City of Donald, Oregon

Water System Master Plan Amendment

TETRA TECH

July 2021

Water System Master Plan Amendment

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PREPARED FOR

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ABBREVIATIONS

Abbreviation	Definition
ERU	equivalent residential units
GGP	Gary Grossen Properties, LLC
gpcd	gallons per capita per day
gpm	gallons per minute
GSI	GSI Water Solutions, Inc.
HVAC	heating, ventilation, and air conditioning
MDD	maximum-day demand
ODFW	Oregon Department of Fish and Wildlife
OHA	Oregon Health Authority
OWRD	Oregon Water Resources Department
PHD	peak hour demand
PLC	programmable logic controller
PUD	planned unit development
PVC	polyvinyl chloride
SCADA	supervisory control and data acquisition
TDH	total dynamic head
VFD	variable frequency drive
WSMP	Water System Master Plan
WTP	Water Treatment Plant
WWTP	Wastewater Treatment Plant

INTRODUCTION

BACKGROUND

An updated Water System Master Plan (WSMP) for the City of Donald (City) was approved by the Oregon Health Authority (OHA) in June 2019 and adopted by City Council in August 2019. The City has requested that Tetra Tech, the City's Engineer of Record as of February 2020, prepare an amendment to the WSMP to reevaluate the projected population and water demand and capital improvement projects (CIPs) over the planning period. Additional capital improvement projects in support of the modified projections were developed as part of the WSMP Amendment. In April 2020, Tetra Tech and GSI Water Solutions (GSI) performed a high-level review of the City's potential to obtain additional water rights and conducted a siting study for two new wells as a supplement to this WSMP Amendment.

AMENDMENT PURPOSE AND NEED

The 2019 WSMP approved by OHA did not include a residential planned unit development (PUD) on acreage that was included within the urban growth boundary (UGB) when the boundary expanded in 2018; that PUD is currently under development review. Its current design includes 297 single-family homes to be constructed starting in 2021. The PUD will result in a significant increase in water demand from the City's water system much sooner than projected in the 2019 WSMP. The 2019 WSMP estimated a 2040 population of 1,705 using the Portland State University (PSU) published population growth rate for Donald, and a peak day water demand of 426,250 gallons per day (gpd). With the addition of the PUD, full buildout within the Donald UGB is projected to occur by 2032. The estimated 2032 population and peak-day water demand with the addition of the PUD is 2,335 persons and 450,655 gpd, respectively. The increase in projected population and water demand within the planning period required this amendment to the 2019 WSMP.

NOTES ABOUT THIS AMENDMENT

Section numbering in this amendment matches the numbering of corresponding sections in the 2019 WSMP. This amendment indicates whether its content replaces or is in addition to content from the 2019 WSMP. Content from the previous plan that is not indicated here as having changed remains valid for the overall WSMP.

This WSMP Amendment uses different terminology from the 2019 WSMP for the following concepts:

- The water demand value called "peak day demand" in the 2019 WSMP is called "maximum-day demand" in this amendment.
- The water demand value called "peak instantaneous demand" in the 2019 WSMP is called "peak-hour demand" in this amendment.

I. EXECUTIVE SUMMARY

(This section is unchanged from the 2019 WSMP approved by OHA except for the information below.)

The City of Donald commissioned Tetra Tech to prepare an amendment to the Water System Master Plan prepared by Curran-McLeod in 2019. This amendment provides an updated population and water demand forecast, and an updated Capital Improvement Plan. An amendment is required to address revised population and water demand forecasts due to planned residential development within the City's water service area.

Average water production has decreased from 100 gallons per capita per day (gpcd) to an estimated 77 gpcd due to reductions in water losses. Production to meet current peak-day demand has been reduced from 250 gpcd to 193 gpcd.

This amendment also revises the recommended capital improvements. Revisions include the following:

- Updated cost estimates based on more recent cost data.
- Removal of Well No.2 capacity increase project. A study conducted for this amendment deemed that additional production from this well may not be achievable.
- Addition of a third production well (Well No.4) for redundancy.
- Addition of a backwash recycle system to reduce water losses.
- Addition of electrical service upgrade to support new booster pumps.

A summary of the water system capital improvements is presented in Table ES-1. The revised CIPs are listed alongside the 2019 WSMP CIPs for clarity.

Table ES-1. Capital Improvement Plan Summary

2019 WSMP Item No.	WSMP Update Item No.	Capital Improvement	Timeline	Estimated Cost
A. Source Improvements				
1	1	Decommission Well No. 1	1 to 2 years	$30,000
2	N/A	Expand Well No. 2 Capacity (No Longer Required)	N/A	N/A
3	2	New Well No. 3	1 to 2 years	$750,000
N/A	3	New Well No. 4 (New project)	10+ years	$1,355,000
		Total Cost of Source Improvements		***$2,135,000***
B. Water Treatment Plant Improvements				
1	1	Replace filter control relay with PLC	6 to 10 years	Inc. in 4b
2	2	Add two 80 gpm green sand filter units (No longer required); Monitor performance	1 to 2 years	Inc. in maintenance budget
3	3	Add secondary containment for chlorine hypochlorite and potassium permanganate feed systems. Relocate to chemical storage room.	1 to 2 years	$10,000
4	4a 4b	SCADA System—Phase 1 SCADA System—Phase 2	1 to 2 years 6 to 10 years	$100,000 $75,000
5	5	Building Expansion for Staff Facilities[a]	6 to 10 years	$120,000
N/A	6	Backwash Recycle System	1 to 2 years	$30,000
		Total Cost of Water Treatment Plant Improvements		***$335,000***
C. Distribution Pumping System Improvements				
1	1	Replace booster Pumps No. 1, No. 2, and No. 3 with two new booster pumps. Includes VFDs, controls, piping, valves	1 to 2 years	$200,000
		Total Cost of Distribution Pump System Improvements		***$200,000***
D. Electrical Service Improvements				
N/A	1	Upsize electrical feed for new well and booster pumps	1 to 2 years	$75,000
		Total Cost of Electrical Service Improvements		***$75,000***
E. Standby Power System Improvements				
1	1	Replace existing standby power system at the WTP building	1 to 2 years	$150,000
		Total Cost of the Standby Power System Improvements		***$150,000***
		Total Water CIP Cost		**$2,895,000**

a. Assumes existing hydropneumatic tank remains

II. EXISTING WATER SYSTEM

A. BACKGROUND

(This section is unchanged from the 2019 WSMP approved by OHA except for the information below.)

The numbers of metered accounts and the rates are as follows:

- The City has 409 active metered water services (374 residential, 31 commercial and 4 industrial) as of October 2020.
- Meters are read monthly and water bills include a base charge of $45.12 per month for the first 1,000 gallons and a unit charge of $2.98 per 1,000 gallons over the first 1,000 gallons.
- All customer classifications pay the same base rate and unit charge. Commercial and industrial customer classifications are treated as one category.
- On July 1, 2021, the water and sewer rates will increase by 3 percent, in lieu of the annual Consumer Price Index increase. The increases are based on the results of a water and sewer rate study completed by Donovan Enterprises in May 2016, which expires on June 30, 2021. Donovan Enterprises is currently preparing an updated rate study with proposed new rates.

B. SERVICE AREA

(This section is unchanged from the 2019 WSMP approved by OHA.)

C. SOURCE OF SUPPLY

(This section is unchanged from the 2019 WSMP approved by OHA.)

D. STATUS OF WATER RIGHTS

(The content below is an addition to the content for this section in the 2019 WSMP)

The City has one water right permit (G-9513) that authorizes a withdrawal of 175 gallons per minute (gpm) from each of the City's two wells (Well No. 1 and Well No. 2), with a maximum combined withdrawal rate of 350 gpm. A copy of the permit is included in Appendix A. The City submitted a Claim of Beneficial Use to the Oregon Water Resources Department (OWRD) in 2010 to partially certificate the permit. Due to the capacity limitation imposed by a sand filter installed at the time of the application, the OWRD proposed to issue a water rights certificate for a combined rate of 300 gpm, leaving the remaining 50 gpm unperfected. The remaining

50 gpm could be certificated after improvements to the system are complete and the City can demonstrate full beneficial use of the water. The City requested that the OWRD continue processing the Claim of Beneficial Use as a partial perfection since it offers the protection of certification for most the City's water right.

The City submitted a permit extension request in 2019, which was referred to the Oregon Department of Fish and Wildlife (ODFW) for review based on a determination by the OWRD that pumping the undeveloped portion of the permit (50 gpm) will have an impact on local surface water bodies (Appendix B). The total impact has been estimated to range between 0.03 and 0.09 gpm.

Based on its review of the City's pumping records, operations manual, and WSMP, GSI determined that the City is able to appropriate the full 350 gpm from both wells and there is no undeveloped portion of the permit that is sufficient to warrant ODFW review or added permit conditions. GSI submitted this evidence to ODFW in April 2020. On October 6, 2020, OWRD issued a Proposed Final Order to extend the time to complete construction and the time to fully apply water to beneficial use to October 1, 2030. The protest period closed November 20, 2020, with no protests filed. OWRD approved the extension in a letter dated December 21, 2020 (Appendix B).

The City's projected maximum-day demand is not expected to exceed the limits of the City's water right during the 20-year planning period.

E. WATER SYSTEM OPERATION

(This section is unchanged from the 2019 WSMP approved by OHA.)

F. WATER SYSTEM DEMAND

(The content below is an addition to the content for this section in the 2019 WSMP)

1. Water Loss

Records of water production volume and consumption volume for 2014 through 2018 indicate that 30.2 percent of the total production volume in that period went to water loss or unaccounted-for water. More recent comparisons of production volume and consumption volume indicate that water loss or unaccounted-for water has been reduced to approximately 4 to 9 percent, through extensive repairs on the piping system. Water loss or unaccounted-for water volumes of 10 percent are considered typical and largely attributable to irrigation and filter backwashing at the City's Water Treatment Plant (WTP).

2. Production

The 2019 WSMP used an average-day required production rate of 100 gallons per capita per day (gpcd) and a maximum-day required production rate of 250 gpcd. These rates incorporate residential and commercial/industrial water use plus water loss. The 2019 rates included 30 percent of total production for water loss. Based on the reduction in water loss achieved through recent improvements, this WSMP Amendment assumes that water loss represents only 9 percent of production, yielding an average-day required production rate of 77 gpcd and a maximum-day required production rate of 193 gpcd.

3. Distribution by Water Use

The assumed average-day production of 77 gpcd and maximum-day production of 193 gpcd include residential and commercial/industrial consumption plus water loss. This WSMP Amendment assumes that the ratio of residential to commercial/industrial consumption will remain relatively unchanged over the planning period, with 81 percent of consumption (excluding water loss) allocated to residential use and 19 percent to commercial/industrial use (the same ratio used for the 2019 WSMP). Table II-1 shows the basis for distributing the average-day production among water uses.

Table II-1. Average-Day Per-Capita Water Use Basis

Water Use	Rate (gpcd)	Percentage of Total (%)
Residential	57	74
Commercial/Industrial	13	17
Water Loss/Unaccounted Water	7	9
Total	**77**	**100**

G. OPERATIONS AND MAINTENANCE REQUIREMENTS

(This section is unchanged from the 2019 WSMP approved by OHA.)

III. WATER QUALITY AND SERVICE GOALS

A. EXISTING REGULATORY REQUIREMENTS

(This section is unchanged from the 2019 WSMP approved by OHA.)

B. MONITORING REQUIREMENTS

1. Arsenic

(This section is unchanged from the 2019 WSMP approved by OHA.)

2. Lead and Copper

(This section is unchanged from the 2019 WSMP approved by OHA.)

3. Inorganic Compounds

(This section is unchanged from the 2019 WSMP approved by OHA.)

4. Nitrate

(This section is unchanged from the 2019 WSMP approved by OHA.)

5. Nitrite

(This section is unchanged from the 2019 WSMP approved by OHA.)

6. Radionuclides

(This section is unchanged from the 2019 WSMP approved by OHA.)

7. Synthetic Organic Chemicals (SOC)

(This section is unchanged from the 2019 WSMP approved by OHA.)

8. Volatile Organic Chemicals

(This section is unchanged from the 2019 WSMP approved by OHA.)

9. Total Coliform

(This section is unchanged from the 2019 WSMP approved by OHA.)

10. Secondary Contaminants

(The content below is an addition to the content for this section in the 2019 WSMP)

The 2019 WSMP summarized the water quality results for iron and manganese taken from Well No. 2 in 1983. Samples were taken from the City's raw and finished water in February 2021 to determine if the current raw water quality has changed significantly from the 1983 samples and to estimate the adequacy of the existing treatment system. The results summarized in Table III-1 show that, unlike the samples taken in 1983, the raw water concentrations for iron and manganese exceed the secondary contaminant levels per OAR 333-061-0030(6). Results from the finished water show that the green sand filters are effectively removing iron and manganese at a total flow rate of 200 gpm pumped from Well No. 2.

Table III-1. Iron and Manganese Water Quality Results

Contaminant	Raw Water, Well No. 2 (mg/L)	Finished Water, Post-Filtration (mg/L)	Removal Efficiency (%)	Secondary Contaminant Level (mg/L)
Iron	0.39	ND	~100%	0.3
Manganese	0.254	0.0059	97.7%	0.05

C. FUTURE REGULATORY REQUIREMENTS

1. Contaminate Candidate List (CCL 5)

(This section is unchanged from the 2019 WSMP approved by OHA.)

2. Lead and Copper Rule (LCR) Revisions

(This section is unchanged from the 2019 WSMP approved by OHA.)

D. NON-REGULATORY WATER QUALITY NEEDS

(The content below is an addition to the content for this section in the 2019 WSMP)

The City has had a recent complaint from a nearby customer about odor issues likely caused by hydrogen sulfide. It is recommended the City perform testing for hydrogen sulfide removal efficiency and odor content on the raw and filtered water to understand the origin of the reported odor and to measure the performance of the treatment process. The results can be used to improve process operations to reduce taste and odor issues.

E. FLOW AND PRESSURE REQUIREMENTS

(The content below is an addition to the content for this section in the 2019 WSMP)

The City's wastewater treatment plant (WWTP) should have a fire flow of 1,500 gpm for 2 hours. The City PUD is modeled for a fire flow of 1,500 gpm. See Section V.F for further analysis.

IV. PROJECTED WATER SYSTEM GROWTH

A. POPULATION

(The content below is an addition to the content for this section in the 2019 WSMP)

1. New Development

The 2019 WSMP population projections were based on data provided by Portland State University Population Research Center and were projected using an annual average growth rate of 2.8 percent. Those projections did not include the PUD currently under development review. The PUD was originally expected to be built over a 12-year period, but the developer has recently set a 2-year time frame for full buildout of the planned 297 single-family homes. The density of the proposed single-family homes will be greater than the typical density currently found in Donald, as approved through the City and County land use approval processes.

In addition to the single-family homes, the PUD is currently designed to provide 80 multi-family units. The developer has not yet determined when the multi-family units will be built. Projections for this amendment assume that they will be built during the second year of the single-family home development.

Assuming an average of 2.8 people in each single-family home and 2.0 people in each multi-family unit, the estimated increase in population from the PUD is 992 people.

2. Infill

A review of undeveloped and under-developed acreage in the Donald service area indicates 16.7 acres zoned single-family residential and 2 acres zoned multi-family residential that has potential for development. It is assumed that the density of any new development on this acreage would fall within the current City zoning requirements of 6 single-family residential units per acre and 14 multi-family units per acre. Projections for this amendment assume, per 2010 U.S. census data, that each single-family home will increase the population by 2.8 people and each multi-family unit will increase the population by 2 people. Land that is zoned downtown mixed use was also included in the infill calculations, with an increase of 2 people per unit. The total potential estimated increase in population at buildout within the current zoning due to infill is 358 people. This amendment assumes that population associated with infill development will grow at a rate of 2.8 percent, per the Portland State University projection, until the total growth of 358 people is reached.

3. Total Projected Growth

Based on the anticipated growth described above, full buildout in Donald is expected to occur in 2032. Table IV-1 tabulates the revised population projections.

Table IV-1. Updated Population Projections

Year	2019 WSMP Projection	2020 WSMP Amendment Projections			
		PUD Growth[a]	Infill Growth[b]	Total Annual Growth	Accumulated Population
2020	1,011	0	0	0	1,011
2021		431	28	459	1,444
2022		561	28	589	2,033
2023		0	29	29	2,062
2024		0	30	30	2,092
2025	1,172	0	31	31	2,123
2026		0	32	32	2,155
2027		0	33	33	2,188
2028		0	33	33	2,221
2029		0	34	34	2,255
2030	1,355	0	35	35	2,290
2031		0	36	36	2,326
2032		0	9	9	2,335
2035	1,555	0	0	0	2,335
2040	1,705	0	0	0	2,335

a. Estimated growth is based on the current planning as described by the PUD developer.
b. Estimated annual average growth rate of 2.8 percent based on Portland State University Population Research Center.

B. PROJECTED WATER DEMANDS

(The content below is an addition to the content for this section in the 2019 WSMP)

1. Average-Day and Maximum-Day Demand

Future water demand is projected based on projected population growth and the assumed per capita water use (average-day production of 77 gpcd and maximum-day production of 193 gpcd). The projected water demand through 2040 is summarized in Table IV-2, reflecting full buildout population and associated demand occurring being reached in 2032.

2. Industrial Demand

Donald is currently limited in its potential for development or expansion of industrial land. It is also unlikely that any newly annexed property over the planning period would be zoned industrial, given the shortage of available housing stock. However, the Donald Industrial Park has asked the City to plan for a consumption rate of 400 gallons per acre per day for the industrial park's 15 acres, or 6,000 gallons per day. Current projections support this requirement. Based on a water use distribution with 17 percent of total water allocated to

commercial/industrial use (see Table II-1), the projected full buildout demand will allocate 30,565 gallons per day (average-day demand) and 76,611 gallons per day (maximum-day demand) to commercial/industrial use.

Table IV-2. Projected Average-Day and Maximum-Day Demand

Year	Population	Average-Day Demand		Maximum-Day Demand	
		(gallons/day)	(gallons/minute)	(gallons/day)	(gallons/minute)
2020	985	75,845	53	190,105	132
2021	1,444	111,111	77	303,396	193
2022	2,033	156,541	109	392,369	272
2023	2,061	158,697	110	397,773	276
2024	2,091	161,007	112	403,563	280
2025	2,122	163,394	113	409,546	284
2026	2,153	165,781	115	415,529	288
2027	2,185	168,245	117	421,705	292
2028	2,219	170,863	119	428,267	297
2029	2,253	173,481	120	434,829	301
2030	2,288	176,176	122	441,584	306
2031	2,324	178,948	124	448,532	311
2032	2,335	179,795	125	450,655	312
2033	2,335	179,795	125	450,655	312
2034	2,335	179,795	125	450,655	312
2035	2,335	179,795	125	450,655	312
2036	2,335	179,795	125	450,655	312
2037	2,335	179,795	125	450,655	312
2038	2,335	179,795	125	450,655	312
2039	2,335	179,795	125	450,655	312
2040	2,335	179,795	125	450,655	312

3. Peak-Hour Demand

The 2019 WSMP determined a peak-hour demand (PHD) of 950 gpm based on a projected population of 1,705 and a methodology from *Source Book of Community Water Systems: Commercial, Institutional, Residential, Industrial Applications* (Joseph Ameen, 1960). This WSMP Amendment determines PHD using the updated buildout population and the following equation from the State of Washington's *Water System Design Manual* (Washington State Department of Health 2020), which is commonly used in Oregon and Washington (Section 3.4.2):

PHD = {[(MDD/N)/1,440] * [(C * N + F)] + 18}

Where:

PHD = Peak-hour demand (gpm)
MDD = Maximum-day demand (gallons per day)
N = Number of equivalent residential units (ERUs) (each ERU is equivalent to 2.8 people)
C = Coefficient associated with ranges of ERUs (C = 1.6 for ERU>500)
F = Factor associated with ranges of ERUs (F= 225 for ERU>500)

Using this equation, the updated PHD for the full buildout population of 2,335 is 603 gpm, about twice the projected MDD of 312 gpm. The PHD:MDD ratio in the 2019 WSMP is 3.3. The lower ratio in the updated projection is considered to be reasonable, given the absence of a large industrial user and the recent pipeline repairs that reduced water loss. Also, the methodology used in the 2019 WSMP was developed in 1960 when water conservation measures were not typical in municipal water systems.

4. Demand Summary

Table IV-3 shows projected average-day demand, MDD and PHD over the planning period.

Table IV-3. Summary of Population and Demand Projections

Year	Population	Average-Day Demand (gpm)	MDD (gpm)	PHD (gpm)
2020	985	53	132	314
2025	2,122	113	284	557
2030	2,288	122	306	593
2035	2,335	125	312	603
2040	2,335	125	312	603

C. FUTURE STORAGE REQUIREMENTS

(The content below replaces the content for this section in the 2019 WSMP.)

The 2019 WSMP stated that the water system must supply a minimum water storage volume sufficient for one day of maximum-day demand (MDD) plus 2 hours of fire-flow. This amendment reevaluates water storage requirements to provide adequate storage to serve the needs of the community for a 20-year period. Storage requirements were based on the specific needs of the City and design guidance per the Washington State *Water System Design Manual* (Washington State Department of Health 2020). The purpose of the water storage is to provide the water system with adequate and resilient storage for the components described below.

1. Operational Storage

The purpose of the operational storage volume is to prevent excessive cycling of the well pumps. A conservative estimate for the minimum operational storage volume for pump protection is the volume required for a maximum cycling frequency of 6 cycles per hour. The operational storage serves a function similar to that of a withdrawal volume for hydropneumatic tanks. The operational storage volume is estimated as the product of the supply pump capacity and one-quarter of the cycle time (2.5 minutes), based on a maximum cycling frequency of 6 cycles per hour.

2. Equalization Storage

Equalization storage provides water storage for PHD events when the source water or WTP capacity cannot meet the PHD. The recommended equalization storage is equal to the difference between the PHD and the source water pumping capacity or water treatment plant capacity for an assumed 150-minute PHD event duration. The equalization storage can be reduced with increased source water pumping and treatment capacity. Because the current source water capacity is lower than the current treatment capacity, equalization storage for this amendment is calculated from the difference in PHD and source water capacity.

3. Fire Suppression Storage

Fire suppression storage is the volume necessary to provide adequate fire protection water for the needs of the City. The recommended fire flow per the 2019 Oregon Fire Code and the Aurora Rural Fire District are summarized below, according to land-use:

- One- and two-family residential dwellings, Group R-3 and R-4 buildings and townhouses:
  - With a fire-flow area of 0 to 3,600 square feet, a minimum fire flow of 1,000 gpm for a 1-hour duration. Equivalent to 60,000 gallons.
- Residential buildings other than one- and two-family residential dwellings, Group R-3 and R-4 residential buildings, and residential townhouses:
  - Depending on fire-flow area and whether a sprinkler system is equipped, a typical minimum of 1,500 gpm for a 2-hour duration. Equivalent to 180,000 gallons.
- City of Donald WWTP
  - A fire flow of 1,500 gpm for a 2-hour duration. Equivalent to 180,000 gallons.
- Industrial/Commercial
  - The City has elected to provide a fire flow of 2,500 gpm for 2 hours to current and future commercial and industrial customers. Equivalent to 300,000 gallons.

4. Standby Storage

Standby storage provides potable water when the source of supply or treatment is unavailable, either during routine maintenance or emergencies such as equipment failure or source water contamination. The City should keep at least 2 days of stored water in reserve for unforeseen emergencies. Standby storage is recommended to be equivalent to 2 times the average-day demand (ADD), per recommendations made in the City's 2005 WSMP.

5. Dead Storage

Dead storage is the volume required to maintain minimum pressure in a distribution system and prevent damage to pumping equipment. The booster pumps at the WTP control pressure in the City's distribution system, so dead storage is only required for maintaining suction head on the booster pumps. The recommended net positive suction head required for the existing and future booster pumps is 15 psi. The corresponding dead storage volume at this water surface elevation is 111,153 gallons

6. Filter Backwash Storage

Filter backwash storage is the volume of water required to completely backwash each filter. Backwash storage, based on the projected MDD at buildout, is 11,472 gallons.

7. Nesting Components

The total storage volume required is the sum of the above storage components. It may be acceptable to nest storage components that are unlikely to be needed at the same time (nesting means to use one or the other component in calculating a total, but not both). Nesting storage components should be based on an assessment of risk and cost. The following storage components of the City's water system should be nested:

- Fire Suppression and Standby—The risk of a fire event occurring at the same time as a loss of source water or treatment plant capacity is considered very low.
- Standby and Filter Backwash—In the event that standby storage is required, such as loss of source water or treatment plant operation, filter backwashing would be suspended.

8. Total Storage Need

Table IV-4 summarizes water storage requirements, storage components, and flows used to estimate the storage components. The water system is estimated to have adequate storage capacity with the existing reservoirs for the planning period through 2040. The WSMP estimated that the City would not have enough storage capacity for the planning period. The reason for this difference is that the 2019 WSMP did not nest storage components.

Table IV-4. Water Storage Requirements and Storage Components

Parameter	2021	2022	2032 to 2040
Source Capacity (gpm)	*200*	*350*	*350*
Operation Storage (gallons)	500	875	875
PHD (gpm)	*440*	*538*	*603*
Equalization Storage (gallons)	35,932	28,260	37,975
Fire Suppression Storage[a] (gallons)	300,000	300,000	300,000
Average Day Demand (gpd)	*111,111*	*156,541*	*179,795*
Standby Storage[a, b] (gallons)	222,222	313,082	359,590
Dead Storage (gallons)	111,153	111,153	111,153
Filter Backwash Storage[b] (gallons)	11,472	11,472	6,300
Minimum Total Storage Required[a, b] (gallons)	***447,585***	***453,370***	***509,593***
Total Storage Available[c] (gallons)	526,000	526,000	526,000
Storage Balance (gallons)	**78,415**	**72,630**	**16,407**

a. Total storage required assumes the fire suppression storage is nested with the standby storage, using whichever value is greater
b. Total storage required assumes the filter backwash storage is nested with the standby storage, using whichever value is greater
c. Combined total capacity of the existing reservoirs

D. FUTURE DISTRIBUTION SYSTEM PUMP REQUIREMENTS

(The content below replaces the content for this section in the 2019 WSMP.)

The distribution system booster pumps must meet the following requirements:

- Have firm capacity to meet the projected MDD plus fire flow at the end of the planning period while maintaining a minimum pressure of 20 psi throughout the distribution system.
- Have firm capacity to meet the PHD at the maximum system pressure of 70 psi at the end of the planning period.
- Have firm capacity to backwash the filters at the required backwash flow rate.

Firm capacity is defined as the capacity of the pumping system with the largest pump out of service. As buildout is projected to occur prior to the end of the planning period, the firm capacity must meet the projected MDD plus fire flow and PHD at buildout. The distribution system booster pump requirements are summarized in Table IV-5.

Table IV-5. Distribution System Pump Requirements

Condition	Firm Capacity	Minimum Pressure
Buildout Fire Flow + MDD	2,812 gpm	20 psi[a]
Pressurizing Hydropneumatic Tank	603 gpm	70 psi[b]
Filter Backwashing	400 gpm	20 psi[c]

a. Distribution system pressure
b. Hydropneumatic tank pressure
c. Filters

V. EVALUATION OF EXISTING WATER SYSTEM

A. WATER SOURCE

(The content below is an addition to the content for this section in the 2019 WSMP)

The City's water sources consist of two groundwater wells: Well No. 1 and Well No. 2. Well No. 1 can only reliably produce 20 gpm and is no longer used. Well No. 2 can produce up to 200 gpm and is currently the City's single source of supply. A study was performed in support of this WSMP amendment to determine if Well No. 1 could be rehabilitated to its original capacity. The study found that although the well capacity could be increased if rehabilitated, the maximum reliable capacity would probably not exceed 60 gpm. This is in large part due to its screen size and improper repairs completed in 1997. Refer to the *Water Rights Strategy and Well 1 Performance Assessment* technical memorandum in Appendix C for further information.

Based on the water demand projections listed in Table IV-2, a new source of supply will need to be developed by the end of 2022, when the MDD is projected to exceed the capacity of Well No. 2. Well No. 2 is 40 years old, which is about the age when wells in the Willamette basin begin to loose production. An additional new source of supply should be developed as a backup source so the City has 100 percent source water redundancy. This additional source of supply will initially augment Well No. 2 as a backup source, and eventually replace it when it begins to decline.

Although the City has sufficient groundwater rights to meet its needs through the planning period, additional water rights may be beneficial to support industrial development, as it is difficult to predict industrial water demand.

Table V-1 summarizes the City's water rights, existing source water capacity, and required new source water capacity. Appendix G summarizes the water system capacity from the water sources through the water treatment process.

Table V-1. Water Source Capacity Evaluation

Water Rights	2021	2022	2032 to 2040
Water Right Permit G-9513 Permitted Withdrawal	350 gpm	350 gpm	350 gpm
Source Capacity			
Well No. 1	<20 gpm	0	0
Well No. 2	200 gpm	200 gpm	0
Required New Source Capacity	—	350 gpm	350 gpm
Required New Backup Source Capacity	—	—	350 gpm

B. WATER TREATMENT FACILITIES

1. Process Summary

(This is a new section to be added as an amendment to the 2019 WSMP.)

The existing water treatment facility was constructed in 1981. Treatment at the facility consists of sediment removal using sand separators, oxidation of hydrogen sulfide, iron, and manganese through the addition of potassium permanganate, filtration/oxidation using pressurized green sand filters, and disinfection with 12.5 percent sodium hypochlorite when required. Below is a summary of the treatment processes prior to the entry point into the distribution system:

- Main Process Stream
  - Raw well water is pumped from the wells to the treatment building.
  - Raw well water passes through a sand separator where process drain water flows to the backwash basin and raw water combines at a 4-way cross fitting with Well No. 1, a process drainpipe, and a connection to the reaction tank.
  - Raw well water is injected with potassium permanganate for oxidation of hydrogen sulfide, iron, and manganese
  - Pretreated water flows into the reaction tank. The water flows through the tank in a downward flow configuration. The tank provides reaction time for oxidation.
  - Pretreated water flows into a header pipe that connects to all three pressurized green sand filters. Water flows through the filters in a downward flow configuration.
  - Filtered water enters a header pipe where sodium hypochlorite can be injected when required.
  - Finished water is stored in two on-site reservoirs
  - Stored finished water is pumped into the hydropneumatic tank and then to the distribution system to meet City water demand and to maintain system pressure.
  - Stored finished water can be pumped to the distribution system by the high flow booster pump in a separate building.
- Backwash Stream
  - Backwash water is supplied from the reservoirs and pumped by the booster pumps into the pressurized green sand filters. The backwash sequence backwashes all filters consecutively, one filter at a time.
  - Backwash water flows into the backwash basin
  - Backwash water accumulates in the tank and flows into a swale on site. A sump pump and sprinkler system that connect to the backwash basin are no longer in use.
- Sand separator process drain water
  - Process drain water separated from the sand filters flows into the backwash basin through hoses tapped into a separate process drain pipe.

2. Water Filtration System

(The content below replaces the content for this section in the 2019 WSMP.)

The existing water treatment facility was constructed in 1981 and consists of a pressurized reaction tank and three pressurized green sand filters. Well water is pumped through the reaction tank and filters, and discharges into two reservoirs. The green sand filter system was originally installed for the purpose of removing hydrogen sulfide,

iron, and manganese. Potassium permanganate is injected prior to the mixing tank to pretreat the water for the oxidation of these contaminants.

The steel reaction and filter tanks are 40 years old and show signs of significant oxidation on their exteriors (see Figure V-1. The filter media was replaced in 2017 by Cascade Waterworks, and the interiors of the tanks were inspected at that time. Cascade Waterworks stated that the piping and interior surfaces of all the filters were in good condition. Filter media typically has a life span of 10 years, so it may need to be replaced by 2027.

Figure V-1. Existing Pressurized Green Sand Filter System

The new media is GreensandPlus supplied by Inversand Company. The media surfaces are coated with manganese dioxide, which acts as a catalyst for the reduction-oxidation reaction with iron and manganese. This media has a recommended hydraulic loading rate of 2 to 12 gpm per square foot. At a loading rate of 12 gpm per square foot, the existing filtration system with the new media has an estimated maximum capacity of 600 gpm with all filters in operation. The firm capacity, with one filter out of service, is 400 gpm. The estimated filter system firm capacity exceeds the projected buildout MDD of 312 gpm.

In February 202, a raw water sample was taken from Well No. 2 and a treated water sample was taken at the filter system outlet to gauge the overall performance of the treatment process. Results from the finished water samples demonstrated 97 percent removal of iron and manganese at the current well pumping rate of 200 gpm. Iron and manganese concentrations in the finished water are well below their secondary contaminant limits. At this removal efficiency, the secondary contaminant limits will be met at the buildout MDD.

The current filter system is not equipped with a filter-to-waste cycle as recommend by the media supplier and per the *Recommended Standards for Water Works* (Great Lakes – Upper Mississippi River Board of State and Provincial Public Health and Environmental Managers 2012). A filter-to-waste cycle prevents contaminants that are loosened from the backwash cycle from being pumped into the distribution system.

Oxidation is achieved by adding potassium permanganate prior to the reaction tank and green sand filters. The reaction tank provides contact time for oxidation prior to reaching the filters. Oxidation could also be achieved by adding sodium hypochlorite prior to the filters, which would also regenerate the media. The City could remove its existing potassium permanganate chemical dosing system and use a single sodium hypochlorite injection system to oxidize the contaminants, regenerate the media, and overdose when a chlorine residual is required for disinfection. However, according to City management, adding chlorine to the City water is unpopular with residents. If the City were to switch to hypo-chlorination for oxidation, then the dosing rate would need to be carefully controlled to ensure uptake of all chlorine in the oxidation process, or a de-chlorination system would need to be added following filtration.

Table V-2 summarizes the parameters of the pressurized green sand filter system.

Table V-2. Existing Pressurized Green Sand Filter System Parameters

Filter Tanks	
Total Number of Filter Tanks	3
Diameter	54 inches
Cross Sectional Area	15 square feet
Design Capacity (each unit)	200 gpm
Firm Capacity	400 gpm
Hydraulic Loading	
Hydraulic Loading Rate	12.58 gpm/sq. ft.
Service Hydraulic Loading Rate (low)	2 gpm/sq. ft.
Service Hydraulic Loading Rate (high)	12 gpm/sq. ft.
Backwash	
Minimum Backwash Hydraulic Loading Rate	12 gpm/sq. ft.
Duration Backwash Cycle (each unit)	8 minutes
Frequency of Backwash	2 times/day

3. Chemical Feed System

a. Potassium Permanganate

(The content below replaces the content for this section in the 2019 WSMP.)

The existing potassium permanganate system provides a continuous chemical feed to oxidize hydrogen sulfide, iron, and manganese and to regenerate the GreensandPlus filter media (Figure V-2). The City purchases 55-pound drums of dry potassium permanganate and creates stock solution in a storage tank with a mechanical mixer. Dry chemicals and water are added daily to maintain a 4,000-ppm solution strength.

Figure V-2. Existing Potassium Permanganate Chemical Feed System

The potassium permanganate chemical feed system includes the following:

- A 150-gallon single-walled polymer storage tank
- A diaphragm chemical metering pump
  - Milton Roy, Model: C131-26S
  - 8 gallon per hour capacity at 60 psi
- A 0.25-hp chemical tank mixer with timer

- An anti-siphon fitting
- Connecting tubing and injection quill

The system is functional but lacks features and appurtenances that are desirable for optimal performance:

- There is no redundant chemical metering pump
- Metering pumps are constant speed rather than flow-paced
- The chemical feed pumps lack the following components:
  - Leak detectors
  - Isolation valves, piping, and fittings for isolating a defective pump
  - Pulsation dampener for steady chemical feed
  - Pressure gauge and sample port
  - Back-pressure check valve for anti-siphoning
  - Calibration column for verifying pumping rates
- There is no method of chemical mixing after injection
- The storge tank lacks the following components:
  - Secondary containment (double-walled or concrete basin)
  - Seismic bracing
  - Level indicator or sensor

b. Reaction Tank

(The content below replaces the content for this section in the 2019 WSMP.)

The steel reaction tank provides contact time for oxidation of hydrogen sulfide, iron, and manganese before the water enters the green sand filters. The tank was installed in 1981 during the construction of the original plant and supplied by Northwest Filter Company. The reaction tank is 40 years old and shows signs of significant oxidation on the exterior. Table V-3 lists general tank parameters and contact times at various flow rates.

Table V-3. Existing Reaction Tank Parameters

Tank Geometry	
Diameter	42 inches
Height	60 inches
Cross Sectional Area	9.6 sq. ft.
Volume	360 gallons
Contact Time	
Contact Time @200 gpm (pumping capacity of Well No. 2)	1.8 minutes
Contact Time @350 gpm (water rights limit)	1.0 minutes
Contact Time @400 gpm (firm capacity of the filtration system)	0.9 minutes

A recommended contact time for oxidation of potassium permanganate is 2 to 5 minutes. The existing reaction tank does not provide this recommended contact time for current or future flow rates. The recommended contact time can be reduced if using a flash mixer in conjunction with the reaction tank or using sodium hypochlorite as an oxidant. However, based on the results of the water sampling conducted in February 2021, the lower than

recommended contact time does not appear to be a concern—the treatment system meets current and projected secondary contaminant limits.

c. Sodium Hypochlorite

(The content below replaces the content for this section in the 2019 WSMP.)

The existing sodium hypochlorite chemical feed (Figure V-3) system provides a means of disinfecting the filtered water. Currently, the system is used infrequently—only when a positive total coliform sample is measured. The City experienced two total coliform positive results in 2018 and is currently changing its policy on taking samples in an enclosed area.

Figure V-3. Existing Sodium Hypochlorite Feed System

The sodium hypochlorite chemical feed system includes the following components:

- A 50-gallon single-walled polymer storage tank
- A peristaltic chemical metering pump

  - Stenner Pump Company, Model: 85MHP40
  - Capacity: 40 gpd at 100 psi
- A hand transfer pump
- A 50-gallon drum of 12.5 percent sodium hypochlorite
- Connecting tubing, saddle tap, and injection quill assembly

The sodium hypochlorite system is in good condition and has adequate capacity through the planning period. However, the system lacks redundancy and features that are desirable for optimal operation:

- There is no redundant chemical metering pump
- Pumps are not flow-paced
- The chemical feed pumps lack the following components:
  - Leak detectors
  - Isolation valves, piping, and fittings for isolating a defective pump
  - Pulsation dampener for steady chemical feed
  - Pressure gauge and sample port
  - Back-pressure check valve for anti-siphoning
  - Calibration column for verifying pumping rates
- There is no method of chemical mixing after injection
- There is no chlorine analyzer for on-line free and total chlorine measurement
- The storage tank lacks the following components:
  - Secondary containment in the form of a double-walled tank or concrete basin
  - Venting of chlorine to the outside
  - Seismic restraints/brackets
  - An automated method of measuring chemical storage level, with associated alarms
- Chemicals are stored in the same room as process and electrical equipment, which can be damaged by spills and off-gassing

4. Filter Control System

(This section has not been changed since the 2019 WSMP was approved by OHA.)

C. WATER STORAGE

(The content below is an addition to the content for this section in the 2019 WSMP)

With a total storage volume of 526,000 gallons, the two existing reservoirs have adequate storage for the planning period (Table IV-4).

D. DISTRIBUTION SYSTEM PUMPS

(The content below is an addition to the content for this section in the 2019 WSMP)

The distribution pumping system must be able to meet the MDD plus fire flow, and PHD at buildout with the largest pump out of service, per Section IV.D. The existing pumping system cannot meet these conditions with the largest pump (Pump No. 4) out of service. The existing firm capacity and required firm capacity are listed in Table V-4.

Table V-4. Distribution Pumping System Firm Capacity Assessment

	Existing Firm Capacity	Required Capacity	Ability to Meet Requirement
Buildout Fire Flow + MDD	~1,000 gpm @ 70 feet total dynamic head (TDH)	2,812 gpm @ 70 feet TDH	Cannot meet flow
Buildout PHD		604 gpm @ 180 feet TDH	Cannot meet TDH

The existing hydropneumatic tank has sufficient capacity at buildout as long as the distribution system booster pumps are operated with variable frequency drives (VFDs). If the pumps are operated without VFDs, or soft starters, then the existing tank does not have sufficient capacity and may cause premature failure of the booster pumps. The existing tank is original and 40 years old but is in good condition and should last through the planning period.

E. STANDBY POWER SYSTEM

(This section has not been changed since the 2019 WSMP was approved by OHA.)

F. DISTRIBUTION SYSTEM

(The content below replaces the content for this section in the 2019 WSMP.)

The City of Donald distribution system consists of 2-inch though 12-inch piping. Most of the piping was installed with the WTP in 1980 and is constructed of PVC. The remaining older smaller-diameter pipe is a mix of cast iron and galvanized steel. The PVC pipe is reported to be in good condition. The older piping is believed to be in fair to poor condition. Leaks have occurred in the older piping, and tuberculation is likely to be present, causing a reduction in capacity.

The distribution system has a single pressure zone. Normal operating pressures are maintained by the 3,500-gallon hydropneumatic tank in the WTP building that is fed by the three operational booster pumps (pumps 1, 2, and 4). Current hydropneumatic tank and booster pump settings are as follows:

- Pumps Off: 70 psi
- Pump 1 On: 65 psi
- Pump 2 On: 60 psi
- Pump 4 On: 57 psi

The distribution system was modeled to identify any system deficiencies and to size replacement booster pumps for projected future demand (Appendix D). The EPANET Version 2.2 model developed for the 2019 WSMP was

used and updated to incorporate new piping and future water demand associated with the PUD and infill development within the existing City UGB. The PUD will include 8-inch water mains that connect to the existing 10-inch water main on Donald Road (see Water Base Map, Appendix F). The new water mains will supply water to the PUD south through tax lot number 041W170002600, west through tax lot number 041W200000300, and north through Butteville Road NE and reconnect to the existing 6-inch main near the city limits.

Junctions 66, 68, 69,70, 71, and 72 were added to represent water demand at the PUD and UGB east of the city limits. Modeling scenarios were simulated by assigning PHD to each junction. The demand assigned to each junction representing a residential area was proportional to that area's estimated 2040 population. The demand assigned to each junction representing an industrial/commercial area was based on existing demand plus an allowance for infill proportional to existing demand. Fire flows were applied at the Donald Industrial Park, which is assumed to have the highest fire flow requirement, and at the two nodes farthest from the WTP, which include the PUD and the WWTP. Key parameters used in the model are summarized in Table V-5.

Table V-5. Water System Modeling Parameters

Total Number of Junctions	70
Buildout PHD	603 gpm
Donald Industrial Park Junction Number	1
Donald Industrial Park PHD	12.5 gpm
Buildout PHD per Residential Junction	5.4 gpm
Buildout PHD per PUD Junction	41.8 gpm

The water distribution system was modeled under four scenarios:

- Scenario 1—Projected buildout PHD plus 1,500 gpm fire flow at the WWTP
- Scenario 2—Projected buildout PHD plus 2,500 gpm fire flow at the Donald Industrial Park
- Scenario 3—Projected buildout PHD plus 1,500 gpm fire flow at the PUD
- Scenario 4—Projected buildout PHD with no fire flow

Based on the booster pump performance curves, fire flow demand will require the high flow pump (Pump No. 4) to run because Pump No. 1 and Pump No. 2 cannot achieve the required flow and pressure. When Pump No. 4 runs at full speed, Pump No. 1 and Pump No. 2 produce little flow because of the higher operating head of Pump No. 4. For this reason, Scenarios 1, 2, and 3 were modeled using the Pump No. 4 curve only (Appendix E). During normal demand, system flow and pressure are met by the hydropneumatic tank, and Scenario 4 was modeled with a constant pressure of 70 psi.

The model tested the system's ability to provide the minimum pressures required for fire flow in combination with PHD. The minimum allowable pressure at any location in the distribution system cannot be less than 20 psi at the PHD with fire flow, and 30 psi with no fire flow. Table V-6 shows the modeling results for each scenario. The results show the existing distribution system is unable to maintain the minimum required pressure with a fire flow of 1,500 gpm at the WWTP (Scenario 1). The minimum pressure requirements were met for all other scenarios.

Table V-6. Water System Modeling Scenarios

Scenario	Fire Flow Location	Flow Requirement (gpm)			Minimum Pressure (psi)	
		2040 PHD	Fire Flow	Total	Required	Modeled
1	WWTP (Junction 56)	603	1,500	2,103	20	18
2	Donald Industrial Park (Junction 1)	603	2,500	3,103	20	42
3	PUD (Junction 71)	603	1,500	2,103	20	51
4	None	603	0	603	30	68

G. OPERATION AND MAINTENANCE REQUIREMENTS

(This section is unchanged from the 2019 WSMP approved by OHA.)

VI. ALTERNATIVES TO CORRECT SYSTEM DEFICIENCIES

A. SOURCE ALTERNATIVES

(The content below replaces the introductory content for Section V.A in the 2019 WSMP.)

Current source water conditions relative to projected growth are summarized below:

- The existing water rights of 350 gpm can accommodate the projected MDD throughout the planning period (312 gpm at buildout).
- The remaining source capacity of 200 gpm cannot accommodate the projected MDD for the 2-year PUD buildout (272 gpm in 2022).
- A reliable source capacity requires redundancy when the single largest system component is out of service. The current pumping capacity does not provide redundancy.

To support the projected growth throughout the planning period, the source capacity must be increased per the recommended water source capacity plan summarized in Section V.A. Four alternatives for increasing the source capacity and providing source water redundancy were evaluated.

1. Surface Water

(The content below is an addition to the content for this section in the 2019 WSMP)

As stated in the 2019 WSMP, this option involves developing a new water intake on the Willamette River. Switching to a surface water source would incur significant costs to meet the OHA requirements for public water systems supplied by a surface water source (per OAR 333-061-0032). Securing easements and water rights on the Willamette River could take years and there is no guarantee that they would be granted. The estimated cost for the surface water option is $4 million to $6 million; this includes acquisition of water rights and construction of a water intake, pump station, raw water transmission line, and new surface water treatment facility. For these reasons, this option is not considered viable.

2. Wholesale Water Purchase

(The content below is an addition to the content for this section in the 2019 WSMP)

As stated in the 2019 WSMP, this option—requiring a contractual agreement and construction of an interconnection with another jurisdiction's water system—is not a viable alternative, primarily due to the cost. Additionally, under this alternative the purchase cost of water would be determined by a second party. The estimated cost for the wholesale water purchase option is at least $2.5 million; this includes investigation and

coordination with water providers, construction of a booster pump station and long-distance water transmission line, and ongoing commodity costs.

3. Well Development

(The content below is an addition to the content for this section in the 2019 WSMP)

a. Well No. 1 Improvements

The Well No. 1 pump is operable and the well can reliably produce up to 20 gpm. Reconditioning could increase the reliable production to 60 gpm. Due to the age of the well, the increased production rate cannot be guaranteed for the long-term. The estimated cost to recondition Well No. 1 is $200,000. As the maximum expected withdrawal after reconditioning falls far short of what is needed to meet current and future requirements, it would be best to decommission this well and invest the savings in a new water source. Refer to the *Water Rights Strategy and Well 1 Performance Assessment* technical memorandum (Appendix C) for further information.

b. New Source Water Well No. 3 with Existing Water Rights

The 2019 WSMP stated that development of additional groundwater capacity will be required to provide a reliable source to meet demand through the planning window. In lieu of any other viable sources of water, including redevelopment of Well No. 1 and surface water, the recommendation to develop a new groundwater well still stands. There are privately owned water sources that could be repurposed for municipal use, but at the time of writing these sources will not be available when they are projected to be needed (this option is discussed in Section VI.A.4).

A study was conducted in support of this WSMP amendment to examine potential sites and costs of a new replacement well (Well No. 3). The well would have a target capacity of 400 gpm to account for loss of production over time. Well pump capacity would be limited to the City's current combined water right of 350 gpm. The study found that the preferred location of Well No. 3 is at the WTP, roughly centered in the site to maximize the distance from adjacent properties. Although this location would not meet required sanitary setbacks, OHA indicated it would give approval on the condition that the seal between the well casing and confining aquifer layer is impermeable. The City would need to prepare and submit a water right transfer application to add Well No. 3 to its existing water rights. Refer to the December 2020 *Well Siting Study* by GSI, for more information (Appendix C).

c. New Backup Well No. 4 with Existing Water Rights

Constructing Well No. 3 would provide partial redundancy with Well No. 2. In order to provide full redundancy, the City would need to add a third groundwater well (Well No. 4) with a capacity between the projected MDD at buildout (312 gpm) and permitted water rights (350 gpm). The *Well Siting Study* (Appendix C) examined eight candidate sites for a new Well No. 4 and evaluated them against the following criteria:

- Hydrogeologic conditions
- Land use compatibility
- Site ownership and setback requirements
- Susceptibility to contamination

- Pumping interference

Each site was rated positive, neutral, or negative for each evaluation criterion. The sites were then ranked according to their total score. The following top-ranked candidates were evaluated further:

- City Hall
- Community Center
- Oak Street right-of-way

The apparent preferred site is at the east end of the Oak Street right-of-way south of the WTP. However, for a new well permit application, OWRD would examine the impact a new well might have on nearby surface waters, including Senecal Creek and Ryan Creek. If the new well location were determined to impact Senecal Creek, it is unlikely that OWRD would issue a permit without mitigation to offset the impact. The area near the WTP and on the east side of Donald, including the preferred Oak Street site, appears to be at higher risk for this scenario than City-owned property near the WWTP or on the west side. However, the Oak Street location has the lowest estimated cost.

Well No. 2 should be decommissioned and the rights transferred to Well No. 4 at the time of construction. The estimated cost of Well No. 4 at the Oak Street site, including raw water line to the WTP and the cost of decommissioning Well No. 2, is $1.36 million.

d. Acquisition of Existing Water Rights

The City may consider acquiring existing water rights to increase source water capacity or as mitigation if OWRD determines that surface waters would be impacted by new wells. Although the City has sufficient water rights to meet the projected MDD at buildout, the ability to provide additional water at some time in the future may be desirable. Donald has a disproportionally high industrial customer base along with industrial zoned areas that have yet to be developed. Having the ability to support a significant water user would be advantageous to the City's economy.

The most straightforward method of obtaining additional water rights is to obtain them from existing private sources. There are numerous wells within the Donald area. Some no longer produce or are no longer needed by their owners but still have water rights assigned to them. However, most of these wells are associated with irrigation, and the use of their rights may be limited to the irrigation season—typically March through October.

The 2019 WSMP identified an irrigation well owned by Gary Grossen Properties, LLC (GGP) that could be repurposed for municipal use. The well (MARI 56719) is located on property owned by GGP on the south side of Donald Road at the intersection with Huckleberry Lane. The well has a reported capacity of 800 gpm and is permitted year-round withdrawal. GGP has indicted it may be willing to transfer 125 gpm of rights from this well to the City should it be needed.

4. Repurposing Existing Wells

(The content below is an addition to the content for this section in the 2019 WSMP)

The 2019 WSMP proposed the use of the GGP irrigation well MARI 56719 as a source of supply for the City's municipal use. In order to use a well for drinking water, it must meet all of the requirements stipulated by OHA,

including being constructed to drinking water standards, being in a confined aquifer, and meeting sanitary setbacks. OHA performed an informal review of the well log and determined that the aquifer is confined at this location and the casing and general construction of the well are generally acceptable for potable water use. A formal review process would be required if the City were to proceed with this option.

The GGP irrigation well MARI 56719 currently provides a reliable capacity of 800 gpm and is permitted for year-round use. GGP, however, is committed to providing irrigation water to the adjacent nursery through 2028. The owner has indicated that 125 gpm could be diverted for City use without impacting the agreement with the nursery. The owner is attempting to rehabilitate two other irrigation wells on the property. If this is successful, it may be possible to transfer some capacity from well MARI 56719 to municipal use.

If the City were able to obtain water from a privately owned well, it would require upgrades to bring it up to municipal drinking water standards including a secured enclosure, a dual metering system, controls, and raw water transmission piping to the WTP. Constructing Well No. 3 would negate the need to repurpose an existing well in order to meet future demand. However, a repurposed well could still be considered for a backup water source. Repurposing well MARI 56719 would be significantly less expensive than constructing a new Well No. 4. It is recommended the City continue discussions with GGP for repurposing their well for municipal use when the nursery contract expires.

B. WATER TREATMENT PLANT IMPROVEMENTS

1. Pressure Filter Improvements

(The content below replaces the content for this section in the 2019 WSMP.)

The existing green sand filters perform adequately and have sufficient capacity for the MDD at buildout. They should not need to be expanded or replaced within the planning period. However, condition assessment and monitoring are recommended, along with a controls upgrade as described in Sections VII.B.1 and VII.B.2. The control valves are functional but are original and operating beyond their service life, so they should be replaced with regular scheduled maintenance. Other recommended maintenance items include an air release valve and filter-to-waste line. The filter backwash settling basin is undersized for the projected demands within the planning period and should be expanded or replaced with a backwash recycle system.

2. Chemical Feed System

(The content below replaces the content for this section in the 2019 WSMP.)

The potassium permanganate and sodium hypochlorite chemical feed systems perform adequately and are expected to continue to do so through the planning period. However, the equipment will eventually need to be replaced due to normal wear and tear. Changes to source water quality and filter performance may also require upgrading the chemical feed systems. Two alternatives were considered for eventual chemical feed system replacement:

- **Alternative 1, Sodium Hypochlorite**—This alternative would replace the potassium permanganate and sodium hypochlorite feed systems with a single sodium hypochlorite system that would provide the dual functions of filter oxidation and emergency disinfection. The advantage of this system would be lower operating cost and complexity and the potential for improved filter performance because hypochlorite is a

more efficient oxidizer than permanganate. The disadvantage would be that the system would need to be carefully controlled to ensure proper dosing and eliminate any residual chlorine in the distribution system, per City residents' preferences.

- **Alternative 2, Sodium Hypochlorite and Potassium Permanganate**— This alternative would retain potassium permanganate as the filter oxidant and sodium hypochlorite for emergency disinfection. The advantage of this alternative would be that it ensures no chlorine residual in the distribution system, except when required following a positive coliform test. The disadvantage would be the higher cost of procuring, operating, and maintaining two chemical feed systems.

Alternative 1 is the preferred alternative for when the chemical feed systems eventually need to be replaced, due to its lower cost. However, this alternative is only viable if City residents change their objection to using chlorine in the treatment process.

3. Filter Control System

(This section has not been changed since the 2019 WSMP was approved by OHA.)

4. Distribution Pumping Equipment

(The content below replaces the content for this section in the 2019 WSMP.)

The existing distribution pumping equipment cannot meet the required firm pumping capacity listed in Table V-4. As Pump No. 3 is inoperable, and Pumps No. 1 and No. 2 have surpassed their typical service life, they should be replaced with new booster pumps capable of meeting the required firm capacity. Two alternatives were considered for the upgraded distribution pumping system:

- **Alternative 1, New Pumps with Existing Hydropneumatic Tank**—This alternative would replace Pumps No. 1, No. 2, and No. 3 with two new booster pumps and retain the existing hydropneumatic tank. The new pumps would need to meet the buildout MDD plus fire flow when running together, and the PHD at buildout when running singly. The existing hydropneumatic tank would maintain distribution system pressure during periods of normal daily demand.
- **Alternative 2, New Pumps with New Hydropneumatic Tank**—This alternative would replace Pumps No. 1, No. 2, and No. 3 with two new booster pumps and one jockey pump and replace the existing hydropneumatic tank with a new 750-gallon tank. The booster pumps would be sized to meet the buildout MDD plus fire flow when running together and the PHD at buildout when running singly. The jockey pump would be sized for the ADD at buildout. The booster pumps would maintain system pressure at demand in excess of the ADD. The jockey pump would work in conjunction with the new hydropneumatic tank to meet demand below the ADD. The hydropneumatic tank would not be essential but would maintain system pressure in the event of a power outage.

For both alternatives, the new pumps would have electric motors and VFDs. Alternative 1 is a lower cost alternative, as it retains the existing hydropneumatic tank and installs fewer pumps. Alternative 2 has a higher cost but floor space would be made available inside the WTP building by removing the existing hydropneumatic tank. This space could be used for an office and staff facilities and partially offset any future need for a building expansion.

Alternative 1 is the preferred alternative for the short term. The City may later consider replacing the hydropneumatic tank and adding a jockey pump (Alternative 2) if new staff facilities are needed.

5. Supervisory Control and Data Acquisition (SCADA)

(This section has not been changed since the 2019 WSMP was approved by OHA.)

6. Office and Staff Facilities

(The content below is an addition to the content for this section in the 2019 WSMP)

As stated in the 2019 WSMP, the existing building has limited space for any improvements. An office and staff facilities including a locker room and bathroom are desired and will be needed when the City increases its staff. Additional floor and wall space also will be needed for new electrical and control panels.

The existing building is too small to accommodate all of the new facilities and will need to be expanded. The building should be expanded to the north, as expansion to the west would impede vehicle access. The extent of the expansion may be reduced if the existing hydropneumatic tank is removed, as described previously.

C. STANDBY POWER SYSTEM

(This section has not been changed since the 2019 WSMP was approved by OHA.)

D. STORAGE

(The content below replaces the content for this section in the 2019 WSMP.)

With a total storage volume of 526,000 gallons, the two existing reservoirs have adequate storage for the planning period.

E. ENVIRONMENTAL IMPACT OF IMPROVEMENTS

(There have been no changes to the environmental impacts since the 2019 WSMP was approved by OHA.)

F. OPERATION AND MAINTENANCE COST

(There have been no changes to the environmental impacts since the 2019 WSMP was approved by OHA.)

VII. RECOMMENDED WATER SYSTEM IMPROVEMENTS

A. SOURCE IMPROVEMENTS

(The content below replaces the content for this section in the 2019 WSMP.)

1. Decommission Well No. 1

(The content below replaces the section titled "Cap Well No. 1" in the 2019 WSMP.)

It is not recommended that Well No. 1 be set aside for future use or rehabilitated, due to the expected low return on investment. Instead Well No. 1 should be decommissioned in accordance with OWRD requirements and the water rights transferred to the new Well No. 3. Decommissioning would require requiring removing the well pump, pump discharge column, and top 5-feet of the well casing and capping the well with a concrete seal.

Decommissioning Well No. 1 and transferring the water rights will need to occur in conjunction with installation of Well No. 3 in the next 1 to 2 years. The estimated cost of decommissioning Well No. 1 is $30,000.

2. Well No. 2

(The content below replaces the content for this section in the 2019 WSMP.)

Well No. 2 continues to produce at its original capacity. However, it is unlikely the capacity could be increased without substantial investment, including modifications to the well itself and a new pump. The modifications are unlikely to guarantee any increase in production and, given its age, it is likely to start losing production capacity over time. For these reasons, it is not recommended that the City attempt to increase Well No. 2 capacity.

3. Well No. 3

(The content below replaces the content for this section in the 2019 WSMP.)

The current water source capacity of 200 gpm from Well No. 2 will not meet the projected MDD when the PUD is constructed. To serve the PUD and future infill within the UGB, a new well, Well No. 3, must be constructed by 2022. Well No. 3 will be located at the WTP approximately 50 feet northwest of the WTP building.

The estimated cost of Well No. 3 is $750,000. The timing of this project is 1 to 2 years.

4. Well No. 4

(The content below replaces the content for this section in the 2019 WSMP.)

It is unknown if the capacity of Well No. 2 can be increased, and due its age the well may begin to decline in capacity. For these reasons, a second new well, Well No. 4, should be constructed as a backup water source. The preferred site for Well No. 4 is in Oak Street, 550 feet south of the WTP. Well No. 2 should be decommissioned and the water rights transferred to Well No. 4.

The estimated cost of constructing Well No. 4 is $1,355,000 and includes the well, well head, raw water line to the WTP, and decommissioning Well No. 2. There is no regulatory requirement for source water redundancy, but the City should construct Well No. 4 as soon as funding is available. The timing of this project is 6 to 10 years.

B. WATER TREATMENT PLANT IMPROVEMENTS

1. Filter Control System

(The content below replaces the content for this section in the 2019 WSMP.)

The existing filter control panel is in good condition and should not need to be replaced within the planning period. It is recommended that the panel be integrated with a centralized programmable logic controller (PLC) and SCADA (supervisory control and data acquisition) system to improve function and operation. The cost of this improvement is included in the SCADA upgrade in Section VII.B.4. The timing of this project is 6 to 10 years.

2. Pressure Filter Improvements

(The content below replaces the content for this section in the 2019 WSMP.)

Water quality testing in February 2021 demonstrated that the existing green sand filters have been providing high removal efficiency of iron and manganese and will likely meet secondary contaminant limit treatment standards at buildout. Although the filter vessels are old and have obvious superficial deterioration, they have adequate performance and are reported to be in overall good condition. Expanding or replacing the filter system within the planning period is not deemed to be necessary. However, the following improvements should be undertaken:

1. Perform non-destructive testing of the reaction tank and filter vessels. Measure vessel wall thicknesses and weld integrity to estimate the remaining life span of this equipment.
2. Perform water quality testing following installation of Well No. 3 to confirm filter performance at the higher loading rate and new water source.
3. Perform water quality testing if there is a noticeable deterioration in treated water quality, such as odors and taste.
4. Install seismic bracing on the filters, reaction tank, and connected piping.
5. Add a filter-to-waste line.
6. Add an air release valve.
7. Replace control valves.

These actions should be completed in the next 1 to 2 years in conjunction with installation of Well No. 3. The estimated cost of these improvements is considered incidental to normal maintenance. The recommended timeline for implementation of items 1, 2, 3 and 4 is 1 to 2 years. The recommended timeline for implementation of items 5, 6, and 7 is 3 to 5 years.

3. Chemical Feed Systems

(The content below replaces the content for this section in the 2019 WSMP.)

The existing potassium permanganate and sodium hypochlorite systems meet current requirements and are in acceptable condition. Based on the performance of the filter system, it appears the potassium permanganate system will provide sufficient oxidation at the higher flows expected with Well No. 3. However, the filter system performance should be monitored following the installation of the new well. If there is a noticeable reduction in performance, then the City should consider oxidizing with sodium hypochlorite. The dosing rate should be automated and adjustable to meet the required residual in the distribution system.

The sodium hypochlorite tank should be relocated to the chlorine storage room in the WTP building and vented to atmosphere and an emergency eyewash should be installed at the WTP building. The estimated cost of relocating the hypochlorite tank and adding an emergency eyewash is $10,000. The recommended timeline for implementation is 1 to 2 years.

4. Supervisory Control and Data Acquisition (SCADA)

(The content below replaces the content for this section in the 2019 WSMP.)

A new SCADA system with centralized PLC and human machine interface should be installed at the WTP. A new SCADA system will greatly enhance operation and reduce operator workload by enabling remote monitoring and control of all system components via a single interface. Table VII-1 lists current and future components of the water system that should be integrated with the new SCADA system, along with suggested conditions to monitor.

