City of Donald, Oregon

Wastewater Facilities Plan Amendment

TETRA TECH

October 2021

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PREPARED FOR

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I. Executive Summary

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

The City of Donald commissioned Tetra Tech to prepare an amendment to the Wastewater Facility Plan (WWFP) prepared by Curran-McLeod in 2019. The amendment is required in order to address revised population and wastewater flow forecasts due to a newly planned Harvest Gardens residential development within the City's sewer service area. This amendment provides the updated population and wastewater flow forecast, as well as an updated capital improvement plan. It investigates new potential wastewater management options, including interim wastewater treatment plant upgrades, discharge to surface water, and enhanced treatment for expanded reclaimed water uses. Resulting revisions to the capital improvement plan include the following:

- Updated cost estimates based on more recent construction cost data
- Phasing of capital improvement projects to initially serve a planned residential development and expansion of the Fargo Interchange Service District
- Phased construction of two smaller storage lagoons instead of one large lagoon, including conversion of the existing recycled water pump station to a lagoon transfer pump station
- Addition of a reclaimed water line to the Twin Springs nursery
- Incorporation of additional irrigation areas into the City's Recycled Water Use Plan
- Addition of enhanced treatment to produce Class A reclaimed water

A summary of the updated wastewater system capital improvements is presented in Table ES-1. The revised projects are listed alongside those from the 2019 WWFP for clarity.

Table ES-1. Capital Improvement Plan

2019 WWFP Project No.	WWFP Amendment Project No.	Project Description	Timing	Estimated Cost
1	1	New Lagoon 5	1-2 years	$2,800,000
N/A	2	New Lagoon 6	5-10 years	$2,050,000
2	3	Chlorination Improvements	5-10 years	$40,000
3	4	New recycled water pump station	1-2 years	$480,000
4	5	Expand irrigation area to north	5-10 years	$260,000
N/A	6	Recycled water force main to Twin Springs nursery	1-2 years	$890,000
N/A	7	Class A treatment system	10+ years	$2,090,000
5	8	SCADA system upgrades	5-10 years	$25,000
6	9	Planning and System Development Charge Updates	1-2 years	$40,000
			Total	**$8,675,000**

The projects will be constructed in three phases, as shown in Table ES-2. Funding for Phase 1 will be split between the owner of the new residential development, Marion County, and the City of Donald. The City will fund Phase 2. Funding for Phase 3 is yet to be determined.

Table ES-2. Capital Improvement Plan Phasing

WWFP Amendment Project No.	Project Description	Estimated Cost
Phase 1		
1	New Lagoon 5	$2,800,000
3	Chlorination Improvements	$40,000
4	New Recycled Water Pump Station	$480,000
6	Recycled Water Force Main to Twin Springs Nursery	$890,000
	Total Phase 1	**$4,210,000**
Phase 2		
2	New Lagoon 6	$2,050,000
5	Expand Irrigation Area to North	$260,000
8	SCADA System Upgrades	$25,000
9	Planning and System Development Charge Updates	$40,000
	Total Phase 2	**$2,375,000**
Phase 3		
7	Class A Treatment System	$2,090,000
	Total Phase 3	**$2,090,000**
	Total	**$8,675,000**

II. INTRODUCTION

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

A. BACKGROUND

(This section is unchanged from the 2019 WWFP approved by DEQ except for the addition of the information below.)

An updated Wastewater Facilities Plan (WWFP) for the City of Donald was approved by the Oregon Department of Environmental Quality (DEQ) in June 2019. The City has requested that Tetra Tech, the City's Engineer of Record as of February 2020, prepare an amendment to the 2019 WWFP reevaluating projected population and wastewater generations over the planning period. Additional capital improvement projects in support of the modified projections were developed as part of this WWFP Amendment.

B. STUDY PURPOSE AND NEED

(This section is unchanged from the 2019 WWFP approved by DEQ except for the addition of the information below.)

The 2019 WWFP approved by DEQ did not include expansion of the Fargo Interchange Service District (ISD) or the Harvest Gardens planned unit development (PUD) on acreage that was included within the urban growth boundary when the boundary expanded in 2018. The Harvest Gardens PUD is currently under development review. Its current design includes 297 single-family homes to be constructed in 2021. These will result in a significant increase in wastewater flow to the City's treatment facilities, requiring this Amendment to the 2019 WWFP.

III. PROJECT PLANNING

A. LOCATION

(This section is unchanged from the 2019 WWFP approved by DEQ.)

B. ENVIRONMENTAL RESOURCES PRESENT

(This section is unchanged from the 2019 WWFP approved by DEQ.)

C. POPULATION TRENDS

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

1. New Development

The 2019 WWFP based population projections on data provided by the Portland State University Population Research Center and an annual average growth rate of 2.8 percent. Those projections did not include the Harvest Gardens PUD currently under development review. The PUD was originally expected to be built over an 8-year period, but the developer, Gary Grossen Properties (GGP), recently modified plans to start phased construction of the planned 297 single-family homes in 2021. The density of the proposed single-family homes will be greater than the typical density currently found in Donald, as approved through the County land use approval process.

In addition to the single-family homes, the PUD is currently designed to provide 80 multi-family units. GGP has not yet determined when the multi-family units will be built. Projections for this Amendment assume that they will be built at the same time as 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 Harvest Gardens 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 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 due to infill is 358 people. This Amendment assumes that population associated with infill development will grow at a rate of 2.8 percent until the total growth of 358 people is reached.

3. Total Projected Growth

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

Table 1. Updated Population Projections

Year	2019 WWFP Projection	2020 WWFP Amendment Projections			
		PUD Growth	Infill Growth[a]	Total Annual Growth	Accumulated Population
2020	1,011	0	0	0	1,011
2021		992	28	1,020	1,444
2022		0	28	28	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 annual average growth rate of 2.8 percent based on Portland State University Population Research Center.

