 66.5'

Formation Description

Formation	Bottom depth
Sand	12
Sandy Silt	34
Sand	68
Sandy gravel	77
Basalt gravel	88
Basalt	90

RECEIVED
OCT 22 2007
DEPARTMENT OF ECOLOGY
EASTERN REGIONAL OFFICE

The Department of Ecology does NOT Warranty the Data and/or the Information on this Well Report.

5

File Original and First Copy with Department of Ecology
Second Copy—Owner's Copy
Third Copy—Driller's Copy

WATER WELL REPORT

STATE OF WASHINGTON

Start Card No. 31344

Water Right Permit No. well #1

(1) OWNER: Name Charles Hyke Address Rt 9 Box 280 Pasco

(2) LOCATION OF WELL: County Walla Walla NE ¼ SE ¼ Sec 16 T. 8 N., R. 31 W.M.

(2a) STREET ADDDRESS OF WELL (or nearest address)

(3) PROPOSED USE: ☐ Domestic ☐ Irrigation ☐ DeWater Industrial ☐ Test Well ☒ Municipal ☐ Other ☐

(4) TYPE OF WORK: Owner's number of well (if more than one) well #1
Abandoned ☒ New well ☒ Deepened ☐ Reconditioned ☐ Method: Dug ☐ Cable ☐ Rotary ☐ Bored ☐ Driven ☐ Jetted ☐

(5) DIMENSIONS: Diameter of well 0 inches.
Drilled 78 feet. Depth of completed well 0 ft.

(6) CONSTRUCTION DETAILS:
Casing installed: 0 " Diam. from ___ ft. to ___ ft.
Welded ☐ ___ " Diam. from ___ ft. to ___ ft.
Liner installed ☐ ___ " Diam. from ___ ft. to ___ ft.
Threaded ☐

Perforations: Yes ☐ No ☐
Type of perforator used
SIZE of perforations ___ in. by ___ in.
___ perforations from ___ ft. to ___ ft.
___ perforations from ___ ft. to ___ ft.
___ perforations from ___ ft. to ___ ft.

Screens: Yes ☐ No ☐
Manufacturer's Name
Type ___ Model No.
Diam. ___ Slot size ___ from ___ ft. to ___ ft.
Diam. ___ Slot size ___ from ___ ft. to ___ ft.

Gravel packed: Yes ☐ No ☐ Size of gravel
Gravel placed from ___ ft. to ___ ft.

Surface seal: Yes ☒ No ☐ To what depth? 78 ft.
Material used in seal
Did any strata contain unusable water? Yes ☐ No ☐
Type of water? ___ Depth of strata
Method of sealing strata off

(7) PUMP: Manufacturer's Name
Type: ___ H.P.

(8) WATER LEVELS: Land-surface elevation above mean sea level ___ ft.
Static level ___ ft. below top of well Date
Artesian pressure ___ lbs. per square inch Date
Artesian water is controlled by ___ (Cap, valve, etc.)

(9) WELL TESTS: Drawdown is amount water level is lowered below static level
Was a pump test made? Yes ☐ No ☐ If yes, by whom?
Yield: ___ gal./min. with ___ ft. drawdown after ___ hrs.
" " " "
" " " "

Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level

Date of test
Bailer test ___ gal./min. with ___ ft. drawdown after ___ hrs.
Airtest ___ gal./min. with stem set at ___ ft. for ___ hrs.
Artesian flow ___ g.p.m. Date
Temperature of water ___ Was a chemical analysis made? Yes ☐ No ☐

(10) WELL LOG or ABANDONMENT PROCEDURE DESCRIPTION

Formation: Describe by color, character, size of material and structure, and show thickness of aquifers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of information.

MATERIAL	FROM	TO
Sand Tan	0	8
Sand Black	8	11
Gravel + Sand Black Cobbles Water @ 36	11	38
Gravel + Sand Black	38	46
Silt Tan	46	49
Gravel Sand Cobbles Silty Water Slow	49	63
Gravel Sand Tan	63	78
Silt Tan		

Work started 11-21, 19. Completed 11-22, 1991

WELL CONSTRUCTOR CERTIFICATION:

I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards. Materials used and the information reported above are true to my best knowledge and belief.

NAME NELSON Well Drilling Inc (PERSON, FIRM, OR CORPORATION) (TYPE OR PRINT)

Address 10036 W Argent Pasco

(Signed) James Nelson (WELL DRILLER) License No. 361

Contractor's Registration No. NELSOWD 198CQ Date 11-22, 1991

(USE ADDITIONAL SHEETS IF NECESSARY)

File Original and First Copy with Department of Ecology
Second Copy—Owner's Copy
Third Copy—Driller's Copy

WATER WELL REPORT

STATE OF WASHINGTON

Start Card No. 31344

Water Right Permit No.

(1) OWNER: Name Charles Hughes Address Rt 9 Box 280 Pasco

(2) LOCATION OF WELL: County Walla Walla NE ¼ SE ¼ Sec 16 T. 8 N., R. 31 W.M.

(2a) STREET ADDDRESS OF WELL (or nearest address)

(3) PROPOSED USE: [X] Domestic [ ] Irrigation [ ] DeWater [ ] Industrial [X] Test Well [ ] Municipal [ ] Other

(4) TYPE OF WORK: Owner's number of well (if more than one) well #2
[ ] Abandoned [X] New well [ ] Deepened [ ] Reconditioned
Method: [ ] Dug [ ] Cable [X] Rotary [ ] Bored [ ] Driven [ ] Jetted

(5) DIMENSIONS: Diameter of well 6 inches.
Drilled 56 feet. Depth of completed well 55 ft.

(6) CONSTRUCTION DETAILS:
Casing installed: 6 " Diam. from +2 ft. to 55 ft.
[X] Welded " Diam. from ft. to ft.
[ ] Liner installed
[ ] Threaded " Diam. from ft. to ft.

Perforations: Yes [ ] No [X]
Type of perforator used
SIZE of perforations in. by in.
perforations from ft. to ft.
perforations from ft. to ft.
perforations from ft. to ft.

Screens: Yes [ ] No [X]
Manufacturer's Name
Type Model No.
Diam. Slot size from ft. to ft.
Diam. Slot size from ft. to ft.

Gravel packed: Yes [ ] No [X] Size of gravel
Gravel placed from ft. to ft.

Surface seal: Yes [X] No [ ] To what depth? 20 ft.
Material used in seal Bentonite
Did any strata contain unusable water? Yes [ ] No [ ]
Type of water? Depth of strata
Method of sealing strata off

(7) PUMP: Manufacturer's Name
Type: H.P.

(8) WATER LEVELS: Land-surface elevation above mean sea level ft.
Static level 30 ft. below top of well Date 11-22-91
Artesian pressure lbs. per square inch Date
Artesian water is controlled by (Cap, valve, etc.)

(9) WELL TESTS: Drawdown is amount water level is lowered below static level
Was a pump test made? Yes [ ] No [ ] If yes, by whom?
Yield: gal./min. with ft. drawdown after hrs.
" " " "
" " " "

Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level

Date of test
Bailer test gal./min. with ft. drawdown after hrs.
Airtest 50 gal./min. with stem set at 50 ft. for 2 hrs.
Artesian flow g.p.m. Date
Temperature of water Was a chemical analysis made? Yes [ ] No [X]

(10) WELL LOG or ABANDONMENT PROCEDURE DESCRIPTION

Formation: Describe by color, character, size of material and structure, and show thickness of aquifers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of information.

MATERIAL	FROM	TO
Sand Tan	0	14
Gravel 4" minus Sand Black water @ 30	14	46
Gravel 4" minus Sand Black silty	46	55
Silt Tan	55	

Work started 11-22, 19 . Completed 11-22, 1991

WELL CONSTRUCTOR CERTIFICATION:

I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards. Materials used and the information reported above are true to my best knowledge and belief.

NAME NELSON Well Drilling Inc (PERSON, FIRM, OR CORPORATION) (TYPE OR PRINT)
Address 10036 West Argent Pasco
(Signed) James Nelson (WELL DRILLER) License No. 361
Contractor's Registration No. NELSOWD149Q Date 11-22, 1991

(USE ADDITIONAL SHEETS IF NECESSARY)

File Original and First Copy with Department of Ecology
Second Copy—Owner's Copy
Third Copy—Driller's Copy

WATER WELL REPORT

7

Start Card No. 54285

STATE OF WASHINGTON

Water Right Permit No. G3 28860P

(1) OWNER: Name Charles Hughes Address Rt 9 Box 280 Pasco

(2) LOCATION OF WELL: County Walla Walla SE ¼ SE ¼ Sec 16 T. 8 N., R. 31E W.M.

(2a) STREET ADDRESS OF WELL (or nearest address)

(3) PROPOSED USE: ☐ Domestic ☒ Irrigation ☐ DeWater ☐ Industrial ☐ Test Well ☐ Municipal ☐ Other

(4) TYPE OF WORK: Owner's number of well (if more than one)
☐ Abandoned ☒ New well ☐ Deepened ☐ Reconditioned
Method: ☐ Dug ☒ Cable ☐ Rotary ☐ Bored ☐ Driven ☐ Jetted

(5) DIMENSIONS: Diameter of well 16 inches.
Drilled 58'6 feet. Depth of completed well 58'6" ft.

(6) CONSTRUCTION DETAILS:
Casing installed: 16" Diam. from +1 ft. to 42'6" ft.
☒ Welded ☐ Liner installed ☐ Threaded
" Diam. from ft. to ft.
14" Diam. from 54'6" ft. to 58'6" ft.

Perforations: Yes ☐ No ☒
Type of perforator used
SIZE of perforations in. by in.
perforations from ft. to ft.
perforations from ft. to ft.
perforations from ft. to ft.

Screens: Yes ☒ No ☐
Manufacturer's Name Huston
Type Stainless Steel Model No.
Diam. 16T Slot size 250 from 42'6" ft. to 54'6" ft.
Diam. Slot size from ft. to ft.

Gravel packed: Yes ☐ No ☒ Size of gravel
Gravel placed from ft. to ft.

Surface seal: Yes ☒ No ☐ To what depth? 20 ft.
Material used in seal Bentonite
Did any strata contain unusable water? Yes ☐ No ☒
Type of water? Depth of strata
Method of sealing strata off

(7) PUMP: Manufacturer's Name
Type: H.P.

(8) WATER LEVELS: Land-surface elevation above mean sea level ft.
Static level 30 ft. below top of well Date 10-3-92
Artesian pressure lbs. per square inch Date
Artesian water is controlled by (Cap, valve, etc.)

(9) WELL TESTS: Drawdown is amount water level is lowered below static level
Was a pump test made? Yes ☒ No ☐ If yes, by whom? Layne
Yield: 2000 gal./min. with 20 ft. drawdown after 4 hrs.

Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level

Date of test
Bailer test gal./min. with ft. drawdown after hrs.
Airtest gal./min. with stem set at ft. for hrs.
Artesian flow g.p.m. Date
Temperature of water Was a chemical analysis made? Yes ☐ No ☐

(10) WELL LOG or ABANDONMENT PROCEDURE DESCRIPTION

Formation: Describe by color, character, size of material and structure, and show thickness of aquifers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of information.

MATERIAL	FROM	TO
Sand Tan	0	14
Gravel 4" minus sand	14	
Black Water 30		46
Gravel 4" minus sand	46	
Black silty		54'6"

RECEIVED
OCT 20 1992
DEPARTMENT OF ECOLOGY
... OFFICE

Work started 9-8, 19. Completed 10-3, 1992

WELL CONSTRUCTOR CERTIFICATION:
I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards. Materials used and the information reported above are true to my best knowledge and belief.

NAME NELSON Well Drilling Inc (PERSON, FIRM, OR CORPORATION) (TYPE OR PRINT)
Address 10036 W. Argent Pasco
(Signed) Jim Nelson (WELL DRILLER) License No. 361
Contractor's Registration No. NELSOWD148CQ Date 10-17, 1992

(USE ADDITIONAL SHEETS IF NECESSARY)

ECY 050-1-20 (10/87) -1329-

The Department of Ecology does NOT Warranty the Data and/or the Information on this Well Report.

55444

8

File Original and First Copy with Department of Ecology
Second Copy — Owner's Copy
Third Copy — Driller's Copy

WATER WELL REPORT

STATE OF WASHINGTON

Start Card No. W 080032
UNIQUE WELL I.D. #
Water Right Permit No.

(1) OWNER: Name Dave Jonker Address 2234 Westbourne Pasco

(2) LOCATION OF WELL: County Walla Walla SW 1/4 SE 1/4 Sec 17 T. 8N N., R. 31E W.M.

(2a) STREET ADDRESS OF WELL (or nearest address)

(3) PROPOSED USE: [x] Domestic [ ] Irrigation [ ] DeWater [ ] Industrial [ ] Test Well [ ] Municipal [ ] Other

(4) TYPE OF WORK: Owner's number of well (If more than one)
[ ] Abandoned [x] New well [ ] Deepened [ ] Reconditioned
Method: [ ] Dug [ ] Cable [x] Rotary [ ] Bored [ ] Driven [ ] Jetted

(5) DIMENSIONS: Diameter of well 6 inches.
Drilled 93 feet. Depth of completed well 90 ft.

(6) CONSTRUCTION DETAILS:
Casing installed: 6" Diam. from +1 ft. to 90 ft.
[x] Welded " Diam. from ft. to ft.
[ ] Liner installed
[ ] Threaded " Diam. from ft. to ft.

Perforations: Yes [ ] No [x]
Type of perforator used
SIZE of perforations in. by in.
perforations from ft. to ft.
perforations from ft. to ft.
perforations from ft. to ft.

Screens: Yes [ ] No [ ]
Manufacturer's Name
Type Model No.
Diam. Slot size from ft. to ft.
Diam. Slot size from ft. to ft.

Gravel packed: Yes [ ] No [x] Size of gravel
Gravel placed from ft. to ft.

Surface seal: Yes [x] No [ ] To what depth? 20 ft.
Material used in seal Bentonite
Did any strata contain unusable water? Yes [ ] No [x]
Type of water? Depth of strata
Method of sealing strata off

(7) PUMP: Manufacturer's Name
Type: H.P.

(8) WATER LEVELS: Land-surface elevation above mean sea level ft.
Static level 70 ft. below top of well Date 9-21-95
Artesian pressure lbs. per square inch Date
Artesian water is controlled by (Cap, valve, etc.)

(9) WELL TESTS: Drawdown is amount water level is lowered below static level
Was a pump test made? Yes [ ] No [ ] If yes, by whom?
Yield: gal./min. with ft. drawdown after hrs.
" " " "
" " " "

Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level

Date of test
Bailer test gal./min. with ft. drawdown after hrs.
Airtest 25 gal./min. with stem set at 85 ft. for 4 hrs.
Artesian flow g.p.m. Date
Temperature of water Was a chemical analysis made? Yes [ ] No [ ]

(10) WELL LOG or ABANDONMENT PROCEDURE DESCRIPTION

Formation: Describe by color, character, size of material and structure, and show thickness of aquifers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of information.

MATERIAL	FROM	TO
Sand Tan	0	9
Sand Tan Trace gravel	9	14
Sand Tan	14	34
Sand Tan silty	34	56
Gravel sand Tan	56	
Water Bearing @		90'6"
Basalt Black	90'6"	93

RECEIVED
OCT 10 1995
DEPARTMENT OF ECOLOGY
EASTERN REGIONAL OFFICE

Work Started 9-20, 19. Completed 9-21, 1995

WELL CONSTRUCTOR CERTIFICATION:

I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards. Materials used and the information reported above are true to my best knowledge and belief.

NAME Nelson Well Drilling Inc (PERSON, FIRM, OR CORPORATION) (TYPE OR PRINT)
Address 9200 W Argent Pasco
(Signed) Jim Nelson (WELL DRILLER) License No. 361
Contractor's Registration No. NELSOWD198CQ Date 9-21, 1995

(USE ADDITIONAL SHEETS IF NECESSARY)

Ecology is an Equal Opportunity and Affirmative Action employer. For special accommodation needs, contact the Water Resources Program at (206) 407-6600. The TDD number is (206) 407-6006.

9

The Department of Ecology does NOT Warranty the Data and/or the Information on this Well Report.

File Original and First Copy with Department of Ecology
Second Copy—Owner's Copy
Third Copy—Driller's Copy

WATER WELL REPORT

STATE OF WASHINGTON

Start Card No. 016395

Water Right Permit No.

(1) OWNER: Name Jerry Wright Address 1215 Lincon Dr. Pasco, WA.

(2) LOCATION OF WELL: County Walla Walla SW ¼ SE ¼ Sec. 17 T. 8 N., R. 31E W.M.

(2a) STREET ADDDRESS OF WELL (or nearest address) Hansen Loop Burbank, WA.

(3) PROPOSED USE: ☒ Domestic ☐ Irrigation ☐ DeWater Industrial ☐ Test Well ☐ Municipal ☐ Other ☐

(4) TYPE OF WORK: Owner's number of well (if more than one)
Abandoned ☐ New well ☒ Deepened ☐ Reconditioned ☐ Method: Dug ☐ Cable ☒ Rotary ☐ Bored ☐ Driven ☐ Jetted ☐

(5) DIMENSIONS: Diameter of well 6 inches. Drilled 93 feet. Depth of completed well 93 ft.

(6) CONSTRUCTION DETAILS:
Casing installed: 6" Diam. from +2 ft. to 88 ft.
Welded ☒ " Diam. from ft. to ft.
Liner installed ☐ " Diam. from ft. to ft.
Threaded ☐

Perforations: Yes ☐ No ☒
Type of perforator used
SIZE of perforations in. by in.
perforations from ft. to ft.
perforations from ft. to ft.
perforations from ft. to ft.

Screens: Yes ☒ No ☐
Manufacturer's Name Johnson
Type Stainless Model No.
Diam. 5 Slot size 20 from 88 ft. to 93 ft.
Diam. Slot size from ft. to ft.

Gravel packed: Yes ☐ No ☒ Size of gravel
Gravel placed from ft. to ft.

Surface seal: Yes ☒ No ☐ To what depth? 20 ft.
Material used in seal Bentonite
Did any strata contain unusable water? Yes ☐ No ☒
Type of water? Depth of strata
Method of sealing strata off

(7) PUMP: Manufacturer's Name
Type: H.P.

(8) WATER LEVELS: Land-surface elevation above mean sea level ft.
Static level ~~72~~ 63 ft. below top of well Date
Artesian pressure lbs. per square inch Date
Artesian water is controlled by (Cap, valve, etc.)

(9) WELL TESTS: Drawdown is amount water level is lowered below static level.
Was a pump test made? Yes ☐ No ☐ If yes, by whom?
Yield: gal./min. with ft. drawdown after hrs.
" " " "
" " " "

Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level

Date of test
Bailer test 30 gal./min. with 0 ft. drawdown after 3 hrs.
Airtest gal./min. with stem set at ft. for hrs.
Artesian flow g.p.m. Date
Temperature of water Was a chemical analysis made? Yes ☒ No ☐

(10) WELL LOG or ABANDONMENT PROCEDURE DESCRIPTION

Formation: Describe by color, character, size of material and structure, and show thickness of aquifers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of information.

MATERIAL	FROM	TO
Brown Silty sand	0	6
Brown & Black Sand	6	10
Brown Silty sand	10	20
Sand small gravel	20	25
Sandy Silt	25	50
Fine Brown Sand	50	56
Cemented gravel	56	75
Brown Sand & small gravel	75	93

RECEIVED OCT 15 1992 DEPARTMENT OF ECOLOGY

Work started 8/24, 1992 Completed 8/29, 1992

WELL CONSTRUCTOR CERTIFICATION:

I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards. Materials used and the information reported above are true to my best knowledge and belief.

NAME B+H Drilling #2 (PERSON, FIRM, OR CORPORATION) (TYPE OR PRINT)
Address P.O. Box 343 Burbank WA.
(Signed) Dale Bigham (WELL DRILLER) License No. 0036
Contractor's Registration No. ~~[illegible]~~ BHDRIZ*135NR Date 9-2, 1992

(USE ADDITIONAL SHEETS IF NECESSARY)

10

Washington State Department of Transportation

145376

LOG OF TEST BORING

Start Card R 65757
HOLE No H-3 03
Sheet 1 of 2

Job No. XL 2024 SR 12 Elevation ft (m)

Project US 12 / SR 124 to McNary Pool Driller Joe Judd Lic# 2454

Site Address SR-12 vic of MP 299 Inspector Dave Nelson

RECEIVED FEB 2 3 2004 DEPARTMENT OF ECOLOGY EASTERN REGIONAL OFFICE

Start September 30 2003 Completion September 30 2003 Well ID# AHF 978 Equipment CME 850 w/ auto hammer

Station 35+88 Offset Casing 28 0 Method Auger

Northing Easting Latitude Longitude

County Walla Walla Subsection NW 1/4 of SE 1/4 Section 17 Range 31 EWM Township 8 N

Depth (ft)	Meters (m)	SPT Blows/6 (N)	Sample No (Tube No)	Lab Tests	Description of Material
	1	2 2 3 (5)	D 1	MC	MC=3% Silty SAND loose light brown dry Homogeneous no HCl reaction Length Recovered 1 0 ft
5	2				
		4 6 8 (14)	D 2	GS MC AL	SM M C =4% Silty SAND medium dense light grey dry Homogeneous no HCl reaction Length Recovered 1 0 ft
10	3				
	4	5 11 13 (24)	D 3	MC	MC=6% Silty SAND medium dense grey dry Homogeneous no HCl reaction Length Recovered 1 0 ft
15	5				
		5 9 10 (19)	D-4	MC	MC=5% Silty SAND medium dense grey dry Homogeneous no HCl reaction Length Recovered 1 0 ft
20	6				

SOIL XL2024 US 12 SR 124 TO MCNARY POOL GPJ SOIL GDT 2/6/04 10 42 47 A2

Washington State Department of Transportation

145374

LOG OF TEST BORING

10

Start Card R 65757

HOLE No H 3-03

Sheet 2 of 2

Job No. XL 2024 SR 12 Elevation ft (m)

Project US 12 / SR 124 to McNary Pool

Driller Joe Judd Lic# 2454

Depth (ft)	Meters (m)	SPT Blows/6 (N)	Sample Type	Sample No (Tube No)	Lab Tests	Description of Material
	7	4 7 10 (17)		D 5	MC	MC=3% Silty SAND medium dense grey dry Homogeneous no HCl reaction Length Recovered 1 0 ft
25	8					
	9	5 8 11 (19)		D 6	MC	MC=4% Silty SAND medium dense grey dry Homogeneous no HCl reaction Length Recovered 1 0 ft
30						End of test hole boring at 29 5 ft below ground elevation This is a summary Log of Test Boring Soil/Rock descriptions are derived from visual field identifications and laboratory test data
	10					
35	11					
40	12					
	13					
45						

Standard Penetration Blows/ft: 10 20 30 40

RESOURCE PROTECTION WELL REPORT

Notice of Intent No. A 60505

(SUBMIT ONE WELL REPORT PER WELL INSTALLED)

11

156726

Construction/Decommission *("x" in circle)*
- O Construction
- ⊗ Decommission *Original Construction Notice of Intent Number* R65757

Type of Well *("x" in circle)*
- ⊗ Resource Protection
- O Geotech Soil Boring

Property Owner: WSDOT

Unique Ecology Well ID Tag No.: AHP-978 H-3

Consulting Firm: WSDOT

Driller or Trainee Name: Harvey

Driller or Trainee Signature: [signature]

Driller or Trainee License No.: 2599

If trainee, licensed driller's Signature and License no.:

Site Address: SR 12 Vic. MP 299

City: Pasco County: Walla Walla

Location NW 1/4-1/4 SE 1/4 Sec 17 Twn 8N R 31 EWM (circle one) or WWM

Lat/Long (s, t, r still REQUIRED) Lat Deg ____ Lat Min/Sec ____ Long Deg ____ Long Min/Sec ____

Tax Parcel No

Cased or Uncased Diameter 1" Static Level Dry

Work/Decommission Start Date 8/21/04

Work/Decommission Completed Date 8/21/04

Construction/Design	Well Data	Formation Description
Top Seal (0–2')	2' Removed Monument Cut off 2' PVC Pipe Filled with Bentonite hole Plug. Hydrate & Cover.	
Pipe in Plug (2'–15')	15'	
Pipe in Sand (15'–18')	18'	
Screen (18'–28')	28'	
Plug (28'–29.5')	29.5'	

RECEIVED
OCT 13 2004
DEPARTMENT OF ECOLOGY
WELL DRILLING UNIT

RECEIVED
OCT 15 2004
DEPARTMENT OF ECOLOGY
EASTERN REGIONAL OFFICE

Scale 1"=

ECY 050-12 (Rev 2/01)

The Department of Ecology does NOT Warranty the Data and/or the Information on this Well Report.

RESOURCE PROTECTION WELL REPORT

Notice of Intent No. A 60505

(SUBMIT ONE WELL REPORT PER WELL INSTALLED)

156725

12

Construction/Decommission *("x" in circle)*
- O Construction
- ⊗ Decommission *Original Construction Notice of Intent Number* R 65757

Type of Well *("x" in circle)*
- ⊗ Resource Protection
- ⊗ Geotech Soil Boring

Property Owner WSDOT

Unique Ecology Well ID Tag No AHP 977 H-2

Consulting Firm WSDOT

Driller or Trainee Name Harvey

Driller or Trainee Signature Thomas M Harvey

Driller or Trainee License No. 2599

If trainee, licensed driller's Signature and License no. ______

Site Address SR 12 Vic. of MP 299

City Pasco County: Walla Walla

Location NW 1/4- 1/4 SE 1/4 Sec 17 Twn 8N R 31 EWM (circle one) or WWM

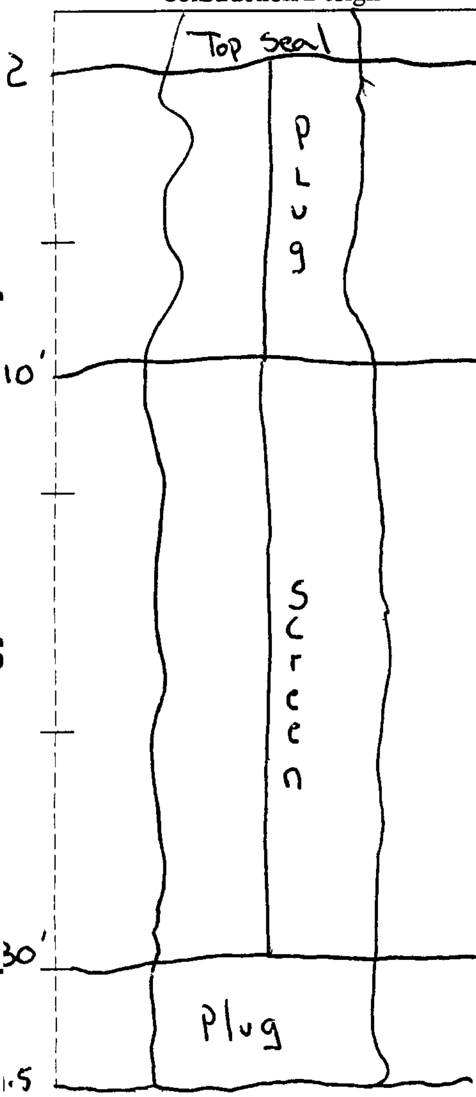
Lat/Long (s, t, r still REQUIRED) Lat Deg ____ Lat Min/Sec ____ Long Deg ____ Long Min/Sec ____

Tax Parcel No ______

Cased or Uncased Diameter 1" Static Level Dry

Work/Decommission Start Date 8/21/04

Work/Decommission Completed Date 8/21/04

Construction/Design	Well Data	Formation Description
	2 Removed Monument Cut off 2' PVC Pipe Filled with Bentonite hole plug Hydrate & 10' Cover. 30' 34.5	RECEIVED OCT 13 2004 DEPARTMENT OF ECOLOGY RECEIVED OCT 15 2004 DEPARTMENT OF ECOLOGY EASTERN REGIONAL OFFICE

Scale 1"= ______ Page 1 of 1 ECY 050-12 (Rev 2/01)

RESOURCE PROTECTION WELL REPORT

Notice of Intent No. A 60505

(SUBMIT ONE WELL REPORT PER WELL INSTALLED)

156374

13

Construction/Decommission *("x" in circle)*

- ○ Construction
- ⊗ Decommission *Original Construction Notice of Intent Number* R65757

Type of Well *("x" in circle)*

- ⊗ Resource Protection
- ⊗ Geotech Soil Boring

Property Owner WSDOT

Unique Ecology Well ID Tag No. AHP 976 H4

Consulting Firm WSDOT

Driller or Trainee Name Harvey

Driller or Trainee Signature Thomas McHarvey

Driller or Trainee License No. 2599

If trainee, licensed driller's Signature and License no. ______

Site Address SR-12 Vic of MP 299

City Close Pasco County Walla Walla

Location NW 1/4- 1/4 SE 1/4 Sec 17 Twn 8N R31 EWM circle one or WWM

Lat/Long (s, t, r still REQUIRED) Lat Deg ____ Lat Min/Sec ____ Long Deg ____ Long Min/Sec ____

Tax Parcel No ______

Cased or Uncased Diameter 1" Static Level Dry

Work/Decommission Start Date 8/21/04

Work/Decommission Completed Date 8/21/04

Construction/Design	Well Data	Formation Description
Top Seal Plug 15' Screen 28' Plug	Removed Monument Cut off PVC 2 FT Filled with Bentonite hole Plug. Hydrate + Cover.	RECEIVED OCT 13 2004 DEPARTMENT OF ECOLOGY WELL DRILLING UNIT RECEIVED OCT 15 2004 DEPARTMENT OF ECOLOGY EASTERN REGIONAL OFFICE

Scale 1"= ______

Page 1 of 1

ECY 050-12 (Rev 2/01)

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File Original with Department of Ecology
Second Copy - Owners Copy
Third Copy - Driller's Copy

WATER WELL REPORT

STATE OF WASHINGTON

Notice of Intent W 104600
UNIQUE WELL I.D. # AFH 028
Water Right Permit No.

(1) OWNER: Name Warren Bogart Address 291 West Lorie Loop

(2) LOCATION OF WELL: County Walla Walla W ½ 1/4 SE 1/4 Sec 17 T 8 N.R. 31E WM

(2a) STREET ADDRESS OF WELL: (or nearest address) 291 West Lorie Loop Burbank Wa 99323

TAX PARCEL NO.:

(3) PROPOSED USE: ☒ Domestic ☐ Industrial ☐ Municipal ☐ Irrigation ☐ Test Well ☐ Other ☐ DeWater

(4) TYPE OF WORK: Owner's number of well (if more than one)
☒ New Well ☐ Deepened ☐ Reconditioned ☐ Decommission
Method: ☐ Dug ☐ Cable ☒ Rotary ☐ Bored ☐ Driven ☐ Jetted

(5) DIMENSIONS: Diameter of well 6 inches
Drilled 85 feet. Depth of completed well 85 ft.

(6) CONSTRUCTION DETAILS
Casing Installed:
☐ Welded 6 " Diam. from +1 ft. to 85 ft.
☐ Liner installed " Diam. from ft. to ft.
☐ Threaded " Diam. from ft. to ft.

Perforations: ☐ Yes ☒ No
Type of perforator used
SIZE of perforations in. by in.
perforations from ft. to ft.

Screens: ☐ Yes ☒ No ☐ K-Pac Location
Manufacturer's Name
Type Model No.
Diam. Slot Size from ft. to ft.
Diam. Slot Size from ft. to ft.

Gravel/Filter packed: ☐ Yes ☒ No ☐ Size of gravel/sand
Material placed from ft. to ft.

Surface seal: ☒ Yes ☐ No To what depth? 18 ft.
Material used in seal Bentonite
Did any strata contain unusable water? ☐ Yes ☐ No
Type of water? Depth of strata
Method of sealing strata off

(7) PUMP: Manufacturer's Name
Type: H.P.

(8) WATER LEVELS: Land-surface elevation above mean sea level ft.
Static level 71 ft. below top of well Date 6-19-00
Artesian pressure lbs. per square inch Date
Artesian water is controlled by (Cap, valve, etc.)

(9) WELL TESTS: Drawdown is amount water level is lowered below static level
Was a pump test made? ☐ Yes ☒ No If yes, by whom?
Yield: gal./min. with ft. drawdown after hrs.
Yield: gal./min. with ft. drawdown after hrs.
Yield: gal./min. with ft. drawdown after hrs.
Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level

Date of test
Bailer test gal./min. with ft. drawdown after hrs.
Airtest 25 gal./min. with 1 ft. drawdown after 2 hrs.
Artesian flow g.p.m. Date
Temperature of water Was a chemical analysis made? ☐ Yes ☐ No

(10) WELL LOG or DECOMMISSIONING PROCEDURE DESCRIPTION
Formation: Describe by color, character, size of material and structure, and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of information. Indicate all water encountered.

MATERIAL	FROM	TO
Sand Tan	0	14
Gravel, Sand Black	14	17
Sand Tan Silty	17	44
Gravel, Sand Black	44	51
Sand Tan	51	66
Gravel, Sand Tan	66	75
Water @ 71 feet		
Gravel, Sand Black	75	85

RECEIVED JUN 21 2000 DEPARTMENT OF ECOLOGY EASTERN REGIONAL OFFICE

Work Started 6-19-00 Completed 6-19-00

WELL CONSTRUCTION CERTIFICATION:
I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards. Materials used and the information reported above are true to my best knowledge and belief.
Type or Print Name Jim Nelson License No. 361 (Licensed Driller/Engineer)
Trainee Name License No.
Drilling Company Nelson Well Drilling Inc
(Signed) Jim Nelson License No. 361 (Licensed Driller/Engineer)
Address NELSOWD198CQ
Contractor's Registration No. 8200 W Argent Date 6-19-00

(USE ADDITIONAL SHEETS IF NECESSARY)

Ecology is an Equal Opportunity and Affirmative Action employer. For special accommodation needs, contact the Water Resources Program at (360) 407-6600. The TDD number is (360) 407-6006.

ECY 050-1-20 (11/98)

The Department of Ecology does NOT Warranty the Data and/or the Information on this Well Report.

15 and 16

77647

WASHINGTON STATE DEPARTMENT OF TRANSPORTATION
RESOURCE PROTECTION WELL DATABASE

GENERAL INFORMATION

DOE S #	05663		DOE R #			REGION	SC		DOE OFFICE	Eastern	
PROJECT NAME	McNarry Pool to Attalia Vic										
PROJECT NUMBER	XL-0748		STATE ROUTE	12			CONTROL SECTION	3601			
NAME	HANNING WILLIAM						LICENSE NUMBER	2196			
COUNTY	Walla Walla	1/4	NE	1/4	NE	SEC	20	TWNSHP	8N	RANGE	31EWM

DRILL HOLE INFORMATION

HOLE #	STATION	OFFSET	START	FINISH	DEPTH	WELL TYPE	~~WELL DEPTH~~ status	REPORT DATE
H-2-00			10-05-00	10-05-00	19'	NONE Geotech	NA Abandon	?
HOLE #	STATION	OFFSET	START	FINISH	DEPTH	WELL TYPE	WELL DEPTH	REPORT DATE
H-1-00	Hobbs -	2517	9-28	9-29	30'	"	Abandon	
HOLE #	STATION	OFFSET	START	FINISH	DEPTH	WELL TYPE	WELL DEPTH	REPORT DATE
HOLE #	STATION	OFFSET	START	FINISH	DEPTH	WELL TYPE	WELL DEPTH	REPORT DATE
HOLE #	STATION	OFFSET	START	FINISH	DEPTH	WELL TYPE	WELL DEPTH	REPORT DATE
HOLE #	STATION	OFFSET	START	FINISH	DE		H	REPORT DATE
HOLE #	STATION	OFFSET	START	FINISH	DE		H	REPORT DATE
						no #		
HOLE #	STATION	OFFSET	START	FINISH	DE		H	REPORT DATE
HOLE #	STATION	OFFSET	START	FINISH	DI		TH	REPORT DATE
HOLE #	STATION	OFFSET	START	FINISH	DEPTH	WELL TYPE	WELL DEPTH	REPORT DATE
HOLE #	STATION	OFFSET	START	FINISH	DEPTH	WELL TYPE	WELL DEPTH	REPORT DATE
HOLE #	STATION	OFFSET	START	FINISH	DEPTH	WELL TYPE	WELL DEPTH	REPORT DATE

REMARKS

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LOG OF TEST BORING

Washington State Department of Transportation

RECEIVED
OCT 27 2000
DEPARTMENT OF ECOLOGY
EASTERN REGIONAL

HOLE No H-4-00

PROJECT McNary Pool to Attalia vicinity

SR-12 @ M P 299 45

Job No XL-0748

S R 12

Station

Offset

C S 3601

Equipment CME 850 w/ autohammer

Casing HQx33

Ground El (m)

Method of Boring Wet Rotary

Start Date September 27, 2000

Completion Date September 28, 2000

Sheet 1 of 2

Depth (ft)	Meters (m)	SPT Blows/6" (N)	Sample Type	Sample No (Tube No)	Lab Tests	Description of Material
0		1, 1, 2, (3)		D-1	GS, MC	SM, MC=10% Silty SAND, very loose, dark grayish brown, moist, Homogeneous, no HCl reaction, with hair roots Length Recovered 1 5 ft
5	1	0, 1, 1, (2)		D 2		Silty SAND very loose, dark grayish brown, wet, Homogeneous, no HCl reaction, with hair roots Length Recovered 1 5 ft
	2					09/28/2000
10	3	3, 6, 8, (14)		D-3	GS, MC	SP-SM, MC=25% Poorly graded SAND with silt, medium dense, dark grayish brown, wet, Homogeneous, no HCl reaction, with FeO stains At approx 7' the soil became more dense demonstrated by drilling Length Recovered 1 2 ft
15	4	7, 33, 32, (65)		D-4		Well graded SAND with gravel, very dense, dark gray, moist Stratified, no HCl reaction, the upper 6" was sand with gravel, then changed to gravel with sand The soil changed at approx 13' 3" Length Recovered 1 0 ft
20	5, 6	115/3" (115/3')		D-5		Well graded GRAVEL with sand, silt, subangular, very dense, dark gray, wet Homogeneous, no HCl reaction, drilling became very hard at approx 15'6"

Standard Penetration Blows/ft: 10 20 30 40

Profile | Groundwater | Instrument

SOIL XL0748-1 GPJ SOIL GDT 10/24/00 11 25 55 A10

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LOG OF TEST BORING

Washington State Department of Transportation

HOLE No H-4-00

PROJECT McNary Pool to Attalia vicinity

Sheet 2 of 2

Job No XL-0748

Depth (ft)	Meters (m)	Profile	Standard Penetration Blows/ft (10 20 30 40)	SPT Blows/6" (N)	Sample Type	Sample No (Tube No)	Lab Tests	Description of Material	Groundwater	Instrument
	7							Length Recovered 0 3 ft		
25	8			RQD 70 FF 2 76		C-6		BASALT, fine grained, fresh, strong rock, no HCl reaction Discontinuities are closely spaced and in good condition Percent Recovered 100 0%		
30	9									
35	10, 11							End of test hole boring at 30 ft below ground elevation This is a summary Log of Test Boring Soil/Rock descriptions are derived from visual field identifications and laboratory test data		
40	12, 13									
45										

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The Department of Ecology does NOT Warranty the Data and/or the Information on this Well Report.

File Original and First Copy with Department of Ecology
Second Copy—Owner's Copy
Third Copy—Driller's Copy

WATER WELL REPORT

STATE OF WASHINGTON

Start Card No. 54912

Water Right Permit No. G3-28860

(1) OWNER: Name Charles Hughes Address

(2) LOCATION OF WELL: County Walla Walla E½ E½ ¼ NE ¼ Sec 21 T. 8 N., R. 31E W.M.

(2a) STREET ADDDRESS OF WELL (or nearest address)

(3) PROPOSED USE: ☐ Domestic ☒ Irrigation ☐ DeWater Industrial ☐ Test Well ☒ Municipal ☐ Other ☐

(4) TYPE OF WORK: Owner's number of well (if more than one)

Abandoned ☐ New well ☒ Deepened ☐ Reconditioned ☐ Method: Dug ☐ Cable ☒ Rotary ☐ Bored ☐ Driven ☐ Jetted ☐

(5) DIMENSIONS: Diameter of well 16 inches. Drilled 576 feet. Depth of completed well 57'6' ft.

(6) CONSTRUCTION DETAILS:

Casing installed: 16 " Diam. from +1'4" ft. to 46-8 ft.
Welded ☒ 14 " Diam. from -53 ft. to 57 6 ft.
Liner installed ☐
Threaded ☐ 1 " Diam. from -46'6 ft. to 33 ft.

Perforations: Yes ☐ No ☒
Type of perforator used
SIZE of perforations in. by in.
perforations from ft. to ft.
perforations from ft. to ft.
perforations from ft. to ft.

Screens: Yes ☒ No ☐
Manufacturer's Name Johnson
Type Stainless Model No.
Diam. 14" Slot size 250 from 49 ft. to 53 ft.
Diam. Slot size 50 from 46 6 ft. to 49 ft.

Gravel packed: Yes ☐ No ☒ Size of gravel
Gravel placed from ft. to ft.

Surface seal: Yes ☒ No ☐ To what depth? 28 ft.
Material used in seal Bentonite
Did any strata contain unusable water? Yes ☐ No ☒
Type of water? Depth of strata
Method of sealing strata off

(7) PUMP: Manufacturer's Name
Type: H.P.

(8) WATER LEVELS: Land-surface elevation above mean sea level ft.
Static level 33 ft. below top of well Date 9-27-91
Artesian pressure lbs. per square inch Date
Artesian water is controlled by (Cap, valve, etc.)

(9) WELL TESTS: Drawdown is amount water level is lowered below static level
Was a pump test made? Yes ☒ No ☐ If yes, by whom? Layne of Washington
Yield: 420 gal./min. with 15 ft. drawdown after 4 hrs.

Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level

Date of test
Bailer test gal./min. with ft. drawdown after hrs.
Airtest gal./min. with stem set at ft. for hrs.
Artesian flow g.p.m. Date
Temperature of water Was a chemical analysis made? Yes ☐ No ☐

(10) WELL LOG or ABANDONMENT PROCEDURE DESCRIPTION

Formation: Describe by color, character, size of material and structure, and show thickness of aquifers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of information.

MATERIAL	FROM	TO
Sand Tan	0	18
Sand Black Trace Gravel	18	25
Sand Blk Silty	25	31
Sand Tan Silty	31	38 6
Gravel + sand Blk Water Bearing	38 6	53
Silt Tan	53	57 6"

RECEIVED OCT 17 1991 DEPARTMENT OF ECOLOGY SPOKANE REGIONAL OFFICE

Work started 9-24, 19. Completed 9-27, 1991

WELL CONSTRUCTOR CERTIFICATION:

I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards. Materials used and the information reported above are true to my best knowledge and belief.

NAME Nelson Well Drilling Inc (PERSON, FIRM, OR CORPORATION) (TYPE OR PRINT)
Address 10036 W Argent Pasco
(Signed) James Nelson (WELL DRILLER) License No. 361
Contractor's Registration No. NELSOWD198CQ Date 9-27, 1991

(USE ADDITIONAL SHEETS IF NECESSARY)

File Original and First Copy with Department of Ecology
Second Copy — Owner's Copy
Third Copy — Driller's Copy

WATER WELL REPORT

18

STATE OF WASHINGTON

Application No.
Permit No. TEST WELL

(1) OWNER: Name ELMER IVERSON   Address EAST HUMORIST RD. PASCO, WN. 99301

(2) LOCATION OF WELL: County WALLA WALLA — SW ¼ SE ¼ Sec. 21 T. 8 N., R. 31E W.M.

Bearing and distance from section or subdivision corner

(3) PROPOSED USE: Domestic ☐ Industrial ☐ Municipal ☐ Irrigation ☐ Test Well ☒ Other ☐

(4) TYPE OF WORK: Owner's number of well (if more than one)
New well ☒ Method: Dug ☐ Bored ☐
Deepened ☐ Cable ☒XX Driven ☐
Reconditioned ☐ Rotary ☐ Jetted ☐

(5) DIMENSIONS: Diameter of well 16 inches.
Drilled 20 ft. Depth of completed well 20 ft.

(6) CONSTRUCTION DETAILS:

Casing installed: " Diam. from ft. to ft.
Threaded ☐ " Diam. from ft. to ft.
Welded ☐ " Diam. from ft. to ft.

Perforations: Yes ☒X No ☐
Type of perforator used Mills
SIZE of perforations 3/8 in. by 2 in.
perforations from ft. to ft.
perforations from ft. to ft.
perforations from ft. to ft.

Screens: Yes ☐ No ☒XX
Manufacturer's Name
Type Model No.
Diam. Slot size from ft. to ft.
Diam. Slot size from ft. to ft.

Gravel packed: Yes ☐ No ☒X Size of gravel:
Gravel placed from ft. to ft.

Surface seal: Yes ☒X No ☐ To what depth? 18 ft.
Material used in seal
Did any strata contain unusable water? Yes ☐ No ☐
Type of water? Depth of strata
Method of sealing strata off

(7) PUMP: Manufacturer's Name XX
Type: H.P.

(8) WATER LEVELS: Land-surface elevation above mean sea level 350 XX ft.
Static level XX ft. below top of well Date XXX
Artesian pressure X lbs. per square inch Date
Artesian water is controlled by X (Cap, valve, etc.)

(9) WELL TESTS: Drawdown is amount water level is lowered below static level
Was a pump test made? Yes ☐ No ☒X If yes, by whom?
Yield: gal./min. with ft. drawdown after hrs.
" " " "
" " " "

Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level

Date of test
Bailer test gal./min. with ft. drawdown after hrs.
Artesian flow g.p.m. Date
Temperature of water Was a chemical analysis made? Yes ☐ No ☐

(10) WELL LOG:

Formation: *Describe by color, character, size of material and structure, and show thickness of aquifers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of formation.*

MATERIAL	FROM	TO
Sandy, silt	0	8
Course black shale rock	8	11
Small black sharp rock 1/4 inch	11	19
Basalt	19	20.5

RECEIVED
DEC 26 1974
DEPARTMENT OF ECOLOGY
SPOKANE REGIONAL OFFICE

Work started 11-18, 1974 Completed Nov. 22, 1974

WELL DRILLER'S STATEMENT:

This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

NAME GOLDEN AUTUMN CONST. CO., INC. 0554
(Person, firm, or corporation) (Type or print)

Address P.O. BOX 811 PASCO, WN. 99301

[Signed]
(Well Driller)

License No. 0554 Date Nov. 25, 1974

12/03/74

(USE ADDITIONAL SHEETS IF NECESSARY)

S. F. No. 7356—OS—(Rev. 4-71)
ECY-070-28

19

Ecology# 100191

File Original and First Copy with Department of Ecology
Second Copy—Owner's Copy
Third Copy—Driller's Copy

WATER WELL REPORT

STATE OF WASHINGTON

Start Card No. ____

Water Right Permit No. G3-28626P

(1) OWNER: Name FLAT TOP RANCH Address STAR RT. BOX K Prescott, WA. 99348

(2) LOCATION OF WELL: County Walla Walla E 1/2 SE 1/4 Sec 21 T. 8 N., R. 31E W.M.

(2a) STREET ADDDRESS OF WELL (or nearest address) Rt 9, Box 285, PASCO, WA. 99301 — IVARSON Rd.

(3) PROPOSED USE: ☐ Domestic ☒ Irrigation ☐ DeWater Industrial ☐ Test Well ☐ Municipal ☐ Other ☐

(4) TYPE OF WORK: Owner's number of well (if more than one) ____
Abandoned ☐ New well ☒ Deepened ☐ Reconditioned ☐
Method: Dug ☒ Cable ☐ Rotary ☐ Bored ☐ Driven ☐ Jetted ☐

(5) DIMENSIONS: Diameter of well 6 FT Culvert inches.
Drilled ____ feet. Depth of completed well 28 ft.

(6) CONSTRUCTION DETAILS:

Casing installed: ____" Diam. from ____ ft. to ____ ft.
Welded ☐ ____" Diam. from ____ ft. to ____ ft.
Liner installed ☐
Threaded ☐ ____" Diam. from ____ ft. to ____ ft.

Perforations: Yes ☒ No ☐
Type of perforator used cut with Torch
SIZE of perforations 3 IN in. by 1/2 in.
____ perforations from ____ ft. to ____ ft.
____ perforations from ____ ft. to ____ ft.
____ perforations from ____ ft. to ____ ft.

Screens: Yes ☐ No ☒
Manufacturer's Name ____
Type ____ Model No. ____
Diam. ____ Slot size ____ from ____ ft. to ____ ft.
Diam. ____ Slot size ____ from ____ ft. to ____ ft.

Gravel packed: Yes ☒ No ☐ Size of gravel 2" to 3/4"
Gravel placed from 20' ft. to 28' ft.