Table VII-1. Proposed SCADA System Parameters

Item	Monitored Conditions
New Booster Pump No. 1	Pump run, pressure, speed
New Booster Pump No. 2	Pump run, pressure, speed
New Jockey Pump No. 3 (future)	Pump run, pressure, speed
Existing Well No. 2	Pump run, flow
New Well No. 3	Pump run, flow
New Well No. 4	Pump run, flow
Existing Treated Water Storage Reservoirs	Tank Level
Existing Sodium Hypochlorite System	Pump Run, Tank Level
Existing Potassium Permanganate System	Pump Run, Tank Level
Existing Filter Controller	Backwash settings and duration
Existing Hydropneumatic Tank (existing and replacement)	Pressure
Existing Standby Generator	Status
New Standby Generator	Status
New Backwash Recycle System	Pump Run, Tank Level

The new SCADA system should be implemented in two phases:

- The first phase will install a new local PLC at the WTP building to integrate existing Well No. 2, new Well No. 3, new booster pumps, existing hydropneumatic tank and new standby power system. The estimated cost of the first phase of the SCADA system is $100,000. The timeline for implementation is 1 to 2 years.
- The second phase will incorporate the new Well No. 4, existing filter backwash controls, new hydropneumatic tank (if installed), new backwash recycle system, and telemetry for remote monitoring and control. The estimated cost of the second phase of the SCADA system is $75,000. The timeline for implementation is 6 to 10 years.

5. Office and Staff Facilities

(The content below replaces the content for this section in the 2019 WSMP.)

This improvement includes expanding the building 10 feet north to make room for an office, restroom, locker room, and new electrical and control panels. The building should be seismically reinforced in conjunction with the expansion.

The estimated cost of the building expansion is $120,000. If the existing hydropneumatic tank is removed and the space used for the new facilities, then the extent and cost of the expansion could be significantly reduced. The recommended timeline for implementation is 6 to 10 years.

6. Backwash Recycle System

(This is a new section to be added as an amendment to the 2019 WSMP.)

The existing backwash settling basin is undersized and will need to be removed to allow for expansion of the WTP building. The settling basin should be replaced with a backwash recovery and recycle system to reduce water loss. System components will include a 15,000-gallon settling tank, recycle pump, and associated piping, valves, backflow preventer, and controls. The recommended design criteria for the new backwash recycle system are summarized in Table VII-2.

Table VII-2. Backwash Recycling System Design Criteria

Backwash volume	9,300 gallons
Filter-to-waste volume	3,000 gallons
Settling basin storage volume	15,000 gallons
Minimum settling time	48 hours
Maximum recycle ratio	0.10[a]
Recycle pump capacity	35 gpm[b]

a. Maximum recommended recycle ratio for iron and manganese filter backwash (Washington State Department of Health 2020)
b. Sized for 10% of the Well No. 3 design capacity

The estimated cost of the new backwash recycle system is $30,000. The system should be constructed within the next 1 to 2 years, in conjunction with the new Well No. 3.

C. DISTRIBUTION SYSTEM PUMPS

1. Booster Pumps

(The content below replaces the content for this section in the 2019 WSMP.)

The distribution system Pumps No. 1, No. 2, and No. 3 will be replaced with two new booster pumps in the WTP building. Booster Pump No. 3 will be demolished. A new jockey pump will be installed in its place if the City choses to replace the hydropneumatic tank. The design criteria for the replacement booster pumps and jockey pump are listed in Table VII-3.

Table VII-3. Distribution System Pump Design Criteria

Pump	Duty Point 1	Duty Point 2	Motor Size
New Booster pump No. 1	1,406 gpm @ 70 feet TDH[a]	603 gpm @ 180 feet TDH[b]	50 HP
New Booster pump No. 2	1,406 gpm @ 70 feet TDH[a]	603 gpm @ 180 feet TDH[b]	50 HP
New Jockey Pump No. 1 (future as required)	125 gpm @ 180 feet TDH[c]	N/A	10 HP

a. Buildout MDD plus fire flow; both pumps operating
b. Buildout PHD
c. Buildout ADD

The following improvements to the booster pumps and connecting process piping and equipment are recommended:

- Demolition of existing booster pumps and pads
- Two new 50-HP booster pumps with electric motors and VFDs
- Provision for future 10-HP jockey pump with electric motor and VFD, if required
- Replace suction line from treated water storage reservoirs
- Replace discharge piping and valves from pumps to hydropneumatic tank
- Suction and discharge pressure gauges
- Discharge and discharge header pressure transmitters
- Discharge header flow meter
- New pump motor control center
- New pump controller
- Provision for integration of pump controller to future new PLC and SCADA system

The estimated cost of the new booster pump system is $200,000. The distribution pumps should be replaced within the next 1 to 2 years.

2. Hydropneumatic Tank

(The content below replaces the content for this section in the 2019 WSMP.)

The existing hydropneumatic tank has sufficient capacity for the planning period as long as the new booster pumps are operated with VFDs. If the City chooses to remove the tank to make space for new staff facilities, then it will need to be replaced with a jockey pump, as described previously, and a new 500-gallon hydropneumatic tank. A hydropneumatic tank of this size can be installed vertically to reduce floor space.

The estimated cost of the new hydropneumatic tank and jockey pump is $20,000. The timeline for this project is 6 to 10 years, and it would be done only if the City chooses to repurpose the space occupied by the existing hydropneumatic tank for staff facilities or new electrical and control panels.

D. ELECTRICAL SERVICE

(This is a new section to be added as an amendment to the 2019 WSMP.)

The existing electrical service, including transformer, conductors, and power distribution panel, will need to be replaced to support Well No. 3 and the new distribution system booster pumps.

The estimated cost of the new electrical service is $75,000, and it should be implemented with Well No. 3 and the new distribution system booster pumps in the next 1 to 2 years.

E. STANDBY POWER SYSTEM

(The content below replaces the content for this section in the 2019 WSMP (numbered VI.D in that plan).)

The existing propane standby generator at the WTP building cannot provide standby power to all of the critical facilities including Well No. 2 and distribution system pumps. The generator should be replaced with a new propone or diesel-fueled standby generator with automatic transfer switch that can provide standby power to run the new booster pumps at full load plus the Well No. 3 pump and ancillary loads, including the WTP building lighting and HVAC systems.

The estimated cost of the new standby power system is $150,000, and it should be installed with the new booster pumps and Well No. 3 in the next 1 to 2 years.

F. STORAGE

(The content below replaces the content for this section in the 2019 WSMP (numbered VI.E in that plan).)

The two existing reservoirs, with a total storage volume of 526,000 gallons, have sufficient storage capacity for the planning period. There are no recommended improvements to the storage reservoirs beyond integrating the level sensors with the new SCADA system.

G. DISTRIBUTION PIPING IMPROVEMENTS

(The content below replaces the content for this section in the 2019 WSMP (numbered VI.F in that plan).)

The distribution system cannot provide the recommended 1,500-gpm fire flow to the WWTP while maintaining a minimum 20 psi pressure in the system. In order to meet this requirement, the City would need to install a new

8-inch water line parallel to the existing water line in Donald Road from the intersection with Butteville Road to the WWTP.

The estimated cost of the new line is $100,000. The fire flow requirements can be reduced if the WWTP has on-site fire protection equipment such as building sprinklers. Adding sprinklers to the existing lab building and storage shed would be significantly less expensive than installing a new line in Donald Road. For this reason, it is recommended that building sprinkler systems be added to the WWTP buildings instead of installing a new waterline in Donald Road. The building sprinkler systems are considered wastewater system improvements and are not included in this WSMP amendment.

H. CAPITAL IMPROVEMENT PLAN SUMMARY

(The content below replaces the Capital Improvement Plan Summary table and introduction in the 2019 WSMP (not numbered as a separate section in that plan).)

Table VII-4 summarizes the recommended capital improvement plan, including project timelines and estimated costs. The projects are numbered in accordance with the 2019 WSMP for ease of comparison. Projects that are no longer required are included in the list and noted as such. Projects in addition to those listed in the 2019 WSMP are also listed.

Table VII-4. Capital Improvement Plan Summary

2019 WSMP Item No.	WSMP Update Item No.	Capital Improvement	Timeline	Estimated Cost
A. Source Improvements				
1	1	Decommission Well No. 1	1 to 2 years	$30,000
2	N/A	Expand Well No. 2 Capacity (No Longer Required)	N/A	N/A
3	2	New Well No. 3	1 to 2 years	$750,000
N/A	3	New Well No. 4 (New project)	10+ years	$1,355,000
		Total Cost of Source Improvements		***$2,135,000***
B. Water Treatment Plant Improvements				
1	1	Replace filter control relay with PLC	6 to 10 years	Inc. in 4b
2	2	Add two 80 gpm green sand filter units (No longer required); Monitor performance	1 to 2 years	Inc. in maintenance budget
3	3	Add secondary containment for chlorine hypochlorite and potassium permanganate feed systems. Relocate to chemical storage room.	1 to 2 years	$10,000
4	4a 4b	SCADA System—Phase 1 SCADA System—Phase 2	1 to 2 years 6 to 10 years	$100,000 $75,000
5	5	Building Expansion for Staff Facilities[a]	6 to 10 years	$120,000
N/A	6	Backwash Recycle System	1 to 2 years	$30,000
		Total Cost of Water Treatment Plant Improvements		***$335,000***
C. Distribution Pumping System Improvements				
1	1	Replace booster Pumps No. 1, No. 2, and No. 3 with two new booster pumps. Includes VFDs, controls, piping, valves	1 to 2 years	$200,000
		Total Cost of Distribution Pump System Improvements		***$200,000***
D. Electrical Service Improvements				
N/A	1	Upsize electrical feed for new well and booster pumps	1 to 2 years	$75,000
		Total Cost of Electrical Service Improvements		***$75,000***
E. Standby Power System Improvements				
1	1	Replace existing standby power system at the WTP building	1 to 2 years	$150,000
		Total Cost of the Standby Power System Improvements		***$150,000***
		Total Water CIP Cost		**$2,895,000**

a. Assumes existing hydropneumatic tank remains

VIII. WATER MANAGEMENT AND CONSERVATION PLAN

(The content presented below replaces the second paragraph of this section in the 2019 WSMP.)

The City does not currently have a Water Management and Conservation Plan. OWRD may require one as a condition of developing a new well source. The estimated cost is $25,000. The timeline for implementation is 1 to 2 years, in conjunction with the Well No. 3 development.

IX. SEISMIC RISK ASSESSMENT AND MITIGATION PLANS

(The content below replaces the content for this section in the 2019 WSMP.)

The City of Donald is located in Area VII on Plate 7 of the Oregon Department of Geology and Mineral Industries' *Map of Earthquake and Tsunami Damage Potential for a Simulated Magnitude 9 Cascadia Earthquake*. Per OAR 333-061-0060(5)(J) Oregon communities in this area with more than 300 connections, or a population greater than 1,000, must include a seismic risk assessment and mitigation plan in a water system master plan.

A. CRITICAL FACILITIES

Critical facilities supply key community needs, including fire suppression, essential health care and first aid, emergency response, and drinking water supply points. The City does not have a fire station or essential health care and emergency response facilities. Police and fire services are provided by the City of Gervais and the Aurora Fire District, respectively. Public access to drinking water is a necessity. Drinking water supply points should be made available to the public in the event of a City-wide disruption in supply, which can be expected following a major earthquake. Public access locations should include the WTP, City Hall, and the Community Center.

B. CRITICAL ASSETS

The sections below describe critical components (assets) of the City's water system that are considered essential for providing potable water and fire suppression water in the event of an emergency.

1. Well No. 2

This well is currently the City's only source of supply. The well, well pump, and casing are unlikely to be damaged in a major earthquake, although the control panel and power supply are vulnerable. Well No. 2 does not have standby power. The concrete modular block well head building, constructed in 1981, predates current building code and is unlikely to be reinforced. Unreinforced concrete block buildings tend to perform poorly in an earthquake and may be damaged.

2. Water Treatment Plant

Raw water from Well No. 2 meets drinking water standards, so the permanganate, sand filters, and hypochlorite equipment in the WTP building are not critical components. However, the following components of the WTP are critical and may be vulnerable:

- Piping in the WTP building—The piping conveys source water to the treated water storage reservoirs and was installed prior to current building code, so it may not be adequately braced.
- Booster pumps—Booster Pumps No. 1 and No. 2 are necessary for maintaining distribution system pressure. The pumps were installed prior to current building code, so they may not be adequately braced. However, Pump No. 4, located in a separate building, can provide this function.
- Motor controls and power distribution—The motor control center and power distribution panels for Well No. 2 and Booster Pumps No. 1 and No. 2 were installed prior to current building code, so they may not be adequately braced. Loss of the motor control center and electrical panels would prevent the City from being able to use its sole well.
- The WTP building—Constructed in 1981, this building is a concrete modular block construction that pre-dates current building code and is unlikely to be reinforced. This type of construction is vulnerable, and it is likely the WTP building would sustain damage following a major earthquake—possibly to the extent that the ability to maintain continued operation of the booster pumps and Well No. 2 would be compromised.
- Rigid piping connections—Piping connections through the building slab are rigid. Differential movement between the building and underlying soil may cause the piping to break and render the water distribution system inoperable until repairs are conducted or temporary bypass piping is installed.

3. Treated Water Storage

Treated water is stored in two ground level reservoirs: a 200,000-gallon welded steel reservoir constructed with the WTP in 1981; and a 326,000-gallon bolted steel reservoir constructed in 2005. Both reservoirs pre-date current seismic standards. Unprotected steel reservoirs are vulnerable to damage and failure during a major seismic event. Ground motion can cause tanks to move off their foundations and buckle walls. Sloshing can cause further damage or overturning. Rigid piping connections can break and cause a sudden loss of stored water. The treated water storage reservoirs are necessary for fire suppression and standby supply. The potential for a sudden and catastrophic loss of water also poses a flooding hazard to homes in immediate proximity to the WTP.

4. High Flow Booster Pump

The high flow booster pump (Pump No. 4) is necessary for fire suppression and maintaining distribution system pressure. Pump No. 4 is installed in a concrete block building separate from the WTP and Well No. 2 buildings. The pump has a dedicated propane fueled standby generator. The pump, pump house, and generator were installed in 2018 and meet current seismic code. Of all the City's assets, Pump No. 4 is the most resilient and most likely to retain full functionality following a major earthquake. However, Pump No. 4 is supplied from the treated water storage reservoirs, which are vulnerable. Failure of these reservoirs would essentially render Pump No. 4 inoperable.

5. Distribution System

The distribution system conveys treated water from the WTP to hydrants, homes, and businesses throughout the City. If the distribution system is damaged, then it could impact the City's ability to provide adequate fire protection and drinking water to residents and businesses. Line breaks can cause pressure loss, deplete stored water, and cause contamination. Most of the City's distribution piping is AWWA C-900 PVC with mechanically restrained joints that was installed with the WTP in 1981. Some older sections of steel and cast-iron pipe remain

within the system. Restrained PVC pipe is generally resilient in an earthquake, but older steel and cast-iron pipe is vulnerable. It is unlikely the PVC pipe would sustain significant damage, but the older cast iron and steel piping is at higher risk and more likely to be damaged.

6. Fire Protection

Most of the City's fire hydrants are fed by PVC pipelines connected to the booster pumps at the WTP and are considered to be seismically resilient. Some loss of fire flow and pressure may occur due to damage in older cast iron and steel piping. Line breaks can be isolated by valving in the distribution system, but it would take time to identify and isolate leaks, and reduced flow and pressure may be experienced until the line can be fully repaired. Even though the distribution system is generally resilient, the ability to provide adequate fire protection following a major earthquake would be compromised by the vulnerabilities at the WTP discussed previously.

7. Summary

Portions of the water system considered vulnerable to a major earthquake are presented in Table IX-1.

Table IX-1. Water System Elements Vulnerable to Earthquake

System Component	Deficiency
WTP and Well No. 2 Buildings	Likely unreinforced concrete block construction
Well No. 2	Inadequately braced controls, lack of standby power
Booster Pumps No. 1 and No. 2	Inadequately braced controls
Treated Water Storage	Rigid pipe connections, non-anchored foundations
Distribution System	Older cast iron and steel pipe

C. EMERGENCY RESPONSE IMPROVEMENTS

The 2019 WSMP recommended incorporating seismic resiliency improvements in the CIPs. This WSMP amendment concurs with this recommendation. There are, however, a number of recommended lower-cost short-term seismic resiliency measures that can be undertaken independent of any CIP. These are described in the sections below.

1. Buildings

Assess the WTP, Well No. 2, and Pump No. 4 buildings to determine vulnerable features and any cost-effective measures that could be implemented to improve resiliency. The assessments should be conducted in accordance with ASCE 41-17. Typical seismic retrofit improvements for concrete block type buildings at the WTP include the following:

- Add steel hardware and anchors to anchor the tops of walls to the roofs.
- Add steel cross ties as part of the seismic wall anchorage.
- Add roof diaphragm boundary nailing to increase diaphragm capacity.
- Add seismic shear transfer clips to strengthen the roof-to-wall connection.

Other improvements that should be implemented at the WTP facility and buildings include the following:

- Install flexible pipe connections at building wall and floor penetrations.
- Verify anchorage capacities for all onsite equipment (generators, fuel tanks, chemical tanks, filters, pumps, motors, piping, etc.) and upgrade as needed.

2. Treated Water Storage

Perform a detailed assessment of the two steel water storage reservoirs at the WTP in accordance with AWWA D 100. Assess foundation anchorage for compliance with ACI 318 and ASCE 7-16. Depending on the findings of these assessments, the following actions may be recommended:

- Anchor tanks to foundations.
- Install flexible seismic expansion joints at the inlets and outlets to each reservoir
- Increase freeboard.

3. Well No. 2

Recommended seismic resiliency improvements to the City's remaining source water well include the following:

- Seismically brace the motor control center, power distribution panels, filters, and piping in the WTP building.
- Add standby power. The CIP to add Well No. 3 and new booster pumps will add new standby power for these items plus Well No. 2.

X. FUNDING PROGRAM

(This section is unchanged from the 2019 WSMP approved by OHA.)

XI. REFERENCES

Aurora Rural Fire District. 2021. "Fire Code Applications Guide." City of Aurora.

Curran-Mcleod, Inc., Consulting Engineers. 2019. "City of Donald Water System Master Plan Update." Portland.

Great Lakes – Upper Mississippi River Board of State and Provincial Public Health and Environmental Managers. 2012. *Recommended Standards for Water Works.* Albany, New York: Health Research Inc., Health Education Services Division.

International Code Council, Inc. 2019. *2019 Oregon Fire Code.* Country Club Hills: International Code Council, Inc.

Oregon Health Authority. 2021. *Oregon Administrative Rules Oregon Health Authority, Public Helath Division Chapter 333 Division 61 Drinking Water.* Oregon Health Authority.

Washington State Department of Health. 2020. "Water System Design Manual."

Appendix A. Water Rights Permit

STATE OF OREGON

MARION COUNTY

PERMIT TO APPROPRIATE THE PUBLIC WATERS

This is to certify that I have examined Application G-9938 and do hereby grant the same SUBJECT TO EXISTING RIGHTS and the following limitations and conditions:

This permit is issued to City of Donald of PO Box 338, Donald, Oregon 97020, Phone 678-5543, for the use of the waters of two wells, being 0.39 cubic foot per second from each well, for the purpose of municipal use; that the priority of the right dates from September 16, 1980 and is limited to the amount of water which can be applied to beneficial use and shall not exceed 0.78 cubic foot per second measured at the point of diversion from the wells, or its equivalent in case of rotation with other water users.

The wells are to be located: Well 1 - is to be located south 78°45'27" east 5,192.85 feet; Well 2 - is to be located south 80°37'42" east 5,225.68 feet, both from the northwest corner of the G.A. Cone DLC 62, Well 1 - being within the NW 1/4SE 1/4; and Well 2 - being within the SW 1/4NE 1/4, both within Township 4 South, Range 1 West, WM, in the county of Marion.

A description of the place of use under the permit, and to which such right is appurtenant, is as follows:

Township 4 South	Range 1 West, WM	Section 17	SW 1/4NW 1/4	Municipal
			SE 1/4NW 1/4	
			SW 1/4NE 1/4	
			NE 1/4SE 1/4	
			NW 1/4SE 1/4	
			NE 1/4SW 1/4	
			NW 1/4SW 1/4	
			SE 1/4SW 1/4	
			SW 1/4SW 1/4	

The wells shall be constructed in accordance with the General Standards for the Construction and Maintenance of Water Wells in Oregon.

The works constructed shall include an air line and pressure gauge or an access port for measuring line, adequate to determine water level elevation in each well at all times.

The permittee shall install and maintain a weir, meter, or other suitable measuring device, and shall keep a complete record of the amount of ground water withdrawn.

Actual construction work shall begin on or before February 8, 1983 and shall thereafter be prosecuted with reasonable diligence and be completed on or before October 1, 1983. Extended to October 1, 1988
Extended to October 1, 1993 / 10-1-98

Complete application of the water to the proposed use shall be made on or before October 1, 1984. Extended to October 1, 1989 Extended to October 1, 1994

WITNESS my hand this 8th day of February, 1982

Appendix B. Regulatory Correspondence

Oregon
Kate Brown, Governor

RECEIVED JAN 17 2020

Water Resources Department
North Mall Office Building
725 Summer St NE, Ste A
Salem, OR 97301
Phone: 503-986-0900
Fax: 503-986-0904
www.Oregon.gov/OWRD

January 10, 2019

City of Donald
Attention: Heidi Bell, City Manager
P.O. Box 388
Donald, OR 97020

REFERENCE: Pending Application for Extension of Time
Application G-9938 (Permit G-9513)

Dear Municipal Water Right Holder:

Oregon Revised Statue (ORS) 537.630(3)(d) requires, in part, that the Department must find that any undeveloped portion of a municipal water use permit is conditioned to maintain the persistence of fish species listed as sensitive, threatened or endangered under state or federal law. The Department is to base its finding on existing data and upon the advice of the Oregon Department of Fish and Wildlife (ODFW). Oregon Administrative Rule (OAR) 690-315-0080(2) guides this review process.

The purpose of this letter is to provide you with notification as per OAR 690-315-0080(2)(b) and (c) that the above referenced municipal permit extension application, *and* the Department's Permit Extension Ground Water Review were delivered to ODFW on January 9, 2020, for review under OAR 690-315-0080. This ground water review includes an estimate of surface water impacts that would result from use of the undeveloped portion of the ground water permit.

If you should have any questions concerning your extension request you may contact me at (503) 986-0802.

Sincerely,

Jeffrey Pierceall
Muncipal Extension Specialist
Oregon Water Resources Department
725 Summer St. NE Suite A
Salem, OR 97301
503-986-0802

Enclosure: Copy of Permit Extension Ground Water Review

cc: File: Appl G-9938
Joel Plahn, Watermaster District # 16

Memorandum

Oregon Water Resources Department
Technical Services Division

To: Jeffrey Pierceall, Permit Extension Review; Justin Iverson, Groundwater Section Manager

From: Travis Brown, Hydrogeologist

Date: December 20, 2019

Regarding: File G-9938 / Permit G-9513, Information to Assess Permit Renewal Request

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Location: T 4S/ R 1W- S 17

Permittee: City of Donald

Use: Municipal

Priority Date: 9/16/1980

Permit History:

Document	Date Issued/Approved	Date Expired
Application G-9938	2/8/1982 (Permit G-9513)	10/1/1984
Special Order 38-255	5/1/1984	10/1/1988
Special Order 43-104	3/8/1989	10/1/1993
Special Order 48-113	2/9/1994	10/1/1998
Claim of Beneficial Use	8/5/2010 (Received)	N/A
Extension Application	9/23/2019 (Received)	N/A

Q: 0.78 cfs combined use (both wells) (0.11 cfs undeveloped portion)
0.39 cfs per well (fully developed)

Well Logs: MARI 562 ("Well 1"), MARI 563 ("Well 2")

Decline Triggers: N/A

Special Conditions: "The works constructed shall include an air line and pressure gauge or an access port for measuring line, adequate to determine water level elevation in each well at all times.

The permittee shall install and maintain a weir, meter, or other suitable measuring device, and shall keep a complete record of the amount of ground water withdrawn."

Renewal Criteria:

1. "Does the ground water source under this permit have the potential for substantial interference?"

2. "Are there any ground water special use designations established since permit issuance relevant to this extension of time that the Department should consider?"

3. "Should any additional conditions be added to this permit to mitigate the effects of the subsequent development on competing demands on the resource? For example: Should the Department establish a reference level for water level declines?"

Pump Test: MARI 562: Not received, no exemption on file (but should be eligible)

MARI 563: Received (Approved 12/28/1990)

Measuring Tube / Air Line: Unknown

Water Use Reporting: Yes (1989-1995; 1997-2006; 2008; 2013-2019)

Comments / Conclusions: The authorized POA (Well 1/MARI 562 and Well 2/MARI 563) under Permit G-9513 were evaluated for their potential to cause substantial interference (PSI) with surface water per the criteria in OAR 690-009 due to the undeveloped portion (0.11 cfs) of the permit.

690-09-040 (1): Evaluation of aquifer confinement:

Well	Aquifer	Confined	Unconfined
1	**Alluvium**	☒	☐
2	**Alluvium**	☒	☐

Basis for aquifer confinement evaluation: The authorized POA are completed in water-bearing sands attributed to the Willamette Aquifer of Gannett and Caldwell (1998), which in this area is overlain by ~100 ft of fine-grained sediments attributed to the Willamette Silt (Gannett and Caldwell, 1998). Reported static water levels following drilling for the authorized POA (Well 1/MARI 562 and Well 2/MARI 563) are 100 ft or more above the applicable water-bearing zones noted in the logs, with significant layers of clay noted overlying the water-bearing zones. Based on the available information, the subject aquifer is confined.

690-09-040 (2) (3): Evaluation of distance to, and hydraulic connection with, surface water sources. All wells located a horizontal distance less than ¼ mile from a surface water source that produce water from an unconfined aquifer shall be assumed to be hydraulically connected to the surface water source. Include in this table any streams located beyond one mile that are evaluated for PSI.

Well	SW #	Surface Water Name	GW Elev (ft msl)	SW Elev (ft msl)	Distance (ft)	Hydraulically Connected? YES	NO	ASSUMED	Potential for Subst. Interfer. Assumed? YES	NO
1	**1**	**Unnamed tributary to Senecal Creek**	**~162-112**	**~161-140**	**~3,310**	☒	☐	☐	☐	☒
1	**2**	**Senecal Creek**	**~162-112**	**~132-130**	**~4,860**	☒	☐	☐	☐	☒
1	**3**	**Ryan Creek**	**~162-112**	**~122-118**	**~4,970**	☒	☐	☐	☐	☒
2	**1**	**Unnamed tributary to Senecal Creek**	**~162-112**	**~161-140**	**~3,220**	☒	☐	☐	☐	☒
1	**2**	**Senecal Creek**	**~162-112**	**~132-130**	**~4,900**	☒	☐	☐	☐	☒
2	**3**	**Ryan Creek**	**~162-112**	**~122-118**	**~4,880**	☒	☐	☐	☐	☒

Basis for aquifer hydraulic connection evaluation: Reported static groundwater elevations range from ~112-162 ft above mean sea level (amsl) for nearby wells completed to similar depths as the authorized POA (see attached Hydrograph). Seasonal fluctuations in water level of up to 45 ft have been reported. Reported annual high (spring) static water levels are typically between for ~135-150 ft amsl for wells MARI 348 and MARI 53553, close to the authorized POA. These reported groundwater elevations are coincident with or above estimated stream elevations for nearby surface water sources within 1 mile of the authorized POA. Additionally, water table (potentiometric) mapping in this area indicates that groundwater is flowing toward and (for SW 2 & 3) discharging into nearby streams (see attached Well Location Map) (Woodward et al., 1998). The authorized POA are approximately located on a groundwater divide between two different predominant flow paths, which roughly corresponds to the topographic divide between two different watersheds. Based on the available evidence, the authorized POA are hydraulically connected to SW 1-3.

Water Availability Basin the well(s) are located within: SW 1 & 2: MILL CR > PUDDING R – AT MOUTH
SW 3: WILLAMETTE R > COLUMBIA R – AB MOLALLA R

690-09-040 (4): Evaluation of stream impacts by total appropriation for all wells determined or assumed to be **hydraulically connected and less than 1 mile** from a surface water source. **Complete only if Q is distributed among wells**. Limit evaluation to instream rights and minimum stream flows that are pertinent to that surface water source, and not lower SW sources to which the stream under evaluation is tributary. Compare the requested rate against the 1% of 80% *natural* flow for the pertinent Water Availability Basin (WAB). Any checked ☒ box indicates the well is assumed to have the potential to cause PSI.

	SW #		Qw > 5 cfs?	Instream Water Right ID	Instream Water Right Q (cfs)	Qw > 1% ISWR?	80% Natural Flow (cfs)	Qw > 1% of 80% Natural Flow?	Interference @ 30 days (%)	Potential for Subst. Interfer. Assumed?
	1		☐	**N/A**		☐	**1.88**	☒	**<<25%**	☒
	2		☐	**N/A**		☐	**1.88**	☒	**<<25%**	☒
	3		☐	**N/A**		☐	**3,830**	☐	**<<25%**	☐

Basis for PSI Determination: **The undeveloped portion (0.11 cfs) of the total authorized rate of diversion (0.78 cfs) for the authorized POA exceeds 1 percent (0.0188 cfs) of the stream discharge which is equaled or exceeded 80 percent of time (1.88 cfs) for SW 1 & 2. Therefore, per OAR 690-009-0040(4)(c), the authorized POA are assumed to have the Potential for Substantial Interference (PSI).**

In order to estimate the amount of interference likely to accrue to nearby surface water sources, an analysis was conducted using the Hunt (2003) analytical model. Hydraulic parameters used for the analysis were derived from regional data and studies (Pumping Test Reports; Conlon et al., 2003, 2005; Iverson, 2002; McFarland and Morgan, 1996; Woodward et al., 1998) or are within a typical range of values for the given parameter within the hydrogeologic regime (Freeze and Cherry, 1979; Domenico and Mifflin, 1965). Results indicate that the anticipated interference with nearby surface water due to the authorized use is anticipated to be much less than 25 percent of the rate of withdrawal within the first 30 days of continuous pumping (see attached Stream Depletion Analysis for further detail).

The low rate of depletion (interference) is largely attributable to the substantial intervening thickness of fine-grained sediments between the water-bearing zone tapped by the authorized POA and the elevation of nearby streams. Although depletion of local surface water will be buffered by the low vertical hydraulic conductivity and substantial thickness of fine-grained sediments, there will still be some depletion of surface water. Net impacts will be small at the onset of pumping but will increase with time until a new equilibrium between local recharge and discharge is reached, at which time surface water depletion is anticipated to be relatively constant throughout the year.

Addressing the requirements of OAR 690-315-0080(2)(c), model results indicate the following stream depletion estimates after 365 days of continuous pumping of the undeveloped portion (0.11 cfs) of Permit G-9513:

- SW 1 (Unnamed tributary to Senecal Creek): ~0.00003-0.0001 cfs
- SW 2 (Senecal Creek): ~0.00003-0.00009 cfs

"Should any additional conditions be added to this permit to mitigate the effects of the subsequent development on competing demands on the resource? For example: Should the Department establish a reference level for water level declines?"

In order to preserve the capacity of the groundwater resource and protect senior users, it is recommended that the following conditions be added to Permit G-9513:

- Condition 7a (water use impact plan)
- Condition 7n (annual measurement condition)
- Large Water Use Reporting Condition

References

Conlon, T.D., Lee, K.K., and Risley, J.R., 2003, Heat tracing in streams in the central Willamette Basin, Oregon, in Stonestrom, D.A. and Constantz, Jim, eds., Heat as a tool for studying the movement of groundwater near streams: U.S. Geological Survey Circular 1260, chapter 5, p. 29-34.

Conlon, T.D., Wozniak, K.C., Woodcock, D., Herrera, N.B., Fisher, B.J., Morgan, D.S., Lee, K.K., and Hinkle, S.R., 2005, *Ground-water hydrology of the Willamette Basin, Oregon*, Scientific Investigations Report 2005-5168: U. S. Geological Survey, Reston, VA.

Domenico, P.A. and Mifflin, 1965, Water from low-permeability sediments and land subsidence: Water Resource Research, v. 1, no. 4, p. 563-576.

Freeze, R.A. and Cherry, J.A., 1979, Groundwater, Prentice Hall, Englewood Cliffs, New Jersey, 604 p.

Gannett, M.W. and Caldwell, R., 1998, *Geologic framework of the Willamette Lowland aquifer system, Oregon and Washington*, Professional Paper 1424-A, 32 p: U. S. Geological Survey, Reston, VA.

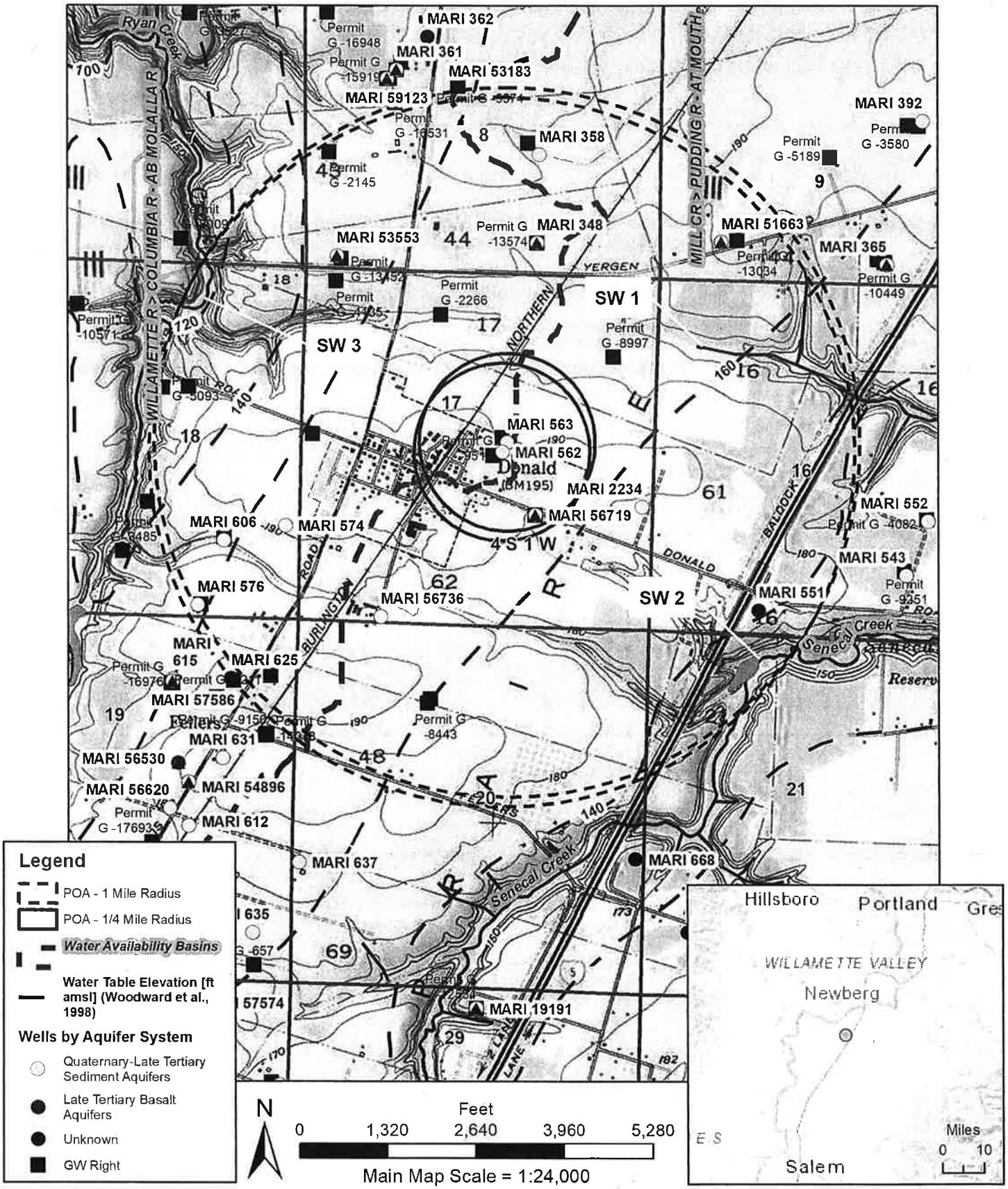
Iverson, J., 2002, Investigation of the hydraulic, physical, and chemical buffering capacity of Missoula flood deposits for water quality and supply in the Willamette Valley of Oregon: Unpublished M.S. thesis, Oregon State University, 147 p.

McFarland, W.D., and Morgan, D.S., 1996, *Description of the Ground-Water Flow System in the Portland Basin, Oregon and Washington*, Water Supply Paper 2470-A, 58 p: U. S. Geological Survey, Reston, VA.

Woodward, D.G., Gannett, M.W., and Vaccaro, J.J., 1998, Hydrogeologic framework of the Willamette Lowland aquifer system, Oregon and Washington: U.S. Geological Survey Professional Paper 1424-B, 82 p.

Well Location Map

File G-9938 / Permit G-9513 City of Donald



Water Availability Analysis

Water Availability Analysis
Detailed Reports

MILL CR > PUDDING R - AT MOUTH
WILLAMETTE BASIN

Water Availability as of 12/19/2019

Watershed ID #: 30200901 (Map)
Date: 12/19/2019

Exceedance Level: 80%
Time: 10:20 AM

Water Availability Calculation | Consumptive Uses and Storages | Instream Flow Requirements | Reservations | Water Rights | Watershed Characteristics

Water Availability Calculation

Monthly Streamflow in Cubic Feet per Second
Annual Volume at 50% Exceedance in Acre-Feet

Month	Natural Stream Flow	Consumptive Uses and Storages	Expected Stream Flow	Reserved Stream Flow	Instream Flow Requirement	Net Water Available
JAN	39.20	9.74	29.50	0.00	0.00	29.50
FEB	53.90	9.88	44.00	0.00	0.00	44.00
MAR	38.40	9.47	28.90	0.00	0.00	28.90
APR	27.60	7.09	20.50	0.00	0.00	20.50
MAY	13.70	5.70	8.00	0.00	0.00	8.00
JUN	8.72	7.01	1.71	0.00	0.00	1.71
JUL	3.79	10.80	-6.96	0.00	0.00	-6.96
AUG	2.09	8.74	-6.65	0.00	0.00	-6.65
SEP	1.88	4.78	-2.90	0.00	0.00	-2.90
OCT	2.39	1.25	1.14	0.00	0.00	1.14
NOV	6.05	7.23	-1.18	0.00	0.00	-1.18
DEC	25.90	9.56	16.30	0.00	0.00	16.30
ANN	30,000.00	5,500.00	25,300.00	0.00	0.00	25,300.00

Water Availability Analysis
Detailed Reports

WILLAMETTE R > COLUMBIA R - AB MOLALLA R
WILLAMETTE BASIN

Water Availability as of 12/19/2019

Watershed ID #: 182 (Map)
Date: 12/19/2019

Exceedance Level: 80%
Time: 10:20 AM

Water Availability Calculation | Consumptive Uses and Storages | Instream Flow Requirements | Reservations | Water Rights | Watershed Characteristics

Water Availability Calculation

Monthly Streamflow in Cubic Feet per Second
Annual Volume at 50% Exceedance in Acre-Feet

Month	Natural Stream Flow	Consumptive Uses and Storages	Expected Stream Flow	Reserved Stream Flow	Instream Flow Requirement	Net Water Available
JAN	21,400.00	2,300.00	19,100.00	0.00	1,500.00	17,600.00
FEB	23,200.00	7,490.00	15,700.00	0.00	1,500.00	14,200.00
MAR	22,400.00	7,260.00	15,100.00	0.00	1,500.00	13,600.00
APR	19,900.00	6,920.00	13,000.00	0.00	1,500.00	11,500.00
MAY	16,600.00	4,260.00	12,300.00	0.00	1,500.00	10,800.00
JUN	8,740.00	1,980.00	6,760.00	0.00	1,500.00	5,260.00
JUL	4,980.00	1,810.00	3,170.00	0.00	1,500.00	1,670.00
AUG	3,830.00	1,650.00	2,180.00	0.00	1,500.00	679.00
SEP	3,890.00	1,400.00	2,490.00	0.00	1,500.00	993.00
OCT	4,850.00	759.00	4,090.00	0.00	1,500.00	2,590.00
NOV	10,200.00	893.00	9,310.00	0.00	1,500.00	7,810.00
DEC	19,300.00	975.00	18,300.00	0.00	1,500.00	16,800.00
ANN	15,200,000.00	2,250,000.00	13,000,000.00	0.00	1,090,000.00	11,900,000.00

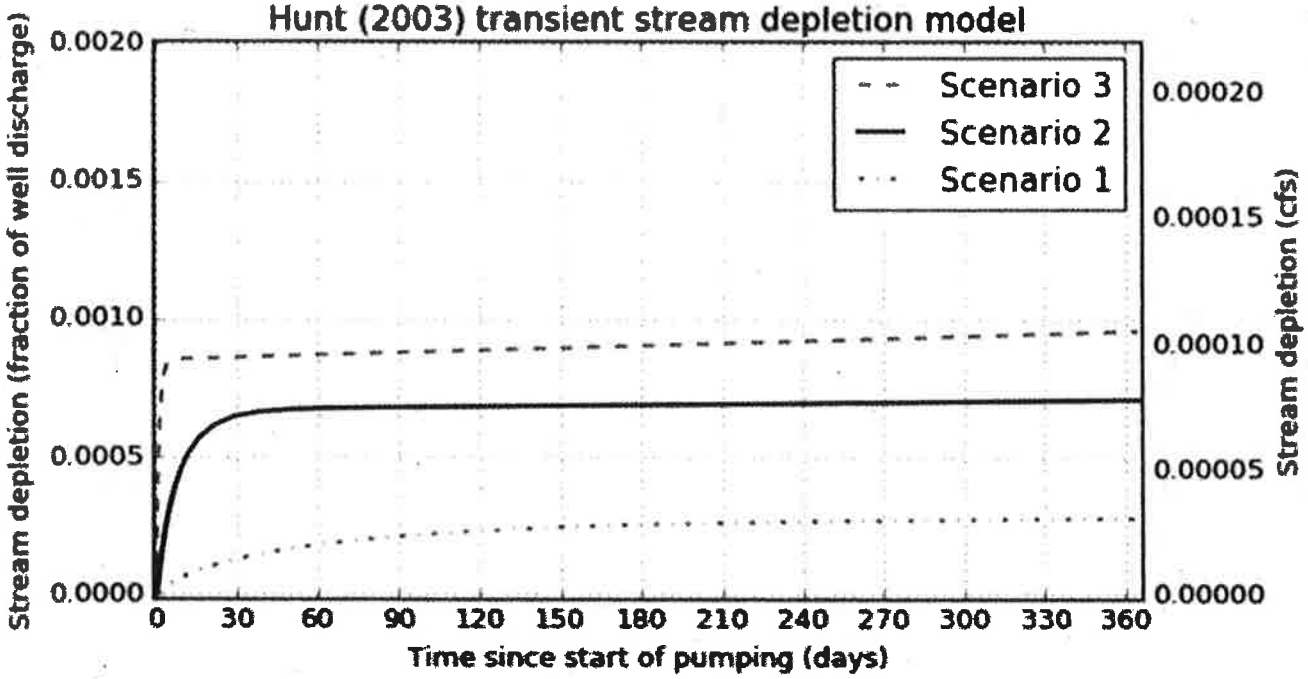
Stream Depletion Analysis – SW 1 (Unnamed tributary to Senecal Creek)

Application type:	G
Application number:	9938
Well number:	1
Stream Number:	1
Pumping rate (cfs):	0.11
Pumping duration (days):	365.0
Pumping start month number (3=March)	1.0

Parameter	Symbol	Scenario 1	Scenario 2	Scenario 3	Units
Distance from well to stream	a	3310	3310	3310	ft
Aquifer transmissivity	T	4700	2300	1800	ft2/day
Aquifer storativity	S	0.001	0.0005	0.0001	-
Aquitard vertical hydraulic conductivity	Kva	0.001	0.005	0.01	ft/day
Aquitard saturated thickness	ba	115	120	125	ft
Aquitard thickness below stream	babs	115	115	115	ft
Aquitard specific yield	Sya	0.2	0.2	0.2	-
Stream width	ws	15	15	15	ft

Stream depletion for Scenario 2:

Days	10	30	60	90	120	150	180	210	240	270	300	330	360
Depletion (%)	0	0	0	0	0	0	0	0	0	0	0	0	0
Depletion (cfs)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00



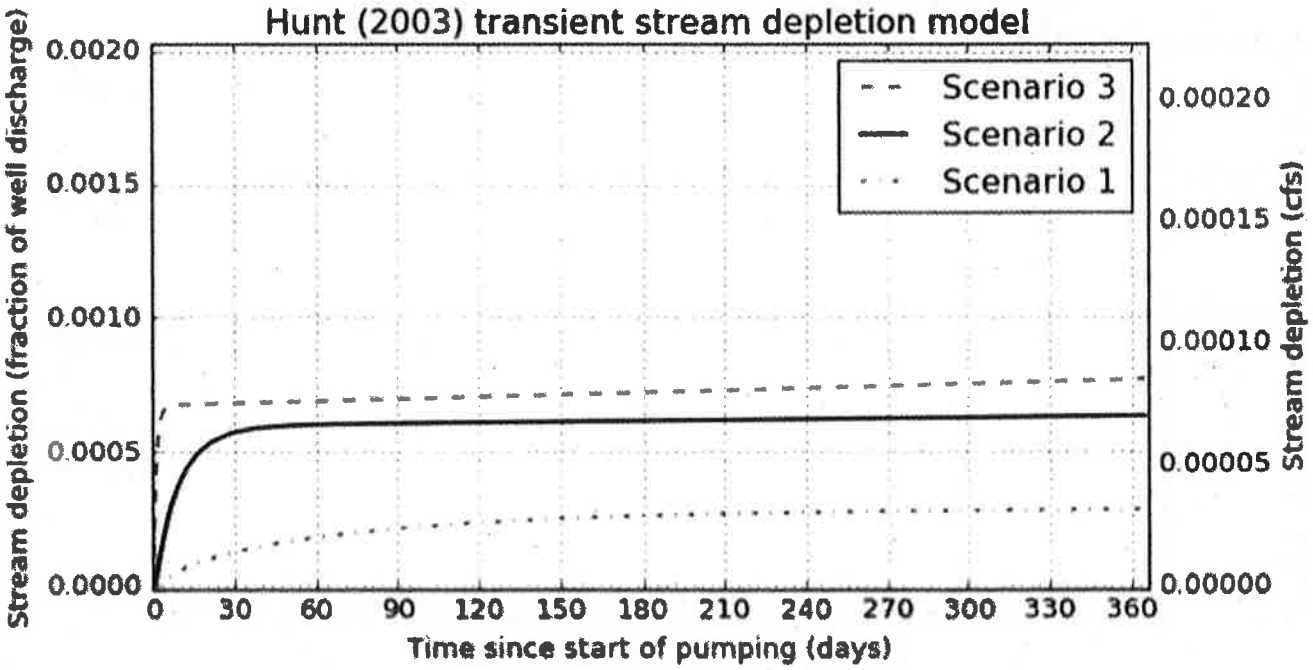
Stream Depletion Analysis – SW 2 (Senecal Creek)

Application type:	G
Application number:	9938
Well number:	1
Stream Number:	2
Pumping rate (cfs):	0.11
Pumping duration (days):	365
Pumping start month number (3=March)	1

Parameter	Symbol	Scenario 1	Scenario 2	Scenario 3	Units
Distance from well to stream	a	4860	4860	4860	ft
Aquifer transmissivity	T	4700	2300	1800	ft2/day
Aquifer storativity	S	0.001	0.0005	0.0001	-
Aquitard vertical hydraulic conductivity	Kva	0.001	0.005	0.01	ft/day
Aquitard saturated thickness	ba	115	120	125	ft
Aquitard thickness below stream	babs	105	105	105	ft
Aquitard specific yield	Sya	0.2	0.2	0.2	-
Stream width	ws	15	15	15	ft

Stream depletion for Scenario 2:

Days	10	30	60	90	120	150	180	210	240	270	300	330	360
Depletion (%)	0	0	0	0	0	0	0	0	0	0	0	0	0
Depletion (cfs)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00



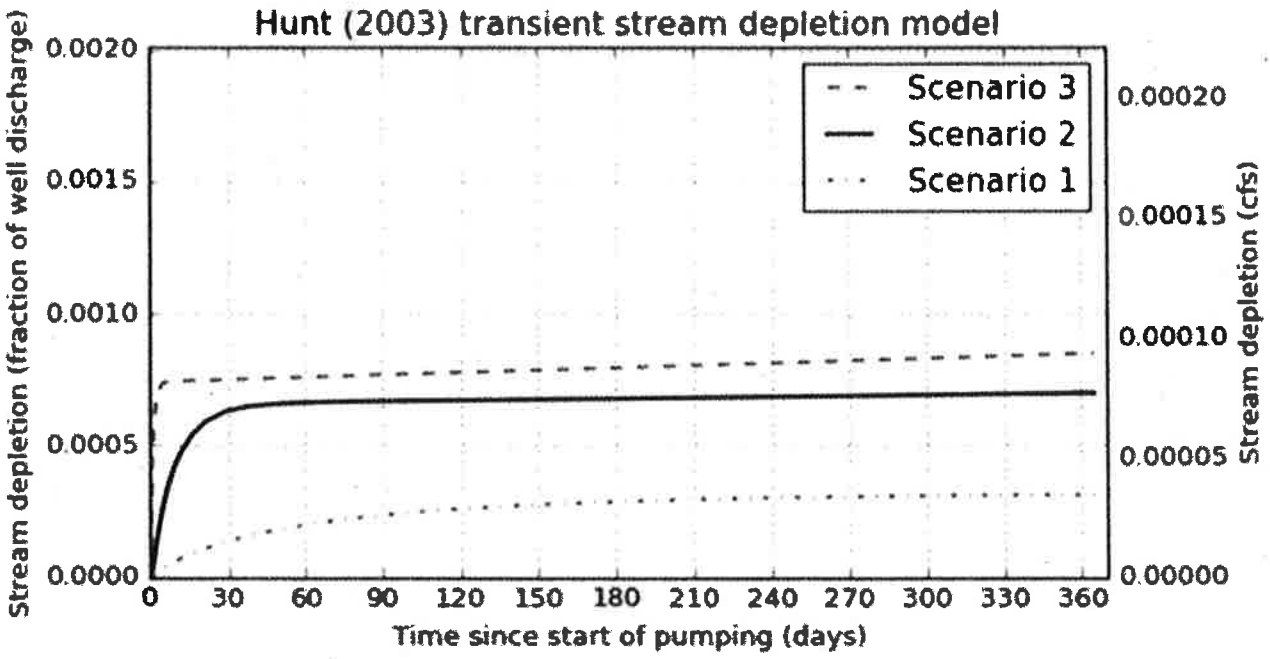
Stream Depletion Analysis – SW 3 (Ryan Creek)

Application type:	G
Application number:	9938
Well number:	1
Stream Number:	3
Pumping rate (cfs):	0.11
Pumping duration (days):	365.0
Pumping start month number (3=March)	1.0

Parameter	Symbol	Scenario 1	Scenario 2	Scenario 3	Units
Distance from well to stream	a	4880.0	4880.0	4880.0	ft
Aquifer transmissivity	T	4700.0	2300.0	1800.0	ft2/day
Aquifer storativity	S	0.001	0.0005	0.0001	-
Aquitard vertical hydraulic conductivity	Kva	0.001	0.005	0.01	ft/day
Aquitard saturated thickness	ba	115.0	120.0	125.0	ft
Aquitard thickness below stream	babs	95.0	95.0	95.0	ft
Aquitard specific yield	Sya	0.2	0.2	0.2	-
Stream width	ws	15.0	15.0	15.0	ft

Stream depletion for Scenario 2:

Days	10	30	60	90	120	150	180	210	240	270	300	330	360
Depletion (%)	0	0	0	0	0	0	0	0	0	0	0	0	0
Depletion (cfs)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00



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Oregon Water Resources Department
Water Right Services Division

Application for Extension of Time

In the Matter of the Application for an Extension of Time	)	
for Permit G-9513, Water Right Application G-9938,	)	FINAL
in the name of the City of Donald	)	ORDER

Permit Information

Application File G-9938 / Permit G-9513

Basin 2B – Middle Willamette Basin / Watermaster District 16
Date of Priority: September 16, 1980

Authorized Use of Water

Source of Water: Well 1 and Well 2 within the Ryan Creek Basin
Purpose or Use: Municipal
Maximum Rate: 0.78 Cubic Feet per Second (cfs), being 0.39 cfs from each well

This Extension of Time request is being processed in accordance with Oregon Revised Statute 537.630 and 539.010(5), and Oregon Administrative Rule Chapter 690, Division 315.

Please read this Proposed Final Order in its entirety.

Appeal Rights

This final order is subject to judicial review by the Court of Appeals under ORS 183.482. Any petition for judicial review must be filed within the 60-day time period specified by ORS 183.482(1). Pursuant to ORS 536.075 and OAR 137-003-0675, you may petition for judicial review or petition the Director for reconsideration of this order. A petition for reconsideration may be granted or denied by the Director, and if no action is taken within 60 days following the date the petition was filed, the petition shall be deemed denied.

Application History

Permit G-9513 was issued by the Department on February 8, 1982. The permit called for completion of construction by October 1, 1983, and complete application of water to beneficial use by October 1, 1984. The most recent extension authorized completion of construction and complete application of water to beneficial use by October 1, 1998. On September 23, 2019, City of Donald submitted an application for an extension of time for Permit G-9513. In

accordance with OAR 690-315-0050(2). On October 6, 2020, the Department issued a Proposed Final Order proposing to extend the time to complete construction to October 1, 2030 and to extend the time to fully apply water to beneficial use to October 1, 2030. The protest period closed November 20, 2020, in accordance with OAR 690-315-0060(1). No protest was filed.

FINDINGS OF FACT

The Department adopts and incorporates by reference the findings of fact in the Proposed Final Order dated October 6, 2020.

At time of issuance of the Proposed Final Order the Department concluded that, based on the factors demonstrated by the applicant, the permit may be extended subject to no additional conditions.

CONCLUSION OF LAW

The applicant has demonstrated good cause for the permit extension pursuant to ORS 537.630, 539.010(5) and OAR 690-315-0080(3).

ORDER

The extension of time for Application G-9938, Permit G-9513, therefore, is approved. The deadline for completing construction is extended from October 1, 1998, to October 1, 2030. The deadline for applying water to full beneficial use within the terms and conditions of the permit is extended from October 1, 1998, to October 1, 2030.

DATED: December 18, 2020

Dwight French
Water Right Services Division Administrator, for
Thomas M. Byler, Director
Oregon Water Resources Department

If you have any questions about statements contained in this document, please contact Jeffrey Pierceall at 503-986-0802.

If you have questions about how to file a protest or if you have previously filed a protest and you want to know the status, please contact Patricia McCarty at 503-986-0820.

Appendix C. GSI Water Solutions Documents

TECHNICAL MEMORANDUM

Water Rights Strategy and Well 1 Performance Assessment

To: Matt Huxley, PE / Tetra Tech, Inc.

From: Kenny Janssen, RG / GSI Water Solutions, Inc.

Owen McMurtrey / GSI Water Solutions, Inc.

Attachments: Attachment A – Well 1 Construction and Alteration Logs and Reports

Date: April 30, 2020

Executive Summary

The City is pursuing options to improve the reliable capacity of its water system to meet current and future demands, and to rectify water right permitting issues associated with its supply sources. This technical memorandum presents results from a desktop performance evaluation of Well 1 and review of the City's water rights records.

Well 1

Based on our current understanding of Well 1, we believe it could be salvaged, but not back to its original performance. The well was capable of producing 300 gpm after it was constructed in 1980, but a recent pumping test by the City indicates that the well is not able to sustain a pumping rate above 20 gallons per minute (gpm) due to cavitation and sand pumping. The casing perforations that allow groundwater to enter the well are the limiting factor preventing it from regaining lost performance. The perforations amount to an open area of less than five percent (wells completed with screens have open areas of roughly 20-40 percent, or more). To maintain an adequate groundwater entrance velocity through the perforations post-repair, the maximum recommended yield would be limited to 60 gpm. Adding perforations could result in casing collapse and complete loss of the well. Consequently, we recommend replacing Well 1 with a new well. A new well would be more reliable and productive and have lower operations and maintenance costs.

Water Rights

The City has one water right permit (G-9513) that authorizes a maximum combined withdrawal rate of 350 gpm for Wells 1 and 2. The City submitted a Claim of Beneficial Use (COBU) to partially certificate the permit during August 2010. Due to the capacity limitation imposed by a sand filter installed at the time, the Oregon Water Resources Department (OWRD) proposed to issue a water rights certificate for a combined rate of 300 gpm. This means that the City would receive a certificate for 300 gpm, while the remaining 50 gpm would remain unperfected. The remaining 50 gpm could be certificated at a later time when improvements to the system are complete and the City could demonstrate full beneficial use of the water. If the City has not yet requested that the OWRD continue processing the COBU as a partial perfection, GSI recommends the City to do so. A partial perfection offers the protection of certification for the majority of the City's water right.

The City's 2019 permit extension request was referred to the Oregon Department of Fish and Wildlife (ODFW) for review based on a determination that pumping the undeveloped portion of the permit (50 gpm) will have an impact on local surface water bodies. After careful review of the City's pumping records, operations

manual, and water system master plans, GSI determined that the City was able to appropriate the full 350 gpm from both wells (175 gpm each), and that there is no undeveloped portion of the permit that would be subject to ODFW review or added permit conditions. GSI submitted this evidence to the OWRD during April 2020 and expects them to repeal the need for ODFW review. We anticipate the OWRD to issue an order approving the City's permit extension request without any added conditions, allowing the City to make modifications to the permit.

The City's projected peak demands are anticipated to exceed the 350 gpm rate currently authorized by water right permit G-9513. In order to obtain authorization to pump groundwater at rates over this amount, the City would need to either apply for a new water right or acquire an existing right. A new water right would likely require some form of mitigation to offset any pumping impacts to nearby surface water bodies, particularly for new wells located on the eastern half of the City. Obtaining and securing an existing water right could potentially be used as mitigation for a new right or for transfer to the City's water right portfolio for municipal use. We recommend exploring the possibility of acquiring a portion of water right(s) held by GK Machine, Inc., or other water rights held by users inside and contiguous to the City.

Introduction

The State of Oregon is piloting five housing projects across the state as part of a Workforce Housing Initiative to address the housing shortage for working families in Oregon. The City of Donald (City) was selected as one the five pilot projects, and has been forming partnerships between local employers and developers to expand their community as part the initiative.

The first phase of the City's pilot project will include upgrading their wastewater and water treatment plants to support 95 new homes, with an eventual planned total of 465 new homes. The City also will need to make improvements to their water system, to increase the reliable production capacity of their supply sources to meet the planned future growth needs.

Background

Groundwater is the sole source of drinking water supply for the City's water system. The City owns and operates two wells: Well 1 (MARI 562) and Well 2 (MARI 563). Since the late-1990's, the City has been attempting to reconstruct and rehabilitate Well 1 to control sand pumping and regain lost production capacity. Well 2 is currently capable of producing up to 200 gallons per minute (gpm) and is the City's only reliable source of water. Past attempts to repair Well 1 have not been successful and the well has been temporarily taken out of service.

The City has one existing water right permit (G-9513) that authorizes a maximum combined withdrawal rate of 0.78 cfs (350 gpm) for City Well 1 and Well 2. During 2010, the City filed for a claim of beneficial use on permit G-9513. During 2019, the City filed for a permit extension to gain additional time to perfect the beneficial use of water as authorized by the permit. The City's permit extension request has been referred to the Oregon Department of Fish and Wildlife (ODFW) for review based on a determination by the Oregon Water Resources Department (OWRD) that pumping the undeveloped portion of the permit (50 gpm) will have an impact on local surface water bodies. The total impact has been estimated to range between 0.03 and 0.09 gpm. The City cannot make modifications to the permit (e.g., adding additional wells) until the extension issue gets resolved.

Purpose

This technical memorandum presents results from (1) a desktop evaluation of the performance of Well 1 and (2) a review of the City's water rights records. The performance evaluation was conducted to help the City decide whether to keep or replace Well 1. The water rights record review was conducted to assess whether the City's water right permit was fully developed pre-2005 in an attempt to resolve the permit extension issue. Recommended next steps are provided herein based on findings from the water rights and Well 1 performance reviews.

Water Rights

2010 Claim of Beneficial Use

The City submitted a Claim of Beneficial Use (COBU) to partially certificate permit G-9513 on August 5, 2010. GSI understands that, upon review of the COBU, the OWRD determined that the City's sand filter limited the total production capacity to 300 gpm (0.67 cfs). In general, in order to make proof on a municipal water right, the permit holder must show beneficial use of the permit for at least four hours in an 8-hour period. Due to the capacity limitation imposed by the sand filter, the OWRD proposed the issuance of a water right certificate for a combined rate of 0.67 cfs (300 gpm), with a maximum of up to 0.39 cfs (175 gpm) available from either well. The proposed certificate effectively recognizes the way the City operated the two well system in 1998 – with either well able to serve as the primary, limited to a combined instantaneous rate of 300 gpm over longer pumping durations. As a municipality, the City is able to partially perfect permit G-9513. This would mean that

the City would receive a certificate for 300 gpm, while the remaining 0.11 cfs (50 gpm) would remain undeveloped and could be certificated at a later date.

2019 Permit Extension

The City submitted an extension application for permit G-9513 on September 23, 2019. Following the same reasoning as the COBU regarding the capacity limitation of the sand filter, the OWRD determined that a 0.11 cfs portion of the permit was not developed at the time of the City's 1998 completion date. Furthermore, the OWRD determined that there were no improvements to the water system between 1998 and 2005. This ultimately led to the 2019 permit extension application being sent to the ODFW for review of the impact on listed fish species of a withdrawal of less than 0.05 gpm from an unnamed tributary to Senecal Creek. The timeline for ODFW review of permit extension applications is unpredictable. Additional permit conditions from OWRD are likely, and would create obstacles to the City's ability to use and modify the remaining 50 gpm of its permit.

However, after careful review of the City's pumping records from 1998, operations manual, and water system master plans, GSI determined that the City was able to appropriate 175 gpm from both wells[1] for short periods of time before the limiting effects of the sand filter limited the pumping rate of the secondary well. The requirement for beneficial use of the maximum rate for four hours in an 8-hour period does not apply to the review criteria for an extension application. That requirement only applies to the review criteria for a COBU review for the purpose of proving up on the permit. GSI submitted this additional evidence to and spoke with OWRD (Pierceall, J.D., OWRD, personal communication, April 2020) and expects them to repeal the need for ODFW review and will be able to issue an order approving the City's permit extension request without any added conditions.

Acquire Existing or Apply for New Water Right

GSI understands that the City's projected peak demands will exceed the 350 gpm currently authorized by permit G-9513. In order to obtain authorization to pump groundwater at rates over 350 gpm, the City would need to either apply for a new groundwater right or acquire an existing water right and transfer it to the City's wells for municipal use.

GSI completed a high-level review of the potential to obtain a new water right for municipal use, and it appears that a new well may be found to have the potential for interference with Senecal Creek, depending on where the well is located. The criteria for review of the potential for interference with surface water is different for a new permit application than for an extension application. For a new permit application, if the City's proposed new well was found to have the potential for interference with Senecal Creek, it is unlikely that OWRD would issue a permit without mitigation to offset the impact to the creek. It is possible however, that the OWRD would not find the potential for interference with Senecal Creek, particularly for a new well located on the west side of the City.