IV. EXISTING FACILITIES

A. LOCATION

(This section is unchanged from the 2019 WWFP approved by DEQ.)

B. HISTORY

(This section is unchanged from the 2019 WWFP approved by DEQ.)

C. CONDITION OF THE EXISTING FACILITIES

1. Management

(This section is unchanged from the 2019 WWFP approved by DEQ.)

2. Waste Discharge Permit Compliance

(This section is unchanged from the 2019 WWFP approved by DEQ.)

3. System Failures

(This section is unchanged from the 2019 WWFP approved by DEQ.)

4. Violations of Regulatory Requirements

(This section is unchanged from the 2019 WWFP approved by DEQ.)

5. Collection and Treatment System Condition and Capacity

a. Collection System

(This section is unchanged from the 2019 WWFP approved by DEQ.)

b. Infiltration and Inflow Review

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

The 2019 WWFP provided a comparison of seasonal flows to analyze the contribution of infiltration and inflow (I/I) to the collection and wastewater treatment systems for the period 2014 through 2017. This comparison has been updated to include three additional years of flow data, as shown in Table 2, and now covers the period from 2014 through 2020. The data for the most recent years do not significantly differ from the earlier period reported in 2019. The design criteria of 65 gallons per capita per day remains an appropriate and conservative estimate for average annual flow.

Table 2. Wet and Dry Weather Flow Comparison

	2014		2015		2016		2017		2018		2019		2020	
	Wet	Dry	Wet	Dry	Wet	Dry	Wet	Dry	Wet	Dry	Wet	Dry	Wet	Dry
Monthly Flow (thousand gallons)														
January	1,657	—	1,816	—	2,427	—	2,327	—	2,394	—	1,826	—	2,189	—
February	2,084	—	1,880	—	1,936	—	3,029	—	1,727	—	1,863	—	1,772	—
March	2,269	—	1,788	—	2,279	—	2,662	—	1,906	—	1,786	—	1,716	—
April	1,771	—	1,549	—	1,626	—	1,938	—	2,092	—	1,959	—	1,802	—
May	—	1,732	—	1,570	—	1,629	—	1,722	—	1,676	—	1,609	—	1,735
June	—	1,597	—	1,521	—	1,574	—	1,596	—	1,604	—	1,585	—	1,681
July	—	1,663	—	1,473	—	1,567	—	1,587	—	1,589	—	1,613	—	1,666
August	—	1,623	—	1,510	—	1,534	—	1,587	—	1,530	—	1,611	—	1,530
September	—	1,529	—	1,468	—	1,446	—	1,447	—	1,505	—	1,552	—	1,587
October	—	1,606	—	1,556	—	1,707	—	1,566	—	1,561	—	1,556	—	1,678
November	1,604	—	1,633	—	2,130	—	1,881	—	1,527	—	1,512	—	1,662	—
December	2,069	—	3,166	—	2,361	—	2,003	—	1,738	—	1,699	—	2,152	—
Seasonal (Totals for Wet Months and for Dry Months)														
Total Flow (thousand gallons)	11,454	9,750	11,832	9,098	12,759	9,457	13,840	9,505	11,384	9,465	10,645	9,526	11,293	9,877
% of Annual	54.0%	46.0%	56.5%	43.5%	57.4%	42.6%	59.3%	40.7%	54.6%	45.4%	52.8%	47.2%	53.3%	46.7%
Avg. (gpd)	63,282	52,989	65,370	49,446	70,492	51,397	76,464	51,658	62,895	51,440	58,812	51,772	62,392	53,679
Per Capita (gpd)	64	54	66	50	72	52	78	52	64	52	60	53	63	54
Annual (Total for Year)														
Per Capita (gpd)	59		58		62		65		58		56		59	
Max Month W:D Ratio	1.5 : 1		2.2 : 1		1.7 : 1		2.1 : 1		1.6 : 1		1.3 : 1		1.4 : 1	

c. Collection System (Continued)

(This section is unchanged from the 2019 WWFP approved by DEQ.)

d. Donald Treatment and Storage Lagoon System

(This section updates and amends the content in the 2019 WWFP approved by DEQ.)

Lagoon hydraulic capacity was recalculated based on changes described in the following sections.

(1) Lagoon Water Depth

The as-built drawings for the wastewater treatment plant (WWTP) show a maximum water level of 8.5 feet for Lagoons 1 and 2, which are stabilization (treatment) cells, and Lagoon 3, which is a storage cell. This provides 3 feet of freeboard, and the capacity calculations are based on this depth. The 2019 WWFP assumed a maximum water depth of 9.5 feet in Lagoons 1, 2, and 3. This water depth provides 2 feet of freeboard and it is currently necessary to operate at this reduced freeboard in order to meet existing demand with the available facilities. This Amendment uses the maximum water depth of 8.5 feet when sizing facilities to meet future demand. For Lagoons 1, 2, and 3, the revised total storage volume of all three lagoons is between a low water level of 2.5 feet and a maximum water level of 8.5 feet.

The 2019 WWFP assumed a maximum water depth of 11.33 feet in the Fargo Interchange Service District (ISD) lagoon, or Lagoon 4, which provides 2 feet of freeboard. The design drawings for Lagoon 4 show the same maximum water level, and 11.33 feet was used to calculate the existing capacity of Lagoon 4. The low water level in Lagoon 4 is listed as 1.5 feet in the design drawings, and as 2.5 feet in the 2019 WWFP. However, City staff report that the lagoon's construction does not allow the water level to be dropped below 3.0 feet; that level is used in this amendment. The revised storage volume of Lagoon 4 is between a low water level of 3.0 feet and a maximum water level of 11.33 feet. However, in the future when additional facilities are available, increasing the freeboard to 3 feet has been selected as a design goal, giving a maximum water level of 10.33 feet. This will provide additional available storage for storm events or other unusual events.