Surface seal: Yes ☐ No ☑ To what depth? ____ ft.
Material used in seal ____
Did any strata contain unusable water? Yes ☐ No ☐
Type of water? ____ Depth of strata ____
Method of sealing strata off ____

(7) PUMP: Manufacturer's Name ____
Type: Centrifical H.P. 10

(8) WATER LEVELS: Land-surface elevation above mean sea level ____ ft.
Static level 22 ft. below top of well Date 7-1-89
Artesian pressure N/A lbs. per square inch Date ____
Artesian water is controlled by ____ (Cap, valve, etc.))

(9) WELL TESTS: Drawdown is amount water level is lowered below static level
Was a pump test made? Yes ☐ No ☒ If yes, by whom? ____
Yield: ____ gal./min. with ____ ft. drawdown after ____ hrs.
" " " "
" " " "

Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level

Date of test ____
Bailer test ____ gal./min. with ____ ft. drawdown after ____ hrs.
Airtest ____ gal./min. with stem set at ____ ft. for ____ hrs.
Artesian flow ____ g.p.m. Date ____
Temperature of water ____ Was a chemical analysis made? Yes ☐ No ☐

(10) WELL LOG or ABANDONMENT PROCEDURE DESCRIPTION

Formation: Describe by color, character, size of material and structure, and show thickness of aquifers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of information.

MATERIAL	FROM	TO
SAND	0	18'
ROCK + Gravel	18'	28
BASALT	28	—

RECEIVED
OCT 1 1991
DEPARTMENT OF ECOLOGY
SPOKANE REGIONAL OFFICE

Work started ____, 19__. Completed ____, 19__

WELL CONSTRUCTOR CERTIFICATION:

I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards. Materials used and the information reported above are true to my best knowledge and belief.

NAME David R. Hovde
(PERSON, FIRM, OR CORPORATION) (TYPE OR PRINT)

Address STAR Rt. Box K Prescott WA 99348

(Signed) ____ License No. ____
(WELL DRILLER)

Contractor's Registration No. ____ Date ____, 19__

(USE ADDITIONAL SHEETS IF NECESSARY)

ECY 050-1-20 (10/87) -1329- 3

The Department of Ecology does NOT Warranty the Data and/or the Information on this Well Report.

The Department of Ecology does NOT Warranty the Data and/or the Information on this Well Report.

File Original and First Copy with Department of Ecology
Second Copy—Owner's Copy
Third Copy—Driller's Copy

WATER WELL REPORT

STATE OF WASHINGTON

Start Card No. 6238

Water Right Permit No.

OWNER: Name Flat Top Ranch Address Star RT K Prescott WA 99348

(2) **LOCATION OF WELL:** County Walla Walla ¼ SE ¼ Sec 21 T. 8 N., R. 31E W.M.

(2a) **STREET ADDDRESS OF WELL** (or nearest address)

(3) **PROPOSED USE:** ☐ Domestic ☐ Irrigation ☐ DeWater Industrial ☐ Test Well ☒ Municipal ☐ Other ☐

(4) **TYPE OF WORK:** Owner's number of well (if more than one)

Abandoned ☐ New well ☒ Deepened ☐ Reconditioned ☐ Method: Dug ☐ Cable ☒ Rotary ☐ Bored ☐ Driven ☐ Jetted ☐

(5) **DIMENSIONS:** Diameter of well 12 inches.
Drilled 32 feet. Depth of completed well ft.

(6) **CONSTRUCTION DETAILS:**

Casing installed: 12 " Diam. from +1 ft. to 31 ft.
Welded ☒ " Diam. from ft. to ft.
Liner installed ☐ " Diam. from ft. to ft.
Threaded ☐

Perforations: Yes ☐ No ☒
Type of perforator used
SIZE of perforations in. by in.
perforations from ft. to ft.
perforations from ft. to ft.
perforations from ft. to ft.

Screens: Yes ☐ No ☒
Manufacturer's Name
Type Model No.
Diam. Slot size from ft. to ft.
Diam. Slot size from ft. to ft.

Gravel packed: Yes ☐ No ☐ Size of gravel
Gravel placed from ft. to ft.

Surface seal: Yes ☒ No ☐ To what depth? 31 ft.
Material used in seal Bentonite 0-18 Cement 26-31
Did any strata contain unusable water? Yes ☐ No ☒
Type of water? Depth of strata
Method of sealing strata off

(7) **PUMP:** Manufacturer's Name
Type: H.P.

(8) **WATER LEVELS:** Land-surface elevation above mean sea level ft.
Static level 19 ft. below top of well Date
Artesian pressure lbs. per square inch Date
Artesian water is controlled by (Cap, valve, etc.)

(9) **WELL TESTS:** Drawdown is amount water level is lowered below static level
Was a pump test made? Yes ☐ No ☐ If yes, by whom?
Yield: gal./min. with ft. drawdown after hrs.
" " " "
" " " "

Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level

Date of test
Bailer test gal./min. with ft. drawdown after hrs.
Airtest gal./min. with stem set at ft. for hrs.
Artesian flow g.p.m. Date
Temperature of water Was a chemical analysis made? Yes ☐ No ☐

(10) **WELL LOG or ABANDONMENT PROCEDURE DESCRIPTION**

Formation: Describe by color, character, size of material and structure, and show thickness of aquifers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of information.

MATERIAL	FROM	TO
Sand	0	5
Gravel + Cobbles sand	5	
Blk Water @ 19 feet		26
Basalt Black	26	32

RECEIVED SEP 25 1989 DEPARTMENT OF ECOLOGY SPOKANE REGIONAL OFFICE

Work started 8-24, 19. Completed 8-25, 1989

WELL CONSTRUCTOR CERTIFICATION:

I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards. Materials used and the information reported above are true to my best knowledge and belief.

NAME Nelson Well Drilling Inc (PERSON, FIRM, OR CORPORATION) (TYPE OR PRINT)
Address 10036 W. Argent Pasco
(Signed) James Nelson (WELL DRILLER) License No. 361
Contractor's Registration No. NELSOWD168CQ Date 9-6, 1989

(USE ADDITIONAL SHEETS IF NECESSARY)

21

File Original and First Copy with Department of Ecology
Second Copy — Owner's Copy
Third Copy — Driller's Copy

WATER WELL REPORT

STATE OF WASHINGTON

Application No.

Permit No.

(1) OWNER: Name Ken Ireland (Columbia Basin Tool + Iron Inc.) Address P.O. Box 223 Pasco, WN.

(2) LOCATION OF WELL: County Walla Walla — SE ¼ SE ¼ Sec 31 T. 8 N., R. 31E W.M.

Bearing and distance from section or subdivision corner 509 547-2471

(3) PROPOSED USE: Domestic ☒ Industrial ☐ Municipal ☐ Irrigation ☐ Test Well ☐ Other ☐

(4) TYPE OF WORK: Owner's number of well (if more than one)

New well ☒ Method: Dug ☐ Bored ☐
Deepened ☐ Cable ☐ Driven ☐
Reconditioned ☐ Rotary ☒ Jetted ☐

(5) DIMENSIONS: Diameter of well 6" inches.
Drilled 125 ft. Depth of completed well 125 ft.

(6) CONSTRUCTION DETAILS:

Casing installed: 6" Diam. from +1 ft. to 40 ft.
Threaded ☐ " Diam. from ft. to ft.
Welded ☒ " Diam. from ft. to ft.

Perforations: Yes ☐ No ☒
Type of perforator used
SIZE of perforations in. by in.
perforations from ft. to ft.
perforations from ft. to ft.
perforations from ft. to ft.

Screens: Yes ☐ No ☒
Manufacturer's Name
Type Model No.
Diam. Slot size from ft. to ft.
Diam. Slot size from ft. to ft.

Gravel packed: Yes ☐ No ☒ Size of gravel:
Gravel placed from ft. to ft.

Surface seal: Yes ☒ No ☐ To what depth? 18+ ft.
Material used in seal Bentonite
Did any strata contain unusable water? Yes ☐ No ☒
Type of water? Depth of strata
Method of sealing strata off

(7) PUMP: Manufacturer's Name
Type: H.P.

(8) WATER LEVELS: Land-surface elevation above mean sea level 391 ft.
Static level 25 ft. below top of well Date
Artesian pressure lbs. per square inch Date
Artesian water is controlled by (Cap, valve, etc.)

(9) WELL TESTS: Drawdown is amount water level is lowered below static level
Was a pump test made? Yes ☐ No ☒ If yes, by whom?
Yield: gal./min. with ft. drawdown after hrs.

Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level

Date of test
Bailer test gal./min. with ft. drawdown after hrs.
Artesian flow g.p.m. Date
Temperature of water Was a chemical analysis made? Yes ☐ No ☒

(10) WELL LOG:

Formation: Describe by color, character, size of material and structure, and show thickness of aquifers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of formation.

MATERIAL	FROM	TO
Sandy Loam	0	14
Gravel clay	14	37
Broken Basalt	37	40
HARD Basalt	40	44
Green shale	44	70
Hard Basalt	70	79
Green shale	79	82
Basalt and G. shal	82	86
Broken Basalt	86	97
white shale	97	122
Green shale	122	125
GPM 30-35		
100' 4" PVC		

Capped

RECEIVED
JUN 13 1978
DEPARTMENT OF ECOLOGY
SPOKANE REGIONAL OFFICE

Work started 5-16 1978 Completed 5-16 1978

WELL DRILLER'S STATEMENT:

This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

NAME Aqua Drilling Inc. (Person, firm, or corporation) (Type or print)

Address Box 659 Hayden Lake, Id

[Signed] Theron D. Lewis (Well Driller)

License No. 0718 Date 5-16, 1978

6/15/78 Humanist 7/4

(USE ADDITIONAL SHEETS IF NECESSARY)

ECY 050-1-20

The Department of Ecology does NOT Warranty the Data and/or the Information on this Well Report.

DOE

22 and 23

WASHINGTON STATE DEPARTMENT OF TRANSPORTATION
DRILLING DATABASE FORM

119150

GENERAL INFORMATION

STATE ROUTE 12	CONTROL SECTION 3601	PROJECT NUMBER XL-0748
PROJECT NAME SR-12 Widening McNary Pool to Attalia		
COUNTY ~~Franklin~~ Walla Walla	DOE REGION Eastern	DOT REGION So Central
DRILLER Johnson, Vince		LICENSE NUMBER 2532
DOE S NUMBER 14606	DOE R NUMBER	
1/4 SW / 1/4 NW / SEC 21	TOWNSHIP 8N	RANGE 31EWM

HOLE INFORMATION

HOLE #	STATION	OFFSET	START	FINISH	DEPTH	WELL TYPE	WELL #
TH 8-01			9-26-01	9 26 01	35	N/A	N/A
TH-7-01			9-27-01	9-27-01	30	N/A	N/A

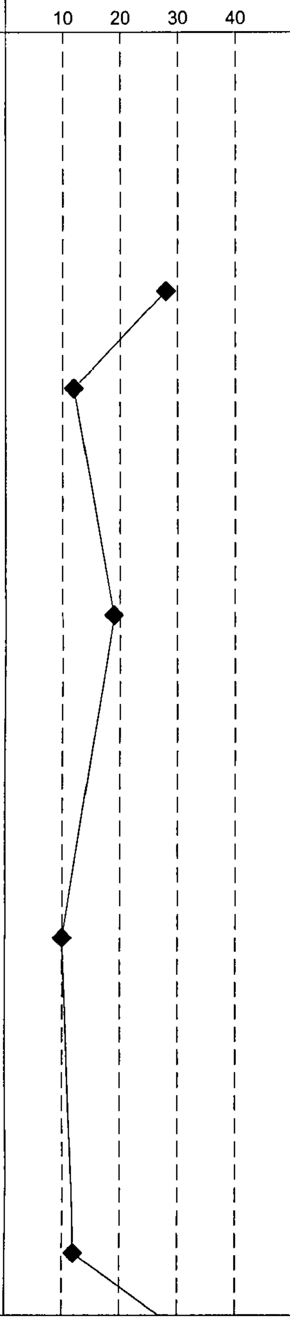
22

Washington State Department of Transportation

119150

LOG OF TEST BORING

Job No	XL 0748	SR	12	HOLE No	H 8 01
PROJECT	McNary Pool to Attalia vicinity			Sheet	1 of 3
	SR 12 @ M P 299 45			Inspector	Hanning
Station		Offset		Equipment	CME 55 w/ autohammer
Latitude		Longitude		Method	Wet Rotary
Northing	0	Easting	0	Casing	HQ
Ground Elevation	(m)	Start Date	September 25 2001	Completion Date	September 25 2001



Depth (ft)	Meters (m)	Profile	SPT Blows/6 (N)	Sample Type	Sample No (Tube No)	Lab Tests	Description of Material	Groundwater	Instrument
	1								
5			12 16 12 (28)		D 1		Poorly graded SAND with trace gravel dense olive gray moist Stratified no HCl reaction Length Recovered 0 5 ft Length Retained 0 5 ft		
	2		5 6 6 (12)		D 2		Poorly graded SAND with trace gravel medium dense olive gray moist Stratified no HCl reaction Length Recovered 0 9 ft Length Retained 0 9 ft		
10	3		5 9 10 (19)		D 3		Poorly graded SAND medium dense olive gray moist Stratified no HCl reaction Length Recovered 1 0 ft Length Retained 1 0 ft		
15	4		2 3 7 (10)		D-4		Poorly graded SAND loose olive gray wet Stratified no HCl reaction Length Recovered 1 4 ft Length Retained 1 4 ft		
20	5 6		4 5		D 5		Poorly graded SAND medium dense olive gray wet Stratified no HCl reaction		

SOIL XL0748 MCNARY POOL TO ATTALIA VIC GPJ SOIL GDT 6/11/02 2 20 24 P6

22

Washington State
Department of Transportation

LOG OF TEST BORING

Job No XL 0748 SR 12 HOLE No H 8 01

PROJECT McNary Pool to Attalia vicinity Sheet 2 of 3

Depth (ft)	Meters (m)	Profile	Standard Penetration Blows/ft (10 20 30 40)	SPT Blows/6 (N)	Sample Type	Sample No (Tube No)	Lab Tests	Description of Material	Groundwater	Instrument
				7 (12)				Length Recovered 1 2 ft Length Retained 1 2 ft		
	7		>>							
25				14 39 47 (86)		D 6		Poorly graded GRAVEL with sand angular very dense dark gray wet Stratified no HCl reaction Length Recovered 1 0 ft Length Retained 1 0 ft		
	8			RQD 15 FF 20		C 7		BASALT fine grained highly weathered strong rock no HCl reaction Discontinuities are very closely spaced and in poor condition Percent Recovered 50 0%		
30	9			RQD 44 FF 20		C 8		BASALT fine grained highly weathered strong rock no HCl reaction Discontinuities are very closely spaced and in poor condition Percent Recovered 80 0%		
35	10, 11							End of test hole boring at 35 5 ft below ground elevation		
40	12, 13							This is a summary Log of Test Boring Soil/Rock descriptions are derived from visual field identifications and laboratory test data		
45										

SOIL XL0748 MCNARY POOL TO ATTALIA VIC GPJ SOIL GDT 6/11/02 12 20 24 P6

Washington State Department of Transportation

LOG OF TEST BORING

22

Job No XL 0748 SR 12 HOLE No H 8 01

PROJECT McNary Pool to Attalia vicinity Sheet 3 of 3

Depth (ft)	Meters (m)	Profile	Standard Penetration Blows/ft (10 20 30 40)	SPT Blows/6 (N)	Sample Type	Sample No (Tube No)	Lab Tests	Description of Material	Groundwater	Instrument
	14									
	15									
50										
	16									
55										
	17									
	18									
60										
	19									
65										
	20									
	21									
70										

SOIL XL0748 MCNARY POOL TO ATTALIA VIC GPJ SOIL GDT 6/11/02 2 20 24 P6

24

The Department of Ecology does NOT Warranty the Data and/or the Information on this Well Report.

File Original and First Copy with Department of Ecology
Second Copy—Owner's Copy
Third Copy—Driller's Copy

WATER WELL REPORT

STATE OF WASHINGTON

Start Card No. S4908

Water Right Permit No.

(1) OWNER: Name Charles Hughes Address Rt 9 Box 280 Pasco Wa

(2) LOCATION OF WELL: County Walla Walla NE ¼ SW ¼ Sec 22 T. 8 N., R. 31E W.M.

(2a) STREET ADDDRESS OF WELL (or nearest address)

(3) PROPOSED USE: ☒ Domestic ☐ Irrigation ☐ DeWater Industrial ☐ Test Well ☐ Municipal ☐ Other ☐

(4) TYPE OF WORK: Owner's number of well (if more than one)
Abandoned ☐ New well ☒ Deepened ☐ Reconditioned ☐
Method: Dug ☐ Cable ☐ Rotary ☒ Bored ☐ Driven ☐ Jetted ☐

(5) DIMENSIONS: Diameter of well 6 inches.
Drilled 80 feet. Depth of completed well 51-6" ft.

(6) CONSTRUCTION DETAILS:
Casing installed: 6 " Diam. from +1 ft. to 51-6" ft.
Welded ☒ " Diam. from ft. to ft.
Liner installed ☐
Threaded ☐ " Diam. from ft. to ft.

Perforations: Yes ☐ No ☒
Type of perforator used
SIZE of perforations in. by in.
perforations from ft. to ft.
perforations from ft. to ft.
perforations from ft. to ft.

Screens: Yes ☐ No ☒
Manufacturer's Name
Type Model No.
Diam. Slot size from ft. to ft.
Diam. Slot size from ft. to ft.

Gravel packed: Yes ☐ No ☒ Size of gravel
Gravel placed from ft. to ft.

Surface seal: Yes ☒ No ☐ To what depth? 20 ft.
Material used in seal Bentonite
Did any strata contain unusable water? Yes ☐ No ☐
Type of water? Depth of strata
Method of sealing strata off

(7) PUMP: Manufacturer's Name
Type: H.P.

(8) WATER LEVELS: Land-surface elevation above mean sea level ft.
Static level 33 ft. below top of well Date 8-26-91
Artesian pressure lbs. per square inch Date
Artesian water is controlled by (Cap, valve, etc.))

(9) WELL TESTS: Drawdown is amount water level is lowered below static level
Was a pump test made? Yes ☐ No ☐ If yes, by whom?
Yield: gal./min. with ft. drawdown after hrs.

Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level

Date of test
Bailer test gal./min. with ft. drawdown after hrs.
Airtest 45 gal./min. with stem set at 45 ft. for hrs.
Artesian flow g.p.m. Date
Temperature of water Was a chemical analysis made? Yes ☐ No ☐

(10) WELL LOG or ABANDONMENT PROCEDURE DESCRIPTION

Formation: Describe by color, character, size of material and structure, and show thickness of aquifers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of information.

MATERIAL	FROM	TO
Sand Tan	0	18
Sand Blk Trace Gravel	18	25
Sand Black Silty	25	31
Sand Tan Silty	31	38-6
Gravel 3" Minus Sand Black Water 38-6	38-6	52
Clay Tan	52	62
Basalt Weathered Black	62	67
Clay Blue	67	80

SEP 4 1991

Work started 8-26, 19 . Completed 8-26, 1991

WELL CONSTRUCTOR CERTIFICATION:

I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards. Materials used and the information reported above are true to my best knowledge and belief.

NAME NELSON Well Drilling Inc (PERSON, FIRM, OR CORPORATION) (TYPE OR PRINT)
Address 10036 W Argent Pasco
(Signed) James Nelson (WELL DRILLER) License No. 361
Contractor's Registration No. NELSOWD196CQ Date 8-26, 1991

(USE ADDITIONAL SHEETS IF NECESSARY)

25

File Original and First Copy with Department of Ecology
Second Copy — Owner's Copy
Third Copy — Driller's Copy

WATER WELL REPORT
STATE OF WASHINGTON

Application No. ....
Permit No. ....

(1) OWNER: Name Kenneth Ireland Address 1704 N. 19th Pasco, WN

(2) LOCATION OF WELL: County Walla Walla — SW ¼ SW ¼ Sec 22 T 8 N., R 31E W.M.

Bearing and distance from section or subdivision corner

(3) PROPOSED USE: Domestic ☒ Industrial ☐ Municipal ☐ Irrigation ☐ Test Well ☐ Other ☐

(4) TYPE OF WORK: Owner's number of well (if more than one) ....
New well ☒ Method: Dug ☐ Bored ☐
Deepened ☐ Cable ☐ Driven ☐
Reconditioned ☐ Rotary ☐ Jetted ☐

(5) DIMENSIONS: Diameter of well 6 inches.
Drilled 177 ft. Depth of completed well 177 ft.

(6) CONSTRUCTION DETAILS:

Casing installed: 6 " Diam. from 41 ft. to 143 ft.
Threaded ☐ ....." Diam. from ..... ft. to ..... ft.
Welded ☒ ....." Diam. from ..... ft. to ..... ft.

Perforations: Yes ☐ No ☒
Type of perforator used.....
SIZE of perforations ..... in. by ..... in.
..... perforations from ..... ft. to ..... ft.
..... perforations from ..... ft. to ..... ft.
..... perforations from ..... ft. to ..... ft.

Screens: Yes ☐ No ☒
Manufacturer's Name.....
Type..... Model No.....
Diam. ..... Slot size ..... from ..... ft. to ..... ft.
Diam. ..... Slot size ..... from ..... ft. to ..... ft.

Gravel packed: Yes ☐ No ☒ Size of gravel: .....
Gravel placed from ..... ft. to ..... ft.

Surface seal: Yes ☒ No ☐ To what depth? ..... ft.
Material used in seal Puddling Clay
Did any strata contain unusable water? Yes ☒ No ☐
Type of water? Sulfer Depth of strata Appox 20 ft.
Method of sealing strata off Casing Installed.

(7) PUMP: Manufacturer's Name.....
Type: ..... H.P. .....

(8) WATER LEVELS: Land-surface elevation above mean sea level... 375 ft.
Static level 60 ft. below top of well Date.....
Artesian pressure ..... lbs. per square inch Date.....
Artesian water is controlled by..... (Cap, valve, etc.)

(9) WELL TESTS: Drawdown is amount water level is lowered below static level
Was a pump test made? Yes ☐ No ☒ If yes, by whom?.....
Yield: ..... gal./min. with ..... ft. drawdown after ..... hrs.
" " " "
" " " "

Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level

Date of test
Bailer test..... gal./min. with..... ft. drawdown after..... hrs.
Artesian flow..... g.p.m. Date
Temperature of water..... Was a chemical analysis made? Yes ☐ No ☐

(10) WELL LOG:

Formation: *Describe by color, character, size of material and structure, and show thickness of aquifers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of formation.*

MATERIAL	FROM	TO
Sand	0	40
gravel - clay	40	110
Blue clay	110	130
Broken Basalt	130	140
Basalt	140	158
Red Basalt	158	163
Green Shale	163	177

50 GPM AIR TEST

Copy

Humorist 7/2

RECEIVED
MAR 24 1978
DEPARTMENT OF ECOLOGY
SPOKANE REGIONAL OFFICE

Work started 2-24, 1978. Completed 2-27, 1978

WELL DRILLER'S STATEMENT:

This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

NAME Aqua Drilling + Dev. Inc. (Person, firm, or corporation) (Type or print)

Address Box 1499 CDA, Ida

[Signed] Theron D. Lewis (Well Driller)

License No. 0718 Date 2-27, 1978

3/24/78

(USE ADDITIONAL SHEETS IF NECESSARY)

ECY 050-1-20

26

The Department of Ecology does NOT Warranty the Data and/or the Information on this Well Report.

Please print, sign and return by mail to Department of Ecology

RESOURCE PROTECTION WELL REPORT

CURRENT Notice of Intent No. R 71633

(SUBMIT ONE WELL REPORT PER WELL INSTALLED)

275184

Construction/Decommission *(select one)*
- [x] Construction
- [ ] Decommission *ORIGINAL INSTALLATION Notice of Intent Number* ________

Type of Well *(select one)*
- [x] Resource Protection
- [ ] Geotech Soil Boring

Consulting Firm: URS Corporation

Unique Ecology Well ID Tag No.: APL083 NP-5

Property Owner: Tyson Foods

Site Address: Between 13983 & 14813 Dodd Rd.

City: Wallula County: Walla Walla

Location: NW 1/4-1/4 NW 1/4 Sec 22 Twn 8 R 31 Select One: [x] EWM [ ] WWM

WELL CONSTRUCTION CERTIFICATION: I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards. Materials used and the information reported above are true to my best knowledge and belief.

[x] Driller [ ] Engineer [ ] Trainee Name (Print): Ronald Sink

Driller/Engineer /Trainee Signature: [signature]

Driller or Trainee License No.: 2661

If trainee, licensed driller's Signature and License No. ________

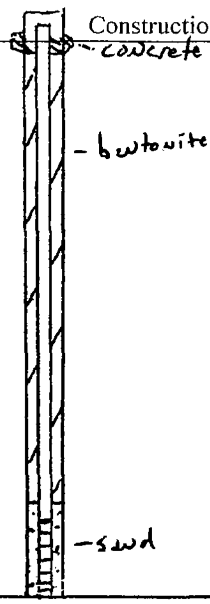
Lat/Long (s, t, r still REQUIRED) Lat Deg ____ Lat Min/Sec ____ Long Deg ____ Long Min/Sec ____

Tax Parcel No. 000000002341

Cased or Uncased Diameter 6" Static Level 34'

Work/Decommission Start Date 9/11/07

Work/Decommission Completed Date 9/11/07

Construction/Design	Well Data	Formation Description
	Drill Method: Air Rotary Screen: 2" sch 40 PVC .010 35' to 55' Casing: 2" sch 40 PVC +2.5' to 35' Sand: 10/20 32' to 55' Seal: Bentonite Chips 2' to 32'	Fine Sand — 4 Fine to Med. grade Sand — 35 silt w/sand — 42 Sandy gravel — 55

RECEIVED
OCT 22 2007
DEPARTMENT OF ECOLOGY
EASTERN REGIONAL OFFICE

27

The Department of Ecology does NOT Warranty the Data and/or the Information on this Well Report.

Please print, sign and return by mail to Department of Ecology

RESOURCE PROTECTION WELL REPORT

CURRENT Notice of Intent No. R71630

(SUBMIT ONE WELL REPORT PER WELL INSTALLED)

275185

Construction/Decommission *(select one)*
☒ Construction
☐ Decommission *ORIGINAL INSTALLATION Notice of Intent Number* ______

Type of Well *(select one)*
☒ Resource Protection
☐ Geotech Soil Boring

Consulting Firm URS Corporation

Unique Ecology Well ID Tag No. APL087 NP-2

Property Owner Simplot

Site Address Between 13983 & 14813 Dodd Rd

City Wallula County Walla Walla

Location NW 1/4-1/4 NW 1/4 Sec 23 Twn 8 R 31 Select One ☒ EWM ☐ WWM

WELL CONSTRUCTION CERTIFICATION: I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards. Materials used and the information reported above are true to my best knowledge and belief

☒ Driller ☐ Engineer ☐ Trainee Name (Print) Ronald Sink

Driller/Engineer /Trainee Signature [signature]

Driller or Trainee License No. 2661

If trainee, licensed driller's Signature and License No. ______

Lat/Long (s, t, r still REQUIRED) Lat Deg ______ Lat Min/Sec ______
Long Deg ______ Long Min/Sec ______

Tax Parcel No. 310826410004

Cased or Uncased Diameter 6" Static Level 40'

Work/Decommission Start Date 9/13/07

Work/Decommission Completed Date 9/13/07

Construction/Design	Well Data	Formation Description
 — concrete; — bentonite; — sand; 60	Drill Method: Air Rotary Screen: 2" sch 40 PVC .010 40' to 60' Casing: 2" sch 40 PVC +2.5' to 40' Sand: 10/20 37' to 60' Seal: Bentonite Chips 2' to 37'	Sand (0–13) Silty Sand (13–15) Gravely Sand (15–24) Silty Sand (24–50) Silt Stone (sand size frags.) (50–60)

RECEIVED
OCT 22 2007
DEPARTMENT OF ECOLOGY
EASTERN REGIONAL OFFICE

Please print, sign and return by mail to Department of Ecology

RESOURCE PROTECTION WELL REPORT

CURRENT Notice of Intent No. AE29471

(SUBMIT ONE WELL REPORT PER WELL INSTALLED)

28

Construction/Decommission *(select one)*

☐ Construction

☑ Decommission *ORIGINAL INSTALLATION Notice of Intent Number* SE53107

Type of Well *(select one)*

☐ Resource Protection

☑ Geotech Soil Boring

Consulting Firm SHANNON & WILSON

Unique Ecology Well ID

Tag No.

WELL CONSTRUCTION CERTIFICATION: I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards. Materials used and the information reported above are true to my best knowledge and belief.

☑ Driller ☐ Engineer ☐ Trainee Name (Print) MIKE CORN

Driller/Engineer /Trainee Signature *Mike C*

Driller or Trainee License No. 2833

If trainee, licensed driller's signature and License No. 2833

Property Owner JR SIMPLOT COMPANY

Site Address 46.142683 -118.870323

City WALLULA County WALLA WALLA

Location NE 1/4-1/4 SE 1/4 Sec 25 Twn 8N R 31 Select One ☒ EWM ☐ WWM

Lat/Long (s, t, r still REQUIRED) Lat Deg ____ Lat Min/Sec ____ Long Deg ____ Long Min/Sec ____

Tax Parcel No.

Cased or Uncased Diameter 8.5" Static Level 21.1

Work/Decommission Start Date 11/06/2014

Work/Decommission Completed Date 11/06/2014

Construction/Design	Well Data	Formation Description
HSA TO A DEPTH OF 25" BGS. PULLOUT AUGERS AND POUR IN 8 BAGS OF 3/8" BENTONITE TO 1 FOOT BELOW SURFACE, THEN DRILL CUTTINGS TO MATCH THE SURFACE.	# 2/2B TRANSMISSION LINE	0-25 SAND

RECEIVED
DEC 1 1 2014
Department of Ecology
Eastern Regional Office

NOT TO SCALE 1 1

Please print, sign and return by mail to Department of Ecology

RESOURCE PROTECTION WELL REPORT

CURRENT Notice of Intent No. SE53107

28

(SUBMIT ONE WELL REPORT PER WELL INSTALLED)

Construction/Decommission *(select one)*

[ ] Construction

[ ] Decommission *ORIGINAL INSTALLATION Notice of Intent Number* ______

Consulting Firm SHANNON & WILSON

Unique Ecology Well ID

Tag No. ______

WELL CONSTRUCTION CERTIFICATION: I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards. Materials used and the information reported above are true to my best knowledge and belief.

[ ] Driller [ ] Engineer [ ] Trainee Name (Print) MIKE CORN

Driller/Engineer /Trainee Signature Mike C

Driller or Trainee License No. 2833

If trainee, licensed driller's ______

Signature and License No. 2833

Type of Well *(select one)*

[ ] Resource Protection

[✓] Geotech Soil Boring

Property Owner JR SIMPLOT COMPANY

Site Address 46.142683 -118.870323

City WALLULA County WALLA WALLA

Location NE 1/4-1/4 SE 1/4 Sec 25 Twn 8N R 31 Select One [X] EWM [ ] WWM

Lat/Long (s, t, r still REQUIRED) Lat Deg ______ Lat Min/Sec ______ Long Deg ______ Long Min/Sec ______

Tax Parcel No. ______

Cased or Uncased Diameter 8.5" Static Level 21.1

Work/Decommission Start Date 11/06/2014

Work/Decommission Completed Date 11/06/2014

Construction/Design	Well Data	Formation Description
HSA TO A DEPTH OF 25" BGS.	# 2/2B TRANSMISSION LINE	0-25 SAND

RECEIVED

DEC 11 2014

Department of Ecology
Eastern Regional Office

NOT TO SCALE 1 1

29

File Original and First Copy with Department of Ecology
Second Copy — Owner's Copy
Third Copy — Driller's Copy

WATER WELL REPORT

STATE OF WASHINGTON

Application No. ....

Permit No. ....

(1) **OWNER:** Name Boise Cascade Paper Group Address P.O. Box 500, Wallula, WA 99363

(2) **LOCATION OF WELL:** County Walla Walla — NW ¼ NW ¼ Sec. 26 T. 8 N., R. 3E W.M.

Bearing and distance from section or subdivision corner

31

(3) **PROPOSED USE:** Domestic ☐ Industrial ☐ Municipal ☐ Irrigation ☐ Test Well ☐ Other ☒

(4) **TYPE OF WORK:** Owner's number of well (If more than one) MW-1
New well ☒ Method: Dug ☐ Bored ☐
Deepened ☐ Cable ☐ Driven ☐
Reconditioned ☐ Rotary ☒ Jetted ☐

(5) **DIMENSIONS:** Diameter of well 6 inches.
Drilled 29 ft. Depth of completed well 29 ft.

(6) **CONSTRUCTION DETAILS:**
Casing installed: 6" Diam. from +2 ft. to 4 ft.
Threaded ☐ 2"PVC" Diam. from +1 ft. to 29 ft.
Welded ☒ ...." Diam. from .... ft. to .... ft.

Perforations: Yes ☐ No ☐
Type of perforator used ....
SIZE of perforations .... in. by .... in.
.... perforations from .... ft. to .... ft.
.... perforations from .... ft. to .... ft.
.... perforations from .... ft. to .... ft.

Screens: Yes ☒ No ☐
Manufacturer's Name Johnson
Type PVC Model No. ....
Diam. 2" Slot size 10 from 19 ft. to 29 ft.
Diam .... Slot size .... from .... ft. to .... ft.

Gravel packed: Yes ☐ No ☒ Size of gravel: ....
Gravel placed from .... ft. to .... ft.

Surface seal: Yes ☒ No ☐ To what depth? 18 ft.
Material used in seal Cement
Did any strata contain unusable water? Yes ☐ No ☒
Type of water? .... Depth of strata ....
Method of sealing strata off ....

(7) **PUMP:** Manufacturer's Name ....
Type: .... H.P. ....

(8) **WATER LEVELS:** Land-surface elevation above mean sea level .... ft.
Static level 19 ft. below top of well Date ....
Artesian pressure .... lbs. per square inch Date ....
Artesian water is controlled by .... (Cap, valve, etc.)

(9) **WELL TESTS:** Drawdown is amount water level is lowered below static level
Was a pump test made? Yes ☐ No ☐ If yes, by whom? ....
Yield: N/A gal./min. with .... ft. drawdown after .... hrs.

Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level

Date of test ....
Bailer test .... gal./min. with .... ft. drawdown after .... hrs.
Artesian flow .... g.p.m. Date ....
Temperature of water .... Was a chemical analysis made? Yes ☐ No ☐

(10) **WELL LOG:**

Formation: *Describe by color, character, size of material and structure, and show thickness of aquifers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of formation.*

MATERIAL	FROM	TO
SILT	0	10
SAND, BLACK W/FINE GRAVEL	10	19
COBBLE	19	29

NOTE:
This is a monitoring well.
Not intended for use as a water well

RECEIVED
APR 22 1987
DEPARTMENT OF ECOLOGY
SPOKANE REGIONAL OFFICE

Work started 4-1, 19 87. Completed 4-1, 19 87

WELL DRILLER'S STATEMENT:

This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

NAME Ponderosa Drilling & Development, inc.
(Person, firm, or corporation) (Type or print)

Address E. 6010 Broadway, Spokane, WA 99212

[Signed] James M. Doyle (Well Driller)
James M. Doyle

License No. 1287 Date 4-1-87, 19 ....

4/22/87

(USE ADDITIONAL SHEETS IF NECESSARY)

ECY 050-1-20

30

The Department of Ecology does NOT Warranty the Data and/or the Information on this Well Report.

File Original and First Copy with Department of Ecology
Second Copy — Owner's Copy
Third Copy — Driller's Copy

WATER WELL REPORT

STATE OF WASHINGTON

Application No.

Permit No.

(1) OWNER: Name Boise Cascade Paper Group Address P.O. Box 500, Wallula, WA 99363

(2) LOCATION OF WELL: County Walla Walla — NW ¼ NW ¼ Sec 26 T. 8 N., R. 3E W.M.

Bearing and distance from section or subdivision corner

31

(3) PROPOSED USE: Domestic ☐ Industrial ☐ Municipal ☐ Irrigation ☐ Test Well ☐ Other ☒

(4) TYPE OF WORK: Owner's number of well (if more than one) MW-4
New well ☒ Method: Dug ☐ Bored ☐
Deepened ☐ Cable ☐ Driven ☐
Reconditioned ☐ Rotary ☒ Jetted ☐

(5) DIMENSIONS: Diameter of well 6 inches.
Drilled 29 ft. Depth of completed well 29 ft.

(6) CONSTRUCTION DETAILS:

Casing installed: 6" Diam. from +2 ft. to 4 ft.
Threaded ☐ 2" PVC" Diam. from +1 ft. to 29 ft.
Welded ☒ " Diam. from ft. to ft.

Perforations: Yes ☐ No ☒
Type of perforator used
SIZE of perforations in. by in.
perforations from ft. to ft.
perforations from ft. to ft.
perforations from ft. to ft.

Screens: Yes ☒ No ☐
Manufacturer's Name Johnson
Type PVC Model No.
Diam. 2 Slot size 10 from 19 ft. to 29 ft.
Diam. Slot size from ft. to ft.

Gravel packed: Yes ☐ No ☐ Size of gravel:
Gravel placed from ft. to ft.

Surface seal: Yes ☒ No ☐ To what depth? 18 ft.
Material used in seal Cement
Did any strata contain unusable water? Yes ☐ No ☐
Type of water? Depth of strata
Method of sealing strata off

(7) PUMP: Manufacturer's Name
Type: H.P.

(8) WATER LEVELS: Land-surface elevation above mean sea level ft.
Static level 19 ft. below top of well Date
Artesian pressure lbs. per square inch Date
Artesian water is controlled by (Cap, valve, etc.)

(9) WELL TESTS: Drawdown is amount water level is lowered below static level
Was a pump test made? Yes ☐ No ☐ If yes, by whom?
Yield: N/A gal./min. with ft. drawdown after hrs.

Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level

Date of test
Bailer test gal./min. with ft. drawdown after hrs.
Artesian flow g.p.m. Date
Temperature of water Was a chemical analysis made? Yes ☐ No ☐

(10) WELL LOG:

Formation: *Describe by color, character, size of material and structure, and show thickness of aquifers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of formation.*

MATERIAL	FROM	TO
SILT	0	10
SAND	10	15
COBBLE	15	29

NOTE:
This is a Monitoring well.
Not intended for use as a water well.

RECEIVED
APR 22 1987
DEPARTMENT OF ECOLOGY
SPOKANE REGIONAL OFFICE

Work started 4-2 19 87 Completed 4-2 19 87

WELL DRILLER'S STATEMENT:

This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

NAME Ponderosa Drilling & Development, Inc.
(Person, firm, or corporation) (Type or print)

Address E. 6010 Broadway, Spokane, WA 99212

[Signed] James M. Doyle (Well Driller)
James M. Doyle

License No. 1287 Date 4-2, 19 87

4/22/87

(USE ADDITIONAL SHEETS IF NECESSARY)

ECY 050-1-20

31

File Original and First Copy with Department of Ecology
Second Copy — Owner's Copy
Third Copy — Driller's Copy

WATER WELL REPORT
STATE OF WASHINGTON

Application No.
Permit No.

(1) OWNER: Name Boise Cascade Paper Group Address P.O. Box 500, Wallula, WA 99363

(2) LOCATION OF WELL: County Walla Walla NW ¼ NW ¼ Sec 26 T. 8 N., R. 3E W.M.

Bearing and distance from section or subdivision corner 31

(3) PROPOSED USE: Domestic ☐ Industrial ☐ Municipal ☐ Irrigation ☐ Test Well ☐ Other ☒

(4) TYPE OF WORK: Owner's number of well (if more than one) MW-2
New well ☒ Method: Dug ☐ Bored ☐
Deepened ☐ Cable ☐ Driven ☐
Reconditioned ☐ Rotary ☒ Jetted ☐

(5) DIMENSIONS: Diameter of well 6 inches.
Drilled 34 ft. Depth of completed well 33 ft.

(6) CONSTRUCTION DETAILS:
Casing installed: 6 " Diam. from +3 ft. to 19 ft.
Threaded ☐ 2" PVC " Diam. from +2 ft. to 33 ft.
Welded ☒ " Diam. from ft. to ft.

Perforations: Yes ☐ No ☐
Type of perforator used
SIZE of perforations in. by in.
perforations from ft. to ft.
perforations from ft. to ft.
perforations from ft. to ft.

Screens: Yes ☒ No ☐
Manufacturer's Name Johnson
Type PVC Model No.
Diam. 2 Slot size 10 from 23 ft. to 33 ft.
Diam. Slot size from ft. to ft.

Gravel packed: Yes ☐ No ☒ Size of gravel:
Gravel placed from ft. to ft.

Surface seal: Yes ☒ No ☐ To what depth? 19 ft.
Material used in seal Bentinite
Did any strata contain unusable water? Yes ☐ No ☒
Type of water? Depth of strata
Method of sealing strata off

(7) PUMP: Manufacturer's Name
Type: H.P.

(8) WATER LEVELS: Land-surface elevation above mean sea level ft.
Static level 24 ft. below top of well Date
Artesian pressure lbs. per square inch Date
Artesian water is controlled by (Cap, valve, etc.)

(9) WELL TESTS: Drawdown is amount water level is lowered below static level
Was a pump test made? Yes ☐ No ☐ If yes, by whom?
Yield: N/A gal./min. with ft. drawdown after hrs.

Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level

Date of test
Bailer test gal./min. with ft. drawdown after hrs.
Artesian flow g.p.m. Date
Temperature of water Was a chemical analysis made? Yes ☐ No ☐

(10) WELL LOG:
Formation: Describe by color, character, size of material and structure, and show thickness of aquifers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of formation.

MATERIAL	FROM	TO
FILL (LIME, ASH, WOOD)	0	14
SAND	14	23
COBBLE	23	34

NOTE:
This is a monitoring well.
Not intended for use as a water well.

RECEIVED
APR 22 1987
DEPARTMENT OF ECOLOGY
SPOKANE REGIONAL OFFICE

Work started 4-1 19 87. Completed 4-1 19 87

WELL DRILLER'S STATEMENT:

This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

NAME Ponderosa Drilling & Development, Inc.
(Person, firm, or corporation) (Type or print)

Address E. 6010 Broadway, Spokane, WA 99212

[Signed] James M. Doyle
(Well Driller)
James M. Doyle

License No. 1287 Date 4-1 19 87

4/22/87

(USE ADDITIONAL SHEETS IF NECESSARY)

ECY 050-1-20

File Original and First Copy with Department of Ecology
Second Copy — Owner's Copy
Third Copy — Driller's Copy

WATER WELL REPORT

32

STATE OF WASHINGTON

Application No.

Permit No.

(1) OWNER: Name Boise Cascade Paper Group Address P.O. Box 500, Wallula, WA 99363

(2) LOCATION OF WELL: County Walla Walla — NW ¼ NW ¼ Sec. 26 T. 8 N., R. 3E W.M.

Bearing and distance from section or subdivision corner

31

(3) PROPOSED USE: Domestic ☐ Industrial ☐ Municipal ☐ Irrigation ☐ Test Well ☐ Other ☒

(4) TYPE OF WORK: Owner's number of well (if more than one) MW-3
New well ☒ Method: Dug ☐ Bored ☐
Deepened ☐ Cable ☐ Driven ☐
Reconditioned ☐ Rotary ☒ Jetted ☐

(5) DIMENSIONS: Diameter of well 6 inches.
Drilled 38 ft. Depth of completed well 38 ft.

(6) CONSTRUCTION DETAILS:
Casing installed: 6" Diam. from +2 ft. to 4 ft.
Threaded ☐ 2" PVC Diam. from +1 ft. to 38 ft.
Welded ☒ " Diam. from ft. to ft.

Perforations: Yes ☐ No ☒
Type of perforator used
SIZE of perforations in. by in.
perforations from ft. to ft.
perforations from ft. to ft.
perforations from ft. to ft.

Screens: Yes ☒ No ☐
Manufacturer's Name Johnson
Type PVC Model No.
Diam. 2 Slot size 10 from 28 ft. to 38 ft.
Diam. Slot size from ft. to ft.

Gravel packed: Yes ☐ No ☒ Size of gravel:
Gravel placed from ft. to ft.

Surface seal: Yes ☒ No ☐ To what depth? 20 ft.
Material used in seal Cement
Did any strata contain unusable water? Yes ☐ No ☒
Type of water? Depth of strata
Method of sealing strata off

(7) PUMP: Manufacturer's Name
Type: H.P.

(8) WATER LEVELS: Land-surface elevation above mean sea level ft.
Static level 28 ft. below top of well Date
Artesian pressure lbs. per square inch Date
Artesian water is controlled by (Cap, valve, etc.)

(9) WELL TESTS: Drawdown is amount water level is lowered below static level
Was a pump test made? Yes ☐ No ☐ If yes, by whom?
Yield: N/A gal./min. with ft. drawdown after hrs.

Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level

Date of test
Bailer test gal./min. with ft. drawdown after hrs.
Artesian flow g.p.m. Date
Temperature of water Was a chemical analysis made? Yes ☐ No ☐

(10) WELL LOG:

Formation: Describe by color, character, size of material and structure, and show thickness of aquifers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of formation.

MATERIAL	FROM	TO
SILT, SAND	0	21
COBBLE	21	22
SAND	22	26
COBBLE	26	38

NOTE: This is a monitoring well. Not intended for use as a water well.

RECEIVED
APR 22 1987
DEPARTMENT OF ECOLOGY
SPOKANE REGIONAL OFFICE

Work started 4-1, 1987. Completed 4-2, 1987

WELL DRILLER'S STATEMENT:

This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

NAME Ponderosa Drilling & Development, Inc. (Person, firm, or corporation) (Type or print)

Address E. 6010 Broadway, Spokane, WA, 99212

[Signed] James M. Doyle (Well Driller)

License No. 1287 Date 4-2, 1987

4/22/87

(USE ADDITIONAL SHEETS IF NECESSARY)

ECY 050-1-20

File Original and First Copy with Department of Ecology
Second Copy — Owner's Copy
Third Copy — Driller's Copy

33

WATER WELL REPORT
STATE OF WASHINGTON

Application No. ....
Permit No. ....

(1) OWNER: Name Boise Cascade Paper Group Address P.O. Box 500, Wallula, WA, 99363

(2) LOCATION OF WELL: County Walla Walla NW ¼ NW ¼ Sec. 26 T. 8 N., R 31E W.M.
Bearing and distance from section or subdivision corner

(3) PROPOSED USE: Domestic ☐ Industrial ☐ Municipal ☐ Irrigation ☐ Test Well ☐ Other ☒

(4) TYPE OF WORK: Owner's number of well (if more than one) MW-6
New well ☒ Deepened ☐ Reconditioned ☐
Method: Dug ☐ Bored ☐ Cable ☐ Driven ☐ Rotary ☒ Jetted ☐

(5) DIMENSIONS: Diameter of well 6 inches.
Drilled 45 ft. Depth of completed well 45 ft.

(6) CONSTRUCTION DETAILS:
Casing installed: 6 " Diam. from +2 ft. to 4 ft.
Threaded ☐ 2"PVC " Diam. from +1 ft. to 45 ft.
Welded ☒ ..... " Diam. from ..... ft. to ..... ft.

Perforations: Yes ☐ No ☐
Type of perforator used ....
SIZE of perforations ..... in. by ..... in.
..... perforations from ..... ft. to ..... ft.
..... perforations from ..... ft. to ..... ft.
..... perforations from ..... ft. to ..... ft.

Screens: Yes ☒ No ☐
Manufacturer's Name Johnson
Type PVC Model No. .....
Diam. 2 Slot size 10 from 35 ft. to 45 ft.
Diam. ..... Slot size ..... from ..... ft. to ..... ft.

Gravel packed: Yes ☐ No ☒ Size of gravel: .....
Gravel placed from ..... ft. to ..... ft.

Surface seal: Yes ☒ No ☐ To what depth? 20 ft.
Material used in seal Cement
Did any strata contain unusable water? Yes ☐ No ☒
Type of water? ..... Depth of strata .....
Method of sealing strata off .....

(7) PUMP: Manufacturer's Name .....
Type: ..... H.P. .....

(8) WATER LEVELS: Land-surface elevation above mean sea level ..... ft.
Static level 35 ft. below top of well Date .....
Artesian pressure ..... lbs. per square inch Date .....
Artesian water is controlled by ..... (Cap, valve, etc.)

(9) WELL TESTS: Drawdown is amount water level is lowered below static level
Was a pump test made? Yes ☐ No ☐ If yes, by whom? .....
Yield: N/A gal./min. with ..... ft. drawdown after ..... hrs.

Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level

Date of test .....
Bailer test ..... gal./min. with ..... ft. drawdown after ..... hrs.
Artesian flow ..... g.p.m. Date .....
Temperature of water ..... Was a chemical analysis made? Yes ☐ No ☐

(10) WELL LOG:
Formation: Describe by color, character, size of material and structure, and show thickness of aquifers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of formation.