If the City were to acquire an existing water right, it could be used either as mitigation in the event that the OWRD found the potential for interference with surface water, or for transfer to municipal use. An important consideration for acquiring an existing right is that the most ubiquitous character of use authorized by water rights in the area is for irrigation. Irrigation rights are limited to use during the irrigation season (March through October), even after transfer to municipal use. Assuming the City's demands are lower outside of the irrigation season, this may not be a problem. It may also be possible for the City to obtain a new permit for only the winter months, even if the Department does find that there is the potential for interference with surface water.

[1] On 8/14/98, 8/22/98, and 8/28/98, City records show that Well 1 produced between 178 and 225 gpm while Well 2 produced between 205 and 226 gpm.

Well 1

Well 1 is located at the City's Water Treatment Plant and was constructed in 1980 to a depth of 207 feet. The well consists of 12 inch diameter steel production casing (0.250-inch wall thickness) that extends to a depth of 210 feet and is perforated between 175 and 185 feet below ground surface (bgs). A 4-inch annular concrete seal extends around the production casing to 25 feet bgs. A water well report documenting the original construction of the well is provided in Attachment A.

After originally constructed, the well was capable of producing 300 gpm with 61 feet of drawdown after pumping for nearly 24 hours, equating to a specific capacity[2] of 4.9 gpm per foot of drawdown (gpm/foot).

The static water level after the well was constructed measured 75 feet bgs.

Alterations

The well construction has been altered over the years in attempts to prevent sand intrusion and regain lost production capacity. A history of the alteration work completed is summarized in Table 1, and further documented in water well reports (MARI 55469 and MARI 55470) and a well rehabilitation report prepared by Stettler Supply Company (circa 1997). Copies of these reports are included in Attachment A.

Table 1. Well 1 Construction Alteration Summary

Date	Activity	Notes
13-AUG-1980	Original Construction (MARI 562)	Well originally consisted of 12-inch diameter production casing, perforated between 175-185 feet bgs
1980-1988	Alteration (no record)	Installed 8 inch diameter PVC well screen (w/ filter pack) and 8 inch diameter PVC liner, both telescoped inside existing 12 inch diameter perforated production casing. Evidence of this is provided on MARI 55470 and in Well 1 Rehabilitation Report by Stettler Supply Company.
5-AUG-1997	Alteration (MARI 55470)	Removed PVC liner and PVC well screen; installed new 8 inch diameter steel liner and 8 inch diameter telescope stainless steel well screen (0.050-inch slot size, from 175-185 feet bgs) and 6-9 filter pack sand (see also Well 1 Rehabilitation Report by Stettler Supply Company)
30-NOV-1998	Alteration (MARI 55469)	Equipped 8 inch diameter steel riser with neoprene gasket, and extended 8 inch diameter steel riser to surface

The previous alteration work has consisted primarily of installing and replacing smaller-diameter liners and filter-packed screens inside the original production casing to help prevent sand intrusion. Some swabbing of the perforations (but no brushing) was reported after removing the PVC liner and screen. The well was reported to have been redeveloped and disinfected prior to installing the new steel liner and well screen.

No video surveys pre- or post-alteration work, or any evidence of chemical rehabilitation, were reported on the alteration logs or discovered as part of this evaluation.

[2] Specific capacity (Q/s) is an estimate of well performance, and is calculated by dividing the pumping rate (Q) by the amount of drawdown (s). It represents the rate a well can produce per unit of drawdown. Specific capacity is both time- and rate-dependent, and therefore comparison between specific capacities calculated for different rates and durations are not directly comparable.

Performance Assessment

Two short-duration (30 minute) pumping tests have been documented at Well 1 (see MARI 562 and MARI 55470 in Attachment A):

- After originally constructed, the well was capable of producing up to 500 gpm with 84 feet of drawdown after pumping for 30 minutes, equating to a short-term specific capacity of 6 gpm/foot.
- After the 5-AUG-1997 alteration work (see Table 1), Well 1 was reported to produce 200 gpm with 65 feet of drawdown after pumping for 30 minutes, equating to a short-term specific capacity of 3.1 gpm/foot.

The installation of the 8-inch well screen and filter pack sand during 1997 increased the total head loss in the well, contributing to additional drawdown (i.e., deeper pumping water level) and reducing the well's performance by over 50 percent.

After a recent pumping test completed at Well 1, the City reports that the well was not able to sustain a pumping rate above 20 gpm due to cavitation and sand production (Limones, A., City Public Works Director, personal communication, March 2020). Assuming a static water level of 75 feet bgs and pump intake depth of 165 feet bgs (Stettler circa 1997), this would equate to an estimated short-term specific capacity of 0.2 gpm/foot, approximately 95 percent less than the specific capacity measured after the 1997 alteration. Plugged casing perforations and/or screen slots could increase head losses and potentially be contributing to the observed decrease in performance.

Potential Issues and Repair Options

Table 2 identifies potential issues and possible repair options based on a desktop evaluation of the original construction and alteration history of Well 1. The greatest factor limiting potential repair of the well are its casing perforations. There are a total 216 perforations between the depths of 175 and 185 feet bgs, each reported to measure ⅜ inches wide by 2½ inches long. The perforations amount to a total open area of approximately 4.5 percent. For comparison, wells completed with continuous wire-wrap screens have open areas of roughly 20-40 percent, or more depending on screen type and design. The significantly low open area of the perforations is greatly limiting groundwater flow to the well and contributing to its poor performance and pumping efficiency.

Table 2. Potenital Issues and Possible Well 1 Repair Options

Potential Issue	Possible Repair Option
Filter pack sand envelope around well screen too course and not capable of filtering and preventing sand intrusion	Replace with appropriately-sized filter pack sand
Filter pack sand may have been lost to the formation through the casing perforations[3], losing its pre-filtration ability and exposing the well screen directly to the formation	Replace with appropriately-sized filter pack sand and overfill the envelope in an attempt to backfill the apparent void space in the formation outside the well casing
The effectiveness of the filter pack sand envelope may have been partially lost or impaired by the upward flow of water through the filter pack[4] (see MARI 55469)	Replace with appropriately-sized filter pack sand and reconstruct liner to include a pressure-relief screen
Well screen slot size too large and not capable of preventing formation sand from entering the well	Replace with new screen having appropriately-sized slots to filter formation sand and filter pack envelope sand

[3] Stettler (circa 1997) reports that filter pack sand was lost to a void in the formation near the top of the perforations.
[4] The difference between water level in the aquifer outside the well casing and the pumping water level inside the casing could result in high pressure differentials and cause the upward flow of water within the filter pack envelope.

Well screen collapsed and possibly split from the weight of the 165-foot, 8-inch diameter steel liner, and possibly from the weight of the pump column[5]. A collapsed and possibly ruptured screen would reduce the ability for groundwater to enter the well and prevent sand intrusion.	Replace with new screen that has the appropriately-designed collapse strength to withstand the additional weight of the steel liner
Well 1 casing perforations amount to a total open area of approximately 4.5 percent. The significantly low open area is greatly limiting groundwater flow to the well, contributing to its poor performance and poor pumping efficiency.	None. Adding perforations could adversely affect the integrity of the well casing and potentially result in casing collapse and complete loss of the well.
The transmitting capacity of the casing perforations is roughly 60 gpm at a fluid entrance velocity of 0.1 foot/sec.	None. Adding perforations could adversely affect the integrity of the well casing and potentially result in casing collapse and complete loss of the well.
Casing perforations plugged and is limiting the ability for groundwater to enter the well[6] and increasing the fluid entrance velocity	Brush and clean well casing perforations. This repair option however, will not increase the total open area of the well beyond 4.5 percent.

If the well was able to be repaired back to its original performance, pumping it at 175 gpm authorized by the water right would exceed the standard fluid entrance velocity by three times. In the water well industry, the standard entrance velocity of water entering a well is recommended to be maintained at 0.1 feet per second (feet/sec) or less. Where entrance velocities exceed this rate, it is common for mineral precipitation clogging or corrosion to increase well operation and maintenance/rehabilitation costs. To limit the potential for clogging or accelerated corrosion, we would recommend the maximum pumping rate of Well 1 post-repair to be limited to approximately 60 gpm. We do not recommend adding perforations to the well in an attempt to increase its open area (and effectively decrease fluid entrance velocity and increase yield) as more casing perforations could adversely affect the integrity of the well casing and potentially result in casing collapse and complete loss of the well.

Planning-Level Cost Estimate

The planning-level construction cost for addressing the possible repair options identified in Table 2 is estimated at $122,000 in 2020 dollars (Table 3). This cost estimate includes construction, cleaning and redeveloping the well, well performance testing post-construction, well disinfection, and a 25 percent construction contingency. Other estimated allowances for engineering, administration, and permitting total an estimated $36,600. The total planning-level cost is estimated at $160,000, ranging between $145,000 (-10%) to $200,000 (+25%).

Benefits from repairing the existing well compared to drilling a new replacement well include lower capital investment costs, shorter construction time, and no water right permitting requirements. Though the repair options are likely to reduce or eliminate sand pumping, they will not improve the open area of the perforations or transmitting capacity of the well. The maximum recommended pumping rate of Well 1 post-repair would be 60 gpm.

[5] Stettler (circa 1997) reports installing a cover on the pump column at the depth of the top of the riser pipe, which is the top of the original screen assembly.
[6] Stettler (circa 1997) reports that the upper 3-4 feet of casing perforations appeared more open than the lower 6-7 feet. No chemical treatment to dissolve precipitate and/or unclog the lower perforations was conducted.

Table 3. Planning-Level Cost Estimate for Well 1 Repair Options

Item	Estimated Cost
Mobilize/demobilize	$15,000
Remove and reinstall existing pumping system	$10,000
Bail and clean out wellbore	$4,500
Conduct video survey	$1,500
Brush and clean casing perforations	$4,000
Furnish and install 8-inch liner (w/ centralizers)	$18,500
Furnish and install 8-inch pipe-size screen (10 feet + 5 feet of pressure-relief)	$4,500
Furnish and install filter pack envelope	$10,000
Well development (bailing and surging)	$9,000
Furnish, install, remove test pump	$7,500
Furnish, install, and remove discharge piping	$2,500
Test pumping	$4,500
Well disinfection	$2,500
Standby time/Authorized hourly work	$3,600
Construction Subtotal	*$97,600*
Construction Contingency (25%)	*$24,400*
Construction Total	**$122,000**
Engineering (15%)	$18,300
Administration (10%)	$12,200
Permitting (5%)	$6,100
Engineering, Admin, and Permitting Subtotal	*$36,600*
(1)TOTAL ESTIMATED COST	$160,000
(1)Total Estimated Cost (-10%)	$145,000
(1)Total Estimated Cost (+25%)	$200,000

Notes

(1) All total estimated cost values are in 2020 dollars and rounded to the nearest $5,000

New Replacement Well

Compared to repairing existing Well 1, benefits from constructing a new replacement well are greater:

- More reliable, efficient, and productive
- Better construction and improved water quality
- Lower operations and maintenance costs

A new replacement well would be designed and constructed much like the existing Well 1, targeting a production capacity of 200 gpm. Rather than perforated casing, the replacement well would be completed with a continuous-slot, stainless steel wire-wrap well screen. Compared to casing perforations, a well screen will provide more intake area for groundwater from the aquifer to enter the well, prevent sand intrusion, and increase its overall performance and longevity.

The planning-level construction cost for a new replacement well totals an estimated $345,000 in 2020 dollars (Table 4). This cost includes drilling, construction, development, and testing, and includes a 25 percent construction contingency. Additional costs for other estimated allowances (engineering, administration, and permitting) are provided in Table 4. The total planning level cost is estimated at $450,000, ranging between $405,000 (-10%) to $565,000 (+25%).

Table 4. Planning-Level Cost Estimate for New Replacement Well

Item	Estimated Cost
Mobilization/Demobilization	$50,000
Well drilling, construction, and development	$165,000
Step- and constant-rate pumping tests	$40,000
Plumbness and alignment testing	$4,000
Well video survey	$2,000
Well disinfection	$3,000
Wellhead completion	$2,500
Standby/Authorized hourly work	$9,000
Construction Subtotal	*$275,500*
Construction Contingency (25%)	*$68,875*
Construction Total	**$345,000**
Engineering (15%)	$51,750
Administration (10%)	$34,500
Permitting (5%)	$17,250
Engineering, Admin, and Permitting Subtotal	*$103,500*
(1)TOTAL ESTIMATED COST	$450,000
(1)Total Estimated Cost (-10%)	$405,000
(1)Total Estimated Cost (+25%)	$565,000

Notes

(1) All total estimated cost values are in 2020 dollars and rounded to the nearest $5,000

Recommendations and Next Steps

Well 1

Based on our current understanding, we believe Well 1 is salvageable, but not back to its original performance after initially constructed. Consequently, we recommend the City construct a new replacement well for the following reasons:

- Well 1 was constructed nearly 40 years ago and is within the typical life expectancy for water supply wells[7]
- Recommended long-term maximum Well 1 pumping rate post-repair would be 60 gpm, based on a groundwater entrance velocity of 0.1 foot/sec or less and 4.5 percent perforated open area

[7] Commonly assumed to be between 30 and 50 years in normal groundwater environments.

- Cost to repair Well 1 outweigh the benefits and its long-term performance or reliability post-repair cannot be predicted
- New replacement well likely to produce 200 gpm or more
- Long-term benefits of a new well are greater (e.g., more reliable, efficient, and productive and will have comparatively lower operations and maintenance costs)

We recommend the following next steps should the City decide to pursue construction of a new well:

- Identify candidate well site(s) for a new municipal supply well, evaluate setback requirements, and assess compatibility with applicable land use requirements
- Develop well design criteria, conceptual design, and technical specifications suitable for competitive public bidding and selection of a qualified drilling contractor
- Prepare and submit plan review information (e.g., site plan, construction specifications, etc.) to the Oregon Health Authority's Drinking Water Services (OHA DWS) for site plan and construction approval of the City's new municipal production well
- Prepare and submit a water right transfer application (as described in the section below) to add the new replacement well as an additional point of withdrawal
- Advertise for bid, select drilling contractor, construct and permit the new well, and connect it to City's water system

Water Rights

Findings from the water rights review support the following recommended next steps:

2010 Claim of Beneficial Use

If the City has not yet requested that the OWRD continue processing the COBU as a partial perfection, GSI recommends the City to do so. A partial perfection offers the protection of certification for the majority of the City's water right. The City can then extend the remaining, unperfected portion of permit G-9513 and will be able to prove up on the remaining 50 gpm once the City is able to demonstrate compliance with the terms of the water right permit and order approving the extension and can show that the water system produced at least 350 gpm for four hours during an eight hour period.

Replace Well 1

If the City decides to drill a new well, the City should submit a water right transfer application to add the new well to the water right certificate (not yet issued) recognizing a partial perfection of permit G-9513. The timeline for review of a water right transfer can be longer than a year, so the City should work with the OWRD to issue a certificate recognizing the partial perfection of permit G-9513 and develop and submit a water right transfer application for the new well as soon as possible.

If the timeline for drilling a replacement well is less than a year, the City may also be able to submit a limited license application to provide a bridge for beneficial use of the new well prior to fully completing the water right transfer process.

The addition of a new water supply well to a water right permit or certificate does not require the water right holder to remove any of the existing authorized points of diversion, nor would it trigger a requirement for the City to decommission existing well(s).

Acquire Existing or Apply for New Water Right

Depending on the location of a new replacement well, OWRD's review, and other factors, the City may be able to obtain a new groundwater permit.

If the OWRD would not issue a new permit without some form of mitigation to offset impacts to surface water bodies from pumping the new well, or with some onerous conditions, the City may be able to acquire an existing water right for transfer or to serve as mitigation. Consequently, we recommend exploring the possibility of acquiring a portion of water right(s) held by GK Machine, Inc., or other water rights held by users inside and contiguous to the City. When acquiring an existing water right, the City should conduct a due diligence review to evaluate the rate and volume of water subject to transfer, and whether the water right can be transferred to the City's wells. The acquisition of an existing water right should only be considered complete once the City has obtained an order approving a transfer to municipal use within the City's water service area at one or more of the City's wells.

In the Willamette Basin, in general, the authorized season of use for irrigation water rights is March through October. If the City acquires an existing water right for irrigation, the City could transfer the water right to municipal use, but the season of use would still be limited to March through October. The City could then apply for a water right during the months of November through February. During this time of year, it is less likely that the City's water right application will trigger the potential for substantial interference (PSI) with Senecal Creek, or other local surface water bodies.

TECHNICAL MEMORANDUM

City of Donald Well Siting Evaluation

To: Heidi Bell and Alonso Limones, City of Donald.

From: Kenny Janssen, RG / GSI Water Solutions, Inc. and Matt Huxley, PE / Tetra Tech, Inc.

Date: December 2, 2020

Executive Summary

The City is pursuing options to improve the reliable source capacity of its water system to meet current and future demands. City Well 1 has been temporarily taken out of service because of sand pumping and significant performance declines. This leaves City Well 2 as the only reliable source of water for the water system.

This technical memorandum presents results from a well siting evaluation to identify locations for two new City production wells. One well will replace Well 1 at the City's Water Treatment Plant (WTP). The other well, which would be the City's third production well, is intended to meet future growth demands and provide additional source redundancy to the City's water system.

The replacement well should be located at the WTP site near existing Well 1. The production capacity of the replacement well is estimated to range between 300 and 400 gallons per minute (gpm). To accommodate a target pumping rate within this range, the replacement well will need to be upsized compared to the City's two existing wells. We recommend that the replacement well be constructed with a 12-inch diameter well screen and 16-inch diameter production well casing. We recommend continuing to consult with the Oregon Health Authority and Oregon Water Resources Department for their input and consensus prior to final siting and actual construction of the replacement well.

Eight potential groundwater development sites were evaluated for siting a third City production well. Each site was evaluated based on certain selection categories and related criteria (e.g., hydrogeology, land use compatibility, site ownership and setback requirements), and correspondingly scored and ranked. The top three candidate sites include City Hall, Community Center, and the Oak Street Right of Way (ROW). Each of these candidate sites scored positively for all site evaluation categories. A well located at any of these sites however, will require an easement with neighboring property owners (or a setback waiver from the Oregon Health Authority) to maintain a 100-foot radius of ownership and control around the well depending on its chosen location at each site.

The least favorable sites were the waterline easement located northwest of the WTP and the Matthieu Street ROW located west of the WTP. Though both sites scored positively for hydrogeologic conditions, the Matthieu site scored negatively for susceptibility to contamination because of a neighboring railway and the waterline easement scored neutrally for land use compatibility and site ownership because it is located outside of City limits on land zoned as Exclusive Farm Use.

Introduction

The City of Donald (City) is planning improvements to their water system in order to increase its reliable production capacity and to meet current and future growth needs. As part of the improvements, the City is evaluating potential locations for two new municipal supply wells. One well is intended to replace the City's existing Well 1 at the Water Treatment Plant (WTP). The other well, which would give the City a total of three groundwater sources, is intended to meet future growth demands and provide additional source redundancy to the City's water system.

This technical memorandum provides recommendations for the location of the replacement well at the WTP and potential new groundwater development sites for a third City production well.

Background

Groundwater is the sole source of drinking water supply for the City's water system. The City currently owns and operates two wells: Well 1 (MARI 562) and Well 2 (MARI 563). Since the late 1990's, the City has been attempting to reconstruct and rehabilitate Well 1 to control sand pumping and regain lost production capacity. Well 2 is currently capable of producing up to 200 gallons per minute (gpm) and is the City's only reliable source of water. Past attempts to repair Well 1 have not been successful and the well has been temporarily taken out of service.

The City has one existing water right permit (G-9513) that authorizes a maximum combined withdrawal rate of 0.78 cfs (350 gpm) for City Well 1 and Well 2. The City is seeking to develop a total instantaneous pumping capacity of 450 gpm to meet peak daily demands projected for full buildout of the planned developments. The City is currently pursuing options for acquiring additional water rights from existing users to meet the full buildout peak demand rate.

Local Hydrogeology

The City is located within the northern portion of the Willamette Valley, a region characterized as a broad alluvial plain consisting primarily of alluvial sediments (e.g., silt, clay, sand, gravel). The majority of groundwater used in the Willamette Valley is sourced from permeable water-bearing units within these alluvial deposits (USGS 2001).

Hydrogeologic Units

The aquifer system beneath the City was characterized by reviewing available geologic reports (USGS 2001 and 2005) and drillers' logs of water wells constructed in and around the City. The well locations are shown on Figure 1. An inventory of the wells is provided in Attachment A.

Two geologic cross-sections extending roughly north-south and west-east thorough the center of the City are shown in Figures 2 and 3, respectively. Well logs used to develop the cross-sections are summarized in Table 1 and provided in Attachment B. The following hydrogeologic units were identified (from shallowest/youngest to deepest/oldest; USGS 2005):

- **Willamette Silt Unit (WSU):** Also referred to as part of the Missoula Flood Deposits, the Willamette Silt hydrogeologic unit (WSU) is widespread at the land surface in the area and generally composed of fine-grained flood sediments consisting of silt and clay (USGS 2001). Though this unit is seldom used as a groundwater supply source because of its low permeability, thin interbeds of sandy silts or silty fine-grained sands are capable of producing water for domestic purposes in some areas. Area well logs indicate that the WSU in the Donald area is between approximately 60 and 100 feet thick. The WSU is known to confine groundwater in deeper units.
- **Middle Sedimentary Unit (MSU):** The Middle Sedimentary hydrogeologic unit (MSU) underlies the WSU and confines groundwater in deeper units. The MSU deposits consist mainly of slightly- to

moderately-consolidated sands and gravels that are older than the Missoula Flood Deposits. The MSU includes the Troutdale Formation, weathered terrace gravel, and pre-Missoula Flood sand and gravel deposits. The pre-Missoula Flood sands and gravels form the bulk of the MSU, and are generally unconsolidated near its upper surface and become more compacted and cemented with depth. Drillers commonly refer to these deposits as hardpan, cemented, or conglomerate. The MSU is found at depth throughout the Donald area and is between approximately 15 and 45 feet thick. The MSU unit is considered a confining bed (i.e., aquitard) and its cemented conditions limit its permeability and development as a groundwater supply source.

- **Lower Sedimentary Unit (LSU):** The Lower Sedimentary hydrogeologic unit (LSU) lies beneath and is confined by the overlying WSU and MSU deposits. The LSU consists of predominately fine-grained sediments, and is commonly described on well logs as blue clay with interbeds of sand and gravel. The sand and gravel interbeds where present within this unit are relatively productive and support moderate to high well yields in some areas. The LSU is widespread throughout the subsurface and is estimated to range between 400 and 500 feet thick in the Donald area.
- **Columbia River Basalt (CRB) Unit:** The deepest hydrogeologic unit in the Donald area is basalt of the Columbia River Basalt (CRB) Group. Well yields in this unit are moderate to high. Large-diameter irrigation and municipal supply wells are known to produce more than 250 gpm whereas small-diameter domestic wells are generally capable of producing 20 gpm. Production rates however, can vary significantly depending on the number, thickness and permeability characteristics of the water-bearing interflow zones within the basalt flows. Well log ID MARI 56530 located approximately one mile southwest of Donald intersected basalt at a depth of approximately 560 feet below ground surface (bgs) and is reported to be capable of producing 80 gpm.

Aquifer System

Most of the wells in the Donald area are completed in a sand and gravel aquifer within the LSU (Figures 2 and 3). The aquifer appears to be continuous throughout the Donald area and is roughly 20 to 30 feet thick. The top of the aquifer ranges between approximately 100 and 175 feet bgs.

The City's existing wells and many domestic and irrigation wells in and around Donald are completed in this aquifer unit and are reported to produce between 30 and 500 gpm, with some capable of producing 600 gpm or more (Table 1). Specific capacity values are reported to range between 3 and 30 gpm per foot of drawdown (gpm/foot). The median is 6 gpm/foot. This sand and gravel aquifer is considered the target groundwater supply source for additional City wells.

Well Siting Evaluation

This section summarizes findings from a desktop evaluation of potential locations for developing two new municipal supply wells. One well will replace the existing Well 1 at the City's Water Treatment Plant site. Potential sites for the other well are identified and ranked based on an assessment of certain criteria[1], focusing on eight properties the City currently owns or may have access to in the future. The target production capacity for each well is 400 gpm.

Replacement Well

The WTP is the location of the City's two existing wells, and is the recommended location for the replacement well. The site is roughly 340 feet long and 125 feet wide, and is bordered on all sides by private property (Figure 4). The site consists of two above-ground storage tanks, two production wells, a water treatment facility, and a high-flow pump station. Yard piping consists of water mains, irrigation lines, tank overflow

[1] Hydrogeologic conditions, land use compatibility, site ownership and setback requirements, susceptibility to contamination, and pumping interference.

piping, and backwash overflow piping. The backwash and tank overflow pipes discharge to a ditch that drains northward along the western margin of the site. Neighboring properties to the east, west and south all have septic tanks and are connected by laterals to pressure sewer mainlines. A single sewer mainline is located in Rees St. NE running east-west past the southern entrance to the site. The site also contains some trees and grassy areas, though is mostly paved for vehicle access and parking.

City Wells 1 and 2 (MARI 562 and MARI 563; Table 1) were constructed in 1980 and are between 190 and 207 feet deep. The wells are fully cased with 12 inch diameter steel production casing and perforated between 175 and 185 feet below ground surface (bgs). Each well has been modified since originally constructed by installing 8-inch diameter stainless steel well screens (0.050-inch slot size, from 175 to 185 feet bgs) with a 6-9 filter pack sand envelopes to prevent sand intrusion. A 4-inch annular concrete seal extends around the production casing to a depth of 25 feet.

Estimated Well Capacity

After originally constructed, City Wells 1 and 2 were each capable of producing 300 gpm with short-term (24 hours) specific capacities between 5 and 7 gpm/foot. Assuming the replacement well will perform similarly, its production capacity is estimated to range between 300 and 400 gpm. The productivity range was estimated based on the following:

- Static water level between 70 and 75 feet bgs
- Top of well screen at 175 feet bgs
- Available drawdown[2] of approximately 80 feet
- Long-term pumping specific capacity of between 4 and 5 gpm/foot

The production capacity of the replacement well was estimated assuming a lower specific capacity range, to account for a potential reduction in permeability over the larger scale of the aquifer that may be encountered during pumping operations lasting longer than 24 hours. The final productivity of the replacement well will depend on its actual performance post-construction and development, and performance characteristics of the aquifer source.

The available drawdown is the height of water in a well above the pump intake (after accounting for some allowances) that may be displaced due to pumping. Generally for wells completed in the same aquifer, a larger available drawdown will accommodate higher pumping rates and longer pumping durations. The 80 feet of available drawdown estimated here includes allowances of 10 feet for seasonal groundwater level changes and 10 feet for pump submergence requirements, and assumes the pump intake will be positioned at the top of the well screen.

Siting Options

The width of the property, location of existing piping and buildings/structures, and neighboring septic tanks and pressurized sewer lines greatly limit locations for a new replacement well. No location at the site (including the locations of the two existing wells) meets all Oregon Health Authority (OHA) and Oregon Water Resources Department (OWRD) setback requirements for municipal supply wells. Some setback requirements however, can be negotiated or waived.

Overdrilling Well 1 and completing a new well in its place is not recommended. Overdrilling is considerably more expensive than standard drilling methods and would require partial demolition and reconstruction of the treatment facility building at additional cost.

[2] Available drawdown is the height of water in a well above the pump intake (after accounting for seasonal groundwater level fluctuations and the column of water required to maintain net positive suction head) that may be displaced due to pumping.

Despite the WTP site constraints, there appears to be two potential options for siting the replacement well (Figure 4). One potential location is near the backwash tank next to existing Well 1 and the other is approximately 50 feet northwest of Well 1. Both potential locations would meet the 50-foot setback requirement from septic tanks, but neither would meet the 100-foot setback requirements from neighboring properties, parking lots/roadways, or pressure sewer lines. Some setback requirements however, can be negotiated or waived if the replacement well is properly constructed and an equivalent level of source water protection can be met. Waivers from these setback requirements are anticipated based on the following, though we recommend continuing to consult with OHA and OWRD for input prior to final siting and actual construction:

- The OHA is aware of the City's plan to construct a replacement well at the WTP and has stated that may be able to waive setback requirements if the well is properly constructed in a confined aquifer
- The replacement well will be designed according to state well construction standards and constructed and adequately sealed by an Oregon-licensed water well constructor
- The target aquifer at this location is overlain and confined by approximately 100 feet of low-permeability silt and clay

One apparent advantage of the first siting option is that it is closer to the WTP building and would require less labor and materials to connect the well to the water system. For this particular well location option however, we would strongly recommend that Well 1 be decommissioned to protect the replacement well from any potential adverse water quality impacts from inactive Well 1. Costs for decommissioning however, would offset potential cost savings from siting the replacement well near the WTP building/Well 1. We do not anticipate a need to decommission Well 1 if the replacement well is located at the second siting option.

Replacement Well Design Recommendations

To accommodate the target pumping rate of 400 gpm, the replacement well will need to be upsized compared to the City's two existing wells. The design capacity of a 10-foot section of 8-inch pipe-size diameter well screen with a slot size ranging between 0.030 and 0.050 inches is estimated to range between 250 and 350 gpm based on manufacturer specifications[3]. If the grain-size characteristics of the sand and gravel aquifer beneath the WTP site require a screen having a slot size on the low-end of the anticipated range, pumping at the target rate would exceed the recommended fluid entrance velocity (0.1 feet/second). We therefore recommend a screen diameter of 12-inches, which would provide a design capacity of between 400 and 600 gpm[4].

The replacement well design recommendations are listed below:

Preliminary Design Element	Description
Well Depth	200 feet
Well Seal Depth	50 feet
Temporary Casing and Permanent Well Casing	Temporary casing: 20-inch nominal diameter, low-carbon steel (0.375-inch wall) for well seal installation; Permanent casing: 16-inch nominal diameter, low-carbon steel (0.375-inch wall) for production casing;
Well Screen	10 feet of 12-inch pipe-size diameter, stainless steel, continuous wire-wrap screen; 0.030- to 0.050-inch slot size, positioned between 175 and 185 feet bgs
Filter Pack Envelope	10-20 or 8-16 filter pack sand

[3] Transmitting capacity between 25 and 35 gpm/foot of screen at a recommended fluid entrance velocity of 0.1 feet/s
[4] Transmitting capacity between 40 and 60 gpm/foot of screen at a recommended fluid entrance velocity of 0.1 feet/s

Planning-Level Cost Estimate

The total planning-level cost estimate for constructing a new 200 gpm replacement well at the WTP was estimated at $450,000 in 2020 dollars, ranging between $405,000 (-10%) and $565,000 (+25%) (GSI 2020). This cost estimate assumed that the replacement well would be designed and constructed much like the existing Well 1, targeting a production capacity of 200 gpm. The estimated cost included (1) drilling, construction, development, and testing services, (2) a 25 percent construction contingency, and (3) estimated allowances for related services (e.g., engineering, administration, and permitting fees).

The total planning-level cost estimate for constructing an upsized replacement well capable of producing between 300 and 400 gpm (including the assumptions mentioned in the paragraph above and design recommendations provided in the preceding section) is estimated at $490,000 in 2020 dollars, ranging between $440,000 (-10%) and $615,000 (+25%):

Item	Estimated Cost
Mobilization/Demobilization	$50,000
Well drilling, construction, and development	$190,000
Step- and constant-rate pumping tests	$40,000
Plumbness and alignment testing	$4,000
Well video survey	$2,000
Well disinfection	$3,000
Wellhead completion	$2,500
Standby/Authorized hourly work	$9,000
Construction Subtotal	*$300,500*
Construction Contingency (25%)	*$75,125*
Construction Total	**$375,625**
Engineering (15%)	$56,350
Administration (10%)	$37,570
Permitting (5%)	$18,790
Engineering, Administration, and Permitting Subtotal	*$112,710*
(1)TOTAL ESTIMATED COST	$490,000
(1)Total Estimated Cost (-10%)	$440,000
(1)Total Estimated Cost (+25%)	$615,000

Notes

(1) All total estimated cost values are in 2020 dollars and rounded to the nearest $5,000

The cost difference between a replacement well with a design capacity of 200 gpm compared to an upsized design capable of producing between 300 and 400 gpm is estimated at $40,000 in 2020 dollars, ranging between $35,000 (-10%) and $50,000 (+25%). The cost differential is a rough approximation of the additional cost for an upsized well to serve the full buildout population (400 gpm) compared to one constructed to serve just the new Harvest Gardens subdivision (220 gpm).

Potential Sites for Future Production Well

The primary objective of this evaluation is to recommend a ranked list of potential groundwater development sites for a future City production well, based on the potential for each candidate site to provide a reliable and safe supply of groundwater. The categories and criteria that were evaluated for meeting this objective consisted of the following:

- **Hydrogeologic Conditions:** Favorable hydrogeologic conditions means the presence of sufficiently thick water-bearing deposits that could yield water to a well completed in those deposits
- **Land Use Compatibility:** The compatibility of land use classifications at each candidate location for siting public utility facilities such as production wells, pump houses, and conveyance lines
- **Site Ownership and Setback Requirements:** Suitable space to meet regulatory setback requirements for water supply wells while posing minimal property ownership or redevelopment constraints
- **Susceptibility to Contamination:** Identification and characterization of potential contaminant sources in the local area
- **Pumping Interference:** Pumping wells may interfere with one another due to the composite drawdown of closely spaced wells

Site Evaluation Scoring

Each of the eight potential groundwater development sites shown on Figure 5 were evaluated against the five categories outlined above, with rating scores assigned to criteria defined for each category to aid in comparing well sites. The methodology for scoring each well site included assigning one of the following three scores to each criteria within each category:

Positive (+)	Favorable site attributes are present, and/or minimal challenges are associated with development of the site
Neutral (0)	Favorable site attributes are accompanied by unfavorable attributes, moderate challenges are associated with development of the site, and/or some information is not available
Negative (-)	Unfavorable site attributes are present, and/or significant challenges are associated with development of the site

Each of the five categories and related criteria are defined in more detail in Attachment C.

Site Evaluation Results

Candidate sites identified as being favorable for potential groundwater development are listed and ranked in Table 2. The maximum score a candidate site can achieve based on the categories and criteria outlined above and in Attachment C is 9 (+).

The top three candidate sites each scored a total of 6 (+), and include City Hall and community center and the Oak Street Right of Way (ROW; Table 2 and Figure 5):

- **City Hall (Site ID No. 6):** This site scored positively for all site evaluation categories. City streets/alley and City property boarders this site along all sides. The City Hall building takes up most of the site area, but a new well could potentially be located along its eastern margin. Easements with property owners to the north across Main St. and possibly south across the alley (or an OHA waiver) would be required to maintain a 100-foot radius of ownership and control around the well depending on its chosen location at the site.
- **Community Center (Site ID No. 4):** This site scored positively for all site evaluation categories. City streets and alley border the site along its north, south and east sides. Private property borders the site

on the west. Easements with property owners to the west, east across Williams St., and south across alley (or OHA waiver) would be required to maintain a 100-foot radius of ownership and control around the well regardless of its chosen location at the site.

- **Oak Street ROW (Site ID No. 1):** This site scored positively for all site evaluation categories with the exception of pumping interference. This site is located within approximately 1,500 feet of existing wells (including the two City wells) with reported production capacities as high as 825 gpm and scored neutrally for pumping interference[5]. Pumping interference on a well at this location from other nearby pumping wells is estimated to range between 5 and 30 feet depending on actual values for aquifer transmissivity[6] and storativity[7], distance between wells, well construction, and pumping rates and durations. These interference estimates should be updated using actual hydraulic conditions observed from pumping tests completed at the WTP replacement well post-construction and the anticipated use of nearby wells, particularly the City's WTP wells and a nearby nursery irrigation well (MARI 56719). That information should then be used to revise the score and rank for this candidate well site. The one advantage that this site has over the preceding two is that the pipeline needed to convey raw water to the WTP will not require crossing under the Burlington Northern Santa Fe (BNSF) railroad line.

The least favorable sites were the waterline easement located northwest of the WTP (Site ID No. 2) and the Matthieu Street ROW located west of the WTP (Site ID No. 3). These sites scored positively for hydrogeologic conditions and neutrally for pumping interference. The Matthieu Street ROW scored negatively for susceptibility to contamination due to its close proximity with the BNSF railroad line. The waterline easement site scored neutrally for land use compatibility and site ownership and setback requirements because it is located outside of City limits on land zoned as Exclusive Farm Use (EFU). Public facilities are permitted as a use in this EFU zone, but are subject to standards and administrative reviews. Additional details are provided in Table 2.

The three remaining sites each scored 5 (+) (Table 2 and Figure 5). All scored favorably for hydrogeology, land use compatibility, and pumping interference. The City Park (Site ID No. 5) and industrial yard (Site ID No. 5) sites each scored neutrally for site ownership and setback requirements, whereas the residential property site planned for redevelopment (Site ID No. 8) scored neutrally for susceptibility to contamination. Additional details are provided in Table 2.

Planning-Level Cost Estimates

Planning-level cost estimates for a third City production well were developed for each of the top three candidate groundwater development sites. The estimated development cost for each site is summarized below, and include estimated costs for (1) well drilling, construction, development, and testing services, (2) pumping systems, (3) pipeline conveyance to the WTP, (4) well buildings, (5), electrical needs, (6) site improvements, and (7) related services (e.g., engineering, administration, and permitting fees):

	Estimated Cost		
[(1)] Cost Item	City Hall Site ID No. 6	Community Center Site ID No. 4	Oak Street ROW Site ID No. 1
Well construction/completion	$300,000	$300,000	$305,000
Pumping system	$42,000	$42,000	$42,000
Pipeline conveyance	$276,000	$202,000	$70,000
Well building	$52,000	$52,000	$52,000

[5] The drawdown produced by each pumping well has the potential to increase drawdown in other neighboring wells.
[6] Aquifer transmissivity was estimated to range between 14,000 and 35,000 gallons per day per foot (OWRD 2019)
[7] Storativity for the confined aquifer was estimated to range between 1 x 10^{-3} to 1 x 10^{-4} (OWRD 2019)

Electrical and Controls	$140,000	$140,000	$140,000
Construction Subtotal	*$810,000*	*$736,00*	*$609,000*
Construction Contingency (~25%)	*$203,000*	*$184,000*	*$152,000*
Construction Total	**$1,013,000**	**$920,000**	**$762,000**
Engineering (~15%)	$152,000	$138,000	$114,000
Administration (~10%)	$101,000	$92,000	$76,000
Permitting (~5%)	$51,000	$46,000	$38,000
Engineering, Administration, and Permitting Subtotal	*$304,000*	*$276,000*	*$228,000*
[2] **TOTAL ESTIMATED COST**	**$1,315,000**	**$1,195,000**	**$990,000**
[2] Total Estimated Cost (-10%)	$1,185,000	$1,075,000	$890,000
[2] Total Estimated Cost (+25%)	$1,646,000	$1,495,000	$1,240,000

Notes

(1) Estimated costs for pumping system, pipeline conveyance, well building, electrical, and site improvements were provided by Tetra Tech, Inc. Cost includes pump, discharge column, valves, sand separator, power, controls, standby generator, CMU building, raw piping in street and bored under rail road.

(2) All total estimated cost values are in 2020 dollars and rounded to the nearest $5,000

Water Right Permit G-9513 Extension Request Update

During September 2019, the City submitted an extension application requesting the time to complete construction and to apply water to full beneficial use under the terms and conditions of City water right permit G-9513 be extended from October 1, 1998 to October 1, 2025. Based on the application information provided, the OWRD determined that a portion of the City's permit was not fully developed and that there were no improvements to the water system between 1998 and 2005. These determinations ultimately led to the 2019 permit extension application being sent to the Oregon Department of Fish and Wildlife (ODFW) for review of the impact on listed fish species from an unnamed tributary to Senecal Creek.

After careful review of the City's pumping records from 1998, operations manual, and water system master plans, GSI determined that the City did in fact develop the full amount of permit G-9513 from both wells and submitted additional evidence demonstrating that the maximum instantaneous rate was fully appropriated under the permit. As a result, the OWRD repealed the need for ODFW review and recently issued a Proposed Final Order (PFO) approving the City's permit extension request without any added conditions. The protest period on the PFO ends November 20. If no protests, there is a good chance that the City will have a Final Order on the extension by the end of this year.

Next Steps

The following are recommended next steps:

- Prepare and submit a water right transfer application to add the new WTP replacement well and other potential new well locations to the City's water right permit after the Final Order has been published.
- Coordinate and attend a site visit with OWRD to discuss potential locations at the WTP site for the replacement well and discuss special well construction needs to meet potential setback issues.
- Prepare and submit plan review information (e.g., site plan, construction specifications, and water rights summary) to the OHA for site and well construction approval of the replacement well.

- Prepare technical specifications for the drilling, construction, development, and testing of the replacement well, including a bid evaluation table and engineer's cost estimate.
- Integrate the technical specifications into the City's contract bid documents and advertise for bid.
- Choose a qualified drilling contractor to drill, construct, develop, and test the replacement well.
- Connect the replacement well to the City's water system.
- Revise the well interference estimates and refine the scoring/ranking of the candidate sites based on information obtained during drilling and testing of the replacement well.

References

GSI, 2020, Water Rights Strategy and Well 1 Performance Assessment, Technical Memorandum prepared for Tetra Tech, Inc. and the City of Donald, Oregon, dated April 30, 2020.

OWRD, 2019, File G-9938 / Permit G-9513, Information to Assess Permit Renewal Request, Memorandum to Jeffery Pierceall and Justin Iverson from Travis Brown, December 20, 2019.

USGS, 2001, Origin, Extent, and Thickness of Quaternary Geologic Units in the Willamette Valley, Oregon. United States Geological Survey Professional Paper 1620. 2001.

USGS, 2005, Ground-Water Hydrology of the Willamette Basin, Oregon. United States Geological Survey Scientific Investigations Report 2005-5168. 2005.

TABLES

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Table 1: General Well Construction and Performance Information

Cross-Section	MARI Well #	Well Owner	Date Constructed	Completed Depth (feet)	Well Diameter (inches)	SWL (feet bgs)	Pumping Rate (gpm)	Drawdown (feet)	Specific Capacity (gpm/foot)
A - A' (see Figure 1)	612	HAZEL MILLER	6/15/1979	130	N/A	N/A	30	N/A	N/A
	54896	PETE FELLER	5/3/2000	153	10	43	600	81	7
	631	HARLAND E FELLER	12/31/1950	120	6	45	40	5	8
	610	NORMAN REILING	3/20/1980	173	12	32.5	1,375	73	19
	68288	BRIAN NEWBY	10/3/2018	147	6	99	30	6	5
	60517	BAKER WEST INC.	5/29/2007	173	12	29	750	71	11
	56736	ITHA REILING	7/15/2002	147	10	78	200	35	6
	58417	TIM HERRLE	10/2/2004	159	6	75	100	N/A	N/A
	557	ROBERT FISHER	4/20/1985	124	6	30	40	16	3
	562	CITY OF DONALD (WELL 1)	8/13/1980	207	12	75	300	61	5
	563	CITY OF DONALD (WELL 2)	9/1/1980	190	12	70	300	42	7
	17205	JIM DECOSTA	3/6/1991	152	6	21	160	N/A	N/A
	2234	MADELENE M HAENER	6/27/1990	214	12	44	600	N/A	N/A
	348	J FRANK SCHMIDT AND SON CO.	10/18/1980	208	12	49	800	23.5	34
B - B' (see Figure 1)	55178	J T UNLIMITED	9/7/2000	158	8	64	300	N/A	N/A
	603	T H YERGEN	11/30/1958	102	6	23	60	15	4
	605	FRANCIS RYAN	11/9/1965	180	12	40	665	75	9
	597	BOB BELOZER	8/11/1976	143	N/A	N/A	150	N/A	N/A
	564	LIN CROMWELL	12/15/1979	160	6	32	60	18	3
	556	BARNEY FELLER	4/14/1986	153	6	40	40	21	2
	568	JOHN SINGER	6/25/1975	166	8	63	490	21	23
	562	CITY OF DONALD (WELL 1)	8/13/1980	207	12	75	300	61	5
	56719	NORMAN AND ITHA REILING TRUST	7/1/2002	238	12	53	825	127	6
	555	RAY GILLES	5/1/1986	188	8	26	250	88	3
	565	RAYMOND GILLES	12/31/1955	104	N/A	N/A	275	N/A	N/A
	551	E W DEKONING	4/24/1958	35	33	17	N/A	N/A	N/A

Notes:

MARI - Marion County

SWL - Static water level

bgs - below ground surface

N/A - Not Available

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Table 2: Candidate Site Evaluation Results

Candidate Site ID [1]	Site Evaluation Categories										Total Score	Observations/Comments
	Hydrogeologic Conditions		Land Use Compatibility		Site Ownership and Setback Requirements		Susceptibility to Contamination		Pumping Interference			
	Criteria	Score	Criteria	Score	Criteria	Score	Criteria	Score	Criteria	Score		
6	(+) Aquifer thickness ≈ 20-25 ft (0) Specific capacity ≈ 2-3 gpm/ft	1 (+)	(+) Located w/in City limits (+) Public zoning designation; development of public utility facilities allowed outright	2 (+)	(+) Owned by the City (0) Would require a waiver and/or special standards request with OHA and/or OWRD to meet setback requirements (0) City Hall building takes up most of site area, but new well could potentially be located along eastern margin of lot	1 (+)	(+) No potential contaminant source sites identified in the area	1 (+)	(+) No high-capacity wells or cluster of wells are mapped within 1,000 feet of this site	1 (+)	**6 (+)**	• Site is approximately 100 feet long and 75 feet wide, and is current site of City Hall • City streets/alley and City property borders the site along all sides • Easements with property owners to the north across Main St. and possibly south across alley or OHA waiver would be required to maintain a 100-foot radius of ownership and control around the well
4	(+) Aquifer thickness ≈ 20-25 ft (0) Specific capacity ≈ 2-3 gpm/ft	1 (+)	(+) Located w/in City limits (+) Public zoning designation; development of public utility facilities allowed outright	2 (+)	(+) Owned by the City (0) Would require a waiver and/or special standards request with OHA and/or OWRD to meet setback requirements (0) Small existing building, with small greenspace and parking area on south side	1 (+)	(+) No potential contaminant source sites identified in the area	1 (+)	(+) No high-capacity wells or cluster of wells are mapped within 1,000 feet of this site	1 (+)	**6 (+)**	• Site is approximately 100 feet long and 50 feet wide, and is current site of City Community Center • City streets and alley borders site along north, south and east; private property borders site on west • Easements with property owners to west, east across Williams St. and south across alley or OHA waiver would be required to maintain a 100-foot radius of ownership and control around the well
1	(+) Aquifer thickness ≈ 30 ft (0) Specific capacity ≈ 1-30 gpm/ft	1 (+)	(+) Located w/in City limits (+) Public zoning designation; development of public utility facilities allowed outright	2 (+)	(+) Owned by the City (0) Would require a waiver and/or special standards request with OHA and/or OWRD to meet setback requirements (+) Greenspace; no existing buildings onsite	2 (+)	(+) No potential contaminant source sites identified in the area	1 (+)	(0) Several existing wells (including the two City wells) with reported production capacities as high as 200 gpm are mapped within 600 feet of this site	(0)	**6 (+)**	• Site is approximately 450 feet long and 60 feet wide • Private properties border all sides of this site except on west and would require easements with neighboring owners or OHA waiver to maintain a 100-foot radius of ownership and control around the well • Pumping interference on a well at this location from pumping other neighboring wells is estimated to range between 7 and 27 feet depending on actual aquifer hydraulic conditions, spacing of the wells, well construction, and pumping rates and durations
8	(+) Aquifer thickness ≈ 20-25 ft (0) Specific capacity ≈ 2-3 gpm/ft	1 (+)	(+) Located w/in City limits (+) Downtown mixed use zoning; development of public utility facilities allowed outright if identified in an adopted City master plan, otherwise conditional use permit if not identified	2 (+)	(0) Not currently owned by the City, but City may have access to the site in the future (0) Would require a waiver and/or special standards request with OHA and/or OWRD to meet setback requirements (+) Site is occupied by dwelling/structures, though is mostly greenspace	1 (+)	(0) Site is located adjacent to a Class C recycled water land application site	(0)	(+) No high-capacity wells or cluster of wells are mapped within 1,000 feet of this site	1 (+)	**5 (+)**	• Site is approximately 150 feet long and 85 feet wide • Site is bordered by City streets along the north and east, and private property along the west and south • Easements with existing property owner (and possibly with other neighboring property owners depending on well location) or OHA waiver would be required to maintain a 100-foot radius of ownership and control around the well • Sucseptibility to groundwater contamination is likely low b/c the land application sites are managed to prevent degradation of groundwater through agronomic application
5	(+) Aquifer thickness ≈ 20-25 ft (0) Specific capacity ≈ 2-3 gpm/ft	1 (+)	(+) Located w/in City limits (+) Public zoning designation; development of public utility facilities allowed outright	2 (+)	(+) Owned by the City (0) Would require a waiver and/or special standards request with OHA and/or OWRD to meet setback requirements (-) Existing building would likely need to be demolished and rebuilt to accomodate drilling rig and support vehicles to drill and construct new well	(0)	(+) No potential contaminant source sites identified in the area; well log MARI 559 suggests the old City well formerly operated at this site was properly decommissioned	1 (+)	(+) No high-capacity wells or cluster of wells are mapped within 1,000 feet of this site	1 (+)	**5 (+)**	• Site is approximately 100 feet long and 75 feet wide, and is current site of City Park and former site of City well • City street, alley and City property borders site along north, south and west; private property borders site on east • Easements with property owners to east and across alley to south or OHA waiver would be required to maintain a 100-foot radius of ownership and control around the well
7	(+) Aquifer thickness ≈ 20-25 ft (0) Specific capacity ≈ 2-3 gpm/ft	1 (+)	(+) Located w/in City limits (+) Industrial zoning; public utility facilities are identified as permitted uses in all zones	2 (+)	(0) Not currently owned by the City, but City may have access to the site in the future (0) Would require a waiver and/or special standards request with OHA and/or OWRD to meet setback requirements (0) Gravel parking/storage areas take up most of the site; well would need to be located in low traffic use area; other setbacks may apply	(0)	(+) No potential contaminant source sites identified in the area	1 (+)	(+) No high-capacity wells or cluster of wells are mapped within 1,000 feet of this site	1 (+)	**5 (+)**	• Site is approximately 125 feet long and 100 feet wide • Site is bordered by City streets and alley along the north, east and south, and private property to the west • Easements with existing property owner (and possibly with property owners to west, north across Oak St., and east across Crisell St. depending on well location) or OHA waiver would be required to maintain a 100-foot radius of ownership and control around the well • Other setback requirements may apply (e.g., chemical storage, fuel transfer storage, vehicle or machinery maintenance, etc.) depending on existing site uses

Candidate Site ID [1]	Site Evaluation Categories										Total Score	Observations/Comments
	Hydrogeologic Conditions		Land Use Compatibility		Site Ownership and Setback Requirements		Susceptibility to Contamination		Pumping Interference			
	Criteria	Score	Criteria	Score	Criteria	Score	Criteria	Score	Criteria	Score		
3	(+) Aquifer thickness ≈ 30 ft (0) Specific capacity ≈ 1-30 gpm/ft	1 (+)	(+) Located w/in City limits (+) Public zoning designation; development of public utility facilities allowed outright	2 (+)	(+) Owned by the City (-) Would require a waiver and/or special standards request with OHA and/or OWRD to meet setback requirements (+) Greenspace; no existing buildings onsite	1 (+)	(-) Site borders an active railway	1 (-)	(0) Several existing wells (including the two City wells) with reported production capacities as high as 200 gpm are mapped within 500 feet of this site	(0)	**3 (+)**	• Site is approximately 400 feet long and 60 feet wide • Private properties border all sides of this site except on south and would require easements with neighboring owners or OHA waiver to maintain a 100-foot radius of ownership and control around the well • Site borders a Burlington Northern Santa Fe Railroad line and associated easement along its west side
2	(+) Aquifer thickness ≈ 30 ft (0) Specific capacity ≈ 1-30 gpm/ft	1 (+)	(0) Not located w/in City limits (0) EFU zoning; public utility facilities are permitted as a use subject to standards and administrative reviews	(0)	(-) Not owned by the City (0) Would require a waiver and/or special standards request with OHA and/or OWRD to meet setback requirements (+) Greenspace; no existing buildings onsite	(0)	(+) No potential contaminant source sites identified in the area	1 (+)	(0) Several existing wells (including the two City wells) with reported production capacities as high as 200 gpm are mapped within 500 feet of this site	(0)	**2 (+)**	• Site is approximately 500 feet long and 30 feet wide • Private properties border all sides of this site and would require easements with neighboring owners or OHA waiver to maintain a 100-foot radius of ownership and control around the well

Notes:

(1) See Figure 5 for candidate well site locations

(+)	Favorable site attributes are present, and/or minimal challenges are associated with development of the site
(0)	Favorable site attributes are accompanied by unfavorable attributes, moderate challenges are associated with development of the site, and/or some information is not available
(-)	Unfavorable site attributes are present, and/or significant challenges are associated with development of the site

FIGURES

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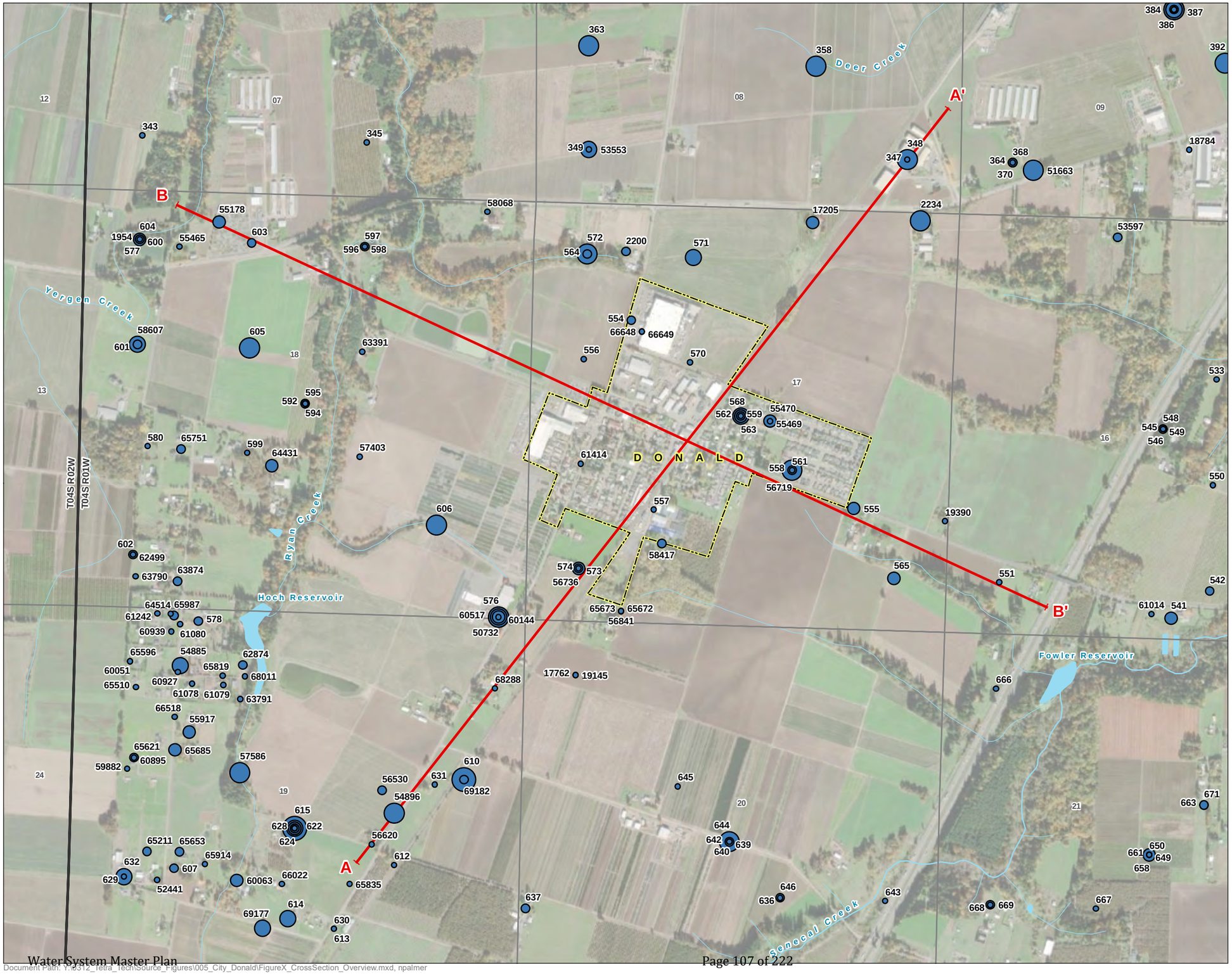
FIGURE 1

Cross Section Overview

City of Donald, Oregon



LEGEND

Well Location, Yield

- 0 - 50
- 50 - 150
- 150 - 300
- 300 - 500
- 500 - 1,000
- >1,000

All Other Features

- Cross Section Line
- City Boundary
- Watercourse
- Waterbody

N

0 600 1,200 1,800

Feet

Date: August 28, 2020

Data Sources: BLM, ESRI, USGS

GSI Water Solutions, Inc.

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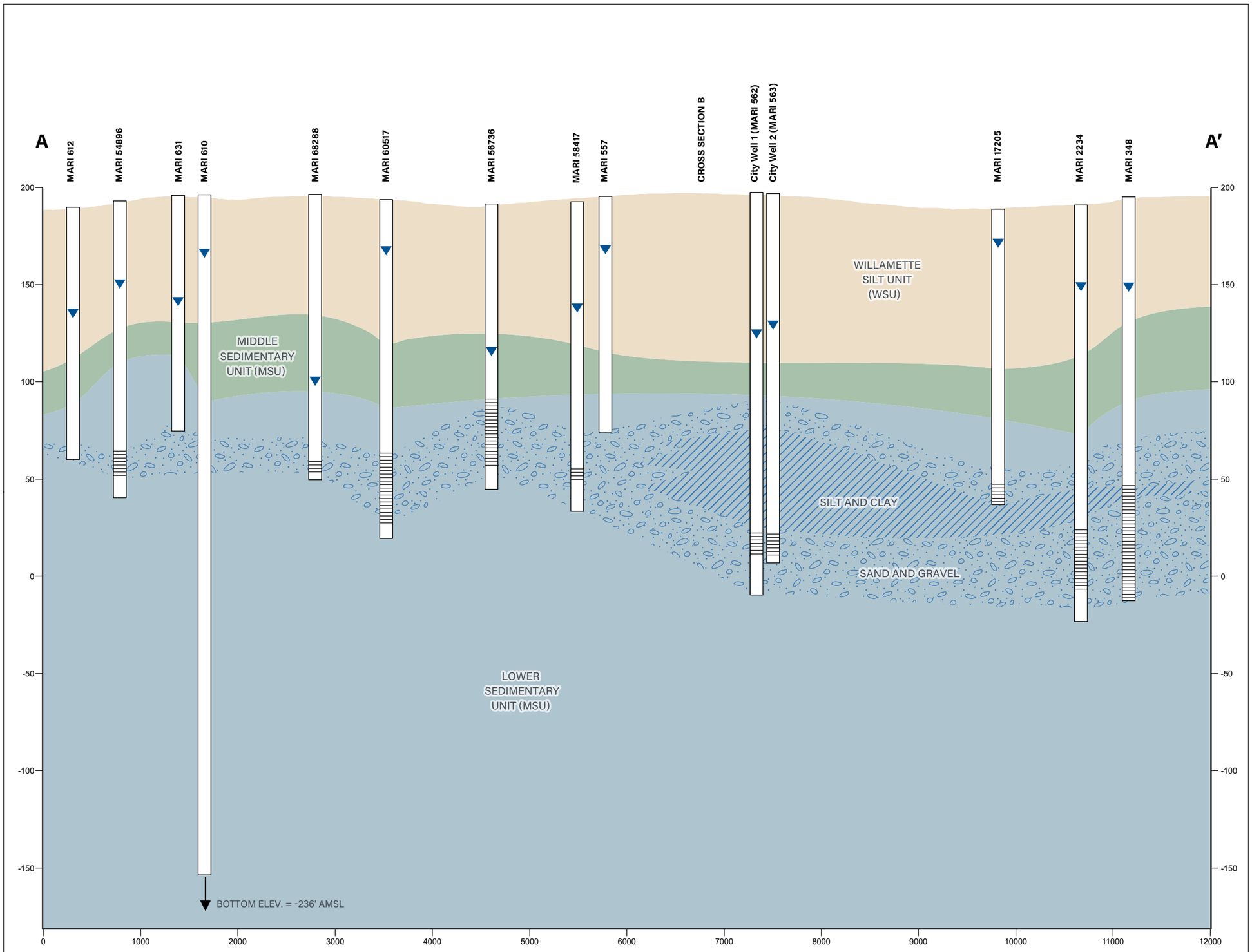
FIGURE 2

Cross Section A-A'

City of Donald, Oregon



LEGEND

- Static Water Level at Well

Geology

- Willamette Silt Unit (WSU)
- Middle Sedimentary Unit (MSU)
- Lower Sedimentary Unit (LSU)

Aquifer

- Sand and gravel
- Silt and clay

Well

- Casing
- Screen/Perforated Casing

see Table 1 for well construction details

GSI Water Solutions, Inc.

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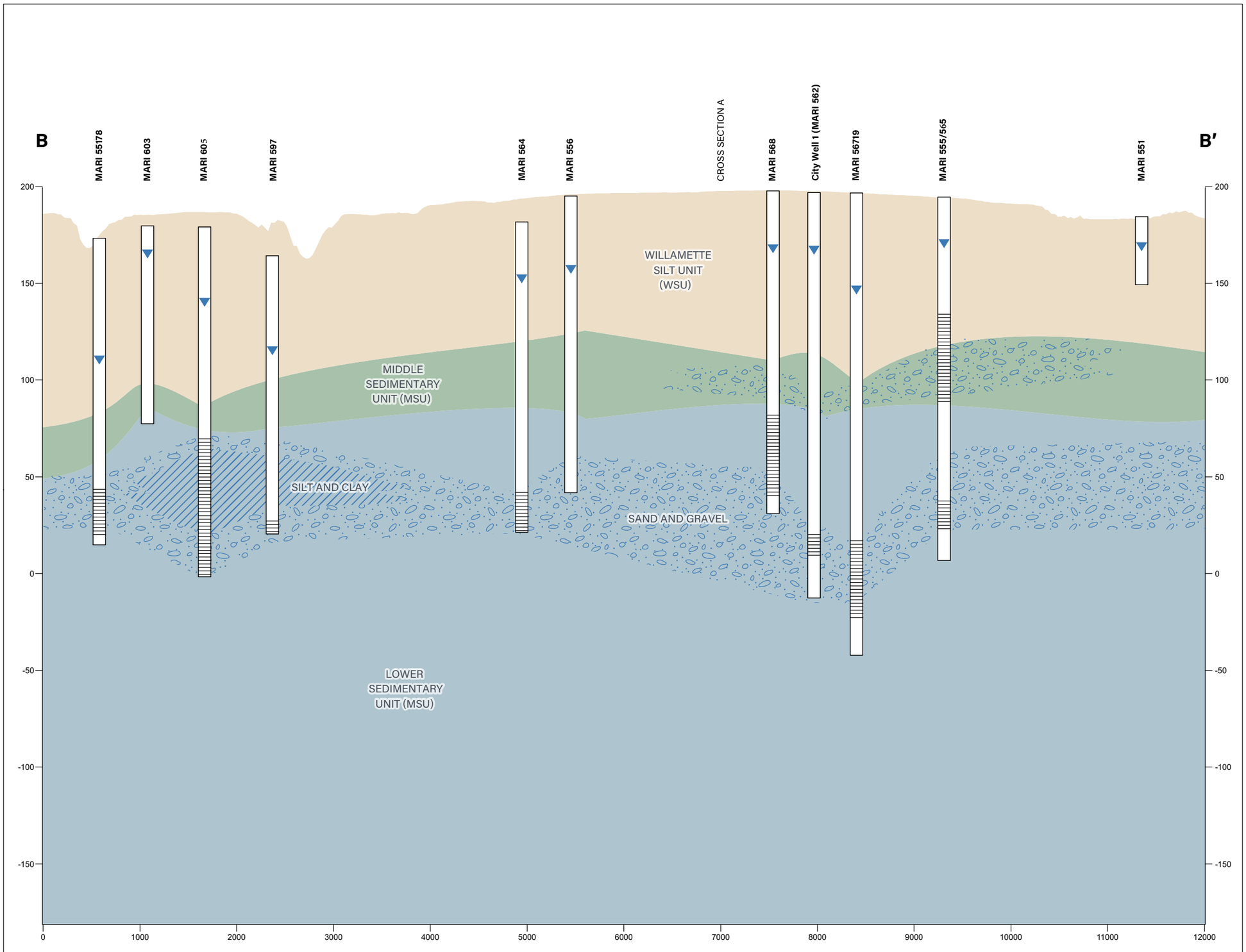
FIGURE 3

Cross Section B-B'

City of Donald, Oregon



LEGEND

- Static Water Level at Well

Geology

- Willamette Silt Unit (WSU)
- Middle Sedimentary Unit (MSU)
- Lower Sedimentary Unit (LSU)

Aquifer

- Sand and gravel
- Silt and clay

Well

- Casing
- Screen/Perforated Casing

see Table 1 for well construction details

GSI Water Solutions, Inc.