(2) Precipitation and Evaporation Historical Data

Newer data were available for the precipitation and evaporation rates used to calculate capacities. Table 3 shows the changes that were made.

Table 3. Precipitation and Evaporation Data Updates

Category	2019 WWFP Value	Updated Value
Precipitation		
Data Source	*Climate of Oregon Climate Zone 2 Willamette Valley* (Oregon State University, 1993)	Western Regional Climate Center website (wrcc.dri.edu)
Monitoring Location	North Willamette Experimental Station (Aurora, OR)	Same location
Years of Data	1961 to 1990	1981 to 2010
Annual Average Precipitation	40.78 inches	42.45 inches
Wet-Season Precipitation	30.21 inches	31.71 inches
Evaporation		
Data Source	*Mean Monthly, Seasonal, and Annual Pan Evaporation for the United States* (NOAA, 1982)	Western Regional Climate Center website (wrcc.dri.edu)
Monitoring Location	North Willamette Experimental Station (Aurora, OR)	Same location
Years of Data	1963 to 1979	1963 to 2005
Annual Average Evaporation	46.2 inches	41.44 inches
Wet-Season Evaporation	10.72 inches	9.03 inches

(3) Precipitation and Evaporation Volume Calculation

The areas used to calculate the total volume of precipitation and evaporation were revised. The 2019 WWFP used the total area of each lagoon to calculate these volumes. Precipitation should be calculated using the total catchment area of the lagoon, including the portion of the lagoon above the high water level. Evaporation should be calculated using the water surface area of the lagoon. A spreadsheet model of the lagoon volume, developed using the WWTP as-built drawings, was used to calculate approximate surface areas at the required elevations. Table 4 shows the changes that were made.

Table 4. Lagoon Surface Updates

Lagoon	2019 WWFP Value	Updated Value
Surface Area Used to Calculate Precipitation Volume		
1 + 2	5.0 acres	4.88 acres
3	5.0 acres	5.29 acres
4	5.0 acres	5.01 acres
Surface Area Used to Calculate Evaporation Volume		
1 + 2	5.0 acres	4.36 acres
3	5.0 acres	4.90 acres
4	5.0 acres	4.63 acres

(4) Wet-Season vs. Annual Capacity

The method of calculating existing capacity was modified. The 2019 WWFP calculated lagoon capacity as follows:

- Determine wet-season capacity by subtracting the wet-season precipitation from the lagoon storage volume (to account for storage lost to rainwater) and adding the wet-season evaporation (to account for storage gained by evaporation).
- Calculate annual capacity by dividing the wet-season capacity by 0.6 (because the 2019 analysis of inflow and infiltration found that 60 percent of annual flow to the WWTP occurs in the wet season).

Because the critical period for lagoon capacity is the wet season, when irrigation is not typically allowed and all flow must be stored, this Amendment omitted the conversion from wet-season to annual capacity. The calculated wet-season capacity has been used as the design criterion.

(5) Summary of Revised Hydraulic Capacity Calculation

After making the revisions described above, lagoon capacities were recalculated as shown in Table 5. As a result of the updates, the daily average recommended combined capacity of Lagoons 1, 2, and 3 was calculated to be 54,900 gallons per day (gpd). The 2019 WWFP calculated a value of 68,800 gpd. This difference is largely due to the recommended increase in freeboard. If operations continue with 2 feet of freeboard, then the combined lagoon capacity is calculated to be 72,200 gpd. A 2-foot freeboard is not recommended for long-term operation. Based on the updated capacity calculations, with 3 feet of freeboard, new climate data, and the average influent flow of 58,617 gpd for 2014 to 2020, the existing flows are over the recommended capacity of the Donald lagoons.

Table 5. Lagoon Capacity Calculation Updates

Lagoon	Maximum Storage Volume (gallons)	Wet-Season Precipitation Volume (gallons)	Wet-Season Evaporation Volume (gallons)	Wet-Season Lagoon Capacity (gallons)	
				(gallons)	(gallons per day)
1 + 2	7,561,039	4,201,741	1,068,048	4,427,346	24,500
3	8,854,476	4,554,525	1,201,539	5,501,490	30,400
1 + 2 +3	***16,415,516***	***8,756,266***	***2,269,587***	***9,928,836***	***54,900***
4	10,027,359	4,313,706	1,135,568	8,650,348	46,500

e. Fargo ISD Lagoon System

(This section updates and amends the content in the 2019 WWFP approved by DEQ.)

The same revisions discussed in the previous section were made to the capacity calculations for the Fargo ISD lagoon (Lagoon 4). After making these revisions, the lagoon capacity was recalculated as shown in Table 5. As a result of the updates, the daily average capacity of the Fargo ISD lagoon was calculated to be 46,500 gpd. The 2019 WWFP calculated a value of 44,600 gpd. Based on the updated capacity calculations and the average influent flow of 46,537 gpd in 2018, 43,942 gpd in 2019, and 37,033 gpd in 2020, flows to the existing Fargo ISD lagoon are near but not yet over its capacity.

f. Effluent Disinfection and Irrigation System Capacity

(The portion of this section that describes the disinfection system is unchanged from the 2019 WWFP approved by DEQ.)

After applying the precipitation and evaporation rate revisions shown in Table 3, the total irrigation capacity was calculated to be 109,200 gpd using the maximum annual irrigation rate of 27.43 inches from the 2010 *Recycled Water Use Plan*. The 2019 WWFP calculated a value of 120,300 gpd. This value assumes that the full, permitted area of 56 acres is under irrigation, which is not currently the case. At present, an area of 49.7 acres is under irrigation, which equates to a total irrigation capacity of 96,300 gpd. Combined flows from the City and the Fargo ISD have averaged 103,623 gpd for 2014 to 2020, indicating that the existing irrigation capacity has frequently been exceeded.