MATERIAL	FROM	TO
SILT	0	10
SAND, BLACK W/ FINE GRAVEL	10	35
COBBLE W/ WATER	35	44
BASALT	44	45

NOTE: This is a monitoring well. Not intended for use as a water well.

RECEIVED
APR 22 1987
DEPARTMENT OF ECOLOGY
SPOKANE REGIONAL OFFICE

Work started 3-31 1987. Completed 3-31 1987

WELL DRILLER'S STATEMENT:
This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

NAME Ponderosa Drilling & Development, Inc. (Person, firm, or corporation) (Type or print)
Address E. 6010 Broadway, Spokane, WA, 99212
[Signed] James M. Doyle (Well Driller)
License No. 1287 Date 3-31, 1987

4/22/87

(USE ADDITIONAL SHEETS IF NECESSARY)

ECY 050-1-20

File Original and First Copy with Department of Ecology
Second Copy — Owner's Copy
Third Copy — Driller's Copy

WATER WELL REPORT

34

STATE OF WASHINGTON

Application No.

Permit No.

(1) OWNER: Name Boise Cascade Paper Group Address P.O. Box 500, Wallula, WA 99363

(2) LOCATION OF WELL: County Walla Walla NW ¼ NW ¼ Sec 26 T. 8 N., R. 3E W.M.

Bearing and distance from section or subdivision corner 31

(3) PROPOSED USE: Domestic ☐ Industrial ☐ Municipal ☐ Irrigation ☐ Test Well ☐ Other ☒

(4) TYPE OF WORK: Owner's number of well (if more than one) MW-5
New well ☒ Method: Dug ☐ Bored ☐
Deepened ☐ Cable ☐ Driven ☐
Reconditioned ☐ Rotary ☐ Jetted ☐

(5) DIMENSIONS: Diameter of well 6 inches.
Drilled 62 ft. Depth of completed well 62 ft.

(6) CONSTRUCTION DETAILS:
Casing installed: 6" Diam. from +2 ft. to 4 ft.
Threaded ☐ 2" PVC " Diam. from +1 ft. to 62 ft.
Welded ☒ " Diam. from ft. to ft.

Perforations: Yes ☐ No ☒
Type of perforator used
SIZE of perforations in. by in.
perforations from ft. to ft.
perforations from ft. to ft.
perforations from ft. to ft.

Screens: Yes ☒ No ☐
Manufacturer's Name Johnson
Type PVC Model No.
Diam. 2 Slot size 10 from 52 ft. to 62 ft.
Diam. Slot size from ft. to ft.

Gravel packed: Yes ☐ No ☐ Size of gravel:
Gravel placed from ft. to ft.

Surface seal: Yes ☒ No ☐ To what depth? 20 ft.
Material used in seal
Did any strata contain unusable water? Yes ☐ No ☐
Type of water? Depth of strata
Method of sealing strata off

(7) PUMP: Manufacturer's Name
Type: H.P.

(8) WATER LEVELS: Land-surface elevation above mean sea level ft.
Static level 54 ft. below top of well Date
Artesian pressure lbs. per square inch Date
Artesian water is controlled by (Cap, valve, etc.)

(9) WELL TESTS: Drawdown is amount water level is lowered below static level
Was a pump test made? Yes ☐ No ☐ If yes, by whom?
Yield: N/A gal./min. with ft. drawdown after hrs.

Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level

Date of test
Bailer test gal./min. with ft. drawdown after hrs.
Artesian flow g.p.m. Date
Temperature of water Was a chemical analysis made? Yes ☐ No ☐

(10) WELL LOG:

Formation: Describe by color, character, size of material and structure, and show thickness of aquifers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of formation.

MATERIAL	FROM	TO
SILT	0	10
SAND, BLACK W/FINE GRAVEL	10	50
COBBLE	50	60
BASALT	60	62

NOTE:
This is a monitoring well.
Not intended for use as a water well.

RECEIVED
APR 22 1987
DEPARTMENT OF ECOLOGY
SPOKANE REGIONAL OFFICE

Work started 4-2 1987 Completed 4-3 1987

WELL DRILLER'S STATEMENT:

This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

NAME Ponderosa Drilling& Development, Inc. (Person, firm, or corporation) (Type or print)

Address E. 6010 Broadway, Spokane, WA 99212

[Signed] James M. Doyle (Well Driller)

License No. 1287 James. M. Doyle Date 4-3 1987

4/22/87

(USE ADDITIONAL SHEETS IF NECESSARY)

ECY 050-1-20

35

S26 T8 R31
WALLA WALLA

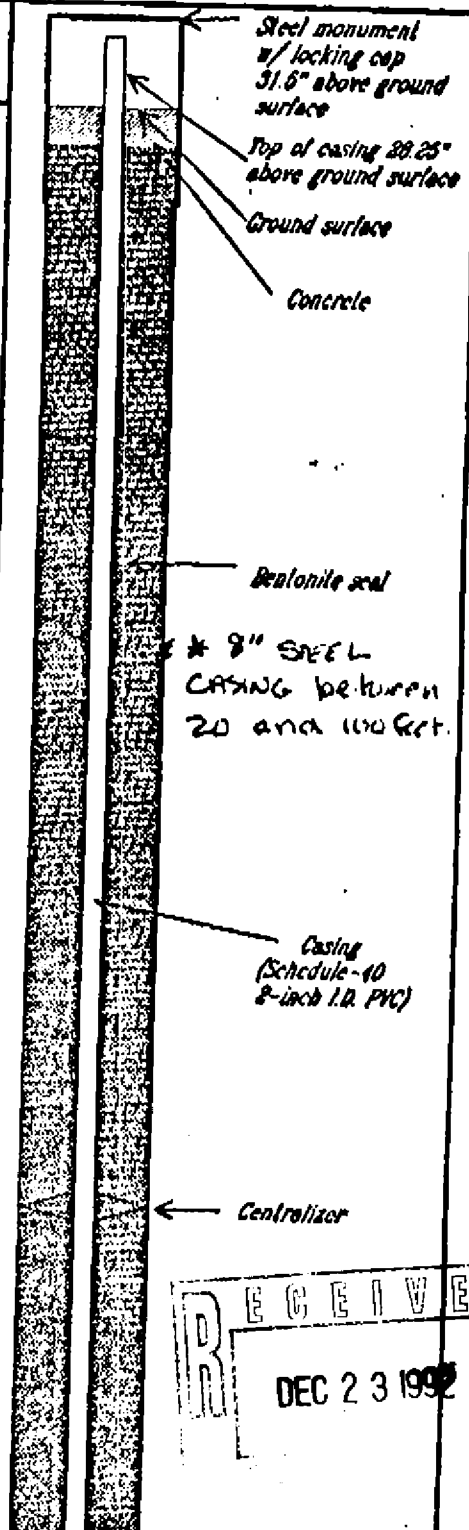
PROJECT *IBP Wallula Plant* W.O. *S-1061* WELL NO. *MW-1(a)*

Elevation reference:
Ground surface elevation:
Casing elevation:

DEPTH (feet)	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	BLOW COUNTS	OVM READING	GROUND WATER
0–7	(Medium stiff) dry, beige, SILT w/some coarse sand and fine gravel in places (Loess)					
7–17	(Medium dense) dry, tan to light brown, silty fine SAND, micaceous in places					
17–19	(Dense) dry, gray, fine to medium SAND w/some silt					
19–20	(Dense) dry, brown, fine SAND w/thin gray medium sand w/silt interbeds					
20–26	(Dense) dry, gray, medium to coarse SAND w/tan silt					
26–30	(Stiff) dry, tan, fine sandy SILT with trace coarse sand					
30–32	(Dense) dry, dark gray to black, medium to coarse sand					
32–33	(Stiff) dry, tan SILT (Loess)					
33–51	(Stiff) dry, tan to beige, fine sandy SILT to silty fine SAND w/trace fine gravel. Micaceous in places. Thin caliche layers at 42.0 feet.					
51–55	(Very dense) dry, white, CALICHE with some thin tan silt interbeds					
55–60	(Dense) dry, tan to brown, SILT and silty fine SAND (Loess)					

AS-BUILT DESIGN

TESTING



RECEIVED
DEC 2 3 1992

RUEN DRILLING, INC.
BOX 267
CLARK FORK, ID 83811
(208) 266-1151
PERMIT # 066052

LEGEND

- - - Inferred stratigraphic contact
SWL elevation and date of measurement

Will Haugen
2085

RZA AGRA, Inc.
Engineering & Environmental Services
539 West Sharp, Suite D
Spokane, WA 99201

Drilling started: *4 August 1992* Drilling completed: *6 August 1992* Logged by: *EWS*

5 26 T8 R 31E.
WALLA WALLA

35

W.O. S-1061 WELL NO. MW-1(b)

PROJECT IBP Wallula Plant

Elevation reference:
Ground surface elevation:
Casing elevation:

DEPTH (feet)	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	BLOW COUNTS	OVM READING	GROUND WATER	AS-BUILT DESIGN	TESTING
60	(Dense dry, brown, fine to medium SAND with trace silt.							
	(Dense to very dense) dry to damp, black basalt GRAVEL with gray to tan, micaceous, medium SAND.						* 8" steel casing from 80 to 160'	
70	(Dense) dry, tan and white, fine to medium silica SAND with some basalt fine gravels.							
	(Dense) damp, brown, gravelly medium SAND w/trace silt. Gravels are subrounded to rounded.						Bentonite seal	
80	(Dense) damp, grey to brown, medium SAND with some fine sandy SILT.						Centralizer	
							Casing (schedule - 40 2-inch I.D. PVC)	
90	(Very dense) damp, brown to gray, angular basalt and quartzite GRAVELS with interbeds of (dense) damp, brown, SAND with traces of fine gravel.							
100	(Dense) damp to wet, brown, SAND with fine gravel and trace silt.							
110	(Dense) damp, light brown, silty fine SAND with caliche near top. Grades down into a fine sandy SILT with trace coarse sands. Thin caliche interbeds at 113.2							
120								

RECEIVED
DEC 2 3 1992

LEGEND

- - - Inferred stratigraphic contact

▼ DATE SWL elevation and date of measurement

RZA AGRA, Inc.
Engineering & Environmental Services
539 West Sharp, Suite D
Spokane, WA 99201

Drilling started: 4 August 1992 Drilling completed: 6 August 1992 Logged by: ENJS

35

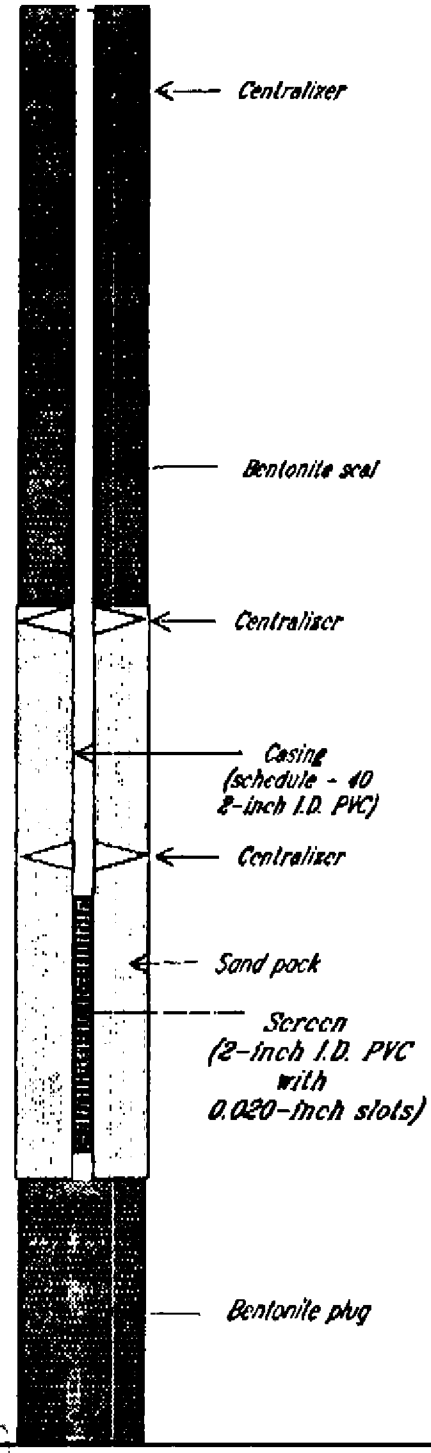
WALLA WALLA

PROJECT *IBP Wallula Plant* W.O. *S-1061* WELL NO. *MW-1(c)*

Elevation reference:
Ground surface elevation: Casing elevation:

DEPTH (feet)	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	BLOW COUNTS	OVM READING	GROUND WATER
120						
130	*(Dense) damp to moist, brown, silty fine SAND with scattered fine gravels. Fine sandy silt interbeds 124.5 - 125.3 feet.*					
140						8/7/92
150						
160	*(Dense) damp to moist, brown, SAND with gravels and trace silt. Silt becomes more abundant with depth.*					
170						
180	*(Stiff) damp, tan, SILT*					

AS-BUILT DESIGN



TESTING

LEGEND

- - - Inferred stratigraphic contact

▼ DATE SWL elevation and date of measurement

RECEIVED DEC 23 1992 DEPARTMENT OF ... EASTERN REGION...

RZA AGRA, Inc.
Engineering & Environmental Services
539 West Sharp, Suite D
Spokane, WA 99201

Drilling started: *4 August 1992* Drilling completed: *6 August 1992* Logged by: *ENJS*

WALLA WALLA

35

PROJECT *IBP Wallula Plant* W.O. *S-1011* WELL NO. *MW-1(d)*

Elevation reference:
Ground surface elevation: Casing elevation:

DEPTH (feet)	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	BLOW COUNTS	OVM READING	GROUND WATER	AS-BUILT DESIGN	TESTING
180	*(Dense) damp, brown very silty coarse SAND with fine gravels*						Bentonite plug	
	(Dense) damp, brown, silty fine SAND with trace fine gravels							
190	*(Medium stiff) moist, tan to gray, SILT and CLAY with some sands. Silty coarse SAND with gravel interbeds from 189.3 to 190.4 feet*							
	Boring terminated at approximately 195.0 feet							
200								
210								
220								
230								
240								

RECEIVED
DEC 23 1992

LEGEND

- - - Inferred stratigraphic contact

▼ DATE SWL elevation and date of measurement

RZA AGRA, Inc.
Engineering & Environmental Services
539 West Sharp, Suite D
Spokane, WA 99201

Drilling started: *4 August 1992* Drilling completed: *6 August 1992* Logged by: *ENJS*

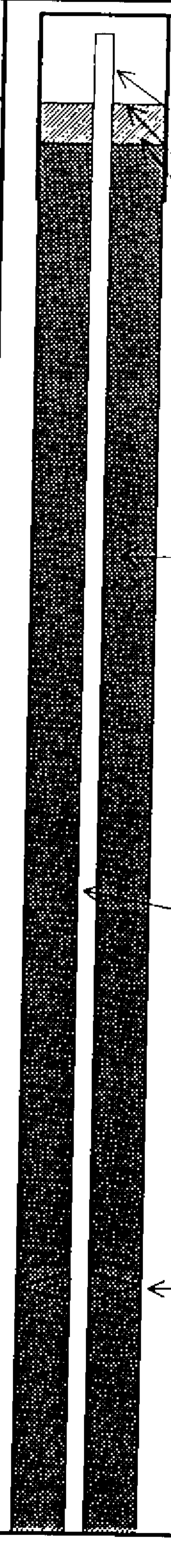
36

PROJECT *IBP Wallula Plant* W.O. *S-1061* WELL NO. *MW-2*

Elevation reference:
Ground surface elevation: *512.4* Casing elevation: *514.52*

DEPTH (feet)	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	BLOW COUNTS	OVM READINGS	GROUND WATER
0	*(Medium stiff) dry, tan, silty fine SAND to brownvery silty fine SAND (Loess).*					
10	*(Dense) damp, brown, fine to medium SAND with some silt. Becoming siltier with depth.*					
20	*(Stiff) damp, brown, fine sandy SILT with clayey silty interbeds.*					
30	*(Medium dense to dense) damp, brown to tannish brown very silty fine SAND. Micaceous in places. Few thin blue clay interbeds upper 10 feet.*					
40–60	*(Stiff) damp, tan, fine sandy SILT. Clayey SILT interval from 46.8 to 49.8 feet. SILT becomes micaceous near 55 feet. Scattered coarse sand in SILT below 60 feet.*					

AS-BUILT DESIGN



TESTING

RECEIVED JAN 14 1993

LEGEND

- - - Inferred stratigraphic contact

▼ SWL elevation and date of measurement

RZA AGRA, Inc.
Engineering & Environmental Services
539 West Sharp, Suite D
Spokane, WA 99201

Drilling started: *4 August 1992* Drilling completed: *6 August 1992* Logged by: *ENJS*

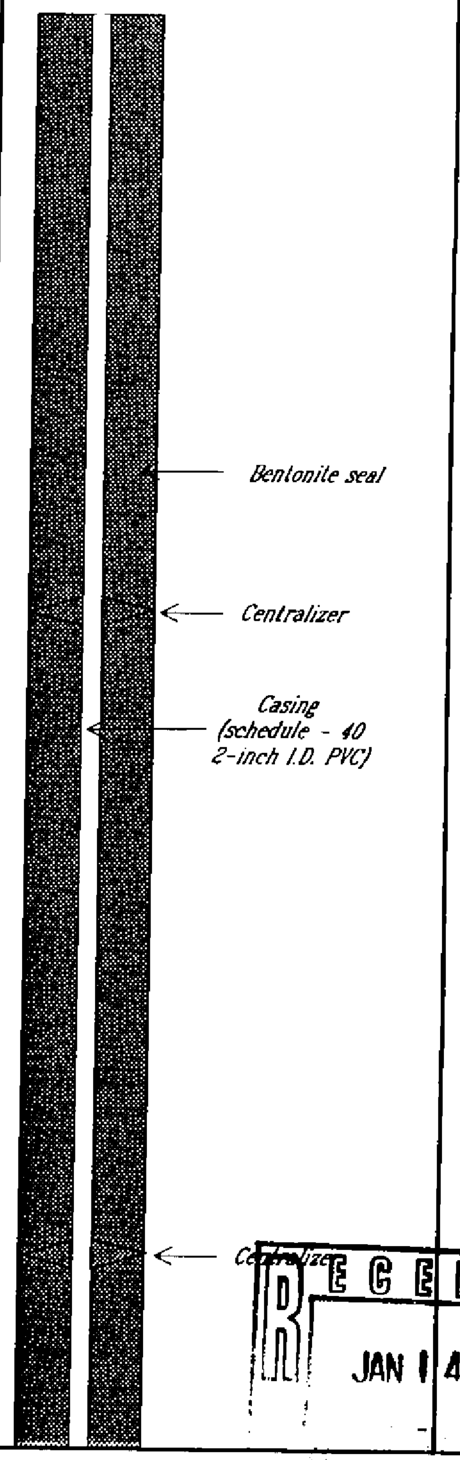
36

PROJECT *IBP Wallula Plant* W.O. *S-1061* WELL NO. *MW-2*

Elevation reference:
Ground surface elevation: *512.4* Casing elevation: *514.52*

DEPTH (feet)	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	BLOW COUNTS	OVM READING	GROUND WATER
60	*(Stiff) damp, tan, fine sandy SILT. Clayey SILT interval from 46.8 to 49.8 feet. SILT becomes micaceous near 55 feet. Scattered coarse sand in SILT below 60 feet.*					
70	*(Dense) damp to wet, tan to brown, micaceous, silty fine SAND with trace gravel.*					
	(Very dense) dry, white CALICHE.					
80	*(Medium dense to stiff) damp, brown to tan silty very fine SAND and SILT with clay interbeds.*					
90						
	(Stiff) damp to moist, brown, fine sandy SILT with trace gravel interbedded with damp, brown, medium silicia SAND with some gravel. Thin caliche beds at 94 feet. SILT grades into a very fine sand near basal contact.					
100						
110						
	(Dense) damp, light brown to gray, fine to medium silicia SAND w/trace silt and fine gravels.					
120						

AS-BUILT DESIGN



TESTING

RECEIVED JAN 14 1993

LEGEND

- - - *Inferred stratigraphic contact*

SWL elevation and date of measurement

RZA AGRA, Inc.
Engineering & Environmental Services
539 West Sharp, Suite D
Spokane, WA 99201

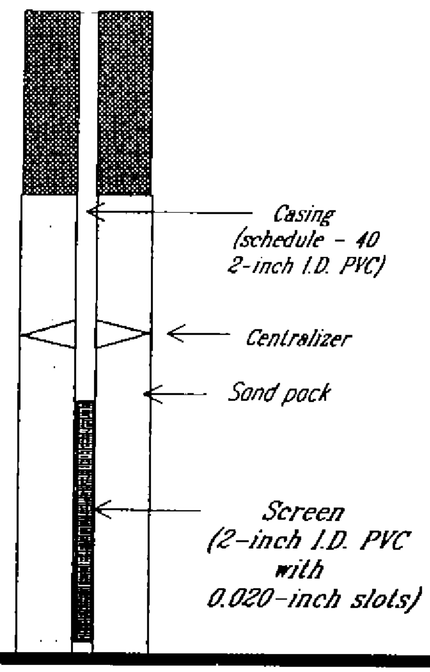
Drilling started: *4 August 1992* Drilling completed: *6 August 1992* Logged by: *ENJS*

36

PROJECT *IBP Wallula Plant* W.O. *S-1061* WELL NO. *MW-2*

Elevation reference:
Ground surface elevation: *512.4* Casing elevation: *514.52*

DEPTH (feet)	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	BLOW COUNTS	OVM READINGS	GROUND WATER	AS-BUILT DESIGN	TESTING
120						8/6/92		
130								
	(Very dense) saturated, black to brown, subrounded GRAVEL with sand interbedded with gray (salt and pepper texture in areas), wet to saturated, gravelly SAND, some caliche on gravels. Some cobbles from 140 to 143 feet.							
140								
	(Dense) wet, light brown, fine to medium SAND with gravels.							
	Boring terminated at approximately 147.2 feet.							
150								
160								
170								
180								



LEGEND

- - - Inferred stratigraphic contact

▼ DATE SWL elevation and date of measurement

Start card info #056053
SE 1/4 SE 1/4 SW 1/4
Sec 26 T8N R31E

RZA AGRA, Inc.
Engineering & Environmental Services
539 West Sharp, Suite D
Spokane, WA 99201

Drilling started: *4 August 1992* Drilling completed: *6 August 1992* Logged by: *ENJS*

S26 T8 R31

36

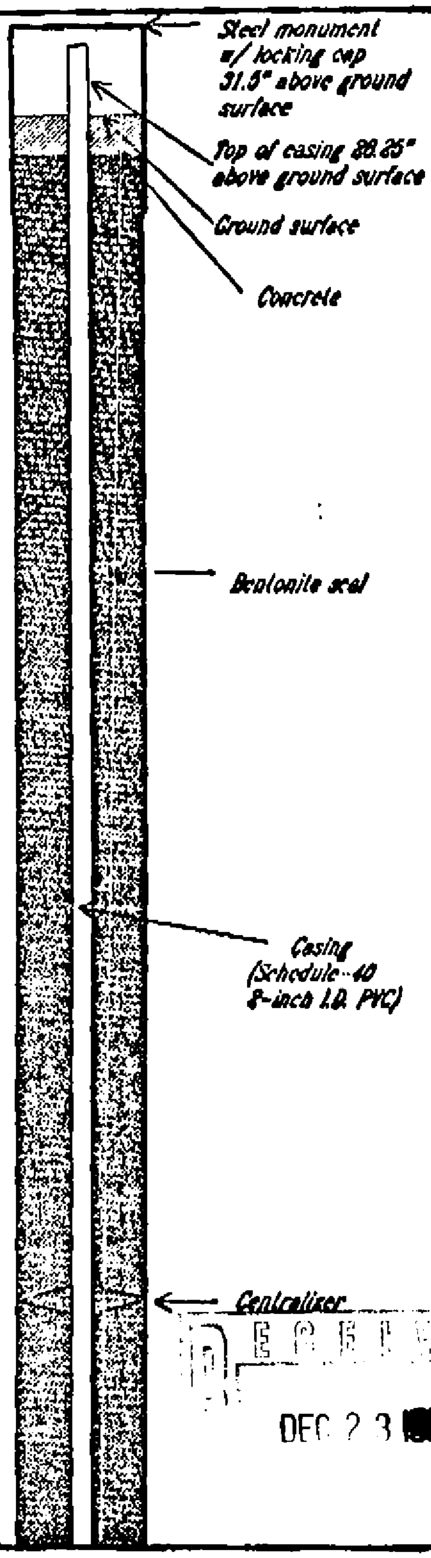
PROJECT *IBP Wallula Plant* W.O. *S-1061* WELL NO. *MW-2(a)*

Elevation reference:
Ground surface elevation: Casing elevation:

DEPTH (feet)	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	BLOW COUNTS	OVM READING	GROUND WATER
0–7	*(Medium stiff) dry, tan, silty fine SAND to brownvery silty fine SAND (Loess)*					
7–24	*(Dense) damp, brown, fine to medium SAND with some silt. Becoming siltier with depth*					
24	*(Stiff) damp, brown, fine sandy SILT with clayey silty interbeds*					
24–40	*(Medium dense to dense) damp, brown to tannish brown very silty fine SAND. Micaceous in places. Few thin blue clay interbeds upper 10 feet.*					
40–60	*(Stiff) damp, tan, fine sandy SILT. Clayey SILT interval from 46.8 to 49.8 feet. SILT becomes micaceous near 53 feet. Scattered coarse sand to SILT below 60 feet.*					

AS-BUILT DESIGN

TESTING



RECEIVED
DEC 2 3 1992

RUEN DRILLING, INC.
BOX 267
CLARK FORK, ID 83811
(208) 266-1151

PERMIT # 056053

2035

LEGEND

- - - Inferred stratigraphic contact

▼ SWL elevation and date of measurement

RZA AGRA, Inc.
Engineering & Environmental Services

539 West Sharp, Suite D
Spokane, WA 99201

Drilling started: *4 August 1992* Drilling completed: *6 August 1992* Logged by: *ENJS*

T5N. R31E.
WALLA WALLA

36

PROJECT *IBP Wallula Plant* W.O. *S-1061* WELL NO. *MW-2(b)*

Elevation reference:
Ground surface elevation: Casing elevation:

DEPTH (feet)	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	BLOW COUNTS	OVM READING	GROUND WATER	AS-BUILT DESIGN	TESTING
60	*(Stiff) damp, tan, fine sandy SILT. Clayey SILT interval from 46.8 to 49.8 feet. SILT becomes micaceous near 55 fet. Scattered coarse sand in SILT below 60 feet.*							
70	*(Dense) damp to wet, tan to brown, micaceous silty fine SAND with trace gravel.*							
	(Very dense) dry, white CALICHE.							
80	*(Medium dense to stiff) damp, brown to tan silty very fine SAND and SILT with clay interbeds.*						*Bentonite seal*	
							Centralizer	
90							*Casing (schedule - 40 2-inch I.D. PVC)*	
	(Stiff) damp to moist, brown, fine sandy SILT with trace gravel interbedded with damp, brown medium silicic SAND with some gravel. Thin caliche beds at 94 feet. SILT grades into a very fine sand near basal contact.							
100								
110								
	(Dense) damp, light brown to gray, fine to medium silicic SAND w/trace silt and fine gravels.						*Centralizer*	
120							DEC 2 3 1992	

LEGEND

- - - *Inferred stratigraphic contact*

DATE SWL elevation and date of measurement

RZA AGRA, Inc.
Engineering & Environmental Services
539 West Sharp, Suite D
Spokane, WA 99201

Drilling started: *4 August 1992* Drilling completed: *6 August 1992* Logged by: *ENJS*

36 13N. R31E.

36

PROJECT *IBP Wallula Plant* W.O. *S-1061* WELL NO. *MW-2(c)*

Elevation reference:
Ground surface elevation: Casing elevation:

DEPTH (feet)	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	BLOW COUNTS	OVM READING	GROUND WATER	AS-BUILT DESIGN	TESTING
120						6/7/92		
130	*(Very dense) damp, black to brown, subrounded GRAVEL with sand interbedded with gray (salt and pepper texture in areas), wet to saturated, gravelly SAND, some caliche on gravels. Some cobbles from 140 to 143 feet.*						Casing (schedule - 40 2-inch I.D. PVC); Centralizer; Sand pack	
140	*(Dense) wet, light brown, fine to medium SAND with gravels.*						Screen (2-inch I.D. PVC with 0.020-inch slots)	
	Boring terminated at approximately 147.2 feet.							
150								
160								
170							DEC 23 1992	
180								

LEGEND

- - - Inferred stratigraphic contact

▼ DATE SWL elevation and date of measurement

RZA AGRA, Inc.
Engineering & Environmental Services
539 West Sharp, Suite D
Spokane, WA 99201

Drilling started: *4 August 1992* Drilling completed: *6 August 1992* Logged by: *ENJS*

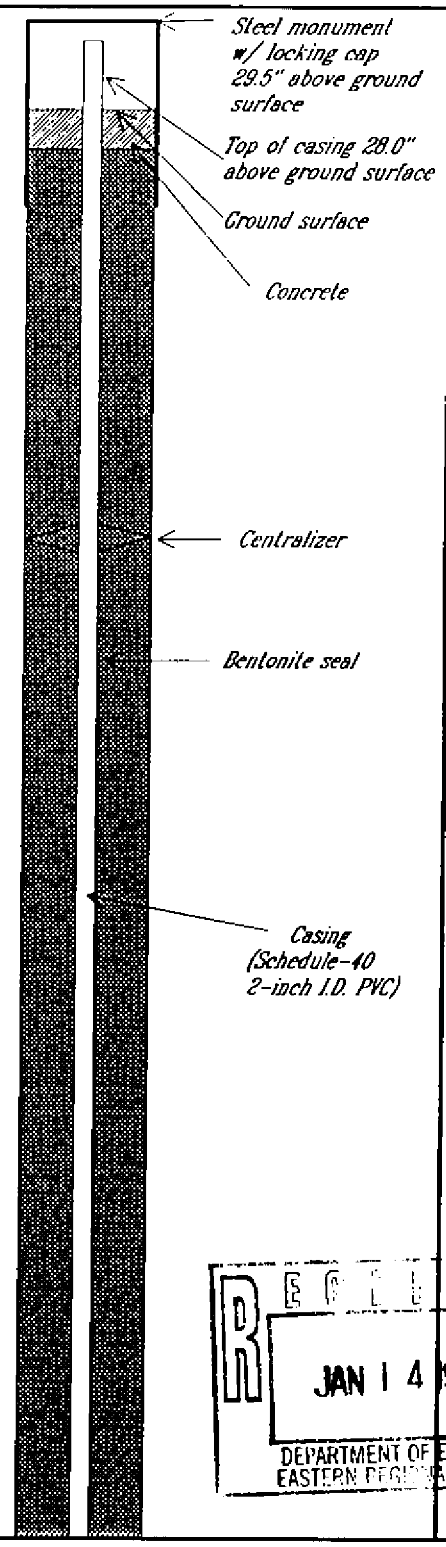
37

PROJECT *IBP Wallula Plant* W.O. *S-1061* WELL NO. *MW-3*

Elevation reference:
Ground surface elevation: *486.1* Casing elevation: *488.50*

DEPTH (feet)	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	BLOW COUNTS	OVM READING	GROUND WATER
0–18	*(Medium stiff to hard) dry, tan to light brown, SILT with fine sand and clay interbedded with hard, dry, white CALICHE.*					
18–21	*(Hard) dry, white CALICHE.*					
21–33	*(Medium stiff) damp, light brown, fine sandy SILT to clayey SILT.*					
33–35	*(Stiff) damp, tan, gravelly SILT w/caliche.*					
35–42	*(Stiff) dry to damp, light brown SILT w/clay.*					
42–47	*(Hard to stiff) damp to moist, brown to oxidized brown CLAY with silt. Some bluish gray clay intervals.*					
47–60	*(Stiff) damp, light brown, SILT with some fine sand and scattered gravel. Few clay interbeds below 65 feet.*					

AS-BUILT DESIGN



TESTING

LEGEND

- - - Inferred stratigraphic contact
DATE SWL elevations and date of measurement

RZA AGRA, Inc.
Engineering & Environmental Services
539 West Sharp, Suite D
Spokane, WA 99201

Drilling started: *4 August 1992* Drilling completed: *6 August 1992* Logged by: *ENJS*

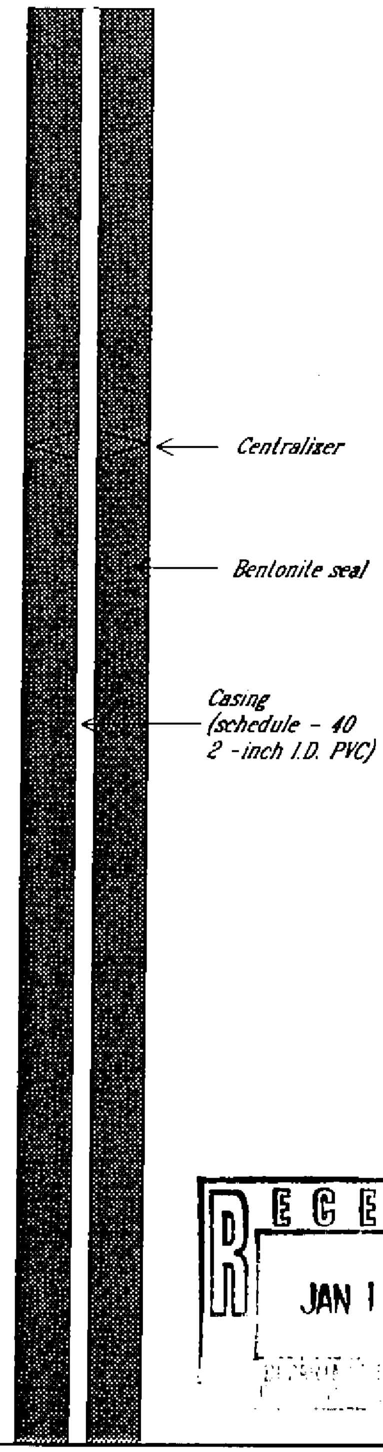
37

PROJECT *IBP Wallula Plant* W.O. *S-1061* WELL NO. *MW-3*

Elevation reference:
Ground surface elevation: *486.1* Casing elevation: *488.50*

DEPTH (feet)	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	BLOW COUNTS	OVM READING	GROUND WATER
60	*(Stiff) damp, light brown, SILT with some fine sand and scattered gravel. Few clay interbeds below 65 feet.*					
70	*(Medium stiff-stiff) damp, gray-brown to bluish-brown CLAY*					
80						
90	*(Stiff) damp, light brown, fine sandy SILT with wet clay interbeds. CLAY becoming more abundant with depth.*					
100						
110	*(Dense) damp, brown, silty coarse SAND.*					
120						

AS-BUILT DESIGN



TESTING

RECEIVED
JAN 14 1993

LEGEND

- - - Inferred stratigraphic contact

DATE SWL elevations and date of measurement

RZA AGRA, Inc.
Engineering & Environmental Services
539 West Sharp, Suite D
Spokane, WA 99201

Drilling started: *4 August 1992* Drilling completed: *6 August 1992* Logged by: *ENJS*

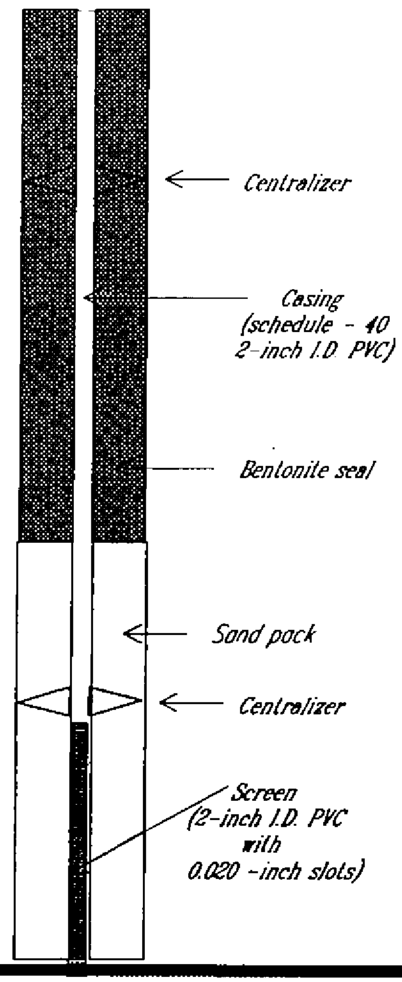
37

PROJECT *IBP Wallula Plant* W.O. *S-1061* WELL NO. *MW-3*

Elevation reference:
Ground surface elevation: *486.1* Casing elevation: *488.5*

DEPTH (feet)	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	BLOW COUNTS	OVM READING	GROUND WATER
120	*(Stiff) damp, blueish and brown CLAY*					
	(Stiff) damp, brown, CLAY and SILT with brown sandy GRAVEL lenses.					8/10/92
130						
140						
150	*(Dense) saturated, brown silty coarse SAND with gravel and clay.*					
160	*Boring terminated at approximately 160 feet.*					
170						
180						

AS-BUILT DESIGN



TESTING

RECEIVED
JAN 14 1993
DEPARTMENT OF ECOLOGY

LEGEND

- - - Inferred stratigraphic contact

▼ DATE SWL elevation and date of measurement

Start card Info #088011
NW 1/4 NW 1/4 NW 1/4
Sec 36 T8N R 31E

RZA AGRA, Inc.
Engineering & Environmental Services
539 West Sharp, Suite D
Spokane, WA 99201

Drilling started: *4 August 1992* Drilling completed: *6 August 1992* Logged by: *ENJS*

Page 3 of 3

The Department of Ecology does NOT Warranty the Data and/or the Information on this Well Report.

File Original and First Copy with Department of Ecology
Second Copy — Owner's Copy
Third Copy — Driller's Copy

WATER WELL REPORT

38

STATE OF WASHINGTON

Application No.
Permit No.

(1) OWNER: Name Iowa Beef Address Walla Walla

(2) LOCATION OF WELL: County Walla Walla — NW ¼ NW ¼ Sec 26 T 8 N., R 31 W.M.
Bearing and distance from section or subdivision corner W end of centerline of NW¼ SW¼ Sec 26 Well #3

(3) PROPOSED USE: Domestic ☐ Industrial ☐ Municipal ☐ Irrigation ☐ Test Well ☒ Other ☐

(4) TYPE OF WORK: Owner's number of well (if more than one) # 3
New well ☒ Method: Dug ☐ Bored ☐
Deepened ☐ Cable ☒ Driven ☐
Reconditioned ☐ Rotary ☐ Jetted ☐

(5) DIMENSIONS: Diameter of well 6 inches.
Drilled 200 ft. Depth of completed well 200 ft.

(6) CONSTRUCTION DETAILS:

Casing installed: 10 " Diam. from 0 ft. to 29.5 ft.
Threaded ☐ 6 " Diam. from +2 ft. to 200 ft.
Welded ☐ " Diam. from ft. to ft.

Perforations: Yes ☒ No ☐
Type of perforator used Equiv. of Mills Knife
SIZE of perforations 1/4 in. by 2 in.
perforations from 70 ft. to 90 ft.
perforations from ft. to ft.
perforations from ft. to ft.

Screens: Yes ☐ No ☒
Manufacturer's Name
Type Model No.
Diam. Slot size from ft. to ft.
Diam. Slot size from ft. to ft.

Gravel packed: Yes ☐ No ☐ Size of gravel:
Gravel placed from ft. to ft.

Surface seal: Yes ☒ No ☐ To what depth? 30 ft.
Material used in seal Bentonite
Did any strata contain unusable water? Yes ☐ No ☒
Type of water? ---- Depth of strata
Method of sealing strata off

(7) PUMP: Manufacturer's Name DNA.
Type: H.P.

(8) WATER LEVELS: Land-surface elevation above mean sea level = 450 ft.
Static level 75 ft. below top of well Date 6/23/80
Artesian pressure lbs. per square inch Date —
Artesian water is controlled by (Cap, valve, etc.)

(9) WELL TESTS: Drawdown is amount water level is lowered below static level
Was a pump test made? Yes ☐ No ☒ If yes, by whom?
Yield: gal./min. with ft. drawdown after hrs.
" " " "
" " " "

Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level

Date of test 6/24/80
Bailer test gal./min. with ft. drawdown after hrs.
Artesian flow g.p.m. Date
Temperature of water 60° Was a chemical analysis made? Yes ☒ No ☐

(10) WELL LOG: PAGE 1 of 2

Formation: Describe by color, character, size of material and structure, and show thickness of aquifers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of formation.

MATERIAL	FROM	TO
Brown Sand	0	5
Brown Sandy Silt	5	14
Caliche	14	14.1
Brown Sand	14.1	14.7
Brown Sandy Silt	14.7	20
Consolid. Sand - med Gravel	20	22
Med. Gravel	22	25.5
Caliche	25.5	26
Brown Silty Sand	26	29
Sandy - med gravel	29	30.5
Caliche	30.5	31
Brown Sandy Silt	31	35
Brown Silty Sand	35	38.5
Silty Sand / Sandstone	38.5	41
Assume Floater Stone	41	41
Silty Sand	41	44
Decomp. Rock, Blue Clay, Sands	44	48.5
" " " " "	48.5	48.5
" " " " "	48.5	54
Ringold Conglomerate	54	60
" "	60	60
" "	60	66
Brown Silty sand, 15% Very Coarse	66	68
" " " " " "	68	68
Brown fine Sand	68	69
Ringold Conglomerate	69	75
Brown fine Sand	75	77
Loose Sand + gravel	77	82
Ringold Congl.	82	83
Brown fine gravel + sand	84	86
Harder Cons. Sand + gravel	86	86
Loose S + G. / Layers of Ring.	86	92
Hard Ringold	92	92.5

Work started 6/6 1980. Completed 7/25, 1980

WELL DRILLER'S STATEMENT:

This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

NAME Hatch Drilling Co. Inc (Person, firm, or corporation) (Type or print)

Address 647 W. Court

[Signed] Dale Bigham (Well Driller)

License No. 0036 Date 8/12, 1980

8/13/80

(USE ADDITIONAL SHEETS IF NECESSARY)

ECY 050-1-20

File Original and First Copy with Department of Ecology
Second Copy — Owner's Copy
Third Copy — Driller's Copy

38

WATER WELL REPORT
STATE OF WASHINGTON

Application No
Permit No

(1) OWNER: Name Iowa Beef Address Well #3

(2) LOCATION OF WELL: County ¼ ¼ Sec T. N., R. W.M.

Bearing and distance from section or subdivision corner

(3) PROPOSED USE: Domestic ☐ Industrial ☐ Municipal ☐ Irrigation ☐ Test Well ☐ Other ☐

(4) TYPE OF WORK: Owner's number of well (if more than one)
New well ☐ Method: Dug ☐ Bored ☐
Deepened ☐ Cable ☐ Driven ☐
Reconditioned ☐ Rotary ☐ Jetted ☐

(5) DIMENSIONS: Diameter of well inches.
Drilled ft. Depth of completed well ft.

(6) CONSTRUCTION DETAILS:

Casing installed: " Diam. from ft. to ft.
Threaded ☐ " Diam. from ft. to ft.
Welded ☐ " Diam. from ft. to ft.

Perforations: Yes ☐ No ☐
Type of perforator used
SIZE of perforations in. by in.
perforations from ft. to ft.
perforations from ft. to ft.
perforations from ft. to ft.

Screens: Yes ☐ No ☐
Manufacturer's Name
Type Model No.
Diam. Slot size from ft. to ft.
Diam. Slot size from ft. to ft.

Gravel packed: Yes ☐ No ☐ Size of gravel
Gravel placed from ft. to ft.

Surface seal: Yes ☐ No ☐ To what depth? ft.
Material used in seal
Did any strata contain unusable water? Yes ☐ No ☐
Type of water? Depth of strata
Method of sealing strata off

(7) PUMP: Manufacturer's Name
Type: H.P.

(8) WATER LEVELS: Land-surface elevation above mean sea level ft.
Static level ft. below top of well Date
Artesian pressure lbs. per square inch Date
Artesian water is controlled by (Cap, valve, etc.)

(9) WELL TESTS: Drawdown is amount water level is lowered below static level
Was a pump test made? Yes ☐ No ☐ If yes, by whom?
Yield: gal./min. with ft. drawdown after hrs.

Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level

Date of test
Bailer test gal./min. with ft. drawdown after hrs.
Artesian flow g.p.m. Date
Temperature of water Was a chemical analysis made? Yes ☐ No ☐

(10) WELL LOG: Page 2 of 2

Formation: Describe by color, character, size of material and structure, and show thickness of aquifers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of formation.

MATERIAL	FROM	TO
Brn Y.		
Brn Yellow clay/w crs Sand	92.5	105
Blue Brn. Clay	105	118
Blue Clay	118	130
Blue Clay & weathered Bas	130	136
Blue clay & Multi Colored Sand layers	136	160
Blue Clay	160	165
Blue clay & gravel Conglom.	165	176
Dark Blue Clay (Hard)	176	183
Black clay	183	185
Blue clay w/green Congl	185	190
Dark BRN Clay	190	200

Work started 19 Completed 19

WELL DRILLER'S STATEMENT:

This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

NAME (Person, firm, or corporation) (Type or print)

Address

[Signed] (Well Driller)

License No. Date , 19

8/18/80

(USE ADDITIONAL SHEETS IF NECESSARY)

File Original and First Copy with Department of Ecology
Second Copy — Owner's Copy
Third Copy — Driller's Copy

WATER WELL REPORT

38

STATE OF WASHINGTON

Application No.

Permit No.

(1) OWNER: Name Iowa Beef Processors, Inc Address Wallula, Wa

(2) LOCATION OF WELL: County Walla Walla NW SW ¼ Sec 26 T. 8 N., R. 31 W.M.

Bearing and distance from section or subdivision corner 2600'S, of W ¼ Cor

(3) PROPOSED USE: Observation Well Domestic ☐ Industrial ☐ Municipal ☐ Irrigation ☐ Test Well ☐ Other ☐

(4) TYPE OF WORK: Owner's number of well (if more than one) 3
New well ☐ Method: Dug ☐ Bored ☐
Deepened ☐ Cable ☐ Driven ☐
Reconditioned ☐ Rotary ☐ Jetted ☐

(5) DIMENSIONS: Diameter of well ...... inches.
Drilled ...... ft. Depth of completed well ...... ft.

(6) CONSTRUCTION DETAILS:
Casing installed: ......" Diam. from ...... ft. to ...... ft.
Threaded ☐ ......" Diam. from ...... ft. to ...... ft.
Welded ☐ ......" Diam. from ...... ft. to ...... ft.

Perforations: Yes ☐ No ☐
Type of perforator used ......
SIZE of perforations ...... in. by ...... in.
...... perforations from ...... ft. to ...... ft.
...... perforations from ...... ft. to ...... ft.
...... perforations from ...... ft. to ...... ft.

Screens: Yes ☐ No ☐
Manufacturer's Name ......
Type ...... Model No. ......
Diam. ...... Slot size ...... from ...... ft. to ...... ft.
Diam. ...... Slot size ...... from ...... ft. to ...... ft.

Gravel packed: Yes ☐ No ☐ Size of gravel: ......
Gravel placed from ...... ft. to ...... ft.

Surface seal: Yes ☐ No ☐ To what depth? ...... ft.
Material used in seal ......
Did any strata contain unusable water? Yes ☐ No ☐
Type of water? ...... Depth of strata ......
Method of sealing strata off ......

(7) PUMP: Manufacturer's Name ......
Type: ...... H.P. ......

(8) WATER LEVELS: Land-surface elevation above mean sea level 460 ft.
Static level 75 ft. below top of well Date ......
Artesian pressure ...... lbs. per square inch Date ......
Artesian water is controlled by ...... (Cap, valve, etc.)

(9) WELL TESTS: Drawdown is amount water level is lowered below static level
Was a pump test made? Yes ☐ No ☐ If yes, by whom? ......
Yield: ...... gal./min. with ...... ft. drawdown after ...... hrs.
" " " "
" " " "

Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level

Date of test ......
Bailer test ...... gal./min. with ...... ft. drawdown after ...... hrs.
Artesian flow ...... g.p.m. Date ......
Temperature of water ...... Was a chemical analysis made? Yes ☐ No ☐

(10) WELL LOG:

Formation: Describe by color, character, size of material and structure, and show thickness of aquifers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of formation.