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LEGEND

- Well
- Septic Tank
- Water Line
- Sewer Line
- Backwash Overflow Piping
- Storage Tank Overflow Piping
- Storage Tank Overflow Ditch

All Other Features

- City Boundary
- Watercourse
- Waterbody

NOTE

No DEQ cleanup site data within map extent.

Date: September 1, 2020
Data Sources: BLM, ESRI, USG

N

0 15 30 45
Feet

GSI Water Solutions, Inc.

FIGURE 4

Water Treatment

Plant Site Overview

City of Donald, Oregon

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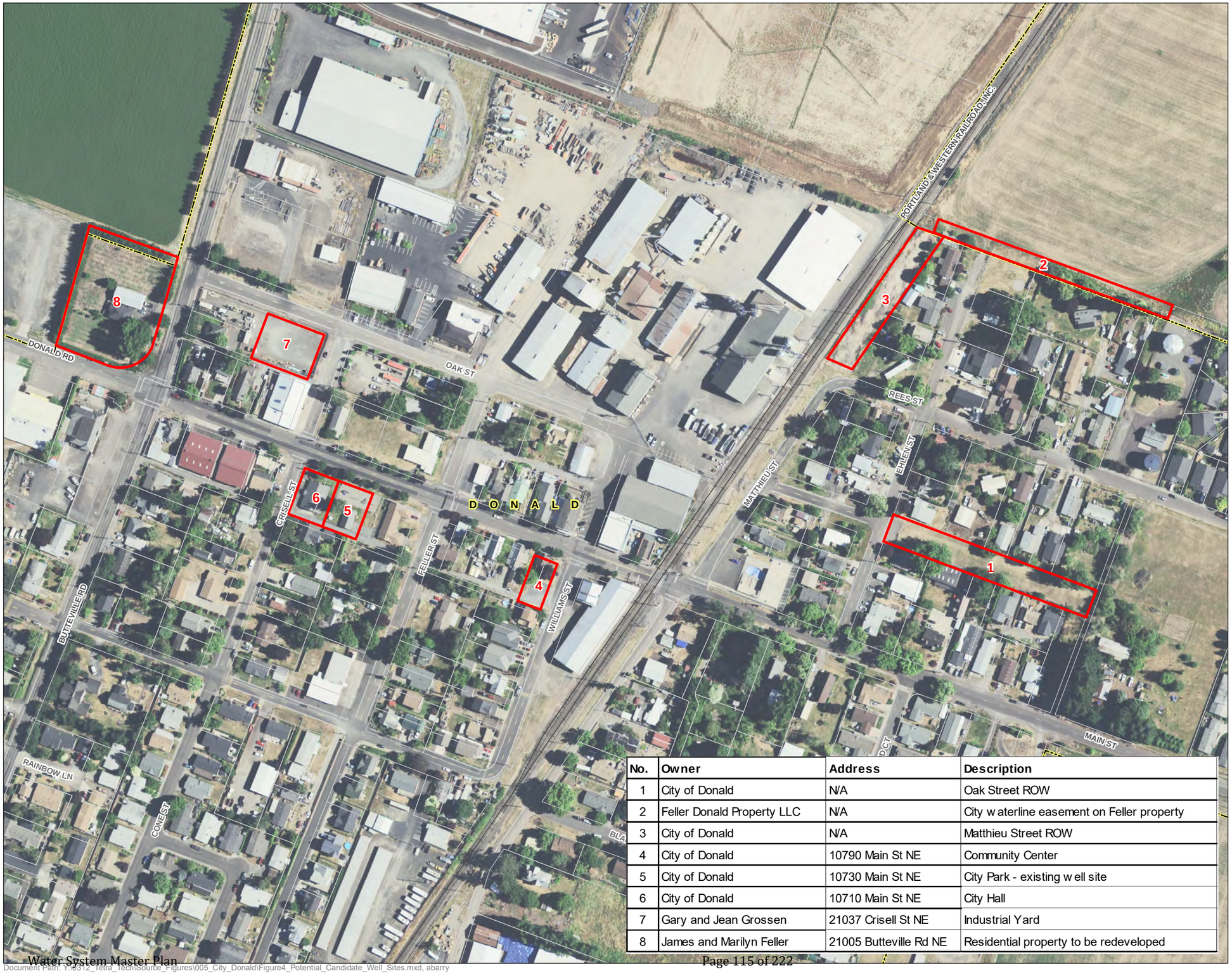
FIGURE 5

Potential Candidate Well Sites

City of Donald



No.	Owner	Address	Description
1	City of Donald	N/A	Oak Street ROW
2	Feller Donald Property LLC	N/A	City waterline easement on Feller property
3	City of Donald	N/A	Matthieu Street ROW
4	City of Donald	10790 Main St NE	Community Center
5	City of Donald	10730 Main St NE	City Park - existing well site
6	City of Donald	10710 Main St NE	City Hall
7	Gary and Jean Grossen	21037 Crisell St NE	Industrial Yard
8	James and Marilyn Feller	21005 Butteville Rd NE	Residential property to be redeveloped

LEGEND

- Candidate Well Site
- Railroad
- Tax Lot
- City Boundary

NOTE

ROW: Right of Way

N

0 100 200 300

Feet

Date: September 2, 2020
Data Sources: ESRI, Marion Co., OSIP Imagery 2018.

GSI Water Solutions, Inc.

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ATTACHMENT A

WATER WELL INVENTORY

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Attachment A: Water Well Inventory

County Code	Well ID#	Last Name	First Name	Company	Well Address	Well Depth (ft)	Static Water Level (ft)	Date Constructed	Pumping Rate (gpm)
MARI	213	SWEENEY	MICHAEL E	--	10497 MATTEHIEU ST	87	38	7/16/1976	20
MARI	332	VIGUS	DAN	--	--	125	44	10/6/1983	60
MARI	333	MCKIAN	A	--	22317 CASE RD	67	35	11/18/1972	25
MARI	334	ITEL	FRANCIS	--	--	212	47	5/21/1970	1190
MARI	335	BOOZE	KENNETH	--	--	127	25	2/10/1972	25
MARI	336	MEDERRIS	ROY	--	--	67	41	5/5/1967	36
MARI	337	MCCAIN	GORDAN	--	--	96	--	2/26/1979	25
MARI	338	LOUMENA	J D	--	--	88	39	5/3/1967	36
MARI	339	CARR	KENNETH	--	--	133	32	9/1/1966	36
MARI	340	FREDRICKSON	AL	--	--	96	32	8/29/1966	40
MARI	341	STORMO	OLE R	STORMO, EDNA L	--	170	29	12/10/1962	300
MARI	342	HIBBARD	DR CARROLL	--	--	150	73	8/24/1973	125
MARI	343	FREDERICKS	FRED H	--	--	165	49	7/29/1974	50
MARI	344	CASHMAN	MRS FRANCES M	--	--	145	46	9/19/1966	200
MARI	345	HISEL	WALTER B	--	2200 N PACIFIC HIGHWAY	93	31	10/20/1950	--
MARI	347	HOEKSTRIE	FRANKLIN D	--	--	192	85	8/4/1986	40
MARI	348	--	--	J FRANK SCHMIDT AND SON CO.	--	208	49	10/18/1980	800
MARI	349	SINGER SR	MRS PAUL	--	--	104	57	9/27/1979	30
MARI	350	KONEV	AKATY	--	--	172	60	6/30/1979	350
MARI	351	SWEENEY	MICHAEL	--	--	140	80	8/8/1977	45
MARI	352	MCGEE	JACK A	--	--	140	40	5/1/1977	50
MARI	353	--	--	ANDERSON RITTER REALTY	--	84	30	6/9/1977	15
MARI	354	SINGER	JOHN	--	--	175	31	5/28/1972	--
MARI	355	GILLIGAN	ROLAND	--	--	133	72	7/29/1967	30
MARI	356	PIERCE	THOMAS L	--	--	230	60	10/22/1979	45
MARI	357	PIERCE	THOMAS L	--	--	110	50	6/7/1977	30
MARI	358	SINGER	PAUL	--	--	225	39	6/15/1972	550
MARI	359	RACETTE	RALPH	--	--	110	--	12/31/1949	260
MARI	360	HOVE	HAROLD E	--	--	136	40	11/16/1948	100
MARI	361	GILLIGAN	ROLAND	--	--	112	43	7/13/1959	220
MARI	362	GILLIGAN	ROLAND E	--	--	86	--	2/14/1957	40
MARI	363	SINGER	PAUL E	--	--	119	26	3/20/1962	550
MARI	364	--	--	BELOZERS HATCHERY	--	187	46	6/7/1986	100
MARI	365	MONTECUCCO	VIRGIL	--	12704 EHLEN RD NE	175	30	3/12/1984	550
MARI	366	ISBERG	JACK	--	--	200	66	4/28/1982	192
MARI	367	--	--	U AND R EXPRESS	--	165	37	4/21/1980	100
MARI	368	--	--	BOB BELOZERS HATCHERY AND POULTRY	--	181	--	11/6/1979	100
MARI	369	BLAND	BILL	--	--	138	42	6/9/1979	60
MARI	370	--	--	BELOZERS HATCHERY AND POULTRY FARM	--	183	37	5/23/1979	100
MARI	371	MCGOWEN	DAVID	--	--	90	59	7/6/1977	5
MARI	372	YERGEN	NORMAN	--	--	105	54	7/19/1963	500
MARI	373	HESS	DON	--	--	152	60	8/13/1975	20
MARI	374	EBY	DAVE	MARION CHATEAU ESTATES LOT 8	--	90	56	7/8/1974	35
MARI	375	FELLER	EARL	--	--	98	60	9/6/1973	20
MARI	376	MARTILLA	W E	--	--	105	60	7/29/1972	20
MARI	377	AKINS	JOHN T	--	--	105	45	7/1/1972	20
MARI	378	SMITH	HAL	--	--	88	32	2/22/1978	30
MARI	379	WIDING	DON	--	--	155	30	12/8/1975	40
MARI	380	WIDING	DON	--	--	137	--	10/29/1975	30

Attachment A: Water Well Inventory

County Code	Well ID#	Last Name	First Name	Company	Well Address	Well Depth (ft)	Static Water Level (ft)	Date Constructed	Pumping Rate (gpm)
MARI	381	SORG	ALBERT	--	--	97	33	11/10/1975	30
MARI	382	WIDING	DON	--	--	133	36	6/9/1975	35
MARI	383	WIDING	DON	--	--	126	8	6/16/1975	30
MARI	384	ROWSE	LARRY	--	--	197	47	10/3/1973	600
MARI	385	STILLWELL	LEROY	--	--	102	40	8/5/1970	35
MARI	386	CANBY	A J	--	--	159	64	9/6/1967	420
MARI	387	SINGER	JOHN	--	--	184	56	7/4/1967	620
MARI	388	WIDING	DON	--	--	83	3	3/24/1975	30
MARI	389	--	--	KUHNS CONSTRUCTION CO.	--	82	28	4/28/1969	30
MARI	390	--	--	UNION OIL CO. OF CALIFORNIA	--	160	75	8/14/1977	125
MARI	391	LEATHERS	CARL	LEATHERS OIL	--	134	34	6/6/1978	40
MARI	392	CANBY	ARTHUR J	--	--	160	30	3/2/1967	575
MARI	393	STRANGE	LUCILLE M	--	--	75	--	12/31/1954	100
MARI	533	--	--	KROUS BROTHERS	12088 DONALD RD NE	99	35	7/25/1968	33
MARI	541	ROBANSKE	DAVID	--	--	164	44	10/16/1986	300
MARI	542	ROBANSKE	DAVID	--	12377 DONALD RD NE	133	35	1/18/1983	150
MARI	543	ZACHER	TED	--	--	158	33	2/20/1981	650
MARI	544	--	--	CANDLELIGHT HOMES INC.	--	90	41	9/12/1975	25
MARI	545	SOUTHERLAND	GENE	--	--	142	38	2/14/1974	35
MARI	546	TAGUE	WILLIAM M	--	--	95	33	7/16/1964	80
MARI	547	TAYLOR	GEORGE	--	--	106	38	9/20/1961	40
MARI	548	DEKONING	E W	--	--	105	23	1/19/1961	70
MARI	549	MENDENHALL	--	--	--	109	--	5/24/1960	40
MARI	550	MEDFORD	ARVOL	--	BALDOCK FWY & DONALD RD (SE JCT)	118	34	11/27/1976	50
MARI	551	DEKONING	E W	--	10945 EHLEN ST	35	17	4/24/1958	--
MARI	553	--	--	CITY OF DONALD	21256 BUTTEVILLE RD NE	188	40	2/3/1988	250
MARI	554	FELLER	PETE	--	11210 DONALD RD NE	360	49	10/21/1987	90
MARI	555	GILLES	RAY	GILLES, CHUCK	--	188	26	5/1/1986	250
MARI	556	FELLER	BARNEY	--	PO BOX 385 MATTIEU RD	153	40	4/14/1986	40
MARI	557	FISHER	ROBERT	--	10650 SW WILSONVILLE RD	124	30	4/20/1985	40
MARI	558	KLIESE	MAX	--	--	145	30	12/31/1984	100
MARI	560	GILLES	CHUCK	GILLES, RAY	--	160	63	8/16/1983	90
MARI	561	KLIESE	MAX	--	--	105	40	7/30/1983	15
MARI	562	--	--	CITY OF DONALD	--	207	75	8/13/1980	300
MARI	563	--	--	CITY OF DONALD	--	190	70	9/1/1980	300
MARI	564	CROMWELL	LIN	--	--	160	32	12/15/1979	60
MARI	565	GILLES	RAYMOND	--	--	104	20	12/31/1955	275
MARI	566	GOOD	HENRY	--	--	111	35	12/29/1969	150
MARI	567	HAENER	DELBERT	--	--	140	38.5	7/31/1961	200
MARI	568	SINGER	JOHN	--	--	166	63	6/25/1975	490
MARI	569	CHRISTOPHERSON	ERNEST W	--	--	103	23	2/22/1972	87
MARI	570	--	--	WILCO FARMERS	--	160	63	7/27/1976	50
MARI	571	OSLUND	CARL	--	--	148	34	8/27/1962	420
MARI	572	CROMWELL	LINWOOD	--	--	118	30	10/31/1967	840
MARI	573	HENDRICKS	SID	HENDRICKS, MILDRED	--	122	37	12/31/1951	150
MARI	574	CHRISTOPHERSON	E W	--	20495 BUTTEVILLE RD	86	28.1	2/3/1960	--
MARI	576	CHRISTOPHERSON	ERSEL	CHRISTOPHERSON, JOAN	--	166	35	3/16/1988	900
MARI	577	RICH	SAMUEL J	--	20492 OLMSTEAD RD	200	29	12/14/1984	110
MARI	578	GIANELLAS	DEL	--	20774 OLMSTEAD NE	154	--	8/1/1984	60

Attachment A: Water Well Inventory

County Code	Well ID#	Last Name	First Name	Company	Well Address	Well Depth (ft)	Static Water Level (ft)	Date Constructed	Pumping Rate (gpm)
MARI	579	HOWARD	ALLEN	--	20961 OLMSTEAD RD NE	127	25	2/14/1982	30
MARI	580	DAVIS	MIKE	--	--	105	28	4/30/1980	40
MARI	581	WILLIAMS	ROBERT J	--	--	165	24	5/19/1978	30
MARI	582	ARNDT	JIM	--	--	145	30	6/2/1976	30
MARI	583	BELL	RICHARD	--	--	150	61	7/28/1973	25
MARI	584	CHRISTOPHERSON	E E	--	--	76	30	6/25/1970	35
MARI	585	DORSETT	JOHN	--	--	150	70	8/10/1973	25
MARI	586	FORCHIONE	JOSEPH	--	--	90	20	4/4/1971	35
MARI	587	GANOE	MARY	--	--	125	56	7/19/1973	30
MARI	588	HENDERSON	MRS ROSE	--	--	40	6	6/12/1961	25
MARI	589	KAUFFMAN	--	--	--	142	120	3/21/1968	30
MARI	590	LINGER	RICHARD	--	--	100	50	7/23/1973	20
MARI	591	LASS	GEORGE	--	--	150	56	7/14/1973	20
MARI	592	MEADERS	HAROLD	--	--	115	47	9/30/1974	75
MARI	593	MERCADO	ADAM	--	--	350	20	4/29/1974	9
MARI	594	REMINGTON	ARTHUR	--	--	100	33	9/13/1968	40
MARI	595	HIGHT	W M	--	--	127	44	9/27/1967	65
MARI	596	BELOZER	BOB	--	--	136	32	10/31/1974	50
MARI	597	BELOZER	BOB	--	--	143	50	8/11/1976	150
MARI	598	BELOZER	BOB	--	--	270	70	8/9/1976	10
MARI	599	PAVLICEK	SYLVESTER	--	--	164	35	4/21/1973	--
MARI	600	GIANELLA	BUCK	--	--	150	28	5/1/1976	70
MARI	601	LOTSPELCH	CHARLES M	--	--	138	63	8/31/1973	60
MARI	602	UNDERLAND	LARS	--	--	110	20	4/20/1971	80
MARI	603	YERGEN	T H	YERGEN, MARY A	--	102	23	11/30/1958	60
MARI	604	DRIEVER	HERSCHEL R	--	--	92	3	12/31/1952	180
MARI	605	RYAN	FRANCIS	--	--	180	40	11/9/1965	665
MARI	606	CHRISTOPHERSON	ERSEL	--	19872 OLMSTEAD RD NE	164	28	3/17/1966	530
MARI	607	JOHNSON	JIM	--	19566 BUTTEVILLE RD	134	32	4/21/1987	125
MARI	609	HATHAWAY	PHIL	--	--	143	13	4/26/1985	15
MARI	610	REILING	NORMAN	--	--	173	32.4	3/20/1980	1375
MARI	611	--	--	GILLES BERRY FARM INC.	--	308	54	8/23/1979	100
MARI	612	MILLER	HAZEL	--	--	130	58	6/15/1979	30
MARI	613	GILLIS	N H	--	--	140	59	10/23/1975	30
MARI	614	GILLIS	N H	--	--	315	49	8/8/1975	500
MARI	615	COOK	WAYNE	--	--	173	40	11/9/1977	1150
MARI	616	BLOCK	WALTER	--	--	111	38	11/26/1974	38
MARI	618	WAY	MELVIN	--	--	70	20	8/7/1973	50
MARI	619	HIGUERA	AL	--	--	170	40	6/23/1970	65
MARI	620	HULSHIZER	DONALD L	--	--	173	40	6/28/1975	40
MARI	621	WILMES	DENNIS	--	--	54	8	2/28/1976	24
MARI	622	MILLER	KENNETH	--	--	182	32	11/27/1978	350
MARI	623	HOFFMAN	BILL	--	--	135	38	8/4/1965	40
MARI	624	COOK	WAYNE M	--	--	128	50	8/1/1964	200
MARI	625	NYQUIST	ERWIN	--	--	140	40	5/20/1966	160
MARI	626	HORNADAY	DAVID L	--	--	115	35	8/23/1963	200
MARI	627	PRIDEAUX	WARREN	--	--	96	18	9/16/1960	40
MARI	628	GILLIS	N H	--	--	138	20	4/10/1974	60
MARI	629	KOCH	BOB	--	--	104	30	5/31/1972	30

Attachment A: Water Well Inventory

County Code	Well ID#	Last Name	First Name	Company	Well Address	Well Depth (ft)	Static Water Level (ft)	Date Constructed	Pumping Rate (gpm)
MARI	630	GILLIS	N H	--	--	196	34	6/1/1974	45
MARI	631	FELLER	HARLAND E	--	--	120	45	12/31/1950	40
MARI	632	BEKEBREDE	A H	--	--	130	22	3/9/1953	450
MARI	633	LINHARDT	C L	--	--	113	20	12/31/1940	100
MARI	634	LENHARDT	C Y	--	--	113	20	12/31/1941	--
MARI	635	GILLES	NORBERT H	--	--	303	11	3/22/1958	700
MARI	637	MILLER	WALTER	--	--	145	52	6/26/1979	80
MARI	638	PAYTON	MARSHALL	--	--	82	25	8/21/1972	50
MARI	639	CHASE	RON	--	--	102	36	9/27/1974	40
MARI	640	MARTIN	WALTER	--	--	106	30	5/4/1970	30
MARI	641	MCKOWN	R B	--	--	99	30	8/22/1969	25
MARI	642	SMITH	CHESTER	--	--	110	51	8/17/1965	150
MARI	643	SEAMAN	W J	--	--	98	35	9/28/1955	--
MARI	644	REILING	NORMAN	--	--	147	35.9	10/30/1978	700
MARI	646	BLISS	ORRIN W	--	--	95	29	9/6/1954	100
MARI	647	--	--	CASES NURSERY	--	198	55	10/29/1987	100
MARI	648	HEROLD	CONRAD	--	--	112	61	11/14/1986	50
MARI	649	PRESCOTT	MIKE	--	--	100	69	9/5/1986	12
MARI	650	CLACK	RONALD	--	--	111	65	8/4/1986	24
MARI	651	BOOZE	JOHN J	--	--	112	60	7/8/1986	23
MARI	652	FOBERT	VERL	--	--	116	30	2/4/1974	30
MARI	653	ALBERS	MARTIN	--	--	116	43	6/20/1972	35
MARI	654	GREGORY	BARRY	--	--	90	16	5/22/1976	40
MARI	655	RIALEY	CLEATWOOD	--	--	96	40	2/14/1972	25
MARI	656	RAILEY	CLEATWOOD	--	--	92	18	11/9/1971	15
MARI	657	SCHARER	MARLIN	--	--	117	41	3/19/1971	30
MARI	658	FREDERIKS	EVERT	--	--	128	43	6/18/1973	300
MARI	659	REBER	DWIGHT	TRAILER PARK OF PORTLAND	--	184	13	8/24/1978	350
MARI	660	LEWIS	HOWARD	--	--	148	78	7/30/1977	45
MARI	661	MEIROW	VERN	--	--	153	7	7/11/1973	40
MARI	662	JEE	RONALD	--	--	153	31	4/24/1976	38
MARI	663	CLARK	DAVE	--	--	170	32	4/6/1985	150
MARI	664	PARDEY	HENRY F	--	--	137	110	8/7/1951	680
MARI	665	BASSETT	RAYMOND HARRIS	--	--	128	--	6/30/1952	280
MARI	666	KOEBEL JR	GEORGE	--	--	90	30	12/31/1954	--
MARI	667	CHUMBLEY	MARTHA	--	--	0	34	9/6/1958	45
MARI	668	SEAMAN	WARREN J	--	--	98	--	9/23/1955	40
MARI	669	NELSON	JOHN B	--	--	100	24	3/31/1950	90
MARI	670	CHUMBLEY	MARTHA	--	--	115	34	9/6/1958	--
MARI	671	STUTZMAN	WILLIAM M	--	--	118	44	6/8/1978	60
MARI	672	BASSETT	R H	--	--	128	34.6	2/3/1960	--
MARI	673	HILDEBRAND	REIN	--	--	110	45	5/7/1970	30
MARI	714	PIERCE	THOMAS L	--	--	230	60	10/22/1979	45
MARI	715	PIERCE	THOMAS L	--	--	110	50	6/7/1977	30
CLAC	1954	--	--	WEYERHAEUSER CO.	21475 BUTTEVILLE RD NE	--	62	9/12/1986	125
MARI	2200	GREENINGER	JOE	--	11424 EHLEN RD NE	150	41	7/12/1990	60
MARI	2234	HAENER	MADELENE M	HAENER FARMS	11190 EHLEN RD NE	214	44	6/27/1990	600
MARI	17205	DECOSTA	JIM	DECOSTA, MADELINE	20531 MATTHIEU ST, DONALD	152	21	3/6/1991	160
MARI	17762	GOODE	GARY	--	22075 BUTTEVILLE RD NE, AURORA	65	16	3/22/1992	30

Attachment A: Water Well Inventory

County Code	Well ID#	Last Name	First Name	Company	Well Address	Well Depth (ft)	Static Water Level (ft)	Date Constructed	Pumping Rate (gpm)
MARI	18753	LEAVY	EDWARD	--	12074 EHLEN RD NE	185	60	10/12/1993	510
MARI	18784	--	--	CBM DEVELOPMENT	--	136	52	11/3/1993	50
MARI	19145	SMITH	CHESTER	--	22235 BUTTEVILLE RD NE	120	73	7/2/1994	--
MARI	19232	HAMMERSLEY	BILL	HAMMERSLEY, LINDA	11507 DONALD RD	156	73	9/23/1994	85
MARI	19390	NIBLER	ROBERT	NIBLER, KATHERINE	11542 FELLER RD	--	--	12/30/1994	--
MARI	19661	SALMONSON	KEN	--	22120 BUTTEVILLE RD NE	107	30	5/4/1995	40
MARI	20821	RISSBERGER	JOHN	--	10236 MATTHIEU LANE	200	60	10/19/1995	75
MARI	50196	ANDERSON	TIM	--	11410 FARGO RD NE	210	50	1/9/1996	30
MARI	50620	HAENER	RICHARD	--	20495 BUTTEVILLE RD	182	25	6/6/1996	545
MARI	50732	WEST	BAKER	SOUTH, CHRISTOPHERSON	11644 EHLEN RD NE	166	75	7/5/1996	400
MARI	51663	--	--	HAENER BROTHERS	19811 OLMSTEAD RD NE	194	38	3/3/1997	1000
MARI	53183	RISSBERGER	JOHN	--	--	209	59	7/10/1998	430
MARI	53553	FELLER	S PETE	--	11814 EHLEN RD	239	69	9/22/1998	450
MARI	53597	MEIROW	JIM	--	11973 FELLER RD NE	180	42	11/2/1998	75
MARI	53691	GOODWIN	BOB	--	11410 FARGO RD NE, AURORA	128	44	11/18/1998	25
MARI	53703	SCHIEDEL	GENE	--	21599 DOLORES WAY, AURORA	219	44	11/18/1998	700
MARI	54118	BATES	HAROLD	ISBERG RV PARK	20342 OLMSTED RD NE	224	78	6/15/1999	200
MARI	54885	GIANELLA	VERMONT	--	BUTTEVILLE RD NE, HUBBARD	190	43	5/15/2000	350
MARI	54896	FELLER	PETE	--	--	153	43	5/3/2000	600
MARI	55178	--	--	J T UNLIMITED	11542 FELLERS RD	158	64	9/7/2000	300
MARI	55189	SALMONSON	KEN	--	11542 FELLERS RD	175	60	9/9/2000	80
MARI	55190	SALMONSON	KEN	--	11410 FARGO RD NE	415	--	8/22/2000	--
MARI	55289	--	--	SCHIEDEL NURSERY	22506 BENTZ RD NE, AURORA	0	14	10/9/2000	--
MARI	55379	--	--	A AND R SPADA FARMS	22506 BENTZ RD NE, AURORA	0	15.5	11/16/2000	--
MARI	55380	--	--	A AND R SPADA FARMS	9703 YERGEN RD NE-AURORA	0	15.5	11/16/2000	--
MARI	55469	--	--	CITY OF DONALD	10983 REES ST	192	--	11/30/1998	--
MARI	55470	--	--	CITY OF DONALD	20242 OLMSTEAD RD NE	192	71	8/5/1997	200
MARI	55917	MCKILLIP	SAM	--	11260 FARGO RD NE, AURORA	161.5	56.5	7/5/2001	175
MARI	56114	GARNER	DEBRA	RICKEY, IRENE	21211 OMSTEAD RD, AURORA	166.5	80	9/13/2001	32
MARI	56135	LOWRIE	ANITA	--	NEAR 22506 BENTS RD, AURORA	100	40	10/8/2001	50
MARI	56472	--	--	A AND R SPADA FARMS 1	BUTTEVILLE RD, DONALD	305	--	3/22/2002	--
MARI	56530	--	--	A AND R SPADA FARMS	19975 BUTTEVILLE RD NE; 1 MI S OF DONALD	613	91	5/3/2002	80
MARI	56620	SPENCE	JUDITH K	--	DONALD RD, DONLAD; E OF DONALD NEXT TO CITY LIMITS	110	66	12/31/1967	--
MARI	56719	REILING	NORMAN	REILING, ITHA; NORMAN AND ITHA REILING TRUST	MATTHIEU LANE, DONALD	238	53	7/1/2002	825
MARI	56736	REILING	ITHA	--	20529 MATTHIEU ST NE	147	78	7/15/2002	200
MARI	56841	ARENSMEIER	EFFIE	--	22506 BENTZ RD, AURORA	132	97	8/26/2002	20
MARI	56906	--	--	A AND R SPADA FARMS	22506 BENTS RD, AURORA	206	78	9/24/2002	575
MARI	57359	--	--	A AND R SPADA FARMS	20852 S OLMSTEAD RD, AURORA	0	--	6/5/2003	--
MARI	57403	CAM	GEORGI	CAM, ANTONIA	20295 BUTTEVILLE RD NE, HUBBARD	134	49	7/11/2003	50
MARI	57586	SPADA	ARTHUR	--	10414 EHLEN RD NE; AURORA	161	65	10/14/2003	600
MARI	58177	MALONE	RICK	--	20774 MATTHIEU ST NE	110.5	44	6/8/2004	220
MARI	58417	HERRLE	TIM	--	21211 OLMSTEAD RD NE, AURORA	159	75	10/2/2004	100
MARI	58607	DUPONT	PAUL	--	22105 BUTTEVILLE RD NE	200	46	12/13/2004	350
MARI	59123	--	--	BRIDLEWOOD FARMS LLC	20361 OLMSTEAD RD	201	68	7/7/2005	175
MARI	59882	KAUFMAN	DAVE	--	19806 SW BUTTEVILLE RD, AURORA	187	97	8/12/2006	30
MARI	60051	WILDER	GEORGE	--	19811 OLMSTEAD RD NE, AURORA	159	48	11/3/2006	40
MARI	60063	TENHULZEN	DAVID	TENHULZEN, NANCY	20495 BUTTEVILLE RD	177	43	10/31/2006	300
MARI	60131	--	--	BAKER WEST INC.	20495 BUTTEVILLE RD	327	55	12/11/2006	--
MARI	60144	--	--	BAKER WEST INC.	20495 BUTTEVILLE RD	200	54	12/20/2006	200

Attachment A: Water Well Inventory

County Code	Well ID#	Last Name	First Name	Company	Well Address	Well Depth (ft)	Static Water Level (ft)	Date Constructed	Pumping Rate (gpm)
MARI	60517	--	--	BAKER WEST INC.	11603 FELLER RD NE	173	28.8	5/29/2007	750
MARI	60554	MEADERS	RANDY	MEADERS, ROBIN	ACROSS ST FROM 20342 OLMSTEAD	118	66	6/30/2007	40
MARI	60895	GIANELLA	VERMONT	--	20361 OLMSTEAD RD	215	98	8/18/2007	32
MARI	60927	KAUFMAN	DAVE	--	9694 IDA LANE	164	59	9/8/2007	32
MARI	60939	GIANELLA	VERMONT	--	12058 DONALD RD NE	172	96	9/17/2007	30
MARI	61014	HAYS	THOMAS	--	2470 MOLALLA HWY	167.5	81	9/21/2007	30
MARI	61016	BURCH	RON	FOX ENTERPRISES LTD	9722 PENNSTAR LANE	122	44	9/4/2007	38
MARI	61078	GIANELLA	VERMONT	--	9742 PENNSTAR LANE	160	89	9/20/2007	30
MARI	61079	GIANELLA	VERMONT	--	9724 IDA LANE	157	87	9/25/2007	32
MARI	61080	GIANELLA	VERMONT	--	9655 IDA LANE	145	69	9/12/2007	35
MARI	61242	GIANELLA	VERMONT	--	20777 BUTTEVILLE RD NE, AURORA	170	89	9/29/2007	30
MARI	61414	OLSEN	KATHY	--	20561 OLMSTEAD RD NE, AURORA	76	35	1/11/2008	50
MARI	62499	--	--	AURORA LOAN SERVICES	9742 PENSTAR LANE, AURORA	125	47	6/3/2009	--
MARI	62874	HOFFMAN	CRAIG	--	21856 BENTS RD NE, AURORA	161	37	2/1/2010	100
MARI	63260	--	--	TA OPERATING LLC	22495 BUTTEVILLE RD, HUBBARD	221	88	9/2/2010	125
MARI	63391	--	--	A AND R SPADA FARMS LLC	9625 IDA LANE	0	55	10/25/2010	--
MARI	63790	GIANELLA	VERMONT	--	9762 PENNSTAR LANE	178	75	7/23/2011	30
MARI	63791	MEIROW	JIM	--	20342 OLMSTEAD RD	159	62	7/30/2011	34
MARI	63874	GIANELLA	VERMONT	--	9779 RYAN CREEK LANE NE	130	72	8/14/2011	90
MARI	64431	JOHNSON	ROBERT	--	9695 IDA LN	164	97	9/24/2012	200
MARI	64514	GIANELLA	VERMONT	--	12334 EHLEN RD, AURORA, OR 97002	172	91	10/26/2012	25
MARI	65054	--	P3304-8153	LEATHERS FUELS	9767 LARIAT LANE	134	--	9/25/2013	--
MARI	65211	DUPONT	BRIAN	--	9621 HIGUERA LANE NE	179	24	4/25/2014	58
MARI	65510	NASH	SCOTT	NASH, PAULEEN	9691 HIGUEA LANE, AURORA	153	57	10/21/2014	25
MARI	65596	EBERLY	EARL	EBERLY, JACKIE	20145 OLMSTEAD RD NE, AURORA	160	39	12/18/2014	23
MARI	65621	RAUEN	DOUG	PAHLISCH HOMES; RAUEN, JULIE	9728 LARIAT LANE, AURORA	164	31	2/18/2015	100
MARI	65653	BOYSEN	BRET	BOYSEN, DEMI	20531 MATTHIEU ST NE	168.5	25.8	3/17/2015	60
MARI	65672	SNETHEN	SANDRA	--	20531 MATTHIEU ST NE	72	--	--	--
MARI	65673	SNETHEN	SANDRA	--	20142 OLMSTEAD RD NE	106	--	--	--
MARI	65685	BALANCE	JEFFREY	--	20911 OLMSTEAD RD NE, AURORA	144	28	4/20/2015	225
MARI	65751	FROLOV	KUPRIAN	--	9743 PENSTAR LN, AURORA	160	98	7/6/2015	100
MARI	65819	PIETROK	MARK	--	19806 S.W. BUTTEVILLE ROAD AURORA, OREGON 97223	171	106	8/8/2015	30
MARI	65914	EMCH	DAVID	EMCH, HEIDI	9695 IDA LN NE	170	51.5	10/8/2015	50
MARI	65987	GIBBONS	PAUL	--	19742 OLMSTEAD RD NE, AURORA	158	45	11/25/2015	150
MARI	66022	CHITWOOD	DON	--	12277 DONALD RD NE	155.33	33	12/3/2015	27
MARI	66257	STIGALL	FORD & SHARON	--	11603 FELLER RD NE	161	37	4/26/2016	150
MARI	66259	EDWARDS	MARCIA & MONTE	--	10526 MATTHIEU LANE N.E. AURORA, OREGON 97002	142	36	12/24/2015	100
MARI	66327	ZELLER	NORMAN	MANOR ACRES LLC	10519 MATTHIEU LN NE	178	48	6/8/2016	75
MARI	66436	MEITHOF	STEVE	MEITHOF, KAREN	12298 DONALD RD NE, AURORA 97002	156	76	8/11/2016	75
MARI	66518	SALLEE	BRIAN	--	21256 NE BUTTEVILLE RD, AURORA	170	76	9/10/2016	38
MARI	66648	--	--	VALLEY PACIFIC CONSTRUCTION	21256 NE BUTTEVILLE RD, AURORA	360	--	11/2/2016	--
MARI	66877	BRANT	ROBYN	--	26170 GELBRICH RD CANBY, OR 97013	152.75	35	5/30/2017	500
CLAC	67845	YOUNG	FRANK	--	9723 PENNSTAR LANE NE, AURORA	105	39	5/31/2011	42
MARI	68011	LOWE	MICHELLE	--	20366 BUTTEVILLE RD	160	76	7/17/2018	50
MARI	68288	NEWBY	BRIAN	--	19733 OLMSTEAD RD. AURORA OR. 97002	147	99	10/3/2018	30
MARI	69177	HARTENSTEIN	MICHAEL	--	20446 BUTTEVILLE RD NE, AURORA	264	34	1/13/2020	450
MARI	69182	--	--	STORM PROPERTIES LLC	PO BOX 23235	142	49	3/30/2020	55

ATTACHMENT B

WELL LOGS AND WATER WELL REPORTS FOR GEOLOGIC CROSS-SECTION A – A’

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NOTICE TO WATER WELL CONTRACTOR
The original and first copy of this report are to be filed with the
WATER RESOURCES DEPARTMENT,
SALEM, OREGON 97310
within 30 days from the date of well completion.

WATER WELL REPORT
STATE OF OREGON
(Please type or print)
(Do not write above this line)

MAR 16 12

State Well No. 4S/1W-19 db

State Permit No.

(1) OWNER:
Name Hazel Miller
Address 19956 ButtevilleㅁRd. N.E.
Hubbard, Or. ㅁ 97032

(2) TYPE OF WORK (check):
New Well ☒ Deepening ☐ Reconditioning ☐ Abandon ☐
If abandonment, describe material and procedure in Item 12.

(3) TYPE OF WELL:
Rotary ☒ Driven ☐
Cable ☐ Jetted ☐
Dug ☐ Bored ☐

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

(5) CASING INSTALLED:
Threaded ☐ Welded ☒
6 " Diam. from 0 ft. to 130 ft. Gage .250
" Diam. from ft. to ft. Gage
" Diam. from ft. to ft. Gage

PERFORATIONS:
Perforated? ☐ 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.

(7) SCREENS:
Well screen installed? ☐ Yes ☒ No
Manufacturer's Name
Type Model No.
Diam. Slot size Set from ft. to ft.
Diam. Slot size Set from ft. to ft.

(8) WELL TESTS:
Drawdown is amount water level is lowered below static level
Was a pump test made? ☒ Yes ☐ No If yes, by whom? driller
Yield: 30 gal./min. with 8 ft. drawdown after 2 hrs.
" " "
" " "
Bailer test gal./min. with ft. drawdown after hrs.
Artesian flow g.p.m.
Temperature of water Depth artesian flow encountered ft.

(9) CONSTRUCTION:
Well seal—Material used Cement
Well sealed from land surface to 65 ft.
Diameter of well bore to bottom of seal 10 in.
Diameter of well bore below seal 6 in.
Number of sacks of cement used in well seal 28 sacks
How was cement grout placed? Pressure grouted from 65 ft. to land surface.
Was a drive shoe used? ☒ Yes ☐ No Plugs Size: location ft.
Did any strata contain unusable water? ☐ Yes ☒ No
Type of water? depth of strata
Method of sealing strata off
Was well gravel packed? ☐ Yes ☒ No Size of gravel:
Gravel placed from ft. to ft.

(10) LOCATION OF WELL:
County Marion Driller's well number 115
NW ¼ SE ¼ Section 19 T. 4S R. 1W W.M.
Bearing and distance from section or subdivision corner

(11) WATER LEVEL: Completed well.
Depth at which water was first found 58 ft.
Static level 58 ft. below land surface. Date 6-15-79
Artesian pressure lbs. per square inch. Date

(12) WELL LOG:
Diameter of well below casing 0
Depth drilled 130 ft. Depth of completed well 130 ft.

Formation: Describe color, texture, grain size and structure of materials; and show thickness and nature of each stratum and aquifer penetrated, with at least one entry for each change of formation. Report each change in position of Static Water Level and indicate principal water-bearing strata.

MATERIAL	From	To	SWL
Top soil	0	2	
Clay, brown	2	58	
*Sand, brown, fine	58	59	
Clay, brown	59	103	
Clay, blue	103	121	
*Sand, black, fine	121	127	
*Gravel, sand, fine	127	130	

RECEIVED
JUN 20 1979
WATER RESOURCES DEPT
SALEM, OREGON

Work started 6-13 1979 Completed 6-15 1979
Date well drilling machine moved off of well 6-15 1979

Drilling Machine Operator's Certification:
This well was constructed under my direct supervision. Materials used and information reported above are true to my best knowledge and belief.
[Signed] George J. Wainwright (Drilling Machine Operator) Date 6-17, 1979
Drilling Machine Operator's License No. 837

Water Well Contractor's Certification:
This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.
Name B & G Drilling (Person, firm or corporation) (Type or print)
Address 10030 S. Macksburg Rd. Canby, Or.
[Signed] George J. Wainwright (Water Well Contractor)
Contractor's License No. 637 Date 6-17, 1979

(USE ADDITIONAL SHEETS IF NECESSARY)

SP*45656-119

RECEIVED
MAR 54896 WELL I.D.# 30609
JUN 05 2000
WATER RESOURCES DEPT.
SALEM, OREGON

STATE OF OREGON
WATER SUPPLY WELL REPORT
(as required by ORS 537.765)

main 54896

(START CARD) # 101539

Instructions for completing this report are on the last page of this form.

(1) OWNER: Well Number

Name Pete Feller

Address 21256 Butteville Rd.NE

City Aurora State OR Zip 97002

(2) TYPE OF WORK

☒ New Well ☐ Deepening ☐ Alteration (repair/recondition) ☐ Abandonment

(3) DRILL METHOD:

☐ Rotary Air ☐ Rotary Mud ☒ Cable ☐ Auger

☐ Other

(4) PROPOSED USE:

☐ Domestic ☐ Community ☐ Industrial ☒ Irrigation

☐ Thermal ☐ Injection ☐ Livestock ☐ Other

(5) BORE HOLE CONSTRUCTION:

Special Construction approval ☒ Yes ☐ No Depth of Completed Well 153 ft.

Explosives used ☐ Yes ☒ No Type Amount

HOLE Diameter	From	To	SEAL Material	From	To	Sacks or pounds
16	0	124	cement	0	124	
16	124	153	See attached sheet			
16	153	160	borehole cemented	153	165	
16	165	358	backfilled w/ 17 layers of gravel			

How was seal placed? ☐ Method ☐ As per Special Standards

☐ Other

Backfill placed from ft. to ft. Material

Gravel placed from ft. to ft. Size of gravel

(6) CASING/LINER:

	Diameter	From	To	Gauge	Steel	Plastic	Welded	Threaded
Casing:	10"	+3	128	250	☒	☐	☒	☐
	10"	See	Below -	Screens	☒	☐	☐	☐
					☐	☐	☐	☐
					☐	☐	☐	☐
Liner:					☐	☐	☐	☐
					☐	☐	☐	☐

Final location of shoe(s) None

(7) PERFORATIONS/SCREENS:

☐ Perforations Method

☒ Screens Type Material stainless

From	To	Slot size	Number	Diameter	Tele/pipe size	Casing	Liner
+3	128			10"	pipe	☒	☐
128	142	.080		10	P.S.	☐	☐
142	153			10"	pipe	☒	☐
152	Lift	bail				☐	☐
153	Bottom	plate				☐	☐

(8) WELL TESTS: Minimum testing time is 1 hour

☒ Pump ☐ Bailer ☒ Air ☐ Flowing Artesian

Yield gal/min	Drawdown	Drill stem at	Time
600	74		1 hr.
600	81		6 hrs

Temperature of water 53 Depth Artesian Flow Found

Was a water analysis done? ☐ Yes By whom

Did any strata contain water not suitable for intended use? ☐ Too little

☐ Salty ☐ Muddy ☐ Odor ☐ Colored ☐ Other

Depth of strata:

(9) LOCATION OF WELL by legal description:

County Marion Latitude Longitude

Township 4S N or S Range 1W E or W. WM.

Section 19 SW 1/4 NE 1/4

Tax Lot 800 Lot Block Subdivision

Street Address of Well (or nearest address) Butteville Rd.NE

Hubbard, OR

(10) STATIC WATER LEVEL:

43 ft. below land surface. Date 5/3/00

Artesian pressure lb. per square inch. Date

(11) WATER BEARING ZONES:

Depth at which water was first found 61

From	To	Estimated Flow Rate	SWL
61	80	50 gpm	17
129	142	600 ~~650~~ gpm	43

~~And 3 layers of bentonite chips as per~~

(12) WELL LOG: ~~special standards~~ Ground Elevation

Material	From	To	SWL
See attatched well log			

RECEIVED
JUL 26 2000
WATER RESOURCES DEPT.
SALEM, OREGON

Date started 10/27/99 Completed 5/3/00

(unbonded) Water Well Constructor Certification:

I certify that the work I performed on the construction, alteration, or abandonment of this well is in compliance with Oregon water supply well construction standards. Materials used and information reported above are true to the best of my knowledge and belief.

WWC Number 1704

Signed Date 5/30/00

(bonded) Water Well Constructor Certification:

I accept responsibility for the construction, alteration, or abandonment work performed on this well during the construction dates reported above. All work performed during this time is in compliance with Oregon water supply well construction standards. This report is true to the best of my knowledge and belief.

WWC Number 783

Signed Date 5/30/00

ORIGINAL & FIRST COPY-WATER RESOURCES DEPARTMENT SECOND COPY-CONSTRUCTOR THIRD COPY-CUSTOMER

MARI 54896

Pete Feller
21256 Butteville Rd. NE
Aurora, OR 97002

Well I.D.# L30609

Start Card # 101539

Marion County Township: 4S Range: 1W Sec: 19 SW 1/4, NE 1/4

WELL LOG

Material	From	To	SWL
Topsoil	0	2	
Clay brown	2	28	
Clay gray	28	51	
Clay dark gray,sticky	51	58	
Clay dk gray,crumbly,traces of sand	58	61	
Sand black,trace clay	61	72	17'
Sand brown,coarse	72	80	17'
Clay tan	80	92	
Clay blue-gray,soft	92	99	
Clay brown	99	107	
Clay blue sticky	107	124	
Clay gray sandy	124	129	
Sand & gravel	129	142	43'
Clay green sandy	142	153	
Clay gray sticky	153	166	
Clay green sticky	166	173	
Clay green sandy	173	183	
Clay dark gray,sticky	183	189	
Clay green sandy	189	199	
Clay black sticky	199	204	
Clay gray/green,sticky	204	217	
Clay blue sticky	217	232	
Clay green sticky	232	241	
Clay gray soft	241	247	
Clay gray sticky	247	268	
Clay green sticky	268	271	
Clay green sandy	271	276	
Clay dark gray,sticky	276	279	
Clay blue sticky	279	292	
Clay gray silty	292	309	
Clay gray & blue, silty	309	324	
Clay & claystone	324	326	
Clay brown, silty	326	341	
Clay blue,sticky	341	350	

MARI 54896

RECEIVED
JUN 05 2000
WATER RESOURCES DEPT.
SALEM, OREGON

Pete Feller
21256 Butteville Rd. NE
Aurora, OR 97002

Well I.D.# L30609

Start Card # 101539

Marion County Township: 4S Range: 1W Sec: 19 SW 1/4, NE 1/4

(5) BORE HOLE CONSTRUCTION
Special Construction approval Depth of completed well 153'

HOLE				SEAL		
Diameter	From	To	Material	From	To	Sacks or pounds
16"	0	3'	cement	0	3'	5 sacks
16"	3'	12'	bentonite	3'	12'	12 sacks
16"	12'	122'	cement	12'	122'	95 sacks
16"	122'	153'				
16"	153'	163'	cement	153'	163'	23 sacks
16"	163'	350				

How was seal placed: Method C
Backfill placed from 153ft. to 350 ft. Material: intermittent layers of gravel & cement

RECEIVED
JUL 26 2000
WATER RESOURCES DEPT.
SALEM, OREGON

STATE ENGINEER
Salem, Oregon

M 1R1 63.1

Well Record

GR- 1023

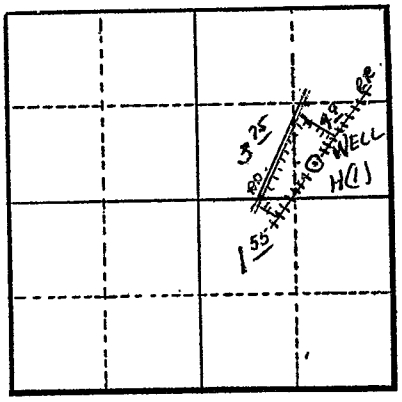
STATE WELL NO. 4/1W-19H(1)
COUNTY Marion
APPLICATION NO. GR- 1061

OWNER: Harland E. Feller
MAILING ADDRESS: Hubbard Rt. Box 378
CITY AND STATE: Hubbard, Oregon

LOCATION OF WELL: Owner's No. .....

SE ¼ NE ¼ Sec. 19 T. 4 S., R. 1 W., W.M.

Bearing and distance from section or subdivision corner N84°13'E. 41.115 ch. from SW cor. Whitney DLC #48



Section 19

Altitude at well 140 ft. ±

TYPE OF WELL: Drilled Date Constructed 1950

Depth drilled 120 ft. Depth cased 120 ft.

CASING RECORD:
6 5/8 inch

FINISH:

AQUIFERS:

WATER LEVEL:
45 ft.

PUMPING EQUIPMENT: Type Pacific Jet H.P. 5
Capacity 40 G.P.M.

WELL TESTS:
Drawdown 5 ft. after ..... hours 40 G.P.M.
Drawdown ..... ft. after ..... hours ..... G.P.M.

USE OF WATER Irrigation Temp. ..... °F. ....., 19.....
SOURCE OF INFORMATION G.R. Record
DRILLER or DIGGER .....
ADDITIONAL DATA:
Log X Water Level Measurements ..... Chemical Analysis ..... Aquifer Test .....

REMARKS:
Irrigation of 10.2 acres.

State Printing 89316

STATE ENGINEER
Salem, Oregon

State Well No. 4/1W-19H(1)
County Marion
Application No. GR- 1061

Well Log

Owner: Harland E. Feller Owner's No. .....

Driller: ..... Date Drilled 1950

CHARACTER OF MATERIAL	(Feet below land surface) From	To	Thickness (feet)
Top soil	0	7	7
Sub-soil	7	37	30
Blue shale	37	61	24
Brown shale & fine sand	61	65	4
Sulpher shale	65	-	-
Fine sand	65	77	12
Ruby sand, coarse	77	-	-
Sand, coarse	77	82	5
Yellow clay	82	111	29
Blue shale	111	116	5
Gravel, younger - alluvial	116	121	6

NOTICE TO WATER WELL CONTRACTOR
The original and first copy of this report are to be filed with the WATER RESOURCES DEPARTMENT, SALEM, OREGON 97310 within 30 days from the date of well completion.

WATER WELL REPORT
STATE OF OREGON
(Please type or print)
(Do not write above this line)

610 MARION

State Well No. 4s/1w-19 ad
State Permit No. 9150

(1) OWNER:
Name Norman Reiling
Address Rt. 1, Hubbard, Ore 97032

(2) TYPE OF WORK (check):
New Well ☒ Deepening ☐ Reconditioning ☐ Abandon ☐
If abandonment, describe material and procedure in Item 12.

(3) TYPE OF WELL:
Rotary ☒ Driven ☐
Cable ☐ Jetted ☐
☐ Bored ☐

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

Rev

(5) CASING INSTALLED:
Threaded ☐ Welded ☒
" Diam. from ft. to ft. Gage
" Diam. from See Sheet Attached ft. to ft. Gage
" Diam. from ft. to ft. Gage

(6) PERFORATIONS:
Perforated? ☒ Yes ☐ No.
Type of perforator used torch
Size of perforations 3/8 in. by 6 in.
192 perforations from 92'3" ft. to 109'9" ft.
perforations from ft. to ft.
perforations from ft. to ft.

(7) SCREENS:
Well screen installed? ☒ Yes ☐ No
Manufacturer's Name Roscoe Moss
Type Std Shutter Model No. 5/16 wall
Diam. 12 3/4 OD Slot size 1/4 Set from 119'9" ft. to 159'11" ft.
Diam. Slot size Set from ft. to ft.

(8) WELL TESTS:
Drawdown is amount water level is lowered below static level
Was a pump test made? ☒ Yes ☐ No If yes, by whom? SEI
1375 gal./min. with 73 ft. drawdown after 9½ hrs.
" 1220 " 71 " 10 "
" 1060 " 62 " 10½ "
Bailer test gal./min. with ft. drawdown after hrs.
Artesian flow g.p.m.
Temperature of water Depth artesian flow encountered ft.

(9) CONSTRUCTION:
Well seal—Material used 20½ yds of 5 sack readimix
Well sealed from land surface to 18½ ft.
Diameter of well bore to bottom of seal 32 in.
Diameter of well bore below seal 32 in.
Number of sacks of cement used in well seal 102 sacks
How was cement grout placed? See attached Dept of Water Resources letter regarding special standard
Was a drive shoe used? ☐ Yes ☒ No Plugs Size: location ft.
Did any strata contain unusable water? ☐ Yes ☒ No
Type of water? depth of strata
Method of sealing strata off
Was well gravel packed? ☒ Yes ☐ No Size of gravel: 3/4 - ½
Gravel placed from 18½ ft. to bottom ft.

(10) LOCATION OF WELL:
County Marion Driller's well number 8002
SE ¼ NE ¼ Section 19 T. 4S R. 1W W.M.
Bearing and distance from section or subdivision corner

(11) WATER LEVEL: Completed well.
Depth at which water was first found 50 ft.
Static level 32'5" ft. below land surface. Date 3-20-80
Artesian pressure lbs. per square inch. Date

(12) WELL LOG:
Diameter of well below casing
Depth drilled 433 ft. Depth of completed well 172'5" ft.

Formation: Describe color, texture, grain size and structure of materials; and show thickness and nature of each stratum and aquifer penetrated, with at least one entry for each change of formation. Report each change in position of Static Water Level and indicate principal water-bearing strata.

MATERIAL	From	To	SWL
See sheet attached			

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APR 11 1980
WATER RESOURCES DEPT
SALEM, OREGON

Work started 12-6 19 79 Completed 3-26- 19 80
Date well drilling machine moved off of well 3-26- 19 80

Drilling Machine Operator's Certification:
This well was constructed under my direct supervision. Materials used and information reported above are true to my best knowledge and belief.
[Signed] Donald G Davis (Drilling Machine Operator) Date 4-9, 19 80
Drilling Machine Operator's License No. 1085

Water Well Contractor's Certification:
This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.
Name Schneider Equipment, Inc. (Person, firm or corporation) (Type or print)
Address 21884 River Rd NE, St. Paul, Or 97137
[Signed] Stephen J Schneider (Water Well Contractor)
Contractor's License No. 649 Date 4-9, 19 80

(USE ADDITIONAL SHEETS IF NECESSARY)

SP*45656-119

Norman Reiling 8002

Material	From	To
Top soil, brown	0	2
Clay, brown	2	21
Clay, gray	21	30
Clay, blue gray	30	44
Clay, brown	44	50
Gravel & sand, cemented, brown, rusty	50	56
Sand, brown, fine, medium	56	61
Clay, brown	61	64
Sand, brown, medium coarse	64	68
Sand & gravel cemented, brown, rusty	68	70
Sand, brown, medium coarse	70	72
Clay, brown,	72	74
Gravel & sand cemented, brown	74	76
Sand, brown, fine-medium	76	79
Gravel up to 2" and sand, cemented, brown, rusty	79	83
Clay, brown	83	89
Clay, light gray	89	92
Clay, brown	92	98
Sand, brown, fine cemented	98	101
Sand, brown, fine	101	107
Clay, brown	107	110
Clay, blue gray	110	117
Clay, green hard flakey	117	125
Sand, black fine medium	125	131
Gravel & sand, medium-coarse	131	142
Clay, dark green, fine, sandy	142	150
Clay, dark green, medium sandy	150	152
Clay, dark green	152	159
Clay, dark gray, fine sandy	159	161
Sand, black fine with some clay, gray fine sandy	161	167
Clay, dark green, fine sandy	167	177
Clay, blue green	177	189
Clay, dark gray	189	192
Clay, gray and blue streaks	192	215
Clay, blue-green, flakey	215	238
Clay, blue	238	253
Clay, blue gray, soft	253	263
Clay, blue, flakey	263	265
Clay, green, soft	265	273
Clay, gray, medium soft	273	303
Clay, gray, soft	303	317
Shale, gray, hard	317	319
Clay, gray, soft	318	342
Clay, blue, medium soft	342	346
Clay, blue-gray	346	361
Clay, blue-green, sticky	361	368
Clay, gray with brown streaks, sticky	368	371
Clay, gray, hard	371	372
Clay, blue	372	377
Clay, gray	377	379
Clay, blue	379	388
Clay, dark blue-green, dry, soft	388	395
Clay, gray, soft, dry	395	416
Clay, dark gray, soft	416	427
Clay, dark brown, medium, soft	427	433

[illegible] OREGON

(5) Casing Installed:

12" Diameter from	+2'2"	to 92'3"	Gage .330
12" Diameter from	92'3"	109'9"	Gage .375
12" Diameter from	109'9"	119'9"	Gage .330
12" Diameter from	159'11"	181'	Gage.330
6" Diameter from	+1'1"	21'4"	Gage.250

ROBERT W STRAUB
GOVERNOR

Water Resources Department

MILL CREEK OFFICE PARK
555 13th STREET N.E., SALEM, OREGON 97310

PHONE 378-8455

May 24, 1978

Milo Schneider
Schneider Equipment, Inc.
21881 River Road N.E.
St. Paul, Oregon 97137

Dear Mr. Schneider:

Please accept my apologies for the delay in responding to your recent letter requesting special standards for the use of concrete instead of cement grout as a sealing material in large diameter wells that provide excessive space between the drill hole wall and the outside casing of the well. You are hereby granted special permission to use concrete instead of neat cement with the following provisions and conditions:

1) Concrete shall consist of clean, hard, endurable aggregate, and not less than five sacks of Portland cement per cubic yard of concrete. Maximum diameter of the aggregate shall not exceed 3/4 of an inch in diameter.

2) If the well bore hole to be sealed is not dry, concrete shall be pumped from the bottom of the seal zone upward in one continuous operation to land surface.

3) In the event that the well bore annular space to be sealed is dry, concrete shall be placed through a tremie pipe to prevent segregation of the aggregate and cement mixture and to prevent bridging.

4) The space between the sealing surfaces of all casings and between all casings and the bore hole shall exceed 3-inches or more.

Special standards to construct a well as described above shall be considered to apply to all wells constructed in such a manner. Please refer to these special standards on the well reports of all well constructed in this manner.

Sincerely,

WILLIAM B. MCCALL
Hydrogeologist

WBM:clh
cc: Clifton R. King, Watermaster, District #16

STATE OF OREGON
WATER SUPPLY WELL REPORT
(as required by ORS 537.765 & OAR 690-205-0210)

WELL I.D. LABEL# L 120920
START CARD # 215107
ORIGINAL LOG #

(1) LAND OWNER
Owner Well I.D.
First Name Brian Last Name Newby
Company
Address 20366 Butteville Rd
City Hubbard State OR Zip 97032

(2) TYPE OF WORK
☒ New Well ☐ Deepening ☐ Conversion ☐ Alteration (complete 2a & 10) ☐ Abandonment(complete 5a)

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(2a) PRE-ALTERATION
	Dia	+	From	To	Gauge	Stl	Plstc	Wld	Thrd
Casing:									

	Material	From	To	Amt	sacks/lbs
Seal:					

(3) DRILL METHOD
☐ Rotary Air ☐ Rotary Mud ☒ Cable ☐ Auger ☐ Cable Mud
☐ Reverse Rotary ☐ Other

(4) PROPOSED USE
☒ Domestic ☐ Irrigation ☐ Community ☐ Industrial/ Commericial ☐ Livestock ☐ Dewatering ☐ Thermal ☐ Injection ☐ Other

(5) BORE HOLE CONSTRUCTION
Special Standard ☐ (Attach copy)
Depth of Completed Well 147 ft.