6. Energy Consumption

(This section is unchanged from the 2019 WWFP approved by DEQ.)

D. FINANCIAL STATUS OF EXISTING FACILITIES

(This section is unchanged from the 2019 WWFP approved by DEQ.)

V. NEED FOR THE PROJECT

A. HEALTH, SANITATION, AND SECURITY

(This section is unchanged from the 2019 WWFP approved by DEQ.)

B. AGING INFRASTRUCTURE

(This section is unchanged from the 2019 WWFP approved by DEQ.)

C. REASONABLE GROWTH

The flow and load estimates in the 2019 WWFP have been updated in accordance with the modified population estimates discussed in Section III.C.3. In the 2019 WWFP, wastewater flow and load estimates were based on the Portland State University (PSU) population projection of 1,705 in 2040. The revised population estimates include significantly higher projected growth in the next two years due to the Harvest Gardens PUD currently under way. Table 6 compares the design criteria using the original, PSU-based population estimates and the updated population estimates. When applying for funding through DEQ and federal agencies, the PSU-based design criteria will be used as mandated by DEQ requirements, and additional upgrades required by the updated population estimates will be funded using other sources.

Table 6. Full Buildout Wastewater Facility Design Criteria Updates

		Buildout Design Criteria		
	Assumptions	2019 WWFP Estimate	Updated Estimate	Increase
Population	n/a	1,705	2,335	630
Average-Day Influent Flow	65 gal/capita/day	110,825 gal	151,775 gal	40,950
Average-Day Biochemical Oxygen Demand (BOD) Load	150 mg/L	140 pounds/day	190 pounds/day	50 pounds/day
Average-Day Total Suspended Solids (TSS) Load	75 mg/L	70 pounds/day	95 pounds/day	25 pounds/day

Marion County hired Keller Associates to prepare growth estimates for the Fargo ISD and evaluate options for wastewater treatment. The February 2021 draft version of this report indicates that annual average flow from the Fargo ISD will reach 58,000 gpd at buildout. Average annualized daily flow from the Fargo ISD for the period 2014 through 2020 was approximately 45,000 gpd, so the predicted growth will represent an increase of 13,000 gpd. The increase represents both additional construction and redevelopment of existing parcels. While the County does not have a timeline for this growth, County staff indicated a desire to help fund infrastructure at the Donald WWTP to accommodate the additional flow as soon as possible.

1. Lagoon Organic Treatment System

The updated biochemical oxygen demand (BOD) and total suspended solids (TSS) loads remain within the estimated treatment capacities of Lagoons 1 and 2.

2. Lagoon Storage Systems

The 2019 WWFP calculated required lagoon storage assuming that 60 percent of annual flow must be stored during the wet-weather months. This approach does not incorporate factors that change from month to month, including influent flow, precipitation, evaporation, and irrigation. In order to account for these factors, a water budget spreadsheet was built using the water budgets in the 2010 *Recycled Water Use Plan* as a model. The water budgets, included in Appendix A, use the updated precipitation and evaporation rates in Table 3 and the surface area revisions in Table 4. Flows from the Fargo ISD were assumed to increase by 13,000 gpd starting in 2021. The following scenarios were modeled using the water budget spreadsheets:

- 2020 (Existing conditions)
- 2020 (Additional storage to address current shortfall)
- 2021 (Updated population estimate)
- 2040 (Updated population estimate)
- 2040 (PSU population estimate)

Additional lagoon storage required was calculated by increasing the additional storage until no overflow occurred in the spreadsheet. The associated additional lagoon surface area was calculated assuming that new lagoons will match the depth of existing lagoons. Additional lagoon capacity requirements relative to the existing capacity are shown in Table 7 for each scenario. The calculations show that additional lagoon capacity is needed in the short term to accommodate the anticipated rapid population growth when the PUD is built and increased flow from the Fargo ISD. Further additional capacity will also be needed to meet the full buildout.

Table 7. Required Lagoon Storage Updates

Scenario	Population	Average Influent Flow		Additional Lagoon Volume Required		Additional Lagoon Surface Area Required	
		2019 WWFP Estimate	Updated Estimate	2019 WWFP Estimate	Updated Estimate	2019 WWFP Estimate	Updated Estimate
2020 (Existing conditions)	1,011	114,465 gpd	104,000 gpd	n/a	n/a	n/a	n/a
2020 (Additional storage to address current shortfall)	1,011	114,465 gpd	104,000 gpd	Not calculated	23.9 acre-feet	Not calculated	3.2 acres
2021 (Updated population)	2,005	Not calculated	183,000 gpd		121.9 acre-feet		15.3 acres
2040 (Updated population)	2,335		203,000 gpd		152.9 acre-feet		19.0 acres
2040 (PSU population)	1,705	161,825 gpd	164,000 gpd	43.9 acre-feet	105.8 acre-feet	7.0 acres	13.3 acres

3. Effluent Recycle

The water budget spreadsheets discussed in the previous section were also used to calculate the additional irrigation area required to accommodate the additional flows. The water budgets assume an annual irrigation rate of 25.2 inches, based on the published irrigation requirements for grass seed. This is slightly more conservative than the 27.43 inches used in the 2010 *Recycled Water Use Plan*, but the City's recycled water use records indicate that the lower rate is more accurate. The calculations use the existing irrigated area of 49.7 acres as the starting point.

Additional irrigation area requirements calculated for each scenario are shown in Table 8. The water budget calculations show that additional irrigation area is needed in the short term to accommodate the anticipated rapid population growth when the PUD is built and increased flow from the Fargo ISD. Further additional area will also be needed to meet the full buildout.