MATERIAL	FROM	TO
Sandy silt, brown	0	20
Consolidated sand	20	30
Medium Gravel		
Some Caliche		
Brown Silty sand		
Sand-silty brown	30	38
Sandstone	38	41
Silty sand	41	44
Decomposed rock	44	54
Blue Clay		
Sand		
Ringold Conglomerate	54	66
Brown Silty Sand	66	69
Ringold Conglomerate	69	75
Sand - gravel	75	82
Ringold Conglomerate	82	83
Sand - gravel	83	86
Ringold Conglomerate	86	92.5
Green yellow clay w Coarse sand	92.5	105
Blue green clay	105	118
Blue clay	118	130
Blue Clay + weathered basalt	130	136
Blue Clay + multicolor sand layers	136	160
Blue Clay	160	165
Blue Clay + Conglomerat	165	176
Dark hard blue Clay	176	183
Black clay	183	185
Blue clay green Conglomerate	185	190
Dark Brown Clay	190	200

Copied from sections submitted by Iowa Beef Processors, Inc

Work started 7/25/80 19... Completed ...... 19......

WELL DRILLER'S STATEMENT:

This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

NAME ...... (Person, firm, or corporation) (Type or print)

Address ......

[Signed] ...... (Well Driller)

License No. ...... Date ......, 19......

ECY 050-1-20 7/25/80

(USE ADDITIONAL SHEETS IF NECESSARY)

38

File Original and First Copy with Department of Ecology
Second Copy — Owner's Copy
Third Copy — Driller's Copy

WATER WELL REPORT

STATE OF WASHINGTON

Application No.

Permit No.

(1) OWNER: Name Iowa Beef Address Well #3

(2) LOCATION OF WELL: County ¼ ¼ Sec. T. N., R. W.M.

Bearing and distance from section or subdivision corner

(3) PROPOSED USE: Domestic ☐ Industrial ☐ Municipal ☐ Irrigation ☐ Test Well ☐ Other ☐

(4) TYPE OF WORK: Owner's number of well (if more than one)
New well ☐ Method: Dug ☐ Bored ☐
Deepened ☐ Cable ☐ Driven ☐
Reconditioned ☐ Rotary ☐ Jetted ☐

(5) DIMENSIONS: Diameter of well inches.
Drilled ft. Depth of completed well ft.

(6) CONSTRUCTION DETAILS:

Casing installed: " Diam. from ft. to ft.
Threaded ☐ " Diam. from ft. to ft.
Welded ☐ " Diam. from ft. to ft.

Perforations: Yes ☐ No ☐
Type of perforator used
SIZE of perforations in. by in.
perforations from ft. to ft.
perforations from ft. to ft.
perforations from ft. to ft.

Screens: Yes ☐ No ☐
Manufacturer's Name
Type Model No.
Diam. Slot size from ft. to ft.
Diam. Slot size from ft. to ft.

Gravel packed: Yes ☐ No ☐ Size of gravel:
Gravel placed from ft. to ft.

Surface seal: Yes ☐ No ☐ To what depth? ft.
Material used in seal
Did any strata contain unusable water? Yes ☐ No ☐
Type of water? Depth of strata
Method of sealing strata off

(7) PUMP: Manufacturer's Name
Type: H.P.

(8) WATER LEVELS: Land-surface elevation above mean sea level ft.
Static level ft. below top of well Date
Artesian pressure lbs. per square inch Date
Artesian water is controlled by (Cap, valve, etc.)

(9) WELL TESTS: Drawdown is amount water level is lowered below static level
Was a pump test made? Yes ☐ No ☐ If yes, by whom?
Yield: gal./min. with ft. drawdown after hrs.
" " " "
" " " "

Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level

Date of test
Bailer test gal./min. with ft. drawdown after hrs.
Artesian flow g.p.m. Date
Temperature of water Was a chemical analysis made? Yes ☐ No ☐

(10) WELL LOG: Page 2 of 2

Formation: *Describe by color, character, size of material and structure, and show thickness of aquifers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of formation.*

MATERIAL	FROM	TO
Grn Y.		
Grn Yellow clay/w crs. Sand	92.5	105
Blue Brn. Clay	105	118
Blue Clay	118	130
Blue Clay & Weathered Bas	130	136
Blue clay + Multi Colored		
Sand layers	136	160
Blue Clay	160	165
Blue clay & gravel Conglom.	165	176
Dark Blue Clay (Hard)	176	183
Black clay	183	185
Blue clay w/green Congl	185	190
Dark Brn Clay	190	200

Work started , 19 . Completed , 19

WELL DRILLER'S STATEMENT:

This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

NAME (Person, firm, or corporation) (Type or print)

Address

[Signed] (Well Driller)

License No. Date , 19

8/18/80

(USE ADDITIONAL SHEETS IF NECESSARY)

ECY 050-1-20

39

File Original and First Copy with Department of Ecology
Second Copy — Owner's Copy
Third Copy — Driller's Copy

WATER WELL REPORT

STATE OF WASHINGTON

Application No. ....

Permit No. ....

(1) OWNER: Name [illegible] Address [illegible]

(2) LOCATION OF WELL: County [illegible] — [illegible] ¼ [illegible] ¼ Sec 26 T. 8 N., R. 31 W.M.

Bearing and distance from section or subdivision corner Well #2

(3) PROPOSED USE: Domestic ☐ Industrial ☐ Municipal ☐ Irrigation ☐ Test Well ☒ Other ☐

(4) TYPE OF WORK: Owner's number of well (if more than one) 2

New well ☒ Method: Dug ☐ Bored ☐
Deepened ☐ Cable ☒ Driven ☐
Reconditioned ☐ Rotary ☐ Jetted ☐

(5) DIMENSIONS: Diameter of well 6 inches.
Drilled 186 ft. Depth of completed well 186 ft.

(6) CONSTRUCTION DETAILS:

Casing installed: 6 " Diam. from +2 ft. to 186 ft.
Threaded ☐ ......" Diam. from ...... ft. to ...... ft.
Welded ☒ ......" Diam. from ...... ft. to ...... ft.

Perforations: Yes ☒ No ☐
Type of perforator used mill knife
SIZE of perforations ...... in. by ...... in.
6 per ft perforations from 110 ft. to 154 ft.
...... perforations from ...... ft. to ...... ft.
...... perforations from ...... ft. to ...... ft.

Screens: Yes ☐ No ☒
Manufacturer's Name ......
Type ...... Model No. ......
Diam. ...... Slot size ...... from ...... ft. to ...... ft.
Diam. ...... Slot size ...... from ...... ft. to ...... ft.

Gravel packed: Yes ☐ No ☒ Size of gravel: ......
Gravel placed from ...... ft. to ...... ft.

Surface seal: Yes ☒ No ☐ To what depth? 30 ft.
Material used in seal Bentonite -
Did any strata contain unusable water? Yes ☐ No ☒
Type of water? ...... Depth of strata ......
Method of sealing strata off ......

(7) PUMP: Manufacturer's Name ......
Type: ...... H.P. ......

(8) WATER LEVELS: Land-surface elevation above mean sea level ...... ft.
Static level 118 ft. below top of well Date ......
Artesian pressure ...... lbs. per square inch Date ......
Artesian water is controlled by ...... (Cap, valve, etc.)

(9) WELL TESTS: Drawdown is amount water level is lowered below static level
Was a pump test made? Yes ☐ No ☐ If yes, by whom? ......
Yield: ...... gal./min. with ...... ft. drawdown after ...... hrs.
" " " "
" " " "

Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level

Date of test ......
Bailer test ...... gal./min. with ...... ft. drawdown after ...... hrs.
Artesian flow ...... g.p.m. Date ......
Temperature of water ...... Was a chemical analysis made? Yes ☐ No ☐

(10) WELL LOG:

Formation: *Describe by color, character, size of material and structure, and show thickness of aquifers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of formation.*

MATERIAL	FROM	TO
Brown silty sand	0	15
clean black sand	16	23
Brown silty sand	23	30
Brown sandy silt	30	38
Brown silty sand	38	55
Hard Caliche	55	64
Brown silty sand	64	81
Brown silty sand 10% small gravel	81	95
Brown silty sand 50% small gravel	95	101
silt-sand gravel cobble conglomerate	101	119
sand + gravel (water)	119	121
silt sand gravel cobbles conglomerate	121	145
Brown sand 10% small gravel	145	154
Brown sandy silt with small gravel	154	168
Brown silty sand	168	176
Blue clay	176	186

D[illegible] AUG 13 1980 DEPART[illegible] CENT[illegible]

Work started ...... 19...... Completed 7/25 1980

WELL DRILLER'S STATEMENT:

This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

NAME Hatch Drilling Co. Inc.
(Person, firm, or corporation) (Type or print)

Address 647 W. Court

[Signed] Dale Bigham
(Well Driller)

License No. 0036 Date 8/12, 1980

8/15/80

(USE ADDITIONAL SHEETS IF NECESSARY)

ECY 050-1-20

File Original and First Copy with Department of Ecology
Second Copy — Owner's Copy
Third Copy — Driller's Copy

WATER WELL REPORT

39

STATE OF WASHINGTON

Application No.

Permit No.

(1) OWNER: Name Iowa Beef Processors Inc Address Wallula, Wa

(2) LOCATION OF WELL: County Walla Walla SW ¼ SW ¼ Sec 26 T. 8 N., R. 31 W.M.
Bearing and distance from section or subdivision corner 600' N. of SW Corn.

(3) PROPOSED USE: Domestic ☐ Industrial ☐ Municipal ☐ Irrigation ☐ Test Well ☐ Other ☐ observation

(4) TYPE OF WORK: Owner's number of well (if more than one) 2
New well ☐ Method: Dug ☐ Bored ☐
Deepened ☐ Cable ☐ Driven ☐
Reconditioned ☐ Rotary ☐ Jetted ☐

(5) DIMENSIONS: Diameter of well ...... inches.
Drilled ...... ft. Depth of completed well ...... ft.

(6) CONSTRUCTION DETAILS:
Casing installed: ......" Diam. from ...... ft. to ...... ft.
Threaded ☐ ......" Diam. from ...... ft. to ...... ft.
Welded ☐ ......" Diam. from ...... ft. to ...... ft.

Perforations: Yes ☐ No ☐
Type of perforator used ......
SIZE of perforations ...... in. by ...... in.
...... perforations from ...... ft. to ...... ft.
...... perforations from ...... ft. to ...... ft.
...... perforations from ...... ft. to ...... ft.

Screens: Yes ☐ No ☐
Manufacturer's Name ......
Type ...... Model No. ......
Diam. ...... Slot size ...... from ...... ft. to ...... ft.
Diam. ...... Slot size ...... from ...... ft. to ...... ft.

Gravel packed: Yes ☐ No ☐ Size of gravel: ......
Gravel placed from ...... ft. to ...... ft.

Surface seal: Yes ☐ No ☐ To what depth? ...... ft.
Material used in seal ......
Did any strata contain unusable water? Yes ☐ No ☐
Type of water? ...... Depth of strata ......
Method of sealing strata off ......

(7) PUMP: Manufacturer's Name ......
Type: ...... H.P. ......

(8) WATER LEVELS: Land-surface elevation above mean sea level.... 490 ft.
Static level 119 ft. below top of well Date ......
Artesian pressure ...... lbs. per square inch Date ......
Artesian water is controlled by ...... (Cap, valve, etc.)

(9) WELL TESTS: Drawdown is amount water level is lowered below static level
Was a pump test made? Yes ☐ No ☐ If yes, by whom? ......
Yield: ...... gal./min. with ...... ft. drawdown after ...... hrs.
" " " "
" " " "

Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level

Date of test ......
Bailer test ...... gal./min. with ...... ft. drawdown after ...... hrs.
Artesian flow ...... g.p.m. Date ......
Temperature of water ...... Was a chemical analysis made? Yes ☐ No ☐

(10) WELL LOG:
Formation: Describe by color, character, size of material and structure, and show thickness of aquifers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of formation.

MATERIAL	FROM	TO
Silty sand, brown	0	15
Sand, black clean	15	28
Silty sand, brown	28	30
Sandy silt, brown	30	38
Silty sand, brown	38	55
Caliche, hard	55	64
Silty sand, brown	64	81
Silty sand, brown w 10% small gravel	81	95
Silty sand, brown w 50% small gravel	95	101
Conglomerate, Consoli-dated Ringold, dry	101	119
Sand + Gravel, soft	119	121
Silt, sand, gravel, sm. boulders - reworked Ringold	121	140
Conglomerate, Cemented Ringold	140	145
Sand, sm. gravel med. brown	145	154
Sandy silt, sm. gravel brown	154	168
Silty sand, brown	168	176
Clay, blue	176	186

Copied from sections submitted by Iowa Beef Processors, Inc.
7/25/80

Work started ......, 19...... Completed ......, 19......

WELL DRILLER'S STATEMENT:

This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

NAME ...... (Person, firm, or corporation) (Type or print)

Address ......

[Signed] ...... (Well Driller)

License No. ...... Date ......, 19......

7/25/80 (USE ADDITIONAL SHEETS IF NECESSARY)

40

The Department of Ecology does NOT Warranty the Data and/or the Information on this Well Report.

File Original and First Copy with Department of Ecology
Second Copy — Owner's Copy
Third Copy — Driller's Copy

WATER WELL REPORT
STATE OF WASHINGTON

Application No. ......
Permit No. ......

(1) OWNER: Name IOWA Beef Address Wallula WA

(2) LOCATION OF WELL: County Walla Walla — NW ¼ NW ¼ Sec 26 T. 8 N., R. 31 W.M.

Bearing and distance from section or subdivision corner ...... Well #1

(3) PROPOSED USE: Domestic ☐ Industrial ☐ Municipal ☐ Irrigation ☐ Test Well ☒ Other ☐

(4) TYPE OF WORK: Owner's number of well (if more than one) 1
New well ☒ Method: Dug ☐ Bored ☐
Deepened ☐ Cable ☒ Driven ☐
Reconditioned ☐ Rotary ☐ Jetted ☐

(5) DIMENSIONS: Diameter of well 6 inches.
Drilled 244 ft. Depth of completed well 244 ft.

(6) CONSTRUCTION DETAILS:

Casing installed: 6" Diam. from 0 ft. to 185½ ft.
Threaded ☐ 5" Diam. from 182 ft. to 244 ft.
Welded ☒ ......" Diam. from ...... ft. to ...... ft.

Perforations: Yes ☒ No ☐
Type of perforator used Mills Knife
SIZE of perforations ...... in. by ...... in.
6 per ft perforations from 130 ft. to 150 ft.
...... perforations from ...... ft. to ...... ft.
...... perforations from ...... ft. to ...... ft.

Screens: Yes ☐ No ☒
Manufacturer's Name ......
Type ...... Model No. ......
Diam. ...... Slot size ...... from ...... ft. to ...... ft.
Diam. ...... Slot size ...... from ...... ft. to ...... ft.

Gravel packed: Yes ☐ No ☒ Size of gravel: ......
Gravel placed from ...... ft. to ...... ft.

Surface seal: Yes ☒ No ☐ To what depth? 30 ft.
Material used in seal Bentonite (cement top 2 ft)
Did any strata contain unusable water? Yes ☐ No ☒
Type of water? ...... Depth of strata ......
Method of sealing strata off ......

(7) PUMP: Manufacturer's Name ......
Type: ...... H.P. ......

(8) WATER LEVELS: Land-surface elevation above mean sea level 487 ft.
Static level 135 ft. below top of well Date 7-25-80
Artesian pressure ...... lbs. per square inch Date ......
Artesian water is controlled by ...... (Cap, valve, etc.)

(9) WELL TESTS: Drawdown is amount water level is lowered below static level
Was a pump test made? Yes ☐ No ☒ If yes, by whom? ......
Yield: ...... gal./min. with ...... ft. drawdown after ...... hrs.
" " " "
" " " "

Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level

Date of test ......
Bailer test ...... gal./min. with ...... ft. drawdown after ...... hrs.
Artesian flow ...... g.p.m. Date ......
Temperature of water ...... Was a chemical analysis made? Yes ☐ No ☒

(10) WELL LOG:

Formation: Describe by color, character, size of material and structure, and show thickness of aquifers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of formation.

MATERIAL	FROM	TO
Silty Brown Sand	0	64
Silty Brown Sand with thin layers of caliche	64	67
silt, gravels ½ minus	67	70
silt, thin layers of Caliche	70	75
silt	75	85
silty sand (brown)	85	92
silt, sand, thin layers of caliche	92	95
silty Brown sand	95	118
Sand (Brown) gravel and cobbels 5 inch minus	118	123
gravel, cobbels 5 inch minus	123	135
Ringold gravel	135	180
black sand	180	185
basalt boulders	185	195
basalt sand & gravel	195	234
basalt	234	244

RECEIVED AUG 13 1980 DEPARTMENT OF ECOLOGY CENTRAL ...

Work started ...... 19...... Completed 7-25 1980

WELL DRILLER'S STATEMENT:

This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

NAME Hatch Drilling Co. (Person, firm, or corporation) (Type or print)

Address 6417 W. Court Pasco, WA.

[Signed] M. L. Bulton (Well Driller)

License No. 065 Date 8-11 1980

8/15/80

(USE ADDITIONAL SHEETS IF NECESSARY)

ECY 050-1-20

File Original and First Copy with Department of Ecology
Second Copy — Owner's Copy
Third Copy — Driller's Copy

40

WATER WELL REPORT

STATE OF WASHINGTON

Application No. ....
Permit No. ....

(1) OWNER: Name Iowa Beef Processors, Inc. Address Wallula, Wa

(2) LOCATION OF WELL: County Walla Walla NW ¼ SE ¼ Sec 26 T 8 N., R 31 W.M.

Bearing and distance from section or subdivision corner

(3) PROPOSED USE: Domestic ☐ Industrial ☐ Municipal ☐ Irrigation ☐ Test Well ☐ Other ☒ observation

(4) TYPE OF WORK: Owner's number of well (if more than one) 1

New well ☐ Deepened ☐ Reconditioned ☐
Method: Dug ☐ Cable ☐ Rotary ☐ Bored ☐ Driven ☐ Jetted ☐

(5) DIMENSIONS: Diameter of well .... inches.
Drilled .... ft. Depth of completed well .... ft.

(6) CONSTRUCTION DETAILS:

Casing installed: ......" Diam. from ...... ft. to ...... ft.
Threaded ☐ ......" Diam. from ...... ft. to ...... ft.
Welded ☐ ......" Diam. from ...... ft. to ...... ft.

Perforations: Yes ☐ No ☐
Type of perforator used ....
SIZE of perforations ...... in. by ...... in.
...... perforations from ...... ft. to ...... ft.
...... perforations from ...... ft. to ...... ft.
...... perforations from ...... ft. to ...... ft.

Screens: Yes ☐ No ☐
Manufacturer's Name ....
Type .... Model No. ....
Diam. ...... Slot size ...... from ...... ft. to ...... ft.
Diam. ...... Slot size ...... from ...... ft. to ...... ft.

Gravel packed: Yes ☐ No ☐ Size of gravel: ....
Gravel placed from ...... ft. to ...... ft.

Surface seal: Yes ☐ No ☐ To what depth? ...... ft.
Material used in seal ....
Did any strata contain unusable water? Yes ☐ No ☐
Type of water? .... Depth of strata ....
Method of sealing strata off ....

(7) PUMP: Manufacturer's Name ....
Type: .... H.P. ......

(8) WATER LEVELS: Land-surface elevation above mean sea level.... 500 ft.
Static level 140 ft. below top of well Date ....
Artesian pressure ...... lbs. per square inch Date ....
Artesian water is controlled by .... (Cap, valve, etc.)

(9) WELL TESTS: Drawdown is amount water level is lowered below static level
Was a pump test made? Yes ☐ No ☐ If yes, by whom? ....
Yield: ...... gal./min. with ...... ft. drawdown after ...... hrs.
" " " "
" " " "

Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level

Date of test ....
Bailer test ...... gal./min. with ...... ft. drawdown after ...... hrs.
Artesian flow ...... g.p.m. Date ....
Temperature of water ...... Was a chemical analysis made? Yes ☐ No ☐

(10) WELL LOG:

Formation: Describe by color, character, size of material and structure, and show thickness of aquifers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of formation.

MATERIAL	FROM	TO
Sand, brown silty	0	50
Silt, brown fine	50	60
Silty sand - Sm Gravel	60	64
" " - " Caliche	64	67
Gravel	67	68
Sand & silt, brown	68	85
Sand-Silt light brown	85	92
Silty sand, slightly moist, lenses caliche	92	109
Silty sand, brown	109	118
Sand & sm. Gravel	118	120½
Sand & gravel, dense	120.5	130
Sandy gravel, fine brown sm. cobbles & boulders	130	144
Dense hard Ringold Gravels	144	170

Copied from sections submitted by Iowa Beef Processors Inc.
7/25/80

Work started ...., 19...... Completed ...., 19......

WELL DRILLER'S STATEMENT:

This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

NAME .... (Person, firm, or corporation) (Type or print)

Address ....

[Signed] .... (Well Driller)

License No. .... Date ...., 19......

7/25/80

(USE ADDITIONAL SHEETS IF NECESSARY)

ECY 050-1-20

File Original and First Copy with Department of Ecology
Second Copy — Owner's Copy
Third Copy — Driller's Copy

WATER WELL REPORT

41

STATE OF WASHINGTON

Application No.

Permit No.

(1) OWNER: Name Iowa Beef Address P.O. Box 515, Dakota City, NE 68731

(2) LOCATION OF WELL: County WALLA WALLA NW ¼ NW ¼ Sec. 26 T. 8 N., R. 3E W.M.

Bearing and distance from section or subdivision corner 31

(3) PROPOSED USE: Domestic ☐ Industrial ☐ Municipal ☐ Irrigation ☐ Test Well ☐ Other ☒

(4) TYPE OF WORK: Owner's number of well (if more than one) 4
New well ☒ Method: Dug ☐ Bored ☐
Deepened ☐ Cable ☐ Driven ☐
Reconditioned ☐ Rotary ☒ Jetted ☐

(5) DIMENSIONS: Diameter of well 6 inches.
Drilled 160 ft. Depth of completed well 159 ft.

(6) CONSTRUCTION DETAILS:

Casing installed: 6 " Diam. from +2 ft. to 160 ft.
Threaded ☐ " Diam. from ft. to ft.
Welded ☒ " Diam. from ft. to ft.

Perforations: Yes ☒ No ☐
Type of perforator used air
SIZE of perforations 1/4 in. by 2 in.
62 perforations from 120 ft. to 140 ft.
perforations from ft. to ft.
perforations from ft. to ft.

Screens: Yes ☐ No ☒
Manufacturer's Name
Type Model No.
Diam. Slot size from ft. to ft.
Diam. Slot size from ft. to ft.

Gravel packed: Yes ☐ No ☒ Size of gravel:
Gravel placed from ft. to ft.

Surface seal: Yes ☒ No ☐ To what depth? 52 ft.
Material used in seal bentonite
Did any strata contain unusable water? Yes ☐ No ☒
Type of water? Depth of strata
Method of sealing strata off

(7) PUMP: Manufacturer's Name
Type: H.P.

(8) WATER LEVELS: Land-surface elevation above mean sea level ft.
Static level 90 ft. below top of well Date 10/21/86
Artesian pressure lbs. per square inch Date
Artesian water is controlled by (Cap, valve, etc.)

(9) WELL TESTS: Drawdown is amount water level is lowered below static level
Was a pump test made? Yes ☐ No ☒ If yes, by whom?
Yield: 7-10 gal./min. with ft. drawdown after hrs.
ESTIMATED AIRLIFT "
" " "

Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level

Date of test
Bailer test gal./min. with ft. drawdown after hrs.
Artesian flow g.p.m. Date
Temperature of water Was a chemical analysis made? Yes ☐ No ☐

(10) WELL LOG:

Formation: *Describe by color, character, size of material and structure, and show thickness of aquifers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of formation.*

MATERIAL	FROM	TO
Sand w/clay mixed	0	45
Sand w/gravel seams	45	65
Sand & Gravel	65	100
Sand & Gravel, coarse w/trace of water	100	110
Sand & clay, gray	110	120
Sand & gravel w/cobble w/water	120	127
Ringold formation w/water	127	140
Ringold formation	140	155
Clay, blue	155	160
1' of cement placed in bottom of well		
THIS IS A MONITORING WELL Not intended for use as a water well		

RECEIVED
NOV 24 1986

Work started 10/20, 19 86 Completed 10/21, 19 86

WELL DRILLER'S STATEMENT:

This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

NAME PONDEROSA DRILLING & DEVELOPMENT INC.
(Person, firm, or corporation) (Type or print)

Address E. 6010 Broadway, Spokane, WA 99212

[Signed] W. Joseph Close Jr. (Well Driller)

License No. 1040 Date 10/21, 19 86

11/24/86

(USE ADDITIONAL SHEETS IF NECESSARY)

ECY 050-1-20

42

Please print, sign and return by mail to Department of Ecology

RESOURCE PROTECTION WELL REPORT

CURRENT Notice of Intent No. R 71629

(SUBMIT ONE WELL REPORT PER WELL INSTALLED) 275187

Construction/Decommission *(select one)*

☒ Construction

☐ Decommission *ORIGINAL INSTALLATION Notice of Intent Number* ______

Consulting Firm URS Corporation

Unique Ecology Well ID Tag No. APL085 NP-1

WELL CONSTRUCTION CERTIFICATION: I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards. Materials used and the information reported above are true to my best knowledge and belief.

☒ Driller ☐ Engineer ☐ Trainee Name (Print) Ronald Sink

Driller/Engineer/Trainee Signature [signature]

Driller or Trainee License No. 2661

If trainee, licensed driller's Signature and License No. ______

Type of Well *(select one)*

☒ Resource Protection

☐ Geotech Soil Boring

Property Owner Tyson Foods

Site Address Between 13983 & 14813 Dodd Rd

City Wallula County Walla Walla

Location NW 1/4-1/4 NE 1/4 Sec 26 Twn 8 R 31 Select One ☒ EWM ☐ WWM

Lat/Long (s, t, r still REQUIRED) Lat Deg ____ Lat Min/Sec ____ Long Deg ____ Long Min/Sec ____

Tax Parcel No. 000000002341

Cased or Uncased Diameter 6" Static Level 77'

Work/Decommission Start Date 9/12/07

Work/Decommission Completed Date 9/12/07

Construction/Design	Well Data	Formation Description
	Drill Method: Air Rotary Screen: 2" sch 40 PVC .010 75' to 95' Casing: 2" sch 40 PVC +2.5' to 75' Sand: 10/20 72' to 95' Seal: Bentonite Chips 2' to 72'	Sand (0–18) Gravely Sand (18–32) Sandy Gravel (32–44) Silt w/some sand (44–92) Silty Sandy Gravel (92–95)

RECEIVED
OCT 22 2007
DEPARTMENT OF ECOLOGY
EASTERN REGIONAL OFFICE

43

The Department of Ecology does NOT Warranty the Data and/or the Information on this Well Report.

File Original with Department of Ecology
Second Copy - Owner's Copy
Third Copy - Driller's Copy

108598

WATER WELL REPORT

STATE OF WASHINGTON

Notice of Intent W122262
UNIQUE WELL I.D. # AEM 795
Water Right Permit No. ____

(1) OWNER: Name Judeh Farms Address 6010 Sheffield Rd, Basin City WA.

(2) LOCATION OF WELL: County Benton '00 NOV -1 P1 :10 1/4 Sec 27 T 8N N.R. 31 WM

(2a) STREET ADDRESS OF WELL: (or nearest address) Farm Unit 30, Block 3, Tract 12 160

TAX PARCEL NO.: ____

DEPT. OF ECOLOGY

(3) PROPOSED USE: ☒ Domestic ☐ Industrial ☐ Municipal ☐ Irrigation ☐ Test Well ☐ Other ☐ DeWater

(4) TYPE OF WORK: Owner's number of well (if more than one) ____
☒ New Well ☐ Deepened ☐ Reconditioned ☐ Decommission
Method: ☐ Dug ☐ Bored ☐ Cable ☐ Driven ☒ Rotary ☐ Jetted

(5) DIMENSIONS: Diameter of well 6 inches
Drilled 145 feet. Depth of completed well 145 ft.

(6) CONSTRUCTION DETAILS
Casing Installed:
☒ Welded 6" Diam. from +2 ft. to 45 ft.
☒ Liner installed 4" Diam. from ____ ft. to 145 ft.
☐ Threaded ____" Diam. from ____ ft. to ____ ft.

Perforations: ☒ Yes ☐ No
Type of perforator used SKil SAW
SIZE of perforations 1/4 in. by 6 in.
____ perforations from 100 ft. to 145 ft.

Screens: ☐ Yes ☒ No ☐ K-Pac Location ____
Manufacturer's Name ____
Type ____ Model No. ____
Diam. ____ Slot Size ____ from ____ ft. to ____ ft.
Diam. ____ Slot Size ____ from ____ ft. to ____ ft.

Gravel/Filter packed: ☐ Yes ☒ No ☐ Size of gravel/sand ____
Material placed from ____ ft. to ____ ft.

Surface seal: ☒ Yes ☐ No To what depth? 20 ft.
Material used in seal Bentonite
Did any strata contain unusable water? ☐ Yes ☐ No
Type of water? ____ Depth of strata ____
Method of sealing strata off ____

(7) PUMP: Manufacturer's Name ____
Type: ____ H.P. ____

(8) WATER LEVELS: Land-surface elevation above mean sea level ____ ft.
Static level 58' ft. below top of well Date ____
Artesian pressure ____ lbs. per square inch Date ____
Artesian water is controlled by ____ (Cap, valve, etc.)

(9) WELL TESTS: Drawdown is amount water level is lowered below static level
Was a pump test made? ☐ Yes ☒ No If yes, by whom? ____
Yield: ____ gal./min. with ____ ft. drawdown after ____ hrs.
Yield: ____ gal./min. with ____ ft. drawdown after ____ hrs.
Yield: ____ gal./min. with ____ ft. drawdown after ____ hrs.
Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level

Date of test ____
Bailer test ____ gal./min. with ____ ft. drawdown after ____ hrs.
Airtest est. 15 gal./min. with ---- ft. drawdown after ---- hrs.
Artesian flow ____ g.p.m. Date ____
Temperature of water 58 Was a chemical analysis made? ☐ Yes ☒ No

(10) WELL LOG or DECOMMISSIONING PROCEDURE DESCRIPTION
Formation: Describe by color, character, size of material and structure, and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of information. Indicate all water encountered.

MATERIAL	FROM	TO
~~Top Soil~~	~~0~~	~~2~~
Sand	0	3
Clay Brown	3	25
Sand & Gravel	25	45
Hard Black Basalt	45	115
White Ash	115	125
Blue Clay	125	130
SAnd Stone (Water)	131	145

RECEIVED
NOV 03 2000
DEPARTMENT OF ECOLOGY
WELL DRILLING UNIT

DEPT. OF ECOLOGY
Received
NOV 08 2000
CENTRAL REGION OFFICE

DEPARTMENT OF ECOLOGY
EASTERN REGIONAL OFFICE

Work Started 6-27 00 Completed 7-5 00

WELL CONSTRUCTION CERTIFICATION:

I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards. Materials used and the information reported above are true to my best knowledge and belief.

Type or Print Name Lyle O. Amos License No. 1224 (Licensed Driller/Engineer)
Trainee Name ____ License No. ____
Drilling Company TRiple A Drilling Inc
(Signed) Lyle O. Amos License No. 1224 (Licensed Driller/Engineer)
Address 2202 W. Windy lane
Contractor's Registration No. TRIPLDI025B9 Date 7-5 00

(USE ADDITIONAL SHEETS IF NECESSARY)

Ecology is an Equal Opportunity and Affirmative Action employer. For special accommodation needs, contact the Water Resources Program at (360) 407-6600. The TDD number is (360) 407-6006.

ECY 050-1-20 (11/98)

44

Please print, sign and return by mail to Department of Ecology

RESOURCE PROTECTION WELL REPORT

CURRENT Notice of Intent No. R 71631

(SUBMIT ONE WELL REPORT PER WELL INSTALLED) 275188

Construction/Decommission (select one)
☒ Construction
☐ Decommission ORIGINAL INSTALLATION Notice of Intent Number ________

Type of Well (select one)
☒ Resource Protection
☐ Geotech Soil Boring

Consulting Firm: URS Corporation

Unique Ecology Well ID Tag No.: APC086 NP-3

Property Owner: Simplot

Site Address: Between 13983 & 14813 Dodd Rd.

City: Wallula County: Walla Walla

Location: SW 1/4-1/4 NE 1/4 Sec 27 Twn 8 R 31 Select One ☒ EWM ☐ WWM

Lat/Long (s, t, r still REQUIRED) Lat Deg ________ Lat Min/Sec ________ Long Deg ________ Long Min/Sec ________

Tax Parcel No. 310826410004

Cased or Uncased Diameter 6" Static Level 77'

Work/Decommission Start Date 9/13/07

Work/Decommission Completed Date 9/13/07

WELL CONSTRUCTION CERTIFICATION: I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards. Materials used and the information reported above are true to my best knowledge and belief.

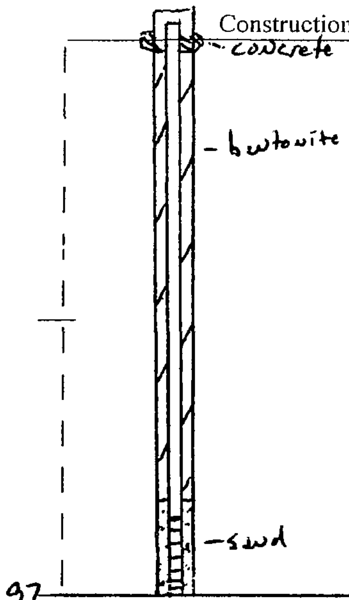
☒ Driller ☐ Engineer ☐ Trainee Name (Print) Ronald Sink

Driller/Engineer/Trainee Signature [signature]

Driller or Trainee License No. 2661

If trainee, licensed driller's Signature and License No. ________

Construction/Design



Well Data

Drill Method: Air Rotary

Screen: 2" sch 40 PVC .010 77' to 97'

Casing: 2" sch 40 PVC +2.5' to 77'

Sand: 10/20 73' to 97'

Seal: Bentonite Chips 2' to 73'

Formation Description

Formation	Depth to (ft)
Sand	4
Gravely Sand	10
Sand	50
Silty Sand	60
Gravely Sand	68
Silty Sand w/some gravel	80
Sand Gravel w/some silt	97

RECEIVED
OCT 22 2007
DEPARTMENT OF ECOLOGY
EASTERN REGIONAL OFFICE

The Department of Ecology does NOT Warranty the Data and/or the Information on this Well Report.

45

File Original and First Copy with Department of Ecology
Second Copy — Owner's Copy
Third Copy — Driller's Copy

WATER WELL REPORT
STATE OF WASHINGTON

RECEIVED APR 19 1984 DEPARTMENT OF ECOLOGY SPOKANE REGIONAL OFFICE

Application No. ....
Permit No. ....

(1) OWNER: Name Whane Buchanan Address

(2) LOCATION OF WELL: County Walla Walla SW 1/4 SW 1/4 Sec. 27 T. 8 N., R. 31 W.M.

Bearing and distance from section or subdivision corner 60 Ft. N. of S. line 300 ft. E. of W. line

(3) PROPOSED USE: Domestic ☒ Industrial ☐ Municipal ☐ Irrigation ☐ Test Well ☐ Other ☐

(4) TYPE OF WORK: Owner's number of well (if more than one) ....
New well ☐ Method: Dug ☐ Bored ☐
Deepened ☒ Cable ☒ Driven ☐
Reconditioned ☐ Rotary ☐ Jetted ☐

(5) DIMENSIONS: Diameter of well 6 inches.
Drilled 50 ft. Depth of completed well 127 ft.

(6) CONSTRUCTION DETAILS:

Casing installed: 6" Diam. from -1 ft. to 79 ft.
Threaded ☐ ....." Diam. from ..... ft. to ..... ft.
Welded ☐ ....." Diam. from ..... ft. to ..... ft.

Perforations: Yes ☐ No ☒
Type of perforator used ....
SIZE of perforations ..... in. by ..... in.
..... perforations from ..... ft. to ..... ft.
..... perforations from ..... ft. to ..... ft.
..... perforations from ..... ft. to ..... ft.

Screens: Yes ☐ No ☒
Manufacturer's Name ....
Type ..... Model No. .....
Diam. ..... Slot size ..... from ..... ft. to ..... ft.
Diam. ..... Slot size ..... from ..... ft. to ..... ft.

Gravel packed: Yes ☐ No ☒ Size of gravel: .....
Gravel placed from ..... ft. to ..... ft.

Surface seal: Yes ☐ No ☒ To what depth? ..... ft.
Material used in seal .....
Did any strata contain unusable water? Yes ☐ No ☐
Type of water? ..... Depth of strata .....
Method of sealing strata off .....

(7) PUMP: Manufacturer's Name Teel
Type: Submersible H.P. 1/2

(8) WATER LEVELS: Land-surface elevation above mean sea level.... 380 ft.
Static level 42 ft. below top of well Date 2-29-84
Artesian pressure ..... lbs. per square inch Date .....
Artesian water is controlled by ..... (Cap, valve, etc.)

(9) WELL TESTS: Drawdown is amount water level is lowered below static level
Was a pump test made? Yes ☐ No ☒ If yes, by whom? .....
Yield: ..... gal./min. with ..... ft. drawdown after ..... hrs.
" " " "
" " " "

Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level

Date of test .....
Bailer test 30 gal./min. with 15 ft. drawdown after 1 hrs.
Artesian flow ..... g.p.m. Date .....
Temperature of water ..... Was a chemical analysis made? Yes ☐ No ☒

4/23/84

(10) WELL LOG:

Formation: *Describe by color, character, size of material and structure, and show thickness of aquifers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of formation.*

MATERIAL	FROM	TO
black sand	77	79
black basalt	79	102
broken black basalt with clay & pumice	102	127

RECEIVED MAR 13 19..

Work started 2-24, 19 84 Completed 2-29, 19 84

WELL DRILLER'S STATEMENT:

This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

NAME M. L. Bultena B+H Drilling #2
(Person, firm, or corporation) (Type or print)

Address Box 343 Burbank

[Signed] M. L. Bultena
(Well Driller)

License No. 0065 Date 2-29-, 19 84

(USE ADDITIONAL SHEETS IF NECESSARY)

WASHINGTON STATE DEPARTMENT OF TRANSPORTATION DRILLING DATABASE FORM

77652

46

GENERAL INFORMATION

STATE ROUTE	12	CONTROL SECTION	3601	PROJECT NUMBER	XL-0748						
PROJECT NAME	McNary Pool to Attalia Vic.										
COUNTY	Walla Walla	DOE REGION	Eastern	DOT REGION	SC						
DRILLER	Sean Nebbs	LICENSE NUMBER	2517								
DOE NUMBER	S 05666	1/4	NW	1/4	NW	SEC	28	TWNSHP	8N	RANGE	31 E

HOLE INFORMATION

HOLE #	STATION	OFFSET	START	FINISH	DEPTH	WELL TYPE	STATUS
H-6-00			10-3-00	10-4-00	25.5	Geotech	abandon

RECEIVED
OCT 27 2000
DEPARTMENT OF ECOLOGY
EASTERN R...

46

LOG OF TEST BORING

Washington State Department of Transportation

HOLE No H-4-00

PROJECT McNary Pool to Attalia vicinity Job No XL-0748

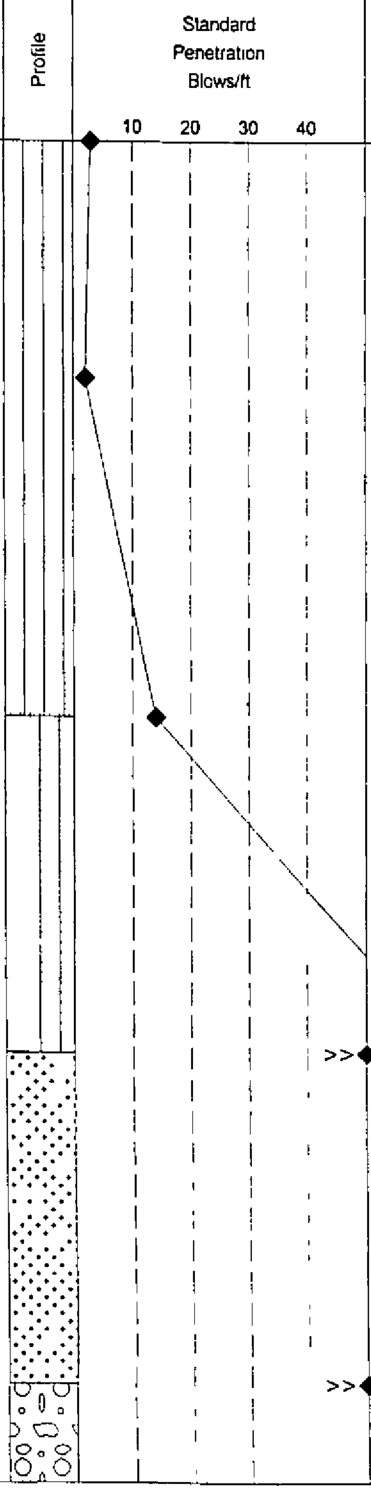
SR-12 @ M P 299 45 S R 12

Station Offset C S 3601

Equipment CME 850 w/ autohammer Casing HQx33 Ground El (m)

Method of Boring Wet Rotary

Start Date September 27, 2000 Completion Date September 28, 2000 Sheet 1 of 2



Depth (ft)	Meters (m)	SPT Blows/6" (N)	Sample Type	Sample No (Tube No)	Lab Tests	Description of Material	Groundwater
0	0	1 1 2 (3)		D-1	GS MC	SM, MC=10% Silty SAND, very loose dark grayish brown, moist, Homogeneous, no HCl reaction with hair roots Length Recovered 1 5 ft	
5	1	0 1 1 (2)		D-2		Silty SAND, very loose dark grayish brown, wet, Homogeneous, no HCl reaction, with hair roots Length Recovered 1 5 ft	
	2					09/28/2000	∇
10	3	3 6 8 (14)		D-3	GS MC	SP-SM, MC=25% Poorly graded SAND with silt, medium dense, dark grayish brown, wet, Homogeneous, no HCl reaction, with FeO stains At approx 7' the soil became more dense demonstrated by drilling Length Recovered 1 2 ft	
15	4	7 33 32 (65)		D 4		Well graded SAND with gravel, very dense, dark gray, moist Stratified, no HCl reaction, the upper 6" was sand with gravel, then changed to gravel with sand The soil changed at approx 13' 3" Length Recovered 1 0 ft	
20	5, 6	115/3' (115/3)		D-5		Well graded GRAVEL with sand, silt, subangular, very dense, dark gray, wet, Homogeneous, no HCl reaction drilling became very hard at approx 15'6"	

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LOG OF TEST BORING

Washington State Department of Transportation

HOLE No H-4-00

Sheet 2 of 2

PROJECT McNary Pool to Attalia vicinity

Job No XL-0748

Depth (ft)	Meters (m)	Profile	Standard Penetration Blows/ft (10 20 30 40)	SPT Blows/6" (N)	Sample Type	Sample No (Tube No)	Lab Tests	Description of Material	Groundwater	Instrument
	7							Length Recovered 0 3 ft		
25	8			RQD 70 FF 2 76		C-6		BASALT, fine grained, fresh, strong rock, no HCl reaction Discontinuities are closely spaced and in good condition Percent Recovered 100 0%		
30	9									
35	10, 11							End of test hole boring at 30 ft below ground elevation This is a summary Log of Test Boring Soil/Rock descriptions are derived from visual field identifications and laboratory test data		
40	12									
45	13									

SOIL XL0748-1 GPJ SOIL GDT 10/24/00 11 25 56 A10

File Original and First Copy with Department of Ecology
Second Copy — Owner's Copy
Third Copy — Driller's Copy

WATER WELL REPORT

47

STATE OF WASHINGTON

Application No. ....
Permit No. G3 25562

(1) OWNER: Name Bob Harvey Address 2027 W. Canal Drive, Kennewidck, Wa.

(2) LOCATION OF WELL: County Walla Walla — NE ¼ NE ¼ Sec. 33 T. 8 N., R. 31 W.M.
Bearing and distance from section or subdivision corner Unit 34, South Columbia Irrigatio- District

(3) PROPOSED USE: Domestic ☐ Industrial ☐ Municipal ☐ Irrigation ☐ Test Well ☒ Other ☐

(4) TYPE OF WORK: Owner's number of well (if more than one) ....
New well ☐ Method: Dug ☐ Bored ☐
Deepened ☐ Cable ☐ Driven ☐
Reconditioned ☒ Rotary ☐ Jetted ☐

(5) DIMENSIONS: Diameter of well 10 inches.
Drilled 165 ft. Depth of completed well 165 ft.

(6) CONSTRUCTION DETAILS:

Casing installed: 10" Diam. from +1 ft. to 19 ft.
Threaded ☐ ......" Diam. from ...... ft. to ...... ft.
Welded ☐ ......" Diam. from ...... ft. to ...... ft.

Perforations: Yes ☐ No ☐
Type of perforator used ......
SIZE of perforations ...... in. by ...... in.
...... perforations from ...... ft. to ...... ft.
...... perforations from ...... ft. to ...... ft.
...... perforations from ...... ft. to ...... ft.

Screens: Yes ☐ No ☐
Manufacturer's Name ......
Type ...... Model No. ......
Diam. ...... Slot size ...... from ...... ft. to ...... ft.
Diam. ...... Slot size ...... from ...... ft. to ...... ft.

Gravel packed: Yes ☐ No ☐ Size of gravel: ......
Gravel placed from ...... ft. to ...... ft.

Surface seal: Yes ☒ No ☐ To what depth? 18 ft.
Material used in seal Bentonite
Did any strata contain unusable water? Yes ☐ No ☐
Type of water? ...... Depth of strata ......
Method of sealing strata off ......

(7) PUMP: Manufacturer's Name ......
Type: ...... H.P. ......

(8) WATER LEVELS: Land-surface elevation above mean sea level.... 2600 ft.
Static level 23 ft. below top of well Date 4/4/78
Artesian pressure ...... lbs. per square inch Date ......
Artesian water is controlled by ...... (Cap, valve, etc.)

(9) WELL TESTS: Drawdown is amount water level is lowered below static level
Was a pump test made? Yes ☐ No ☐ If yes, by whom? ......
Yield: ...... gal./min. with ...... ft. drawdown after ...... hrs.
" " " "
" " " "

Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level

Air 500 gpm
Date of test ......
Bailer test ...... gal./min. with ...... ft. drawdown after ...... hrs.
Artesian flow ...... g.p.m. Date ......
Temperature of water ...... Was a chemical analysis made? Yes ☐ No ☒

(10) WELL LOG:

Formation: *Describe by color, character, size of material and structure, and show thickness of aquifers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of formation.*

MATERIAL	FROM	TO
Sandy Loam	0	4
Sand and silt	4	14
Broken basalt	13	17
Basalt	17	24
Broken Basalt	24	29
Yellow hard -- clay	29	31
Porous basalt	31	55
Basalt	55	65
Porous basalt	65	73
Basalt	73	104
Broken bssalt	104	105
Blue hard clay	105	115
Brown white caliche	115	140
Blue hard clay	140	160
Basalt	160	165

Work started 4/3/78, 19...... Completed 4/3/78, 19......

WELL DRILLER'S STATEMENT:

This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

NAME Enterprise Drilling Co. (Person, firm, or corporation) (Type or print)
Address Box 404, Post Falls, Id.83854

[Signed] Floyd Curtis (Well Driller)

License No. 0086 Date 4/5/78, 19......

3/27/86

(USE ADDITIONAL SHEETS IF NECESSARY)

Copied by Roy Anderson 3/27/80

ECY 050-1-20

The Department of Ecology does NOT Warranty the Data and/or the Information on this Well Report.

File Original and First Copy with Department of Ecology
Second Copy — Owner's Copy
Third Copy — Driller's Copy

WATER WELL REPORT

47

STATE OF WASHINGTON

Application No. ....

Permit No. G3 25561

(1) OWNER: Name Robert G Harvey Address 2027 W. Canal Kennewick

(2) LOCATION OF WELL: County Walla Walla — SE ¼ NE ¼ Sec 33 T. 8 N., R 31E W.M.

Bearing and distance from section or subdivision corner

(3) PROPOSED USE: Domestic ☐ Industrial ☐ Municipal ☐ Irrigation ☒ Test Well ☐ Other ☐

(4) TYPE OF WORK: Owner's number of well (if more than one) ....
New well ☒ Method: Dug ☐ Bored ☐
Deepened ☐ Cable ☐ Driven ☐
Reconditioned ☐ Rotary ☒ Jetted ☐

(5) DIMENSIONS: Diameter of well 6" then 10 inches.
Drilled 180 ft. Depth of completed well 160 ft.

(6) CONSTRUCTION DETAILS:
Casing installed: 6 then to 10" Diam. from 1 ft. to 20 ft.
Threaded ☐ ......" Diam. from ...... ft. to ...... ft.
Welded ☐ ......" Diam. from ...... ft. to ...... ft.