BORE HOLE
Dia	From	To
10	0	37
6	37	147

SEAL
Material	From	To	Amt	sacks/lbs
Bentonite Chips	0	37	17	5
		Calculated	17	
		Calculated		

How was seal placed: Method ☐ A ☐ B ☐ C ☐ D ☐ E
☒ Other 690-210-0340
Backfill placed from ft. to ft. Material
Filter pack from ft. to ft. Material Size
Explosives used: ☐ Yes Type Amount

(5a) ABANDONMENT USING UNHYDRATED BENTONITE
Proposed Amount Pounds Actual Amount Pounds

(6) CASING/LINER
Casing	Liner	Dia	+	From	To	Gauge	Stl	Plstc	Wld	Thrd
●	○	6	☒	1.33	136,147	.250	●	○	☒	☐
○	●	5	☐	133.17	147	.188	●	○	☒	☐
○	○		☐				○	○	☐	☐
○	○		☐				○	○	☐	☐
○	○		☐				○	○	☐	☐

Shoe ☐ Inside ☒ Outside ☐ Other Location of shoe(s) 136
Temp casing ☐ Yes Dia From To

(7) PERFORATIONS/SCREENS
Perforations Method
Screens Type v wire Material stainless

Perf/Screen	Casing/ Liner	Screen Dia	From	To	Scrn/slot width	Slot length	# of slots	Tele/ pipe size
Screen		5	137	142	.035			

(8) WELL TESTS: Minimum testing time is 1 hour
● Pump ○ Bailer ○ Air ○ Flowing Artesian

Yield gal/min	Drawdown	Drill stem/Pump depth	Duration (hr)
30	6		1

Temperature 53 °F Lab analysis ☐ Yes By
Water quality concerns? ☐ Yes (describe below) TDS amount 88 mg/L

From	To	Description	Amount	Units

MARI 68288

(9) LOCATION OF WELL (legal description)
County MARION Twp 4 S N/S Range 1 W E/W WM
Sec 19 N E 1/4 of the NE 1/4 Tax Lot 200
Tax Map Number Lot
Lat ° ' " or DMS or DD
Long ° ' " or DMS or DD
● Street address of well ○ Nearest address
20366 Butteville Rd

(10) STATIC WATER LEVEL
	Date	SWL(psi)	+	SWL(ft)
Existing Well / Pre-Alteration				
Completed Well	10-03-2018			99

Flowing Artesian? ☐ Dry Hole? ☐

WATER BEARING ZONES Depth water was first found 124

SWL Date	From	To	Est Flow	SWL(psi)	+	SWL(ft)
09-14-2018	124	142	75			99

(11) WELL LOG
Ground Elevation

Material	From	To
Clay, brown	0	34
clay, gray, medium	34	44
clay, blue gray, sticky	44	52
clay, brown	52	57
sand and clay, brown	57	61
sand and clay, blue gray, hard	61	72
clay, brown, medium	72	74
sand, brown, corse	74	77
clay, sandy, brown	77	80
sand, brown	80	85
clay, brown	85	98
clay, blue gray	98	112
sand, brown, loose	112	114
clay, sticky blue	114	124
gravel, cemented and sand	124	142.5
clay green	142.5	147

RECEIVED DEC 19 2018 OWRD

Date Started 09-04-2018 Completed 10-03-2018

(unbonded) Water Well Constructor Certification
I certify that the work I performed on the construction, deepening, alteration, or abandonment of this well is in compliance with Oregon water supply well construction standards. Materials used and information reported above are true to the best of my knowledge and belief.
License Number Date
Signed

(bonded) Water Well Constructor Certification
I accept responsibility for the construction, deepening, alteration, or abandonment work performed on this well during the construction dates reported above. All work performed during this time is in compliance with Oregon water supply well construction standards. This report is true to the best of my knowledge and belief.
License Number 783 Date 10-25-2018
Signed
Contact Info (optional)

ORIGINAL - WATER RESOURCES DEPARTMENT
THIS REPORT MUST BE SUBMITTED TO THE WATER RESOURCES DEPARTMENT WITHIN 30 DAYS OF COMPLETION OF WORK Form Version: 0.95

WATER SUPPLY WELL REPORT - continuation page

WELL I.D. LABEL# L 120920
START CARD # 215107
ORIGINAL LOG #

MART 68288

(2a) PRE-ALTERATION

Dia	+	From	To	Gauge	Stl	Plstc	Wld	Thrd

Material	From	To	Amt	sacks/lbs

(5) BORE HOLE CONSTRUCTION

BORE HOLE Dia	From	To	SEAL Material	From	To	Amt	sacks/lbs
					Calculated		
					Calculated		
					Calculated		
					Calculated		

FILTER PACK

From	To	Material	Size

(6) CASING/LINER

Casing	Liner	Dia	+	From	To	Gauge	Stl	Plstc	Wld	Thrd

(7) PERFORATIONS/SCREENS

Perf/Screen	Casing/Liner	Screen Dia	From	To	Scrn/slot width	Slot length	# of slots	Tele/pipe size

(8) WELL TESTS: Minimum testing time is 1 hour

Yield gal/min	Drawdown	Drill stem/Pump depth	Duration (hr)

Water Quality Concerns

From	To	Description	Amount	Units

(10) STATIC WATER LEVEL

SWL Date	From	To	Est Flow	SWL(psi)	+	SWL(ft)

(11) WELL LOG

Material	From	To

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OWRD

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DEC 19 2018
OWRD

Comments/Remarks

cross bar as lift bail 135' 9"

Bottom plate at 147'

Mari 60517

STATE OF OREGON
WATER SUPPLY WELL REPORT
(as required by ORS 537.765 & OAR 690-205-0210)

WELL LABEL # L 75914

START CARD # 190361

(1) LAND OWNER

Owner Well I.D. _____

First Name _____ Last Name _____

Company Baker West Inc.

Address 20495 Butteville Rd.

City Hubbard State OR Zip 97032

(2) TYPE OF WORK

☒ New Well ☐ Deepening ☐ Conversion ☐ Alteration (repair/recondition) ☐ Abandonment

(3) DRILL METHOD

☐ Rotary Air ☐ Rotary Mud ☒ Cable ☐ Auger ☐ Cable Mud ☐ Reverse Rotary ☐ Other _____

(4) PROPOSED USE

☐ Domestic ☒ Irrigation ☐ Community ☐ Industrial/ Commericial ☐ Livestock ☐ Dewatering ☐ Thermal ☐ Injection ☐ Other _____

(5) BORE HOLE CONSTRUCTION

Special Standard ☐ (Attach copy)

Depth of Completed Well 173 ft.

BORE HOLE

Dia	From	To
16	0	3
16	3	173

SEAL

Material	From	To	Amt	sacks/ lbs
Bentonite	0	3	3	S
Cement	3	120	126	S

How was seal placed: Method ☐ A ☐ B ☒ C ☐ D ☐ E

☐ Other _____

Backfill placed from _____ ft. to _____ ft. Material _____

Filter pack from 120 ft. to 173 ft. Material 6 gravel Size 4-10

Explosives used: ☐ Yes Type _____ Amount _____

(6) CASING/LINER

Casing	Liner	Dia	+	From	To	Gauge	Stl	Plstc	Wld	Thrd
◉	○	12	☒	2.5	130.5	.250	◉	○	☒	☐
○	○		☐				○	○	☐	☐
○	○		☐				○	○	☐	☐
○	○		☐				○	○	☐	☐
○	○		☐				○	○	☐	☐

Shoe ☐ Inside ☐ Outside ☐ Other Location of shoe(s) _____

Temp casing ☐ Yes Dia _____ From _____ To _____

(7) PERFORATIONS/SCREENS

Perforations Method _____

Screens Type v wire Material stainless

Perf/ Screen	Casing/ Liner	Screen Dia	From	To	Scrn/slot width	Slot length	# of slots	Tele/ pipe size
	Casing	12	2.5	130.5				
Screen		12	130.5	166.37	.15			12
	Casing	12	166.37	173				
			173					

(8) WELL TESTS: Minimum testing time is 1 hour

◉ Pump ○ Bailer ○ Air ○ Flowing Artesian

Yield gal/min	Drawdown	Drill stem/Pump depth	Duration (hr)
750	65.1		1
750	67.6		2
750	70.9		6

Temperature 53 °F Lab analysis ☐ Yes By _____

Water quality concerns? ☐ Yes (describe below)

From	To	Description	Amount	Units

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OCT 17 2007
WATER RESOURCES DEPT
SALEM, OREGON

(9) LOCATION OF WELL (legal description)

County MARION Twp 4 S N/S Range 1 W E/W WM

Sec 18 SW 1/4 of the SE 1/4 Tax Lot 0201

Tax Map Number _____ Lot _____

Lat ° ' " or _____ DMS or DD

Long ° ' " or _____ DMS or DD

◉ Street address of well ○ Nearest address

20495 Butteville Rd. Hubbard, OR 97032

(10) STATIC WATER LEVEL

	Date	SWL(psi)	+	SWL(ft)
Existing Well / Predeepening				
Completed Well	05-14-2007			28.8

Flowing Artesian? ☐ Dry Hole? ☐

WATER BEARING ZONES Depth water was first found _____

SWL Date	From	To	Est Flow	SWL(psi)	+	SWL(ft)
03-30-2007	129	167	750			33

(11) WELL LOG

Ground Elevation _____

Material	From	To
Topsoil	0	2
Clay brown	2	12
Clay silty, light brown	12	39
Clay gray	39	68
Clay gray sticky	68	74
Sand & clay gray, cemented	74	87
Clay green silty	87	107
Clay dark gray	107	112
Clay gray sticky	112	122
Clay green sticky	122	129
Gravel & clay cemented	129	142
Sand & gravel	142	167
Clay silty soft, dark brown	167	171
Cemented gravel	171	173
Clay blue sticky	173	174

Date Started 02-02-2007 Completed 05-29-2007

(unbonded) Water Well Constructor Certification

I certify that the work I performed on the construction, deepening, alteration, or abandonment of this well is in compliance with Oregon water supply well construction standards. Materials used and information reported above are true to the best of my knowledge and belief.

License Number 1704 Date 06-26-2007

Password : (if filing electronically) _____

Signed _____

(bonded) Water Well Constructor Certification

I accept responsibility for the construction, deepening, alteration, or abandonment work performed on this well during the construction dates reported above. All work performed during this time is in compliance with Oregon water supply well construction standards. This report is true to the best of my knowledge and belief.

License Number 783 Date 06-26-2007

Password : (if filing electronically) _____

Signed Dan Grossen

Contact Info (optional) Grossen Well Drilling (503)982-2060

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JUN 29 2007
WATER RESOURCES DEPT
SALEM, OREGON

ORIGINAL - WATER RESOURCES DEPARTMENT

THIS REPORT MUST BE SUBMITTED TO THE WATER RESOURCES DEPARTMENT WITHIN 30 DAYS OF COMPLETION OF WORK

Form Version: 0.88

WATER SUPPLY WELL REPORT - continuation page

WELL I.D. # L 75914

START CARD # 190361

(5) BORE HOLE CONSTRUCTION

BORE HOLE

Dia	From	To

SEAL

Material	From	To	Amt	sacks/ lbs

FILTER PACK

From	To	Material	Size

(6) CASING/LINER

Casing	Liner	Dia	+	From	To	Gauge	Stl	Plstc	Wld	Thrd

(7) PERFORATIONS/SCREENS

Perf/ Screen	Casing/ Liner	Screen Dia	From	To	Scrn/slot width	Slot length	# of slots	Tele/ pipe size

(8) WELL TESTS: Minimum testing time is 1 hour

Yield gal/min	Drawdown	Drill stem/Pump depth	Duration (hr)

Water Quality Concerns

From	To	Description	Amount	Units

(10) STATIC WATER LEVEL

Water Bearing Zones

SWL Date	From	To	Est Flow	SWL(psi)	+	SWL(ft)

(11) WELL LOG

Material	From	To

Comments/Remarks

#7 Screens: 173' Bottom Plate & lift bail.

RECEIVED MARI 56736

AUG 07 2002

WATER RESOURCES DEPT. SALEM, OREGON

STATE OF OREGON
WATER SUPPLY WELL REPORT
(as required by ORS 537.765)
Instructions for completing this report are on the last page of this form.

WELL I.D. # L 56632
START CARD # 101569

(1) OWNER: Well Number
Name Itha Reiling
Address 10773 Feller Rd. NE
City Hubbard State OR Zip 97032

(2) TYPE OF WORK
☒ New Well ☐ Deepening ☐ Alteration (repair/recondition) ☐ Abandonment

(3) DRILL METHOD:
☐ Rotary Air ☐ Rotary Mud ☒ Cable ☐ Auger
☐ Other

(4) PROPOSED USE:
☐ Domestic ☐ Community ☐ Industrial ☒ Irrigation
☐ Thermal ☐ Injection ☐ Livestock ☐ Other

(5) BORE HOLE CONSTRUCTION:
Special Construction approval ☐ Yes ☒ No Depth of Completed Well 147 ft.
Explosives used ☐ Yes ☒ No Type Amount

HOLE Diameter	From	To	SEAL Material	From	To	Sacks or pounds
16"	0	255	hole plug bentonite	0	8	20 sacks
			cement	8	100	70sacks &5% bentonite

How was seal placed: Method ☐ A ☐ B ☒ C ☐ D ☐ E
☐ Other
Backfill placed from 147 ft. to 255 ft. Material cemebt&5%bentonite
Gravel placed from 101 ft. to 147 ft. Size of gravel 5-8

(6) CASING/LINER:

	Diameter	From	To	Gauge	Steel	Plastic	Welded	Threaded
Casing:					☐	☐	☐	☐
					☐	☐	☐	☐
					☐	☐	☐	☐
Liner:					☐	☐	☐	☐
					☐	☐	☐	☐

Final location of shoe(s)

(7) PERFORATIONS/SCREENS:
☐ Perforations Method
☒ Screens Type Material stainless

From	To	Slot size	Number	Diameter	Tele/pipe size	Casing	Liner
+2 6"	101 4"			10"	pipe	☒	☐
101 4"	135 7"	.075		10"	p.s.	☐	☐
135 7"	147			10"	pipe	☒	☐
147	Bottom plate & lift bail					☐	☐
+1	100			2½"	pipe- Gravel feed	☐	☒

(8) WELL TESTS: Minimum testing time is 1 hour
☒ Pump ☐ Bailer ☐ Air ☐ Flowing Artesian

Yield gal/min	Drawdown	Drill stem at	Time
200	30		1 hr.
200	34 10"		7 hrs

Temperature of water 53 Depth Artesian Flow Found
Was a water analysis done? ☐ Yes By whom
Did any strata contain water not suitable for intended use? ☐ Too little
☐ Salty ☐ Muddy ☐ Odor ☐ Colored ☐ Other
Depth of strata:

(9) LOCATION OF WELL by legal description:
County Marion Latitude Longitude
Township 4S N or S Range 1W E or W. WM.
Section 17 SW 1/4 SW 1/4
Tax Lot 300 Lot Block Subdivision
Street Address of Well (or nearest address) Matthieu Lane
Donald, OR

(10) STATIC WATER LEVEL:
78 ft. below land surface. Date 7/8/02
Artesian pressure lb. per square inch. Date

(11) WATER BEARING ZONES:
Depth at which water was first found 49

From	To	Estimated Flow Rate	SWL
49	66	4 gpm	15
101	138	200 gpm	78

(12) WELL LOG:
Ground Elevation

Material	From	To	SWL
Topsoil	0	2	
Clay brown	2	18	
Clay gray	18	49	
Sand & clay gray	49	64	15
Sand & gravel w/clay seams	64	66	15
Clay brown & red	66	78	
Clay brown sandy	78	86	
Clay gray sticky	86	97	
Clay gray soft	97	104	
Sand & gravel loose	104	106	78
Sand & gravel cemented	106	121	78
Sand & gravel	121	128	78
Sand green	128	138	78
Clay green sticky	138	143	
Clay gray & green	143	168	
Clay gray & green sticky	168	223	
Clay gray sticky	223	226	
Clay green silty	226	233	
Clay gray	233	238	
Clay gray silty	238	255	

Date started 4/10/02 Completed 7/15/02

(unbonded) Water Well Constructor Certification:
I certify that the work I performed on the construction, alteration, or abandonment of this well is in compliance with Oregon water supply well construction standards. Materials used and information reported above are true to the best of my knowledge and belief.
WWC Number 1704
Signed Date 7/23/02

(bonded) Water Well Constructor Certification:
I accept responsibility for the construction, alteration, or abandonment work performed on this well during the construction dates reported above. All work performed during this time is in compliance with Oregon water supply well construction standards. This report is true to the best of my knowledge and belief.
WWC Number 783
Signed Date 7/18/02

ORIGINAL – WATER RESOURCES DEPARTMENT FIRST COPY – CONSTRUCTOR SECOND COPY – CUSTOMER

STATE OF OREGON
WATER SUPPLY WELL REPORT
(as required by ORS 537.765)

WELL I.D. # L 71035
START CARD # 166154

Instructions for completing this report are on the last page of this form.

(1) LAND OWNER Well Number
Name Tim Herrle
Address 20774 Matthieu St NE
City Donald State OR Zip

(2) TYPE OF WORK ☒ New Well
☐ Deepening ☐ Alteration (repair/recondition) ☐ Abandonment ☐ Conversion

(3) DRILL METHOD
☒ Rotary Air ☐ Rotary Mud ☐ Cable ☐ Auger ☐ Cable Mud
☐ Other

(4) PROPOSED USE
☒ Domestic ☐ Community ☐ Industrial ☐ Irrigation
☐ Thermal ☐ Injection ☐ Livestock ☐ Other

(5) BORE HOLE CONSTRUCTION Special Construction: ☐ Yes ☒ No
Depth of Completed Well 159 ft.
Explosives used: ☐ Yes ☒ No Type Amount

BORE HOLE Diameter	From	To	SEAL Material	From	To	Sacks or Pounds
10	0	54	Bentonite	0	6	5
			Cement	6	54	15
6	54	159.5				

How was seal placed: Method ☐ A ☐ B ☒ C ☐ D ☐ E
☒ Other Bentonite placed dry
Backfill placed from ft. to ft. Material
Gravel placed from ft. to ft. Size of gravel

(6) CASING/LINER

	Diameter	From	To	Gauge	Steel	Plastic	Welded	Threaded
Casing:	6 in	+1	159.5	.25	☒	☐	☒	☐
					☐	☐	☐	☐
					☐	☐	☐	☐
					☐	☐	☐	☐
Liner:					☐	☐	☐	☐
					☐	☐	☐	☐

Drive Shoe used ☒ Inside ☐ Outside ☐ None
Final location of shoe(s) 159' 6"

(7) PERFORATIONS/SCREENS
☒ Perforations Method Holte
☐ Screens Type Material

From	To	Slot Size	Number	Diameter	Tele/pipe size	Casing	Liner
137	142	4x1	120			☒	☐
						☐	☐
						☐	☐
						☐	☐
						☐	☐

(8) WELL TESTS: Minimum testing time is 1 hour
☐ Pump ☐ Bailer ☒ Air ☐ Flowing Artesian

Yield gal/min	Drawdown	Drill stem at	Time
100 +			1 Hr

Temperature of water 54 ± Depth Artesian Flow Found
Was a water analysis done? ☐ Yes By whom
Did any strata contain water not suitable for intended use? ☐ Too little
☐ Salty ☐ Muddy ☐ Odor ☐ Colored ☐ Other
Depth of strata:

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SALEM, OREGON

(9) LOCATION OF WELL (legal description)
County Marion
Tax Lot 00800 Lot
Township 4-S N or S Range 1-W E or W WM
Section 17 SW 1/4 SW 1/4
Lat ° ' " or . (degrees or decimal)
Long ° ' " or . (degrees or decimal)
Street Address of Well (or nearest address) Same as #1

(10) STATIC WATER LEVEL
75 ft. below land surface. Date 10-2-04
ft. below land surface. Date
Artesian pressure lb. per square inch Date

(11) WATER BEARING ZONES
Depth at which water was first found 24

From	To	Estimated Flow Rate	SWL
24	24	1.5	12
108	157	100 +	75

(12) WELL LOG Ground Elevation

Material	From	To	SWL
Top Soil	0	2	
Silty brown clay	2	24	
Gray Clay	24	77	
Soft Sandy gray clay	77	80	
Brown clay some sand	80	96	
Sandy gray clay	96	108	
Small to med. black gravel with soft blue clay	108	122	
Gravel - Small to Med Sandy - black	122	150	
Black Sand	150	157	
Tight gravel with clay	157	159	

Date Started 9-28-04 Completed 10-2-04

(unbonded) Water Well Constructor Certification
I certify that the work I performed on the construction, deepening, alteration, or abandonment of this well is in compliance with Oregon water supply well construction standards. Materials used and information reported above are true to the best of my knowledge and belief.

WWC Number 1629 Date 10-7-04
Signed

(bonded) Water Well Constructor Certification
I accept responsibility for the construction, deepening, alteration, or abandonment work performed on this well during the construction dates reported above. All work performed during this time is in compliance with Oregon water supply well construction standards. This report is true to the best of my knowledge and belief.

WWC Number 1273 Date 10-7-04
Signed Floyd M Sippe

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WATER WELL REPORT
STATE OF OREGON

RECEIVED
APR 25 1985
WATER RESOURCES DEPT
SALEM, OREGON

557
MARION

State Well No. 4S/1W-17Ca

State Permit No.

PLEASE TYPE or PRINT IN INK

(1) OWNER:
Name Robert Fisher
Address P.O. 385 Mattie Rd
City Donald State OR

(2) TYPE OF WORK (check):
New Well ☒ Deepening ☐ Reconditioning ☐ Abandon ☐
If abandonment, describe material and procedure in Item 12.

(3) TYPE OF WELL:
Rotary Air ☐ Driven ☐
Rotary Mud ☐ Dug ☐
Cable ☒ Bored ☐

(4) PROPOSED USE (check):
Domestic ☒ Industrial ☐ Municipal ☐
Irrigation ☐ Test Well ☐ Other ☐
Thermal: Withdrawal ☐ Reinjection ☐

(5) CASING INSTALLED:
Steel ☒ Plastic ☐
Threaded ☐ Welded ☒
6 " Diam. from +1 ft. to 124 ft. Gauge .250
" Diam. from ft. to ft. Gauge

LINER INSTALLED:
" Diam. from ft. to ft. Gauge

(6) PERFORATIONS:
Perforated? ☐ 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.

(7) SCREENS:
Well screen installed? ☐ Yes ☒ No
Manufacturer's Name
Type Model No.
Diam. Slot Size Set from ft. to ft.
Diam. Slot Size Set from ft. to ft.

(8) 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 gal./min. with drill stem at ft. hrs.
Bailer test 40 gal./min. with 16 ft. drawdown after 1 hrs.
Artesian flow g.p.m.
Temperature of water Depth artesian flow encountered ft.

(9) CONSTRUCTION:
Special standards: Yes ☐ No ☒
Well seal—Material used Portland cement Grout
Well sealed from land surface to 18 ft.
Diameter of well bore to bottom of seal 10" in.
Diameter of well bore below seal 6 in.
Number of sacks of cement used in well seal 6 sacks
How was cement grout placed? pumped
Was pump installed? no Type HP Depth ft.
Was a drive shoe used? ☒ Yes ☐ No Plugs Size: location ft.
Did any strata contain unusable water? ☐ Yes ☒ No
Type of Water? depth of strata
Method of sealing strata off
Was well gravel packed? ☐ Yes ☒ No Size of gravel:
Gravel placed from ft. to ft.

(10) LOCATION OF WELL:
County Marion Driller's well number 47
NE ¼ SW ¼ Section 17 T. 4S R. R1W W.M.
Tax Lot # Lot Blk Subdivision
Address at well location: Same

(11) WATER LEVEL: Completed well.
Depth at which water was first found 121 ft.
Static level 30' ft. below land surface. Date 4/20/85
Artesian pressure lbs. per square inch. Date

(12) WELL LOG:
Diameter of well below casing —
Depth drilled 124' ft. Depth of completed well 124' ft.
Formation: Describe color, texture, grain size and structure of materials; and show thickness and nature of each stratum and aquifer penetrated, with at least one entry for each change of formation. Report each change in position of Static Water Level and indicate principal water-bearing strata.

MATERIAL	From	To	SWL
Clay Brown	0	32	
Clay Grey	32	75	
Gravel & Clay	75	77	
Clay Brown	77	93	
Clay Grey	93	114	
Gravel & Clay	114	121	
Gravel	121	124	30'

Work started 4/18 19 85 Completed 4/20 19 85
Date well drilling machine moved off of well 4/20 19 85

(unbonded) Water Well Constructor Certification (if applicable):
This well was constructed under my direct supervision. Materials used and information reported above are true to my best knowledge and belief.
[Signed] Date , 19

Bonded Water Well Constructor Certification:
Bond 97-7b-5318-9 (number) Issued by: State Farm (Surety Company Name)
This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.
Name Crossen's Well Drilling (Person, firm or corporation) (Type or print)
Address 19927 Mill Ck. Rd. Scotts Mills
[Signed] Ivan Crossen (Water Well Constructor)
Date 4/20, 19 85

NOTICE TO WATER WELL CONSTRUCTOR
The original and first copy of this report are to be filed with the WATER RESOURCES DEPARTMENT SALEM, OREGON 97310 within 30 days from the date of well completion.

SP*45292-690

NOTICE TO WATER WELL CONTRACTOR
The original and first copy of this report are to be filed with the WATER RESOURCES DEPARTMENT, SALEM, OREGON 97310 within 30 days from the date of well completion.

RECEIVED
AUG 26 1980
WATER RESOURCES DEPT
SALEM, OREGON

WATER WELL REPORT
STATE OF OREGON
(Please type or print)
(Do not write above this line)

MAR 5562

State Well No. 4S/1W-17

State Permit No.

(1) OWNER:
Name City of Donald
Address City Hall
Donald, Oregon 97020

(2) TYPE OF WORK (check):
New Well ☒ Deepening ☐ Reconditioning ☐ Abandon ☐
If abandonment, describe material and procedure in Item 12.

(3) TYPE OF WELL:
Rotary ☐ Driven ☐
Cable ☒ Jetted ☐
[redacted] ☐ Bored ☐

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

(5) CASING INSTALLED:
Threaded ☐ Welded ☒
12 " Diam. from +1½ ft. to 210 ft. Gage .250
" Diam. from ft. to ft. Gage
" Diam. from ft. to ft. Gage

(6) PERFORATIONS:
Perforated? ☒ Yes ☐ No.
Type of perforator used Mills Knife
Size of perforations 3/8 in. by 2½ in.
216 perforations from 175 ft. to 185 ft.
perforations from ft. to ft.
perforations from ft. to ft.

(7) SCREENS:
Well screen installed? ☐ Yes ☒ No
Manufacturer's Name
Type Model No.
Diam. Slot size Set from ft. to ft.
Diam. Slot size Set from ft. to ft.

(8) WELL TESTS:
Drawdown is amount water level is lowered below static level
Was a pump test made? ☒ Yes ☐ No If yes, by whom?
[redacted]: 500 gal./min. with 84 ft. drawdown after ½ hrs.
300 " 61 " 23½ "
" " " "
Bailer test gal./min. with ft. drawdown after hrs.
[redacted]sian flow g.p.m.
[redacted]mperature of water Depth artesian flow encountered ft.

(9) CONSTRUCTION:
Well seal—Material used Portland Cement
Well sealed from land surface to 25 ft.
Diameter of well bore to bottom of seal 16 in.
Diameter of well bore below seal 12 in.
Number of sacks of cement used in well seal 17 sacks
How was cement grout placed? mixed and poured through tremy pipe
Was a drive shoe used? ☒ Yes ☐ No Plugs Size: location ft.
Did any strata contain unusable water? ☐ Yes ☒ No
Type of water? depth of strata
Method of sealing strata off crushed gravel placed from
Was well gravel packed? ☐ Yes ☒ No Size of gravel: 3/4 minus
Gravel placed from 207 ft. to 210 ft.

(10) LOCATION OF WELL:
County Marion Driller's well number 2314
¼ ¼ Section 17 T. 4S R. 1W W.M.
Bearing and distance from section or subdivision corner

(11) WATER LEVEL: Completed well.
Depth at which water was first found 103 ft.
Static level 75 ft. below land surface. Date 8/13/80
Artesian pressure lbs. per square inch. Date

(12) WELL LOG:
Diameter of well below casing
Depth drilled 210 ft. Depth of completed well 210 207 ft.

Formation: Describe color, texture, grain size and structure of materials; and show thickness and nature of each stratum and aquifer penetrated, with at least one entry for each change of formation. Report each change in position of Static Water Level and indicate principal water-bearing strata.

MATERIAL	From	To	SWL
Topsoil	0	2	
Hard Brown Clay	2	6	
Brown Clay	6	27	
Blue Clay	27	42	
Sticky Blue Clay	42	68	
Brown Clay	68	83	
Sticky Brown Clay	83	96	
Brown Silty Clay	96	103	
Brown Sand and Gravel, clay some water	103	123	67
Brown Clay	123	128	
Silty Blue Gray Clay	128	136	
Sticky Blue Clay	136	159	
Silty Blue Clay	159	171	
Black Sandy Gravel	171	174	
Black Sand and Gravel	174	186	75
Black Sand and wood	186	206	
Blue Clay	206	210	
Black Sand	210	?	

Work started 7/28/80 19 Completed 8/13/80 19
Date well drilling machine moved off of well 8/13/80 19

Drilling Machine Operator's Certification:
This well was constructed under my direct supervision. Materials used and information reported above are true to my best knowledge and belief.
[Signed] Mark D Beers (Drilling Machine Operator) Date 8/15/80, 19
Drilling Machine Operator's License No. 811

Water Well Contractor's Certification:
This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.
Name Willamette Drilling Co. (Person, firm or corporation) (Type or print)
Address 7365 O'Neil Rd. N.E. Salem, OR 97303
[Signed] Dallas L Beers (Water Well Contractor)
Contractor's License No. 561 Date 8/15/80, 19

(USE ADDITIONAL SHEETS IF NECESSARY)

SP*45656-119

NOTICE TO WATER WELL CONTRACTOR
The original and first copy of this report are to be filed with the WATER RESOURCES DEPARTMENT SALEM, OREGON 97310 within 30 days from the date of well completion.

RECEIVED
SEP 22 1980
WATER RESOURCES DEPT
SALEM, OREGON

WATER WELL REPORT

STATE OF OREGON (Please type or print) (Do not write above this line)

563
MARION

State Well No. 4S/1W-17

State Permit No.

(1) OWNER:

Name City of Donald
Address City Hall
Donald, Oregon 97020

(2) TYPE OF WORK (check):

New Well ☒ Deepening ☐ Reconditioning ☐ Abandon ☐
If abandonment, describe material and procedure in Item 12.

(3) TYPE OF WELL:

Rotary ☐ Driven ☐
[redacted] ☒ Jetted ☐
[redacted] ☐ Bored ☐

(4) PROPOSED USE (check):

Domestic ☐ Industrial ☐ Municipal ☒
Irrigation ☐ Test Well ☐ Other ☐

(5) CASING INSTALLED:

Threaded ☐ Welded ☒
12 " Diam. from +1½ ft. to 190 ft. Gage .250
" Diam. from ft. to ft. Gage
" Diam. from ft. to ft. Gage

(6) PERFORATIONS:

Perforated? ☒ Yes ☐ No.
Type of perforator used Mills Knife
Size of perforations 3/8 in. by 2½ in.
192 perforations from 175 ft. to 185 ft.
perforations from ft. to ft.
perforations from ft. to ft.

(7) SCREENS:

Well screen installed? ☐ Yes ☒ No
Manufacturer's Name
Type Model No.
Diam. Slot size Set from ft. to ft.
Diam. Slot size Set from ft. to ft.

(8) WELL TESTS:

Drawdown is amount water level is lowered below static level

Was a pump test made? Yes ☒ No If yes, by whom? driller
Yield: 300 gal./min. with 42 ft. drawdown after 2 hrs.
[redacted] 450 " 52 " 1 "
" " " "
Bailer test gal./min. with ft. drawdown after hrs.
Artesian flow g.p.m.
Temperature of water Depth artesian flow encountered ft.

(9) CONSTRUCTION:

Well seal—Material used Portland Cement
Well sealed from land surface to 25 ft.
Diameter of well bore to bottom of seal 16+ in.
Diameter of well bore below seal 12 in.
Number of sacks of cement used in well seal 25½ sacks
How was cement grout placed? poured thru tremy pipe

Was a drive shoe used? ☒ Yes ☐ No Plugs Size: location ft.
Did any strata contain unusable water? ☐ Yes ☒ No
Type of water? depth of strata
Method of sealing strata off
Was well gravel packed? ☐ Yes ☒ No Size of gravel:
Gravel placed from ft. to ft.

(10) LOCATION OF WELL:

County Marion Driller's well number 2322
¼ ¼ Section 17 T. 4S R. 1W W.M.
Bearing and distance from section or subdivision corner

(11) WATER LEVEL: Completed well.

Depth at which water was first found 96 ft.
Static level 70 ft. below land surface. Date 9/1/80
Artesian pressure lbs. per square inch. Date

(12) WELL LOG:

Diameter of well below casing
Depth drilled 190 ft. Depth of completed well 190 ft.

Formation: Describe color, texture, grain size and structure of materials; and show thickness and nature of each stratum and aquifer penetrated, with at least one entry for each change of formation. Report each change in position of Static Water Level and indicate principal water-bearing strata.

MATERIAL	From	To	SWL
Topsoil	0	2	
Hard Brown Clay	2	6	
Brown Clay	6	25	
Blue Clay	25	41	
Sticky Blue Clay	41	69	
Brown Clay	69	74	
Sticky Brown Clay	74	92	
Silty Brown Clay	92	96	
Brown Sand and Gravel, with clay and some water	96	117	
Brown Clay	117	132	
Blue Clay	132	142	
Sticky Blue Clay	142	158	
Blue [redacted] Silty Clay	158	170	
Black Sand and Gravel	170	185	
Blue Clay and Gravel	185	190	

Work started 8/15/80 19 Completed 9/2/80 19
Date well drilling machine moved off of well 9/2/80 19

Drilling Machine Operator's Certification:

This well was constructed under my direct supervision. Materials used and information reported above are true to my best knowledge and belief.

[Signed] Mark D. Beis (Drilling Machine Operator) Date 9/3/80, 19

Drilling Machine Operator's License No. 811

Water Well Contractor's Certification:

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

Name WILLAMETTE DRILLING CO. (Person, firm or corporation) (Type or print)
Address 7365 O'Neil Rd. N.E. Salem, Oregon 97303

[Signed] Dallas L Beis (Water Well Contractor)

Contractor's License No. 561 Date 9/3/80, 19

(USE ADDITIONAL SHEETS IF NECESSARY)

SP*45656-119

#14

STATE OF OREGON

WATER WELL REPORT

(as required by ORS 537.765)

MAR 17 2005

4S/1W/17 aa

(START CARD) # 22430

Well Number:

(1) OWNER:

Name Jim & Madeline DeCosta

Address 11424 Ehlen Rd. NE

City Aurora State OR Zip 97002

(2) TYPE OF WORK:

☒ New Well ☐ Deepen ☐ Recondition ☐ Abandon

(3) DRILL METHOD

☐ Rotary Air ☐ Rotary Mud ☒ Cable

☐ Other

(4) PROPOSED USE:

☒ Domestic ☐ Community ☐ Industrial ☐ Irrigation

☐ Thermal ☐ Injection ☐ Other

(5) BORE HOLE CONSTRUCTION:

Special Construction approval Yes ☐ No ☒ Depth of Completed Well 151'6" ft.

Explosives used Yes ☐ No ☒ Type ____ Amount ____

HOLE Diameter	From	To	SEAL Material	From	To	Amount sacks or pounds
10"	0	23	Portland	0	23'	29 sacks
			quick gel bentonite			1 sack
6"	23	151'6"				

How was seal placed: Method ☐ A ☐ B ☒ C ☐ D ☐ E

☐ Other

Backfill placed from ____ ft. to ____ ft. Material ____

Gravel placed from ____ ft. to ____ ft. Size of gravel ____

(6) CASING/LINER:

	Diameter	From	To	Gauge	Steel	Plastic	Welded	Threaded
Casing:	6"	+19"	138'9"	.250	☒	☐	☒	☐
					☐	☐	☐	☐
					☐	☐	☐	☐
					☐	☐	☐	☐
Liner:					☐	☐	☐	☐
					☐	☐	☐	☐

Final location of shoe(s) 138'9"

(7) PERFORATIONS/SCREENS:

☐ Perforations Method ____

☒ Screens Type Huston Material stainless

From	To	Slot size	Number	Diameter	Tele/pipe size	Casing	Liner
134'10"	140'2"	Packers and 5'			pipe	☐	☐
140'2"	150'10½"	.018	slot	5"	screen	☐	☐
150'10½"	151'7"			5"	pipe	☐	☐
						☐	☐
						☐	☐
						☐	☐

(8) WELL TESTS: Minimum testing time is 1 hour

☐ Pump ☐ Bailer ☒ Air ☐ Flowing Artesian

Yield gal/min	Drawdown	Drill stem at	Time
			1 hr.
160			4 hrs.

Temperature of water 53 degrees Depth Artesian Flow Found ____

Was a water analysis done? ☐ Yes By whom ____

Did any strata contain water not suitable for intended use? ☐ Too little

☐ Salty ☐ Muddy ☐ Odor ☐ Colored ☐ Other ____

Depth of strata: ____

(9) LOCATION OF WELL by legal description:

County Marion Latitude ____ Longitude ____

Township 4S N or S. Range 1W E or W, WM.

Section 17 NE ¼ NE ¼

Tax Lot 00101 Lot ____ Block ____ Subdivision ____

Street Address of Well (or nearest address) 11190 Ehlen Rd. NE

Aurora, OR 97002

(10) STATIC WATER LEVEL:

21 ft. below land surface. Date 3/6/91

Artesian pressure ____ lb. per square inch. Date ____

(11) WATER BEARING ZONES:

Depth at which water was first found 137'

From	To	Estimated Flow Rate	SWL
137'	151'6"	160	21

(12) WELL LOG:

Ground elevation ____

Material	From	To	SWL
Fill	0	2	
Top soil	2	4	
Clay brown sandy	4	15	
Silt brown	15	17	
Clay brown	17	25	
Clay grey	25	81	
Clay brown	81	105	
Clay grey	105	137	
Sand black	137	151½	21

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APR - 1 1991

WATER RESOURCES DEPT

SALEM, OREGON

Date started 2/25/91 Completed 3/6/91

(unbonded) Water Well Constructor Certification:

I certify that the work I performed on the construction, alteration, or abandonment of this well is in compliance with Oregon well construction standards. Materials used and information reported above are true to my best knowledge and belief.

WWC Number ____

Signed ____ Date ____

(bonded) Water Well Constructor Certification:

I accept responsibility for the construction, alteration, or abandonment work performed on this well during the construction dates reported above. all work performed during this time is in compliance with Oregon well construction standards. This report is true to the best of my knowledge and belief.

WWC Number 284

Signed John Reuse Date 3/27/91

ORIGINAL & FIRST COPY - WATER RESOURCES DEPARTMENT SECOND COPY - CONSTRUCTOR THIRD COPY - CUSTOMER 9809C 3/88

JUL 31 1990

STATE OF OREGON WATER RESOURCES DEPT.
SALEM, OREGON

WATER WELL REPORT
(as required by ORS 537.765)

MAR 2234

4S/1W/16 CC

(START CARD) # 18463

(1) OWNER:
Well Number:
Name Haener Farms Madelene M. Haener
Address 11424 Ehlen Rd. NE
City Aurora State OR Zip 97002

(2) TYPE OF WORK:
☒ New Well ☐ Deepen ☐ Recondition ☐ Abandon

(3) DRILL METHOD
☐ Rotary Air ☐ Rotary Mud ☒ Cable
☐ Other

(4) PROPOSED USE:
☐ Domestic ☐ Community ☐ Industrial ☒ Irrigation
☐ Thermal ☐ Injection ☐ Other

(5) BORE HOLE CONSTRUCTION:
Special Construction approval Yes ☐ No ☒ Depth of Completed Well 214 ft.
Explosives used Yes ☐ No ☒ Type Amount

HOLE Diameter	From	To	SEAL Material	From	To	Amount sacks or pounds
16"	0	20	Bentonite	o	2o	31 sacks
12"	20	214				

How was seal placed: Method ☐ A ☐ B ☐ C ☐ D ☐ E
☒ Other Granular bentonite OAR 690-210-340
Backfill placed from ft. to ft. Material
Gravel placed from ft. to ft. Size of gravel

(6) CASING/LINER:

	Diameter	From	To	Gauge	Steel	Plastic	Welded	Threaded
Casing:	12"	+1½	214	.250	☒	☐	☒	☐
					☐	☐	☐	☐
					☐	☐	☐	☐
					☐	☐	☐	☐
Liner:					☐	☐	☐	☐
					☐	☐	☐	☐

Final location of shoe(s) 214'

(7) PERFORATIONS/SCREENS:
☒ Perforations Method Mills knife
☐ Screens Type Material

From	To	Slot size	Number	Diameter	Tele/pipe size	Casing	Liner
167	197	3/8x2½	576			☐	☐
						☐	☐
						☐	☐
						☐	☐
						☐	☐
						☐	☐

(8) WELL TESTS: Minimum testing time is 1 hour
☐ Pump ☐ Bailer ☒ Air ☐ Flowing Artesian

Yield gal/min	Drawdown	Drill stem at	Time
600		210'	1 hr.
600		210'	5 hrs.

Temperature of water 53 degrees Depth Artesian Flow Found
Was a water analysis done? ☐ Yes By whom
Did any strata contain water not suitable for intended use? ☐ Too little
☐ Salty ☐ Muddy ☐ Odor ☐ Colored ☐ Other
Depth of strata:

(9) LOCATION OF WELL by legal description:
County Marion Latitude ' " Longitude ' "
Township 4S N or S, Range 1W E or W, WM.
Section 16 NW ¼ SW ¼
Tax Lot 01700 Lot Block Subdivision
Street Address of Well (or nearest address) 11424 Ehlen Rd.NE
Aurora,OR 97002

(10) STATIC WATER LEVEL:
44 ft. below land surface. Date 6/27/90
Artesian pressure lb. per square inch. Date

(11) WATER BEARING ZONES:
Depth at which water was first found 132'

From	To	Estimated Flow Rate	SWL
132	145	280	44
161	200	900	44

(12) WELL LOG:
Ground elevation

Material	From	To	SWL
Topsoil	0	1	
Clay brown	1	14	
Clay sandy brown	14	17	
Clay brown	17	24	
Clay sandy brown	24	31	
Clay grey	31	39	
Clay soft grey	39	43	
Clay,trace black sand,gravel	43	53	
Clay sticky grey	53	61	
Clay grey	61	63	
Clay sticky grey	63	73	
Clay sandy grey	73	79	
Sand brown,silt,clay	79	94	
Sand brown	94	106	
Sand coarse brown	106	108	
Gravel,clay brown	108	109	
Clay,gravel brown	109	112	
Clay sticky brown	112	117	
Clay sticky brown& grey	117	118½	
Clay sticky grey	118½	122	
Clay sticky grey,brown sand	122	127	
Sand brown	127	130	
Continued			

Date started 5/28/90 Completed 7/2/90

(unbonded) Water Well Constructor Certification:
I certify that the work I performed on the construction, alteration, or abandonment of this well is in compliance with Oregon well construction standards. Materials used and information reported above are true to my best knowledge and belief.
Signed Kermit Martin WWC Number 1391 Date 7-26-90

(bonded) Water Well Constructor Certification:
I accept responsibility for the construction, alteration, or abandonment work performed on this well during the construction dates reported above. all work performed during this time is in compliance with Oregon well construction standards. This report is true to the best of my knowledge and belief.
Signed Evan Grossen WWC Number 783 Date 7/27/90

ORIGINAL & FIRST COPY - WATER RESOURCES DEPARTMENT SECOND COPY - CONSTRUCTOR THIRD COPY - CUSTOMER 9809C 3/88

JUL 31 1990

STATE OF OREGON WATER RESOURCES DEPT.
SALEM, OREGON

WATER WELL REPORT
(as required by ORS 537.765)

MARS 2234

4S/1W/16 DAO CB

(START CARD) # 18463

(1) OWNER:
Well Number:
Name Haener Farms Madelene M.Haener
Address 11424 Ehlen Rd. NE
City Aurora State OR Zip 97002

(2) TYPE OF WORK:
☐ New Well ☐ Deepen ☐ Recondition ☐ Abandon

(3) DRILL METHOD
☐ Rotary Air ☐ Rotary Mud ☐ Cable
☐ Other

(4) PROPOSED USE:
☐ Domestic ☐ Community ☐ Industrial ☐ Irrigation
☐ Thermal ☐ Injection ☐ Other

(5) BORE HOLE CONSTRUCTION:
Special Construction approval Yes ☐ No ☐ Depth of Completed Well ____ ft.
Explosives used Yes ☐ No ☐ Type ____ Amount ____

HOLE Diameter	From	To	SEAL Material	From	To	Amount sacks or pounds

How was seal placed: Method ☐ A ☐ B ☐ C ☐ D ☐ E
☐ Other
Backfill placed from ____ ft. to ____ ft. Material ____
Gravel placed from ____ ft. to ____ ft. Size of gravel ____

(6) CASING/LINER:

	Diameter	From	To	Gauge	Steel	Plastic	Welded	Threaded
Casing:					☐	☐	☐	☐
					☐	☐	☐	☐
					☐	☐	☐	☐
					☐	☐	☐	☐
Liner:					☐	☐	☐	☐
					☐	☐	☐	☐

Final location of shoe(s)

(7) PERFORATIONS/SCREENS:
☐ Perforations Method
☐ Screens Type ____ Material

From	To	Slot size	Number	Diameter	Tele/pipe size	Casing	Liner
						☐	☐
						☐	☐
						☐	☐
						☐	☐
						☐	☐
						☐	☐

(8) WELL TESTS: Minimum testing time is 1 hour
☐ Pump ☐ Bailer ☐ Air ☐ Flowing Artesian

Yield gal/min	Drawdown	Drill stem at	Time
			1 hr.

Temperature of water ____ Depth Artesian Flow Found ____
Was a water analysis done? ☐ Yes By whom ____
Did any strata contain water not suitable for intended use? ☐ Too little
☐ Salty ☐ Muddy ☐ Odor ☐ Colored ☐ Other ____
Depth of strata: ____

(9) LOCATION OF WELL by legal description:
County Marion Latitude ____ Longitude ____
Township 4S N or S, Range 1W E or W, WM.
Section 16 NW ¼ SW ¼
Tax Lot 01700 Lot ____ Block ____ Subdivision ____
Street Address of Well (or nearest address) ____

(10) STATIC WATER LEVEL:
____ ft. below land surface. Date ____
Artesian pressure ____ lb. per square inch. Date ____

(11) WATER BEARING ZONES:
Depth at which water was first found ____

From	To	Estimated Flow Rate	SWL

(12) WELL LOG:
Ground elevation ____

Material	From	To	SWL
continued			
Sand,clay brown	130	132	
Sand brown	132	145	44
Sand,gravel,clay grey	145	146	
Clay grey,trace sand & gravel	146	148	
Clay grey	148	156	
Clay grey,gravel	156	159	
Sand,gravel,clay grey	159	161	
Gravel,black sand	161	169	44
Gravel,sand brown	169	190	
Gravel,sand black	190	193	
Sand black,gravel	193	196	
Gravel,sand black	196	200	
Sand black,gravel	200	209	
Clay sticky grey	209	214	

Date started 5/28/90 Completed 7/2/90

(unbonded) Water Well Constructor Certification:
I certify that the work I performed on the construction, alteration, or abandonment of this well is in compliance with Oregon well construction standards. Materials used and information reported above are true to my best knowledge and belief.
WWC Number 1391
Signed Kermit Martin Date 7/26/90

(bonded) Water Well Constructor Certification:
I accept responsibility for the construction, alteration, or abandonment work performed on this well during the construction dates reported above. all work performed during this time is in compliance with Oregon well construction standards. This report is true to the best of my knowledge and belief.
WWC Number 783
Signed Ivan Grossen Date 7/27/90

ORIGINAL & FIRST COPY - WATER RESOURCES DEPARTMENT SECOND COPY - CONSTRUCTOR THIRD COPY - CUSTOMER 9809C 3/88

NOTICE TO WATER WELL CONTRACTOR
The original and first copy of this report are to be filed with the
WATER RESOURCES DEPARTMENT,
SALEM, OREGON 97310
within 30 days from the date of well completion.

WATER WELL REPORT
STATE OF OREGON
(Please type or print)
(Do not write above this line)

MAR 348

State Well No. 4S/1W-8G

State Permit No.

(1) OWNER:
Name: J. Frank Schmidt & Son Co.
Address: 9500 SE 327th Ave.
Boring, Or 97009

(2) TYPE OF WORK (check):
New Well ☒ Deepening ☐ Reconditioning ☐ Abandon ☐
If abandonment, describe material and procedure in Item 12.

(3) TYPE OF WELL:
Rotary ☒ Driven ☐
Cable ☐ Jetted ☐
Dug ☐ Bored ☐

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

Rev

(5) CASING INSTALLED:
Threaded ☐ Welded ☒
16 " Diam. from +1 ft. to 18 ft. Gage .250
12 " Diam. from +1'2" ft. to 144'9" ft. Gage .330
12 " Diam. from 204'11" ft. to 226 ft. Gage .330

(6) PERFORATIONS:
Perforated? ☐ 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.

(7) SCREENS:
Well screen installed? ☒ Yes ☐ No
Manufacturer's Name: Roscoe Moss
Type: Std Shutter Model No.: 5/16 wall
Diam.: 12 3/4 OD Slot size: 1 Set from: 144'9" ft. to: 204'11" ft.
Diam. Slot size Set from ft. to ft.

(8) 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 sheet attached " "
" " "
Bailer test gal./min. with ft. drawdown after hrs.
Artesian flow g.p.m.
Temperature of water Depth artesian flow encountered ft.

(9) CONSTRUCTION:
24 Cu Yds
Well seal—Material used: 5 sk readimix concrete
Well sealed from land surface to: 18 ft.
Diameter of well bore to bottom of seal: 32 in.
Diameter of well bore below seal: 32 in.
Number of sacks of cement used in well seal: 120 sacks
How was cement grout placed? See attached Department of Water Resources letter regarding special standards
Was a drive shoe used? ☐ Yes ☒ No Plugs Size: location ft.
Did any strata contain unusable water? ☐ Yes ☒ No
Type of water? - depth of strata -
Method of sealing strata off -
Was well gravel packed? ☒ Yes ☐ No Size of gravel: 3/4-1
Gravel placed from 18 ft. bottom ft.

(10) LOCATION OF WELL:
County: Marion Driller's well number: 8010
¼ SE ¼ Section 8 T. 4S R. 1W W.M.
Bearing and distance from section or subdivision corner

(11) WATER LEVEL: Completed well.
Depth at which water was first found: 58 ft.
Static level: 49 ft. below land surface. Date: 10-18-80
Artesian pressure lbs. per square inch. Date

(12) WELL LOG:
Diameter of well below casing
Depth drilled: 225 ft. Depth of completed well: 208 ft.

Formation: Describe color, texture, grain size and structure of materials; and show thickness and nature of each stratum and aquifer penetrated, with at least one entry for each change of formation. Report each change in position of Static Water Level and indicate principal water-bearing strata.

MATERIAL	From	To	SWL
See sheet attached			

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NOV 12 1980
WATER RESOURCES DEPT
SALEM, OREGON

Work started 3-25 19 80 Completed 10-18 19 80
Date well drilling machine moved off of well 10-18 19 80

Drilling Machine Operator's Certification:
This well was constructed under my direct supervision. Materials used and information reported above are true to my best knowledge and belief.
[Signed] Donald G Davis (Drilling Machine Operator) Date 11-7, 19 80
Drilling Machine Operator's License No. 1085

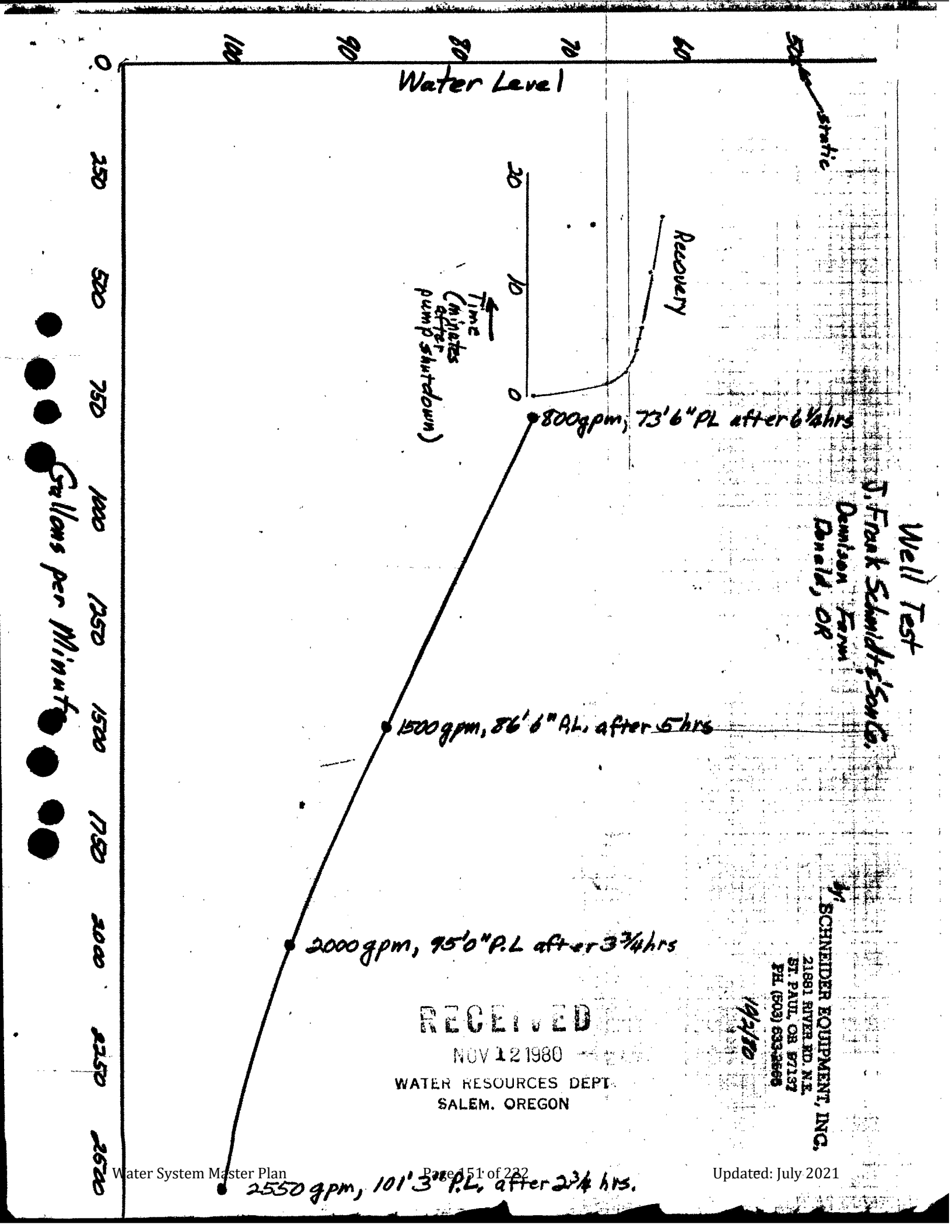
Water Well Contractor's Certification:
This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.
Name Schneider Equipment, Inc. (Person, firm or corporation) (Type or print)
Address 21881 River Rd NE, St. Paul, Or 97137
[Signed] Stephen J Schneider (Water Well Contractor)
Contractor's License No. 649 Date 11-7-80, 19

(USE ADDITIONAL SHEETS IF NECESSARY)

SP*45656-119

J. Frank Schmidt & Son Co. 8010

Material	From	To
Top soil, Brown	0	3
Clay, brown	3	12
Clay, brown, silty	12	40
Clay, blue-green	40	49
Clay, dark gray	49	52
Clay, dark green med sandy	52	58
Sand, fine black w/ some clay	58	61
Clay, rusty brown, fine sandy	61	64
Sand, brown, fine	64	72
Sand, black fine, medium cemented w/ some gravel	72	76
Clay, light brown	76	79
Clay, brown & sand cemented, brown	79	82
Clay, brown	82	91
Sand, brown, fine-medium	91	96
Gravel & sand, brown cemented	96	100
Clay, rusty brown	100	102
Clay, dark green	102	120
Sand, black medium w/ some pea gravel & wood	120	142
Sand, black, medium fine & gravel up to 3"	142	143
Sand, black, medium fine w/ wood	143	148
Clay, dark green, medium sandy	148	152
Sand, black, medium w/ wood	152	155
Sand & gravel, medium fine	155	157
Sand, black, fine	157	161
Gravel & sand, cemented	161	166
Gravel up to 4" w/ sand, coarse	166	185
Gravel & sand, coarse loose	185	205
Clayy dark gray, flakey	205	208
Clay, green, hard	208	215
Clay, green, medium sandy	215	220
Clay, green, hard	220	225


Water Level
Static
Recovery
Time (minutes after pump shutdown)
800gpm, 73'6" P.L after 6½hrs
1500gpm, 86'6" P.L. after 5 hrs
2000gpm, 95'0" P.L after 3¾hrs
2550gpm, 101'3" P.L. after 2¾ hrs.
Gallons per Minute
Well Test
J. Frank Schmidt & Son Co.
Denison Farm
Donald, OR
By SCHNEIDER EQUIPMENT, INC.
21881 RIVER RD. N.E.
ST. PAUL, OR 97137
PH. (503) 633-2568
11/2/80
RECEIVED
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WATER RESOURCES DEPT.
SALEM, OREGON

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ATTACHMENT B

WELL LOGS AND WATER WELL REPORTS FOR GEOLOGIC CROSS-SECTION B – B'

RECEIVED

MARI 55178

SEP 12 2000

WATER RESOURCES DEPT.
SALEM, OREGON

STATE OF OREGON

WATER SUPPLY WELL REPORT
(as required by ORS 537.765)

Instructions for completing this report are on the last page of this form.

WELL I.D. # L 37375
START CARD # Q133929

(1) LAND OWNER Well Number 3532
Name J.T. UNLIMITED
Address P.O. BOX 529
City DONALD State OR Zip 97020

(2) TYPE OF WORK
☒ New Well ☐ Deepening ☐ Alteration (repair/recondition) ☐ Abandonment

(3) DRILL METHOD:
☒ Rotary Air ☐ Rotary Mud ☐ Cable ☐ Auger
☐ Other

(4) PROPOSED USE:
☐ Domestic ☐ Community ☐ Industrial ☒ Irrigation
☐ Thermal ☐ Injection ☐ Livestock ☐ Other

(5) BORE HOLE CONSTRUCTION:
Special Construction approval ☐ Yes ☒ No Depth of Completed Well 158 ft.
Explosives used ☐ Yes ☒ No Type Amount

HOLE Diameter	From	To	SEAL Material	From	To	Sacks or pounds
14"	0	18	BENTONITE	0	18	15 SACKS
8"	18	280				

How was seal placed: Method ☐ A ☐ B ☐ C ☐ D ☐ E
☒ Other POURED DRY
Backfill placed from ft. to ft. Material
Gravel placed from 158 ft. to 175 ft. Size of gravel 3/4"

(6) CASING/LINER:

	Diameter	From	To	Gauge	Steel	Plastic	Welded	Threaded
Casing:	8"	+1	160	.250	☒	☐	☒	☐
					☐	☐	☐	☐
					☐	☐	☐	☐
					☐	☐	☐	☐
Liner:					☐	☐	☐	☐
					☐	☐	☐	☐

Drive Shoe used ☐ Inside ☒ Outside ☐ None
Final location of shoe(s) 160

(7) PERFORATIONS/SCREENS:
☒ Perforations Method HOLTE AUG PERFORATOR
☐ Screens Type Material

From	To	Slot size	Number	Diameter	Tele/pipe size	Casing	Liner
158	158	3/16 x 3/4	320	8"		☒	☐
						☐	☐
						☐	☐
						☐	☐

(8) WELL TESTS: Minimum testing time is 1 hour
☐ Pump ☐ Bailer ☒ Air ☐ Flowing Artesian

Yield gal/min	Drawdown	Drill stem at	Time
300+		158	1 hr.

Temperature of water 55° Depth Artesian Flow Found
Was a water analysis done? NO ☐ Yes By whom
Did any strata contain water not suitable for intended use? NO ☐ Too little
☐ Salty ☐ Muddy ☐ Odor ☐ Colored ☐ Other
Depth of strata:

(9) LOCATION OF WELL by legal description:
County MARION Latitude Longitude
Township 4S N or S Range 1W E or W. WM.
Section 18 NW 1/4 NW 1/4
Tax Lot 00600 Lot Block Subdivision
Street Address of Well (or nearest address) 9803 YERGEN RD NE AURORA, OR 97002

(10) STATIC WATER LEVEL:
64 ft. below land surface. Date 9/7/00
Artesian pressure lb. per square inch Date

(11) WATER BEARING ZONES:
Depth at which water was first found 122

From	To	Estimated Flow Rate	SWL
122	147	3000 GPH	64

(12) WELL LOG:
Ground Elevation

Material	From	To	SWL
TOPSOIL	0	3	
SOFT BROWN CLAY	3	23	
SOFT GRAY CLAY	23	47	
STICKY BROWN CLAY	47	72	
SANDY STICKY BROWN CLAY	72	93	
SANDY STICKY GRAY CLAY	93	95	
SANDY STICKY GREEN CLAY	95	97	
SANDY STICKY BROWN CLAY	97	122	
BROWN GRAVEL W/BLACK SAND	122	147	64
SANDY STICKY GRAY CLAY	147	157	
SOFT BROWN CLAY	157	280	
WELL CAVED IN TO 175' AND WAS GRAVEL PACKED TO 158' WITH 3/4 MINUS GRAVEL			

Date started 8/22/00 Completed 9/7/00

(unbonded) Water Well Constructor Certification:
I certify that the work I performed on the construction, alteration, or abandonment of this well is in compliance with Oregon water supply well construction standards. Materials used and information reported above are true to the best of my knowledge and belief.
WWC Number 1750
Signed Date 9/7/00

(bonded) Water Well Constructor Certification:
I accept responsibility for the construction, alteration, or abandonment work performed on this well during the construction dates reported above. All work performed during this time is in compliance with Oregon water supply well construction standards. This report is true to the best of my knowledge and belief.
WWC Number 56
Signed Dallas L Reis Date 9/10/00

ORIGINAL – WATER RESOURCES DEPARTMENT FIRST COPY – CONSTRUCTOR SECOND COPY – CUSTOMER

603

MAR1.....

File Original and First Copy with the STATE ENGINEER, SALEM, OREGON

WATER WELL REPORT

STATE OF OREGON

State Well No. 4/1W-18C(1)

State Permit No. .....

(1) OWNER:

Name T.H. & MARY A. VERGEN

Address AURORA OREGON RT 1 Box 221

(2) LOCATION OF WELL:

County Marion Owner's number, if any—

¼ ¼ Section 18 T. 4 S. R. 1 W. W.M.

Bearing and distance from section or subdivision corner

800's & 1350W from NW Corner Section 18

(3) TYPE OF WORK (check):

New Well ☒ Deepening ☐ Reconditioning ☐ Abandon ☐

If abandonment, describe material and procedure in Item 11.

(4) PROPOSED USE (check):

Domestic ☒ Industrial ☐ Municipal ☐

Irrigation ☐ Test Well ☐ Other ☐

(5) TYPE OF WELL:

Rotary ☐ Driven ☐

Cable ☒ Jetted ☐

Dug ☐ Bored ☐

(6) CASING INSTALLED:

Threaded ☐ Welded ☒

6" Diam. from 0 ft. to 96 ft. Gage .....

..." Diam. from ..... ft. to ..... ft. Gage .....

..." Diam. from ..... ft. to ..... ft. Gage .....

(7) PERFORATIONS:

Perforated? ☐ 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.

..... perforations from ..... ft. to ..... ft.

..... perforations from ..... ft. to ..... ft.

(8) SCREENS:

Well screen installed ☐ Yes ☐ No

Manufacturer's Name .....

Type ..... Model No. .....

...m. ..... Slot size ..... Set from ..... ft. to ..... ft.

...n. ..... Slot size ..... Set from ..... ft. to ..... ft.

(9) CONSTRUCTION:

Was well gravel packed? ☐ Yes ☐ No Size of gravel: .....

Gravel placed from ..... ft. to ..... ft.

Was a surface seal provided? ☒ Yes ☐ No To what depth? ..... ft.

Material used in seal— mud

Did any strata contain unusable water? ☐ Yes ☐ No

Type of water? Depth of strata

Method of sealing strata off

(10) WATER LEVELS:

Static level 23 ft. below land surface Date 11- -58

Artesian pressure lbs. per square inch Date

Log Accepted by:

[Signed] ..... Date ....., 19..

(Owner)

(11) 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.
"	"	"	"
"	"	"	"

Bailer test 60 gal./min. with 15 ft. drawdown after hrs.

Artesian flow g.p.m. Date

Temperature of water Was a chemical analysis made? ☐ Yes ☐ No

(12) WELL LOG:

Diameter of well 6 inches.