Table 8. Required Irrigation Area Updates

Scenario	Population	Average Influent Flow		Additional Irrigation Area Required	
		2019 WWFP Estimate	Updated Estimate	2019 WWFP Estimate	Updated Estimate
2020 (Existing conditions)	1,011	114,465 gpd	103,776 gpd	Not calculated	n/a
2020 (Additional storage to address current shortfall)	1,011	114,465 gpd	103,776 gpd		8.9 acres
2021 (Updated population)	2,005	Not calculated	183,000 gpd		57 acres
2040 (Updated population)	2,335		203,000 gpd		71 acres
2040 (PSU population)	1,705	161,825 gpd	164,000 gpd	19.0 acres	47 acres

VI. Alternatives Considered / Proposed Project

The revised population estimates discussed in Section III.C.3 required revisions to the wastewater flow estimates. These flow estimates are shown in Table 9. These estimates are slightly higher than those used in the water budget spreadsheets because they use per capita flow assumptions for existing and projected flows; the water budgets use actual flow data for existing flows and per capita flow assumptions for additional flows.

Table 9. Average Daily Flow Projection Updates

Year	Population		City Flow		Fargo ISD Flow		Total Flow	
	2019 WWFP Estimate	Updated Estimate	2019 WWFP Estimate	Updated Estimate	2019 WWFP Estimate	Updated Estimate	2019 WWFP Estimate	Updated Estimate
2020	1,011	1,011	65,715 gpd	58,687 gpd[a]	48,750 gpd	45,089 gpd[a]	114,465 gpd	103,776 gpd[a]
2021	Not calculated	2,005	Not calculated	130,325 gpd	Not calculated	58,000 gpd	Not calculated	188,325 gpd
2025	1,172	2,122	76,180 gpd	137,930 gpd	51,000 gpd	58,000 gpd	127,180 gpd	201,841 gpd
2030	1,355	2,288	88,075 gpd	148,720 gpd	51,000 gpd	58,000 gpd	139,075 gpd	212,631 gpd
2035	1,555	2,335	101,075 gpd	151,775 gpd	51,000 gpd	58,000 gpd	152,075 gpd	215,686 gpd
2040	1,705	2,335	110,825 gpd	151,775 gpd	51,000 gpd	58,000 gpd	161,825 gpd	215,686 gpd

a. Actual flow data, average of January 2014 to December 2020

The 2019 WWFP details only one project to address each noted deficiency in the City's wastewater facilities, without presenting alternatives. Additional alternatives evaluated for this Amendment are described in the following sections.

A. COLLECTION SYSTEM IMPROVEMENTS

There have been no changes to the planned collection system improvements since DEQ approved the 2019 WWFP. The construction of the Harvest Gardens PUD will include the construction of new infrastructure, including extensions to the existing wastewater collection system.

B. LAGOON TREATMENT AND STORAGE IMPROVEMENTS

The 2019 WWFP included one lagoon treatment and storage improvement project, listed as capital improvement plan (CIP) Project 1—the addition of a new 10-acre lagoon to provide additional storage. The updated flow projections will require more new lagoon storage than previously calculated. Constructing additional lagoons presents challenges, including lack of available land upon which to build them. The only readily available City-owned property is farm land immediately adjacent to the WWTP that is currently used for irrigation and disposal of treated wastewater. Constructing lagoons on this property would reduce the area available for disposal and force the City to find alternate disposal sites on privately owned property. The City would also incur a loss of income as the property is rented to a neighboring farmer who uses the fields and treated wastewater for raising nursery crops. For these reasons, other treatment, storage, and disposal alternatives were considered as part of this Amendment.

1. Alternatives Considered

a. Raise Lagoon Berms

Raising the elevation of the berms around the existing lagoons would provide a simple method of increasing their storage capacity. The existing berms around Lagoons 1, 2, and 3 have an approximate top width of 10 feet and have a crushed rock surface so that they can be used for vehicle access to the lagoons. The existing berm slopes have a horizontal-to-vertical slope of 3:1.

It would be possible to raise the berms on the outside edges of the lagoons while maintaining the original road width by adding material to the outer wall of the berm. This would not be possible for the inner berms that are shared walls between lagoon cells without reducing the lagoon volume. Maintaining the desired slope while increasing the height of these interior berms would result in a 6-inch reduction in the width of the top of berm (3 inches on each side) for each 1 inch the berm is raised. An 8-foot berm is the narrowest width that would allow safe vehicle access, which limits the total increase in interior berm height to 4 inches. The additional volume provided by this increase in height is shown in Table 10.

Table 10. Increased Lagoon Volume Due to Increased Berm Height

Lagoon	Increased Volume Provided by 4" Increase in Berm Height	
	acre-feet	gallons
1	0.73	238,772
2	0.72	232,717
3	1.62	529,251
4	1.54	500,255
1 + 2 + 3	**3.07**	**1,000,739**
1 + 2 + 3 + 4	**4.61**	**1,500,944**

Raising the existing berms would be faster to construct than new lagoons and would not take from the permitted disposal area. This option could provide short-term capacity while more substantial improvements are designed and constructed. However, the additional storage provided by this approach would be only a small portion of the additional short-term volume requirements shown in Table 7. Therefore, raising the berms is not considered to be worth the investment and was eliminated from further consideration.

b. Add Lagoon Cover

The addition of floating covers to the lagoons was evaluated as a short-term lagoon capacity improvement. Based on the water budget spreadsheets used to model the lagoon system, precipitation makes up 32 percent of the water entering the lagoon system in a typical year. Covering one or more lagoons could eliminate the input of precipitation and thereby increase available storage.