Perforations: Yes ☐ No ☒
Type of perforator used ....
SIZE of perforations ...... in. by ...... in.
...... perforations from ...... ft. to ...... ft.
...... perforations from ...... ft. to ...... ft.
...... perforations from ...... ft. to ...... ft.

Screens: Yes ☐ No ☒
Manufacturer's Name ....
Type .... Model No. ....
Diam. ...... Slot size ...... from ...... ft. to ...... ft.
Diam. ...... Slot size ...... from ...... ft. to ...... ft.

Gravel packed: Yes ☐ No ☒ Size of gravel: ....
Gravel placed from ...... ft. to ...... ft.

Surface seal: Yes ☒ No ☐ To what depth? ...... ft.
Material used in seal B. clay
Did any strata contain unusable water? Yes ☒ No ☐
Type of water? .... Depth of strata ....
Method of sealing strata off ....

(7) PUMP: Manufacturer's Name ....
Type: .... H.P. ......

(8) WATER LEVELS: Land-surface elevation above mean sea level...... ft.
Static level ...... ft. below top of well Date ......
Artesian pressure ...... lbs. per square inch Date ......
Artesian water is controlled by .... (Cap, valve, etc.)

(9) WELL TESTS: Drawdown is amount water level is lowered below static level
Was a pump test made? Yes ☐ No ☒ If yes, by whom? ....
Yield: ...... gal./min. with ...... ft. drawdown after ...... hrs.
" " " "
" " " "

Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level

Date of test ....
Bailer test ...... gal./min. with ...... ft. drawdown after ...... hrs.
Artesian flow ...... g.p.m. Date ......
Temperature of water ...... Was a chemical analysis made? Yes ☐ No ☐

(10) WELL LOG:

Formation: Describe by color, character, size of material and structure, and show thickness of aquifers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of formation.

MATERIAL	FROM	TO
Top Soil	0	14
Basalt	14	38
Red Basalt	38	58
Gray Basalt	58	112
Clay-Basalt	112	145
Green Basalt	145	150
Broken Basalt	150	160
Gray Basalt	160	180

Permit C.A. APP'd
50 2 Ac
2 3 5 60

Standing water level 14 ft

RECEIVED
JAN 16 1980
DEPARTMENT OF ECOLOGY
SPOKANE REGIONAL OFFICE

Work started 1/13 1977 Completed 1/14 1977

WELL DRILLER'S STATEMENT:

This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

NAME Done by Coeur D'Alene Dr... (Person, firm, or corporation) (Type or print)

Address ....

[Signed] .... (Well Driller)

License No. .... Date ......, 19......

ECY 050-1-20

3/27/80

(USE ADDITIONAL SHEETS IF NECESSARY)

109973

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Resource Protection Well Report

(SUBMIT ONE WELL REPORT PER WELL INSTALLED)

CURRENT
Notice of Intent No. R47979

Construction/Decommission *("x" in circle)*
X Construction
O Decommission *ORGINAL INSTALLATION Notice of Intent Number* ______

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MAR 0 4 2002
DEPARTMENT OF ECOLOGY
WELL DRILLING UNIT

Type of Well *("x" in circle)*
X Resource Protection
O Geotech Soil Boring

Consulting Firm Tetra Tech
Unique Ecology Well ID
Tag No AGT 607

WELL CONTRUCTION CERTIFICATION I constructed and/or accept for construction of this well, and it compliance with all Washington construction standards Materials used and the information reported above are true to my best knowledge and belief

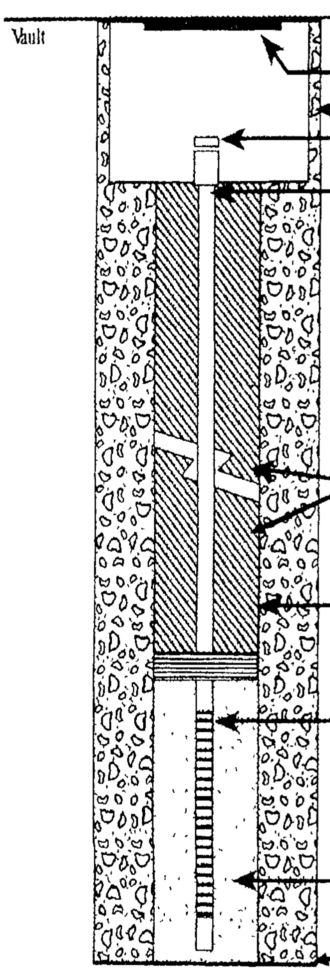
X Driller ☐ Engineer ☐ Trainee Name (Print) Pete Larsen
Driller/Engineer/Trainee Signature [signature]
Driller or Trainee License No ______

If trainee, licensed driller's Signature and License no. ______

Property Owner US Army Corp of Engineers
Site Address Dalel Rd + Hwy 12
City Kennewick County Walla Walla
Location SW 1/4 NE 1/4 Sec 33 Twn 8N R 31 EWM or WWM

Lat/Long (s, t, r, still REQUIRED) Lat Deg ______ Lat Min/Sec ______
Lat Deg ______ Long Min/Sec ______

Tax Parcel No None
Cased or Uncased Diameter ______ Static Level ______
Work/Decommission Start Date 2/5/02
Work/Decommission Completed Date 2/6/02

Construction/Design	Well Data	Formation Description
	Water-tight cover Surface flush vault Locking Cap\Lock Casing Diameter 3/4 in Material PVC Welded ☐ Threaded X Glued ☐ Well Seal From 1 ft To 2 ft Material Bent. Amount 5 lbs Grout Weight ______ Drilling Method ___ Hollow-Stem Auger ___ Air Rotary X Push Probe ___ Mud Rotary ___ Other Borehole diameter 2 1/4 in Screen Material PVC Interval(s) From 3 To 13 From ___ To ___ Slot Size .010 in Filter Pack From 2 ft To 13 ft Material Per Pack Sand Size 10-20 in Completed Depth 13	0 ft to 13 ft Gravels, Sand w/Basalt ___ ft. to ___ ft ___ ft to ___ ft ___ ft to ___ ft ___ ft to ___ ft

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MAR - 7 2002
DEPARTMENT OF ECOLOGY
EASTERN REGIONAL OFFICE

Scale 1"= ______

Page 1 of 6

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109974

Resource Protection Well Report

CURRENT
Notice of Intent No. R47979

(SUBMIT ONE WELL REPORT PER WELL INSTALLED)

Construction/Decommission (*"x" in circle*)
X Construction
O Decommission *ORGINAL INSTALLATION Notice of Intent Number* ____________

RECEIVED
MAR 0 4 2002
DEPARTMENT OF ECOLOGY
WELL DRILLING UNIT

Type of Well (*"x" in circle*)
X Resource Protection
O Geotech Soil Boring

Consulting Firm Tetra Tech
Unique Ecology Well ID
Tag No AGT 608

WELL CONTRUCTION CERTIFICATION I constructed and/or accept for construction of this well, and it compliance with all Washington construction standards Materials used and the information reported above are true to my best knowledge and belief

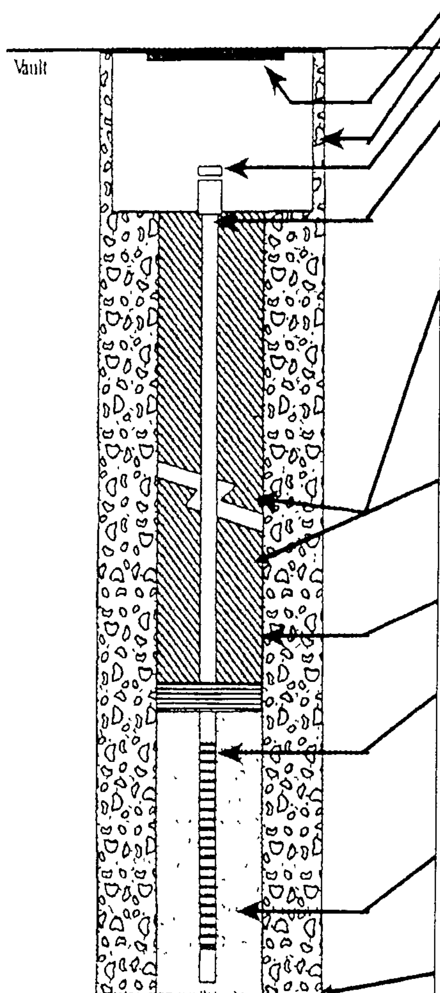
X Driller ☐ Engineer ☐ Trainee Name (Print) Pete Larsen
Driller/Engineer/Trainee Signature [signature]
Driller or Trainee License No ____________

If trainee, licensed driller's Signature and License no. ____________

Property Owner US Army Corp of Engineers
Site Address Dodd Rd & Hwy 12
City Kennewick County Walla Walla
Location SW 1/4 NE 1/4 Sec 33 Twn 8N R 31 EWM or WWM

Lat/Long (s, t, r, still REQUIRED) Lat Deg ______ Lat Min/Sec ______
Lat Deg ______ Long Min/Sec ______

Tax Parcel No None
Cased or Uncased Diameter ______ Static Level ______
Work/Decommission Start Date 2/5/02
Work/Decommission Completed Date 2/6/02

Construction/Design	Well Data	Formation Description
	Water-tight cover Surface flush vault Locking Cap\Lock Casing Diameter 3/4 in Material PVC Welded ☐ Threaded X Glued ☐ Well Seal From 1 ft To 3 ft Material Bent Amount 5 lbs Grout Weight Drilling Method ___ Hollow-Stem Auger ___ Air Rotary X Push Probe ___ Mud Rotary ___ Other Borehole diameter 2 1/4 in Screen Material PVC Interval(s) From 4 To 14 From ____ To ____ Slot Size .010 in Filter Pack From 3 ft To 4 ft Material Prepak Sand Size 10-20 in Completed Depth 14	0 ft to 14 ft Gravels, Sand w/basalt. ___ ft to ___ ft ___ ft to ___ ft ___ ft to ___ ft ___ ft to ___ ft RECEIVED MAR - 7 2002 DEPARTMENT OF ECOLOGY EASTERN REGIONAL OFFICE

Scale 1"= ________

Page 2 of 6

109975

50

Resource Protection Well Report

(SUBMIT ONE WELL REPORT PER WELL INSTALLED)

CURRENT
Notice of Intent No. R47979

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MAR 04 2002
DEPARTMENT OF ECOLOGY
WELL DRILLING UNIT

Construction/Decommission (*"x" in circle*)
X Construction
O Decommission *ORGINAL INSTALLATION Notice of Intent Number* ____

Type of Well (*"x" in circle*)
X Resource Protection
O Geotech Soil Boring

Consulting Firm Tetra Tech
Unique Ecology Well ID
Tag No AGT 610

WELL CONTRUCTION CERTIFICATION I constructed and/or accept for construction of this well, and it compliance with all Washington construction standards Materials used and the information reported above are true to my best knowledge and belief

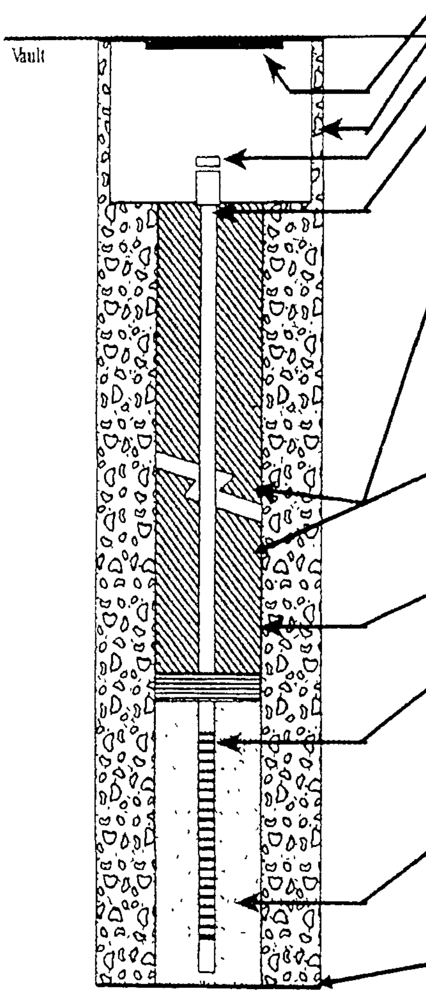
X Driller ☐ Engineer ☐ Trainee Name (Print) Pete Larsen
Driller/Engineer/Trainee Signature [signature]
Driller or Trainee License No ____

If trainee, licensed driller's Signature and License no. ____

Property Owner US Army Corp of Engineers
Site Address Dodd Rd + Hwy 12
City Kennewick County Walla Walla
Location SW 1/4 NE 1/4 Sec 33 Twn 8N R 31 EWM or WWM

Lat/Long (s, t, r, still REQUIRED) Lat Deg ____ Lat Min/Sec ____
Lat Deg ____ Long Min/Sec ____

Tax Parcel No None
Cased or Uncased Diameter ____ Static Level ____
Work/Decommission Start Date 2/5/02
Work/Decommission Completed Date 2/6/02

Construction/Design	Well Data	Formation Description
	Water-tight cover Surface flush vault Locking Cap\Lock Casing Diameter 3/4 in Material PVC Welded ☐ Threaded X Glued ☐ Well Seal From 1 ft To 5.5 ft Material Bentonite Amount 7 lbs Grout Weight ____ Drilling Method __ Hollow-Stem Auger __ Air Rotary X Push Probe __ Mud Rotary __ Other Borehole diameter 2 1/4 in Screen Material PVC Interval(s): From 8.5 To 18.5 From ____ To ____ Slot Size .010 in Filter Pack From 5.5 ft To 18.5 ft Material Sand Size 10-20 in Completed Depth 20	0 ft to 20 ft Gravely Sand, W/Basalt __ ft to __ ft __ ft to __ ft __ ft to __ ft __ ft to __ ft

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EASTERN REGIONAL OFFICE

Scale 1" = ____

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109976

Resource Protection Well Report

CURRENT
Notice of Intent No. R47979

(SUBMIT ONE WELL REPORT PER WELL INSTALLED)

Construction/Decommission (*"x" in circle*)
X Construction
O Decommission *ORGINAL INSTALLATION Notice of Intent Number* ________

Type of Well (*"x" in circle*)
X Resource Protection
O Geotech Soil Boring

Consulting Firm Tetra Tech
Unique Ecology Well ID
Tag No AGT 609

WELL CONTRUCTION CERTIFICATION I constructed and/or accept for construction of this well, and it compliance with all Washington construction standards Materials used and the information reported above are true to my best knowledge and belief

X Driller ☐ Engineer ☐ Trainee Name (Print) Pete Larsen
Driller/Engineer/Trainee Signature [signature]
Driller or Trainee License No ________

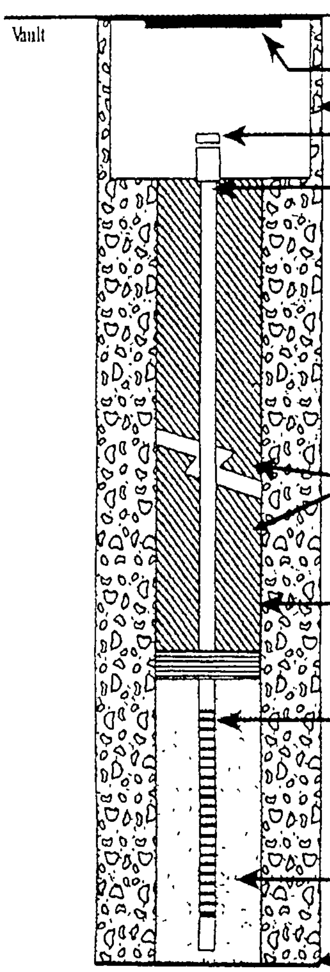
If trainee, licensed driller's Signature and License no. ________

Property Owner US Army Corp of Engineers
Site Address Dodd Rd & Hwy 12
City Kennewick County Walla Walla
Location SW1/4 NE1/4 Sec 33 Twn 8N R 31 EWM or WWM

Lat/Long (s, t, r, still REQUIRED) Lat Deg ____ Lat Min/Sec ____
Lat Deg ____ Long Min/Sec ____

Tax Parcel No None
Cased or Uncased Diameter ____ Static Level ____
Work/Decommission Start Date 2/5/02
Work/Decommission Completed Date 2/6/02

Construction/Design | Well Data | Formation Description



Water-tight cover
Surface flush vault
Locking Cap\Lock

Casing
Diameter 3/4 in
Material PVC

Welded ☐ Threaded X Glued ☐
Well Seal

From 1 ft. To 9 ft
Material Bent
Amount 10 lbs
Grout Weight ____

Drilling Method
___ Hollow-Stem Auger ___ Air Rotary
X Push Probe ___ Mud Rotary ___ Other

Borehole diameter
2 1/4 in

Screen
Material PVC
Interval(s)
From 11 To 21
From ____ To ____
Slot Size .010 in
Filter Pack
From 9 ft To 21 ft
Material PRE Pack Sand
Size 10-20 in
Completed Depth 21

0 ft to 21 ft
Gravels, Sand, Weathered Basalt

____ ft to ____ ft

____ ft to ____ ft

____ ft to ____ ft

____ ft to ____ ft

Scale 1"= ____

Page 3 of 6

109977

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Resource Protection Well Report

CURRENT
Notice of Intent No. R47979

(SUBMIT ONE WELL REPORT PER WELL INSTALLED)

Construction/Decommission ("x" in circle)
X Construction
O Decommission *ORGINAL INSTALLATION Notice of Intent Number* ______

Type of Well ("x" in circle)
X Resource Protection
O Geotech Soil Boring

Consulting Firm Tetra Tech
Unique Ecology Well ID
Tag No AGT Cell

WELL CONTRUCTION CERTIFICATION I constructed and/or accept for construction of this well, and it compliance with all Washington construction standards Materials used and the information reported above are true to my best knowledge and belief

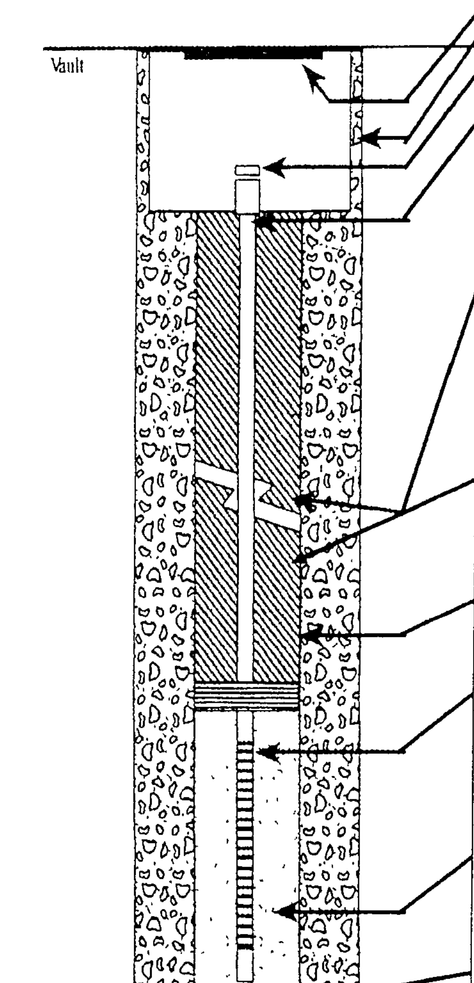
X Driller ☐ Engineer ☐ Trainee Name (Print) Pete Larsen
Driller/Engineer/Trainee Signature [signature]
Driller or Trainee License No ______

If trainee, licensed driller's Signature and License no. ______

Property Owner US Army Corp of Engineers
Site Address Dodd Rd & Hwy 12
City Kennewick County Walla Walla
Location SW 1/4 NE 1/4 Sec 33 Twn 8N R 31 EWM or WWM

Lat/Long (s, t, r, still REQUIRED) Lat Deg ______ Lat Min/Sec ______
Lat Deg ______ Long Min/Sec ______

Tax Parcel No None
Cased or Uncased Diameter ______ Static Level ______
Work/Decommission Start Date 2/5/02
Work/Decommission Completed Date 2/6/02

Construction/Design	Well Data	Formation Description
	Water-tight cover Surface flush vault Locking Cap\Lock Casing Diameter 3/4 in Material PVC Welded ☐ Threaded X Glued ☐ Well Seal From 1 ft To 4 ft Material Bentonite Amount 7 lbs Grout Weight ______ Drilling Method ___ Hollow-Stem Auger ___ Air Rotary X Push Probe ___ Mud Rotary ___ Other Borehole diameter 2 1/4 in Screen Material PVC Interval(s) From 10.5 To 15 From ______ To ______ Slot Size .010 in Filter Pack From 4 ft To 15 ft Material Sand - Pre Pack Size 10-20 in Completed Depth 15	0 ft to 15 ft gravels, sands w/ basalt ___ ft. to ___ ft ___ ft to ___ ft ___ ft to ___ ft ___ ft to ___ ft

Scale 1"= ______

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109978

Resource Protection Well Report

CURRENT
Notice of Intent No. R47979

(SUBMIT ONE WELL REPORT PER WELL INSTALLED)

Construction/Decommission (*"x" in circle*)
X Construction
O Decommission *ORGINAL INSTALLATION Notice of Intent Number* ______

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DEPARTMENT OF ECOLOGY
WELL DRILLING UNIT

Type of Well (*"x" in circle*)
X Resource Protection
O Geotech Soil Boring

Consulting Firm Tetra Tech
Unique Ecology Well ID
Tag No AGT 612

WELL CONTRUCTION CERTIFICATION I constructed and/or accept for construction of this well, and it compliance with all Washington construction standards Materials used and the information reported above are true to my best knowledge and belief

X Driller ☐ Engineer ☐ Trainee Name (Print) Pete Larsen
Driller/Engineer/Trainee Signature [signature]
Driller or Trainee License No ______

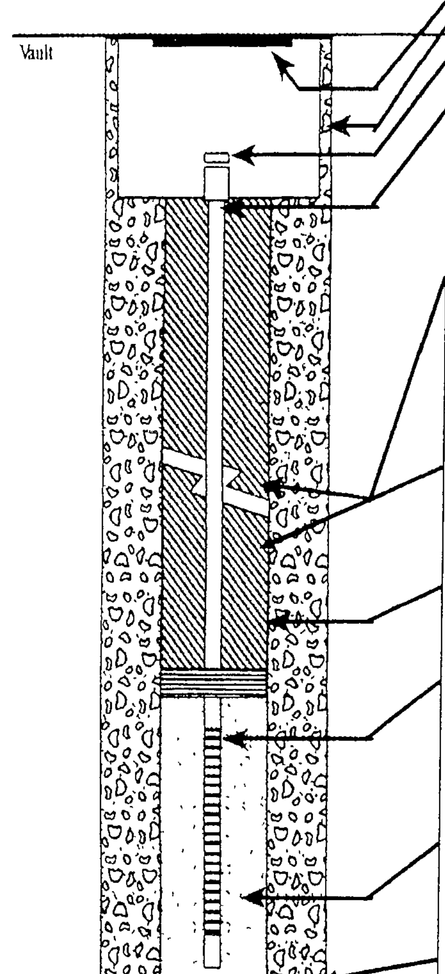
If trainee, licensed driller's Signature and License no. ______

Property Owner US Army Corp of Engineers
Site Address Dodd Rd & Hwy 12
City Kennewick County Walla Walla
Location SW1/4 NE1/4 Sec 33 Twn 8N R 31 EWM or WWM

Lat/Long (s, t, r, still REQUIRED) Lat Deg ______ Lat Min/Sec ______
Lat Deg ______ Long Min/Sec ______

Tax Parcel No None
Cased or Uncased Diameter ______ Static Level ______
Work/Decommission Start Date 2/5/02
Work/Decommission Completed Date 2/6/02

Construction/Design



Well Data

Water-tight cover
Surface flush vault
Locking Cap\Lock

Casing
Diameter 3/4 in
Material PVC

Welded ☐ Threaded X Glued ☐
Well Seal

From 1 ft To 3 ft
Material Bentonite
Amount 5 lbs
Grout Weight ______

Drilling Method
__ Hollow-Stem Auger __ Air Rotary
X Push Probe __ Mud Rotary __ Other

Borehole diameter 2 1/4 in

Screen
Material PVC
Interval(s)
From 4 To 9
From ______ To ______
Slot Size .010 in
Filter Pack
From 3 ft To 9 ft
Material Sand-Prepack
Size 10-20 in
Completed Depth 9.6

Formation Description

0 ft to 9 ft
Gravely Sands, w/basalt

______ ft to ______ ft

______ ft to ______ ft

______ ft to ______ ft

______ ft to ______ ft

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EASTERN REGIONAL OFFICE

Scale 1"= ______ Page ______ of ______

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Washington State Department of Transportation

LOG OF TEST BORING

173517

Start Card S-22760

HOLE No. PH3-1-05

Sheet 1 of 2

Job No. XL-2134 SR 12 Elevation ft (m)

Project US 12 Attalia Vic. Widening (Phase 3)

Driller Vince Johnson Lic# 2532

Site Address SR-12 vic. mp 302

Inspector Brian Hilts

Start April 6, 2005 Completion April 6, 2005 Well ID#

Equipment CME 850 w/ autohammer

Station Offset Casing 4"x23.5 Method Wet Rotary

Northing Easting Latitude Longitude

County Walla Walla Subsection SE1/4 SE1/4 Section 33 Range 31 EWM Township 8

Depth (ft)	Meters (m)	Profile	Standard Penetration Blows/ft (10 20 30 40)	SPT Blows/6" (N)	Sample Type	Sample No. (Tube No.)	Lab Tests	Description of Material	Groundwater	Instrument
5	1–2			50/2" (50) RQD 10 FF 4.3		D-1 C-2		Well graded GRAVEL with sand, angular, very dense, brown , wet, Homogeneous, HCl reaction not tested, The beginning of Basalt. Length Recovered 0.2 ft, Length Retained 0.2 ft BASALT, medium gray, fine grained, slightly weathered, strong rock, HCl reaction not tested. Discontinuities are very closely spaced and in good condition, with some soil infilling., Percent Recovered 100.0%		
10	3–4			RQD 13 FF 4.4		C-3		BASALT, medium gray, fine grained, fresh, strong rock, HCl reaction not tested. Discontinuities are very closely spaced and in good condition, With some soil infilling., Percent Recovered 100.0%		
15–20	5–6			RQD 41 FF 3.6		C-4		BASALT, medium gray, fine grained, fresh, strong rock, HCl reaction not tested. Discontinuities are very closely spaced and in good condition, With some soil infilling. Percent Recovered 100.0%		

Washington State Department of Transportation

LOG OF TEST BORING

Start Card S-22760

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Job No. XL-2134 SR 12 Elevation ft (m)

HOLE No. PH3-1-05

Sheet 2 of 2

Project US 12 Attalia Vic. Widening (Phase 3)

Driller Vince Johnson Lic# 2532

Depth (ft)	Meters (m)	Profile	Standard Penetration Blows/ft (10 20 30 40)	SPT Blows/6" (N)	Sample Type	Sample No. (Tube No.)	Lab Tests	Description of Material	Groundwater	Instrument
								End of test hole boring at 20.5 ft below ground elevation. This is a summary Log of Test Boring. Soil/Rock descriptions are derived from visual field identifications and laboratory test data.		
	7									
25	8									
30	9									
	10									
35	11									
40	12									
	13									
45										

SOIL XL-2134 SR 12 ATTALIA VIC.WIDENING (PHASE 3).GPJ SOIL.GDT 4/11/05,2:38:51 P4

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Washington State Department of Transportation

LOG OF TEST BORING

173518

Start Card S-22760

HOLE No. PH3-2-05

Job No. XL-2134 SR 12 Elevation ft (m)

Sheet 1 of 1

Project US 12 Attalia Vic. Widening (Phase 3)

Driller Vince Johnson Lic# 2532

Site Address SR-12 Vic. mp 302

Inspector Brian Hilts

Start April 6, 2005 Completion April 6, 2005 Well ID#

Equipment CME 850 w/ autohammer

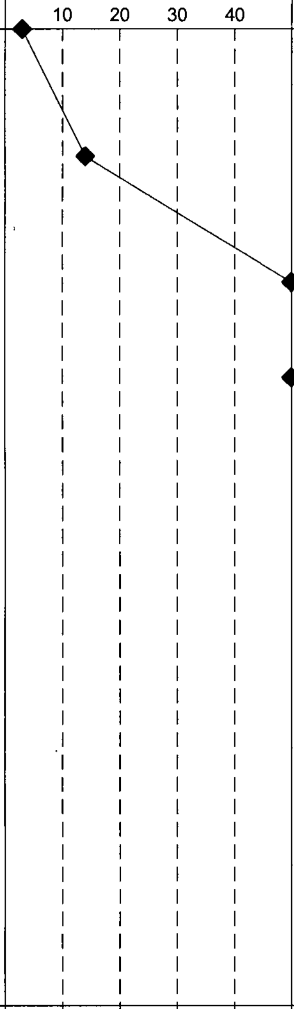
Station Offset Casing 4"x18.5

Method Wet Rotary

Northing Easting Latitude Longitude

County Walla Walla Subsection SE1/4 SE1/4 Section 33 Range 31 EWM Township 8

Standard Penetration Blows/ft



Depth (ft)	Meters (m)	Profile	SPT Blows/6" (N)	Sample Type	Sample No. (Tube No.)	Lab Tests	Description of Material	Groundwater	Instrument
			1 2 1 2 (3)		D-1		Poorly graded SAND, very loose, brown, moist, Homogeneous, HCl reaction not tested, With some hair roots. Length Recovered 1.5 ft, Length Retained 1.5 ft		
	1		2 3 11 24 (14)		D-2		Well graded GRAVEL with sand, angular, medium dense, brown, wet, Stratified, HCl reaction not tested, The top .8' was (SP) sand and wet with some hair roots, and the bottom.6' was gravel. Water table area. Length Recovered 1.4 ft, Length Retained 1.4 ft	▽ 04/06/2005	
5			40 50/4" (50)		D-3		Well graded GRAVEL with sand, angular, very dense, gray, dry, Homogeneous, HCl reaction not tested, With some reddish brown color. (note) We sampled with out drilling with any water to this depth.		
	2		24 50/2" (50)		D-4		Length Recovered 0.8 ft, Length Retained 0.8 ft Well graded GRAVEL with sand, angular, very dense, brown, moist, Homogeneous, HCl reaction not tested, highly weathered Basalt. Length Recovered 0.7 ft, Length Retained 0.7 ft		
10	3		RQD 19 FF 3.7		C-5		BASALT, medium gray, fine grained, slightly weathered, moderately strong rock, HCl reaction not tested. Discontinuities are very closely spaced and in fair condition, Discontinuity was fair to good. With some soil infilling. The top .4' was all broken up to gravel., Percent Recovered 100.0%		
15	4		RQD 11 FF 3.7		C-6		BASALT, medium gray, fine grained, moderately weathered, moderately strong rock, HCl reaction not tested. Discontinuities are very closely spaced and in good condition, Percent Recovered 70.0%		
20	5 6						End of test hole boring at 15.5 ft below ground elevation. This is a summary Log of Test Boring. Soil/Rock descriptions are derived from visual field identifications and laboratory test data.		

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SOIL XL-2134 SR 12 ATTALIA VIC.WIDENING (PHASE 3).GPJ SOIL.GDT 4/11/05,2:38:51 P4

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Washington State
Department of Transportation

LOG OF TEST BORING

173519

Start Card	S-22760
HOLE No.	PH3-3-05
Sheet	1 of 2
Driller	Vince Johnson
Lic#	2532
Inspector	Brian Hilts
Job No.	XL-2134
SR	12
Elevation	ft (m)
Project	US 12 Attalia Vic. Widening (Phase 3)
Site Address	SR-12 vic. mp 302
Start	April 7, 2005
Completion	April 7, 2005
Well ID#	
Equipment	CME 850 w/ autohammer
Station	
Offset	
Casing	4"x23.5
Method	Wet Rotary
Northing	
Easting	
Latitude	
Longitude	
County	Walla Walla
Subsection	SE1/4 SE1/4
Section	33
Range	31 EWM
Township	8

SPT Blows/6" (N)	Sample No. (Tube No.)	Description of Material
2 2 1 2 (3)	D-1	Poorly graded SAND, very loose, brown, moist, Homogeneous, HCl reaction not tested, With some hair roots. Length Recovered 1.6 ft, Length Retained 1.6 ft
2 2 1 2 (3)	D-2	Poorly graded SAND, very loose, brown, wet, Homogeneous, HCl reaction not tested, With some hair roots. The bottom .6' was very wet. (water table area) Length Recovered 1.2 ft, Length Retained 1.2 ft
3 3 4 4 (7)	D-3	Silty SAND with gravel, loose, brown, wet, Homogeneous, HCl reaction not tested Length Recovered 0.6 ft, Length Retained 0.6 ft
4 3 3 (6)	D-4	Well graded SAND with gravel, loose, dark grayish brown, wet, Homogeneous, HCl reaction not tested Length Recovered 1.0 ft, Length Retained 1.0 ft
3 3 4 8 (7)	D-5	Well graded SAND, loose, very dark gray, wet, Homogeneous, HCl reaction not tested, With a trace of gravel. Length Recovered 1.4 ft, Length Retained 1.4 ft
	C-6	Well graded GRAVEL, angular, very dense, dark gray, moist, Homogeneous, HCl reaction not tested, (Basalt) At approx. 10' we encountered BASALT bedrock.
50/3" (50)	D-7	Length Recovered 0.5 ft, Length Retained 0.5 ft
RQD .07 FF 4	C-8	Well graded GRAVEL with sand, angular, very dense, brown, wet, Homogeneous, HCl reaction not tested, With some reddish brown color throughout. Highly weathered Basalt. Length Recovered 0.3 ft, Length Retained 0.3 ft BASALT, medium gray, fine grained, slightly weathered, moderately strong rock, HCl reaction not tested. Discontinuities are very closely spaced and in fair condition, fair to good condition. From 14.1 to 15' was moderately weathered. From 15' to 15.5' was moderately vesicular with some soil infilling throughout., Percent Recovered 77.0%
RQD .08 FF 4.2	C-9	BASALT, medium gray, fine grained, slightly weathered, moderately strong rock, HCl reaction not tested. Discontinuities are very closely spaced and in fair condition, Fair to good condition with some soil infilling, Percent Recovered 48.0%

Groundwater: 04/07/2005

Depth (ft): 5, 10, 15, 20 — Meters (m): 1, 2, 3, 4, 5, 6 — Standard Penetration Blows/ft: 10, 20, 30, 40

RECEIVED MAY - 2 2005 DEPARTMENT OF ECOLOGY EASTERN REGIONAL OFFICE

SOIL XL-2134 SR 12 ATTALIA VIC WIDENING (PHASE 3).GPJ SOIL.GDT 4/11/05,2:38:52 P4

Washington State
Department of Transportation

LOG OF TEST BORING

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Start Card S-22760

HOLE No. PH3-3-05

Sheet 2 of 2

Job No. XL-2134 SR 12 Elevation ft (m)

Project US 12 Attalia Vic. Widening (Phase 3)

Driller Vince Johnson Lic# 2532

Depth (ft)	Meters (m)	Profile	Standard Penetration Blows/ft (10 20 30 40)	SPT Blows/6" (N)	Sample Type	Sample No. (Tube No.)	Lab Tests	Description of Material	Groundwater	Instrument
								End of test hole boring at 20.5 ft below ground elevation. This is a summary Log of Test Boring. Soil/Rock descriptions are derived from visual field identifications and laboratory test data.		
	7									
25	8									
30	9									
	10									
35	11									
	12									
40	13									
45										

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Washington State Department of Transportation

LOG OF TEST BORING

173520

Start Card	S-22760
HOLE No.	PH3-4-05
Sheet	1 of 1
Driller	Vince Johnson
Lic#	2532
Inspector	Brian Hilts
Job No.	XL-2134
SR	12
Elevation	ft (m)
Project	US 12 Attalia Vic. Widening (Phase 3)
Site Address	SR-12 vic. mp 302
Start	April 7, 2005
Completion	April 1, 0705
Well ID#	
Equipment	CME 850 w/ autohammer
Station	
Offset	
Casing	4"x18.5'
Method	Wet Rotary
Northing	
Easting	
Latitude	
Longitude	
County	Walla Walla
Subsection	SE1/4 SE1/4
Section	33
Range	31 EWM
Township	8

Depth (ft)	Meters (m)	Profile	Standard Penetration Blows/ft (10 20 30 40)	SPT Blows/6" (N)	Sample Type	Sample No. (Tube No.)	Lab Tests	Description of Material	Groundwater	Instrument
				1 2 3 3 (5)		D-1		Poorly graded SAND, loose, brown, moist, Homogeneous, HCl reaction not tested, With some hair roots. Length Recovered 1.6 ft, Length Retained 1.6 ft		
				23 50/1" (50)		D-2		Well graded GRAVEL with sand, angular, dense, grayish brown, dry, Stratified, HCl reaction not tested, The top .2' brown with hair roots and the bottom .4" was gray in color. Basalt contact. Length Recovered 0.6 ft, Length Retained 0.6 ft		
	1			RQD 0 FF 4.5		C-3		BASALT, medium gray, fine grained, slightly weathered, moderately strong rock, HCl reaction not tested. Discontinuities are very closely spaced and in good condition, With some soil infilling., Percent Recovered 88.0%		
5	2			RQD .08 FF 4.2		C-4		BASALT, medium gray, fine grained, slightly weathered, strong rock, HCl reaction not tested. Discontinuities are very closely spaced and in good condition, Discontinuity fair to good condition with some soil infilling., Percent Recovered 93.0%		
10	3			RQD 14 FF 5.3		C-5		BASALT, medium gray, fine grained, slightly weathered, strong rock, HCl reaction not tested. Discontinuities are very closely spaced and in good condition, discontinuity fair to good with some soil infilling. Percent Recovered 100.0%		
15	4 5 6							End of test hole boring at 13.5 ft below ground elevation. This is a summary Log of Test Boring. Soil/Rock descriptions are derived from visual field identifications and laboratory test data.		
20										

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SOIL XL-2134 SR 12 ATTALIA VIC.WIDENING (PHASE 3).GPJ SOIL.GDT 4/11/05,2:38:52 P4

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Appli: 9737

STATE OF WASHINGTON
DEPARTMENT OF CONSERVATION
DIVISION OF WATER RESOURCES

WELL LOG

Record by: Driller

Source: Driller's Record

Location: State of WASHINGTON

County: Walla Walla

Area:

Map:

NE ¼ NE ¼ sec 34 T 8 N., R 31 E. E./W.

Diagram of Section

Drilling Co. Smith & Son Drilling

Address: 905 E. Chestnut, Walla Walla, Washington

Method of Drilling: Rotary Date: October 21 1968

Owner: Atlantic Richfield Hanford Company

Address: P O Box 769, Richland, Washington 99352

Land surface, datum .... ft. above/below

SWL: 203 Date ...., 19...... Dims.: 10"x385'

Correlation	Material	From (feet)	To (feet)
	(Transcribe driller's terminology literally but paraphrase as necessary, in parentheses. If material water-bearing, so state and record static level if reported. Give depths in feet below land-surface datum unless otherwise indicated. Correlate with stratigraphic column, if feasible. Following log of materials, list all casings, perforations, screens, etc.)		
	INDUSTRIAL		
	See Attached		
	Sand, gravel, silt	0	62
	Sand, gravel, cobbles, boulders	62	80
	Yellow clay ;and basalt gravel	80	127
	Blue clay	127	130
	Honeycomb weathered basalt	130	145
	Baked clay and silt	145	152
	Black basalt	152	217
	Volcanic ash, tuffaceous sand	217	277
	Black basalt	277?	297
	Green claystone w/ basalt	297	307
	Basalt, some sand	307	317
	Black basalt	317	330
	Green clay, sand and gravel	330	385
	Hard black basalt	385	480

Turn up Sheet .... of .... sheets

MAY-08-1991 11:49 FROM PONDEROSA TO 59 14022412068 P.02

The Department of Ecology does NOT Warranty the Data and/or the Information on this Well Report.

...nal and First Copy with ...ment of Ecology
Second Copy—Owner's Copy
Third Copy—Driller's Copy

WATER WELL REPORT

STATE OF WASHINGTON

Start Card No. 036530

Water Right Permit No.

(1) OWNER: Name I.B.P. Inc. Address Box 515 Dakota City, NE 68731

(2) LOCATION OF WELL: County Walla-Walla N1/2 ne ¼ Sec. 34 T. 8 N., R. 31 W.M.

(2a) STREET ADDRESS OF WELL (or nearest address)

(3) PROPOSED USE: ☐ Domestic ☐ Irrigation ☐ DeWater Industrial ☒ Test Well ☐ Municipal ☐ Other ☐

(4) TYPE OF WORK: Owner's number of well (if more than one) 1

Abandoned ☐ New well ☒ Deepened ☐ Reconditioned ☐ Method: Dug ☐ Cable ☐ Rotary ☒ Bored ☐ Driven ☐ Jetted ☐

(5) DIMENSIONS: Diameter of well 10x8 inches. Drilled 700 feet. Depth of completed well 700 ft.

(6) CONSTRUCTION DETAILS:

Casing installed: 12" Diam. from +2 ft. to 138 ft.
Welded ☐ 10" Diam. from +2 ft. to 417 ft.
Liner installed ☐ 8" Diam. from 405 ft. to 700 ft.
Threaded ☐

Perforations: Yes ☐ No ☒
Type of perforator used
SIZE of perforations in. by in.
perforations from ft. to ft.
perforations from ft. to ft.
perforations from ft. to ft.

Screens: Yes ☒ No ☐
Manufacturer's Name Johnson
Type Stainless Steel Model No.
Diam. 8 Slot size 100 from 645 ft. to 695 ft.
Diam. Slot size from ft. to ft.

Gravel packed: Yes ☐ No ☒ Size of gravel
Gravel placed from ft. to ft.

Surface seal: Yes ☒ No ☐ To what depth? 417 ft.
Material used in seal Bentonite
Did any strata contain unusable water? Yes ☐ No ☐
Type of water? Depth of strata
Method of sealing strata off

(7) PUMP: Manufacturer's Name
Type: H.P.

(8) WATER LEVELS: Land-surface elevation above mean sea level ft.
Static level 111 ft. below top of well Date
Artesian pressure lbs. per square inch Date
Artesian water is controlled by (Cap, valve, etc.)

(9) WELL TESTS: Drawdown is amount water level is lowered below static level
Was a pump test made? Yes ☐ No ☐ If yes, by whom?
Yield: gal./min. with ft. drawdown after hrs.

Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level

Date of test
Bailer test gal./min. with ft. drawdown after hrs.
Airtest gal./min. with stem set at ft. for hrs.
Artesian flow g.p.m. Date
Temperature of water Was a chemical analysis made? Yes ☐ No ☐

(10) WELL LOG or ABANDONMENT PROCEDURE DESCRIPTION

Formation: Describe by color, character, size of material and structure, and show thickness of aquifers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of information.

MATERIAL	FROM	TO
Sandy Loam	0	6
Black Sand	6	60
Cement Gravel	60	94
Large Bolders and Gravel	74	83
Basalt and Gravel	83	94
Basalt, hard, black	94	97
Clay, brown	97	99
Basalt, red and black	99	201
Crevus	101	102
Basalt, black, Fractured	102	115
Clay and Gravel, blue	115	115
Basalt, Weathered	115	122
Basalt, black, Fractured	122	180
Basalt, broken w/blue clay & Shale	180	223
Basalt, black, Fractured	223	307
Blue Shale conglomerate & Basalt	307	355
Basalt & shale, red & blue	355	363
Basalt, Hard, Black	363	428
Basalt w/Shale, Hard Fractured	428	480
Basalt, Hard Fractured	480	600
Basalt, fractured w/brown & blue Shale, little water	600	648
Basalt, hard, Black	648	800
Basalt, Badley broken, Black w/water	645	700

JUL 26

Work started 3/13 19 90 Completed 5/10 19 90

WELL CONSTRUCTOR CERTIFICATION:

I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards. Materials used and the information reported above are true to my best knowledge and belief.

NAME Ponderosa Drilling & Development INC. (PERSON, FIRM, OR CORPORATION) (TYPE OR PRINT)

Address E 6010 Broadway Spokane WA 99212

(Signed) Robert R. Hutton (WELL DRILLER) License No. 0043

Contractor's Registration No. PO-ND-EI-248 JE Date May 11 19 90

(USE ADDITIONAL SHEETS IF NECESSARY)

ECY 050-1-20 (10/87) -1329-

WASHINGTON STATE DEPARTMENT OF ECOLOGY

DOH - 644

59

UNIQUE WELL I D NUMBER A B R 6 4 7
X Y Z 1 2 3

WELL TAGGING FORM

Date of Field Visit 8/16/94 By Pat Repp

ADDITIONAL WELL IDENTIFIERS

Department of Health System ID Number 14131P Source Number SO 03

USGS Site Identification ______

RECORD VERIFICATION

☒ Well Report available *(please attach)*
☐ Well Report not available
☐ Verification inconclusive

WELL OWNERSHIP, IF DIFFERENT FROM WELL REPORT

Name IBP, inc.

Street address Dodd Road

City Pasco State Washington

LOCATION OF WELL, IF DIFFERENT FROM WELL REPORT

Well Address ______

City ______ County ______

T. 8 N. R. 31 E W M Sec. 34 NW ¼ of the NE ¼

Latitude 46 ° 08 ' 18 "
Longitude 118 ° 54 ' 47 "

☐ GPS (raw data)
☐ GPS (corrected)
☒ Topographic Map
☐ Survey
☐ Computer generated
☐ Other ______

Elevation at land surface Unknown feet/meters *(circle one)*

☐ Digital Altimeter
☐ Topographic Map

Additional information, if available: 59

☒ Location marked on topographic map *(please attach)*

☐ Location marked on air photo *(please attach)*

Water Right # G3-28463 Priority Date March 8, 1990

Circle one: Application Permit **Certificate** Claim Exempt

WELL CHARACTERISTICS

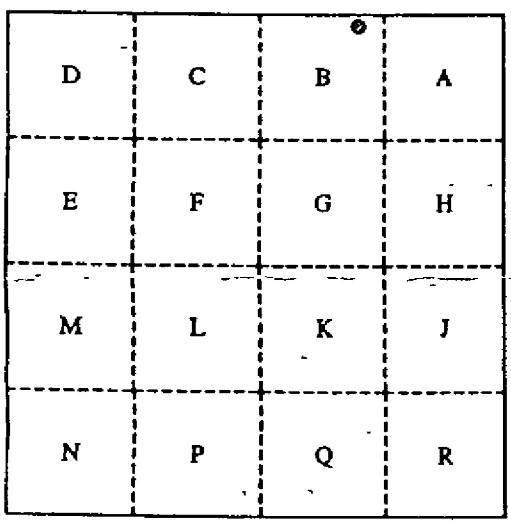
Physical Description of Well (size of casing, type of well, housing, etc.): Rotary Well, 700 feet deep, 12 inch casing. Located in well pit.

Location of Well Identification Tag: ____________________

Was Supplemental Tag needed for ease of identifying well?
☒ NO ☐ YES

If yes, where was tag placed? ____________________

Scale 1:24,000 (1"=2,000')



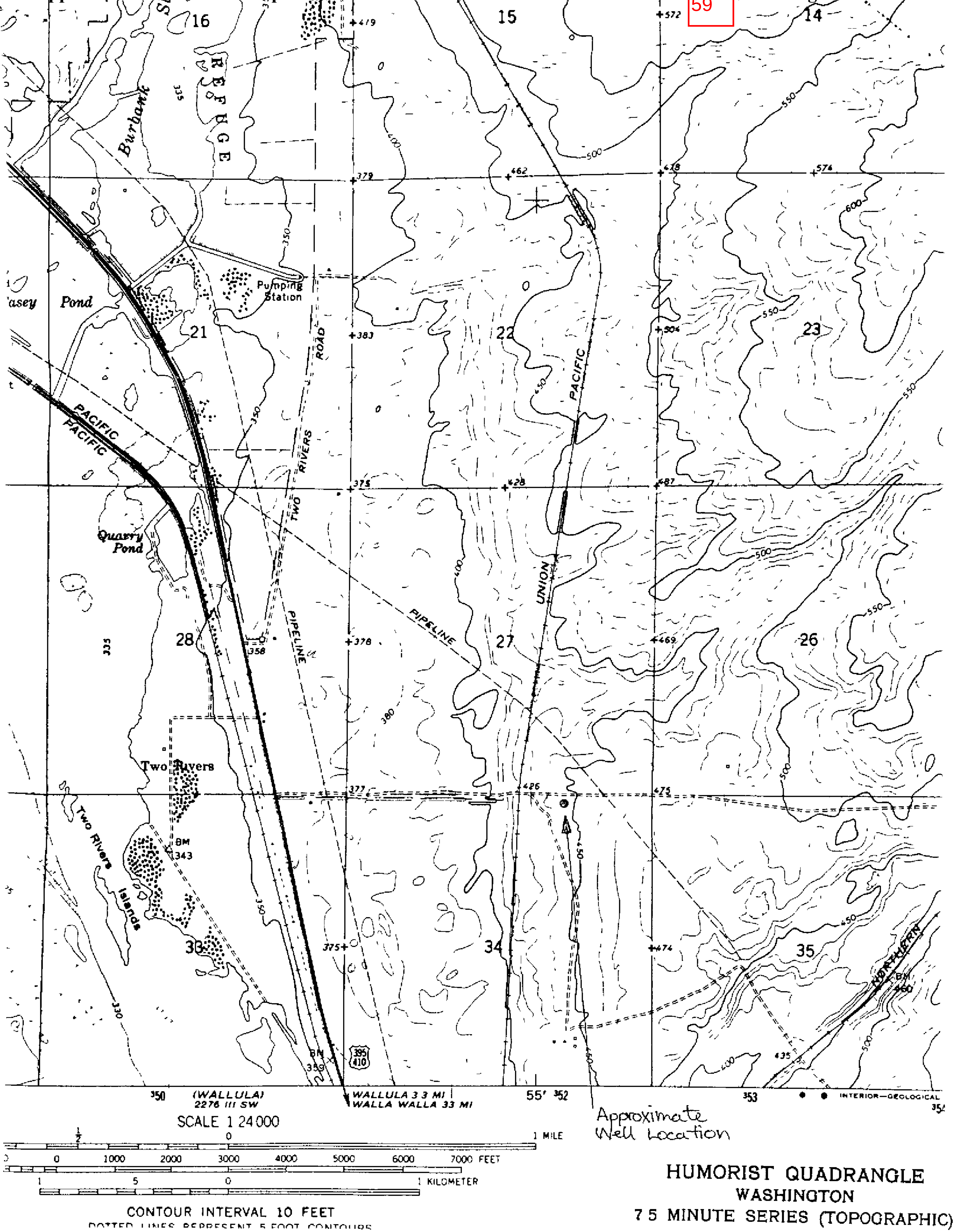
Indicate the location of the well within the Section by drawing a dot at that point.