Depth drilled 102 ft. Depth of completed well 102 ft.

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
surface	0	4
yellow clay	4	42
red sand and small gravel	42	43
sandy clay	43	80
black sand	80	90
blue clay	90	93
sand and gravel	93	98
grey clay	98	98
coarse sand and gravel	98	102

Work started Nov,3rd. 1958 Completed Nov.6th 1958

(13) PUMP:

Manufacturer's Name .....

Type: ..... H.P. .....

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 J.T.Miller

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

Address Box 198, Aurora Ore.

Driller's well number .....

[Signed] .....

(Well Driller)

License No. 7 Date Nov.6th, 1958

(USE ADDITIONAL SHEETS IF NECESSARY)

NOTICE TO WATER WELL CONTRACTOR
The original and first copy of this report are to be filed with the STATE ENGINEER, SALEM, OREGON 97310 within 30 days from the date of well completion.

RECEIVED NOV 24 1965 STATE ENGINEER SALEM OREGON

RECEIVED NOV 29 1965 STATE ENGINEER SALEM OREGON

MARION 605

WATER WELL REPORT

STATE OF OREGON (Please type or print)

State Well No. 4/1W-18F(1)

State Permit No. G-8165

(1) OWNER:

Name: Francis Ryan

Address: Rt. 1, Box 222, Aurora, Oregon

(2) LOCATION OF WELL:

County: Marion Driller's well number:

¼ ¼ Section 18 T. 4S R. 1W W.M.

Bearing and distance from section or subdivision corner: 1 mi W. of Donald, Oregon

(3) TYPE OF WORK (check):

New Well ☒ Deepening ☐ Reconditioning ☐ Abandon ☐

If abandonment, describe material and procedure in Item 12.

(4) PROPOSED USE (check):

Domestic ☐ Industrial ☐ Municipal ☐
Irrigation ☒ Test Well ☐ Other ☐

(5) TYPE OF WELL:

Rotary ☐ Driven ☐
Cable ☐ Jetted ☐
Dug ☐ Bored ☐

(6) CASING INSTALLED:

Threaded ☐ Welded ☐

18" Diam. from 0 ft. to 82'8" ft. Gage .250
12" Diam. from 0 ft. to 181'6" ft. Gage .250
16" Diam. from 181'6" ft. to 182'6" ft. Gage .375

(7) PERFORATIONS:

Perforated? ☒ Yes ☐ No

Type of perforator used: torch mill knife ½ x 3

Size of perforations: 3/8 x 8 in. by in.

480 T perforations from 109'6" ft. to 149'6" ft.
240 T perforations from 159'6" ft. to 179'6" ft.
168 M K perforations from 98'6" ft. to 108'6" ft.
168 M K perforations from 149'6" ft. to 159'6" ft.
perforations from ft. to ft.

(8) SCREENS:

Well screen installed? ☐ Yes ☒ No

Manufacturer's Name:
Type: Model No.:
Diam. Slot size Set from ft. to ft.
Diam. Slot size Set from ft. to ft.

(9) CONSTRUCTION:

Well seal—Material used in seal: Bentonite
Depth of seal: 40 ft. Was a packer used? yes
Diameter of well bore to bottom of seal: 24 in.
Were any loose strata cemented off? ☐ Yes ☒ No Depth:
Was a drive shoe used? ☐ Yes ☒ No
Was well gravel packed? ☒ Yes ☐ No Size of gravel: 3/8 - 3/4
Gravel placed from 0 ft. to 180 ft.
Did any strata contain unusuable water? ☐ Yes ☒ No
Type of water? depth of strata
Method of sealing strata off

(10) WATER LEVELS:

Static level 40 ft. below land surface Date 11-9-65
Artesian pressure lbs. per square inch Date

(11) WELL TESTS:

Drawdown is amount water level is lowered below static level

Was a pump test made? ☒ Yes ☐ No If yes, by whom?

Yield: 2000 gal./min. with 75 ft. drawdown after 4 hrs.
" 1400 " 54 " 5 "
" 1000 665 " 42 30 " 5½ 6 "
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

(12) WELL LOG:

Diameter of well below casing: 0

Depth drilled 182'6" ft. Depth of completed well 180 ft.

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	0	2
Brown clay	2	14
Sandy Brown Clay	14	28
Soft Blue Clay	28	34
Brown "	34	48
~~XXXX~~ Hard Brown Clay	48	74
Blue Clay	74	80
Brown Clay	80	93
Extra Hard Brown Clay	93	103
Black Sand	103	110
Blue Clay	110	116
Sand	116	121
Hard Brown Clay	121	125
Tough Blue Clay	125	133
Brown Clay	133	141
Soft light brown clay	141	147
" " " " w/ sand layer & wood	147	154
Cemented gravel & clay	154	158
Sand	158	161
Cemented sand gravel clay	161	174
Sand	174	180
Cemented gravel sand clay	180	182½

Work started 9-22-65 19 . Completed 11-9 1965
Date well drilling machine moved off of well 11-9-65 19

(13) PUMP:

Manufacturer's Name:
Type: H.P.:

Water Well Contractor's Certification:

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

NAME Milo Schneider Equipment Co. (Person, firm or corporation) (Type or print)
Address Star Rt., Box 97, St. Paul, Oregon

Drilling Machine Operator's License No. 212

[Signed] Milo Schneider (Water Well Contractor)

Contractor's License No. 387 Date 11-22 1965

(USE ADDITIONAL SHEETS IF NECESSARY)

NOTICE TO WATER WELL CONTRACTOR
The original and first copy of this report are to be filed with the

STATE ENGINEER, SALEM, OREGON 97310 within 30 days from the date of well completion.

597 MART...

WATER WELL REPORT
STATE OF OREGON
(Please type or print)
(Do not write above this line)

RECEIVED
AUG 16 1976
WATER RESOURCES DEPT.
SALEM, OREGON

State Well No. ....
State Permit No. 4S/1W-18ab

(1) OWNER:
Name Bob Belozer #3
Address 2500 S. Beavercreek Rd.
Oregon City, OR 97045

(2) TYPE OF WORK (check):
New Well XX Deepening ☐ Reconditioning ☐ Abandon ☐
If abandonment, describe material and procedure in Item 12.

(3) TYPE OF WELL:
Rotary XX Driven ☐
Cable ☐ Jetted ☐
Dug ☐ Bored ☐

(4) PROPOSED USE (check):
Domestic ☐ Industrial ☐ Municipal ☐
Irrigation ☐ Test Well ☐ Other XX Farm

(5) CASING INSTALLED:
Threaded ☐ Welded XX
6 " Diam. from 0 ft. to 138 ft. Gage .250
" Diam. from ft. to ft. Gage
" Diam. from ft. to ft. Gage

(6) PERFORATIONS:
Perforated? ☐ Yes XX 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.

(7) SCREENS:
Well screen installed? XX Yes ☐ No
Manufacturer's Name Johnson
Type Stainless Model No.
Diam. 6 Slot size 14 Set from 138 ft. to 143 ft.
Diam. Slot size Set from ft. to ft.

(8) WELL TESTS:
Drawdown is amount water level is lowered below static level
Was a pump test made? XX Yes ☐ No If yes, by whom? Driller
Yield: 150 gal./min. with 80 ft. drawdown after 1 hrs.
" 50 " 35 " 1 "
" " " "
Bailer test gal./min. with ft. drawdown after hrs.
Artesian flow g.p.m.
Temperature of water Depth artesian flow encountered ft.

(9) CONSTRUCTION:
Well seal—Material used Bentonite
Well sealed from land surface to 20 ft.
Diameter of well bore to bottom of seal 9 in.
Diameter of well bore below seal 6 in.
Number of sacks of cement used in well seal 0 sacks
Number of sacks of bentonite used in well seal 3 sacks
Brand name of bentonite Baroid
Number of pounds of bentonite per 100 gallons of water granular lbs./100 gals.
Was a drive shoe used? XX Yes ☐ No Plugs Size: location ft.
Did any strata contain unusable water? ☐ Yes XX No
Type of water? depth of strata
Method of sealing strata off
Was well gravel packed? ☐ Yes XX No Size of gravel:
Gravel placed from ft. to ft.

(10) LOCATION OF WELL:
County Marion Driller's well number 53-76
NW ¼ NE ¼ Section 18 T. 4S R. 1W W.M.
Bearing and distance from section or subdivision corner

(11) WATER LEVEL: Completed well.
Depth at which water was first found 89 ft.
Static level 50 ft. below land surface. Date 8-11-76
Artesian pressure lbs. per square inch. Date

(12) WELL LOG:
Diameter of well below casing 6
Depth drilled 147 ft. Depth of completed well 143 ft.

Formation: Describe color, texture, grain size and structure of materials; and show thickness and nature of each stratum and aquifer penetrated, with at least one entry for each change of formation. *Report each change in position of Static Water Level and indicate principal water-bearing strata.*

MATERIAL	From	To	SWL
Topsoil	0	2	
Clay brown	2	18	
Clay brown sandy	18	32	
Clay brown	32	44	
Clay grey	44	63	
Claystone grey	63	89	
Sand & gravel waterbearing	89	102	
Clay grey	102	117	
Brown sandy clay	117	128	
Sand & gravel Waterbearing	128	147	50

Work started 8-9 1976 Completed 8-11 1976
Date well drilling machine moved off of well 8-11 1976

Drilling Machine Operator's Certification:
This well was constructed under my direct supervision. Materials used and information reported above are true to my best knowledge and belief.
[Signed] Eugene M. Skyles (Drilling Machine Operator) Date 8-12, 1976
Drilling Machine Operator's License No. 271

Water Well Contractor's Certification:
This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.
Name Skyles Drilling and Supply (Person, firm or corporation) (Type or print)
Address 1169 Molalla Avenue, Oregon City
[Signed] Maxine R. Skyles (Water Well Contractor)
Contractor's License No. 553 Date 8-12, 1976

(USE ADDITIONAL SHEETS IF NECESSARY)

SP*45656-119

NOTICE TO WATER WELL CONTRACTOR
The original and first copy of this report are to be filed with the

WATER RESOURCES DEPARTMENT,
SALEM, OREGON 97310
within 30 days from the date of well completion.

WATER WELL REPORT
STATE OF OREGON
(Please type or print)
(Do not write above this line) MAR 1...4 564

State Well No. 45/1W-1766
State Permit No.

(1) OWNER:
Name Lyn. Cromwell
Address Donald Ore.

(2) TYPE OF WORK (check):
New Well ☑ Deepening ☐ Reconditioning ☐ Abandon ☐
If abandonment, describe material and procedure in Item 12.

(3) TYPE OF WELL:
Rotary ☐ Driven ☐
[illegible] ☑ Jetted ☐
[illegible] ☐ Bored ☐

(4) PROPOSED USE (check):
Domestic ☑ Industrial ☐ Municipal ☐
Irrigation ☐ Test Well ☐ Other ☐

(5) CASING INSTALLED:
Threaded ☐ Welded ☑
6 " Diam. from 0 ft. to 160 ft. Gage 250
[illegible] " Diam. from [illegible] ft. to [illegible] ft. Gage [illegible]
[illegible] " Diam. from [illegible] ft. to [illegible] ft. Gage [illegible]

(6) PERFORATIONS:
Perforated? ☐ Yes ☑ No.
Type of perforator used
Size of perforations in. by in.
[illegible] perforations from [illegible] ft. to [illegible] ft.
[illegible] perforations from [illegible] ft. to [illegible] ft.
[illegible] perforations from [illegible] ft. to [illegible] ft.

(7) SCREENS:
Well screen installed? ☐ Yes ☑ No
Manufacturer's Name
Type Model No.
Diam. Slot size Set from ft. to ft.
Diam. Slot size Set from ft. to ft.

(8) WELL TESTS:
Drawdown is amount water level is lowered below static level
[illegible] a pump test made? ☑ Yes ☐ No If yes, by whom? Driller
Yield: 60 gal./min. with 18 ft. drawdown after 24 hrs.
[illegible] " " "
" " " "
[illegible]er test gal./min. with ft. drawdown after hrs.
[illegible]rtesian flow g.p.m.
[illegible]mperature of water Depth artesian flow encountered ft.

(9) CONSTRUCTION:
Well seal—Material used Cement
Well sealed from land surface to 24 ft.
Diameter of well bore to bottom of seal 10 in.
Diameter of well bore below seal 6 in.
Number of sacks of cement used in well seal 9 sacks
How was cement grout placed? Pumped

Was a drive shoe used? ☑ Yes ☐ No Plugs Size: location ft.
Did any strata contain unusable water? ☐ Yes ☐ No
Type of water? depth of strata
Method of sealing strata off
Was well gravel packed? ☐ Yes ☑ No Size of gravel:
Gravel placed from ft. to ft.

(10) LOCATION OF WELL:
County Marion Driller's well number
NW ¼ NW ¼ Section 17 T. 4S R. R. 1W W.M.
Bearing and distance from section or subdivision corner

(11) WATER LEVEL: Completed well.
Depth at which water was first found ft.
Static level 32 ft. below land surface. Date 12-15-79
Artesian pressure lbs. per square inch. Date

(12) WELL LOG:
Diameter of well below casing —
Depth drilled 160 ft. Depth of completed well 160 ft.

Formation: Describe color, texture, grain size and structure of materials; and show thickness and nature of each stratum and aquifer penetrated, with at least one entry for each change of formation. Report each change in position of Static Water Level and indicate principal water-bearing strata.

MATERIAL	From	To	SWL
Top Soil	0	2	
Brown Clay	2	22	
Light Brown Clay	22	28	
Light Blue Clay	28	32	
Dark Blue Clay	32	62	
Brown Sand	62	92	
Blue Clay Sandy	92	104	
Blue Clay	104	140	
Black Sand	140	154	
Sand & Gravel	154	160	32

RECEIVED
JAN 24 1980
WATER RESOURCES DEPT.
SALEM, OREGON

Work started 12-7 1979 Completed 12-15 1979
Date well drilling machine moved off of well 12-15 1979

Drilling Machine Operator's Certification:
This well was constructed under my direct supervision. Materials used and information reported above are true to my best knowledge and belief.
[Signed] John W Beck (Drilling Machine Operator) Date 12-15, 1979
Drilling Machine Operator's License No. 437

Water Well Contractor's Certification:
This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.
Name J W Beck Well Drilling (Person, firm or corporation) (Type or print)
Address 24137 S Skyline Dr Canby Ore
[Signed] John W Beck (Water Well Contractor)
Contractor's License No. 1149 Date 12-15, 1979

(USE ADDITIONAL SHEETS IF NECESSARY)
SP*45656-119

STATE ENGINEER
Salem, Oregon

565
MARION

Well Record

GR- 1731

STATE WELL NO. 4/1W-17R
COUNTY Marion
APPLICATION NO. GR- 1789

OWNER: Raymond Gilles

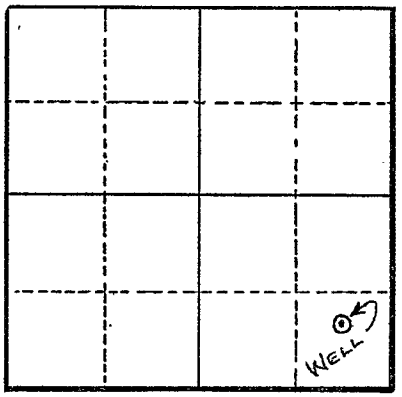
MAILING ADDRESS: RT. 1, Box 228

LOCATION OF WELL: Owner's No. .....

CITY AND STATE: Aurora, Oregon

SE ¼ SE ¼ Sec. 17 T. 4 S., R. 1 W., W.M.

Bearing and distance from section or subdivision corner 693' E. & 924' N. from SE cor. Sec. 17



Altitude at well 180'

TYPE OF WELL: Drilled Date Constructed 1955

Depth drilled 104' Depth cased 104'

Section 17

CASING RECORD:
8"

FINISH:
Torch cut perforations: 16" x 1/8" (100 total) from 60 to 104 ft.

AQUIFERS:

WATER LEVEL:
20'

PUMPING EQUIPMENT: Type Layne & Bowler H.P. 15
Capacity 275 G.P.M.

WELL TESTS:
Drawdown ..... ft. after ..... hours ..... G.P.M.
Drawdown ..... ft. after ..... hours ..... G.P.M.

USE OF WATER Irrigation Temp. ..... °F. ....., 19.....
SOURCE OF INFORMATION GR Record
DRILLER or DIGGER .....
ADDITIONAL DATA:
Log ..... Water Level Measurements ..... Chemical Analysis ..... Aquifer Test .....

REMARKS:

Log:

Top soil	0 to 4 ft.
Brown clay	4 to 28 ft.
Sandy blue clay	28 to 67 ft.
Brown clay	67 to 74 ft.
Sand & small gravel	74 to 94 ft.
Sand & large gravel	94 to 104 ft.

Irrigation of 31.7 acres.

State Printing 89316

NOTICE TO WATER WELL CONTRACTOR
The original and first copy of this report are to be filed with the
STATE ENGINEER, SALEM, OREGON 97310 within 30 days from the date of well completion.

WATER WELL REPORT
STATE OF OREGON
(Please type or print)

RECEIVED
AUG 1 1975
WATER RESOURCES DEPT.
SALEM, OREGON

MAR. 568

State Well No. 4S/1W-17
State Permit No.

(Do not write above this line)

(1) OWNER:
Name John Singer
Address Rt 1, Box 43
Aurora, Ore. 97002

(2) TYPE OF WORK (check):
New Well ☒ Deepening ☐ Reconditioning ☐ Abandon ☐
If abandonment, describe material and procedure in Item 12.

(3) TYPE OF WELL:
Rotary ☐ Driven ☐
Cable ☒ Jetted ☐
Dug ☐ Bored ☐

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

(5) CASING INSTALLED:
Threaded ☐ Welded ☒
8" Diam. from +2 ft. to 163'10" Gage .250
" Diam. from ft. to ft. Gage
" Diam. from ft. to ft. Gage

(6) PERFORATIONS:
Perforated? ☒ Yes ☐ No.
Type of perforator used Cutting torch
Size of perforations 3/8 in. by 6 in.
344 perforations from 116 ft. to 157'9" ft.
perforations from ft. to ft.
perforations from ft. to ft.

(7) SCREENS:
Well screen installed? ☐ Yes ☒ No
Manufacturer's Name
Type Model No.
Diam. Slot size Set from ft. to ft.
Diam. Slot size Set from ft. to ft.

(8) WELL TESTS:
Drawdown is amount water level is lowered below static level
Was a pump test made? ☒ Yes ☐ No If yes, by whom? driller
Yield: 490 gal./min. with 21 ft. drawdown after 4 hrs.
" " " "
" " " "
Bailer test gal./min. with ft. drawdown after hrs.
Artesian flow g.p.m.
Temperature of water Depth artesian flow encountered ft.

(9) CONSTRUCTION:
spudded in clay cuttings
Well seal—Material used
Well sealed from land surface to 25 ft.
Diameter of well bore to bottom of seal 12 in.
Diameter of well bore below seal 12 in.
Number of sacks of cement used in well seal — sacks
Number of sacks of bentonite used in well seal — sacks
Brand name of bentonite
Number of pounds of bentonite per 100 gallons of water lbs./100 gals.
Was a drive shoe used? ☐ Yes ☒ No Plugs Size: location ft.
Did any strata contain unusable water? ☐ Yes ☒ No
Type of water? — depth of strata —
Method of sealing strata off —
Was well gravel packed? ☒ Yes ☐ No Size of gravel: 3/4-1/4
Gravel placed from 0 ft. to 147 ft.

(10) LOCATION OF WELL:
County Marion Driller's well number 7502
¼ ¼ Section 17 T. 4S R. 1W W.M.
Bearing and distance from section or subdivision corner

(11) WATER LEVEL: Completed well.
Depth at which water was first found 14 ft.
Static level 63 ft. below land surface. Date 6-25-75
Artesian pressure lbs. per square inch. Date

(12) WELL LOG:
Diameter of well below casing —
Depth drilled 167 ft. Depth of completed well 165'10" ft.

Formation: Describe color, texture, grain size and structure of materials; and show thickness and nature of each stratum and aquifer penetrated, with at least one entry for each change of formation. *Report each change in position of Static Water Level and indicate principal water-bearing strata.*

MATERIAL	From	To	SWL
brown soil	0	2	
brown clay	2	9	
silty brown clay	9	14	
hard brown clay	14	26	
silty blue clay	26	33	
sticky gray clay	33	39	
sticky blue blay	39	46	
silty brown clay	46	52	
hard brown sand	52	65	
gritty brown clay	65	80	
gritty blue clay	80	90	
brown sand	90	96	
black sand & gravel	96	108	
blue clay	108	123	
green sticky clay	123	131	
gray gritty clay	131	140	
black sand & gravel	140	167	

Work started 5-20 19 75 Completed 6-26- 19 75
Date well drilling machine moved off of well 6-26 19 75

Drilling Machine Operator's Certification:
This well was constructed under my direct supervision. Materials used and information reported above are true to my best knowledge and belief.
[Signed] Edgar J Mullen (Drilling Machine Operator) Date 7-21-, 19 75
Drilling Machine Operator's License No. 581

Water Well Contractor's Certification:
This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.
Name Milo Schneider Equipment Co. (Person, firm or corporation) (Type or print)
Address Star Rt., Box 97, St. Paul, Ore.
[Signed] Milo Schneider (Water Well Contractor)
Contractor's License No. 387 Date 7-23, 19 75

(USE ADDITIONAL SHEETS IF NECESSARY)

SP*45656-119

NOTICE TO WATER WELL CONTRACTOR
The original and first copy of this report are to be filed with the WATER RESOURCES DEPARTMENT, SALEM, OREGON 97310 within 30 days from the date of well completion.

RECEIVED
AUG 26 1980
WATER RESOURCES DEPT
SALEM, OREGON

WATER WELL REPORT
STATE OF OREGON
(Please type or print)
(Do not write above this line)

MAR 5562

State Well No. 4S/1W-17

State Permit No.

(1) OWNER:
Name City of Donald
Address City Hall
Donald, Oregon 97020

(2) TYPE OF WORK (check):
New Well ☒ Deepening ☐ Reconditioning ☐ Abandon ☐
If abandonment, describe material and procedure in Item 12.

(3) TYPE OF WELL:
Rotary ☐ Driven ☐
Cable ☒ Jetted ☐
[redacted] ☐ Bored ☐

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

(5) CASING INSTALLED:
Threaded ☐ Welded ☒
12 " Diam. from +1½ ft. to 210 ft. Gage .250
" Diam. from ft. to ft. Gage
" Diam. from ft. to ft. Gage

(6) PERFORATIONS:
Perforated? ☒ Yes ☐ No.
Type of perforator used Mills Knife
Size of perforations 3/8 in. by 2½ in.
216 perforations from 175 ft. to 185 ft.
perforations from ft. to ft.
perforations from ft. to ft.

(7) SCREENS:
Well screen installed? ☐ Yes ☒ No
Manufacturer's Name
Type Model No.
Diam. Slot size Set from ft. to ft.
Diam. Slot size Set from ft. to ft.

(8) WELL TESTS:
Drawdown is amount water level is lowered below static level
Was a pump test made? ☒ Yes ☐ No If yes, by whom?
[redacted]: 500 gal./min. with 84 ft. drawdown after ½ hrs.
[redacted] 300 " 61 " 23½ "
" " " "
Bailer test gal./min. with ft. drawdown after hrs.
[redacted]sian flow g.p.m.
[redacted]mperature of water Depth artesian flow encountered ft.

(9) CONSTRUCTION:
Well seal—Material used Portland Cement
Well sealed from land surface to 25 ft.
Diameter of well bore to bottom of seal 16 in.
Diameter of well bore below seal 12 in.
Number of sacks of cement used in well seal 17 sacks
How was cement grout placed? mixed and poured through tremy pipe
Was a drive shoe used? ☒ Yes ☐ No Plugs Size: location ft.
Did any strata contain unusable water? ☐ Yes ☒ No
Type of water? depth of strata
Method of sealing strata off crushed gravel placed from
Was well gravel packed? ☐ Yes ☒ No Size of gravel: 3/4 minus
Gravel placed from 207 ft. to 210 ft.

(10) LOCATION OF WELL:
County Marion Driller's well number 2314
¼ ¼ Section 17 T. 4S R. 1W W.M.
Bearing and distance from section or subdivision corner

(11) WATER LEVEL: Completed well.
Depth at which water was first found 103 ft.
Static level 75 ft. below land surface. Date 8/13/80
Artesian pressure lbs. per square inch. Date

(12) WELL LOG:
Diameter of well below casing
Depth drilled 210 ft. Depth of completed well 210 207 ft.

Formation: Describe color, texture, grain size and structure of materials; and show thickness and nature of each stratum and aquifer penetrated, with at least one entry for each change of formation. Report each change in position of Static Water Level and indicate principal water-bearing strata.

MATERIAL	From	To	SWL
Topsoil	0	2	
Hard Brown Clay	2	6	
Brown Clay	6	27	
Blue Clay	27	42	
Sticky Blue Clay	42	68	
Brown Clay	68	83	
Sticky Brown Clay	83	96	
Brown Silty Clay	96	103	
Brown Sand and Gravel, clay some water	103	123	67
Brown Clay	123	128	
Silty Blue Gray Clay	128	136	
Sticky Blue Clay	136	159	
Silty Blue Clay	159	171	
Black Sandy Gravel	171	174	
Black Sand and Gravel	174	186	75
Black Sand and wood	186	206	
Blue Clay	206	210	
Black Sand	210	?	

Work started 7/28/80 19 Completed 8/13/80 19
Date well drilling machine moved off of well 8/13/80 19

Drilling Machine Operator's Certification:
This well was constructed under my direct supervision. Materials used and information reported above are true to my best knowledge and belief.
[Signed] Mark D Beers (Drilling Machine Operator) Date 8/15/80, 19
Drilling Machine Operator's License No. 811

Water Well Contractor's Certification:
This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.
Name Willamette Drilling Co. (Person, firm or corporation) (Type or print)
Address 7365 O'Neil Rd. N.E. Salem, OR 97303
[Signed] Dallas L Beers (Water Well Contractor)
Contractor's License No. 561 Date 8/15/80, 19

(USE ADDITIONAL SHEETS IF NECESSARY)

SP*45656-119

MARI 56719 Amended *

STATE OF OREGON
WATER SUPPLY WELL REPORT
(as required by ORS 537.765)

MARI 56719

WELL I.D. # L 56631
START CARD # 101574

Instructions for completing this report are on the last page of this form.

(1) OWNER: Well Number
Name Norman & Itha Reiling Trust
Address 10773 Feller Rd.
City Aurora ~~OR Hubbard~~ State OR Zip ~~97002~~ 97032

(2) TYPE OF WORK
☒ New Well ☐ Deepening ☐ Alteration (repair/recondition) ☐ Abandonment

(3) DRILL METHOD:
☐ Rotary Air ☐ Rotary Mud ☒ Cable ☐ Auger
☐ Other

(4) PROPOSED USE:
☐ Domestic ☐ Community ☐ Industrial ☒ Irrigation
☐ Thermal ☐ Injection ☐ Livestock ☐ Other

(5) BORE HOLE CONSTRUCTION:
Special Construction approval ☐ Yes ☒ No Depth of Completed Well 238 ft.
Explosives used ☐ Yes ☒ No Type Amount

HOLE Diameter	From	To	SEAL Material	From	To	Sacks or pounds
18"	0	238	cement	0	150	174sacks cem & 5%bentonite

How was seal placed: Method ☐ A ☐ B ☒ C ☐ D ☐ E
☐ Other
Backfill placed from ft. to ft. Material
Gravel placed from 150 ft. to 238 ft. Size of gravel 5-9

(6) CASING/LINER:

	Diameter	From	To	Gauge	Steel	Plastic	Welded	Threaded
Casing:					☐	☐	☐	☐
					☐	☐	☐	☐
					☐	☐	☐	☐
					☐	☐	☐	☐
Liner:	~~2½"~~	+8"	199 4"		☒	☐	☐	☒
	~~2½"~~	+19"	175 5"		☒	☐	☐	☒

Final location of shoe(s)

(7) PERFORATIONS/SCREENS:
☐ Perforations Method
☒ Screens Type Material stainless

From	To	Slot size	Number	Diameter	Tele/pipe size	Casing	Liner
+2	178 6"			12"	pipe	☒	☐
178 6"	192 10"	.075		12"	p.s.	☐	☐
192 10"	200 7"			12"	pipe	☒	☐
200 7"	208	.075		12"	p.s.	☐	☐
208	210 9"			12"	pipe	☒	☐
210 9"	231 1"	.075		12"	p.s.	☐	
231 1"	238			12"	pipe	☒	

(8) WELL TESTS: Minimum testing time is 1 hour
☒ Pump ☐ Bailer ☐ Air ☐ Flowing ☐ Artesian

Yield gal/min	Drawdown	Drill stem at	Time
825	127 3"		1 hr.
775	128 8"		5 hrs.

Temperature of water 53 Depth Artesian Flow Found
Was a water analysis done? ☐ Yes By whom
Did any strata contain water not suitable for intended use? ☐ Too little
☐ Salty ☐ Muddy ☐ Odor ☐ Colored ☐ Other
Depth of strata:

(9) LOCATION OF WELL by legal description:
County Marion Latitude Longitude
Township 4S N or S Range 1W E or W. WM.
Section 17 NW 1/4 SE 1/4
Tax Lot 2600 Lot Block Subdivision
Street Address of Well (or nearest address) Donald Rd (east of Donald next to city limits- Donald OR

(10) STATIC WATER LEVEL:
53 ft. below land surface. Date 6/6/02
Artesian pressure lb. per square inch. Date

(11) WATER BEARING ZONES:
Depth at which water was first found 82

From	To	Estimated Flow Rate	SWL
82	109	30gpm	
179	231	775 gpm	53

(12) WELL LOG:
Ground Elevation

Material	From	To	SWL
See attached page			

RECEIVED
SEP 05 2002
WATER RESOURCES DEPT.
SALEM, OREGON

Date started 3/1/02 Completed 7/1/02

(unbonded) Water Well Constructor Certification:
I certify that the work I performed on the construction, alteration, or abandonment of this well is in compliance with Oregon water supply well construction standards. Materials used and information reported above are true to the best of my knowledge and belief.
WWC Number 1704
Signed Date 7/26/02

(bonded) Water Well Constructor Certification:
I accept responsibility for the construction, alteration, or abandonment work performed on this well during the construction dates reported above. All work performed during this time is in compliance with Oregon water supply well construction standards. This report is true to the best of my knowledge and belief.
WWC Number 783
Signed Date 7/10/02

ORIGINAL - WATER RESOURCES DEPARTMENT FIRST COPY - CONSTRUCTOR SECOND COPY - CUSTOMER

STATE OF OREGON
WATER SUPPLY WELL REPORT
(as required by ORS 537.765)
Instructions for completing this report are on the last page of this form.

Mari 56719

WELL I.D. # L 56631
START CARD # 101574

(1) OWNER: Well Number
Name Norman & Itha Reiling Trust
Address 10773 Feller Rd.
City Aurora, OR State Zip 97002

(2) TYPE OF WORK
☒ New Well ☐ Deepening ☐ Alteration (repair/recondition) ☐ Abandonment

(3) DRILL METHOD:
☐ Rotary Air ☐ Rotary Mud ☒ Cable ☐ Auger
☐ Other

(4) PROPOSED USE:
☐ Domestic ☐ Community ☐ Industrial ☒ Irrigation
☐ Thermal ☐ Injection ☐ Livestock ☐ Other

(5) BORE HOLE CONSTRUCTION:
Special Construction approval ☐ Yes ☒ No Depth of Completed Well 238 ft.
Explosives used ☐ Yes ☒ No Type Amount

HOLE Diameter	From	To	Material	SEAL From	To	Sacks or pounds
18"	0	238	cement	0	150	174sacks cem & 5%bentonite

How was seal placed: Method ☐ A ☐ B ☒ C ☐ D ☐ E
☐ Other
Backfill placed from ft. to ft. Material
Gravel placed from 150 ft. to 238 ft. Size of gravel 5-9

(6) CASING/LINER:

	Diameter	From	To	Gauge	Steel	Plastic	Welded	Threaded
Casing:					☐	☐	☐	☐
					☐	☐	☐	☐
					☐	☐	☐	☐
					☐	☐	☐	☐
Liner:	~~2½"~~	~~+8"~~	~~199 4"~~		☐	☐	☐	☐
	2½"	+19"	175 5"		☐	☐	☐	☒

Final location of shoe(s)

(7) PERFORATIONS/SCREENS:
☐ Perforations Method
☒ Screens Type Material stainless

From	To	Slot size	Number	Diameter	Tele/pipe size	Casing	Liner
+2	178 6"			12"	pipe	☒	☐
178 6"	192 10"	.075		12"	p.s.	☐	☐
192 10"	200 7"			12"	pipe	☒	☐
~~200 7"~~	~~208~~	~~.075~~		12"	p.s.	☐	☐
~~208~~	210 9"			12"	pipe	☒	☐
210 9"	231 1"	.075		12"	p.s.	☐	
231 1"	238			12"	pipe	☒	

(8) WELL TESTS: Minimum testing time is 1 hour
☒ Pump ☐ Bailer ☐ Air ☐ Flowing Artesian

Yield gal/min	Drawdown	Drill stem at	Time
825	127 3"		1 hr.
775	128 8"		5 hrs.

Temperature of water 53 Depth Artesian Flow Found
Was a water analysis done? ☐ Yes By whom
Did any strata contain water not suitable for intended use? ☐ Too little
☐ Salty ☐ Muddy ☐ Odor ☐ Colored ☐ Other
Depth of strata:

(9) LOCATION OF WELL by legal description:
County Marion Latitude Longitude
Township 4S N or S Range 1W E or W. WM.
Section 17 NW 1/4 SE 1/4
Tax Lot 2600 Lot Block Subdivision
Street Address of Well (or nearest address) Donald Rd (east of Donald next to city limits- Donald OR

(10) STATIC WATER LEVEL:
53 ft. below land surface. Date 6/6/02
Artesian pressure lb. per square inch. Date

(11) WATER BEARING ZONES:
Depth at which water was first found 82

From	To	Estimated Flow Rate	SWL
82	109	30gpm	
179	231	775 gpm	53

(12) WELL LOG:
Ground Elevation

Material	From	To	SWL
See attached page			

RECEIVED
JUL 31 2002
WATER RESOURCES DEPT.
SALEM, OREGON

Date started 3/1/02 Completed 7/1/02

(unbonded) Water Well Constructor Certification:
I certify that the work I performed on the construction, alteration, or abandonment of this well is in compliance with Oregon water supply well construction standards. Materials used and information reported above are true to the best of my knowledge and belief.
WWC Number 1704
Signed Date 7/26/02

(bonded) Water Well Constructor Certification:
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WWC Number 783
Signed Date 7/10/02

ORIGINAL – WATER RESOURCES DEPARTMENT FIRST COPY – CONSTRUCTOR SECOND COPY – CUSTOMER

Mari
56719

Norman & Itha Reiling Trust
10773 Feller Rd.
Aurora, OR 97002

Well I.D.# L56631

Start Card # 101574

Marion County Township: 4S Range: 1W Sec: 17 NW1/4, SE1/4

WELL LOG

Material	From	To	SWL
Topsoil	0	2	
Clay brown	2	16	
Clay gray	16	43	
Clay gray soft	43	64	
Clay gray sticky	64	72	
Clay blue	72	78	
Clay brown sandy	78	82	
Sand brown & clay	82	98	36
Sand brown & gravel	98	109	36
Clay brown sandy	109	112	
Clay gray sticky	112	115	
Clay gray	115	119	
Sand & clay gray	119	126	44
Sand & clay	126	166	44
Clay gray & blue,sandy	166	175	
Sand	175	177	
Clay gray silty	177	179	
Sand & Gravel	179	193	44
Sand fine silty &clay	193	201	
Sand fine, clay green	201	205	44
Sand black coarse	205	208	44
Clay gray & green sticky	208	210	
Sand,silt & clay green	210	212	44
Sand & clay layers green	212	222	44
Sand	222	225	44
Sand & clay layer green	225	234	44
Clay green,gray, & black	234	239	

STATE OF OREGON

WATER WELL REPORT

(as required by ORS 537.765)

RECEIVED
MAY 23 1986
WATER RESOURCES DEPT.
SALEM, OREGON

MARI.....555

4s/1W-17

Deep. & Record

(for official use only)

PLEASE TYPE or PRINT IN INK

(1) OWNER:

Name Ray + Chuck Gilles

Address 11210 Donald Rd. NE

City Aurora State Oregon

(2) TYPE OF WORK (check):

New Well ☐ Deepening ☑ Reconditioning ☑ Abandon ☐

If abandonment, describe material and procedure in Item 12.

(3) TYPE OF WELL:

Rotary Air ☐ Driven ☐

Rotary Mud ☐ Dug ☐

Cable ☑ Bored ☐

(4) PROPOSED USE (check):

Domestic ☐ Industrial ☐ Municipal ☐

Irrigation ☑ Thermal: ☐ Withdrawal ☐ Reinjection ☐

Other: Piezometric ☐ Grounding ☐ Test ☐

(5) CASING INSTALLED:

Steel ☑ Threaded ☐ Plastic ☐ Welded ☑

8 " Diam. from +1 ft. to 194 ft. Gauge .250

" Diam. from ft. to ft. Gauge

LINER INSTALLED:

Steel ☐ Threaded ☐ Plastic ☐ Welded ☐

" Diam. from ft. to ft. Gauge

(6) PERFORATIONS:

Perforated? ☑ Yes ☐ No

Size of perforations 3/8 in. by 2½ in.

336 perforations from 155 ft. to 169 ft.

perforations from ft. to ft.

perforations from ft. to ft.

(7) SCREENS:

Well screen installed? ☐ Yes ☑ No

Manufacturer's Name

Type Model No.

Diam. Slot Size Set from ft. to ft.

Diam. Slot Size Set from ft. to ft.

(8) WELL TESTS:

Drawdown is amount water level is lowered below static level

Was a pump test made? ☑ Yes ☐ No If yes, by whom? Driller

250 gal./min. with 88 ft. drawdown after 6 hrs.

375 " 109 " 4 "

Air test gal./min. with drill stem at ft. hrs.

Bailer test gal./min. with ft. drawdown after hrs.

Artesian flow g.p.m.

Temperature of water Depth artesian flow encountered ft.

(9) CONSTRUCTION:

Special standards: Yes ☑ No ☐ Rd.

Well seal—Material used 5 sack/yd. concrete Mix

Well sealed from land surface to 18 ft.

Diameter of well bore to bottom of seal 60 in.

Diameter of well bore below seal 8 in.

Amount of sealing material 10yds. concrete-50 sacks ☑ pounds ☐

How was cement grout placed? Delivered to bottom through a tremie pipe.

Was pump installed? No Type HP Depth ft.

Was a drive shoe used? ☑ Yes ☐ No Plugs Size: location ft.

Did any strata contain unusable water? ☐ Yes ☑ No

Type of Water? depth of strata

Method of sealing strata off

Was well gravel packed? ☐ Yes ☑ No Size of gravel:

Gravel placed from ft. to ft.

(10) LOCATION OF WELL by legal description:

County Marion ¼ ¼ of Section 17 of

Township 4S (Township is North or South), Range 1W (Range is East or West), WM.

Tax Lot Lot Block Subdivision

MAILING ADDRESS OF WELL (or nearest address) Same as owner

(11) WATER LEVEL of COMPLETED WELL:

Depth at which water was first found 128 ft.

Static level 26 ft. below land surface. Date 5-1-86

Artesian pressure lbs. per square inch. Date

(12) WELL LOG:

Diameter of well below casing 0"

Depth drilled 194 ft. Depth of completed well 188 ft.

Formation: Describe color, texture, grain size and structure of materials; and show thickness and nature of each stratum and aquifer penetrated, with at least one entry for each change of formation. Report each change in position of Static Water Level and indicate principal water-bearing strata.

MATERIAL	From	To	SWL
An old well was reconditioned by removal of the old casing + installing new 8" casing. The original aquifer from 60'-100' was bypassed because of being too Sandy. After removal of casing to cavern extending from -6' to -18' + measuring on average of 60" across was found. From 0' to -6' the annulus measured 30".			
Brown clay	100'	109'	
Blue-gray silty clay w/some fine Sand + small gravel	109'	128'	
Fine black sand	128'	147'	26'
Fine-medium black sd w/some small-med gravel	147'	151'	
Small-med gravel w/fine-coarse black sand (Aquifer)	151'	169'	26'
Dense blue clay	169'	172'	
Gray clay w/some sand	172'	188'	
Fine black sand w/small gravel	188'	189'	
Fine sd w/sparse amt. of ¼" gravel	189'	194'	

Date work started Jan. 14, 86 /completed MAY 15, '86

Date well drilling machine moved off of well May 20 19 86

(unbonded) Water Well Constructor Certification (if applicable):

This well was constructed under my direct supervision. Materials used and information reported above are true to my best knowledge and belief.

[Signed] Date , 19

(bonded) Water Well Constructor Certification:

Bond #499460 (number) Issued by: MARYLAND FIDELITY + DEPOSIT (Surety Company Name)

On behalf of MIKE WALDROOP (type or print name of Water Well Constructor)

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

(Signed) Michael Waldroop (Water Well Constructor)

(Dated) May 21, 1986

NOTICE TO WATER WELL CONSTRUCTOR
The original and first copy of this report are to be filed with the

WATER RESOURCES DEPARTMENT, SALEM, OREGON 97310 within 30 days from the date of well completion.

SP*46866-690

STATE ENGINEER
Salem, Oregon

565
MARI...

Well Record

GR- 1731

STATE WELL NO. 4/1W-17R
COUNTY Marion
APPLICATION NO. GR- 1789

OWNER: Raymond Gilles

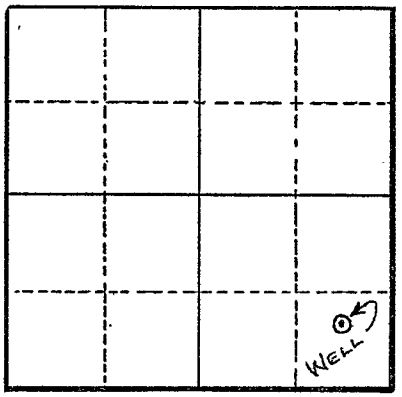
MAILING ADDRESS: RT. 1, Box 228

LOCATION OF WELL: Owner's No. .....

CITY AND STATE: Aurora, Oregon

SE ¼ SE ¼ Sec. 17 T. 4 S., R. 1 W., W.M.

Bearing and distance from section or subdivision corner 693' E. & 924' N. from SE cor. Sec. 17



Altitude at well 180'

TYPE OF WELL: Drilled Date Constructed 1955

Depth drilled 104' Depth cased 104'

Section 17

CASING RECORD:
8"

FINISH:
Torch cut perforations: 16" x 1/8" (100 total) from 60 to 104 ft.

AQUIFERS:

WATER LEVEL:
20'

PUMPING EQUIPMENT: Type Layne & Bowler H.P. 15
Capacity 275 G.P.M.

WELL TESTS:
Drawdown ..... ft. after ..... hours ..... G.P.M.
Drawdown ..... ft. after ..... hours ..... G.P.M.

USE OF WATER Irrigation Temp. ..... °F. ....., 19.....
SOURCE OF INFORMATION GR Record
DRILLER or DIGGER .....
ADDITIONAL DATA:
Log ..... Water Level Measurements ..... Chemical Analysis ..... Aquifer Test .....

REMARKS:

Log:

Top soil	0 to 4 ft.
Brown clay	4 to 28 ft.
Sandy blue clay	28 to 67 ft.
Brown clay	67 to 74 ft.
Sand & small gravel	74 to 94 ft.
Sand & large gravel	94 to 104 ft.

Irrigation of 31.7 acres.

State Printing 89316

ORIGINAL
File Original and Duplicate with the STATE ENGINEER, SALEM, OREGON

RECEIVED JUN 4 1958 STATE ENGINEER

WATER WELL REPORT
STATE OF OREGON

MAR. 551

State Well No. 4/1W - 16N

State Permit No.

(1) OWNER:
Name E.W. DeKoning
Address 2410 S.W. Glen Eagles Rd Oswego, Oregon.

(2) LOCATION OF WELL:
County Marion Owner's number, if any—

¼ ¼ Section T. R. W.M.

Bearing and distance from section or subdivision corner
Intersection Baldock Freeway & Donald Road overpass. S.E. Corner of intersection

(3) TYPE OF WORK (check):
New Well ☒ Deepening ☐ Reconditioning ☐ Abandon ☐
If abandonment, describe material and procedure in Item 11.

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

(5) TYPE OF WELL:
Rotary ☐ Driven ☐
Cable ☐ Jetted ☐
Dug ☒ Bored ☐

(6) CASING INSTALLED:
Threaded ☐ Welded ☐
33 " Diam. from 0 ft. to 35' ft. Gage
" Diam. from ft. to ft. Gage
" Diam. from ft. to ft. Gage

(7) PERFORATIONS:
Perforated? ☐ 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.
perforations from ft. to ft.
perforations from ft. to ft.

(8) SCREENS:
Well screen installed ☐ Yes ☒ No
Manufacturer's Name
Type Model No.
Diam. Slot size Set from ft. to ft.
Diam. Slot size Set from ft. to ft.

(9) CONSTRUCTION:
Was well gravel packed? ☒ Yes ☐ No Size of gravel: 3/4
Gravel placed from 16 ft. to 35' ft.
Was a surface seal provided? ☐ 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

(10) WATER LEVELS:
Static level 17 ft. below land surface Date 4-24-58
Artesian pressure lbs. per square inch Date

Log Accepted by:
[Signed] E.W. DeKoning (Owner) Date June 2, 1958

(11) 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.
" " " "
" " " "
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

(12) WELL LOG:
Diameter of well 33 inches.
Depth drilled 35 ft. Depth of completed well 35 ft.
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	2
clay	2	5
Sand Rock	5	17
Soft light sand	17	24
Sand and clay Mixed	24	35

Work started April 15 1958 Completed May 9 1958

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

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 C.H. & S. H. MYERS (Person, firm, or corporation) (Type or print)
Address 17905 S.W. S. Boones Ferry Rd. Lgnd Gr One
Driller's well number 54
[Signed] Chas H Myers (Well Driller)
License No. 144 Date May 12, 1958

(USE ADDITIONAL SHEETS IF NECESSARY)

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ATTACHMENT C

Well Site Scoring Methodology and Criteria

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Hydrogeologic Conditions

The hydrogeologic conditions of each candidate site are critical for maximizing production capacity of a well or a group of wells. To compare the hydrogeologic characteristics of each candidate site, the following criteria were considered:

- Aquifer Thickness: Conceptually, for an aquifer with a relatively homogenous composition, a larger saturated aquifer thickness corresponds to a greater production capacity potential, as more water bearing material is available for development. For this criterion, candidate sites having larger saturated aquifer thicknesses are scored more favorably than sites with smaller saturated thicknesses.
- Well Specific Capacities: Specific capacity is a well performance metric that provides a general indication of aquifer yield and the production capacity of a well. For this criterion, sites in the vicinity of wells with higher specific capacities are scored more favorably than those with lower values.

Using the scoring methodology in conjunction with the two criteria, the maximum score a candidate site can achieve for this category is 2 (+), based on a positive (+) score for each of the two criteria.

Land Use Compatibility

The land use compatibility classification of site regulates how the site can be developed and what uses can be allowed on the site. Sites in which the development of a public utility facility (such as a production well and pump house) is an allowed use or conditional use are scored more favorably than sites not currently zoned to accommodate such facilities. The following criteria were considered for this category:

- City Limits: Candidate sites situated within City limits where the City would have regulatory authority are scored more favorably than sites that are not.
- Zoning: Candidate sites designated with land uses that allow development of public utility facilities for outright or conditioned use are scored more favorably than sites with more restrictive land uses.

The maximum score a candidate site can achieve for this category is 2 (+), based on a positive (+) score for each of the two criteria.

Setback Requirements and Site Ownership

Potential siting restrictions for water supply wells are outlined as setback requirements in the Oregon Administrative Rules (OAR) through minimum standards for construction and maintenance of wells [OAR 690-210-0030(1)] and for source water protection planning for Group A Public Water Supplies [OAR 333-061-0050(2)(a)(B-G)]. Setback requirements include, but not limited to:

Setback Distance (feet)	Setback Description	Regulatory Authority
5	Any permanent structure, excluding pump houses	OWRD
50	Gravity sewer lines or septic tanks	OHA / OWRD
100	The area within 100 feet of a well shall be owned and controlled by the water supplier	OHA
100	Potential contaminant sources (e.g., pressurized sewer lines, parking lots/roadways, chemical or fuel storage, junk/auto/scrap yards, underground storage tanks, etc.)	OHA
500	Surface water	OHA
500	Hazardous waste storage, disposal, or treatment; underground injection	OWRD

The following criteria were considered for this category:

- Site Ownership: Candidate sites that are owned by the City are scored more favorably than sites that are privately owned.
- Setback Requirements: While some setback requirements can be negotiated or waived if an equivalent level of source water protection can be met, this evaluation scores sites that are able to meet these setback requirements more favorably than sites that may not.
- Developable Area: Candidate locations with less site constraints (e.g., existing buildings and parking lots) are scored more favorably than sites having more site development limitations.

The maximum score a candidate site can achieve for this category is 3 (+), based on a positive (+) score for each of the three criteria.

Susceptibility to Contamination

The proximity of potential contaminant sources can be problematic for production wells if pumping operations are deemed to have the potential to draw contaminants into the well and thereby adversely impact groundwater quality to a degree that requires additional treatment or abandonment of the well. The following criterion was considered for this category:

- Proximity to Potential Contaminant Source: Sites that are proximal to few potential contaminant sources are scored more favorably than sites that are proximal to many potential contaminant sources.

The maximum score a candidate site can achieve for this category is 1 (+), based on a positive (+) score for the single criterion.

Pumping Interference

Pumping interference occurs when the pumping operations of one well reduce the available drawdown and production capacity of a neighboring well. This generally takes place when production wells are too closely spaced and draw groundwater from the same aquifer system. The following criterion was considered for this category:

- Proximity to Existing Wells: Sites that are proximal to existing high-capacity wells or clusters of wells are scored less favorably than sites that are located further away from these pumping centers.

The maximum score a candidate site can achieve for this category is 1 (+), based on a positive (+) score for the single criterion.

MARI 56719 Amended *

MARI 56719

STATE OF OREGON
WATER SUPPLY WELL REPORT
(as required by ORS 537.765)

Instructions for completing this report are on the last page of this form.

WELL I.D. # L 56631
START CARD # 101574

(1) OWNER: Well Number

Name Norman & Itha Reiling Trust

Address 10773 Feller Rd.

City ~~Aurora OR~~ Hubbard State OR Zip ~~97002~~ 97032

(2) TYPE OF WORK

☒ New Well ☐ Deepening ☐ Alteration (repair/recondition) ☐ Abandonment

(3) DRILL METHOD:

☐ Rotary Air ☐ Rotary Mud ☒ Cable ☐ Auger

☐ Other

(4) PROPOSED USE:

☐ Domestic ☐ Community ☐ Industrial ☒ Irrigation

☐ Thermal ☐ Injection ☐ Livestock ☐ Other

(5) BORE HOLE CONSTRUCTION:

Special Construction approval ☐ Yes ☒ No Depth of Completed Well 238 ft.

Explosives used ☐ Yes ☒ No Type Amount

HOLE Diameter	From	To	SEAL Material	From	To	Sacks or pounds
18"	0	238	cement	0	150	174sacks cem & 5%bentonite

How was seal placed: Method ☐ A ☐ B ☒ C ☐ D ☐ E

☐ Other

Backfill placed from ft. to ft. Material

Gravel placed from 150 ft. to 238 ft. Size of gravel 5-9

(6) CASING/LINER:

	Diameter	From	To	Gauge	Steel	Plastic	Welded	Threaded
Casing:					☐	☐	☐	☐
					☐	☐	☐	☐
					☐	☐	☐	☐
					☐	☐	☐	☐
Liner:	~~2½"~~	+8"	199 4"		☒	☐	☐	☒
	~~2½"~~	+19"	175 5"		☒	☐	☐	☒

Final location of shoe(s)

(7) PERFORATIONS/SCREENS:

☐ Perforations Method

☒ Screens Type Material stainless

From	To	Slot size	Number	Diameter	Tele/pipe size	Casing	Liner
+2	178 6"			12"	pipe	☒	☐
178 6"	192 10"	.075		12"	p.s.	☐	☐
192 10"	200 7"			12"	pipe	☒	☐
200 7"	208	.075		12"	p.s.	☐	☐
208	210 9"			12"	pipe	☒	☐
210 9"	231 1"	.075		12"	p.s.	☐	
231 1"	238			12"	pipe	☒	

(8) WELL TESTS: Minimum testing time is 1 hour

☒ Pump ☐ Bailer ☐ Air ☐ Flowing ☐ Artesian

Yield gal/min	Drawdown	Drill stem at	Time
825	127 3"		1 hr.
775	128 8"		5 hrs.

Temperature of water 53 Depth Artesian Flow Found

Was a water analysis done? ☐ Yes By whom

Did any strata contain water not suitable for intended use? ☐ Too little

☐ Salty ☐ Muddy ☐ Odor ☐ Colored ☐ Other

Depth of strata:

(9) LOCATION OF WELL by legal description:

County Marion Latitude Longitude

Township 4S N or S Range 1W E or W. WM.

Section 17 NW 1/4 SE 1/4

Tax Lot 2600 Lot Block Subdivision

Street Address of Well (or nearest address) Donald Rd (east of Donald next to city limits- Donald OR

(10) STATIC WATER LEVEL:

53 ft. below land surface. Date 6/6/02

Artesian pressure lb. per square inch. Date

(11) WATER BEARING ZONES:

Depth at which water was first found 82

From	To	Estimated Flow Rate	SWL
82	109	30gpm	
179	231	775 gpm	53

(12) WELL LOG:

Ground Elevation

Material	From	To	SWL
See attached page			

RECEIVED
SEP 05 2002
WATER RESOURCES DEPT.
SALEM, OREGON

Date started 3/1/02 Completed 7/1/02

(unbonded) Water Well Constructor Certification:

I certify that the work I performed on the construction, alteration, or abandonment of this well is in compliance with Oregon water supply well construction standards. Materials used and information reported above are true to the best of my knowledge and belief.

WWC Number 1704

Signed Date 7/26/02

(bonded) Water Well Constructor Certification:

I accept responsibility for the construction, alteration, or abandonment work performed on this well during the construction dates reported above. All work performed during this time is in compliance with Oregon water supply well construction standards. This report is true to the best of my knowledge and belief.

WWC Number 783

Signed Date 7/10/02

ORIGINAL - WATER RESOURCES DEPARTMENT FIRST COPY - CONSTRUCTOR SECOND COPY - CUSTOMER

STATE OF OREGON
WATER SUPPLY WELL REPORT
(as required by ORS 537.765)

Instructions for completing this report are on the last page of this form.

Mari 56719

WELL I.D. # L 56631
START CARD # 101574

(1) OWNER: Well Number

Name Norman & Itha Reiling Trust
Address 10773 Feller Rd.
City Aurora, OR State Zip 97002

(2) TYPE OF WORK

☒ New Well ☐ Deepening ☐ Alteration (repair/recondition) ☐ Abandonment

(3) DRILL METHOD:

☐ Rotary Air ☐ Rotary Mud ☒ Cable ☐ Auger
☐ Other

(4) PROPOSED USE:

☐ Domestic ☐ Community ☐ Industrial ☒ Irrigation
☐ Thermal ☐ Injection ☐ Livestock ☐ Other

(5) BORE HOLE CONSTRUCTION:

Special Construction approval ☐ Yes ☒ No Depth of Completed Well 238 ft.
Explosives used ☐ Yes ☒ No Type Amount

HOLE Diameter	From	To	Material	SEAL From	To	Sacks or pounds
18"	0	238	cement	0	150	174sacks cem & 5%bentonite

How was seal placed: Method ☐ A ☐ B ☒ C ☐ D ☐ E
☐ Other
Backfill placed from ft. to ft. Material
Gravel placed from 150 ft. to 238 ft. Size of gravel 5-9

(6) CASING/LINER:

	Diameter	From	To	Gauge	Steel	Plastic	Welded	Threaded
Casing:					☐	☐	☐	☐
					☐	☐	☐	☐
					☐	☐	☐	☐
					☐	☐	☐	☐
Liner:	~~2½"~~	+8"	199 4"		☐	☐	☐	☐
	2½"	+19"	175 5"		☐	☐	☐	☒

Final location of shoe(s)

(7) PERFORATIONS/SCREENS:

☐ Perforations Method
☒ Screens Type Material stainless

From	To	Slot size	Number	Diameter	Tele/pipe size	Casing	Liner
+2	178 6"			12"	pipe	☒	☐
178 6"	192 10"	.075		12"	p.s.	☐	☐
192 10"	200 7"			12"	pipe	☒	☐
200 7"	208	.075		12"	p.s.	☐	☐
208	210 9"			12"	pipe	☒	☐
210 9"	231 1"	.075		12"	p.s.	☐	
231 1"	238			12"	pipe	☒	

(8) WELL TESTS: Minimum testing time is 1 hour

☒ Pump ☐ Bailer ☐ Air ☐ Flowing Artesian

Yield gal/min	Drawdown	Drill stem at	Time
825	127 3"		1 hr.
775	128 8"		5 hrs.

Temperature of water 53 Depth Artesian Flow Found
Was a water analysis done? ☐ Yes By whom
Did any strata contain water not suitable for intended use? ☐ Too little
☐ Salty ☐ Muddy ☐ Odor ☐ Colored ☐ Other
Depth of strata:

(9) LOCATION OF WELL by legal description:

County Marion Latitude Longitude
Township 4S N or S Range 1W E or W. WM.
Section 17 NW 1/4 SE 1/4
Tax Lot 2600 Lot Block Subdivision
Street Address of Well (or nearest address) Donald Rd (east of Donald next to city limits- Donald OR

(10) STATIC WATER LEVEL:

53 ft. below land surface. Date 6/6/02
Artesian pressure lb. per square inch. Date

(11) WATER BEARING ZONES:

Depth at which water was first found 82

From	To	Estimated Flow Rate	SWL
82	109	30gpm	
179	231	775 gpm	53

(12) WELL LOG:

Ground Elevation

Material	From	To	SWL
See attached page			

RECEIVED
JUL 31 2002
WATER RESOURCES DEPT.
SALEM, OREGON

Date started 3/1/02 Completed 7/1/02

(unbonded) Water Well Constructor Certification:

I certify that the work I performed on the construction, alteration, or abandonment of this well is in compliance with Oregon water supply well construction standards. Materials used and information reported above are true to the best of my knowledge and belief.

WWC Number 1704
Signed Date 7/26/02

(bonded) Water Well Constructor Certification:

I accept responsibility for the construction, alteration, or abandonment work performed on this well during the construction dates reported above. All work performed during this time is in compliance with Oregon water supply well construction standards. This report is true to the best of my knowledge and belief.