Lagoon cover manufacturers were contacted to discuss this approach. Removing rainwater that collects on top of the cover would require a small pump system located in a sump on the cover. City personnel initially requested a way to move or retract the covers during the summer to facilitate maintenance and allow evaporation. However, available lagoon cover systems do not allow this level of flexibility; once installed, they are intended to remain in place for their approximately 20-year lifespan.

The water budget calculations updated for this amendment show that over the course of an average year, the volume of precipitation into the lagoons and the volume of evaporation out of them are roughly balanced. However, since precipitation and evaporation are strongly seasonal, covering the lagoon would free up storage capacity in winter by keeping out most precipitation, but reduce it in summer by preventing most of the evaporation. The water budget calculations indicate that, although total storage capacity would be increased, it would result in more water that would need to be disposed of in summer, as much less would be evaporated. This would place further constraints on disposal capacity, due to the limited quantity of irrigation land available.

The lagoon cover option was eliminated for the following reasons:

- Initial cost estimates for a cover system for Lagoon 3, including the support structure and rainwater pumping system, were approximately $1 million, and this was higher than anticipated.
- A non-removable cover that prevents evaporation would reduce available storage during the summer when it is currently most needed.

c. Obtain Fargo ISD Lagoon for City Use

As discussed in the WWFP, Lagoon 4 was constructed by and received flow from the Fargo ISD, a Marion County wastewater district. Lagoon 4 has a total storage volume of 36.3 acre-feet with 3 feet of freeboard, or 41.0 acre-feet with 2 feet of freeboard. Wastewater from the Fargo ISD is currently pumped to Lagoon 4, and the lagoon is nearing its design capacity. One way for the Fargo ISD to provide additional capacity and reduce maintenance for the force main from the ISD to the lagoon would be to construct and operate its own treatment lagoon closer to the District. In this scenario, the City would take over Lagoon 4 for its own use as an additional storage lagoon.

A meeting was held between Marion County and City personnel on April 3, 2020, to discuss wastewater capacity and plans for future development. One option presented to the County at this meeting was for the City to purchase Lagoon 4. Approximately $500,000 is estimated to remain on the loan obtained to construct the lagoon. The County noted that multiple options were considered for wastewater disposal but the lagoon at the Donald WWTP site was found to be the best option. The County has continued to invest in this option through improvements to the force main and does not have alternate plans to the existing lagoon at this time.

Based on Keller Associates' February 2021 draft report, some additional flow is expected from the Fargo ISD as additional construction occurs and existing parcels are redeveloped. However, parcels in the ISD without an existing connection to the collection system, which make up 25.5 percent of the existing land area, will not be allowed to connect when they are developed and will instead be required to use septic systems. The County plans to continue using the existing arrangement with the City and expand it to provide additional lagoon capacity, so this option was eliminated from further consideration.

d. <u>Construct New Lagoon</u>

Constructing one or more additional lagoons was the only option identified in the 2019 WWFP. Particularly in light of the additional storage requirements now anticipated due to Harvest Gardens PUD construction, it appears to be the only method of providing adequate storage capacity.

(1) Location

In order to minimize complexity of WWTP operations and maintenance, new lagoons should be constructed as close as possible to the existing lagoons. Sites west of Lagoon 3 and north of Lagoon 4 were considered as possible locations. Both sites are on land currently owned by the City and are permitted for irrigation disposal of treated wastewater.

The west site was initially preferred because it is not currently used for irrigation, but an initial environmental review indicated that construction in the existing tree-covered portion of that site would likely be considered an impact on waters of the United States. In that case, permitting would need to include the U.S. Army Corps of Engineers as well as DEQ, with a permit preparation and review time of six to nine months. Preliminary layouts indicated that a lagoon small enough to avoid potential wetland sites would be comparable in size to Lagoons 1 and 2, which would not provide enough additional storage to accommodate estimated 2021 growth. A lagoon at this site also would need to be near the western property line, very close to an existing home to the west, possibly resulting in future odor complaints. As a result, the site to the north of the existing lagoons is recommended for use for a new lagoon.

(2) Elevation

As described in Table 7, full buildout will require an additional storage volume of 152.9 acre-feet. If the new lagoon matches the existing maximum water depth of 8.5 feet, providing this volume will require a lagoon surface area of 19.0 acres. Matching the existing water elevations would allow gravity flow from Lagoon 3 to the new lagoon. This would place the top of berm elevation for the new lagoon roughly at existing grade in the area north of Lagoon 4. Lagoons 1, 2, and 3 have top of berm elevations 10 to 15 feet above surrounding grade. Building the new lagoon to match the existing water surface elevation does not appear to be practical, because it would result in a large amount of excavation, large quantities of spoils to be hauled off-site, and the likelihood of high groundwater issues during construction and operation. Instead, the recommended approach is to build the new lagoon at a height and depth that will roughly match cut and fill during construction. This will require pumping to transfer flow to the new lagoon(s).

(3) Depth

Since the elevation of the new lagoon will not be tied to that of the existing lagoons, its depth could be increased. Increasing lagoon depth would allow for the necessary storage volume to be achieved with a reduced lagoon surface area. Reducing the lagoon surface area, in turn, would allow more permitted irrigation land to remain in use. Table 11 shows the required surface area if the depth of the lagoon were increased to 12 or 17 feet, which, with 3 feet of freeboard, would result in total berm heights of 15 and 20 feet, respectively. Total lagoon footprint areas, including berm slopes outside the lagoon, are also shown.

Table 11. New Lagoon Surface Area Required to Accommodate Full Buildout Wastewater Flow

Lagoon Depth	Total Berm Height	New Lagoon Surface Area Required	New Lagoon Footprint Area
8.5 feet water depth (existing lagoon design)	11.5 feet	19.0 acres	23.0 acres
12 feet water depth	15 feet	10.6 acres	13.8 acres
17 feet water depth	20 feet	6.9 acres	8.9 acres

Table 11 indicates that increasing the lagoon depth would result in substantial decreases to the total required surface area. Increased lagoon depth also would decrease the total volume required. Reduced surface area would introduce less precipitation to the system and thereby reduce the required wet season storage volume. Also, increased depth would result in a higher percentage of the total volume being usable, because the first 2.5 feet are assumed to be unusable regardless of total depth.