SECTION 34

COMMENTS: ____________________

Please attach this form to the Well Report and submit it to the Department of Ecology Water Resources Program Headquarters, Well Identification Program, P.O. Box 47600, Olympia, WA 98504-7600

47600 98504 7600



16
15
14
REFUGE
Burbank
Casey Pond
Pumping Station
21
22
23
ROAD
TWO RIVERS
PACIFIC
UNION PACIFIC
PIPELINE
Quarry Pond
28
27
26
Two Rivers
Two Rivers Islands
BM 343
33
34
35
NORTHERN
BM 359
395
410
(WALLULA) 2276 III SW
WALLULA 3.3 MI
WALLA WALLA 33 MI
Approximate Well Location
SCALE 1:24 000
1 MILE
7000 FEET
1 KILOMETER
CONTOUR INTERVAL 10 FEET
DOTTED LINES REPRESENT 5 FOOT CONTOURS
HUMORIST QUADRANGLE
WASHINGTON
7.5 MINUTE SERIES (TOPOGRAPHIC)

RESOURCE PROTECTION WELL REPORT

Notice of Intent No S 09096

(SUBMIT ONE WELL REPORT PER WELL INSTALLED)

116085

60

Construction/Decommission *("x" in circle)*
- ⊗ Construction
- ○ Decommission *Original Construction Notice of Intent Number* ______

Type of Well *(x in circle)*
- ○ Resource Protection
- ⊗ Geotech Soil Boring

Property Owner: IBP
Unique Ecology Well ID Tag No: N/A
Consulting Firm: Shannon and Wilson
Driller or Trainee Name: Kelly C. Hill
Driller or Trainee Signature: Kelly C. Hill
Driller or Trainee License No: 2561 T

If trainee licensed driller's Signature and License no: Dan Claassen 1827

Site Address: 13983 Dodd Rd.
City: Wallula County: Walla Walla
Location: ~~NE~~ NW 1/4 1/4 NE 1/4 Sec 34 Twn 8N R 31 EWM (circle one) or WWM
Lat/Long (s t r still REQUIRED): Lat Deg ____ Lat Min/Sec ____ Long Deg ____ Long Min/Sec ____
Tax Parcel No: ______
Cased or Uncased Diameter: 6" Static Level: 0
Work/Decommission Start Date: 6-3-02
Work/Decommission Completed Date: 6-3-02

Depth	Construction/Design	Well Data	Formation Description
0'–8"		Asphalt patch	
8"–15'		~~N/A~~ Bentnite chips	Sand, Fine grained
15'–25'		Bentnite chips	Fine to med. Sand Small amount of rounded gravel

RECEIVED JUL -2002

Scale 1"= 5'   Page 1 of 1   ECY 050 12 (Rev 2/01)

L+M Feeders, Inc

61

File Original and First Copy with Department of Ecology
Second Copy — Owner's Copy
Third Copy — Driller's Copy

WATER WELL REPORT

STATE OF WASHINGTON

Application No. ....

Permit No. ....

(1) OWNER: Name L+M Feedlots Inc. Address PO Box 2403 Pasco, 99302

(2) LOCATION OF WELL: County Walla Walla ~~SW~~ SE ¼ ~~NE~~ SE ¼ Sec 34 T. 8 N., R. 31 W.M.

Bearing and distance from section or subdivision corner

(3) PROPOSED USE: Domestic ☐ Industrial ☐ Municipal ☐ Irrigation ☒ Test Well ☐ Other ☐

(4) TYPE OF WORK: Owner's number of well (if more than one)....
New well ☐ Method: Dug ☐ Bored ☐
Deepened ☒ Cable ☒ Driven ☐
Reconditioned ☒ Rotary ☐ Jetted ☐

(5) DIMENSIONS: Diameter of well 10" inches.
Drilled 410 ft. Depth of completed well 410 ft.

(6) CONSTRUCTION DETAILS:

Casing installed: 8 " Diam. from +1 ft. to 400 ft.
Threaded ☐ ...." Diam. from .... ft. to .... ft.
Welded ☒ ...." Diam. from .... ft. to .... ft.

Perforations: Yes ☒ No ☐
Type of perforator used Mills Knife
SIZE of perforations 3/8 in. by 2 in.
280 perforations from 165 ft. to 210 ft.
220 perforations from 225 ft. to 260 ft.
520 perforations from 310 ft. to 390 ft.

Screens: Yes ☐ No ☒
Manufacturer's Name ....
Type .... Model No. ....
Diam. .... Slot size .... from .... ft. to .... ft.
Diam. .... Slot size .... from .... ft. to .... ft.

Gravel packed: Yes ☐ No ☒ Size of gravel: ....
Gravel placed from .... ft. to .... ft.

Surface seal: Yes ☐ No ☒ To what depth? .... ft.
Material used in seal ....
Did any strata contain unusable water? Yes ☐ No ☐
Type of water? .... Depth of strata ....
Method of sealing strata off ....

(7) PUMP: Manufacturer's Name PeaBody
Type: Turbine H.P. 40

(8) WATER LEVELS: Land-surface elevation above mean sea level.... ft.
Static level .... ft. below top of well Date 1/15/88
Artesian pressure .... lbs. per square inch Date ....
Artesian water is controlled by .... (Cap, valve, etc.)

(9) WELL TESTS: Drawdown is amount water level is lowered below static level
Was a pump test made? Yes ☒ No ☐ If yes, by whom? Co.

Yield: gal./min.	with ft. drawdown	after hrs.
65	"	"
"	"	"

Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level

Date of test 1/14/88
Bailer test .... gal./min. with .... ft. drawdown after .... hrs.
Artesian flow .... g.p.m. Date ....
Temperature of water .... Was a chemical analysis made? Yes ☐ No ☒

(10) WELL LOG:

Formation: *Describe by color, character, size of material and structure, and show thickness of aquifers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of formation.*

MATERIAL	FROM	TO
Cleaned well		
Deepened 10 Ft		
in Basalt (Black)	400	410
installed liner		

RECEIVED FEB 11 1988 DEPARTMENT OF ECOLOGY CENTRAL REGION OFFICE

RECEIVED FEB 16 1988 DEPARTMENT OF ECOLOGY SPOKANE REGIONAL OFFICE

Work started 11/23, 19 87. Completed 1/14, 19 88

WELL DRILLER'S STATEMENT:

This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

NAME Omwego Drilling Co Inc (Person, firm, or corporation) (Type or print)

Address Rt 14 Box 3010 Kennewick

[Signed] David Garcia (Well Driller)

License No. 1143 Date 1/15, 19 88

(USE ADDITIONAL SHEETS IF NECESSARY)

ECY 050-1-20

62

Elev 400

STATE OF WASHINGTON
DEPARTMENT OF CONSERVATION
AND DEVELOPMENT

WELL LOG

No. Appli. #2612
Permit #2410

Date May 12, 1952

Record by Moore S. Anderson

Source Well driller's record

Location: State of WASHINGTON

County Walla Walla

Area

Map

NW ¼ SE ¼ sec. 34 T. 8 N., R. 31 E.

34

DIAGRAM OF SECTION

Drilling Co. Moore S. Anderson

Address Walla Walla, Wash.

Method of Drilling drilled Date May 15 1952

Owner LOUIS F. JAUSSAUD

Address Walla Walla, Wash.

Land surface, datum 400 ft. above below

Correlation	Material	Thickness (feet)	Depth (feet)
	Dirt	62	62
	Brown rock	30	92
	Blue rock	85	177
	Blue clay	53	230
	Black rock	10	240
Pump	Test:		
	Dim: 240' x 8"		
	SWL: 95'		
	Dd: 125'		
	Yield: 100 gpm		
	Casing: 8" dia. line pipe from 0' to 103'		
	8" drive shoe on bottom of casing.		
	Pump data: recovery instantaneous		
	Pump: Turbine		
	Motor: 7½ hp		

(Transcribe driller's terminology literally but paraphrase as necessary, in parentheses. If material water-bearing, so state and record static level if reported. Give depths in feet below land-surface datum unless otherwise indicated. Correlate with stratigraphic column, if feasible. Following log of materials, list all casings, perforations, screens, etc.)

Turn up Sheet___of___sheets

63

Appl: 10087
Per: 9227

STATE OF WASHINGTON
DEPARTMENT OF CONSERVATION
DIVISION OF WATER RESOURCES

WELL LOG

Record by Project Corporation

Source Driller's record

Location: State of WASHINGTON

County Walla Walla

Area

Map

SE ¼ SE ¼ sec 34 T. 8 N., R. 31E E. W.

Diagram of Section

Drilling Co. Project Corporation

Address 905 East Chestnut, Walla Walla, Wash.

Method of Drilling Date , 19

Owner McGregor Land & Livestock Co.

Address Box 607, Pasco, Washington

Land surface, datum ft. above below

SWL: 105 Date Jan. 30, 19 69 Dims.:

CORRELATION	MATERIAL	From (feet)	To (feet)
	(Transcribe driller's terminology literally but paraphrase as necessary, in parentheses. If material water-bearing, so state and record static level if reported. Give depths in feet below land-surface datum unless otherwise indicated. Correlate with stratigraphic column, if feasible. Following log of materials, list all casings, perforations, screens, etc.)		
	Soil overburden, cased	0	92
	Gravel	92	99
	BAsalt, honeycombed, red	99	120
	Basalt, black	120	167
	Void, or crevasse, water bearing	167	175
	Basalt, black	175	180
	Basalt, black with blue shale	180	195
	Basalt, black with clay (water bearing)	195	210
	Basalt, black with blue shale (water bearing)	210	225
	Basalt, black (water bearing)	225	240
	Basalt, black	240	255
	Basalt, grey, hard	255	270
	Basalt, grey, hard	270	320
	Shale, blue, grey (water bearing)	320	395

Turn up

Sheet of sheets

63

WELL LOG.—Continued No................/..........-...............

CORRELATION	MATERIAL	From (feet)	To (feet)
	Depth forward	———	
	Basalt, black	395	400
	Casing: 10" from 0' to 93'		
	Pump test: 300 gpm with 195 DD after 8 hrs.		
	Recovery data: 1st 50' fast, balance very slow for 30 minutes.		

S. F. No. 7449—OS—12-65.

64

Appli. 9805
Permit. 9093
Certi. 6476

STATE OF WASHINGTON
DEPARTMENT OF CONSERVATION
DIVISION OF WATER RESOURCES

WELL LOG

Record by Driller

Source Driller's Record

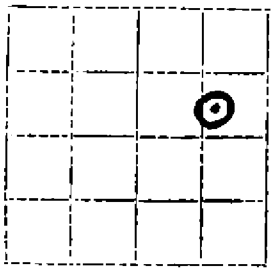


Diagram of Section

Location: State of WASHINGTON

County Walla, Walla

Area 1040'W. and 620'N. from

Map E¼ corner of Sec. 34

SE ¼ NE ¼ sec 34 T. 8 N., R. 31 E./W.

Drilling Co. Smith & Son Drilling Co.

Address 2103 N 52

Method of Drilling Cable, Rotary Date Sept 5, 19 68

Owner McGregor Land & Livestock Co.

Address Hooper, Washington 99333

Land surface, datum ...... ft. above/below

SWL: ...... Date ......, 19 ...... Dims.: ......

Correlation	Material	From (feet)	To (feet)
	(Transcribe driller's terminology literally but paraphrase as necessary, in parentheses. If material water-bearing, so state and record static level if reported. Give depths in feet below land-surface datum unless otherwise indicated. Correlate with stratigraphic column, if feasible. Following log of materials, list all casings, perforations, screens, etc.)		
	Industrial		
	Silt Sand	0	20
	Gravel Silty, Small	20	40
	Sand, gravel, silt	40	80
	Gravel, sand	80	93
	Rock, broken	93	105
	Basalt, black, brown	105	223
	Lava-water bearing, broken	223	275
	Basalt, black	275	341
	Lava- water bearing	341	387
	Basalt, black an gray	387	420
	Lava, brown	420	470
	Basalt, gray, black	470	480
	Casing: 10" from 0 to 97"ft		

Turn up

Sheet ...... of ...... sheets

64

WELL LOG.—Continued No........../........-..........

CORRE-LATION	MATERIAL	From (feet)	To (feet)
	Depth forward	———	
	Yield: 375gpm w/83dd after 2 hrs.		
	415gpm w/103 dd after 2 hrs.		
	Recovery time: full in 3 minutes		
	Date of test: Sept 9, 1968		

S. F. No. 7449—OS—12-65.

65

File Original and First Copy with Department of Ecology
Second Copy — Owner's Copy
Third Copy — Driller's Copy

94824

WATER WELL REPORT

STATE OF WASHINGTON

Start Card No W07493
UNIQUE WELL I D # AAS277
Water Right Permit No

(1) OWNER Name Port of Walla Walla Address 310 "A" St., Walla Walla Regional A/P, Walla Walla, WA 99362

(2) LOCATION OF WELL County Walla Walla '01 MAY 21 ISE 1/4 SW 1/4 Sec 34 T 8 N R 31E WM

(2a) STREET ADDRESS OF WELL (or nearest address) 34266 Hwy 12, Walulla, WA (nearest)

(3) PROPOSED USE ☐ Domestic ☐ Irrigation ☐ DeWater Industrial ☐ Test Well ☐ Municipal ☐ Other ☒

(4) TYPE OF WORK Owner's number of well (If more than one)
Abandoned ☒ New well ☒ Deepened ☐ Reconditioned ☐ Method Dug ☐ Cable ☐ Rotary ☒ Bored ☐ Driven ☐ Jetted ☐

(5) DIMENSIONS Diameter of well 8" bore inches
Drilled 107 feet. Depth of completed well 0 ft

(6) CONSTRUCTION DETAILS none - all removed
Casing Installed ____" Diam from ____ ft to ____ ft
Welded ☐ ____" Diam from ____ ft to ____ ft
Liner installed ☐
Threaded ☐ ____" Diam from ____ ft to ____ ft

Perforations Yes ☐ No ☒
Type of perforator used
SIZE of perforations ____ in by ____ in
____ perforations from ____ ft to ____ ft
____ perforations from ____ ft to ____ ft
____ perforations from ____ ft to ____ ft

Screens Yes ☐ No ☒
Manufacturer's Name
Type ____ Model No
Diam ____ Slot size ____ from ____ ft to ____ ft
Diam ____ Slot size ____ from ____ ft to ____ ft

Gravel packed Yes ☐ No ☒ Size of gravel
Gravel placed from ____ ft to ____ ft

Surface seal Yes ☒ No ☐ To what depth? 107 ft
Material used in seal cement grout for abandonment
Did any strata contain unusable water? Yes ☐ No ☐
Type of water? ____ Depth of strata
Method of sealing strata off

(7) PUMP. Manufacturer's Name
Type ____ H P

(8) WATER LEVELS: Land surface elevation above mean sea level approx 380 ft
Static level 13 before abandonment ft below top of well Date 9/6/00
Artesian pressure ____ lbs per square inch Date
Artesian water is controlled by ____ (Cap valve etc)

(9) WELL TESTS Drawdown is amount water level is lowered below static level
Was a pump test made? Yes ☐ No ☒ If yes by whom?
Yield ____ gal /min with ____ ft drawdown after ____ hrs
" " " "
" " " "

Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level

Date of test
Bailer test ____ gal /min with ____ ft drawdown after ____ hrs
Airtest 15 gal /min with stem set at 107 ft for 1 hrs
Artesian flow ____ g p m Date
Temperature of water ~55° Was a chemical analysis made? Yes ☐ No ☒

(10) WELL LOG or ABANDONMENT PROCEDURE DESCRIPTION

Formation: Describe by color, character size of material and structure and show thickness of aquifers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of information

MATERIAL	FROM	TO
Sand, brown, fine	0	10
Gravel, pea & sand, brown, coarse	10	18
Gravel, medium w/sand, brown	18	22
Basalt, brown, weathered	22	25
Gravel, large w/sand, brown	25	28
Basalt, brown & gray, frac	28	33
Basalt, gray, hard, frac	33	40
Basalt, red w/brown, weathered,	40	
vesicular w/claystone, brown		50
Basalt, black, hard, vesicular	50	52
Basalt, black & gray, frac, hard	52	53
Basalt, gray, hard	53	60
Basalt, gray, hard w/light blue quartz	60	107
in seams		
Abandoned by pumping neat cement grout		
from bottom to top.		

RECEIVED
MAY 2 4 2001
DEPARTMENT OF ECOLOGY
WELL DRILLING UNIT

RECEIVED
MAY 2 9 2001
DEPARTMENT OF ECOLOGY
EASTERN REGIONAL OFFICE

Work Started 8/30/00 19 Completed 5/9/01, 19

WELL CONSTRUCTOR CERTIFICATION

I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards Materials used and the information reported above are true to my best knowledge and belief

NAME Schneider Equipment, Inc.
(PERSON FIRM OR CORPORATION) (TYPE OR PRINT)
Address 21881 River Rd NE, St. Paul, OR 97137
(Signed) [signature] License No 0643
(WELL DRILLER)
Contractor's Registration No SCHNEI*226LG Date 5/15/01, 19

(USE ADDITIONAL SHEETS IF NECESSARY)

Ecology is an Equal Opportunity and Affirmative Action employer For special accommodation needs, contact the Water Resources Program at (206) 407-6600 The TDD number is (206) 407-6006

ECY 050 1 20 (9/93)

The Department of Ecology does NOT Warranty the Data and/or the Information on this Well Report.

66

File Original and First Copy with Department of Ecology
Second Copy — Owner's Copy
Third Copy — Driller's Copy

94823

WATER WELL REPORT

STATE OF WASHINGTON

Start Card No W07491
UNIQUE WELL I D # AAS276
Water Right Permit No

(1) OWNER Name Port of Walla Walla Address 310 "A" St., Walla Walla Regional A/P, Walla Walla, WA 99362

(2) LOCATION OF WELL County Walla Walla — SE 1/4 SW 1/4 Sec 34 T 8 N R 31E WM

(2a) STREET ADDRESS OF WELL (or nearest address) 34266 Hwy 12, Walulla, WA (nearest)

(3) PROPOSED USE ☐ Domestic ☐ Irrigation ☐ DeWater Industrial ☒ Test Well ☐ Municipal ☐ Other ☐

(4) TYPE OF WORK Owner's number of well (If more than one) Dodd Rd Ind Pk #1
Abandoned ☐ New well ☒ Deepened ☐ Reconditioned ☐ Method Dug ☐ Cable ☐ Rotary ☒ Bored ☐ Driven ☐ Jetted ☐

(5) DIMENSIONS Diameter of well 16 x 12 inches
Drilled 861 feet Depth of completed well 861 ft

(6) CONSTRUCTION DETAILS.
Casing installed 16 " Diam from +3 ft to 497 ft
Welded ☒ " Diam from ft to ft
Liner installed ☒ 12 " Diam from 482 ft to 859 ft
Threaded ☐ except at screen

Perforations Yes ☒ No ☐
Type of perforator used factory milled
SIZE of perforations 3/16 in by 3 in
912 perforations from 528 ft to 548 ft
7536 perforations from 588 ft to 753 ft
3840 perforations from 774 ft to 858 ft

Screens Yes ☒ No ☐
Manufacturer's Name Houston
Type V shape wire wrap Model No 304 SS
Diam 12 Slot size .150 from 753 ft to 774 ft
Diam Slot size from ft to ft

Gravel packed Yes ☐ No ☒ Size of gravel
Gravel placed from ft to ft

Surface seal Yes ☒ No ☐ To what depth? 497 ft
Material used in seal cement grout
Did any strata contain unusable water? Yes ☐ No ☐
Type of water? Depth of strata
Method of sealing strata off

(7) PUMP Manufacturer's Name
Type H P

(8) WATER LEVELS: Land surface elevation above mean sea level approx 380 ft
Static level 57 ft below top of well Date 4/30/01
Artesian pressure lbs per square inch Date
Artesian water is controlled by (Cap valve etc)

(9) WELL TESTS Drawdown is amount water level is lowered below static level
Was a pump test made? Yes ☒ No ☐ If yes, by whom? SEI
Yield gal /min with ft drawdown after hrs
" see attached graph " "
" " " "

Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level
	see attached graph				

Date of test 4/30/01 - 5/1/01
Bailer test gal /min with ft drawdown after hrs
Airtest gal /min with stem set at ft for hrs
Artesian flow g p m Date
Temperature of water 72°F Was a chemical analysis made? Yes ☒ No ☐

(10) WELL LOG or ABANDONMENT PROCEDURE DESCRIPTION

Formation Describe by color character size of material and structure, and show thickness of aquifers and the kind and nature of the material in each stratum penetrated with at least one entry for each change of information

MATERIAL	FROM	TO
see attached log		

RECEIVED
MAY 2 4 2001
DEPARTMENT OF ECOLOGY
WELL DRILLING UNIT

MAY 2 9 2001
EASTERN REGIONAL OFFICE

Work Started 2/22/00 19 Completed 5/9/01 , 19

WELL CONSTRUCTOR CERTIFICATION

I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards Materials used and the information reported above are true to my best knowledge and belief

NAME Schneider Equipment, Inc. (PERSON FIRM OR CORPORATION) (TYPE OR PRINT)
Address 21891 River Rd NE, St. Paul, OR 97137
(Signed) [signature] (WELL DRILLER) License No 0643
Contractor's Registration No SCHNEI*226LG Date 5/15/01 , 19

(USE ADDITIONAL SHEETS IF NECESSARY)

Ecology is an Equal Opportunity and Affirmative Action employer For special accommodation needs, contact the Water Resources Program at (206) 407-6600 The TDD number is (206) 407-6006

66

Port of Walla Walla Dodd Road Industrial Park Well
by Schneider Drilling Co.
SC# W07491 - Label # AAS276

FM	TO	DESCRIPTION
0	7	Silty loam, brown
7	12	Sand, black w/ gravel, small
12	18	Sand, grey, med-fine, w/ clay
18	22	Gravel, medium w/ sand, brown
22	25	Basalt, brown, weathered
25	28	Gravel, w/sand, brown
28	33	Basalt, brown & gray, fractured
33	40	Basalt, grey, hard, fractured
40	50	Basalt, red, weathered, porous w/ claystone, brown
50	52	Basalt, black, hard, vesicular
52	53	Basalt, black and gray, hard, fractured
53	60	Basalt, gray, hard
60	109	Basalt, gray, hard, w/ seams of quarts, blue
109	125	Basalt, black and gray, medium-hard
125	135	Basalt, black, fractured w/ claystone, green
135	150	Claystone, gray-green-white
150	160	Sandstone, hard, coarse w/ some claystone, green-gray-white
160	162	Claystone, green & gray
162	181	Sandstone, dark green, fine, medium hard w/ white crystal
181	200	Basalt, black, medium hard, vesicular w/ some claystone, green
200	222	Basalt, gray, hard, fractured, crystal seams
222	264	Basalt, gray, hard
264	268	Basalt, gray, medium hard, w/ clay, gray, soft
268	275	Sandstone, green & gray, coarse w/ clay, green
275	280	Claystone & clay, green, soft
280	288	Claystone & clay, gray, soft
288	309	Clay, gray, soft
309	320	Basalt, gray, vesicular
320	333	Basalt, gray, fractured, vesicular w/ crystals
333	340	Basalt, gray, fractured, vesicular w/ claystone, gray
340	364	Basalt, gray, fractured, vesicular w/ claystone, green

66

364	373	Basalt, gray, very hard
373	386	Basalt, gray, fractured, vesicular
386	390	Claystone/sandstone, dark blue, coarse, broken
390	407	Basalt, gray-black, hard, very fractured
407	471	Basalt, gray, hard
471	476	Basalt, gray, medium hard, fractured
476	507	Basalt, gray, hard
507	537	Basalt, gray, fractured, w/broken lenses
537	543	Claystone, green w/ some basalt, gray, vesicular
543	545	Basalt, gray, medium-hard
545	550	Claystone, green w/ some basalt, gray
550	567	Claystone, green
567	575	Claystone, green w/ some basalt, gray
575	577	Basalt, gray, medium-hard
577	590	Claystone, green & gray w/ some basalt, gray
590	601	Basalt, gray, medium, vesicular
601	606	Basalt, gray, medium, fractured, broken
606	616	Basalt, gray, hard, fractured
616	626	Basalt, black, medium, fractured w/some claystone, green
626	644	Basalt, gray, medium, fractured
644	650	Basalt, gray, hard, some fractures
650	653	Basalt, gray, hard, fractured w/brown seams
653	676	Basalt, gray, hard, some fractures
676	759	Basalt, dark gray, medium, fractured
759	767	Basalt, dark gray, medium, fractured, some vesicular
767	783	Basalt, dark gray, medium, fractured
783	838	Basalt, dark gray, very hard, some fractures
838	840	Basalt, blue-brown-gray, medium-soft, fractured
840	844	Clay, blue-brown-gray, medium-soft
844	846	Claystone, gray w/green, hard
846	848	Basalt, gray & brown & claystone, green & gray, medium-hard, fracture
848	851	Basalt, gray, hard, fractured, vesicular w/claystone, green
851	854	Basalt, grey, medium-hard, some fractures w/white crystals
854	861	Basalt, grey, medium-hard, some fractures

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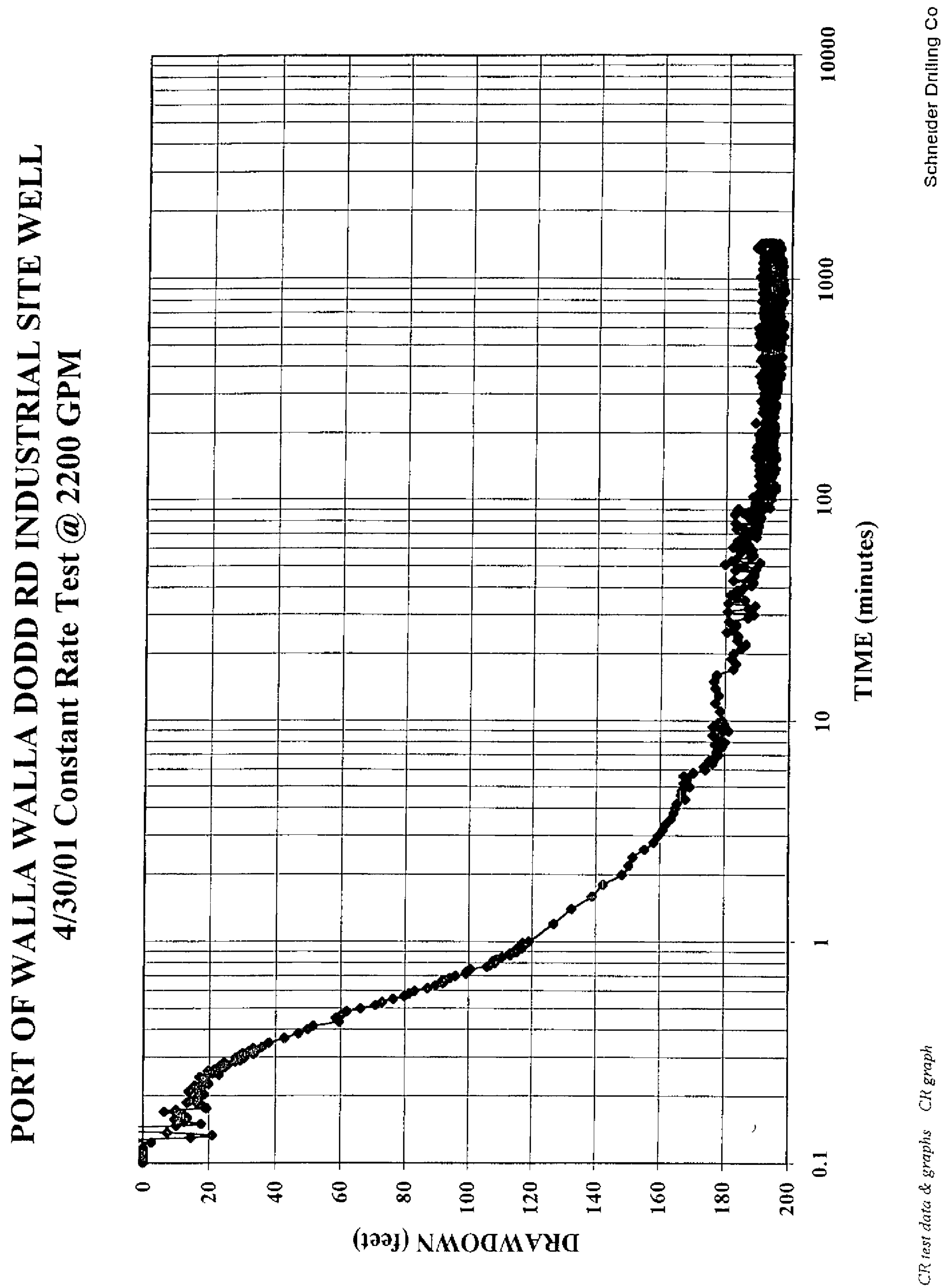
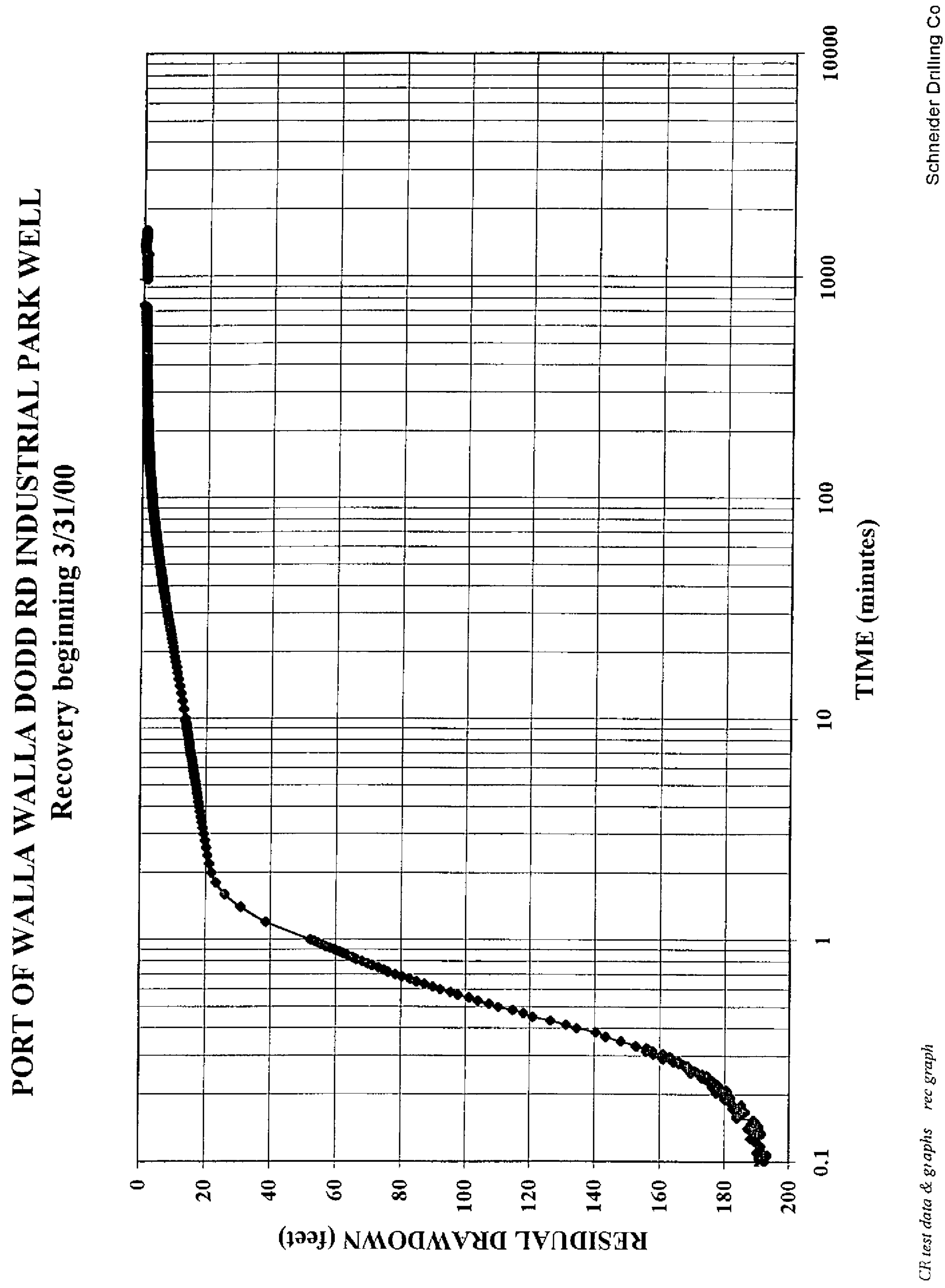

PORT OF WALLA WALLA DODD RD INDUSTRIAL SITE WELL
4/30/01 Constant Rate Test @ 2200 GPM
DRAWDOWN (feet)
0
20
40
60
80
100
120
140
160
180
200
TIME (minutes)
0.1
1
10
100
1000
10000
CR test data & graphs
CR graph
Schneider Drilling Co

66


PORT OF WALLA WALLA DODD RD INDUSTRIAL PARK WELL
Recovery beginning 3/31/00
RESIDUAL DRAWDOWN (feet)
0
20
40
60
80
100
120
140
160
180
200
TIME (minutes)
0.1
1
10
100
1000
10000
Schneider Drilling Co
CR test data & graphs rec graph

485114

Please print, sign and return by mail to Department of Ecology

RESOURCE PROTECTION WELL REPORT

CURRENT Notice of Intent No. SE47999

(SUBMIT ONE WELL REPORT PER WELL INSTALLED)

67

Construction/Decommission *(select one)*

☑ Construction

☐ Decommission *ORIGINAL INSTALLATION Notice of Intent Number* ________

Type of Well *(select one)*

☐ Resource Protection

☑ Geotech Soil Boring

Consulting Firm ANDERSON PERRY & ASSOCIATES

Unique Ecology Well ID Tag No. ________

Property Owner PORT OF WALLA WALLA

Site Address 46.124465° -118.878363°

City WALLULA County WALLA WALLA

Location SW 1/4-1/4 SE 1/4 Sec 34 Twn 8N R 31 Select One ☒ EWM ☐ WWM

WELL CONSTRUCTION CERTIFICATION: I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards. Materials used and the information reported above are true to my best knowledge and belief.

Lat/Long (s, t, r still REQUIRED) Lat Deg ____ Lat Min/Sec ____ Long Deg ____ Long Min/Sec ____

☑ Driller ☐ Engineer ☐ Trainee Name (Print) MIKE CORN

Driller/Engineer /Trainee Signature [signature]

Driller or Trainee License No. 2833

Tax Parcel No. ________

Cased or Uncased Diameter 8.5" Static Level DRY

Work/Decommission Start Date 04/30/2013

Work/Decommission Completed Date 04/30/2013

If trainee, licensed driller's Signature and License No. 2833

Construction/Design	Well Data	Formation Description
HSA TO A DEPTH OF 70' BGS.	B-2 4.25" I.D. HSA 34 BAGS 3/8" BENTONITE	0-70 VERY FINE SAND, TAN

NOT TO SCALE

485115 Please print, sign and return by mail to Department of Ecology

RESOURCE PROTECTION WELL REPORT

CURRENT Notice of Intent No. AE21574

67

(SUBMIT ONE WELL REPORT PER WELL INSTALLED)

Construction/Decommission *(select one)*

☐ Construction

☑ Decommission *ORIGINAL INSTALLATION Notice of Intent Number* SE47999

Type of Well *(select one)*

☐ Resource Protection

☑ Geotech Soil Boring

Consulting Firm ANDERSON PERRY & ASSOCIATES

Unique Ecology Well ID Tag No.

Property Owner PORT OF WALLA WALLA

Site Address 46.124465° -118.878363°

City WALLULA County WALLA WALLA

Location SW 1/4-1/4 SE 1/4 Sec 34 Twn 8N R 31 Select One ☒ EWM ☐ WWM

WELL CONSTRUCTION CERTIFICATION: I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards. Materials used and the information reported above are true to my best knowledge and belief.

☑ Driller ☐ Engineer ☐ Trainee Name (Print) MIKE CORN

Driller/Engineer /Trainee Signature Michael C

Driller or Trainee License No. 2833

If trainee, licensed driller's Signature and License No. 2833

Lat/Long (s, t, r still REQUIRED) Lat Deg ____ Lat Min/Sec ____

Long Deg ____ Long Min/Sec ____

Tax Parcel No.

Cased or Uncased Diameter 8.5" Static Level DRY

Work/Decommission Start Date 04/30/2013

Work/Decommission Completed Date 04/30/2013

Construction/Design	Well Data	Formation Description
HSA TO A DEPTH OF 70' BGS. PULL OUT THE AUGERS AND INSTALL 34 BAGS OF 3/8" BENTONITE CHIPS UNTIL 1' BGS THEN DRILL CUTTINGS TO MATCH THE SURFACE.	B-2 4.25" I.D. HSA 34 BAGS 3/8" BENTONITE	0-70 VERY FINE SAND, TAN

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MAY 20 2013
DEPARTMENT OF ECOLOGY
EASTERN REGIONAL OFFICE

NOT TO SCALE 1 1

485116 Please print, sign and return by mail to Department of Ecology

RESOURCE PROTECTION WELL REPORT

CURRENT Notice of Intent No. SE47998

(SUBMIT ONE WELL REPORT PER WELL INSTALLED)

Construction/Decommission *(select one)*

☑ Construction

☐ Decommission *ORIGINAL INSTALLATION Notice of Intent Number* ______

Type of Well *(select one)*

☐ Resource Protection

☑ Geotech Soil Boring

68

Consulting Firm ANDERSON PERRY & ASSOCIATES

Unique Ecology Well ID Tag No. ______

WELL CONSTRUCTION CERTIFICATION: I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards. Materials used and the information reported above are true to my best knowledge and belief.

☑ Driller ☐ Engineer ☐ Trainee Name (Print) MIKE CORN

Driller/Engineer /Trainee Signature [signature]

Driller or Trainee License No. 2833

If trainee, licensed driller's Signature and License No. 2833

Property Owner PORT OF WALLA WALLA

Site Address 46.124586° -118.921592°

City WALLULA County WALLA WALLA

Location SE 1/4-1/4 SW 1/4 Sec 34 Twn 8N R 31 Select One ☒ EWM ☐ WWM

Lat/Long (s, t, r still REQUIRED) Lat Deg ______ Lat Min/Sec ______ Long Deg ______ Long Min/Sec ______

Tax Parcel No. ______

Cased or Uncased Diameter 8.5" Static Level 13

Work/Decommission Start Date 04/30/2013

Work/Decommission Completed Date 04/30/2013

Construction/Design	Well Data	Formation Description
HSA TO A DEPTH OF 25' BGS.	B-1 4.25" I.D. HSA 11 BAGS 3/8" BENTONITE	0-.5 PARKING LOT GRAVEL. .5-7 SAND TAN, FINE GRAIN. 7-8 SAND W/ GRAVEL LAYER. 8-20 SAND TAN, FINE GRAIN 20-23 SAND AND GRAVEL. 23-25 WEATHERED BASALT BEDROCK.

RECEIVED
MAY 20 2013
DEPARTMENT OF ECOLOGY
EASTERN REGIONAL OFFICE

485117 Please print, sign and return by mail to Department of Ecology

RESOURCE PROTECTION WELL REPORT

CURRENT Notice of Intent No. AE21573

(SUBMIT ONE WELL REPORT PER WELL INSTALLED)

Construction/Decommission *(select one)*
☐ Construction
☑ Decommission *ORIGINAL INSTALLATION Notice of Intent Number* SE47998

Type of Well *(select one)*
☐ Resource Protection
☑ Geotech Soil Boring

68

Consulting Firm ANDERSON PERRY & ASSOCIATES
Unique Ecology Well ID
Tag No.

Property Owner PORT OF WALLA WALLA
Site Address 46.124586° -118.921592°
City WALLULA County WALLA WALLA
Location SE 1/4-1/4 SW 1/4 Sec 34 Twn 8N R 31 Select One ☒ EWM ☐ WWM

WELL CONSTRUCTION CERTIFICATION: I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards. Materials used and the information reported above are true to my best knowledge and belief.

☑ Driller ☐ Engineer ☐ Trainee Name (Print) MIKE CORN
Driller/Engineer /Trainee Signature Michael C
Driller or Trainee License No. 2833

If trainee, licensed driller's Signature and License No. 2833

Lat/Long (s, t, r still REQUIRED) Lat Deg Lat Min/Sec
Long Deg Long Min/Sec
Tax Parcel No.
Cased or Uncased Diameter 8.5" Static Level 13
Work/Decommission Start Date 04/30/2013
Work/Decommission Completed Date 04/30/2013

Construction/Design	Well Data	Formation Description
HSA TO A DEPTH OF 25' BGS. PULL OUT THE AUGERS AND INSTALL 11 BAGS OF 3/8" BENTONITE CHIPS UNTIL 1' BGS THEN DRILL CUTTINGS AND GRAVEL TO MATCH THE SURFACE.	B-1 4.25" I.D. HSA 11 BAGS 3/8" BENTONITE	0-.5 PARKING LOT GRAVEL. .5-7 SAND TAN, FINE GRAIN. 7-8 SAND W/ GRAVEL LAYER. 8-20 SAND TAN, FINE GRAIN 20-23 SAND AND GRAVEL. 23-25 WEATHERED BASALT BEDROCK. RECEIVED MAY 20 2013 DEPARTMENT OF ECOLOGY EASTERN REGIONAL OFFICE

NOT TO SCALE 1 1

69

File Original and First Copy with Department of Ecology
Second Copy — Owner's Copy
Third Copy — Driller's Copy

WATER WELL REPORT

STATE OF WASHINGTON

Start Card No. R 17896
UNIQUE WELL I.D. # ACP 719
Water Right Permit No.

OWNER: Name Simplot Feeders Address 20876 Wagner Road, Caldwell Id 83605

(2) **LOCATION OF WELL:** County Walla Walla SW 1/4 SE 1/4 Sec 34 T 8 N., R 31 E W.M.

(2a) **STREET ADDRESS OF WELL** (or nearest address) Dodd Iowa Beef Rd.

(3) **PROPOSED USE:** ☐ Domestic ☐ Irrigation ☐ DeWater Industrial ☐ Test Well ☑ Municipal ☐ Other ☐

(4) **TYPE OF WORK:** Owner's number of well (If more than one) MW #5
Abandoned ☐ New well ☑ Deepened ☐ Reconditioned ☐ Method: Dug ☐ Cable ☐ Rotary ☑ Bored ☐ Driven ☐ Jetted ☐

(5) **DIMENSIONS:** Diameter of well 8 inches.
Drilled 47 feet. Depth of completed well 47 ft.

(6) **CONSTRUCTION DETAILS:**
Casing Installed: 4" Diam. from +2.5 ft. to 32 ft.
Welded ☐ Liner installed ☐ Threaded ☑ " Diam. from ft. to ft.
" Diam. from ft. to ft.

Perforations: Yes ☐ No ☑
Type of perforator used
SIZE of perforations in. by in.
perforations from ft. to ft.
perforations from ft. to ft.
perforations from ft. to ft.

Screens: Yes ☑ No ☐
Manufacturer's Name Johnson
Type Sch 40 Model No.
Diam. 4" Slot size .020 from 32 ft. to 47 ft.
Diam. Slot size from ft. to ft.

Gravel packed: Yes ☑ No ☐ Size of gravel 8/12
Gravel placed from 29 ft. to 47 ft.

Surface seal: Yes ☑ No ☐ To what depth? 29 ft.
Material used in seal Grout 0-25 Chips 25-29
Did any strata contain unusable water? Yes ☐ No ☐
Type of water? Depth of strata
Method of sealing strata off

(7) **PUMP:** Manufacturer's Name N/A
Type: H.P.

(8) **WATER LEVELS:** Land-surface elevation above mean sea level ft.
Static level 28.65 ft. below top of well Date
Artesian pressure lbs. per square inch Date
Artesian water is controlled by (Cap, valve, etc.)

(9) **WELL TESTS:** Drawdown is amount water level is lowered below static level
Was a pump test made? Yes ☐ No ☑ If yes, by whom?
Yield: gal./min. with ft. drawdown after hrs.
" " " "
" " " "
Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level

Date of test
Bailer test gal./min. with ft. drawdown after hrs.
Airtest gal./min. with stem set at ft. for hrs.
Artesian flow g.p.m. Date
Temperature of water Was a chemical analysis made? Yes ☐ No ☐

(10) **WELL LOG or ABANDONMENT PROCEDURE DESCRIPTION**

Formation: Describe by color, character, size of material and structure, and show thickness of aquifers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of information.

MATERIAL	FROM	TO
Fine Sand	0	39
Fine Sand w/silt	39	41
Gravel w/silt & sand	41	42
Basalt Gravel	42	47

Work Started 6/18, 19. Completed 6/18, 19 97

WELL CONSTRUCTOR CERTIFICATION:

I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards. Materials used and the information reported above are true to my best knowledge and belief.

NAME Environmental West Exp (PERSON, FIRM, OR CORPORATION) (TYPE OR PRINT)
Address PO Box 11095 Spokane Wa 99211
(Signed) (WELL DRILLER) License No. 2271
Contractor's Registration No. ENVIRWE101PP Date 6-20, 19 97

(USE ADDITIONAL SHEETS IF NECESSARY)

Ecology is an Equal Opportunity and Affirmative Action employer. For special accommodation needs, contact the Water Resources Program at (206) 407-6600. The TDD number is (206) 407-6006.

ECY 050-1-20 (9/93)

70

File Original and First Copy with Department of Ecology
Second Copy — Owner's Copy
Third Copy — Driller's Copy

WATER WELL REPORT

STATE OF WASHINGTON

Start Card No. W 09704
UNIQUE WELL I.D. # AAP 536
Water Right Permit No.

(1) **OWNER:** Name Simplot Feeders Inc Address 13981 Dodd Rd Burbank, WA 99323

LOCATION OF WELL: County Walla-Walla SE 1/4 SE 1/4 Sec 34 T. 8 N., R 31 W.M.

(2a) **STREET ADDRESS OF WELL** (or nearest address) 13981 Dodd Rd

(3) **PROPOSED USE:** ☐ Domestic ☐ Irrigation ☐ DeWater Industrial ☒ Test Well ☐ Municipal ☐ Other ☐

(4) **TYPE OF WORK:** Owner's number of well (If more than one) Replacement Well #2
Abandoned ☐ New well ☒ Deepened ☐ Reconditioned ☐ Method: Dug ☐ Cable ☐ Rotary ☐ Bored ☐ Driven ☐ Jetted ☐

(5) **DIMENSIONS:** Diameter of well 16 inches.
Drilled 915 feet. Depth of completed well 915 ft.

(6) **CONSTRUCTION DETAILS:**
Casing Installed: 16 " Diam. from +2 ft. to 632 ft.
Welded ☒ Liner installed ☒ Threaded ☐ " Diam. from ft. to ft.
12 " Diam. from 625 ft. to 915 ft.