WWC Number 783
Signed Date 7/10/02

ORIGINAL – WATER RESOURCES DEPARTMENT FIRST COPY – CONSTRUCTOR SECOND COPY – CUSTOMER

Mari
56719

Norman & Itha Reiling Trust
10773 Feller Rd.
Aurora, OR 97002

Well I.D.# L56631

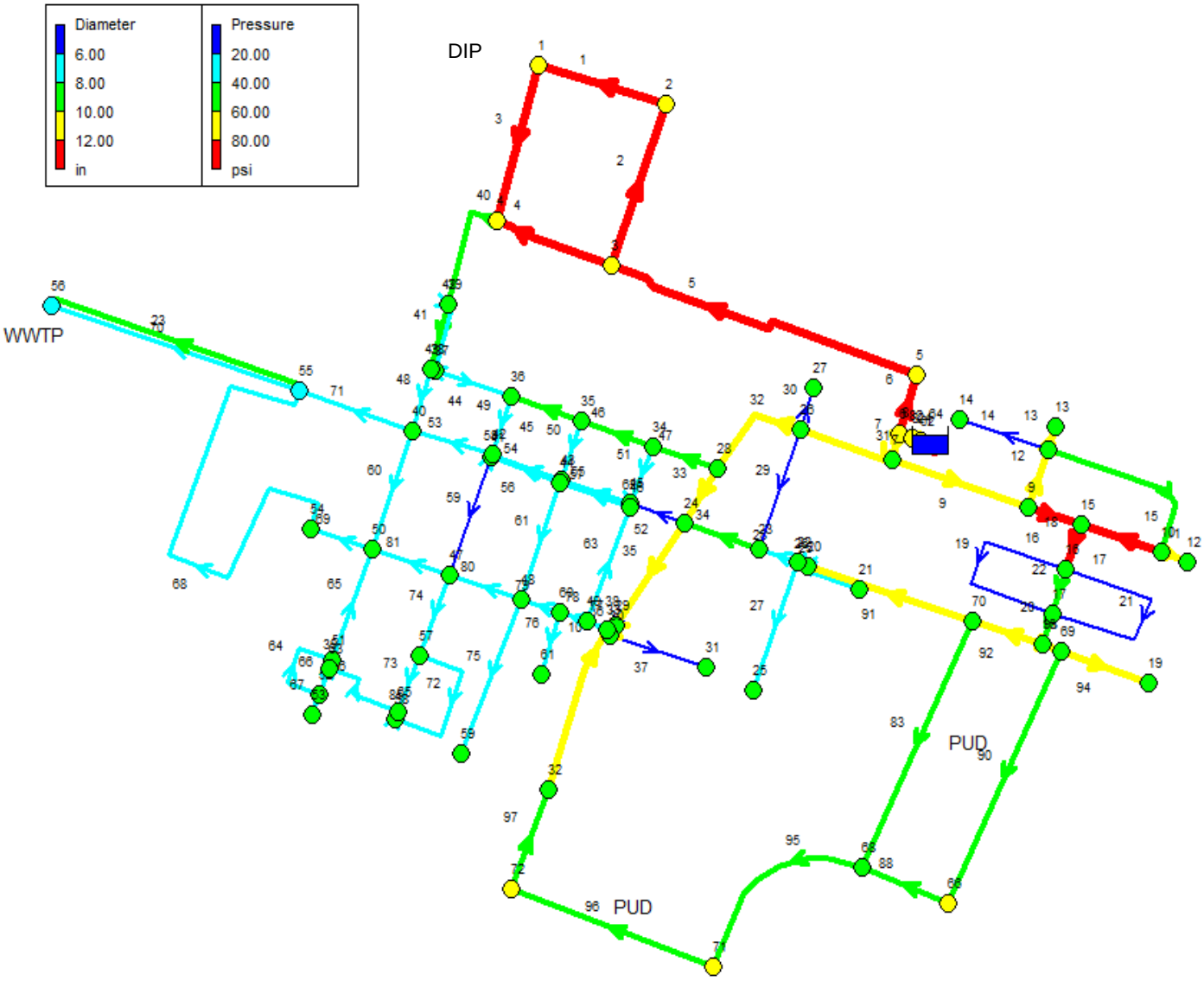
Start Card # 101574

Marion County Township: 4S Range: 1W Sec: 17 NW1/4, SE1/4

WELL LOG

Material	From	To	SWL
Topsoil	0	2	
Clay brown	2	16	
Clay gray	16	43	
Clay gray soft	43	64	
Clay gray sticky	64	72	
Clay blue	72	78	
Clay brown sandy	78	82	
Sand brown & clay	82	98	36
Sand brown & gravel	98	109	36
Clay brown sandy	109	112	
Clay gray sticky	112	115	
Clay gray	115	119	
Sand & clay gray	119	126	44
Sand & clay	126	166	44
Clay gray & blue,sandy	166	175	
Sand	175	177	
Clay gray silty	177	179	
Sand & Gravel	179	193	44
Sand fine silty &clay	193	201	
Sand fine, clay green	201	205	44
Sand black coarse	205	208	44
Clay gray & green sticky	208	210	
Sand,silt & clay green	210	212	44
Sand & clay layers green	212	222	44
Sand	222	225	44
Sand & clay layer green	225	234	44
Clay green,gray, & black	234	239	

Appendix D. Water System Modeling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8.00
10.00
12.00
in
Pressure
20.00
40.00
60.00
80.00
psi
DIP
WWTP
PUD
PUD

WMCP Update, Donald, Scenario 1, v5.0
Network Table - Nodes

Node ID	Elevation ft	ase Deman GPM	Demand GPM	Head ft	Pressure psi
Junc 1	179	12.5	12.5	331.25	65.97
Junc 2	181	5.391	5.39	331.33	65.14
Junc 3	192	5.391	5.39	331.46	60.43
Junc 4	190	5.391	5.39	331.15	61.16
Junc 5	192	5.391	5.39	333.67	61.39
Junc 6	195	5.391	5.39	334.06	60.25
Junc 7	196	5.391	5.39	332.5	59.15
Junc 8	195	5.391	5.39	335.46	60.86
Junc 9	196	5.391	5.39	331.33	58.64
Junc 10	195	5.391	5.39	331.19	59.01
Junc 11	196	5.391	5.39	331.31	58.63
Junc 12	196	5.391	5.39	331.19	58.58
Junc 13	196	5.391	5.39	331.31	58.63
Junc 14	196	5.391	5.39	331.3	58.62
Junc 15	196	5.391	5.39	331.19	58.58
Junc 16	195	5.391	5.39	330.46	58.69
Junc 17	194	5.391	5.39	329.68	58.79
Junc 18	194	5.391	5.39	328.92	58.46
Junc 19	193	5.391	5.39	328.9	58.88
Junc 20	196	5.391	5.39	328.51	57.42
Junc 21	194	5.391	5.39	328.51	58.28
Junc 22	196	5.391	5.39	328.41	57.37
Junc 23	196	5.391	5.39	328.06	57.22
Junc 24	198	5.391	5.39	327.8	56.24
Junc 25	194	5.391	5.39	328.41	58.24
Junc 26	197	5.391	5.39	330.04	57.65
Junc 27	197	5.391	5.39	330.03	57.64
Junc 28	199	5.391	5.39	327.97	55.88
Junc 29	198	5.391	5.39	327.25	56
Junc 30	196	5.391	5.39	327.08	56.8
Junc 31	194	5.391	5.39	326.62	57.47
Junc 32	189	5.391	5.39	327.22	59.89
Junc 33	196	5.391	5.39	327.21	56.85
Junc 34	198	5.391	5.39	326.23	55.56
Junc 35	197	5.391	5.39	325.57	55.71
Junc 36	195	5.391	5.39	325.3	56.46
Junc 37	194	5.391	5.39	325.42	56.94
Junc 38	194	5.391	5.39	325.4	56.93
Junc 39	193	5.391	5.39	326.88	58.01
Junc 40	197	5.391	5.39	316.3	51.69
Junc 41	197	5.391	5.39	323.54	54.83
Junc 42	197	5.391	5.39	323.43	54.78
Junc 43	198	5.391	5.39	325.12	55.08

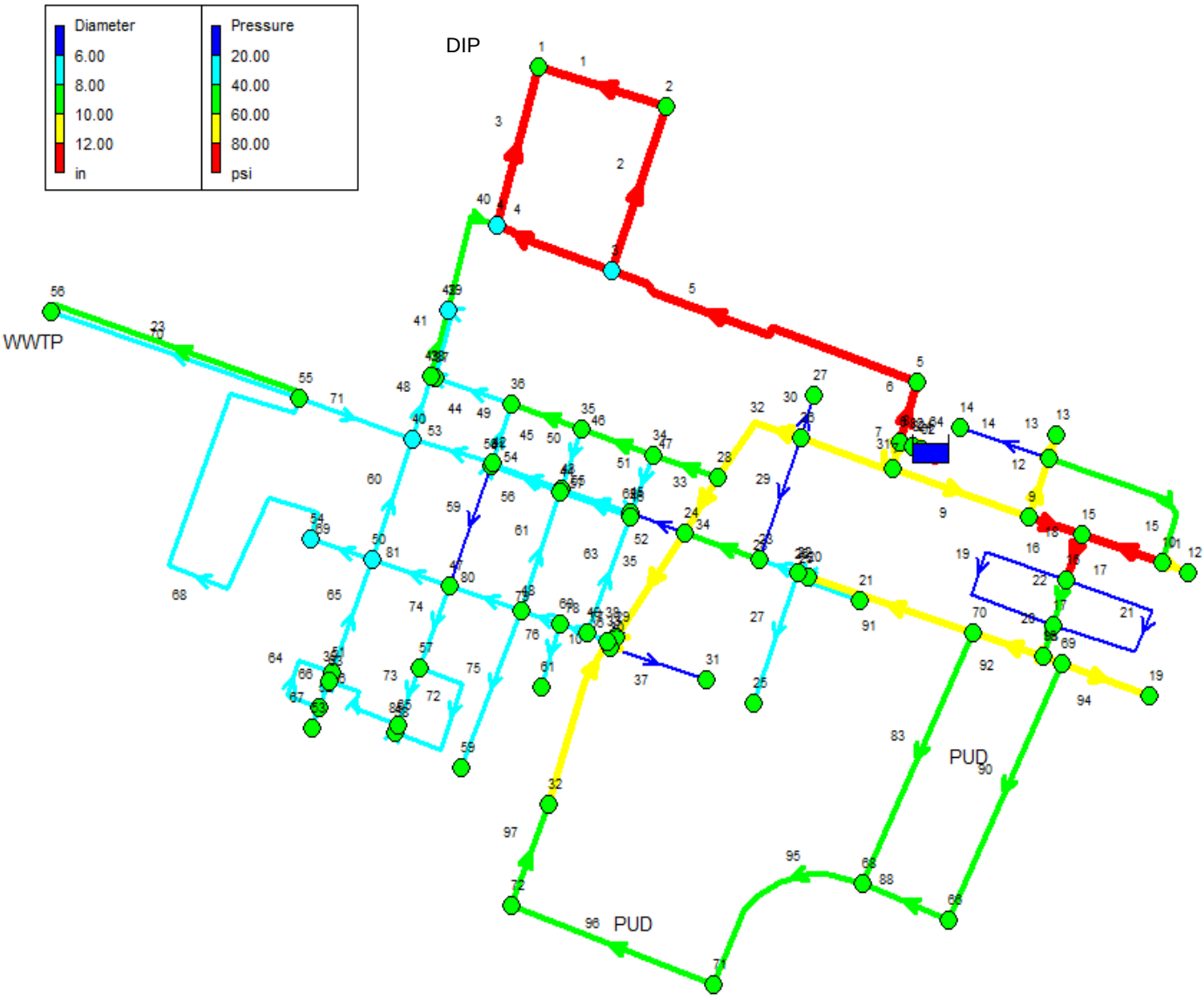
Junc 44	198	5.391	5.39	323.97	54.58
Junc 45	198	5.391	5.39	325.51	55.25
Junc 46	198	5.391	5.39	325.42	55.21
Junc 47	197	5.391	5.39	319.39	53.03
Junc 48	197	5.391	5.39	323.3	54.73
Junc 49	197	5.391	5.39	325.72	55.77
Junc 50	199	5.391	5.39	316.23	50.8
Junc 51	195	5.391	5.39	317.02	52.87
Junc 52	195	5.391	5.39	317.13	52.92
Junc 53	195	5.391	5.39	317.13	52.92
Junc 54	198	5.391	5.39	310.07	48.56
Junc 55	195	5.391	5.39	272.13	33.42
Junc 56	188	1505.391	1505.39	248.86	26.37
Junc 57	194	5.391	5.39	318.36	53.89
Junc 58	192	5.391	5.39	318.1	54.64
Junc 59	191	5.391	5.39	323.29	57.32
Junc 60	197	5.391	5.39	324.71	55.34
Junc 61	194	5.391	5.39	324.71	56.64
Junc 63	195	5.391	5.39	317.17	52.93
Junc 65	192	5.391	5.39	318.09	54.63
Junc 66	179	41.811	41.81	328.2	64.65
Junc 68	197	41.811	41.81	328.11	56.81
Junc 69	194	41.811	41.81	328.9	58.45
Junc 70	194	41.811	41.81	328.68	58.36
Junc 71	183	41.811	41.81	327.58	62.65
Junc 72	183	41.811	41.81	327.31	62.53
Junc 62	195	5.391	5.39	335.57	60.91
Resvr 64	335.69	#N/A	-2103	335.69	0

WMCP Update, Donald, Scenario 1, v5.0
Network Table - Links

	Length	Diameter	Roughness	Flow	Velocity
Link ID	ft	in		GPM	fps
Pipe 1	450	12	120	218.8	0.62
Pipe 2	680	12	120	224.2	0.64
Pipe 3	650	12	120	206.3	0.59
Pipe 4	420	12	120	-472	1.34
Pipe 5	1450	12	120	701.59	1.99
Pipe 6	250	12	120	706.98	2.01
Pipe 7	120	10	120	1379.85	5.64
Pipe 8	50	10	120	2092.22	8.55
Pipe 9	570	10	120	509.74	2.08
Pipe 11	120	10	120	5.39	0.02
Pipe 12	250	10	120	85.28	0.35
Pipe 13	100	10	120	5.39	0.02
Pipe 14	380	4	120	5.39	0.14
Pipe 15	780	8	120	69.11	0.44

Pipe 16	240	12	120	419.07	1.19
Pipe 17	330	12	120	-58.32	0.17
Pipe 18	1000	12	120	472	1.34
Pipe 19	920	4	120	28.31	0.72
Pipe 20	150	8	120	461.22	2.94
Pipe 21	970	4	120	27.51	0.7
Pipe 22	190	8	120	410.78	2.62
Pipe 25	275	6	120	5.39	0.06
Pipe 26	50	6	120	133.04	1.51
Pipe 27	600	6	120	5.39	0.06
Pipe 28	200	6	120	122.26	1.39
Pipe 29	500	4	120	65.4	1.67
Pipe 30	240	4	120	5.39	0.14
Pipe 31	450	10	120	864.72	3.53
Pipe 32	450	10	120	788.53	3.22
Pipe 33	240	10	120	285.37	1.17
Pipe 34	280	8	120	182.27	1.16
Pipe 35	520	10	120	359.37	1.47
Pipe 36	40	2	120	10.78	1.1
Pipe 37	400	2	120	5.39	0.55
Pipe 38	40	10	120	343.2	1.4
Pipe 40	420	8	120	672.92	4.3
Pipe 41	300	8	120	455.64	2.91
Pipe 42	300	6	120	211.89	2.4
Pipe 43	10	6	120	-146.47	1.66
Pipe 44	250	6	120	60.02	0.68
Pipe 45	250	8	120	-199.91	1.28
Pipe 46	250	8	120	323.39	2.06
Pipe 47	300	8	120	497.77	3.18
Pipe 48	275	6	120	596.72	6.77
Pipe 49	275	6	120	254.55	2.89
Pipe 50	275	6	120	118.09	1.34
Pipe 51	225	6	120	168.99	1.92
Pipe 52	250	4	120	-102.88	2.63
Pipe 53	325	6	120	477.9	5.42
Pipe 54	300	6	120	221.37	2.51
Pipe 55	275	6	120	108.68	1.23
Pipe 56	300	6	120	-110.11	1.25
Pipe 57	275	6	120	221.51	2.51
Pipe 58	20	6	120	-228.75	2.6
Pipe 59	500	4	120	97.35	2.49
Pipe 60	510	6	120	32.09	0.36
Pipe 61	500	6	120	106.01	1.2
Pipe 62	30	6	120	157.8	1.79
Pipe 63	480	6	120	-69.1	0.78
Pipe 64	550	6	120	-37.4	0.42
Pipe 65	400	6	120	-130.4	1.48

Pipe 67	100	6	120	5.39	0.06
Pipe 68	1760	6	120	-473.65	5.37
Pipe 69	280	6	120	479.04	5.44
Pipe 70	1050	6	120	480.79	5.46
Pipe 71	480	6	120	1037.14	11.77
Pipe 72	650	6	120	55.1	0.63
Pipe 74	325	6	120	168.14	1.91
Pipe 75	700	6	120	5.39	0.06
Pipe 76	250	6	120	5.39	0.06
Pipe 77	100	6	120	388.16	4.4
Pipe 78	100	6	120	313.67	3.56
Pipe 79	150	6	120	302.89	3.44
Pipe 80	250	6	120	398.12	4.52
Pipe 81	300	6	120	321.93	3.65
Pipe 10	650	10	120	-50.35	0.21
Pipe 39	125	6	120	-98.4	1.12
Pipe 66	125	6	120	48.18	0.55
Pipe 73	200	6	120	107.65	1.22
Pipe 85	50	6	120	-49.71	0.56
Pipe 86	350	6	120	151.97	1.72
Pipe 83	1773.58	8	120	104.45	0.67
Pipe 88	508.23	8	120	76.73	0.49
Pipe 90	1700.95	8	120	-118.54	0.76
Pipe 91	877	10	120	-143.83	0.59
Pipe 92	333	10	120	-290.09	1.19
Pipe 93	102.42	10	120	165.74	0.68
Pipe 94	477.58	10	120	5.39	0.02
Pipe 95	967.39	8	120	139.37	0.89
Pipe 96	948.64	8	120	97.56	0.62
Pipe 97	830.23	8	120	55.74	0.36
Pipe 23	1050	8	120	1024.61	6.54
Pipe 24	10	12	120	2103	5.97
Pipe 82	10	12	120	2097.61	5.95


Diameter
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8.00
10.00
12.00
in
Pressure
20.00
40.00
60.00
80.00
psi
DIP
WWTP
PUD
PUD

WMCP Update, Donald, Scenario 2, v3.0
Network Table - Nodes

Node ID	Elevation ft	ase Deman GPM	Demand GPM	Head ft	Pressure psi
Junc 1	179	2512.5	2512.5	277.46	42.66
Junc 2	181	5.391	5.39	279.11	42.51
Junc 3	192	5.391	5.39	281.64	38.84
Junc 4	190	5.391	5.39	280.94	39.41
Junc 5	192	5.391	5.39	295.27	44.75
Junc 6	195	5.391	5.39	297.63	44.47
Junc 7	196	5.391	5.39	296.41	43.51
Junc 8	195	5.391	5.39	300.52	45.72
Junc 9	196	5.391	5.39	295.48	43.1
Junc 10	195	5.391	5.39	295.37	43.49
Junc 11	196	5.391	5.39	295.46	43.1
Junc 12	196	5.391	5.39	295.37	43.06
Junc 13	196	5.391	5.39	295.46	43.1
Junc 14	196	5.391	5.39	295.45	43.09
Junc 15	196	5.391	5.39	295.36	43.05
Junc 16	195	5.391	5.39	294.79	43.24
Junc 17	194	5.391	5.39	294.18	43.41
Junc 18	194	5.391	5.39	293.58	43.15
Junc 19	193	5.391	5.39	293.56	43.57
Junc 20	196	5.391	5.39	293.29	42.15
Junc 21	194	5.391	5.39	293.29	43.02
Junc 22	196	5.391	5.39	293.22	42.13
Junc 23	196	5.391	5.39	293	42.03
Junc 24	198	5.391	5.39	292.84	41.09
Junc 25	194	5.391	5.39	293.22	42.99
Junc 26	197	5.391	5.39	294.53	42.26
Junc 27	197	5.391	5.39	294.52	42.25
Junc 28	199	5.391	5.39	292.94	40.71
Junc 29	198	5.391	5.39	292.48	40.94
Junc 30	196	5.391	5.39	292.32	41.73
Junc 31	194	5.391	5.39	291.86	42.4
Junc 32	189	5.391	5.39	292.46	44.83
Junc 33	196	5.391	5.39	292.46	41.8
Junc 34	198	5.391	5.39	291.48	40.51
Junc 35	197	5.391	5.39	290.72	40.61
Junc 36	195	5.391	5.39	290	41.16
Junc 37	194	5.391	5.39	286.48	40.07
Junc 38	194	5.391	5.39	286.45	40.06
Junc 39	193	5.391	5.39	285.01	39.87
Junc 40	197	5.391	5.39	288.92	39.83
Junc 41	197	5.391	5.39	290.16	40.37
Junc 42	197	5.391	5.39	290.06	40.32
Junc 43	198	5.391	5.39	290.72	40.17

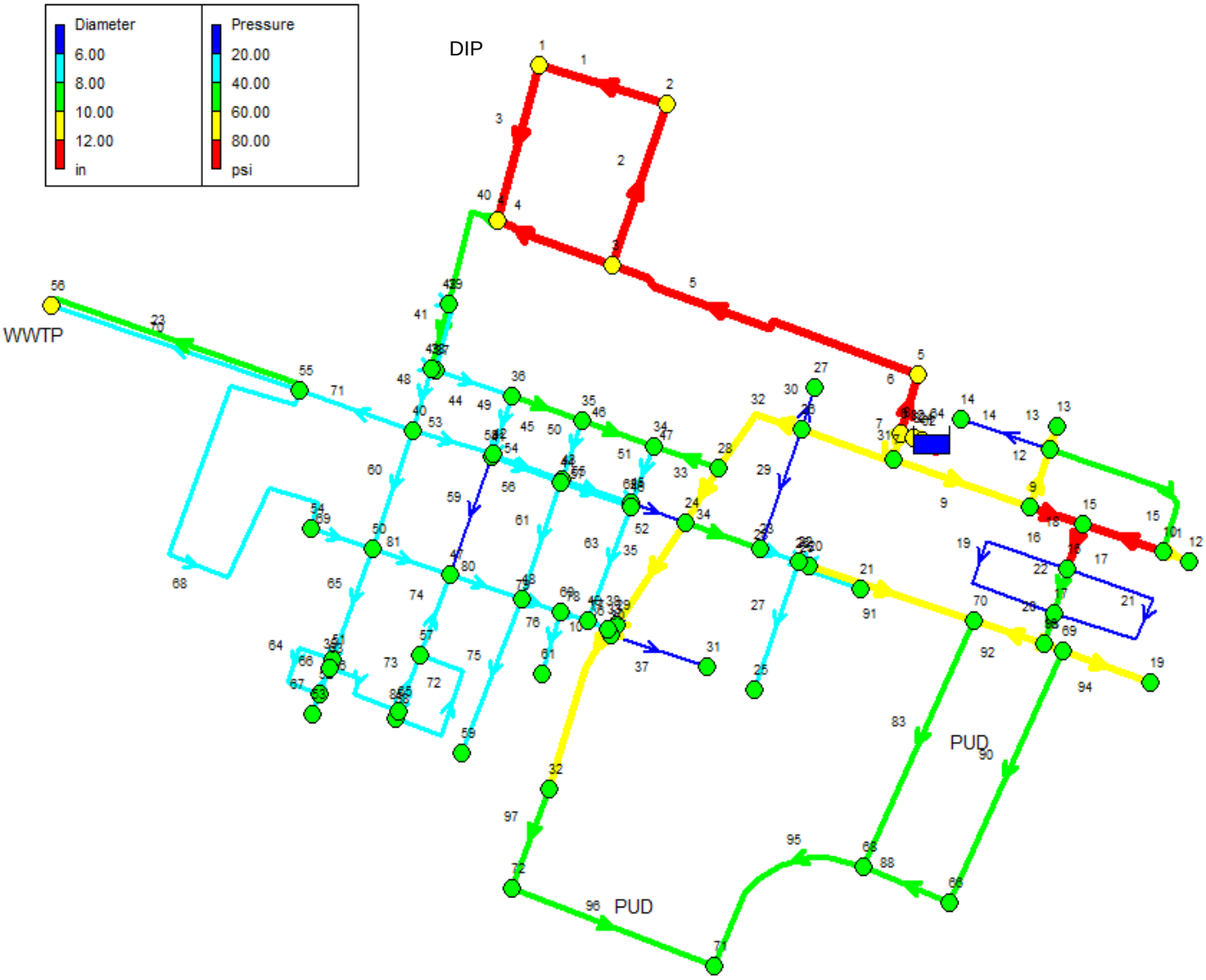
Junc 44	198	5.391	5.39	290.7	40.17
Junc 45	198	5.391	5.39	291.23	40.4
Junc 46	198	5.391	5.39	291.22	40.39
Junc 47	197	5.391	5.39	289.92	40.26
Junc 48	197	5.391	5.39	290.7	40.6
Junc 49	197	5.391	5.39	291.64	41.01
Junc 50	199	5.391	5.39	289.47	39.2
Junc 51	195	5.391	5.39	289.52	40.96
Junc 52	195	5.391	5.39	289.53	40.96
Junc 53	195	5.391	5.39	289.53	40.96
Junc 54	198	5.391	5.39	289.39	39.6
Junc 55	195	5.391	5.39	288.98	40.72
Junc 56	188	5.391	5.39	288.98	43.76
Junc 57	194	5.391	5.39	289.72	41.48
Junc 58	192	5.391	5.39	289.67	42.32
Junc 59	191	5.391	5.39	290.7	43.2
Junc 60	197	5.391	5.39	291.24	40.84
Junc 61	194	5.391	5.39	291.24	42.13
Junc 63	195	5.391	5.39	289.54	40.96
Junc 65	192	5.391	5.39	289.67	42.32
Junc 66	179	41.811	41.81	293.03	49.41
Junc 68	197	41.811	41.81	292.97	41.58
Junc 69	194	41.811	41.81	293.56	43.14
Junc 70	194	41.811	41.81	293.4	43.07
Junc 71	183	41.811	41.81	292.62	47.5
Junc 72	183	41.811	41.81	292.48	47.44
Junc 62	195	5.391	5.39	300.76	45.83
Resvr 64	301	#N/A	-3103	301	0

WMCP Update, Donald, Scenario 2, v3.0
Network Table - Links

	Length	Diameter	Roughness	Flow	Velocity
Link ID	ft	in		GPM	fps
Pipe 1	450	12	120	1129.02	3.2
Pipe 2	680	12	120	1134.42	3.22
Pipe 3	650	12	120	-1383.48	3.92
Pipe 4	420	12	120	-733.48	2.08
Pipe 5	1450	12	120	1873.29	5.31
Pipe 6	250	12	120	1878.68	5.33
Pipe 7	120	10	120	1208.15	4.94
Pipe 8	50	10	120	3092.22	12.63
Pipe 9	570	10	120	452.77	1.85
Pipe 11	120	10	120	5.39	0.02
Pipe 12	250	10	120	77.08	0.31
Pipe 13	100	10	120	5.39	0.02
Pipe 14	380	4	120	5.39	0.14
Pipe 15	780	8	120	60.91	0.39

Pipe 16	240	12	120	370.29	1.05
Pipe 17	330	12	120	-50.13	0.14
Pipe 18	1000	12	120	415.03	1.18
Pipe 19	920	4	120	24.86	0.63
Pipe 20	150	8	120	404.25	2.58
Pipe 21	970	4	120	24.16	0.62
Pipe 22	190	8	120	360.63	2.3
Pipe 25	275	6	120	5.39	0.06
Pipe 26	50	6	120	105.41	1.2
Pipe 27	600	6	120	5.39	0.06
Pipe 28	200	6	120	94.62	1.07
Pipe 29	500	4	120	56.72	1.45
Pipe 30	240	4	120	5.39	0.14
Pipe 31	450	10	120	749.99	3.06
Pipe 32	450	10	120	682.49	2.79
Pipe 33	240	10	120	224.89	0.92
Pipe 34	280	8	120	145.95	0.93
Pipe 35	520	10	120	280.7	1.15
Pipe 36	40	2	120	10.78	1.1
Pipe 37	400	2	120	5.39	0.55
Pipe 38	40	10	120	264.53	1.08
Pipe 40	420	8	120	-655.39	4.18
Pipe 41	300	8	120	-448.23	2.86
Pipe 42	300	6	120	-212.55	2.41
Pipe 43	10	6	120	-158.27	1.8
Pipe 44	250	6	120	-376.21	4.27
Pipe 45	250	8	120	-341.3	2.18
Pipe 46	250	8	120	351.25	2.24
Pipe 47	300	8	120	452.21	2.89
Pipe 48	275	6	120	-295.35	3.35
Pipe 49	275	6	120	-40.3	0.46
Pipe 50	275	6	120	4.56	0.05
Pipe 51	225	6	120	95.57	1.08
Pipe 52	250	4	120	-84.74	2.16
Pipe 53	325	6	120	177.36	2.01
Pipe 54	300	6	120	125.62	1.43
Pipe 55	275	6	120	126.45	1.43
Pipe 56	300	6	120	-123.84	1.41
Pipe 57	275	6	120	127.1	1.44
Pipe 58	20	6	120	-223.05	2.53
Pipe 59	500	4	120	21.02	0.54
Pipe 60	510	6	120	-93.5	1.06
Pipe 61	500	6	120	-2.13	0.02
Pipe 62	30	6	120	48.48	0.55
Pipe 63	480	6	120	-84.02	0.95
Pipe 64	550	6	120	-8.79	0.1
Pipe 65	400	6	120	-31.86	0.36

Pipe 67	100	6	120	5.39	0.06
Pipe 68	1760	6	120	-40.66	0.46
Pipe 69	280	6	120	46.05	0.52
Pipe 70	1050	6	120	1.72	0.02
Pipe 71	480	6	120	-29.88	0.34
Pipe 72	650	6	120	21.87	0.25
Pipe 74	325	6	120	69.6	0.79
Pipe 75	700	6	120	5.39	0.06
Pipe 76	250	6	120	5.39	0.06
Pipe 77	100	6	120	280.16	3.18
Pipe 78	100	6	120	190.75	2.16
Pipe 79	150	6	120	179.97	2.04
Pipe 80	250	6	120	167.06	1.9
Pipe 81	300	6	120	113.09	1.28
Pipe 10	650	10	120	-21.02	0.09
Pipe 39	125	6	120	-28.46	0.32
Pipe 66	125	6	120	19.58	0.22
Pipe 73	200	6	120	42.34	0.48
Pipe 85	50	6	120	-16.48	0.19
Pipe 86	350	6	120	53.43	0.61
Pipe 83	1773.58	8	120	90.51	0.58
Pipe 88	508.23	8	120	61.34	0.39
Pipe 90	1700.95	8	120	-103.15	0.66
Pipe 91	877	10	120	-116.19	0.47
Pipe 92	333	10	120	-248.5	1.02
Pipe 93	102.42	10	120	150.35	0.61
Pipe 94	477.58	10	120	5.39	0.02
Pipe 95	967.39	8	120	110.03	0.7
Pipe 96	948.64	8	120	68.22	0.44
Pipe 97	830.23	8	120	26.41	0.17
Pipe 23	1050	8	120	3.67	0.02
Pipe 24	10	12	120	3103	8.8
Pipe 82	10	12	120	3097.61	8.79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in
Pressure
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40.00
60.00
80.00
psi
DIP
WWTP
PUD
PUD

WMCP Update, Donald, Scenario 3, v2.0
Network Table - Nodes

Node ID	Elevation ft	ase Deman GPM	Demand GPM	Head ft	Pressure psi
Junc 1	179	12.5	12.5	332.6	66.55
Junc 2	181	5.391	5.39	332.64	65.71
Junc 3	192	5.391	5.39	332.71	60.97
Junc 4	190	5.391	5.39	332.55	61.77
Junc 5	192	5.391	5.39	333.85	61.47
Junc 6	195	5.391	5.39	334.06	60.25
Junc 7	196	5.391	5.39	332.03	58.94
Junc 8	195	5.391	5.39	335.46	60.86
Junc 9	196	5.391	5.39	329.56	57.87
Junc 10	195	5.391	5.39	329.26	58.18
Junc 11	196	5.391	5.39	329.52	57.86
Junc 12	196	5.391	5.39	329.26	57.74
Junc 13	196	5.391	5.39	329.52	57.86
Junc 14	196	5.391	5.39	329.51	57.85
Junc 15	196	5.391	5.39	329.25	57.74
Junc 16	195	5.391	5.39	327.63	57.47
Junc 17	194	5.391	5.39	325.89	57.15
Junc 18	194	5.391	5.39	324.18	56.41
Junc 19	193	5.391	5.39	324	56.76
Junc 20	196	5.391	5.39	324.58	55.71
Junc 21	194	5.391	5.39	324.58	56.58
Junc 22	196	5.391	5.39	325	55.9
Junc 23	196	5.391	5.39	326.79	56.67
Junc 24	198	5.391	5.39	327.14	55.96
Junc 25	194	5.391	5.39	325	56.76
Junc 26	197	5.391	5.39	329.81	57.55
Junc 27	197	5.391	5.39	329.8	57.54
Junc 28	199	5.391	5.39	328.03	55.91
Junc 29	198	5.391	5.39	326.01	55.47
Junc 30	196	5.391	5.39	325.85	56.26
Junc 31	194	5.391	5.39	325.39	56.93
Junc 32	189	5.391	5.39	323.01	58.07
Junc 33	196	5.391	5.39	325.93	56.3
Junc 34	198	5.391	5.39	328.03	56.34
Junc 35	197	5.391	5.39	328.08	56.8
Junc 36	195	5.391	5.39	328.24	57.73
Junc 37	194	5.391	5.39	329.67	58.78
Junc 38	194	5.391	5.39	329.68	58.79
Junc 39	193	5.391	5.39	330.41	59.54
Junc 40	197	5.391	5.39	328.29	56.89
Junc 41	197	5.391	5.39	327.99	56.76
Junc 42	197	5.391	5.39	328.04	56.78
Junc 43	198	5.391	5.39	327.96	56.31

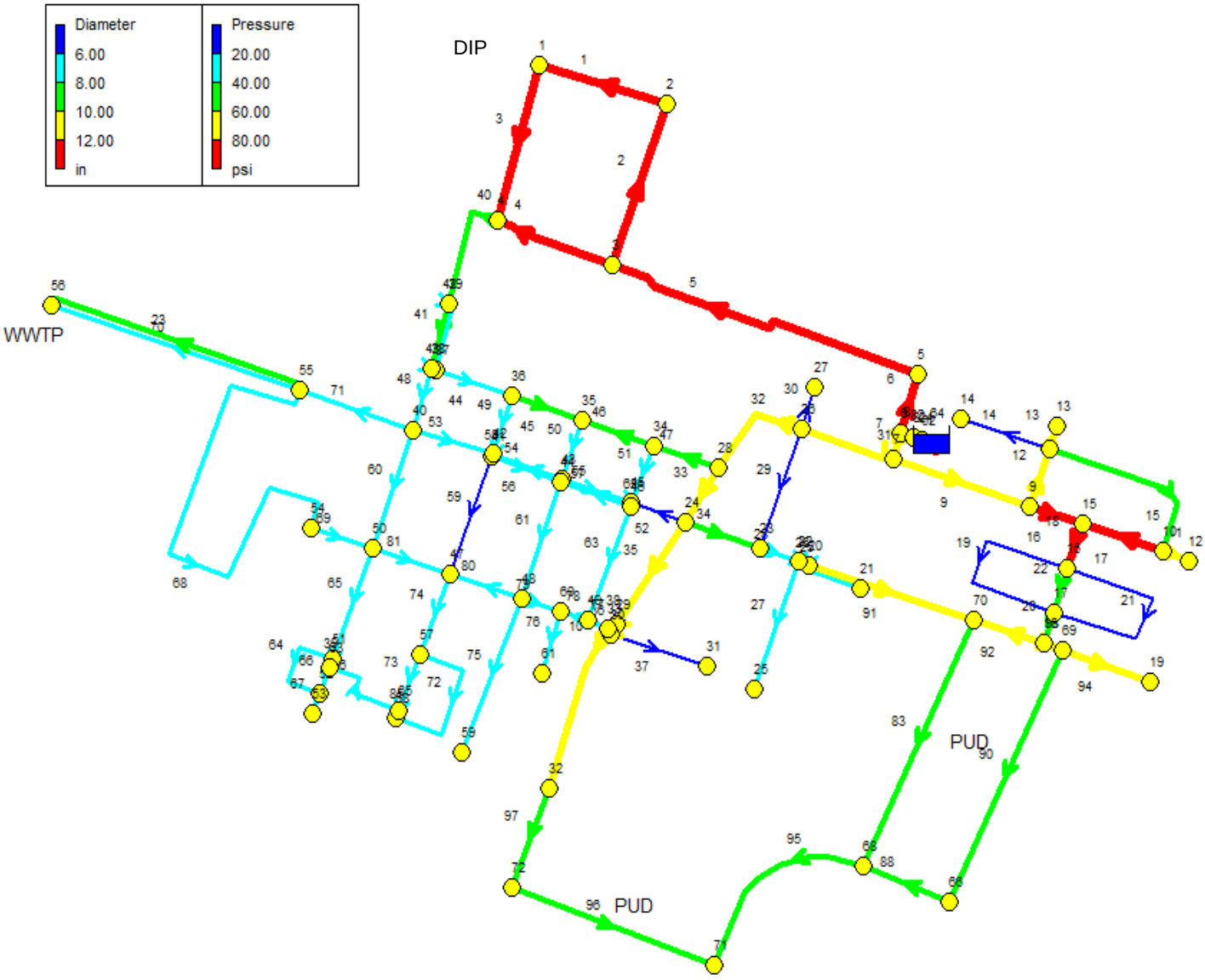
Junc 44	198	5.391	5.39	327.69	56.2
Junc 45	198	5.391	5.39	327.74	56.22
Junc 46	198	5.391	5.39	327.69	56.19
Junc 47	197	5.391	5.39	327.64	56.6
Junc 48	197	5.391	5.39	327.36	56.49
Junc 49	197	5.391	5.39	326.71	56.2
Junc 50	199	5.391	5.39	327.8	55.81
Junc 51	195	5.391	5.39	327.69	57.49
Junc 52	195	5.391	5.39	327.67	57.49
Junc 53	195	5.391	5.39	327.67	57.49
Junc 54	198	5.391	5.39	327.84	56.26
Junc 55	195	5.391	5.39	328.15	57.69
Junc 56	188	5.391	5.39	328.15	60.73
Junc 57	194	5.391	5.39	327.64	57.91
Junc 58	192	5.391	5.39	327.64	58.77
Junc 59	191	5.391	5.39	327.36	59.08
Junc 60	197	5.391	5.39	326.95	56.31
Junc 61	194	5.391	5.39	326.95	57.61
Junc 63	195	5.391	5.39	327.67	57.49
Junc 65	192	5.391	5.39	327.64	58.77
Junc 66	179	41.811	41.81	316.59	59.62
Junc 68	197	41.811	41.81	314.77	51.03
Junc 69	194	41.811	41.81	324	56.33
Junc 70	194	41.811	41.81	324.01	56.33
Junc 71	183	1541.811	1541.81	300.86	51.07
Junc 72	183	41.811	41.81	312.1	55.94
Junc 62	195	5.391	5.39	335.57	60.91
Resvr 64	335.69	#N/A	-2103	335.69	0

WMCP Update, Donald, Scenario 3, v2.0
Network Table - Links

	Length	Diameter	Roughness	Flow	Velocity
Link ID	ft	in		GPM	fps
Pipe 1	450	12	120	152.96	0.43
Pipe 2	680	12	120	158.35	0.45
Pipe 3	650	12	120	140.46	0.4
Pipe 4	420	12	120	-328.52	0.93
Pipe 5	1450	12	120	492.27	1.4
Pipe 6	250	12	120	497.66	1.41
Pipe 7	120	10	120	1589.17	6.49
Pipe 8	50	10	120	2092.22	8.55
Pipe 9	570	10	120	764.3	3.12
Pipe 11	120	10	120	5.39	0.02
Pipe 12	250	10	120	121.87	0.5
Pipe 13	100	10	120	5.39	0.02
Pipe 14	380	4	120	5.39	0.14
Pipe 15	780	8	120	105.7	0.67

Pipe 16	240	12	120	637.03	1.81
Pipe 17	330	12	120	-94.92	0.27
Pipe 18	1000	12	120	726.56	2.06
Pipe 19	920	4	120	43.76	1.12
Pipe 20	150	8	120	715.78	4.57
Pipe 21	970	4	120	42.53	1.09
Pipe 22	190	8	120	634.88	4.05
Pipe 25	275	6	120	5.39	0.06
Pipe 26	50	6	120	-284.05	3.22
Pipe 27	600	6	120	5.39	0.06
Pipe 28	200	6	120	-294.83	3.35
Pipe 29	500	4	120	82.03	2.09
Pipe 30	240	4	120	5.39	0.14
Pipe 31	450	10	120	819.48	3.35
Pipe 32	450	10	120	726.67	2.97
Pipe 33	240	10	120	700.36	2.86
Pipe 34	280	8	120	-218.18	1.39
Pipe 35	520	10	120	526.6	2.15
Pipe 36	40	2	120	10.78	1.1
Pipe 37	400	2	120	5.39	0.55
Pipe 38	40	10	120	510.43	2.09
Pipe 40	420	8	120	463.59	2.96
Pipe 41	300	8	120	311.15	1.99
Pipe 42	300	6	120	147.06	1.67
Pipe 43	10	6	120	89.36	1.01
Pipe 44	250	6	120	231.02	2.62
Pipe 45	250	8	120	149.96	0.96
Pipe 46	250	8	120	-86.42	0.55
Pipe 47	300	8	120	20.92	0.13
Pipe 48	275	6	120	216.4	2.46
Pipe 49	275	6	120	75.67	0.86
Pipe 50	275	6	120	58.15	0.66
Pipe 51	225	6	120	101.94	1.16
Pipe 52	250	4	120	49.82	1.27
Pipe 53	325	6	120	-77.4	0.88
Pipe 54	300	6	120	-26.64	0.3
Pipe 55	275	6	120	-79.4	0.9
Pipe 56	300	6	120	89.81	1.02
Pipe 57	275	6	120	-12.1	0.14
Pipe 58	20	6	120	147.68	1.68
Pipe 59	500	4	120	25.84	0.66
Pipe 60	510	6	120	87.58	0.99
Pipe 61	500	6	120	72.32	0.82
Pipe 62	30	6	120	126.13	1.43
Pipe 63	480	6	120	132.84	1.51
Pipe 64	550	6	120	12.62	0.14
Pipe 65	400	6	120	46.2	0.52

Pipe 67	100	6	120	5.39	0.06
Pipe 68	1760	6	120	35.24	0.4
Pipe 69	280	6	120	-29.85	0.34
Pipe 70	1050	6	120	1.76	0.02
Pipe 71	480	6	120	46.02	0.52
Pipe 72	650	6	120	-5.79	0.07
Pipe 74	325	6	120	-8.46	0.1
Pipe 75	700	6	120	5.39	0.06
Pipe 76	250	6	120	5.39	0.06
Pipe 77	100	6	120	-272.96	3.1
Pipe 78	100	6	120	-145.51	1.65
Pipe 79	150	6	120	-156.29	1.77
Pipe 80	250	6	120	-94.76	1.08
Pipe 81	300	6	120	-65.85	0.75
Pipe 10	650	10	120	778	3.18
Pipe 39	125	6	120	28.18	0.32
Pipe 66	125	6	120	-1.84	0.02
Pipe 73	200	6	120	-8.06	0.09
Pipe 85	50	6	120	11.18	0.13
Pipe 86	350	6	120	-24.63	0.28
Pipe 83	1773.58	8	120	469.1	2.99
Pipe 88	508.23	8	120	383.73	2.45
Pipe 90	1700.95	8	120	-425.54	2.72
Pipe 91	877	10	120	273.26	1.12
Pipe 92	333	10	120	-237.64	0.97
Pipe 93	102.42	10	120	472.74	1.93
Pipe 94	477.58	10	120	5.39	0.02
Pipe 95	967.39	8	120	811.01	5.18
Pipe 96	948.64	8	120	-730.8	4.66
Pipe 97	830.23	8	120	-772.61	4.93
Pipe 23	1050	8	120	3.63	0.02
Pipe 24	10	12	120	2103	5.97
Pipe 82	10	12	120	2097.61	5.95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10.00
12.00
in
Pressure
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60.00
80.00
psi
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PUD
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WMCP Update, Donald, Scenario 4, v2.0
Network Table - Nodes

Node ID	Elevation ft	ase Deman GPM	Demand GPM	Head ft	Pressure psi
Junc 1	179	12.5	12.5	356.43	76.88
Junc 2	181	5.391	5.39	356.43	76.01
Junc 3	192	5.391	5.39	356.44	71.25
Junc 4	190	5.391	5.39	356.42	72.11
Junc 5	192	5.391	5.39	356.58	71.31
Junc 6	195	5.391	5.39	356.6	70.02
Junc 7	196	5.391	5.39	356.43	69.51
Junc 8	195	5.391	5.39	356.74	70.08
Junc 9	196	5.391	5.39	356.22	69.42
Junc 10	195	5.391	5.39	356.2	69.85
Junc 11	196	5.391	5.39	356.22	69.42
Junc 12	196	5.391	5.39	356.2	69.41
Junc 13	196	5.391	5.39	356.22	69.42
Junc 14	196	5.391	5.39	356.2	69.42
Junc 15	196	5.391	5.39	356.2	69.41
Junc 16	195	5.391	5.39	356.1	69.8
Junc 17	194	5.391	5.39	356	70.19
Junc 18	194	5.391	5.39	355.9	70.15
Junc 19	193	5.391	5.39	355.89	70.58
Junc 20	196	5.391	5.39	355.91	69.29
Junc 21	194	5.391	5.39	355.91	70.15
Junc 22	196	5.391	5.39	355.92	69.3
Junc 23	196	5.391	5.39	356.01	69.33
Junc 24	198	5.391	5.39	356.03	68.48
Junc 25	194	5.391	5.39	355.92	70.16
Junc 26	197	5.391	5.39	356.23	68.99
Junc 27	197	5.391	5.39	356.22	68.99
Junc 28	199	5.391	5.39	356.08	68.06
Junc 29	198	5.391	5.39	355.99	68.46
Junc 30	196	5.391	5.39	355.82	69.25
Junc 31	194	5.391	5.39	355.37	69.92
Junc 32	189	5.391	5.39	355.94	72.34
Junc 33	196	5.391	5.39	355.99	69.32
Junc 34	198	5.391	5.39	356.06	68.49
Junc 35	197	5.391	5.39	356.06	68.92
Junc 36	195	5.391	5.39	356.07	69.79
Junc 37	194	5.391	5.39	356.16	70.26
Junc 38	194	5.391	5.39	356.16	70.26
Junc 39	193	5.391	5.39	356.23	70.73
Junc 40	197	5.391	5.39	356.04	68.91
Junc 41	197	5.391	5.39	356.04	68.91
Junc 42	197	5.391	5.39	356.04	68.91
Junc 43	198	5.391	5.39	356.04	68.48

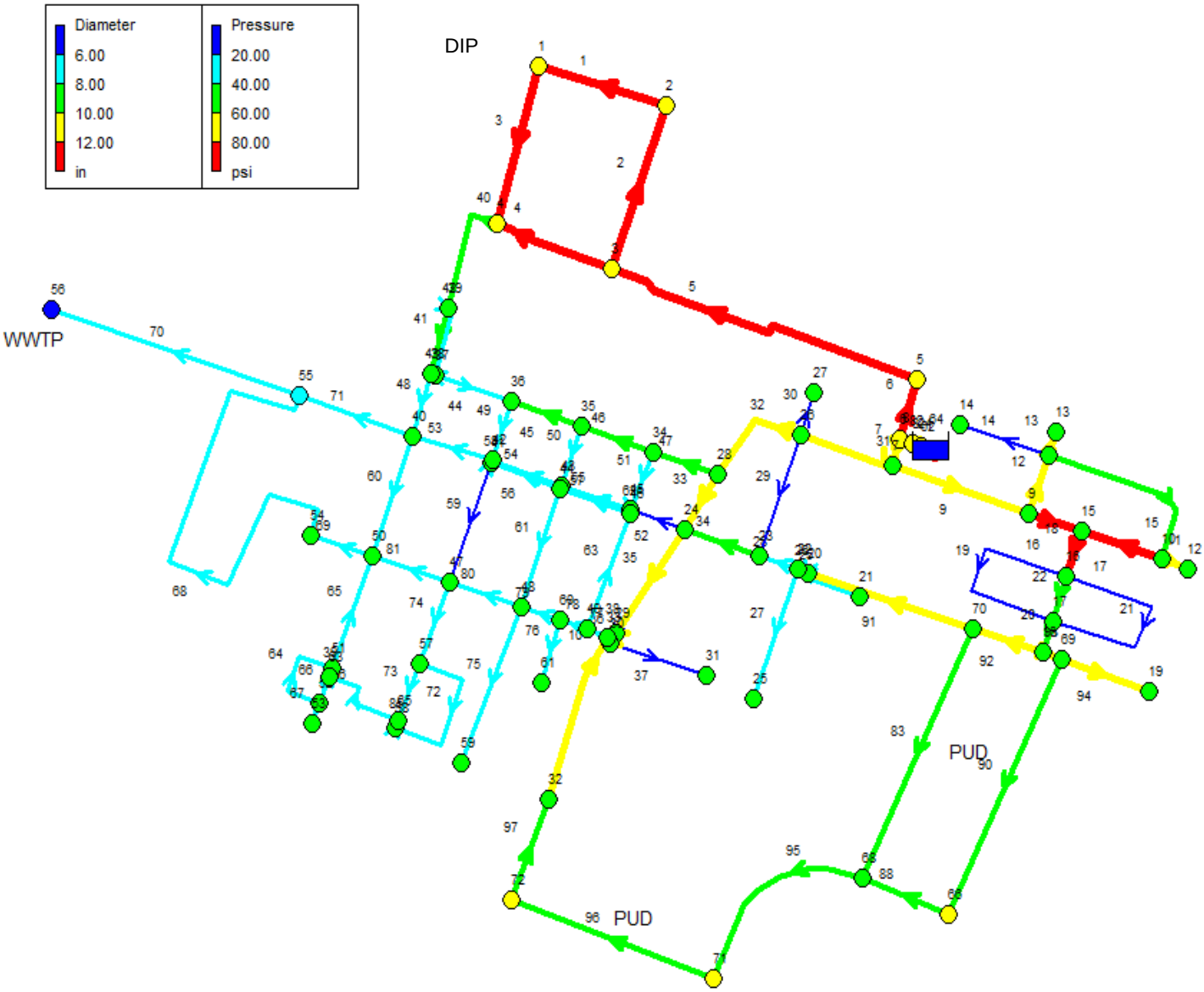
Junc 44	198	5.391	5.39	356.02	68.47
Junc 45	198	5.391	5.39	356.03	68.48
Junc 46	198	5.391	5.39	356.03	68.47
Junc 47	197	5.391	5.39	355.98	68.89
Junc 48	197	5.391	5.39	355.99	68.89
Junc 49	197	5.391	5.39	355.99	68.89
Junc 50	199	5.391	5.39	355.99	68.02
Junc 51	195	5.391	5.39	355.96	69.75
Junc 52	195	5.391	5.39	355.96	69.74
Junc 53	195	5.391	5.39	355.96	69.74
Junc 54	198	5.391	5.39	355.99	68.46
Junc 55	195	5.391	5.39	356.01	69.77
Junc 56	188	5.391	5.39	356.01	72.8
Junc 57	194	5.391	5.39	355.97	70.18
Junc 58	192	5.391	5.39	355.96	71.05
Junc 59	191	5.391	5.39	355.98	71.49
Junc 60	197	5.391	5.39	355.99	68.89
Junc 61	194	5.391	5.39	355.99	70.19
Junc 63	195	5.391	5.39	355.96	69.75
Junc 65	192	5.391	5.39	355.96	71.05
Junc 66	179	41.811	41.81	355.77	76.59
Junc 68	197	41.811	41.81	355.77	68.79
Junc 69	194	41.811	41.81	355.9	70.15
Junc 70	194	41.811	41.81	355.89	70.15
Junc 71	183	41.811	41.81	355.77	74.86
Junc 72	183	41.811	41.81	355.8	74.87
Junc 62	195	5.391	5.39	356.75	70.09
Resvr 64	356.76	#N/A	-603	356.76	0

WMCP Update, Donald, Scenario 4, v2.0
Network Table - Links

	Length	Diameter	Roughness	Flow	Velocity
Link ID	ft	in		GPM	fps
Pipe 1	450	12	120	47.09	0.13
Pipe 2	680	12	120	52.48	0.15
Pipe 3	650	12	120	34.59	0.1
Pipe 4	420	12	120	-98.51	0.28
Pipe 5	1450	12	120	156.38	0.44
Pipe 6	250	12	120	161.77	0.46
Pipe 7	120	10	120	425.05	1.74
Pipe 8	50	10	120	592.22	2.42
Pipe 9	570	10	120	198.64	0.81
Pipe 11	120	10	120	5.39	0.02
Pipe 12	250	10	120	40.36	0.16
Pipe 13	100	10	120	5.39	0.02
Pipe 14	380	4	120	5.39	0.14
Pipe 15	780	8	120	24.19	0.15

Pipe 16	240	12	120	152.89	0.43
Pipe 17	330	12	120	-13.4	0.04
Pipe 18	1000	12	120	160.91	0.46
Pipe 19	920	4	120	9.44	0.24
Pipe 20	150	8	120	150.12	0.96
Pipe 21	970	4	120	9.17	0.23
Pipe 22	190	8	120	136.91	0.87
Pipe 25	275	6	120	5.39	0.06
Pipe 26	50	6	120	-48.02	0.54
Pipe 27	600	6	120	5.39	0.06
Pipe 28	200	6	120	-58.8	0.67
Pipe 29	500	4	120	19.68	0.5
Pipe 30	240	4	120	5.39	0.14
Pipe 31	450	10	120	221.02	0.9
Pipe 32	450	10	120	190.56	0.78
Pipe 33	240	10	120	143.07	0.58
Pipe 34	280	8	120	-44.51	0.28
Pipe 35	520	10	120	91.83	0.38
Pipe 36	40	2	120	10.78	1.1
Pipe 37	400	2	120	5.39	0.55
Pipe 38	40	10	120	75.66	0.31
Pipe 40	420	8	120	127.71	0.82
Pipe 41	300	8	120	83.12	0.53
Pipe 42	300	6	120	39.2	0.44
Pipe 43	10	6	120	19.76	0.22
Pipe 44	250	6	120	53.57	0.61
Pipe 45	250	8	120	22.26	0.14
Pipe 46	250	8	120	6.55	0.04
Pipe 47	300	8	120	42.09	0.27
Pipe 48	275	6	120	57.97	0.66
Pipe 49	275	6	120	25.92	0.29
Pipe 50	275	6	120	23.42	0.27
Pipe 51	225	6	120	30.15	0.34
Pipe 52	250	4	120	-1.33	0.03
Pipe 53	325	6	120	-5.63	0.06
Pipe 54	300	6	120	6.15	0.07
Pipe 55	275	6	120	-11.89	0.13
Pipe 56	300	6	120	17.64	0.2
Pipe 57	275	6	120	9.41	0.11
Pipe 58	20	6	120	26.16	0.3
Pipe 59	500	4	120	9.27	0.24
Pipe 60	510	6	120	27.08	0.31
Pipe 61	500	6	120	21.66	0.25
Pipe 62	30	6	120	37.98	0.43
Pipe 63	480	6	120	23.18	0.26
Pipe 64	550	6	120	4.83	0.05
Pipe 65	400	6	120	18.83	0.21

Pipe 67	100	6	120	5.39	0.06
Pipe 68	1760	6	120	9.08	0.1
Pipe 69	280	6	120	-3.69	0.04
Pipe 70	1050	6	120	1.72	0.02
Pipe 71	480	6	120	19.86	0.23
Pipe 72	650	6	120	4.68	0.05
Pipe 74	325	6	120	18.91	0.21
Pipe 75	700	6	120	5.39	0.06
Pipe 76	250	6	120	5.39	0.06
Pipe 77	100	6	120	-9.41	0.11
Pipe 78	100	6	120	8.38	0.1
Pipe 79	150	6	120	-2.41	0.03
Pipe 80	250	6	120	8.47	0.1
Pipe 81	300	6	120	-6.56	0.07
Pipe 10	650	10	120	79.68	0.33
Pipe 39	125	6	120	8.61	0.1
Pipe 66	125	6	120	5.96	0.07
Pipe 73	200	6	120	8.84	0.1
Pipe 85	50	6	120	0.71	0.01
Pipe 86	350	6	120	2.74	0.03
Pipe 83	1773.58	8	120	45.99	0.29
Pipe 88	508.23	8	120	5.15	0.03
Pipe 90	1700.95	8	120	-46.97	0.3
Pipe 91	877	10	120	37.24	0.15
Pipe 92	333	10	120	-50.56	0.21
Pipe 93	102.42	10	120	94.17	0.38
Pipe 94	477.58	10	120	5.39	0.02
Pipe 95	967.39	8	120	9.33	0.06
Pipe 96	948.64	8	120	-32.48	0.21
Pipe 97	830.23	8	120	-74.29	0.47
Pipe 23	1050	8	120	3.67	0.02
Pipe 24	10	12	120	603	1.71
Pipe 82	10	12	120	597.61	1.7


Diameter
6.00
8.00
10.00
12.00
in
Pressure
20.00
40.00
60.00
80.00
psi
DIP
WWTP
PUD
PUD

WMCP Update, Donald, Scenario PHD+WWTP, v1.0
Network Table - Nodes

Node ID	Elevation ft	ase Deman GPM	Demand GPM	Head ft	Pressure psi
Junc 1	179	12.5	12.5	331.25	65.97
Junc 2	181	5.391	5.39	331.33	65.14
Junc 3	192	5.391	5.39	331.46	60.43
Junc 4	190	5.391	5.39	331.15	61.16
Junc 5	192	5.391	5.39	333.67	61.39
Junc 6	195	5.391	5.39	334.06	60.25
Junc 7	196	5.391	5.39	332.5	59.15
Junc 8	195	5.391	5.39	335.46	60.86
Junc 9	196	5.391	5.39	331.33	58.64
Junc 10	195	5.391	5.39	331.19	59.01
Junc 11	196	5.391	5.39	331.31	58.63
Junc 12	196	5.391	5.39	331.19	58.58
Junc 13	196	5.391	5.39	331.31	58.63
Junc 14	196	5.391	5.39	331.3	58.62
Junc 15	196	5.391	5.39	331.19	58.58
Junc 16	195	5.391	5.39	330.46	58.69
Junc 17	194	5.391	5.39	329.68	58.79
Junc 18	194	5.391	5.39	328.92	58.46
Junc 19	193	5.391	5.39	328.9	58.88
Junc 20	196	5.391	5.39	328.51	57.42
Junc 21	194	5.391	5.39	328.51	58.28
Junc 22	196	5.391	5.39	328.41	57.37
Junc 23	196	5.391	5.39	328.06	57.22
Junc 24	198	5.391	5.39	327.8	56.24
Junc 25	194	5.391	5.39	328.41	58.24
Junc 26	197	5.391	5.39	330.04	57.65
Junc 27	197	5.391	5.39	330.03	57.64
Junc 28	199	5.391	5.39	327.97	55.88
Junc 29	198	5.391	5.39	327.25	56
Junc 30	196	5.391	5.39	327.08	56.8
Junc 31	194	5.391	5.39	326.62	57.47
Junc 32	189	5.391	5.39	327.22	59.89
Junc 33	196	5.391	5.39	327.21	56.85
Junc 34	198	5.391	5.39	326.23	55.56
Junc 35	197	5.391	5.39	325.57	55.71
Junc 36	195	5.391	5.39	325.3	56.46
Junc 37	194	5.391	5.39	325.42	56.94
Junc 38	194	5.391	5.39	325.4	56.93
Junc 39	193	5.391	5.39	326.88	58.01
Junc 40	197	5.391	5.39	316.3	51.69
Junc 41	197	5.391	5.39	323.54	54.83
Junc 42	197	5.391	5.39	323.43	54.78
Junc 43	198	5.391	5.39	325.12	55.08

Junc 44	198	5.391	5.39	323.97	54.58
Junc 45	198	5.391	5.39	325.51	55.25
Junc 46	198	5.391	5.39	325.42	55.21
Junc 47	197	5.391	5.39	319.39	53.03
Junc 48	197	5.391	5.39	323.3	54.73
Junc 49	197	5.391	5.39	325.72	55.77
Junc 50	199	5.391	5.39	316.23	50.8
Junc 51	195	5.391	5.39	317.02	52.87
Junc 52	195	5.391	5.39	317.13	52.92
Junc 53	195	5.391	5.39	317.13	52.92
Junc 54	198	5.391	5.39	310.07	48.56
Junc 55	195	5.391	5.39	272.13	33.42
Junc 56	188	1505.391	1505.39	79.47	-47.03
Junc 57	194	5.391	5.39	318.36	53.89
Junc 58	192	5.391	5.39	318.1	54.64
Junc 59	191	5.391	5.39	323.29	57.32
Junc 60	197	5.391	5.39	324.71	55.34
Junc 61	194	5.391	5.39	324.71	56.64
Junc 63	195	5.391	5.39	317.17	52.93
Junc 65	192	5.391	5.39	318.09	54.63
Junc 66	179	41.811	41.81	328.2	64.65
Junc 68	197	41.811	41.81	328.11	56.81
Junc 69	194	41.811	41.81	328.9	58.45
Junc 70	194	41.811	41.81	328.68	58.36
Junc 71	183	41.811	41.81	327.58	62.65
Junc 72	183	41.811	41.81	327.31	62.53
Junc 62	195	5.391	5.39	335.57	60.91
Resvr 64	335.69	#N/A	-2103	335.69	0

WMCP Update, Donald, Scenario PHD+WWTP, v1.0
Network Table - Links

	Length	Diameter	Roughness	Flow	Velocity
Link ID	ft	in		GPM	fps
Pipe 1	450	12	120	218.8	0.62
Pipe 2	680	12	120	224.2	0.64
Pipe 3	650	12	120	206.3	0.59
Pipe 4	420	12	120	-472	1.34
Pipe 5	1450	12	120	701.59	1.99
Pipe 6	250	12	120	706.98	2.01
Pipe 7	120	10	120	1379.85	5.64
Pipe 8	50	10	120	2092.22	8.55
Pipe 9	570	10	120	509.74	2.08
Pipe 11	120	10	120	5.39	0.02
Pipe 12	250	10	120	85.28	0.35
Pipe 13	100	10	120	5.39	0.02
Pipe 14	380	4	120	5.39	0.14
Pipe 15	780	8	120	69.11	0.44

Pipe 16	240	12	120	419.07	1.19
Pipe 17	330	12	120	-58.32	0.17
Pipe 18	1000	12	120	472	1.34
Pipe 19	920	4	120	28.31	0.72
Pipe 20	150	8	120	461.22	2.94
Pipe 21	970	4	120	27.51	0.7
Pipe 22	190	8	120	410.78	2.62
Pipe 25	275	6	120	5.39	0.06
Pipe 26	50	6	120	133.04	1.51
Pipe 27	600	6	120	5.39	0.06
Pipe 28	200	6	120	122.26	1.39
Pipe 29	500	4	120	65.4	1.67
Pipe 30	240	4	120	5.39	0.14
Pipe 31	450	10	120	864.72	3.53
Pipe 32	450	10	120	788.53	3.22
Pipe 33	240	10	120	285.37	1.17
Pipe 34	280	8	120	182.27	1.16
Pipe 35	520	10	120	359.37	1.47
Pipe 36	40	2	120	10.78	1.1
Pipe 37	400	2	120	5.39	0.55
Pipe 38	40	10	120	343.2	1.4
Pipe 40	420	8	120	672.92	4.3
Pipe 41	300	8	120	455.64	2.91
Pipe 42	300	6	120	211.89	2.4
Pipe 43	10	6	120	-146.47	1.66
Pipe 44	250	6	120	60.02	0.68
Pipe 45	250	8	120	-199.91	1.28
Pipe 46	250	8	120	323.39	2.06
Pipe 47	300	8	120	497.77	3.18
Pipe 48	275	6	120	596.72	6.77
Pipe 49	275	6	120	254.55	2.89
Pipe 50	275	6	120	118.09	1.34
Pipe 51	225	6	120	168.99	1.92
Pipe 52	250	4	120	-102.88	2.63
Pipe 53	325	6	120	477.9	5.42
Pipe 54	300	6	120	221.37	2.51
Pipe 55	275	6	120	108.68	1.23
Pipe 56	300	6	120	-110.11	1.25
Pipe 57	275	6	120	221.51	2.51
Pipe 58	20	6	120	-228.75	2.6
Pipe 59	500	4	120	97.35	2.49
Pipe 60	510	6	120	32.09	0.36
Pipe 61	500	6	120	106.01	1.2
Pipe 62	30	6	120	157.8	1.79
Pipe 63	480	6	120	-69.1	0.78
Pipe 64	550	6	120	-37.4	0.42
Pipe 65	400	6	120	-130.4	1.48

Pipe 67	100	6	120	5.39	0.06
Pipe 68	1760	6	120	-473.65	5.37
Pipe 69	280	6	120	479.04	5.44
Pipe 70	1050	6	120	1505.39	17.08
Pipe 71	480	6	120	1037.14	11.77
Pipe 72	650	6	120	55.1	0.63
Pipe 74	325	6	120	168.14	1.91
Pipe 75	700	6	120	5.39	0.06
Pipe 76	250	6	120	5.39	0.06
Pipe 77	100	6	120	388.16	4.4
Pipe 78	100	6	120	313.67	3.56
Pipe 79	150	6	120	302.89	3.44
Pipe 80	250	6	120	398.12	4.52
Pipe 81	300	6	120	321.93	3.65
Pipe 10	650	10	120	-50.35	0.21
Pipe 39	125	6	120	-98.4	1.12
Pipe 66	125	6	120	48.18	0.55
Pipe 73	200	6	120	107.65	1.22
Pipe 85	50	6	120	-49.71	0.56
Pipe 86	350	6	120	151.97	1.72
Pipe 83	1773.58	8	120	104.45	0.67
Pipe 88	508.23	8	120	76.73	0.49
Pipe 90	1700.95	8	120	-118.54	0.76
Pipe 91	877	10	120	-143.83	0.59
Pipe 92	333	10	120	-290.09	1.19
Pipe 93	102.42	10	120	165.74	0.68
Pipe 94	477.58	10	120	5.39	0.02
Pipe 95	967.39	8	120	139.37	0.89
Pipe 96	948.64	8	120	97.56	0.62
Pipe 97	830.23	8	120	55.74	0.36
Pipe 24	10	12	120	2103	5.97
Pipe 82	10	12	120	2097.61	5.95

Appendix E. High Flow Booster Pump and House Records

Customer Price Sheet

Project name	:	Tag Number	: 003
Consulting engineer	:	Service	:
Customer	: PREFERRED PUMP & EQUIPMENT	Model	: 60123 LC
Customer ref. / PO	:	*Quantity*	: *1*
Quote Number / ID	: 16RG0831-01	Quoted By (Sales Office)	: Grundfos Industrial Business - GPU
Date last saved	: 03/30/2017 9:00 AM	*Quoted By (Sales Engineer)*	: *Roberto Vidal-Garcia*