The relative benefits of increasing the depth to 20 feet do not appear to be justified, because achieving this depth while roughly balancing cut and fill during excavation would result in a lagoon bottom 8.5 feet below existing grade. This would be difficult to construct due to high groundwater and could result in future high groundwater floating the lagoon liner when water levels in the lagoon are low. For the purposes of cost estimating, a total depth of 12 feet, with a berm height of 15 feet, was assumed.

(4) Number and Phasing

A single combined lagoon would be the simplest and most cost-effective approach. However, a phased approach is proposed because the most urgent need for additional storage is driven by the construction of the PUD housing in 2021 and expected short-term growth at the Fargo ISD. The first phase would construct Lagoon 5 to serve flow from the PUD and the Fargo ISD, and a second phase would construct Lagoon 6 to serve additional City growth. Both lagoons would serve only as storage rather than providing additional treatment.

While the cost would be higher for two smaller lagoons than for a combined lagoon, the phased approach provides scheduling and funding benefits. The cost of the Phase 1 lagoon would be shared between the County and PUD developer GGP. The Phase 2 lagoon would be funded by the City.

e. Construct Replacement Treatment Facility for All Flows

Construction of a new treatment facility to replace the existing lagoon system was reviewed in the early stages of this evaluation. However, the treatment requirements of the City are well suited to a lagoon system, given the low strength of influent, irrigation-based permit, available area of City-owned land, and excess treatment capacity of the facultative lagoons. No replacement technology is expected to provide the same simple operations and low maintenance costs, and the construction cost of a new facility would be substantially more than those required to expand the existing system. In addition, while irrigation is the primary use for treated effluent, significant post-treatment storage would still be required for an alternative treatment, so the majority of land currently used for treatment and storage lagoons would be needed for storage, and little City land could be regained for irrigation or other purposes. For these reasons, this option was eliminated from further consideration.

f. Construct New Treatment Facility for PUD

At the request of Harvest Gardens PUD developer GGP, a second treatment facility to treat flows from the PUD was evaluated. This treatment plant would serve the projected PUD population of 992 people, have a design average influent flow of 64,480 gallons per day, and put the treated wastewater to beneficial reuse within the PUD. To provide baseline costs, estimates were obtained for an AdvanTex packed-bed filter system manufactured by Orenco. An initial cost estimate for this system installed was $2.85 million, which would not include provisions for irrigation.

A second treatment plant would significantly increase City operation and maintenance costs if City staff were required to operate it. New staff would be required if the developer formed a new wastewater district to separately operate the new plant. The new facility would also require land area currently allocated for other uses in the PUD area, would not provide Class A treatment allowing for expanded uses of recycled water, and likely would not be cost-effective. In general, unless pumping costs are prohibitive due to long distances or difficult terrain, a single treatment plant is more cost effective to construct and operate than two facilities. As a result, this option was eliminated from further consideration.

2. Proposed Projects

Construction of two new lagoons is the proposed project to provide needed additional storage. The proposed location for the new lagoons is directly north of the Fargo ISD lagoon. This Amendment assumes that the existing irrigation pump station will be retrofitted to serve as a transfer pump station and pump effluent from Lagoon 3 to the new lagoons. Effluent from the new lagoons will flow by gravity to a new recycled water pump station (see Section VI.D) or to new tertiary treatment (see Section VI.E.2.b).

Table 12 presents design parameters for two new lagoons with adequate capacity to accommodate the City's buildout wastewater flow. The total volume required is less than the volume requirements reported in Table 7 because of the volume reduction benefit provided by increasing the lagoon depth, as discussed in Section VI.B.1.d(3). Preliminary cost estimates for each lagoon are shown in Table 13 and Table 14. Phased expansion of the WWTP is shown in Figure 1, Figure 2, and Figure 3. Proposed hydraulic profiles for the existing and expanded WWTP are shown in Figure 4 and Figure 5.