Perforations: Yes ☒ No ☐
Type of perforator used Fact
SIZE of perforations 3/16 in. by 2 in.
Double Row perforations from 625 ft. to 915 ft.
perforations from ft. to ft.
perforations from ft. to ft.

Screens: Yes ☐ No ☒
Manufacturer's Name
Type Model No.
Diam. Slot size from ft. to ft.
Diam. Slot size from ft. to ft.

Gravel packed: Yes ☐ No ☒ Size of gravel
Gravel placed from ft. to ft.

Surface seal: Yes ☒ No ☐ To what depth? 635 ft.
Material used in seal Cement
Did any strata contain unusable water? Yes ☐ No ☒
Type of water? Depth of strata
Method of sealing strata off See attached Sheet

(7) **PUMP:** Manufacturer's Name
Type: H.P.

(8) **WATER LEVELS:** Land-surface elevation above mean sea level ft.
Static level 128 ft. below top of well Date 5-16-00
Artesian pressure lbs. per square inch Date
Artesian water is controlled by (Cap, valve, etc.)

(9) **WELL TESTS:** Drawdown is amount water level is lowered below static level
Was a pump test made? Yes ☐ No ☒ If yes, by whom?
Air Yield: 800+ gal./min. with ft. drawdown after hrs.

Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level

Date of test 5-15-00
Bailer test gal./min. with ft. drawdown after hrs.
Airtest 800 gal./min. with stem set at 500 ft. for 2 hrs.
Artesian flow g.p.m. Date
Temperature of water Was a chemical analysis made? Yes ☐ No ☒

(10) **WELL LOG or ABANDONMENT PROCEDURE DESCRIPTION**

Formation: Describe by color, character, size of material and structure, and show thickness of aquifers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of information.

MATERIAL	FROM	TO
See Attached		

RECEIVED
JUN 2 1 2000
SWRO

RECEIVED
JUN 2 6 2000
EASTERN REGIONAL OFFICE

Work Started 1/17/00, 19. Completed 5/16/00, 19

WELL CONSTRUCTOR CERTIFICATION:

I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards. Materials used and the information reported above are true to my best knowledge and belief.

NAME STACo by Chuck Stadeli (PERSON, FIRM, OR CORPORATION) (TYPE OR PRINT)
Address
(Signed) (WELL DRILLER) License No. 0857
Contractor's Registration No. Date 6-14-00, 19 00

(USE ADDITIONAL SHEETS IF NECESSARY)

Ecology is an Equal Opportunity and Affirmative Action employer. For special accommodation needs, contact the Water Resources Program at (206) 407-6600. The TDD number is (206) 407-6006.

The Department of Ecology does NOT Warranty the Data and/or the Information on this Well Report.

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Simplot Feeders

0 - 65	Sand and Small Gravel	
65 - 100	Sand and Cobles	
100 - 106	Broken Weathered Basalt	
106 - 108	Black Basalt	
108 - 115	Basalt Weathered Brown Gray	
115 - 132	Basalt Gray Hard	
132 - 135	Basalt Vesic Maroon/Lavender	
135 - 149	Claystone Green Firm to Hard	
149 - 181	Basalt Gray Hard	
181 - 185	Basalt Gray Fract	
185 - 246	Claystone Green some Gray w/occ basalt lense	
246 - 260	Basalt Black Vesic WB	
260 - 316	Basalt Gray Hard	
316 - 324	Basalt Gray Fract	
324 - 373	Claystone Green Firm but Silty (363 - 365 Penetration Increased & Lost Circ.)	
373 - 382	Basalt Gray Vesic	
382 - 600	Basalt Gray hard w/Continuous Intermittent Fract (440 - 441 Penetration Increased Dramaticly Mud Thinned Suspect WB) (490 - 501 Highly Fract/Broken)	
600 - 615	Claystone Green Firm	
615 - 621	Claystone Green Firm w/Basalt Lenses	
621 - 630	Basalt Gray Hard	
630 - 645	Lava Brown w/occ Claystone Green WB	
645 - 654	Basalt Gray/Brown Vesic WB	
654 - 679	Basalt Gray Hard w/occ Fract	
679 - 682	Basalt Hard Fract Black	
682 - 689	Basalt Gray Well Fract w/Green Claystone WB	
689 - 706	Basalt Gray/Brown/Green Vesic w/some Claystone Green	
706 - 717	Basalt Gray Hard Fract	
717 - 721	Basalt Gray Hard Well Fract WB	
721 - 770	Basalt Hard occ Fract WB	
770 - 830	Basalt Dark Gray Very Hard Fract WB	
830 - 880	Basalt Dark Gray Very Hard occ Fract WB	
880 - 885	Basalt Med Hard Gray/Green/Brown Fract WB	
885 - 913	Basalt Gray/Brown Vesic w/Claystone Green WB	
913 - 915	Basalt Gray Med-Hard WB	

70

20" temp casing Installed from l.s. to 103' nominal 20" hole drilling to 629'. 629' of 16" steel casing installed. Neat cement grout installed from 507' to 629'.

Pea gravel backfill installed from 507' up to 157', neat cement grout installed from 157' to l.s. as 20" temp casing was removed.

Gravel backfill was installed in lieu of cement from 157' to 507' as landowner was utilizing old existing well 40' away and the existing well production zone is believed to be from 185' to 480'.

Cement contamination/migration to the existing well was eliminated utilizing this construction method.

71

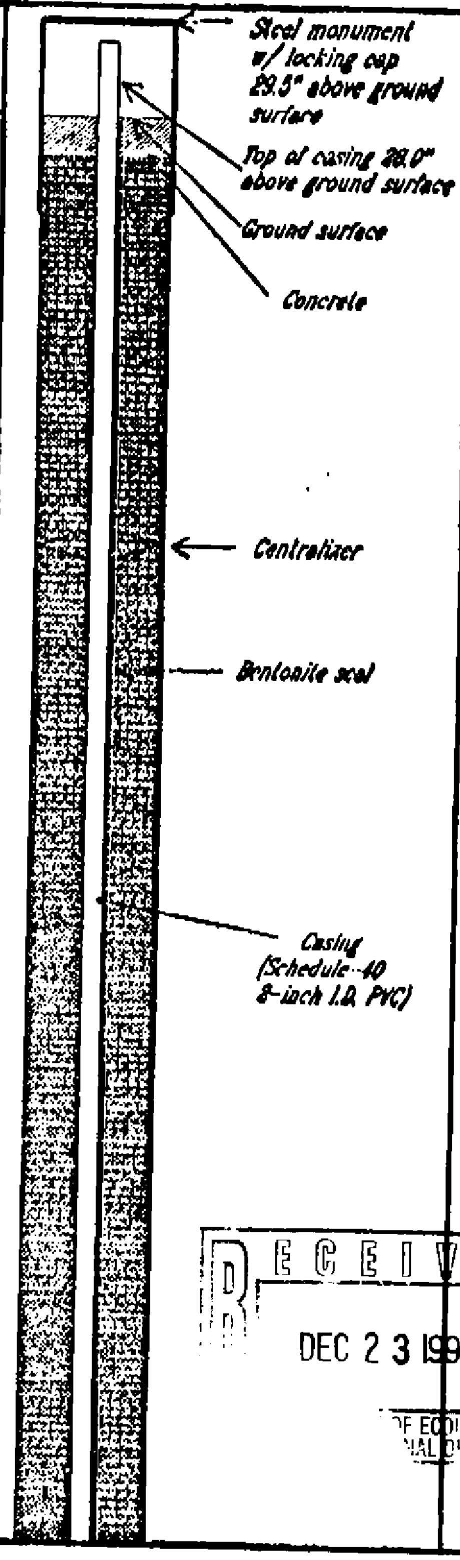
S 35 T8 R31

PROJECT *IBP Wallula Plant* W.O. *S-1061* WELL NO. *MW-3(a)*

Elevation reference:
Ground surface elevation: Casing elevation:

DEPTH (feet)	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	BLOW COUNTS	OVM READING	GROUND WATER
0						
10	*(Medium stiff to hard) dry, tan to light brown, SILT with fine sand and clay interbedded with hard, dry, white CALICHE*					
20	*(Hard) dry, white CALICHE*					
30	*(Medium stiff) damp, light brown, fine sandy SILT to clayey SILT*					
	(Stiff) damp, tan, gravelly SILT w/caliche					
40	*(Stiff) dry to damp, light brown SILT w/clay*					
	(Hard to stiff) damp to moist, brown to oxidized brown CLAY with silt. Some bluish gray clay intervals					
50						
60	(Stiff) damp, light brown, SILT with some fine sand and scattered gravel. Few clay interbeds below 65 feet.					

AS-BUILT DESIGN



TESTING

RECEIVED
DEC 23 1992
DEPT OF ECOLOGY

RUEN DRILLING, INC.
BOX 267
CLARK FORK, ID 83811
(208) 266-1151

LEGEND

- - - Inferred stratigraphic contact
SWL elevations and date of measurement

PERMIT # 056011
2035

RZA AGRA, Inc.
Engineering & Environmental Services
539 West Sharp, Suite D
Spokane, WA 99201

Drilling started: *4 August 1992* Drilling completed: *6 August 1992* Logged by: *ENJS*

71

KSTE.
WALLA WALLA

PROJECT *IBP Wallula Plant* W.O. *S-1061* WELL NO. *MW-3(b)*

Elevation reference:
Ground surface elevation: Casing elevation:

DEPTH (feet)	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	BLOW COUNTS	OVM READING	GROUND WATER	AS-BUILT DESIGN	TESTING
60	*(Stiff) damp, light brown, SILT with some fine sand and scattered gravel. Few clay interbeds below 65 feet.*							
70	*(Medium stiff-stiff) damp, gray-brown to bluish-brown CLAY.*							
80							*Centralizer*	
							Bentonite seal	
90	*(Stiff) damp, light brown, fine sandy SILT with wet clay interbeds. CLAY becoming more abundant with depth.*						*Casing (schedule - 40 8-inch I.D. PVC)*	
100								
110								
	(Dense) damp, brown, silty coarse SAND.							
120								

RECEIVED
DEC 2 3 1992

LEGEND

- - - Inferred stratigraphic contact

DATE SWL elevations and date of measurement

RZA AGRA, Inc.
Engineering & Environmental Services
539 West Sharp, Suite D
Spokane, WA 99201

Drilling started: *4 August 1992* Drilling completed: *6 August 1992* Logged by: *ENJS*

71

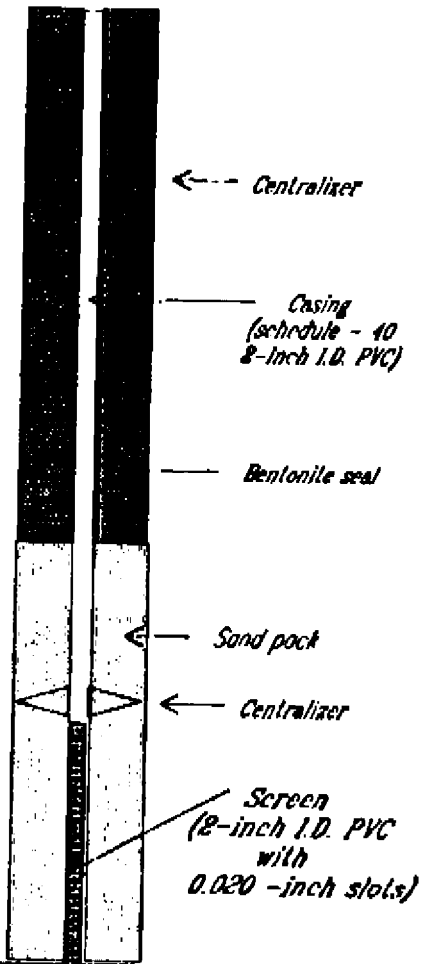
R31E.

PROJECT *IBP Wallula Plant* W.O. *S-1061* WELL NO. *MW-3(c)*

Elevation reference:
Ground surface elevation: Casing elevation:

DEPTH (feet)	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	BLOW COUNTS	OVM READING	GROUND WATER
120	*(Stiff) damp, bluish and brown CALYS*					
						8/10/92
130	*(Stiff) damp, brown, CLAY and SILT with brown sandy GRAVEL lenses*					
140						
150	*(Dense) damp, brown silty coarse SAND with gravel and clay.*					
160	*Boring terminated at approximately 160 feet.*					
170						
180						

AS-BUILT DESIGN



TESTING

RECEIVED
DEC 23 1992

LEGEND

- - - Inferred stratigraphic contact

DATE SWL elevation and date of measurement

RZA AGRA, Inc.
Engineering & Environmental Services
539 West Sharp, Suite D
Spokane, WA 99201

Drilling started: *4 August 1992* Drilling completed: *6 August 1992* Logged by: *ENJS*

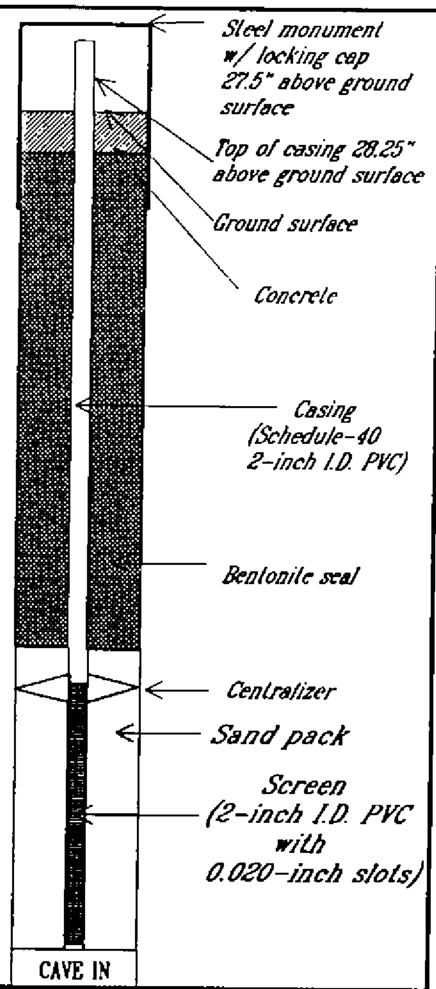
72

PROJECT *IBP Wallula Plant* W.O. *S-1061* WELL NO. *MW-4*

Elevation reference:
round surface elevation: *411.5* Casing elevation: *413.62*

DEPTH (feet)	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	BLOW COUNTS	OVM READINGS	GROUND WATER
0	*(Loose) dry, tan SILT (Loess)*					
	(Dense) damp, brown, silty SAND with gravel					
	(Dense) moist, dark brown, fine to medium SAND with some silt and gravel. Some caliche on gravels.					
10	*(Dense to Very Dense) moist, brown to dark brown SAND with gravel and cobbles.*					
	(Dense) moist, brown, gravelly, medium to coarse SAND with silt. Few thin clay interbeds from 14.0 to 15.5 feet.					
	(Dense) damp, brown, micaceous, fine SAND with silt.					
20	*(Dense to Very Dense) damp to wet, brown, gravelly SAND*					
	(Very Dense) wet, brown, sandy GRAVELS and COBBLES					8/6/92
30	*(Dense) saturated, dark brown to black, sandy GRAVEL with silt. Interbedded brown, wet, gravelly SANDS from 30.0 to 33.0 feet.*					
	Boring terminated at approximately 37.8 feet.					
40						
50						
60						

AS-BUILT DESIGN



TESTING

LEGEND

- - - Inferred stratigraphic contact

▼ DATE SWL elevations and date of measurement

Start card info #056010
SE 1/4 NE 1/4 SW 1/4
Sec 35 T8N R31E

RZA AGRA, Inc.
Engineering & Environmental Services
539 West Sharp, Suite 0
Spokane, WA 99201

Drilling started: *4 August 1992* Drilling completed: *6 August 1992* Logged by: *ENJS*

72

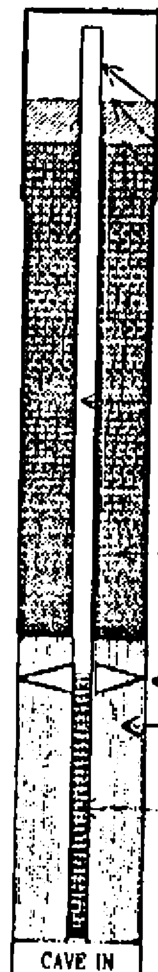
5 35 T8 R31

PROJECT *IBP Wallula Plant* W.O. *S-1061* WELL NO. *MW-4*

Elevation reference:
Ground surface elevation: Casing elevation:

DEPTH (feet)	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	BLOW COUNTS	OVM READING	GROUND WATER
0	(Loose) dry, tan SILT (Loess)					
	(Dense) damp, brown, silty SAND with gravel					
	(Dense) moist, dark brown, fine to medium SAND with some silt and gravel. Some caliche on gravels					
10	(Dense to Very Dense) moist, brown to dark brown, SAND with gravel and cobbles					
	(Dense) moist, brown, gravelly, medium to coarse SAND with silt. Few thin clay interbeds from 14.0 to 15.5 feet					
	(Dense) damp, brown, micaceous, fine SAND with silt					
20	(Dense to Very Dense) damp to wet, brown, gravelly SAND					
	(Very Dense) wet, brown, sandy GRAVELS and COBBLES					8/6/92
30	(Dense) wet, dark brown to black, sandy GRAVEL with silt. Interbedded brown, wet, gravelly SANDS from 30.0 to 33.0 feet.					
	Boring terminated at approximately 37.8 feet					
40						
50						
60						

AS-BUILT DESIGN



TESTING

RECEIVED DEC 23 1992 DEPARTMENT OF ECOLOGY EASTERN REGIONAL OFFICE

RUEN DRILLING, INC.
BOX 267
CLARK FORK, ID 83811
(208) 266-1151

LEGEND

PERMIT # 050010

Will Dougherty

- - - Inferred stratigraphic contact

SWL elevations and date of measurement

Gene St Godard 2035

John Sondegaard

RZA AGRA, Inc.
Engineering & Environmental Services
(509) 325-0104
539 West Sharp, Suite D
Spokane, WA 99201

Drilling started: *4 August 1992* Drilling completed: *6 August 1992* Logged by: *ENJS*

73

The Department of Ecology does NOT Warranty the Data and/or the Information on this Well Report.

File Original and First Copy with Department of Ecology
Second Copy — Owner's Copy
Third Copy — Driller's Copy

WATER WELL REPORT

STATE OF WASHINGTON

Start Card No. 056011
UNIQUE WELL I.D. #
Water Right Permit No.

(1) OWNER: Name Iowa Beef Processors Address Dakota city, Nebraska

LOCATION OF WELL: County Walla Walla NW 1/4 NW 1/4 Sec 35 T 8 N., R 31E W.M.

(2a) STREET ADDRESS OF WELL (or nearest address) Dodd Road, Wallula, Wa.

(3) PROPOSED USE: ☐ Domestic ☐ Irrigation ☐ DeWater Industrial ☐ Test Well ☒ Municipal ☐ Other ☐

(4) TYPE OF WORK: Owner's number of well (If more than one) MW-3
Abandoned ☒ New well ☐ Deepened ☐ Reconditioned ☐ Method: Dug ☐ Cable ☐ Rotary ☐ Bored ☐ Driven ☐ Jetted ☐

(5) DIMENSIONS: Diameter of well 2 inches.
Drilled 160 feet. Depth of completed well 160 ft.

(6) CONSTRUCTION DETAILS:
Casing installed: 2 " Diam. from +2.5 ft. to 160 ft.
Welded ☐ " Diam. from ft. to ft.
Liner installed ☐ " Diam. from ft. to ft.
Threaded ☒

Perforations: Yes ☐ No ☐
Type of perforator used
SIZE of perforations in. by in.
perforations from ft. to ft.
perforations from ft. to ft.
perforations from ft. to ft.

Screens: Yes ☒ No ☐
Manufacturer's Name
Type PVC Model No.
Diam. 2" Slot size .020 from 150 ft. to 160 ft.
Diam. Slot size from ft. to ft.

Gravel packed: Yes ☒ No ☐ Size of gravel 10/20 css
Gravel placed from 142 ft. to 160 ft.

Surface seal: Yes ☒ No ☐ To what depth? 142 ft.
Material used in seal Bentonite
Did any strata contain unusable water? Yes ☐ No ☐
Type of water? Depth of strata
Method of sealing strata off

(7) PUMP: Manufacturer's Name N/A
Type: H.P.

(8) WATER LEVELS: Land-surface elevation above mean sea level ft.
Static level 126 bgs ft. below top of well Date 8-10-92
Artesian pressure lbs. per square inch Date
Artesian water is controlled by (Cap, valve, etc.)

(9) WELL TESTS: Drawdown is amount water level is lowered below static level
Was a pump test made? Yes ☐ No ☒ If yes, by whom?
Yield: gal./min. with ft. drawdown after hrs.
" " " "
" " " "

Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level

Date of test
Bailer test gal./min. with ft. drawdown after hrs.
Airtest gal./min. with stem set at ft. for hrs.
Artesian flow g.p.m. Date
Temperature of water Was a chemical analysis made? Yes ☐ No ☐

(10) WELL LOG or ABANDONMENT PROCEDURE DESCRIPTION

Formation: Describe by color, character, size of material and structure, and show thickness of aquifers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of information.

MATERIAL	FROM	TO
Tremie grout with high		
solids bentonite grout.		
Cut off surface protection		
2 ft. B.G.S. pull guard posts.		
Recontour surface.		

RECEIVED 15

Work Started 12-6-95, 19. Completed 12-7-95, 19

WELL CONSTRUCTOR CERTIFICATION:

I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards. Materials used and the information reported above are true to my best knowledge and belief.

NAME RUEN DRILLING, INC. (PERSON, FIRM, OR CORPORATION) (TYPE OR PRINT)

Address PO BOX 267, CLARK FORK, ID 83811

(Signed) [signature] (WELL DRILLER) License No. 1724

Contractor's Registration No. RUENCDI175QM Date DEC 14, 1995

(USE ADDITIONAL SHEETS IF NECESSARY)

ECL 050-1-20 (2/93)

74

File Original and First Copy with Department of Ecology
Second Copy — Owner's Copy
Third Copy — Driller's Copy

WATER WELL REPORT

STATE OF WASHINGTON

Start Card No. 056010
UNIQUE WELL I.D. #
Water Right Permit No.

(1) OWNER: Name Iowa Beef Processors Address Dakota City, Nebraska

(2) LOCATION OF WELL: County Walla Walla NW 1/4 SW 1/4 Sec 35 T. 8 N., R 31E W.M.

(2a) STREET ADDRESS OF WELL (or nearest address) Dodd Road, Wallula, WA

(3) PROPOSED USE: ☐ Domestic ☐ Irrigation ☐ DeWater ☐ Industrial ☒ Test Well ☐ Municipal ☐ Other

(4) TYPE OF WORK: Owner's number of well (If more than one) MW-4
Abandoned ☒ New well ☐ Deepened ☐ Reconditioned ☐ Method: Dug ☐ Cable ☐ Rotary ☐ Bored ☐ Driven ☐ Jetted ☐

(5) DIMENSIONS: Diameter of well 2" inches.
Drilled 37.8 feet. Depth of completed well 37.5 ft.

(6) CONSTRUCTION DETAILS:
Casing installed: 2" Diam. from +2.5 ft. to 37.5 ft.
Welded ☐ " Diam. from ft. to ft.
Liner installed ☐ " Diam. from ft. to ft.
Threaded ☒

Perforations: Yes ☐ No ☒
Type of perforator used
SIZE of perforations in. by in.
perforations from ft. to ft.
perforations from ft. to ft.
perforations from ft. to ft.

Screens: Yes ☒ No ☐
Manufacturer's Name
Type PVC Model No.
Diam. 2 Slot size 0.020 from 27.5 ft. to 37.5 ft.
Diam. Slot size from ft. to ft.

Gravel packed: Yes ☒ No ☐ Size of gravel 10/20 css.
Gravel placed from 23 ft. to 37.5 ft.

Surface seal: Yes ☒ No ☐ To what depth? 23 ft.
Material used in seal Bentonite
Did any strata contain unusable water? Yes ☐ No ☒
Type of water? Depth of strata
Method of sealing strata off

(7) PUMP: Manufacturer's Name N/A
Type: H.P.

(8) WATER LEVELS: Land-surface elevation above mean sea level ft.
Static level 24.2 bgs ft. below top of well Date 8.9.92
Artesian pressure lbs. per square inch Date
Artesian water is controlled by (Cap, valve, etc.)

(9) WELL TESTS: Drawdown is amount water level is lowered below static level
Was a pump test made? Yes ☐ No ☒ If yes, by whom?
Yield: gal./min. with ft. drawdown after hrs.
" " " "
" " " "

Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level

Date of test
Bailer test gal./min. with ft. drawdown after hrs.
Airtest gal./min. with stem set at ft. for hrs.
Artesian flow g.p.m. Date
Temperature of water Was a chemical analysis made? Yes ☐ No ☐

(10) WELL LOG or ABANDONMENT PROCEDURE DESCRIPTION

Formation: Describe by color, character, size of material and structure, and show thickness of aquifers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of information.

MATERIAL	FROM	TO
Tremie grout with high solids bentonite grout. Pull surface protection and guard posts. recontour ground surface.		

RECEIVED DEC 15 1995 DEPARTMENT OF ECOLOGY EASTERN REGIONAL OFFICE

Work Started 12-6-95, 19. Completed 12-7-95, 19

WELL CONSTRUCTOR CERTIFICATION:

I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards. Materials used and the information reported above are true to my best knowledge and belief.

NAME Ruen Drilling, Inc (PERSON, FIRM, OR CORPORATION) (TYPE OR PRINT)
Address P.O. Box 267, Clark Fork, Id 83811
(Signed) [signature] (WELL DRILLER) License No. 1724
Contractor's Registration No. RUENCDI175QM Date DEC 14, 19 95

(USE ADDITIONAL SHEETS IF NECESSARY)

The Department of Ecology does NOT Warranty the Data and/or the Information on this Well Report.

File Original and First Copy with the Division of Water Resources
Second Copy — Owner's Copy
Third Copy — Driller's Copy

75

WATER WELL REPORT
STATE OF WASHINGTON

Application No.

Permit No. G3-01075C

(1) OWNER: Name McGregor Feedlot ~~Feed Systems, Inc.~~ Address ~~PO Bx 3105 Terminal Annex, Spokane, Wn~~ 607, Pasco, Con.

(2) LOCATION OF WELL: County Walla Walla NE¼ NE ¼ NW ¼ Sec. 35 T. 8 N., R. 31 E.W.M.

Bearing and distance from section or subdivision corner 100' South + 200' W of N¼ Cor Sec 35

(3) PROPOSED USE: Domestic ☐ Industrial ☒ Municipal ☐ Irrigation ☐ Test Well ☐ Other ☐

(4) TYPE OF WORK: Owner's number of well (if more than one) ....
New well ☒ Deepened ☐ Reconditioned ☐
Method: Dug ☐ Cable ☐ Rotary ☐ Bored ☐ Driven ☐ Jetted ☐

(5) DIMENSIONS: Diameter of well 10 inches.
Drilled 505 ft. Depth of completed well 505 ft.

(6) CONSTRUCTION DETAILS:

Casing installed: 10" Diam. from 0 ft. to 142 ft.
Threaded ☐ 8" Diam. from 0 ft. to 208 ft.
Welded ☒ ...." Diam. from .... ft. to .... ft.

Perforations: Yes ☐ No ☐
Type of perforator used ....
SIZE of perforations .... in. by .... in.
.... perforations from .... ft. to .... ft.
.... perforations from .... ft. to .... ft.
.... perforations from .... ft. to .... ft.

Screens: Yes ☐ No ☒
Manufacturer's Name ....
Type .... Model No. ....
Diam. .... Slot size .... from .... ft. to .... ft.
Diam. .... Slot size .... from .... ft. to .... ft.

Gravel packed: Yes ☐ No ☒ Size of gravel: ....
Gravel placed from .... ft. to .... ft.

Surface seal: Yes ☒ No ☐ To what depth? 208 ft.
Material used in seal Cement Grout
Did any strata contain unusable water? Yes ☐ No ☒
Type of water? .... Depth of strata ....
Method of sealing strata off ....

(7) PUMP: Manufacturer's Name ....
Type: .... H.P. ....

(8) WATER LEVELS: Land-surface elevation above mean sea level.... 500 ft.
Static level 152 ft. below top of well Date 4/21/71
Artesian pressure .... lbs. per square inch Date ....
Artesian water is controlled by .... (Cap, valve, etc.)

(9) WELL TESTS: Drawdown is amount water level is lowered below static level
Was a pump test made? Yes ☐ No ☒ If yes, by whom? ....
Yield: gal./min. with ft. drawdown after hrs.
Air Test" 800-1,000gpm " "
" " "

Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level

Date of test ....
Bailer test .... gal./min. with .... ft. drawdown after .... hrs.
Artesian flow .... g.p.m. Date ....
Temperature of water 78° Was a chemical analysis made? Yes ☐ No ☒

(10) WELL LOG: First Water 320-360'

Formation: Describe by color, character, size of material and structure, and show thickness of aquifers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of formation.

MATERIAL	FROM	TO
Sand, Brown	0	50
Clay, white	50	55
Clay, Brwn.w/Conglomerated Gravel, Streaks	55	89
Basalt, Gray	89	97
Clay, Brown	97	113
Gravel, Medium	113	170
Clay Brown and Blue	170	195
Gravel, Medium	195	200
Basalt, Black, Hard	200	235
Basalt, Brown, Soft	235	255
Basalt, Black, Hard	255	275
Basalt, Gray, Hard	275	320
Basalt, Brwn. W/White Clay Water Bearing	320	360
Basalt, Gray, Hard	360	450
Basalt, W/Blue Clay	450	498
Basalt, Gravel, Large Water Bearing	498	505

RECEIVED
JUL 17 1971

500 gpm
438 AF
Stock

Work started 4/6/ 19 71 Completed 4/21/ 19 71

WELL DRILLER'S STATEMENT:

This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

NAME PROJECT:Corporation
(Person, firm, or corporation) (Type or print)

Address 24 North Second, Walla Walla, Wn. 99362

[Signed] Ernie Stout
(Well Driller)

License No. Oreg. #698 Date 4/21/ 19 71

(USE ADDITIONAL SHEETS IF NECESSARY)

Please print, sign and return by mail to Department of Ecology

RESOURCE PROTECTION WELL REPORT

CURRENT Notice of Intent No. SE53111

76

(SUBMIT ONE WELL REPORT PER WELL INSTALLED)

Construction/Decommission (*select one*)
☑ Construction
☐ Decommission *ORIGINAL INSTALLATION Notice of Intent Number*

Type of Well (*select one*)
☐ Resource Protection
☑ Geotech Soil Boring

Consulting Firm SHANNON & WILSON
Unique Ecology Well ID
Tag No.

Property Owner PORT OF WALLA WALLA
Site Address 46.128127 -118.896427
City WALLULA County WALLA WALLA
Location NW1/4-1/4 SE 1/4 Sec 35 Twn 8N R 31 Select One ☒ EWM ☐ WWM

WELL CONSTRUCTION CERTIFICATION: I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards. Materials used and the information reported above are true to my best knowledge and belief.

☐ Driller ☐ Engineer ☐ Trainee Name (Print) MIKE CORN
Driller/Engineer /Trainee Signature
Driller or Trainee License No. 2833

If trainee, licensed driller's Signature and License No. 2833

Lat/Long (s, t, r still REQUIRED) Lat Deg Lat Min/Sec
Long Deg Long Min/Sec
Tax Parcel No.
Cased or Uncased Diameter 8.5" Static Level DRY
Work/Decommission Start Date 11/06/2014
Work/Decommission Completed Date 11/06/2014

Construction/Design	Well Data	Formation Description
HSA TO A DEPTH OF 25" BGS.	# 3/11 TRANSMISSION LINE	0-4 SAND TAN FINE 4-12.5 SAND W/GRAVEL LAYERS 12.5-18 SAND FINE 18-21 SAND W/GRAVEL LAYERS 21-25 SAND

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DEC 11 2014
Department of Ecology
Eastern Regional Office

NOT TO SCALE 1 1

Please print, sign and return by mail to Department of Ecology

RESOURCE PROTECTION WELL REPORT

CURRENT Notice of Intent No. AE29475

(SUBMIT ONE WELL REPORT PER WELL INSTALLED)

76

Construction/Decommission *(select one)*

☐ Construction

☑ Decommission *ORIGINAL INSTALLATION Notice of Intent Number* SE53111

Type of Well *(select one)*

☐ Resource Protection

☑ Geotech Soil Boring

Consulting Firm SHANNON & WILSON

Unique Ecology Well ID

Tag No.

Property Owner PORT OF WALLA WALLA

Site Address 46.128127 -118.896427

City WALLULA County WALLA WALLA

Location NW1/4-1/4 SE 1/4 Sec 35 Twn 8N R 31 Select One ☒ EWM ☐ WWM

WELL CONSTRUCTION CERTIFICATION: I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards. Materials used and the information reported above are true to my best knowledge and belief.

☐ Driller ☐ Engineer ☐ Trainee Name (Print) MIKE CORN

Driller/Engineer /Trainee Signature

Driller or Trainee License No. 2833

If trainee, licensed driller's Signature and License No. 2833

Lat/Long (s, t, r still REQUIRED) Lat Deg ___ Lat Min/Sec ___ Long Deg ___ Long Min/Sec ___

Tax Parcel No.

Cased or Uncased Diameter 8.5" Static Level DRY

Work/Decommission Start Date 11/06/2014

Work/Decommission Completed Date 11/06/2014

Construction/Design	Well Data	Formation Description
HSA TO A DEPTH OF 25" BGS. FILL THE AUGERS WITH 3 BAGS OF 3/8" BENTONITE CHIPS, THEN PULL OUT THE AUGERS AND POUR IN 5 MORE BAGS TO 1 FOOT FROM THE SURFACE THEN DRILL CUTTINGS TO MATCH THE SURFACE.	# 3/11 TRANSMISSION LINE	0-4 SAND TAN FINE 4-12.5 SAND W/GRAVEL LAYERS 12.5-18 SAND FINE 18-21 SAND W/GRAVEL LAYERS 21-25 SAND

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Department of Ecology
Eastern Regional Office

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Please print, sign and return by mail to Department of Ecology

RESOURCE PROTECTION WELL REPORT

CURRENT Notice of Intent No. SE53110

(SUBMIT ONE WELL REPORT PER WELL INSTALLED)

77

Construction/Decommission *(select one)*
☑ Construction
☐ Decommission *ORIGINAL INSTALLATION Notice of Intent Number*

Type of Well *(select one)*
☐ Resource Protection
☑ Geotech Soil Boring

Consulting Firm SHANNON & WILSON

Unique Ecology Well ID
Tag No.

Property Owner Simplot Feeders, LLC

Site Address 46.133894 -118.889696

City WALLULA County WALLA WALLA

Location SE 1/4-1/4 NE 1/4 Sec 35 Twn 8N R 31 Select One ☒ EWM ☐ WWM

WELL CONSTRUCTION CERTIFICATION: I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards. Materials used and the information reported above are true to my best knowledge and belief.

☐ Driller ☐ Engineer ☐ Trainee Name (Print) MIKE CORN
Driller/Engineer /Trainee Signature Mike C
Driller or Trainee License No. 2833

If trainee, licensed driller's Signature and License No. 2833

Lat/Long (s, t, r still REQUIRED) Lat Deg Lat Min/Sec
Long Deg Long Min/Sec

Tax Parcel No.

Cased or Uncased Diameter 8.5" Static Level DRY

Work/Decommission Start Date 11/06/2014

Work/Decommission Completed Date 11/06/2014

Construction/Design	Well Data	Formation Description
HSA TO A DEPTH OF 25" BGS.	# 3/4 TRANSMISSION LINE	0-21 FINE SAND TAN 21-25 SAND W/GRAVEL

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DEC 11 2014
Department of Ecology
Eastern Regional Office

NOT TO SCALE 1 1

RESOURCE PROTECTION WELL REPORT

CURRENT Notice of Intent No. AE29474

(SUBMIT ONE WELL REPORT PER WELL INSTALLED)

77

Construction/Decommission *(select one)*
- [ ] Construction
- [x] Decommission *ORIGINAL INSTALLATION Notice of Intent Number* SE53110

Type of Well *(select one)*
- [ ] Resource Protection
- [x] Geotech Soil Boring

Consulting Firm SHANNON & WILSON

Unique Ecology Well ID

Tag No.

WELL CONSTRUCTION CERTIFICATION: I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards. Materials used and the information reported above are true to my best knowledge and belief.

☐ Driller ☐ Engineer ☐ Trainee Name (Print) MIKE CORN

Driller/Engineer /Trainee Signature *Mike C*

Driller or Trainee License No. 2833

If trainee, licensed driller's signature and License No. 2833

Property Owner *Simplot Feeders LLC*

Site Address 46.133894 -118.889696

City WALLULA County WALLA WALLA

Location SE 1/4-1/4 NE 1/4 Sec 35 Twn 8N R 31 Select One [X] EWM [ ] WWM

Lat/Long (s, t, r still REQUIRED) Lat Deg ____ Lat Min/Sec ____ Long Deg ____ Long Min/Sec ____

Tax Parcel No.

Cased or Uncased Diameter 8.5" Static Level DRY

Work/Decommission Start Date 11/06/2014

Work/Decommission Completed Date 11/06/2014

Construction/Design	Well Data	Formation Description
HSA TO A DEPTH OF 25" BGS. FILL THE AUGERS WITH 3 BAGS OF 3/8" BENTONITE CHIPS, THEN PULL OUT THE AUGERS AND POUR IN 5 MORE BAGS TO 1 FOOT FROM THE SURFACE THEN DRILL CUTTINGS TO MATCH THE SURFACE.	# 3/4 TRANSMISSION LINE	0-21 FINE SAND TAN 21-25 SAND W/GRAVEL

RECEIVED
DEC 11 2014
Department of Ecology
Eastern Regional Office

NOT TO SCALE 1 1

Please print, sign and return by mail to Department of Ecology

RESOURCE PROTECTION WELL REPORT

CURRENT Notice of Intent No. AE29472

(SUBMIT ONE WELL REPORT PER WELL INSTALLED)

Construction/Decommission *(select one)*
☐ Construction
☐ Decommission *ORIGINAL INSTALLATION Notice of Intent Number* SE53108

Type of Well *(select one)*
☐ Resource Protection
☑ Geotech Soil Boring

78

Consulting Firm SHANNON & WILSON
Unique Ecology Well ID Tag No.

Property Owner Washington Department of Natural Resources
Site Address 46.137534 -118.882859
City WALLULA County WALLA WALLA
Location NE 1/4-1/4 NW 1/4 Sec 36 Twn 8N R 31 Select One ☒ EWM ☐ WWM

WELL CONSTRUCTION CERTIFICATION: I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards. Materials used and the information reported above are true to my best knowledge and belief.

☐ Driller ☐ Engineer ☐ Trainee Name (Print) MIKE CORN
Driller/Engineer /Trainee Signature Mike C
Driller or Trainee License No. 2833

If trainee, licensed driller's Signature and License No. 2833

Lat/Long (s, t, r still REQUIRED) Lat Deg ___ Lat Min/Sec ___ Long Deg ___ Long Min/Sec ___
Tax Parcel No.
Cased or Uncased Diameter 8.5" Static Level 12
Work/Decommission Start Date 11/06/2014
Work/Decommission Completed Date 11/06/2014

Construction/Design	Well Data	Formation Description
HSA TO A DEPTH OF 25" BGS. PULLOUT AUGERS AND POUR IN 7 BAGS OF 3/8" BENTONITE TO 1 FOOT BELOW SURFACE, THEN DRILL CUTTINGS TO MATCH THE SURFACE.	# 2/12 TRANSMISSION LINE	0-25 SAND

RECEIVED
DEC 11 2014
Department of Ecology
Eastern Regional Office

NOT TO SCALE 1 1

Please print, sign and return by mail to Department of Ecology

RESOURCE PROTECTION WELL REPORT

CURRENT Notice of Intent No. SE53108

(SUBMIT ONE WELL REPORT PER WELL INSTALLED)

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Construction/Decommission *(select one)*

☑ Construction

☐ Decommission *ORIGINAL INSTALLATION Notice of Intent Number* ______

Consulting Firm SHANNON & WILSON

Unique Ecology Well ID

Tag No. ______

WELL CONSTRUCTION CERTIFICATION: I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards. Materials used and the information reported above are true to my best knowledge and belief.

☐ Driller ☐ Engineer ☐ Trainee Name (Print) MIKE CORN

Driller/Engineer /Trainee Signature *Mike C*

Driller or Trainee License No. 2833

If trainee, licensed driller's signature and License No. 2833

Type of Well *(select one)*

☐ Resource Protection

☑ Geotech Soil Boring

Property Owner Washington Department of Natural Resources

Site Address 46.137534 -118.882859

City WALLULA County WALLA WALLA

Location NE 1/4-1/4 NW 1/4 Sec 36 Twn 8N R 31 Select One ☒ EWM ☐ WWM

Lat/Long (s, t, r still REQUIRED) Lat Deg ______ Lat Min/Sec ______ Long Deg ______ Long Min/Sec ______

Tax Parcel No. ______

Cased or Uncased Diameter 8.5" Static Level 12

Work/Decommission Start Date 11/06/2014

Work/Decommission Completed Date 11/06/2014

Construction/Design	Well Data	Formation Description
HSA TO A DEPTH OF 25" BGS.	# 2/12 TRANSMISSION LINE	0-25 SAND

RECEIVED
DEC 11 2014
Department of Ecology
Eastern Regional Office

NOT TO SCALE 1 1

79

File Original and First Copy with Department of Ecology
Second Copy — Owner's Copy
Third Copy — Driller's Copy

WATER WELL REPORT

STATE OF WASHINGTON

Application No. ....
Permit No. ....

(1) OWNER: Name FRANK Hutchison Address 4012 W. Livingston, PASCO

(2) LOCATION OF WELL: County WALLA WALLA E ½ NE ¼ SE ¼ Sec 9 T 8 N., R 31 W.M.

Bearing and distance from section or subdivision corner ABOUT 15' NE OF SW CORNER

(3) PROPOSED USE: Domestic ☒ Industrial ☐ Municipal ☐ Irrigation ☐ Test Well ☐ Other ☐

(4) TYPE OF WORK: Owner's number of well (if more than one) ....
New well ☒ Method: Dug ☐ Bored ☐
Deepened ☐ Cable ☒ Driven ☐
Reconditioned ☐ Rotary ☐ Jetted ☐

(5) DIMENSIONS: Diameter of well 6 inches.
Drilled 170 ft. Depth of completed well 170 ft.

(6) CONSTRUCTION DETAILS:

Casing installed: 6 " Diam. from 0 ft. to 170 ft.
Threaded ☐ ......" Diam. from ...... ft. to ...... ft.
Welded ☒ ......" Diam. from ...... ft. to ...... ft.

Perforations: Yes ☐ No ☒
Type of perforator used ......
SIZE of perforations ...... in. by ...... in.
...... perforations from ...... ft. to ...... ft.
...... perforations from ...... ft. to ...... ft.
...... perforations from ...... ft. to ...... ft.

Screens: Yes ☐ No ☒
Manufacturer's Name ......
Type ...... Model No. ......
Diam. ...... Slot size ...... from ...... ft. to ...... ft.
Diam. ...... Slot size ...... from ...... ft. to ...... ft.

Gravel packed: Yes ☐ No ☒ Size of gravel: ......
Gravel placed from ...... ft. to ...... ft.

Surface seal: Yes ☒ No ☐ To what depth? 20 ft.
Material used in seal Bentonite
Did any strata contain unusable water? Yes ☐ No ☒
Type of water? ...... Depth of strata ......
Method of sealing strata off ......

(7) PUMP: Manufacturer's Name ......
Type: ...... H.P. ......

(8) WATER LEVELS: Land-surface elevation above mean sea level.... 500 ft.
Static level 110 ft. below top of well Date 4/18/74
Artesian pressure ...... lbs. per square inch Date ......
Artesian water is controlled by ...... (Cap, valve, etc.)

(9) WELL TESTS: Drawdown is amount water level is lowered below static level
Was a pump test made? Yes ☐ No ☐ If yes, by whom? ......
Yield: ...... gal./min. with ...... ft. drawdown after ...... hrs.
" " " "
" " " "

Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level

Date of test ......
Bailer test 25 gal./min. with 4 ft. drawdown after 2 hrs.
Artesian flow ...... g.p.m. Date ......
Temperature of water ...... Was a chemical analysis made? Yes ☐ No ☒

(10) WELL LOG:

Formation: *Describe by color, character, size of material and structure, and show thickness of aquifers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of formation.*

MATERIAL	FROM	TO
Brown Fine Silty Sand	0	12
Silty Sandy cemented gravels Real Hard packed, slow drilling	12	110
Black Course Sand & Gravel Water Bearing about 10 gpm	110	120
Firm Brown Clay, Dry	120	135
" Blue clay "	135	167
Fractured Basalt Dr, Blk. Water Bearing About 50 gpm.	167	170

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RECEIVED
MAY 23 1974
DEPARTMENT OF ECOLOGY
SPOKANE REGIONAL OFFICE

Work started April, 1974. Completed April, 1974

WELL DRILLER'S STATEMENT:

This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

NAME Hatch Drilling Co Inc (Person, firm, or corporation) (Type or print)

Address 420 Road 45 Pasco

[Signed] [signature] (Well Driller)

License No. 176 Date 5/9, 1974

5/24/74 [initials]

(USE ADDITIONAL SHEETS IF NECESSARY)

S. F. No. 7356—OS—(Rev. 4-71).

File Original and First Copy with Department of Ecology
Second Copy — Owner's Copy
Third Copy — Driller's Copy

WATER WELL REPORT

80

STATE OF WASHINGTON

Permit No. ....

(1) **OWNER:** Name Imrsen Address

(2) **LOCATION OF WELL:** County Walla Walla — ¼ ¼ Sec. 9 T. 8 N., R. 31 W.M.

Bearing and distance from section or subdivision corner

(3) **PROPOSED USE:** Domestic ☒ Industrial ☐ Municipal ☐ Irrigation ☐ Test Well ☐ Other ☐

(4) **TYPE OF WORK:** Owner's number of well (if more than one)....
New well ☒ Method: Dug ☐ Bored ☐
Deepened ☐ Cable ☒ Driven ☐
Reconditioned ☐ Rotary ☐ Jetted ☐

(5) **DIMENSIONS:** Diameter of well 6 inches.
Drilled 175 ft. Depth of completed well 190 ft.

(6) **CONSTRUCTION DETAILS:**

Casing installed: 6" Diam. from +1 ft. to 185 ft.
Threaded ☐ ......" Diam. from ...... ft. to ...... ft.
Welded ☐ ......" Diam. from ...... ft. to ...... ft.

Perforations: Yes ☐ No ☒
Type of perforator used
SIZE of perforations ...... in. by ...... in.
...... perforations from ...... ft. to ...... ft.
...... perforations from ...... ft. to ...... ft.
...... perforations from ...... ft. to ...... ft.

Screens: Yes ☒ No ☐
Manufacturer's Name Johnson
Type Stainless Model No.
Diam. 5 7/8 Slot size 012 from 185 ft. to 190 ft.
Diam. ...... Slot size ...... from ...... ft. to ...... ft.

Gravel packed: Yes ☐ No ☒ Size of gravel:
Gravel placed from ...... ft. to ...... ft.

Surface seal: Yes ☒ No ☐ To what depth? 30 ft.
Material used in seal Bentonite
Did any strata contain unusable water? Yes ☐ No ☒
Type of water? Depth of strata
Method of sealing strata off

(7) **PUMP:** Manufacturer's Name
Type: H.P.

(8) **WATER LEVELS:** Land-surface elevation above mean sea level.... ft.
Static level 166 ft. below top of well Date 2-15-74
Artesian pressure ...... lbs. per square inch Date
Artesian water is controlled by ~ (Cap, valve, etc.)

(9) **WELL TESTS:** Drawdown is amount water level is lowered below static level
Was a pump test made? Yes ☐ No ☒ If yes, by whom?
Yield: gal./min. with ft. drawdown after hrs.
" " " "
" " " "

Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level

Date of test
Bailer test 20 gal./min. with 4 ft. drawdown after 1 hrs.
Artesian flow ...... g.p.m. Date 2-15-74
Temperature of water ...... Was a chemical analysis made? Yes ☐ No ☒

(10) **WELL LOG:**

Formation: *Describe by color, character, size of material and structure, and show thickness of aquifers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of formation.*

MATERIAL	FROM	TO
Soil	0	2
Sand Black course	2	34
Gravel 2" + sand	34	39
Sand Black	42	48
Sand fine Tan + gravel 1" minus	48	59
Gravel 2" + fine tan sand + silt	59	94
Boulders Black Basalt	94	97
Gravel 2" + fine Tan sand	97	126
Cobbles + gravel very clean	126	147
Gravel + sand very compact	147	168
Tan sand + gravel	168	178
Tan sand + gravel 2" minus		
Water Bearing	178	192
Clay Tan	92	194
Clay Blue	194	

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Work started 2-1, 1974. Completed 2-15, 1974

WELL DRILLER'S STATEMENT:

This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

NAME Nelson Well Drilling
(Person, firm, or corporation) (Type or print)

Address 902 Franklin Pasco

[Signed] James Nelson
(Well Driller)

License No. 361 Date 2-15, 1974

(USE ADDITIONAL SHEETS IF NECESSARY)

S. F. No. 7356—OS—(Rev. 4-71).

Appendix F.