Construction

PACO Construction Code:	10-60123-150008-1922P	Flow: 1,994.4 USgpm	Head: 119.3 ft	Impeller diameter: 11.60 in

Totals

Grand Total		Lead Time Total	10 wks

Pump

Qty	Description	Average Unit Price	Extended Price
1	*60123 LC*		

Scope of Supply

Scope

Scope of Supply: Complete Unit (Pump and Motor mounted horizontally)

General Pump Construction

Materials

Pump Case Material: Cast Iron, ASTM A48 - Class 30

Nozzle Configuration: 125# ANSI flange

Impeller Material: Stainless Steel, AISI-304 (H304)

Hardware Material: Steel, Grade 5

Wear Ring Material: Tin Bronze, ASTM B584-90500 (B18)

Shaft Material: Steel, AISI-1040

Shaft Sleeve Material: Bronze, III932, C89835

Insert: Provided

Coating: Standard Manufacturer's Paint

Certifications: None

Seal & Packing Construction

Seal Options

Seal Material (Stationary Seat/Rotating Head/Elastomer/Spring/ Hardware): Single Seal, Type 21S Buna Carbon Ceramic SS-Spring and Hardware

Recirculation Lines: None

Coupling and Base

Coupling and Base Options

Base: None

Motor Driver

Driver Options

Motor Size: 75HP 230/460/3/60 1800 RPM ODP Premium Motor; Baldor 365TCZ Direct On Line Footed

Motor Manufacturer: Baldor

Motor Enclosure: ODP

Motor Efficiency: NEMA Premium

Motor Phase: Three Phase

Motor Application: General Purpose

Shaft Grounding: None

Testing & Documentation

Testing

Test Level: No test

Pump

Qty	Description	Average Unit Price	Extended Price
	Documentation		
	Leadtime: 10 wks		
	Estimated Weights ea: 1169 lbs		
	Accessories		
	Accessories		
	Motor Bracket: Motor bracket provided		
	Motor Bracket Material: Cast Iron, ASTM-A48, CL 30		

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Pump Performance Datasheet

Project name	:	Tag Number	: 003
Consulting engineer	:	Service	:
Customer	: PREFERRED PUMP & EQUIPMENT	Model	: 60123 LC
Customer ref. / PO	:	Quantity	: 1
Quote Number / ID	: *16RG0831-01*	*Quoted By (Sales Office)*	: *Grundfos Industrial Business - GPU*
Date last saved	: 03/30/2017 9:00 AM	Quoted By (Sales Engineer)	: Roberto Vidal-Garcia

Operating Conditions

Flow, rated	: 1,994.4 USgpm
Differential head / pressure, rated (requested)	: 119.3 ft
Differential head / pressure, rated (actual)	: 119.3 ft
Suction pressure, rated / max	: 0.00 / 0.00 psi.g
NPSH available, rated	: Ample
Frequency	: 60 Hz

Performance

Speed, rated	: 1780 rpm
Impeller diameter, rated	: 11.60 in
Impeller diameter, maximum	: 12.10 in
Impeller diameter, minimum	: 9.00 in
Efficiency	: 88.65 %
NPSH required / margin required	: 19.34 / 0.00 ft
nq (imp. eye flow) / S (imp. eye flow)	: 40 / 166 Metric units
MCSF	: 433.6 *USgpm*
Head, maximum, rated diameter	: 137.7 ft
Head rise to shutoff	: 14.42 %
Flow, best eff. point	: 1,990.1 USgpm
Flow ratio, rated / BEP	: 100.21 %
Diameter ratio (rated / max)	: 95.87 %
Head ratio (rated dia / max dia)	: 85.04 %
Cq/Ch/Ce/Cn [ANSI/HI 9.6.7-2010]	: 1.00 / 1.00 / 1.00 / 1.00
Selection status	: Acceptable

Liquid

Liquid type	: Cold Water
Additional liquid description	:
Solids diameter, max	: 0.00 in
Solids concentration, by volume	: 0.00 %
Temperature, max	: 68.00 deg F
Fluid density, rated / max	: 1.000 / 1.000 SG
Viscosity, rated	: 1.00 cP
Vapor pressure, rated	: 0.34 psi.a

Material

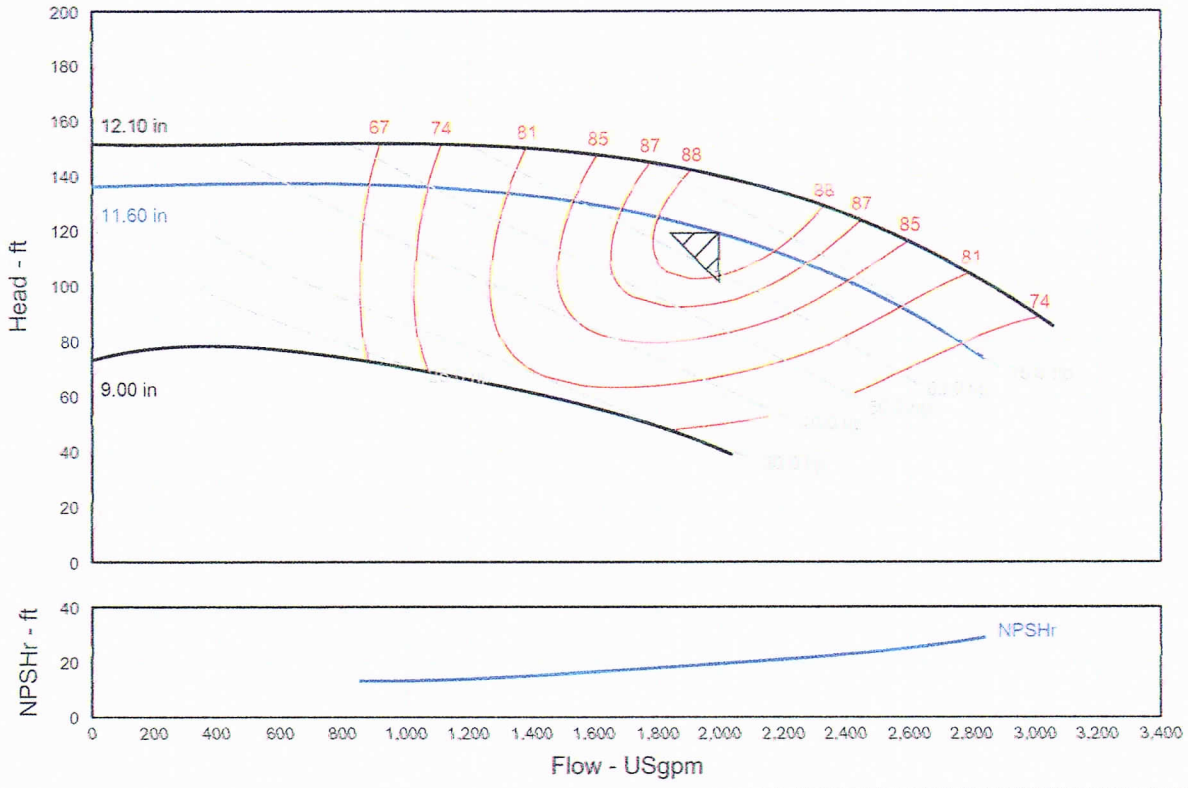
Material selected	: Cast iron

Pressure Data

Maximum working pressure	: 59.59 psi.g
Maximum allowable working pressure	: 175.0 psi.g
Maximum allowable suction pressure	: 175.0 psi.g
Hydrostatic test pressure	: 263.0 psi.g

Driver & Power Data (@Max density)

Motor sizing specification	: Max power (non-overloading)
Margin over specification	: 0.00 %
Service factor	: 1.00
Power, hydraulic	: 60.05 hp
Rated power (based on duty point)	: 67.75 hp
Max power (non-overloading)	: 74.73 hp
Nameplate motor rating	: 75.00 hp / 55.93 kW



Construction Datasheet

Project name	:	Tag Number	: 003
Consulting engineer	:	Service	:
Customer	: PREFERRED PUMP & EQUIPMENT	Model	: 60123 LC
Customer ref. / PO	:	*Quantity*	: 1
Quote Number / ID	: 16RG0831-01	Quoted By (Sales Office)	: Grundfos Industrial Business - GPU
Date last saved	: 03/30/2017 9:00 AM	Quoted By (Sales Engineer)	: Roberto Vidal-Garcia

Nozzle	*Size (in.)*	*Nozzle Configuration*	*Pos'n*
Suction	8	125# ANSI	End
Discharge	6	125# ANSI	Top

Orientation / Configuration	: Horizontal	Manufacturer	: Baldor
Rotation	: Clockwise	Frame Size	: 365TCZ
Wear Ring Configuration	: Single - Case	Power	: 75.00 hp
Discharge Elbow Size	: -	RPM	: 1800 rpm
Subplate	: -	Enclosure	: ODP
Sump Depth (feet)	: -	Operating Power Supply	: 230/460/3/60
Bearing Frame	: -	Efficiency	: Premium
Bearing Frame Foot	: -	Service factor	: 1.15
Bearing Type (Radial/Thrust)	: In motor	Motor Application	: General Purpose
Bearing Lubrication	: -	Motor Options/Accessories	: -
Thrust Bearing	: -	Cord Length (feet)	: -
Intermediate Bearing	: -		
Lower Bearing	: -		
Bearing Housing Accessories	: -		
PACO Construction code	: 10-60123-150008-1922P		

Baseplate	: Not Applicable	Case	: Cast Iron, ASTM A48 - Class 30
Drip Pan	: -	Motor Bracket	: Cast Iron, ASTM-A48, CL 30
Coupling	: -	Impeller	: Stainless Steel, AISI-304 (H304)
Guard	: Not Applicable	Impeller Cap Screw and Washer	: Anodized Steel
		Impeller Key	: Stainless Steel, AISI 316
Sealing Method	: Single Seal, Type 21S	Case wear ring	: Tin Bronze, ASTM B584-90500 (B18)
Seal Material	: Buna Carbon Ceramic SS-Spring and Hardware	Impeller wear ring	: -
Packing Gland	: -	Pump Shaft	: Steel, AISI-1040
Lantern Ring	: -	Sleeve	: Bronze, III932, C89835
Recirculation Lines	: None	Line Shaft	: -
		Column	: -
Pump	: 338.0 lb	Discharge Pipe	: -
Baseplate	: -	Discharge Elbow	: -
Driver	: 831.0 lb	Suction Elbow	: -
Estimated Shipping gross weight	: 1,169.0 lb	Subplate	: -
		Hardware	: Steel, Grade 5
		O Rings	: Buna N
		Pump Coatings	: Standard Manufacturer's Paint

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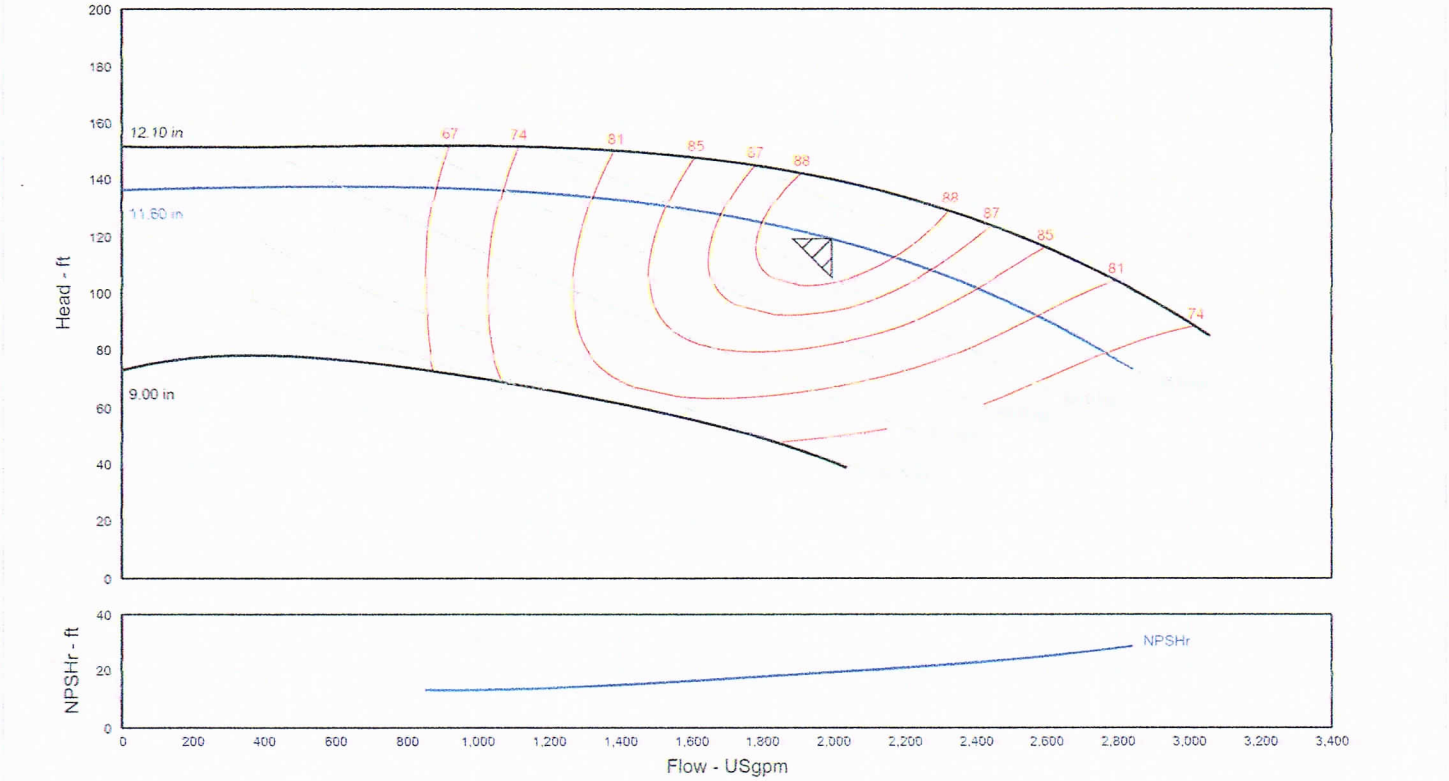
Grundfos Quotation System 17.1.2.0

Pump Performance Curve



Project name	:	Tag Number	: 003	Speed, rated	: 1780 rpm
Consulting engineer	:	Service	:	Flow, rated	: 1,994.4 USgpm
Customer	: PREFERRED PUMP & EQUIPMENT	Model	: 60123 LC	Differential head / pressure, rated	: 119.3 ft
Customer ref. / PO	:	Quantity	: 1	Rated power (based on duty point)	: 67.75 hp
Quote Number / ID	: 16RG0831-01	Quoted By (Sales Office)	: Grundfos Industrial Business - GPU	Max power (non-overloading)	: 74.73 hp
Date last saved	: 03/30/2017 9:00 AM	Quoted By (Sales Engineer)	: Roberto Vidal-Garcia	Efficiency	: 88.65 %
	:	Stages	: 1	Based on curve number	: RC2010-SS Rev 0

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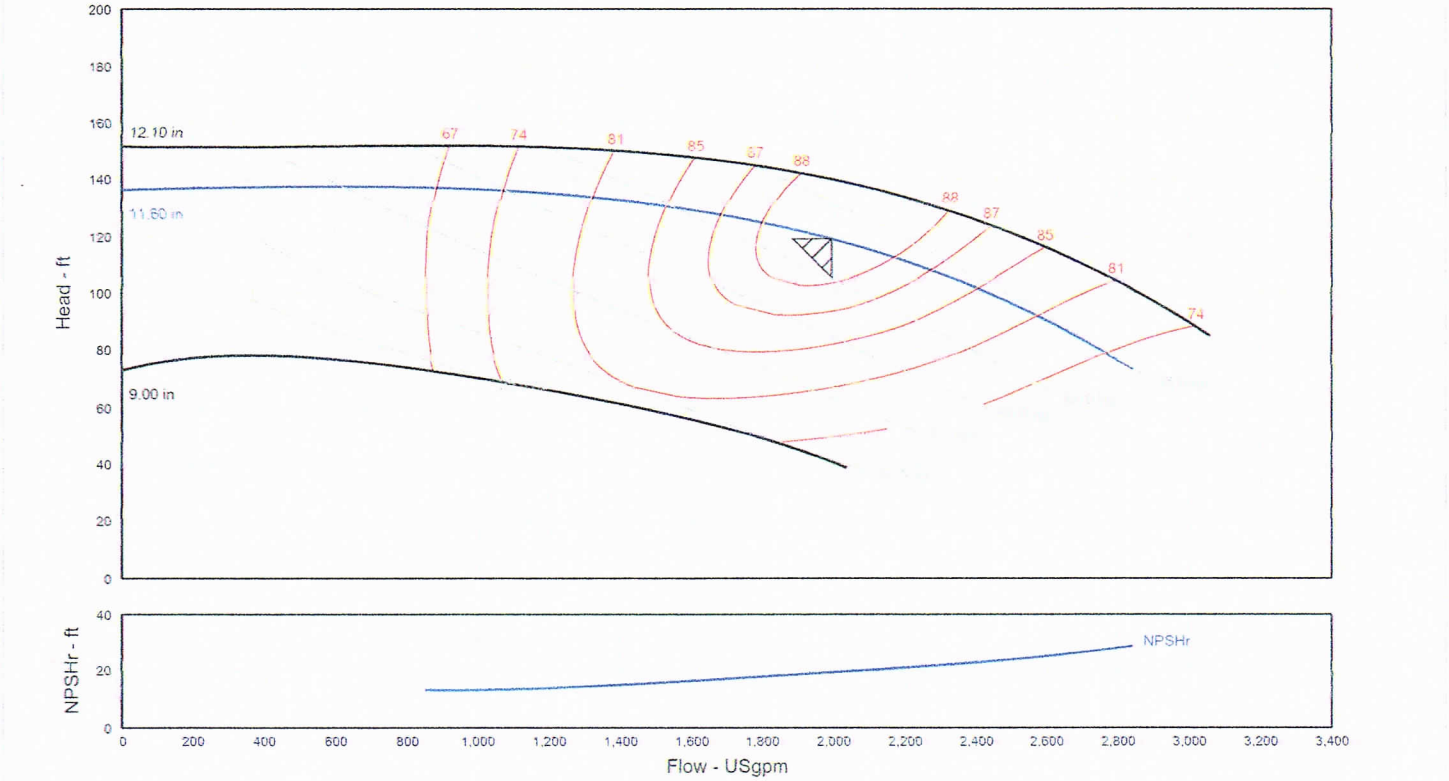
Pump Performance Curve



Project name	:	Tag Number	: 003	Speed, rated	: 1780 rpm
Consulting engineer	:	Service	:	Flow, rated	: 1,994.4 USgpm
Customer	: PREFERRED PUMP & EQUIPMENT	Model	: 60123 LC	Differential head / pressure, rated	: 119.3 ft
Customer ref. / PO	:	Quantity	: 1	Rated power (based on duty point)	: 67.75 hp
Quote Number / ID	: 16RG0831-01	Quoted By (Sales Office)	: Grundfos Industrial Business - GPU	Max power (non-overloading)	: 74.73 hp
Date last saved	: 03/30/2017 9:00 AM	Quoted By (Sales Engineer)	: Roberto Vidal-Garcia	Efficiency	: 88.65 %
	:	Stages	: 1	Based on curve number	: RC2010-SS Rev 0

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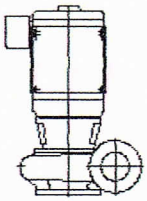
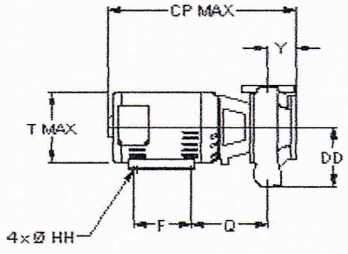
General Arrangement

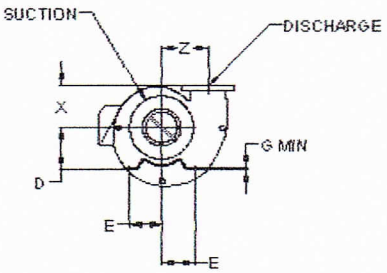
Project name	:	Tag Number	: 003
Consulting engineer	:	Service	:
Customer	: PREFERRED PUMP & EQUIPMENT	Model	: 60123 LC
Customer ref. / PO	:	Quantity of pumps	: 1
Quote Number / ID	: 16RG0831-01	Quoted By (Sales Office)	: Grundfos Industrial Business - GPU
Date last saved	: 03/30/2017 9:00 AM	Quoted By (Sales Engineer)	: Roberto Vidal-Garcia



PLAN



SIDE VIEW



END VIEW

NOT FOR CONSTRUCTION. Unless certified and referenced on order

Units	Frame	Suct(in)	Disch(in)	CP	D	DD	E	F	G	HH	Q	T	X	Y	Z	Weight ea
inches	365TCZ	8	6	45.00	9.00	12.50	7.00	12.25	1.00	0.66	16.31	18.25	8.88	6.06	9.88	1,169.0

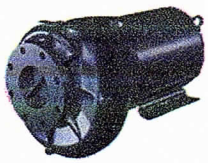
Conditions of Service		Motor Data			
Flow: 1,994.4 USgpm	Fluid: Cold Water	HP: 75	Encl: ODP	Phase: 3	Efficiency: Premium
TDH: 119.3 ft	Temp.: 68.00 deg F	RPM: 1780 rpm	Hz: 60	Voltage: 230/460	S.F.: 1.15

GRUNDFOS

SUBMITTAL

PACO Series LC - End Suction Centrifugal Pump, Close Coupled

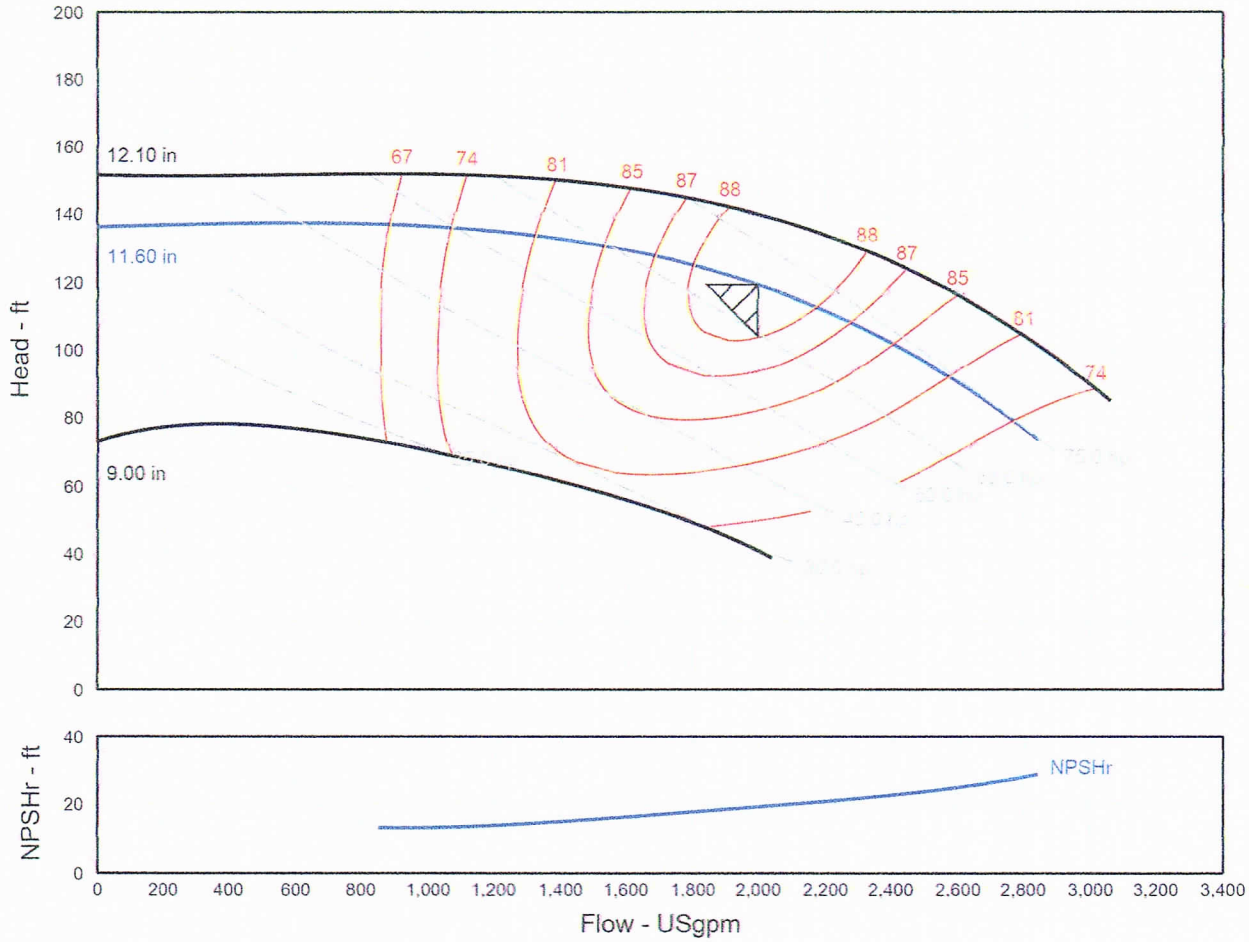
PROJECT: 16RG0831-01	UNIT TAG: 003	QUANTITY: 1
	SERVICE:	
REPRESENTATIVE:	SUBMITTED BY:	DATE:
ENGINEER:	APPROVED BY:	DATE:
CONTRACTOR:	ORDER #:	DATE:



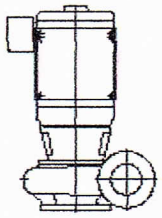
LC 60123
1780 rpm

Part Number: N/A

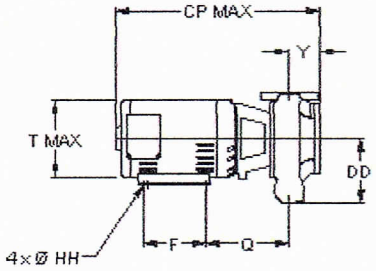
Conditions of Service		Pump Data		Motor Data	
Flow:	1,994.4 USgpm	Impeller Diameter:	11.60 in	Motor HP:	75.00 hp
Head:	119.3 ft	Max. Imp. Dia.:	12.10 in	BHP:	67.75 hp
Liquid:	Cold Water	Min. Imp. Dia.:	9.00 in	Enclosure:	ODP
Temperature:	68.00 deg F	Efficiency:	88.65 %	Voltage:	208-230/460 V
NPSHr:	19.34 ft	Suction:	8 in.	Phase:	3 Phase
Viscosity:	1.00 cP	Discharge:	6 in.	Cycle:	60 Hz
Specific Gravity:	1.000 SG	Configuration:	Horizontal	Frame Size:	365TCZ



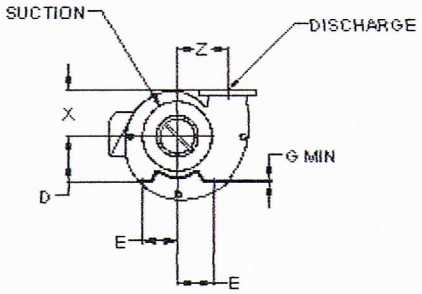
PACO Series LC - End Suction Centrifugal Pump, Close Coupled



PLAN



SIDE VIEW



END VIEW

NOT FOR CONSTRUCTION, unless certified and referenced on order

Units	Frame	Suct	Disch	CP	D	DD	E	F	G	HH	Q	T	X	Y	Z	Weight
inches	365	8	6	45.00	9.00	12.50	7.00	12.25	1.00	0.66	16.31	18.25	8.88	6.06	9.88	TBD

PACO Series LC - End Suction Centrifugal Pump, Close Coupled

PROJECT: 16RG0831-01	UNIT TAG: 003	: LC 60123

MATERIALS OF CONSTRUCTION			
PART	**MATERIAL**	**PART**	**MATERIAL**
Rotation Options	Clockwise	Impeller Washer	S.S., AISI-303
Base/Stand Type	None	Impeller Key	Steel, AISI 1045
Connections	FPT (threaded)/ 125# ANSI	Sleeve Material	Bronze, III932, C89835 or No Sleeves
Wear Ring Type	Case Wear Ring	Wear Ring Material	NiAl-Bronze, ASTM-B148, C95500
Pump Coatings	Standard Paint	Packing Gland	Not Applicable
NSF-50 Certification	Not Required	Lantern Ring	None
NSF-61 Certification	Not Required	Seal Type	Type 21
Motor Drip Canopy	Not Required	Seal Material	Ceramic/Carbon/Buna
Casing	Cast Iron, ASTM-A48, CL 30	O-Rings	Buna N
Motor Shaft	*Steel, AISI 1045 or S.S*	*Seal Flush Options*	*No External flush*
Backplate/Seal Plate	Cast Iron, ASTM-A48, CL 30	Gaskets	Vegetable Fiber
Motor Bracket	Cast Iron, ASTM-A48, CL 30	Casing Bolts	Steel, Grade 5
Impeller	*Stainless Steel, AISI-304*	*Impeller Cap Screw*	*Stainless Steel, AISI-316*

* All materials based on STANDARD configuration

GRUNDFOS USA - GENERAL TERMS AND CONDITIONS

1. **ACCEPTANCE**. These Terms of sale (these "Terms") are the only terms which govern the sale of the goods ("Goods") and services ("Services") by Grundfos Pumps Corporation and any of its affiliates or subsidiaries in the United States ("Grundfos") (including, but not limited to, Grundfos CBS Inc. ("PACO"), Yeomans Chicago Corporation ("Yeomans"), and Sterling Fluid Systems USA LLC D/B/A Peerless Pump Company ("Peerless") (collectively, Grundfos, PACO, Yeomans and Peerless are referred to herein as the "Seller") to the purchaser (the "Purchaser") named in the accompanying confirmation of sale (the "Sales Confirmation"). The Sales Confirmation confirms Purchaser's order (the "Order"). The Order will be filled only after credit approval and acceptance of the Order at Seller's administrative offices. Any acceptance of the Order is subject to the most recent Terms, as modified from time to time, and which supersede any inconsistent or additional Terms contained in the Order. There are no agreements or representations, oral or otherwise, outside of the Terms. Submittal of technical information does not constitute acceptance of any terms contained Purchaser's order form, and no agent, distributor, business partner, or manufacturer's representative of Seller has the authority to change or modify these Terms. No change or modification to these shall be valid unless it is agreed to in writing by Seller. Any Purchaser document which contains terms in addition to or inconsistent with these Terms, or terms that reject any term or condition set forth herein, shall be deemed to be a counter offer to Seller, and shall not be binding upon Seller unless specifically accepted in writing by a duly authorized representative of Seller. The preceding clause shall constitute a continuing objection to any such terms not specifically so accepted by Seller.

2. **SHIPPING DATE.** Seller will make commercially reasonable efforts to promptly deliver Equipment and Service. The dates for shipping of Equipment or delivery of Service specified in the Sales Confirmation (if any) are approximate. Seller will ship Equipment upon completion of manufacturing and after the Equipment meets design and performance specifications. SELLER SHALL NOT BE RESPONSIBLE FOR ANY LOSS OR DAMAGE OF ANY KIND; INCLUDING LIQUIDATED DAMAGES, RESULTING FROM ANY DELAY IN DELIVERY OR FAILURE TO DELIVER THE EQUIPMENT OR SERVICE, UNLESS AGREED TO IN ADVANCE AND IN WRITING PRIOR TO ACCEPTANCE OF THE ORDER.

3. **FORCE MAJEURE**. Seller shall not be responsible for any loss or damage, including liquidated damages resulting from any delay in delivery or failure to deliver the Equipment or Service where such delay or failure is caused by fire, flood, natural causes, labor troubles (including strikes, slowdowns and lockouts), war, government regulations, riots, civil disorders, interruption of or delay in transportation, power failure, acts of vandalism, force of nature, inability to obtain materials and supplies, accidents, acts of God or any other cause beyond Seller's control.

4. **SHIPMENTS**. All prices are EXW (Ex-works) Seller's designated location, packed for domestic shipment (Incoterms® 2010), unless otherwise agreed in writing. The origin point of shipment, method of transportation, and routing are at the Seller's discretion. Unless otherwise noted, the Equipment will be shipped prepaid with the charges added to Purchaser's invoice. If Purchaser specifies "freight collect, 3rd-party carrier or will call" in Purchaser's Order, it is clearly understood that there will be no freight allowance and an additional fee of 2% of the order or minimum of $100, with a maximum of $500 will be charged to the Purchaser as a handling fee. Purchaser may request shipment via a transportation mode other than truck, and all additional expenses incurred will be billed to the Purchaser. If shipment is accepted by Purchaser at one destination and re-forwarded by Purchaser, the re-forwarding is at the Purchaser's expense and risk. The risk shall pass to Purchaser when the Equipment is made available for delivery in accordance with this paragraph. Where shipment is (a) requested by Purchaser beyond Seller's normal shipment schedule; (b) deferred at Purchaser's request; (c) delayed by failure of Purchaser to fulfill its obligations to facilitate shipment as agreed; or (d) delayed by any other act or failure to act on the part of the Purchaser without fault on the part of Seller (including but not limited to Purchaser's failure to provide necessary shipment information to Seller, or Purchaser's failure to schedule their carrier in a timely manner) Purchaser agrees to pay a delayed delivery storage fee at the rate of three percent (3%) of the Equipment price per month beyond the normal shipping date as established by Sellers internal production lead times. Purchaser may designate in the Purchaser's order form that the Equipment will be picked up at Sellers designated location. If Purchaser does not pickup Equipment within 5 days of the date they are notified the Equipment is available, the Order will be cancelled and subject to cancellation charges as outlined in Paragraph 14 below.

5. **PRICES**. Unless otherwise specified by Seller in writing, Purchaser shall purchase the Goods and Services from Seller at the price set forth in Seller's published price list in force as of the date of the Order as accepted by Seller, or as contained in a written quotation to Purchaser (the "Quote"). Prices contained in a Quote are valid for thirty (30) days from the date of the Quote unless otherwise specified. Services shall be billed at the hourly/daily rate provided in a Quote. Any price quoted to Purchaser may be modified in the event of Purchaser's delay or failure to provide Seller all necessary credit information. Prices as set forth in the price list are subject to change without notice. All other costs, including packing for storage, freight, insurance, taxes, customs duties and import/export fees, or any other item specified in the Quote shall be paid by Purchaser unless separately stated in the Quote. If Purchaser fails to furnish Seller with all necessary drawings duly approved by the Purchaser within thirty (30) days after submission of such drawings to Purchaser by Seller, Seller's prices are subject to change at Seller's sole discretion after notice to Purchaser.

6. **CHANGES**. By delivering a written notice to Seller, Purchaser may request changes in the designs, drawings and specifications of the Equipment. As promptly as practicable after receipt of such request, Seller will advise Purchaser what amendments to the agreement between Seller and Purchaser may be necessitated by such requested changes, if any. Possible amendments would include but are not limited to the price, specifications, shipment schedule or date of delivery. Any changes agreed upon by the parties shall be evidenced by a change order signed by both Seller and Purchaser. If at any time the Purchaser causes changes or modifications to the Order, the Order will be subject to a minimum change fee of 12% of the Order line or a $250 charge; whichever is greater, plus the actual cost of the Equipment change.

7. **CONFIDENTIAL INFORMATION**. All non-public, confidential or proprietary information of Seller, including but not limited to, specifications, samples, patterns, designs, plans, drawings, documents, data, business operations, customer lists, pricing, discounts or rebates, disclosed by Seller to Purchaser, whether disclosed orally or disclosed or accessed in written, electronic or other form or media, and whether or not marked, designated or otherwise identified as "confidential" in connection with this Agreement is confidential, solely for the use of performing this Agreement and may not be disclosed or copied unless authorized in advance by Seller in writing. Upon Seller's request, Buyer shall promptly return all documents and other materials received from Seller. Seller shall be entitled to injunctive relief for any violation of this Section. This Section does not apply to information that is: (a) in the public domain; (b) known to Buyer at the time of disclosure; or (c) rightfully obtained by Buyer on a non-confidential basis from a third party.

8. **EXPRESS ORDER FEE**. Purchaser may request shipment in advance of the normal shipping date designated by Seller. In consideration of such request, Purchaser shall be charged 12% of the Order total or $50.00, whichever is greater (the "Express Fee") on orders less than $10,000. This charge does not guarantee that Seller will ship Equipment on or before the date requested by Purchaser. If the Order is not shipped on or before the Purchaser's requested shipping date, the Express Fee will not apply. Orders without a requested shipping date will be subject to Seller's internal standard lead times or the shipping date contained in the Quote.

9. **MINIMUM ORDER CHARGE**. Extranet or EDI order values must be a minimum of $25 net. Faxed, emailed, or verbal orders must be a minimum value of $300 net. Order values less than the stated minimum value, will be automatically adjusted to the minimum order values listed in this Paragraph 10.

10. **RETURN OF EQUIPMENT.** Equipment may only be returned when authorized by the Seller pursuant to a written Return Material Authorization (a "RMA") issued by Seller. All returned equipment shall be shipped to Seller's designated location freight prepaid by the Purchaser and FOB destination. Any Equipment returned will be subject to an inspection. If after inspection, and in Seller's sole discretion the Equipment is returned in good condition, credit will be issued for the purchase price less a minimum 30% restocking fee. Any Equipment returned to Seller without a RMA will be rejected and returned.

11. **TAXES**. Prices specified in Seller's published price list, or in any Quote do not include any federal, state or municipal sales, use, excise or other taxes (collectively "Taxes"). Purchaser shall be responsible for payment of all Taxes, and in jurisdictions where seller is required by law to register and remit Taxes; Seller will invoice all Taxes to Purchaser at the applicable rates at the time of shipment. Purchaser may furnish Seller with exemption certificates (or the like) demonstrating that Purchaser is exempt from the payment of Taxes. The validity of such exemption certificates shall be determined by Seller in its sole discretion. Notwithstanding the foregoing, all Taxes due and payable outside the United States are the sole responsibility of the Purchaser, unless otherwise agreed in writing.

12. **PAYMENTS**. Terms of payment are Net 30 Days. Payment for the Equipment is due upon shipment or when Seller notifies Purchaser that Equipment is packed for shipment EXW (Ex-works) Seller's designated location, whichever occurs first, unless otherwise agreed in writing. Payment for Service is due upon completion unless otherwise agreed in writing. Subject to a review of Purchaser's credit history, additional payment terms and/or progress payments may be required for jobs over $300,000, which payment terms or progress payments shall be agreed to in writing..

13. **CANCELLATION**. Orders that have been acknowledged by Seller are firm commitments and are not subject to cancellation without the consent of Seller. If cancellation is approved by Seller, Seller shall impose a cancellation fee. The minimum cancellation fee shall be 30% of the Order, and the maximum cancellation fee shall be the full price of the Order, as necessary for Seller to cover Sellers actual costs of material, fabrication costs, special engineering costs and the costs associated with testing, handling, and accounting.

14. **LIMITED WARRANTY.** NEW EQUIPMENT MANUFACTURED BY SELLER OR SERVICE SUPPLIED BY SELLER IS WARRANTED TO BE FREE FROM DEFECTS IN MATERIAL AND WORKMANSHIP UNDER NORMAL USE AND SERVICE FOR A MINIMUM OF TWELVE (12) MONTHS FROM DATE OF INSTALLATION, EIGHTEEN (18) MONTHS FROM DATE OF SHIPMENT, UNLESS OTHERWISE STATED IN PRODUCT WARRANTY GUIDE(AVAILABLE UPON REQUEST). IN THE CASE OF SPARE OR REPLACEMENT PARTS MANUFACTURED BY SELLER, THE WARRANTY PERIOD SHALL BE FOR A PERIOD OF TWELVE MONTHS FROM SHIPMENT. SELLER'S OBLIGATION UNDER THIS WARRANTY IS LIMITED TO REPAIRING OR REPLACING, AT ITS OPTION, ANY PART FOUND TO ITS SATISFACTION TO BE SO DEFECTIVE, PROVIDED THAT SUCH PART IS, UPON REQUEST, *RETURNED TO SELLER'S FACTORY FROM WHICH IT WAS SHIPPED, TRANSPORTATION PREPAID. PARTS REPLACED UNDER WARRANTY* SHALL BE WARRANTED FOR TWELVE MONTHS FROM THE DATE OF THE REPAIR, NOT TO EXCEED THE ORIGINAL WARRANTY PERIOD. THIS WARRANTY DOES NOT COVER PARTS DAMAGED BY DECOMPOSITION FROM CHEMICAL ACTION OR WEAR CAUSED BY ABRASIVE *MATERIALS, NOR DOES IT COVER DAMAGE RESULTING FROM MISUSE, ACCIDENT, NEGLECT, OR FROM IMPROPER OPERATION,* MAINTENANCE, INSTALLATION, MODIFICATION OR ADJUSTMENT. THIS WARRANTY DOES NOT COVER PARTS REPAIRED OUTSIDE SELLER'S FACTORY WITHOUT PRIOR WRITTEN APPROVAL. SELLER MAKES NO WARRANTY AS TO STARTING EQUIPMENT, ELECTRICAL APPARATUS OR OTHER MATERIAL NOT OF ITS MANUFACTURE. IF PURCHASER OR OTHERS REPAIR, REPLACE, OR ADJUST EQUIPMENT OR PARTS WITHOUT *SELLER'S PRIOR WRITTEN APPROVAL, SELLER IS RELIEVED OF ANY FURTHER OBLIGATION TO PURCHASER UNDER THIS PARAGRAPH WITH* RESPECT TO SUCH EQUIPMENT OR PARTS, UNLESS SUCH REPAIR, REPLACEMENT, OR ADJUSTMENT WAS MADE AFTER SELLER FAILED TO SATISFY WITHIN A REASONABLE TIME SELLER'S OBLIGATIONS UNDER THIS PARAGRAPH. SELLER'S LIABILITY FOR BREACH OF THESE *WARRANTIES (OR FOR BREACH OF ANY OTHER WARRANTIES FOUND BY A COURT OF COMPETENT JURISDICTION TO HAVE BEEN GIVEN BY* SELLER) SHALL BE LIMITED TO: (A) ACCEPTING RETURN OF SUCH EQUIPMENT EXW PLANT OF MANUFACTURE, AND (B) REFUNDING ANY AMOUNT PAID THEREON BY PURCHASER (LESS DEPRECIATION AT THE RATE OF 15% PER YEAR IF PURCHASER HAS USED EQUIPMENT FOR MORE THAN THIRTY [30] DAYS), AND CANCELING ANY BALANCE STILL OWING ON THE EQUIPMENT, or (C) IN THE CASE OF SERVICE, AT SELLER'S OPTION, REDOING THE SERVICE, OR REFUNDING THE PURCHASE ORDER AMOUNT OF THE SERVICE OR PORTION THEREOF UPON WHICH SUCH LIABILITY IS BASED. THESE WARRANTIES ARE EXPRESSLY IN LIEU OF ANY OTHER WARRANTIES, EXPRESS OR IMPLIED, AND SELLER SPECIFICALLY DISCLAIMS ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE, AND IN LIEU OF ANY OTHER OBLIGATION OR LIABILITY ON THE PART OF THE SELLER WHETHER A CLAIM IS BASED UPON NEGLIGENCE, BREACH OF WARRANTY, OR ANY OTHER THEORY OR CAUSE OF ACTION. IN NO EVENT SHALL SELLER BE LIABLE FOR ANY CONSEQUENTIAL, INCIDENTAL, INDIRECT, SPECIAL OR PUNITIVE DAMAGES OF ANY KIND. FOR PURPOSES OF THIS PARAGRAPH, THE EQUIPMENT WARRANTED SHALL NOT INCLUDE EQUIPMENT, PARTS, AND WORK NOT MANUFACTURED OR PERFORMED BY SELLER. WITH RESPECT TO SUCH EQUIPMENT, PARTS, OR WORK, SELLER'S ONLY OBLIGATION SHALL BE TO ASSIGN TO PURCHASER THE WARRANTIES PROVIDED TO SELLER BY THE MANUFACTURER OR SUPPLIER PROVIDING SUCH EQUIPMENT, PARTS OR WORK. NO EQUIPMENT FURNISHED BY SELLER SHALL BE DEEMED TO BE DEFECTIVE BY REASON OF NORMAL WEAR AND TEAR, FAILURE TO RESIST EROSIVE OR CORROSIVE ACTION OF ANY FLUID OR GAS, PURCHASER'S FAILURE TO PROPERLY STORE, INSTALL, OPERATE, OR MAINTAIN THE EQUIPMENT IN ACCORDANCE WITH GOOD INDUSTRY PRACTICES OR SPECIFIC RECOMMENDATIONS OF SELLER, INCLUDING, BUT NOT LIMITED TO SELLER'S INSTALLATION AND OPERATION MANUALS, OR PURCHASER'S FAILURE TO PROVIDE COMPLETE AND ACCURATE INFORMATION TO SELLER CONCERNING THE OPERATIONAL APPLICATION OF THE EQUIPMENT.

15. **COMPLIANCE WITH LAWS**. Purchaser shall be solely responsible for securing any necessary permits under and for compliance with all safety, health and sanitation laws, ordinances and regulations in connection with the installation, service, repair and operation of the Equipment. Purchaser agrees to provide Seller, upon request, with evidence of the securing of any such permits and of compliance with any such laws, ordinances and regulations. Seller shall be responsible for requesting any U. S. Export License Permits which may be required, and Purchaser agrees to provide all necessary information to enable Seller to apply for such permits. Purchaser agrees to comply with applicable *United Sates international trade laws and regulations in its business dealings with Seller and will deliver to Seller at the time of execution of* this agreement a completed International Order Header form or End User Statement signed by an authorized officer or owner of Purchaser. Purchaser agrees to disclose the name and address and business of the user of the goods supplied upon Seller's request. Purchaser shall *automatically disclose this information if the goods are to be exported outside of the United States. Notwithstanding Purchaser's* sole responsibility to ensure compliance with all relevant laws, Seller reserves the right to cancel order without compensation to Purchaser if Seller considers or suspects that goods, or delivery of the same, may breach any laws of the United States.

16. ***INDEMNIFICATION.*** *It is understood that Seller has relied upon data furnished by and on behalf of Purchaser with respect to the safety* aspects of the Equipment, and that it is Purchaser's responsibility to insure that the Equipment will, when installed and put in use, be in compliance with safety requirements fixed by law and otherwise legally adequate to safeguard against injuries or damage to persons or property. *Purchaser hereby agrees to defend, indemnify and hold harmless Seller, its agents and employees against any and all losses, costs,*

damages, claims, liabilities or expenses, including but not limited to reasonable attorneys' fees, arising out of or resulting from any injury or damage to any person or property caused by the inadequacy of safety features, devices or characteristics in the Equipment or arising out of the installation, Service, repair, or use or operation of the same, except where the injury or damage is solely caused by Seller's negligence *and except for claims for repair or replacement of defective parts in accordance with Paragraph 15 hereof. Purchaser indemnifies Seller for* any loss to Seller, including reasonable attorneys' fees, caused by Seller's manufacturing, installing or building to specifications provided by the Purchaser. Purchaser shall indemnify Seller and hold Seller harmless from any claims or liability for patent or trademark infringement *on the account of the manufacture or sale of the Equipment.*

17. **RISK OF LOSS**. Full risk of loss (including transportation delays and losses) shall pass to Purchaser upon delivery, regardless of whether title has passed to Purchaser, transport is arranged or supervised by Seller, or start-up is carried out under the direction or supervision of Seller. Loss or destruction of the equipment or injury or damage to the equipment that occurs while the risk of loss or damage is borne by the Purchaser does not relieve Purchaser of its obligations to pay Seller for the Equipment.

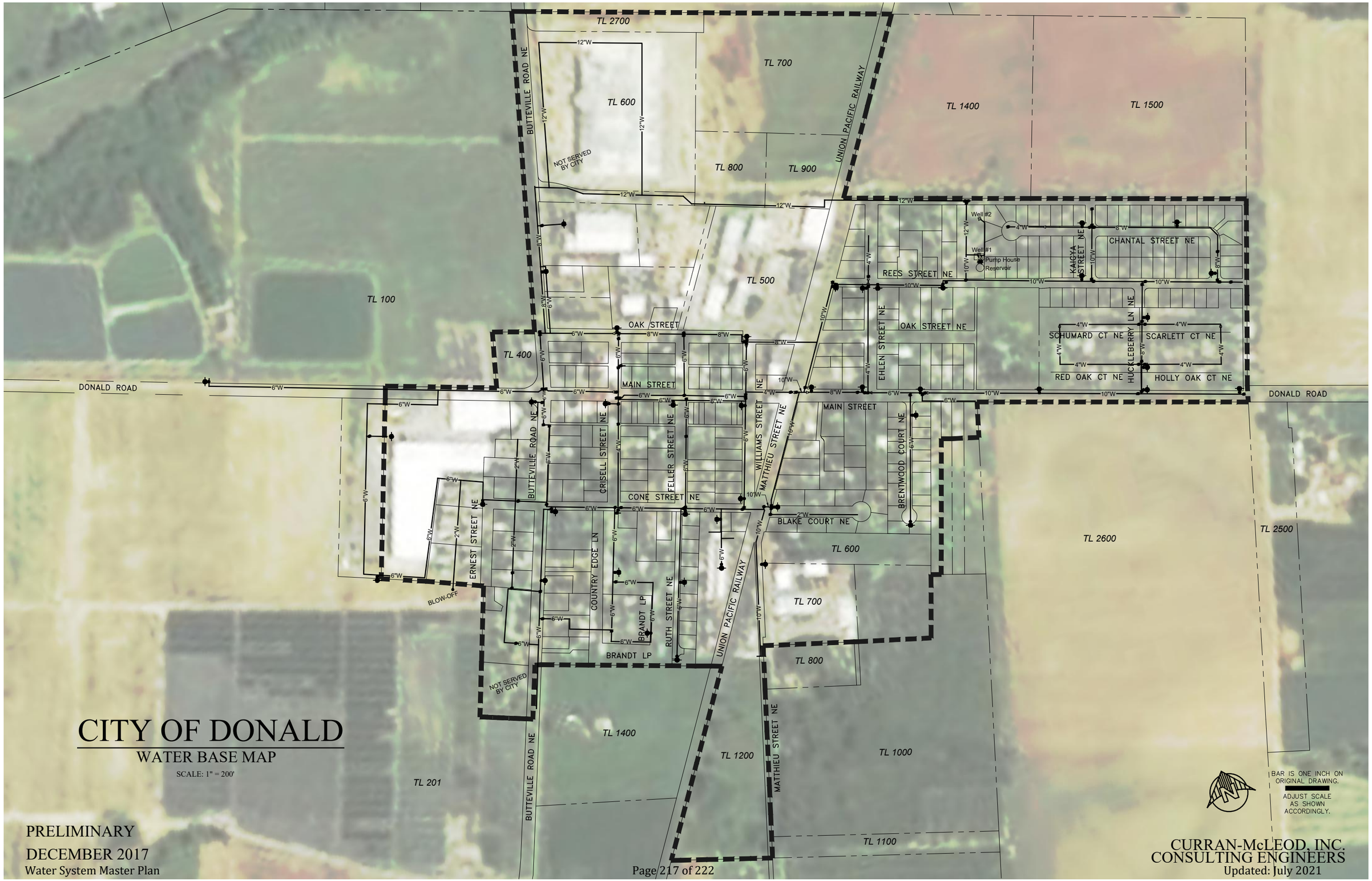
18. ***LIMITATION OF DAMAGES AND DISCLAIMER OF CONSEQUENTIAL DAMAGES OR PENALTIES***. TO THE EXTENT PERMITTED BY LAW, SELLER SHALL NOT BE LIABLE FOR CONSEQUENTIAL, INCIDENTAL, INDIRECT, SPECIAL OR PUNITIVE DAMAGES, ARISING OUT OF THE ORDER, OR OUT OF ANY BREACH OF ANY OF SELLER'S OBLIGATIONS HEREUNDER, OR OUT OF ANY DEFECT IN, OR FAILURE OF, OR MALFUNCTION OF THE EQUIPMENT, WHETHER OR NOT CAUSED BY SELLER'S NEGLIGENCE. CONSEQUENTIAL DAMAGES, FOR THE PURPOSE OF THIS AGREEMENT, SHALL INCLUDE BUT NOT BE LIMITED TO, PERSONAL INJURY, LOSS OF USE, LOST INCOME OR PROFITS, LOST INTEREST, LOST GOODWILL, WORK STOPPAGE, IMPAIRMENT OF OTHER EQUIPMENT, ENVIRONMENTAL DAMAGE, INCREASED EXPENSES OF OPERATION, COST OF PURCHASE OF REPLACEMENT POWER OR CLAIMS OF PURCHASER OR CUSTOMERS OF PURCHASER FOR SERVICE INTERRUPTION, DAMAGE TO PROPERTY (INCLUDING, BUT NOT LIMITED TO, PRODUCTS MANUFACTURED, PROCESSED OR TRANSPORTED BY THE USE OF THE EQUIPMENT), OR ANY OTHER LOSS OCCASIONED BY OR ARISING OUT OF THE OPERATION, USE, INSTALLATION, REPAIR OR REPLACEMENT OF THE EQUIPMENT OR OTHERWISE, WHETHER OR NOT SUCH LOSS IS BASED UPON CONTRACT, TORT (INCLUDING NEGLIGENCE AND STRICT LIABILITY) OR OTHERWISE. SELLER'S DAMAGES ARE LIMITED TO DAMAGES SET FORTH IN PARAGRAPH 15, WARRANTY. SELLER SHALL NOT BE LIABLE FOR ANY DAMAGES, PENALTIES OR LIQUIDATED DAMAGES BASED UPON OR RELATING TO SELLER'S FAILURE OR INABILITY TO SHIP WITHIN A SPECIFIED TIME. THE FOREGOING NOTWITHSTANDING, SELLER'S MAXIMUM AGGREGATE LIABILITY RELATED TO THE PERFORMANCE OF THIS CONTRACT SHALL NOT EXCEED THE PURCHASE ORDER AMOUNT OF THE EQUIPMENT OR SERVICE PORTION THEREOF UPON WHICH SUCH LIABILITY IS BASED. ALL SUCH LIABILITY SHALL TERMINATE FOUR YEARS FROM THE DATE OF THE PURCHASE ORDER IF NOT SOONER TERMINATED.

19. **CHOICE OF LAW**. All questions relating to the formation of or performance under the contract based hereon shall be determined in accordance with the laws of the State of Delaware. The United Nations Convention on contracts for the International Sales of Goods shall have no application to this Agreement or to any proceeding brought pursuant hereto.

20. **DISPUTE RESOLUTION**. The parties stipulate that the state and federal courts of Delaware have exclusive jurisdiction over all matters arising out of the Order and/or these Terms. For any sale of Equipment by Seller to a Purchaser outside of the United States or a Purchaser organized or with a principal place of business or substantial assets outside of the United States ("International Sale"), *all disputes arising in connection with the International Sale shall be finally settled by arbitration in accordance with the rules* set forth by the United Nations Commission for International Trade Law (UNCITRAL) Arbitration Rules, under the auspices of the American Arbitration Association (Arbitration). In the event of any dispute or difference arising out of or relating to an *International Sale, the parties hereto first shall use their best endeavors to settle such disputes or differences. To this effect,* the parties shall consult and negotiate with each other, in good faith and understanding of their mutual interest, to reach a just and equitable solution satisfactory to both parties. If the parties do not reach such solution within a period of ninety (90) calendar days from the commencement of consultations and negotiations, before arbitration may be invoked, one of the parties must, by written notice to the other party, have the dispute referred to their respective Chief Executive Officer (or the equivalent), or to their designated representatives who have the final authority to resolve the dispute, with the request that they attempt in good faith to resolve the dispute within ninety (90) calendar days after valid notice is served pursuant to this Paragraph 20. No party may invoke arbitration without first complying with the provisions of this Paragraph 20. In the event that the foregoing designated representatives of the parties are not able, for whatever reason, to resolve such dispute in good faith within the ninety (90) calendar day period, the parties agree that the disputes or differences shall be settled by arbitration in accordance with the rules set forth by the United Nations Commission for International Trade Law (UNCITRAL) Arbitration Rules, under the auspices of the American Arbitration Association (Arbitration). The arbitration shall take place in the State of Delaware, USA, or another location, at the sole discretion of Seller. The arbitration shall be conducted in and the award rendered in English and payable in US Dollars, and such award shall be final and binding on the parties, not subject to any appeal, and shall deal with the question of costs of arbitration and all matters related thereto. The parties agree that any judgment, decision, or award of the arbitrators shall be made enforceable in any court of competent jurisdiction, including courts in the country of Purchaser. Judgment upon the award rendered may be entered into any court having jurisdiction, or application may be made to such court for a judicial recognition of the award or an order of enforcement thereof, as the case may be. This paragraph 20 shall survive any termination or expiration of this Agreement.

21. **MISCELLANEOUS**. If any part of these Terms is contrary to, prohibited by, or deemed invalid under applicable laws or regulations, such provision shall be inapplicable and deemed omitted to the extent so contrary, prohibited or invalid, but the remainder hereof shall not be invalidated and shall be given effect so far as possible. No waiver of any term or condition or the breach of any term or condition of this agreement shall be deemed to constitute a waiver of any subsequent breach of such term or condition, nor justify or authorize a nonobservance upon any occasion of such term or condition or any other term or condition; nor shall the acceptance of payment by Seller at any time when Purchaser is in default of any term or condition be construed as a waiver of such default or waiver of Seller's right to terminate this agreement on account of such default. The Purchaser warrants and represents that only those persons with authority to execute the documents related to these Terms will sign on behalf of the Purchaser, and electronic orders will be placed only by those persons so authorized by the Purchaser. All Orders so placed by Purchaser shall be binding on the Purchaser upon acceptance by the Seller with or without a hand written signature of Purchaser.

Appendix F. Maps



CITY OF DONALD

WATER BASE MAP

SCALE: 1" = 200'

BAR IS ONE INCH ON ORIGINAL DRAWING.
ADJUST SCALE AS SHOWN ACCORDINGLY.

PRELIMINARY
DECEMBER 2017
Water System Master Plan

CURRAN-McLEOD, INC.
CONSULTING ENGINEERS
Updated: July 2021

J:\Donald\VMAP\1690-BaseMap.dwg, 12/28/2017 3:55:16 PM, Paul Beskow

Appendix G. Water System Capacity Evaluation

	Year 2021	Year 2022	Year 2032-2040
Water Rights	(gpm)	(gpm)	(gpm)
Water Right Permit G-9513 Permitted Withdrawal	350	350	350
Capacity	350	350	350
Well Capacity			
Well No. 1 (decommissioned)	<20	0	0
Well No. 2	200	200	0-200
Well No. 3	-	400-600	400-600
Well No. 4	-	-	>400
Capacity	200	400-600	>400
Firm Capacity	-	200	>400
Well Pumps			
Pump, Well No. 1 (decommissioned)	0	0	0
Pump, Well No. 2	200	200	0-200
Pump, Well No. 3	-	350	350
Pump, Well No. 4	-	-	200-350
Maximum Capacity	200	350	350
Firm Capacity	-	200	350
Water Treatment Plant Capacity			
Green sand filters firm capacity	400	400	400
Capacity	400	400	400
Firm Capacity	400	400	400
Water Demands			
MDD	193	272	312
Overall Capacity	200	350	350
Overall Firm Capacity	0	200	350
MDD Demand	193	272	312
Water Balance	7	78	38
Water Balance (Firm Capacity)	-193	-72	38

Appendix H. Data Sheets

Burlington, WA *Corporate Laboratory (a)*
1620 S Walnut St - Burlington, WA 98233 - **800.755.9295** • 360.757.1400

Bellingham, WA *Microbiology (b)*
805 Orchard Dr Ste 4 - Bellingham, WA 98225 - 360.715.1212

Portland, OR *Microbiology/Chemistry (c)*
9150 SW Pioneer Ct Ste W - Wilsonville, OR 97070 - 503.682.7802

Corvallis, OR *Microbiology/Chemistry (d)*
1100 NE Circle Blvd, Ste 130 - Corvallis, OR 97330 - 541.753.4946

Bend, OR *Microbiology (e)*
20332 Empire Blvd Ste 4 - Bend, OR 97701 - 541.639.8425

INORGANIC COMPOUNDS (IOC) REPORT

Client Name: Donald, City of
PO Box 388
10710 Main St NE
Donald, OR 97020

Reference Number: 21-04716
Project: Iron and Manganese

System Name:
System ID Number:
Source Number:
Multiple Sources:
Sample Type:
Sample Purpose: Investigative or Other
Sample Location: Well #2 (Raw)
County:

Sample Number: Well #2 (Raw)
Lab Number: 21_09132
Collect Date: 2/10/21 08:45
Date Received: 2/10/21
Report Date: 2/25/21
Sampled By: Jesus Rios
Sampler Phone:
Approved by: bsp
Authorized by:

Thanh B Phan
Lab Manager, Portland

EPA#	ANALYTES	RESULTS	UNITS	LRL	MCL	Analyst	Lab Code*	METHOD	Analyzed	COMMENT
	IRON	**0.39**	mg/L	0.05	0.3	bj	4072 a	200.7	02/18/21	
	MANGANESE	**0.254**	mg/L	0.001	0.05	bj	4072 a	200.7	02/18/21	

NOTES:
ND (Not Detected): indicates that the parameter was not detected above the Lower Reporting limit (LRL).
MCL (Maximum Contaminant Level) maximum permissible level of a contaminant in water established by EPA; Federal Action Levels are 0.015 mg/L for Lead and 1.3 mg/L for Copper. Sodium has a recommended limit of 20 mg/L. A blank MCL value indicates a level is not currently established.
* Lab Code - lists the laborstory accreditation code plus a letter at the far right to indicate the Edge Analytical lab facility where the analyses was performed.

If you have any questions concerning this report contact us at the above phone number.
FORM: clOC OR.rpt

EDGE ANALYTICAL

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Bend, OR *Microbiology (e)*
20332 Empire Blvd Ste 4 - Bend, OR 97701 - 541.639.8425

INORGANIC COMPOUNDS (IOC) REPORT

Client Name: Donald, City of
PO Box 388
10710 Main St NE
Donald, OR 97020

Reference Number: 21-04716
Project: Iron and Manganese

System Name:
System ID Number:
Source Number:
Multiple Sources:
Sample Type:
Sample Purpose: Investigative or Other
Sample Location: Well #2 (Finished)
County:

Sample Number: Well #2 (Finished)
Lab Number: 21_09133
Collect Date: 2/10/21 08:40
Date Received: 2/10/21
Report Date: 2/25/21
Sampled By: Jesus Rios
Sampler Phone:
Approved by: bsp
Authorized by:

Thanh B Phan
Lab Manager, Portland

EPA#	ANALYTES	RESULTS	UNITS	LRL	MCL	Analyst	Lab Code*	METHOD	Analyzed	COMMENT
	IRON	**ND**	mg/L	0.05	0.3	bj	4072 a	200.7	02/18/21	
	MANGANESE	**0.0059**	mg/L	0.001	0.05	bj	4072 a	200.7	02/18/21	

NOTES:
ND (Not Detected): indicates that the parameter was not detected above the Lower Reporting limit (LRL).
MCL (Maximum Contaminant Level) maximum permissible level of a contaminant in water established by EPA; Federal Action Levels are 0.015 mg/L for Lead and 1.3 mg/L for Copper. Sodium has a recommended limit of 20 mg/L. A blank MCL value indicates a level is not currently established.
* Lab Code - lists the laborstory accreditation code plus a letter at the far right to indicate the Edge Analytical lab facility where the analyses was performed.

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