Groundwater Monitoring Data

Appendix F. Groundwater Monitoring Data

Well	Date	Depth to Water	Elevation	pH	EC	TKN	NO_3 + NO_2-N	NH_3-N	TDS	TDIS	TOC	Total P	Na	Ca	Mg	K	Cl	SO_4	HCO_3	CO_3	Mn
		feet	ft msl	s.u.	µmhos/cm	milligrams per litr															
MW1	Q1 2009	142.54	379.75	6.98	1,474	7.960	34.2	0.57	1,017	756	2.18	ND	102.0	154.0	49.0	4.29	140	237.0	157	ND	0.007
MW1	Q2 2009	142.54	379.75	7.28	1,469	0.770	51.0	0.57	1,022	783	2.41	0.063	102.0	147.0	48.1	4.09	140	251.0	178	ND	0.003
MW1	Q3 2009	142.54	379.75	6.81	4,130	0.280	31.7	ND	1,020	742	1.64	0.904	92.0	133.0	42.2	3.65	135	254.0	175	ND	0.011
MW1	Q4 2009	142.54	379.75	7.26	1,471	<1.000	30.6	<1.00	972	787	3.15	0.016	108.0	148.0	48.0	4.27	145	268.0	179	ND	0.025
MW1	Q1 2010	142.54	379.75	7.34	1,445	0.570	32.5	0.28	964	725	1.65	0.023	101.0	134.0	44.2	4.11	120	274.0	175	ND	0.025
MW1	Q2 2010	--	--	7.26	1,439	1.110	30.6	0.28	932	760	1.45	0.017	98.8	138.0	44.5	4.08	131	248.0	181	ND	0.036
MW1	Q3 2010	142.54	379.75	7.40	1,428	0.840	30.6	0.84	1,467	958	1.47	0.016	98.4	136.0	43.9	3.75	137	241.0	179	ND	0.029
MW1	Q4 2010	142.54	379.75	7.30	1,431	1.130	30.8	0.28	953	670	1.38	0.077	93.4	132.0	43.5	3.96	141	253.0	179	ND	0.702
MW1	Q1 2011	142.54	379.75	7.00	1,422	0.430	29.9	0.43	1,011	704	1.52	0.022	93.4	138.0	44.7	3.96	137	245.0	178	ND	0.026
MW1	Q2 2011	142.54	379.75	7.21	1,415	0.830	32.0	0.55	860	711	1.81	0.047	91.6	137.0	45.2	4.02	145	394.0	178	ND	0.065
MW1	Q3 2011	142.54	379.75	7.48	1,405	0.550	28.2	0.28	996	758	1.50	0.020	95.7	140.0	45.8	4.74	130	397.0	183	ND	0.020
MW1	Q4 2011	124.54	397.75	7.50	1,346	0.720	28.3	0.17	933	755	1.49	0.033	84.1	125.0	40.8	3.45	125	354.0	172	ND	0.030
MW1	Q1 2012	142.54	379.75	7.54	1,316	0.470	28.6	<1.00	920	690	1.42	0.032	79.4	130.0	43.0	3.57	122	370.0	164	ND	0.065
MW1	Q2 2012	142.54	379.75	7.54	1,326	1.420	28.0	<1.00	902	699	1.45	0.021	76.4	129.0	42.5	3.60	120	337.0	172	ND	0.039
MW1	Q3 2012	142.54	379.75	7.57	1,296	0.570	23.4	<1.00	1,406	705	1.44	0.028	75.2	132.0	41.3	3.57	115	230.0	170	ND	0.117
MW1	Q4 2012	142.54	379.75	7.28	1,253	0.430	25.6	<1.00	858	713	1.44	0.041	71.9	123.0	38.1	3.79	113	215.0	169	ND	0.223
MW1	Q1 2013	142.54	379.75	7.28	1,250	0.995	27.0	<1.00	863	705	1.48	0.110	71.0	124.0	38.8	3.64	107	212.0	176	ND	0.121
MW1	Q2 2013	142.54	379.75	7.26	1,235	0.658	26.5	<1.00	875	695	3.16	0.141	70.2	120.9	40.9	3.50	113	226.0	177	<5.00	0.017
MW1	Q3 2013	140.04	382.25	7.10	1,219	1.850	26.9	<1.00	1,038	648	1.49	0.023	68.4	121.4	39.2	3.50	112	203.0	171	<2.40	0.027
MW1	Q4 2013	140.29	382.00	7.06	1,149	0.597	25.6	<1.00	830	663	1.13	0.045	73.3	119.0	39.1	3.60	105	190.0	168	<2.40	0.014
MW1	Q1 2014	126.30	395.99	7.05	1,187	0.853	25.0	<1.00	808	--	1.50	--	71.5	115.7	38.0	3.30	107	189.0	169	--	--
MW1	Q2 2014	139.62	382.67	7.27	1,178	0.286	25.8	<1.00	858	--	1.27	--	68.8	114.9	36.6	3.90	103	192.0	168	--	--
MW1	Q3 2014	135.59	386.70	7.11	1,160	0.512	24.8	<1.00	1,018	--	1.24	--	72.7	116.2	35.1	3.50	104	182.0	166	--	--
MW1	Q4 2014	139.96	382.33	7.42	1,152	1.280	26.2	<1.00	903	--	1.15	--	73.4	113.6	35.7	3.20	121	178.0	161	--	--
MW1	Q1 2015	139.14	383.15	6.81	1,176	1.300	26.4	<1.00	823	--	1.17	--	72.5	111.9	34.6	3.70	102	186.0	166	--	--
MW1	Q2 2015	138.89	383.40	6.96	1,171	0.870	28.5	<1.00	838	--	1.26	--	73.3	108.9	34.0	3.40	99	182.0	175	--	--
MW1	Q3 2015	139.09	383.20	7.64	1,151	1.440	27.8	<1.15	773	--	1.35	--	71.9	105.9	32.7	4.00	103	212.3	172	--	--
MW1	Q4 2015	139.09	383.20	7.65	1,128	0.720	23.8	<1.00	863	--	1.09	--	71.2	99.8	31.5	3.60	108	177.0	170	--	--
MW1	Q1 2016	138.64	383.65	7.43	1,144	0.990	27.8	<1.00	775	--	1.33	--	78.6	115.0	36.0	4.00	97	161.0	162	--	--
MW1	Q2 2016	135.29	387.00	7.53	1,189	1.560	20.7	<1.00	760	--	1.38	--	79.2	119.0	36.6	3.82	102	193.9	166	--	--
MW1	Q3 2016	138.69	383.60	7.50	1,145	1.300	27.1	<1.00	853	--	1.32	--	80.3	114.0	35.3	4.26	101	165.6	180	--	--
MW1	Q4 2016	138.39	383.90	7.43	1,133	1.430	25.6	<1.00	760	--	1.23	--	80.0	110.0	34.4	3.56	121	177.0	175	--	--
MW1	Q1 2017	137.45	384.84	7.01	1,117	0.570	26.0	<1.00	738	--	1.38	--	76.0	113.0	34.1	3.30	94	182.1	180	--	--
MW1	Q2 2017	137.39	384.90	7.37	1,281	2.120	25.3	1.70	908	--	1.50	--	50.3	116.0	38.1	3.60	128	170.0	198	--	--
MW1	Q3 2017	137.79	384.50	6.96	1,178	0.707	21.9	<1.00	660	--	1.50	--	56.0	115.0	42.8	41.60	108	200.0	177	--	--
MW1	Q4 2017	137.89	384.40	7.08	940	0.850	27.8	<1.00	743	--	1.36	--	45.5	137.0	55.3	4.30	141	193.0	176	--	--
MW1	Q1 2018	136.39	385.90	7.69	1,240	1.550	32.1	1.00	853	--	1.59	--	47.0	142.9	55.0	4.30	159	165.0	165	--	--
MW1	Q2 2018	135.24	387.05	7.49	1,096	4.000	10.2	<1.83	640	--	2.96	--	69.1	106.0	37.7	4.20	104	139.0	282	--	--
MW1	Q3 2018	123.00	399.29	7.76	965	2.980	0.3	<1.00	615	--	1.73	--	71.7	85.4	31.6	4.01	95	147.0	233	--	--
MW1	Q4 2018	122.75	399.54	7.54	1,064	1.710	24.5	<1.00	723	--	1.05	--	65.1	104.0	31.5	3.50	93	154.0	178	--	--
MW1	Q1 2019	122.25	400.04	7.50	1,082	1.000	24.5	<1.00	750	--	1.01	--	68.8	98.8	31.5	3.94	92	171.0	184	--	--
MW1	Q2 2019	122.28	400.01	8.08	660	0.718	0.2	<1.00	473	--	1.69	--	79.2	45.5	23.8	3.54	94	120.0	144	--	--
MW1	Q3 2019	122.90	399.39	7.23	885	0.857	1.8	<1.00	528	--	1.12	--	79.9	37.8	22.7	3.27	94	139.0	130	--	--
Count		42	42	43	43	43	43	42	43	20	43	19	43	43	43	43	43	43	43	2	20
Minimum		122.25	379.75	6.81	660	0.280	0.2	<0.17	473	648	1.01	0.016	45.5	37.8	22.7	3.20	92	120.0	130	<2.40	0.003
Maximum		142.54	400.04	8.08	4,130	7.960	51.0	<1.83	1,467	958	3.16	0.904	108.0	154.0	55.3	41.60	159	397.0	282	<2.40	0.702
Average		137.37	384.92	7.32	1,287	1.228	25.7	<0.90	872	731	1.55	0.088	77.9	118.8	39.2	4.67	116	218.0	176	<2.40	0.080

Appendix F. Groundwater Monitoring Data

Well	Date	Depth to Water	Elevation	pH	EC	TKN	NO_3 + NO_2-N	NH_3-N	TDS	TDIS	TOC	Total P	Na	Ca	Mg	K	Cl	SO_4	HCO_3	CO_3	Mn
		feet	ft msl	s.u.	µmhos/cm	milligrams per litr															
MW2	Q1 2009	110.20	390.33	6.96	2,240	9.090	65.0	0.71	1,503	903	1.42	ND	48.2	274.0	85.0	6.38	409	83.3	157	ND	0.176
MW2	Q2 2009	116.20	384.33	7.15	2,200	0.840	68.5	0.68	1,916	916	1.69	0.015	49.2	255.0	81.3	6.17	395	84.2	157	ND	0.005
MW2	Q3 2009	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--		
MW2	Q4 2009	116.20	384.33	7.18	2,190	<1.000	67.8	<1.00	1,380	920	1.60	0.073	50.8	259.0	81.8	7.62	395	93.9	164	ND	0.412
MW2	Q1 2010	116.20	384.33	7.06	2,170	0.850	69.4	0.14	1,453	880	1.48	0.016	48.2	239.0	75.8	6.22	374	90.2	165	ND	0.016
MW2	Q2 2010	--	--	7.08	2,150	1.530	62.1	0.28	1,508	867	1.41	0.016	47.8	247.0	77.0	6.11	366	97.6	163	ND	0.042
MW2	Q3 2010	116.20	384.33	7.09	2,120	0.700	61.9	0.56	1,085	746	1.42	0.028	47.7	241.0	75.8	5.97	371	109.0	171	ND	0.011
MW2	Q4 2010	116.20	384.33	7.09	2,110	1.270	67.9	0.14	1,518	1,206	1.26	0.048	45.5	238.0	77.2	6.07	370	103.0	176	ND	0.442
MW2	Q1 2011	116.20	384.33	6.72	2,080	0.430	60.6	0.28	1,601	909	1.48	0.017	46.2	227.0	72.8	6.08	347	119.0	172	ND	0.052
MW2	Q2 2011	116.20	384.33	6.88	2,050	0.690	81.5	0.28	1,665	1,139	1.59	0.026	46.3	225.0	72.8	6.02	341	142.0	173	ND	0.032
MW2	Q3 2011	116.20	384.33	7.17	2,010	0.690	58.6	0.28	1,553	962	1.47	ND	48.2	253.0	76.1	7.42	332	146.0	166	ND	0.033
MW2	Q4 2011	116.20	384.33	7.21	2,010	0.720	60.2	0.017	1,675	853	1.33	0.029	44.3	218.0	69.4	5.59	329	151.0	169	ND	0.081
MW2	Q1 2012	116.20	384.33	7.23	3,450	0.470	59.0	<1.00	1,335	855	2.18	0.020	44.5	224.0	72.8	5.93	645	173.0	234	ND	0.035
MW2	Q2 2012	110.20	390.33	7.34	1,953	0.990	57.3	<1.00	1,532	818	1.53	0.087	45.6	218.0	71.0	5.79	312	156.0	176	ND	0.528
MW2	Q3 2012	116.20	384.33	7.35	1,921	0.570	51.0	<1.00	1,809	917	1.77	0.057	44.1	222.0	69.0	5.60	297	149.0	164	ND	0.188
MW2	Q4 2012	116.20	384.33	6.91	1,877	0.720	52.8	<1.00	1,740	950	1.60	0.021	44.0	205.0	61.8	5.96	283	151.0	167	ND	0.034
MW2	Q1 2013	116.20	384.33	6.96	1,851	0.853	53.8	<1.00	1,413	888	1.51	0.130	42.4	198.0	62.7	5.60	280	154.0	174	ND	0.138
MW2	Q2 2013	116.20	384.33	7.06	1,862	0.853	54.4	<1.00	1,720	890	2.35	0.084	42.4	209.9	68.3	5.30	282	167.0	174	<5.00	0.013
MW2	Q3 2013	114.03	386.50	6.72	1,819	1.710	56.1	<1.00	1,745	843	1.52	0.022	42.4	205.9	66.8	5.40	261	160.0	168	<2.40	0.036
MW2	Q4 2013	114.11	386.42	7.02	1,178	0.426	49.8	<1.00	1,640	878	1.37	0.035	46.1	201.5	68.5	5.70	256	159.0	167	<2.40	0.022
MW2	Q1 2014	108.50	392.03	6.95	1,824	1.140	52.5	<1.00	1,470	--	1.38	--	43.4	205.0	66.8	5.20	255	162.0	167	--	--
MW2	Q2 2014	113.53	387.00	7.09	1,800	0.428	52.2	<1.00	1,660	--	1.71	--	43.1	203.5	64.3	6.07	106	167.0	168	--	--
MW2	Q3 2014	113.53	387.00	6.95	1,770	0.783	49.9	<1.00	2,195	--	1.41	--	41.9	205.3	62.3	5.30	250	165.0	165	--	--
MW2	Q4 2014	113.83	386.70	7.17	1,783	1.280	55.8	<1.00	2,043	--	1.29	--	41.5	198.5	61.5	5.40	255	165.0	164	--	--
MW2	Q1 2015	113.73	386.80	6.65	1,780	1.400	27.5	<1.00	1,590	--	1.32	--	40.7	206.3	61.9	5.50	252	167.0	166	--	--
MW2	Q2 2015	112.83	387.70	6.76	1,759	0.870	51.8	<1.00	1,540	--	1.78	--	39.7	193.9	58.7	5.20	230	170.0	174	--	--
MW2	Q3 2015	113.13	387.40	7.34	1,724	1.440	52.5	1.15	1,478	--	1.36	--	42.0	205.4	61.8	5.40	208	207.9	169	--	--
MW2	Q4 2015	113.13	387.40	7.36	1,665	0.720	42.7	<1.00	1,418	--	1.21	--	33.7	169.8	49.5	4.20	213	160.0	166	--	--
MW2	Q1 2016	112.71	387.82	7.19	1,664	0.990	53.1	<1.00	1,248	--	1.40	--	41.9	206.0	61.5	5.70	107	183.0	166	--	--
MW2	Q2 2016	112.63	387.90	7.30	1,630	1.560	48.1	<1.00	1,908	--	1.49	--	42.9	195.0	58.1	5.60	201	190.2	170	--	--
MW2	Q3 2016	107.43	393.10	7.25	1,619	1.300	51.2	<1.00	1,068	--	1.51	--	43.6	207.0	60.1	5.83	170	208.9	177	--	--
MW2	Q4 2016	113.13	387.40	7.21	1,606	1.430	51.1	<1.00	1,252	--	1.42	--	41.8	195.0	58.2	5.46	146	190.0	173	--	--
MW2	Q1 2017	112.13	388.40	6.99	1,579	0.570	50.4	<1.00	1,155	--	1.48	--	39.0	218.0	54.9	5.20	173	202.0	170	--	--
MW2	Q2 2017	111.54	388.99	7.28	1,531	2.120	45.0	1.70	1,438	--	1.70	--	40.1	189.0	55.0	6.00	160	151.0	196	--	--
MW2	Q3 2017	111.53	389.00	7.37	1,500	0.566	45.1	<1.00	933	--	1.40	--	40.9	168.0	50.5	5.20	151	202.0	184	--	--
MW2	Q4 2017	112.13	388.40	7.17	1,190	0.990	36.8	<1.00	835	--	1.55	--	44.1	160.0	51.3	5.50	149	182.0	190	--	--
MW2	Q1 2018	110.83	389.70	6.21	1,374	2.530	41.3	<1.00	930	--	1.79	--	42.0	164.5	48.3	5.00	144	169.0	198	--	--
MW2	Q2 2018	110.53	390.00	7.38	1,367	26.000	0.3	23.40	1,050	--	13.40	--	5.4	11.1	2.8	1.08	155	10.0	56	--	--
MW2	Q3 2018	105.27	395.26	7.28	1,301	4.120	4.8	<1.00	863	--	2.77	--	44.0	155.0	48.6	7.00	132	178.0	298	--	--
MW2	Q4 2018	105.17	395.36	7.00	1,363	0.853	39.2	<1.00	913	--	4.81	--	41.4	151.0	44.8	4.68	130	170.0	192	--	--
MW2	Q1 2019	104.75	395.78	7.12	1,325	1.000	35.0	<1.00	970	--	1.48	--	46.1	147.0	44.2	5.50	123	166.0	207	--	--
MW2	Q2 2019	105.00	395.53	7.27	1,296	7.180	22.2	6.89	795	--	3.64	--	49.5	132.0	43.8	6.13	119	138.0	271	--	--
MW2	Q3 2019	105.17	395.36	7.02	1,237	0.571	28.9	<1.00	890	--	1.34	--	43.7	128.0	42.8	4.19	114	178.0	190	--	--
Count		41	41	42	42	42	42	42	42	19	42	17	42	42	42	42	42	42	42	2	19
Minimum		104.75	384.33	6.21	1,178	0.426	0.3	<0.02	795	746	1.21	0.015	5.4	11.1	2.8	1.08	106	10.0	56	<2.40	0.005
Maximum		116.20	395.78	7.38	3,450	26.000	81.5	23.40	2,195	1,206	13.40	0.130	50.8	274.0	85.0	7.62	645	208.9	298	<2.40	0.528
Average		112.62	387.91	7.08	1,784	2.006	49.9	<1.54	1,415	913	1.97	0.043	43.0	199.4	61.8	5.60	252	151.7	177	<2.40	0.121

Appendix F. Groundwater Monitoring Data

Well	Date	Depth to Water	Elevation	pH	EC	TKN	NO_3 + NO_2-N	NH_3-N	TDS	TDIS	TOC	Total P	Na	Ca	Mg	K	Cl	SO_4	HCO_3	CO_3	Mn
		feet	ft msl	s.u.	µmhos/cm	milligrams per litr															
MW4	Q1 2009	117.90	368.25	6.88	3,440	7.960	137.0	1.71	2,220	1,370	2.95	ND	190.0	329.5	126.9	10.80	619	60.5	263	ND	0.013
MW4	Q2 2009	117.90	368.25	7.01	3,450	1.970	128.2	0.65	2,625	1,383	9.17	0.020	190.0	334.0	122.0	10.50	615	69.0	265	ND	0.017
MW4	Q3 2009	117.90	368.25	6.62	3,350	0.110	136.5	ND	2,390	1,568	2.51	0.087	176.0	301.0	110.0	10.00	631	72.2	257	ND	0.015
MW4	Q4 2009	118.90	367.25	6.95	3,570	0.000	139.8	0.00	2,228	1,479	2.85	0.013	198.0	318.0	121.0	10.60	651	72.5	255	ND	0.035
MW4	Q1 2010	118.90	367.25	6.85	3,540	1.560	152.2	0.14	2,304	1,463	2.86	0.014	190.0	300.0	117.0	11.00	649	91.5	205	ND	0.034
MW4	Q2 2010	--	--	6.98	3,540	0.980	131.0	0.14	2,381	1,435	2.26	0.015	195.0	315.0	120.0	11.10	646	68.5	250	ND	0.037
MW4	Q3 2010	117.90	368.25	7.04	3,580	0.560	150.0	0.28	2,524	1,919	2.36	0.022	209.0	324.0	120.0	10.40	668	54.8	245	ND	0.026
MW4	Q4 2010	117.90	368.25	6.81	3,600	0.850	159.2	0.14	2,549	2,321	2.23	0.027	198.0	311.0	120.0	11.10	672	65.8	243	ND	0.088
MW4	Q1 2011	117.90	368.25	6.45	3,580	0.990	133.0	0.28	2,518	1,388	2.45	0.015	207.0	309.0	119.0	11.40	670	68.1	238	ND	0.052
MW4	Q2 2011	117.90	368.25	6.85	3,540	0.690	175.0	0.28	2,654	1,753	2.54	0.018	199.0	302.0	117.0	10.90	660	63.3	224	ND	0.051
MW4	Q3 2011	117.90	368.25	7.06	3,500	0.830	106.0	0.43	2,543	1,575	2.11	ND	208.0	354.0	125.0	13.20	651	68.4	246	ND	0.033
MW4	Q4 2011	117.90	368.25	7.07	3,470	0.720	137.0	0.14	2,818	1,428	2.12	0.013	175.0	306.0	114.0	9.93	645	68.7	239	ND	0.033
MW4	Q1 2012	117.90	368.25	7.05	3,450	0.470	126.0	<1.00	2,238	1,470	2.10	0.020	166.0	318.0	119.0	10.50	645	65.1	234	ND	0.054
MW4	Q2 2012	117.90	368.25	7.12	3,460	1.140	125.0	<1.00	2,597	1,432	2.25	0.016	160.0	311.0	115.0	9.97	656	68.2	230	ND	0.057
MW4	Q3 2012	117.90	368.25	7.20	3,460	0.710	113.0	<1.00	3,231	1,481	2.20	0.015	159.0	328.0	113.0	9.83	660	70.4	224	ND	0.039
MW4	Q4 2012	117.90	368.25	6.94	3,450	0.290	117.0	<1.00	3,250	1,628	2.10	0.013	158.0	310.0	100.0	10.60	655	63.0	208	ND	0.035
MW4	Q1 2013	117.90	368.25	7.14	3,290	0.711	110.0	<1.00	2,405	1,448	1.92	0.040	161.0	292.0	102.0	9.56	612	65.0	231	ND	0.028
MW4	Q2 2013	117.90	368.25	6.88	3,090	0.284	102.0	<1.00	2,843	1,480	3.22	0.017	154.4	266.3	103.8	8.90	591	73.0	218	<5.00	0.013
MW4	Q3 2013	114.65	371.50	6.80	2,900	1.990	100.0	<1.00	2,695	1,370	1.98	0.013	151.4	261.2	99.1	9.00	549	71.0	199	<2.40	0.017
MW4	Q4 2013	114.57	371.58	7.06	2,650	0.426	85.5	<1.00	2,433	1,293	1.61	0.087	155.9	251.3	96.1	8.90	514	72.0	181	<2.40	0.013
MW4	Q1 2014	95.08	391.07	6.98	2,660	0.711	85.4	<1.00	2,015	--	1.48	--	140.5	223.0	87.5	8.20	486	73.0	172	--	--
MW4	Q2 2014	113.90	372.25	7.17	2,370	0.428	76.3	<1.00	1,940	--	1.57	--	118.3	191.5	72.6	8.60	460	69.0	153	--	--
MW4	Q3 2014	113.55	372.60	7.06	2,460	0.512	7.7	<1.00	2,633	--	1.44	--	132.6	221.2	82.6	7.90	348	75.0	148	--	--
MW4	Q4 2014	113.85	372.30	7.25	2,410	1.280	77.8	<1.00	2,573	--	1.34	--	122.0	204.2	78.0	7.80	473	77.0	145	--	--
MW4	Q1 2015	113.18	372.97	6.96	2,320	1.150	73.7	<1.00	1,758	--	1.28	--	116.4	211.2	78.7	7.80	442	80.0	140	--	--
MW4	Q2 2015	113.15	373.00	6.98	2,290	0.870	73.7	<1.00	1,685	--	1.29		103.4	188.8	71.7	7.20	413	79.8	143	--	--
MW4	Q3 2015	118.25	367.90	7.59	2,220	1.440	72.7	<1.00	1,785	--	1.30	--	104.4	201.5	76.5	7.70	399	99.4	140	--	--
MW4	Q4 2015	102.95	383.20	7.61	2,160	0.720	84.0	<1.00	1,755	--	1.16	--	96.5	187.9	71.3	7.00	388	79.2	140	--	--
MW4	Q1 2016	112.95	373.20	7.58	2,110	0.850	72.0	<1.00	1,540	--	1.27	--	103.0	194.0	74.2	7.70	384	82.0	138	--	--
MW4	Q2 2016	112.55	373.60	7.59	2,040	1.560	51.3	<1.00	1,478	--	1.19	--	96.8	192.0	74.9	7.45	364	81.7	130	--	--
MW4	Q3 2016	112.55	373.60	7.53	1,982	1.160	60.0	<1.00	1,380	--	1.20	--	92.5	183.0	71.5	7.61	387	109.0	135	--	--
MW4	Q4 2016	116.85	369.30	7.55	1,944	1.570	55.7	<1.00	1,420	--	1.15	--	88.6	177.0	69.7	6.75	368	107.0	130	--	--
MW4	Q1 2017	111.87	374.28	7.41	1,846	0.860	54.6	<1.00	1,303	--	1.13	--	81.3	176.0	65.5	6.50	319	84.3	140	--	--
MW4	Q2 2017	111.85	374.30	7.60	1,804	1.270	53.0	<1.00	1,705	--	1.10	--	78.6	161.0	61.2	6.40	300	102.0	134	--	--
MW4	Q3 2017	111.35	374.80	7.48	1,749	0.566	50.5	<1.00	1,078	--	1.10	--	6.2	146.0	58.7	6.20	298	96.1	130	--	--
MW4	Q4 2017	110.85	375.30	7.43	1,652	0.990	49.2	<1.00	1,003	--	1.04	--	77.3	152.0	60.4	6.10	285	103.0	130	--	--
MW4	Q1 2018	110.45	375.70	6.83	1,667	1.270	47.9	<1.00	1,080	--	1.10	--	72.0	145.5	56.8	5.90	271	91.2	130	--	--
MW4	Q2 2018	110.13	376.02	7.43	1,615	2.000	48.9	<1.00	1,155	--	0.92	--	72.3	143.0	57.4	5.85	268	79.0	138	--	--
MW4	Q3 2018	91.10	395.05	7.53	1,578	2.420	47.3	<1.00	1,368	--	0.93	--	70.7	140.0	56.5	6.05	255	89.1	122	--	--
MW4	Q4 2018	90.75	395.40	6.46	1,566	0.995	45.4	<1.00	1,135	--	0.85	--	68.2	137.0	54.3	5.89	248	82.3	124	--	--
MW4	Q1 2019	90.50	395.65	7.34	1,518	1.000	42.0	<1.00	1,318	--	0.95	--	67.5	128.0	52.5	6.30	240	87.3	151	--	--
MW4	Q2 2019	90.44	395.71	7.07	1,537	0.718	43.3	<1.00	1,278	--	1.27	--	66.3	133.0	53.2	5.79	236	74.8	144	--	--
MW4	Q3 2019	90.33	395.82	7.07	1,492	1.430	35.7	<1.00	1,188	--	1.02	--	59.8	119.0	52.6	4.91	226	77.9	138	--	--
Count		42	42	43	43	43	43	42	43	20	43	18	43	43	43	43	43	43	43	2	20
Minimum		90.33	367.25	6.45	1,492	0.000	7.7	<0.00	1,003	1,293	0.85	0.013	6.2	119.0	52.5	4.91	226	54.8	122	<2.40	0.013
Maximum		118.90	395.82	7.61	3,600	7.960	175.0	1.71	3,250	2,321	9.17	0.087	209.0	354.0	126.9	13.20	672	109.0	265	<2.40	0.088
Average		111.76	374.39	7.12	2,626	1.140	90.0	<0.84	2,024	1,534	1.88	0.026	131.1	234.8	88.8	8.51	477	77.9	183	<2.40	0.034

Appendix F. Groundwater Monitoring Data

Well	Date	Depth to Water	Elevation	pH	EC	TKN	NO_3 + NO_2-N	NH_3-N	TDS	TDIS	TOC	Total P	Na	Ca	Mg	K	Cl	SO_4	HCO_3	CO_3	Mn
		feet	ft msl	s.u.	µmhos/cm	milligrams per litr															
RZA-1	Q1 2009	104.00	480.78	6.96	649	6.820	23.1	0.85	442	266	0.87	ND	19.4	65.2	35.3	3.15	50	52.0	112	ND	ND
RZA-1	Q2 2009	105.00	479.78	7.41	665	0.880	25.8	0.71	467	283	2.98	0.036	20.0	60.2	34.6	3.17	45	57.7	110	ND	ND
RZA-1	Q3 2009	105.00	479.78	6.73	681	0.060	24.2	ND	509	340	1.17	ND	18.4	57.1	31.6	2.88	85	62.9	111	ND	ND
RZA-1	Q4 2009	105.00	479.78	7.39	590	<1.000	19.2	<1.00	407	283	3.86	0.008	18.5	52.7	28.6	3.32	35	49.1	123	0.001	ND
RZA-1	Q1 2010	105.00	479.78	7.16	568	0.710	22.5	0.28	385	243	0.29	0.025	17.2	49.0	27.1	3.13	10	42.3	120	ND	0.013
RZA-1	Q2 2010	104.00	480.78	7.41	678	0.980	24.0	0.14	458	280	0.46	0.009	19.1	61.2	33.4	3.12	47	60.4	107	ND	0.002
RZA-1	Q3 2010	105.00	479.78	7.36	676	0.560	25.5	0.14	462	202	0.44	0.012	18.7	59.2	32.4	3.08	47	56.0	114	ND	0.001
RZA-1	Q4 2010	105.00	479.78	7.27	590	0.570	23.1	0.14	431	300	0.10	0.032	16.9	52.2	28.7	3.19	28	46.0	124	ND	0.019
RZA-1	Q1 2011	105.00	479.78	6.99	577	0.430	18.9	0.28	391	253	0.21	0.025	17.6	50.0	27.5	3.19	27	46.3	123	ND	0.008
RZA-1	Q2 2011	105.00	479.78	6.52	600	0.550	24.0	0.14	420	324	0.27	0.012	17.0	50.4	27.9	2.96	27	47.0	130	ND	0.005
RZA-1	Q3 2011	105.00	479.78	7.74	604	0.550	20.1	0.28	444	281	0.19	ND	18.8	61.7	31.0	3.80	37	51.6	122	ND	ND
RZA-1	Q4 2011	105.00	479.78	7.69	622	0.720	16.5	0.17	480	308	0.73	0.027	17.6	69.0	28.6	2.73	51	58.2	134	ND	0.013
RZA-1	Q1 2012	105.00	479.78	7.72	650	0.470	17.8	<1.00	500	333	0.84	0.015	17.6	86.5	30.3	2.44	57	68.0	143	ND	0.007
RZA-1	Q2 2012	104.00	480.78	7.64	772	1.280	15.5	<1.00	569	342	0.48	0.010	20.3	66.0	30.7	3.09	87	54.5	125	ND	0.002
RZA-1	Q3 2012	105.00	479.78	7.71	718	2.420	15.1	<1.00	513	317	0.93	0.017	18.2	92.7	29.7	2.18	67	71.3	140	ND	0.006
RZA-1	Q4 2012	105.00	479.78	7.27	658	0.140	17.5	<1.00	508	355	0.95	0.017	18.2	91.5	28.1	2.11	63	65.0	143	ND	0.007
RZA-1	Q1 2013	105.00	479.78	7.45	608	0.711	21.6	<1.00	435	303	0.40	0.038	17.2	52.9	27.6	3.11	47	46.0	126	ND	0.002
RZA-1	Q2 2013	105.00	479.78	7.20	729	1.140	21.1	<1.00	530	323	1.73	0.101	17.5	77.3	29.9	2.50	55	60.0	142	<5.00	<0.00014
RZA-1	Q3 2013	79.50	505.28	7.09	913	1.850	14.5	<1.00	720	405	1.31	0.048	17.8	84.2	30.3	2.80	62	59.0	141	<2.40	0.018
RZA-1	Q4 2013	78.75	506.03	6.87	792	0.568	16.6	<1.00	1,153	930	1.03	0.039	19.5	102.9	31.7	1.60	80	67.0	152	<2.40	<0.0001
RZA-1	Q1 2014	77.75	507.03	7.10	834	0.767	19.2	<1.00	453	--	0.43	--	19.0	57.4	30.1	3.40	55	49.0	127	--	--
RZA-1	Q2 2014	77.25	507.53	7.38	838	0.286	18.3	<1.00	583	--	0.49	--	17.9	28.7	28.9	3.50	106	54.0	132	--	--
RZA-1	Q3 2014	77.00	507.78	7.27	852	0.711	15.4	<1.00	705	--	0.94	--	17.9	85.4	28.8	2.60	109	61.0	138	--	--
RZA-1	Q4 2014	76.70	508.08	7.53	633	1.280	17.7	<1.00	545	--	0.53	--	19.4	73.7	29.3	2.60	55	55.0	134	--	--
RZA-1	Q1 2015	75.75	509.03	7.20	652	0.865	15.9	<1.00	525	--	0.86	--	18.6	92.8	30.0	2.40	67	63.0	145	--	--
RZA-1	Q2 2015	75.33	509.45	7.33	605	0.870	21.8	<1.00	538	--	0.28	--	17.1	52.1	27.8	3.00	32	46.2	127	--	--
RZA-1	Q3 2015	74.08	510.70	7.87	600	1.440	20.0	<1.00	500	--	0.53	--	18.2	57.4	29.6	3.20	53	43.0	127	--	--
RZA-1	Q4 2015	74.60	510.18	7.83	594	0.860	20.2	<1.00	465	--	0.25	--	17.4	53.3	28.0	3.10	38	47.9	119	--	--
RZA-1	Q1 2016	74.50	510.28	7.75	588	0.850	21.5	<1.00	510	--	0.35	--	17.9	52.9	29.2	3.10	62	68.0	115	--	--
RZA-1	Q2 2016	73.60	511.18	7.78	593	1.410	18.0	<1.00	430	--	0.21	--	18.2	54.2	29.6	3.00	37	43.8	110	--	--
RZA-1	Q3 2016	73.40	511.38	7.75	655	1.160	17.7	<1.00	513	--	0.41	--	18.9	69.5	32.3	3.09	71	82.1	126	--	--
RZA-1	Q4 2016	73.03	511.75	7.67	614	1.570	20.2	<1.00	395	--	0.29	--	18.3	57.1	30.1	3.18	57	50.9	124	--	--
RZA-1	Q1 2017	72.50	512.28	7.61	587	0.570	19.8	<1.00	365	--	<0.50	--	16.8	54.6	28.9	2.90	27	48.4	120	--	--
RZA-1	Q2 2017	72.00	512.78	7.74	598	0.710	20.6	<1.00	563	--	0.60	--	17.0	54.1	29.1	3.40	38	57.7	126	--	--
RZA-1	Q3 2017	71.70	513.08	7.72	594	0.566	20.3	<1.00	378	--	0.20	--	17.3	51.3	28.1	3.10	33	54.4	120	--	--
RZA-1	Q4 2017	71.00	513.78	7.67	578	0.850	20.7	<1.00	363	--	0.29	--	18.1	53.2	29.3	3.00	32	54.4	112	--	--
RZA-1	Q1 2018	70.30	514.48	7.13	596	0.980	20.9	<1.00	380	--	0.24	--	18.0	54.8	28.8	2.90	32	53.8	105	--	--
RZA-1	Q2 2018	69.04	515.74	7.63	587	2.000	21.2	<1.00	390	--	<1.00	--	17.8	54.0	28.9	2.89	31	45.9	114	--	--
RZA-1	Q3 2018	68.82	515.96	7.63	590	1.990	20.3	<1.00	438	--	<0.15	--	17.9	54.0	29.2	3.08	32	63.9	120	--	--
RZA-1	Q4 2018	68.42	516.36	6.54	604	0.853	19.9	<1.00	405	--	0.15	--	17.1	52.6	27.3	3.03	33	44.5	125	--	--
RZA-1	Q1 2019	67.42	517.36	7.75	596	1.000	19.6	<1.00	445	--	0.15	--	17.7	50.3	27.2	3.47	31	55.4	128	--	--
RZA-1	Q2 2019	67.15	517.63	6.81	616	1.000	19.7	<1.00	440	--	2.41	--	18.7	54.3	28.4	3.36	34	56.1	130	--	--
RZA-1	Q3 2019	66.72	518.06	7.22	591	0.286	17.4	<1.00	433	--	0.36	--	20.5	48.5	26.6	2.74	32	47.7	116	--	--
Count		43	43	43	43	43	43	42	43	20	43	17	43	43	43	43	43	43	43	3	13
Minimum		66.72	479.78	6.52	568	0.060	14.5	0.14	363	202	0.10	0.008	16.8	28.7	26.6	1.60	10	42.3	105	<0.00	0.001
Maximum		105.00	518.06	7.87	913	6.820	25.8	<1.00	1,153	930	3.86	0.101	20.5	102.9	35.3	3.80	109	82.1	152	<2.40	0.019
Average		86.36	498.42	7.38	650	1.053	19.8	<0.84	488	333	0.72	0.028	18.2	61.8	29.5	2.97	49	55.0	125	<1.60	0.008

Appendix F. Groundwater Monitoring Data

Well	Date	Depth to Water	Elevation	pH	EC	TKN	NO_3 + NO_2-N	NH_3-N	TDS	TDIS	TOC	Total P	Na	Ca	Mg	K	Cl	SO_4	HCO_3	CO_3	Mn
		feet	ft msl	s.u.	µmhos/cm	milligrams per litr															
RZA-2	Q1 2009	119.00	395.58	6.85	1,651	5.680	37.3	1.00	1,106	795	3.63	ND	136.0	163.0	54.2	7.62	170	150.9	338	ND	ND
RZA-2	Q2 2009	120.00	394.58	7.07	1,664	1.070	73.9	0.42	1,089	866	4.27	0.028	135.0	154.0	53.0	7.24	165	166.0	322	ND	ND
RZA-2	Q3 2009	120.00	394.58	6.89	1,683	1.980	36.9	ND	1,129	917	2.83	0.034	128.0	144.0	47.6	6.90	170	177.0	326	ND	ND
RZA-2	Q4 2009	120.00	394.58	7.13	1,676	<1.000	40.3	<1.00	1,089	864	2.97	0.030	139.0	147.0	48.9	7.09	165	180.0	316	ND	0.010
RZA-2	Q1 2010	120.00	394.58	6.88	1,679	0.710	41.7	0.14	1,104	838	3.17	0.016	134.0	141.0	48.2	7.09	160	204.0	302	ND	0.002
RZA-2	Q2 2010	120.00	394.58	7.04	1,692	1.390	36.9	0.28	1,201	867	2.70	0.035	137.0	147.0	49.6	0.02	158	216.0	300	ND	0.015
RZA-2	Q3 2010	120.00	394.58	7.06	1,700	0.280	39.9	0.14	1,154	870	2.93	0.035	140.0	146.0	50.4	6.82	162	220.0	298	ND	0.007
RZA-2	Q4 2010	120.00	394.58	6.85	1,707	0.570	46.5	0.14	1,082	860	2.84	0.031	132.0	146.0	50.6	7.07	158	239.0	293	ND	0.013
RZA-2	Q1 2011	120.00	394.58	6.82	1,721	0.850	38.1	0.28	1,174	837	2.86	0.031	143.0	149.0	51.4	7.47	162	223.0	288	ND	0.013
RZA-2	Q2 2011	120.00	394.58	6.78	1,745	0.690	51.4	0.41	1,188	978	3.08	0.019	134.0	147.0	51.6	7.00	164	330.0	295	ND	0.007
RZA-2	Q3 2011	120.00	394.58	7.15	1,749	0.280	37.4	0.14	1,172	950	3.02	0.016	143.0	177.0	55.7	8.15	175	363.0	302	ND	ND
RZA-2	Q4 2011	120.00	394.58	7.16	1,719	0.720	37.3	0.14	1,155	863	2.87	0.017	129.0	147.0	51.1	6.63	165	399.0	280	ND	0.001
RZA-2	Q1 2012	120.00	394.58	7.14	1,711	0.470	39.8	<1.00	1,145	925	2.95	0.016	133.0	149.0	52.8	7.18	157	401.0	277	ND	0.005
RZA-2	Q2 2012	120.00	394.58	7.21	1,734	1.140	41.3	<1.00	1,173	913	2.82	0.023	128.0	150.0	53.6	6.81	172	372.0	293	ND	0.008
RZA-2	Q3 2012	120.00	394.58	7.25	1,729	2.980	37.6	<1.00	1,212	943	2.84	0.046	124.0	158.0	52.7	6.55	167	251.0	280	ND	0.025
RZA-2	Q4 2012	120.00	394.58	6.98	1,703	0.290	38.6	<1.00	1,180	983	2.94	0.033	126.0	154.0	49.9	7.16	163	238.0	271	ND	0.014
RZA-2	Q1 2013	120.00	394.58	7.02	1,703	1.140	40.6	<1.00	1,065	865	2.65	0.050	121.0	150.0	50.1	6.59	164	233.0	283	ND	0.024
RZA-2	Q2 2013	120.00	394.58	6.99	1,689	0.853	39.9	<1.00	1,188	943	4.54	0.026	115.7	143.4	52.7	6.20	162	258.0	273	<5.00	<0.00014
RZA-2	Q3 2013	119.58	395.00	6.86	1,662	1.850	40.3	<1.00	1,273	920	3.19	0.022	113.2	143.4	52.3	6.20	112	250.0	267	<2.40	0.003
RZA-2	Q4 2013	119.50	395.08	6.85	1,622	0.796	38.1	<1.00	645	385	2.55	0.022	128.9	151.8	52.8	6.30	150	238.0	261	<2.40	<0.0001
RZA-2	Q1 2014	119.00	395.58	6.95	1,621	0.909	35.9	<1.00	1,128	--	2.68	--	129.1	149.3	51.9	6.20	139	244.0	251	--	--
RZA-2	Q2 2014	118.75	395.83	7.10	1,606	1.430	36.4	<1.00	1,150	--	2.64	--	115.7	137.2	47.4	6.20	138	246.0	251	--	--
RZA-2	Q3 2014	119.00	395.58	7.05	16	0.711	34.1	<1.00	1,168	--	2.62	--	124.3	142.4	46.8	6.10	148	238.0	255	--	--
RZA-2	Q4 2014	119.20	395.38	7.28	1,578	1.280	34.8	<1.00	1,160	--	2.54	--	127.5	140.0	48.0	6.30	183	236.0	248	--	--
RZA-2	Q1 2015	118.33	396.25	6.91	1,556	1.010	34.4	<1.00	1,080	--	2.55	--	123.6	139.5	46.9	6.30	127	240.0	254	--	--
RZA-2	Q2 2015	118.08	396.50	6.96	1,555	0.870	34.0	<1.00	1,153	--	2.57	--	121.0	129.9	44.4	5.80	128	235.0	254	--	--
RZA-2	Q3 2015	118.40	396.18	7.36	1,538	1.440	33.2	<1.00	1,065	--	3.91	--	122.4	148.9	46.0	6.70	43	226.0	249	--	--
RZA-2	Q4 2015	118.30	396.28	7.39	1,497	0.860	31.9	<1.00	1,068	--	2.41	--	121.6	122.0	42.7	6.10	118	254.0	248	--	--
RZA-2	Q1 2016	117.70	396.88	7.33	1,508	0.850	35.3	<1.00	1,018	--	2.64	--	128.0	127.0	45.2	6.70	121	238.0	246	--	--
RZA-2	Q2 2016	117.40	397.18	7.38	1,500	1.410	26.9	<1.00	955	--	2.62	--	130.0	130.0	43.8	6.28	136	267.7	242	--	--
RZA-2	Q3 2016	117.50	397.08	7.33	1,496	1.160	30.8	<1.00	953	--	2.59	--	132.8	127.3	46.5	6.90	121	283.4	250	--	--
RZA-2	Q4 2016	118.00	396.58	7.25	1,489	1.570	32.0	<1.00	920	--	2.50	--	135.0	126.0	44.0	6.11	131	280.0	250	--	--
RZA-2	Q1 2017	117.10	397.48	7.25	1,493	0.860	30.8	<1.00	1,055	--	2.58	--	132.2	126.0	43.8	5.80	119	276.0	244	--	--
RZA-2	Q2 2017	117.00	397.58	7.34	1,496	0.710	32.3	<1.00	1,220	--	1.10	--	118.0	122.0	43.7	6.10	115	209.0	236	--	--
RZA-2	Q3 2017	116.80	397.78	7.39	1,495	0.566	31.4	<1.00	953	--	1.10	--	126.0	119.0	42.9	6.20	118	269.0	256	--	--
RZA-2	Q4 2017	117.00	397.58	7.31	1,485	0.850	32.4	<1.00	910	--	2.70	--	132.0	120.0	44.1	5.80	116	242.0	250	--	--
RZA-2	Q1 2018	116.10	398.48	6.97	1,508	0.980	31.6	<1.00	973	--	2.82	--	127.0	117.3	42.8	5.70	122	227.0	244	--	--
RZA-2	Q2 2018	115.04	399.54	7.26	1,496	1.000	32.5	<1.00	885	--	2.62	--	131.0	120.0	44.2	5.79	125	221.0	250	--	--
RZA-2	Q3 2018	115.50	399.08	7.12	1,499	2.130	31.4	<1.00	1,018	--	2.81	--	131.0	119.0	44.1	6.19	122	317.0	252	--	--
RZA-2	Q4 2018	115.33	399.25	6.57	1,520	1.140	30.7	<1.00	1,023	--	2.67	--	128.0	119.0	43.8	5.94	123	231.0	264	--	--
RZA-2	Q1 2019	114.75	399.83	7.28	1,514	1.000	30.0	<1.00	1,090	--	2.82	--	136.0	115.0	43.6	6.85	125	194.0	279	--	--
RZA-2	Q2 2019	115.00	399.58	6.89	1,532	0.718	29.9	<1.00	1,063	--	3.73	--	133.0	125.0	46.0	6.18	125	185.0	284	--	--
RZA-2	Q3 2019	115.11	399.47	7.21	1,487	0.571	24.1	<1.00	1,003	--	2.84	--	113.0	109.0	43.9	5.09	122	300.0	280	--	--
Count		43	43	43	43	43	43	42	43	20	43	19	43	43	43	43	43	43	43	2	14
Minimum		114.75	394.58	6.57	16	0.280	24.1	0.14	645	385	1.10	0.016	113.0	109.0	42.7	0.02	43	150.9	236	<2.40	0.001
Maximum		120.00	399.83	7.39	1,749	5.680	73.9	<1.00	1,273	983	4.54	0.050	143.0	177.0	55.7	8.15	183	401.0	338	<2.40	0.025
Average		118.43	396.15	7.09	1,568	1.134	36.5	<0.84	1,082	869	2.83	0.028	128.8	138.1	48.0	6.36	142	250.4	272	<2.40	0.011

NOTES:

Data is from Tyson Fresh Meats, Inc. discharge monitoring reports.

Abbreviations: Ca = calcium, Cl = chloride, CO_3 = carbonate, EC = electrical conductivity, ft msl = feet above mean sea level, HCO_3 = bicarbonate, K = potassium, Mg = magnesium, Mn = manganese, Na = sodium, ND = non-detect, NH_3-N = ammonia-nitrogen, NO_3 + NO_2-N = nitrate + nitrite as nitrogen, P = phosphorus, s.u. = standard units, SO_4 = sulfate, TDIS = total dissolved inorganic solids, TDS = total dissolved solids, TKN = total Kjeldahl nitrogen, TOC = total organic carbon, µmhos/cm = micromhos per centimeter.