Table 12. Lagoon Design Parameters

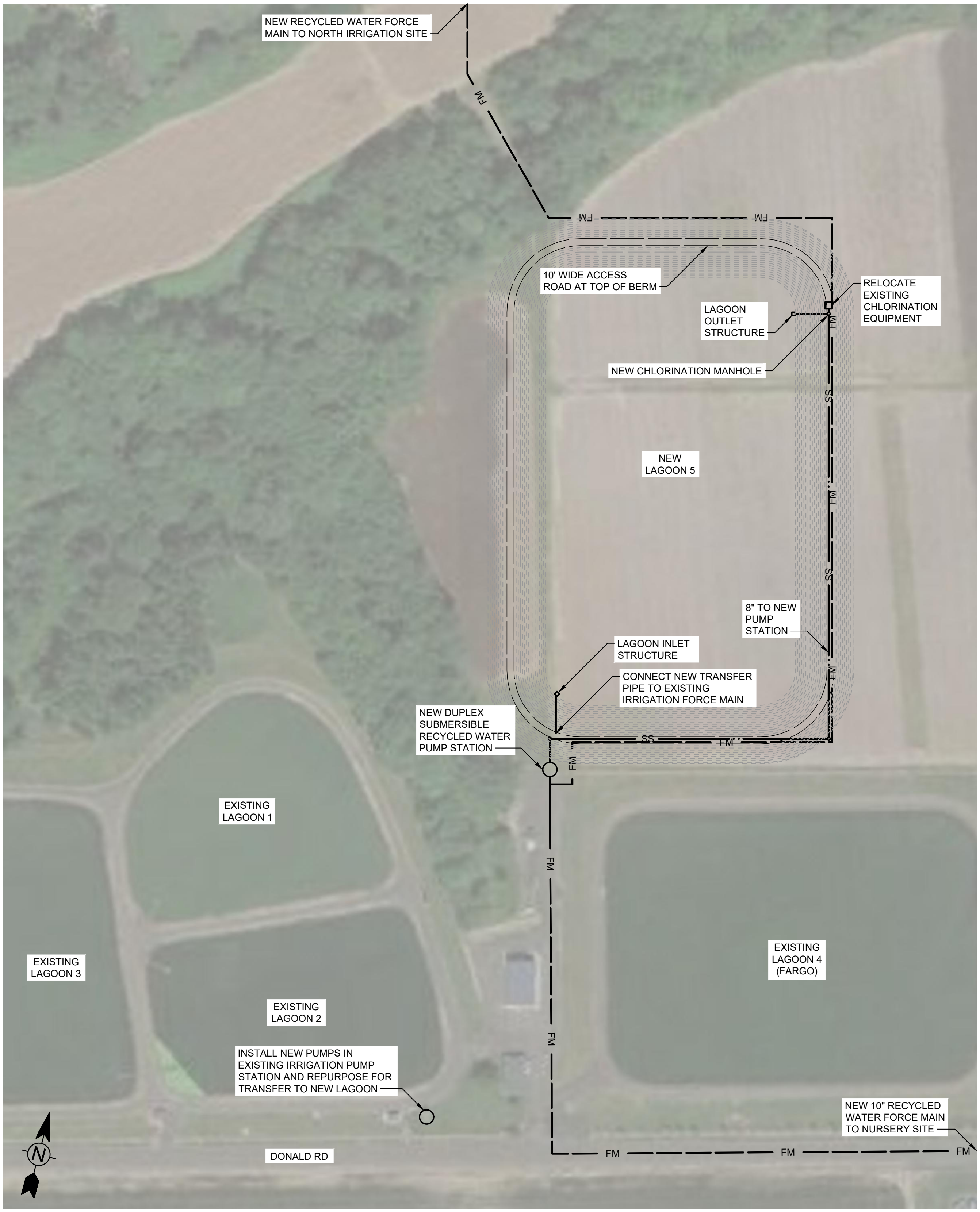
Design Parameter	Lagoon 5 (PUD)	Lagoon 6 (City)
Total Volume	68.9 acre-feet	46.5 acre-feet
Storage Volume (with 3 feet of freeboard)	56.2 acre-feet	38.1 acre-feet
Water Surface Area	6.59 acres	4.57 acres
Minimum Water Depth	2.5 feet	2.5 feet
Maximum Water Depth	12 feet	12 feet
Berm Height	15 feet (inside lagoon) 9.5 feet (outside lagoon)	15 feet (inside lagoon) 9.5 feet (outside lagoon)
Top-of-Berm Width	10 feet	10 feet
Top-of-Berm Elevation	195.5 feet	195.5 feet
Bottom of Lagoon Elevation	180.5 feet	180.5 feet
Side Slope	3 feet horizontal : 1 foot vertical	3 feet horizontal : 1 foot vertical

Table 13. Estimated Costs for Lagoon 5 (PUD & Fargo ISD)

Item	Quantity	Units	Unit Price	Total
Mobilization (percentage of total)	8%	lump sum	$144,000	$144,000
Earthwork (Excavation)	50,500	cubic yards	$8	$404,000
Earthwork (Compaction)	44,000	cubic yards	$8	$352,000
Fill Dirt, Hauling	6,500	cubic yards	$50	$325,000
Liner (80 mil HDPE Liner)	305,000	square feet	$1.20	$366,000
Riprap Protection	80	cubic yards	$35	$2,800
Crushed Rock, 3/4" - 0	320	cubic yards	$85	$27,200
Inlet and Outlet Structures	2	each	$60,000	$120,000
Security Fencing	2,700	linear feet	$5	$13,500
Transfer Pump Station (Retrofit Existing PS)	1	lump sum	$100,000	$100,000
Additional Piping	1,100	linear feet	$80	$88,000
			Construction Subtotal	***$1,943,000***
			Construction Contingencies (20% of Construction Subtotal)	*$389,000*
			Engineering, Architectural, Administrative, and Legal Fees (25% of Construction and Contingency)	*$466,000*
			Total Project Cost	**$2,800,000**

Table 14. Estimated Costs for Lagoon 6 (City)

Item	Quantity	Units	Unit Price	Total
Mobilization (percentage of total)	8%	lump sum	$105,000	$105,000
Earthwork (Excavation)	34,000	cubic yards	$8	$272,000
Earthwork (Compaction)	26,000	cubic yards	$8	$208,000
Fill Dirt, Hauling	8,000	cubic yards	$50	$400,000
Liner (80 mil HDPE Liner)	220,000	square feet	$1.20	$264,000
Riprap Protection	70	cubic yards	$35	$2,450
Crushed Rock, 3/4" - 0	285	cubic yards	$85	$24,225
Inlet and Outlet Structures	2	each	$60,000	$120,000
Security Fencing	1,470	linear feet	$5	$7,350
Additional Piping	200	linear feet	$80	$16,000
			Construction Subtotal	***$1,420,000***
			Construction Contingencies (20% of Construction Subtotal)	*$284,000*
			Engineering, Architectural, Administrative, and Legal Fees (25% of Construction and Contingency)	*$341,000*
			Total Project Cost	**$2,050,000**



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City of Donald

Wastewater Facility Plan Update Amendment

Proposed WWTP Modifications
Phase 1

PROJ:	200-166682-20001
DATE:	March 2021
DESN:	HBD

Figure
1

Bar Measures 1 inch

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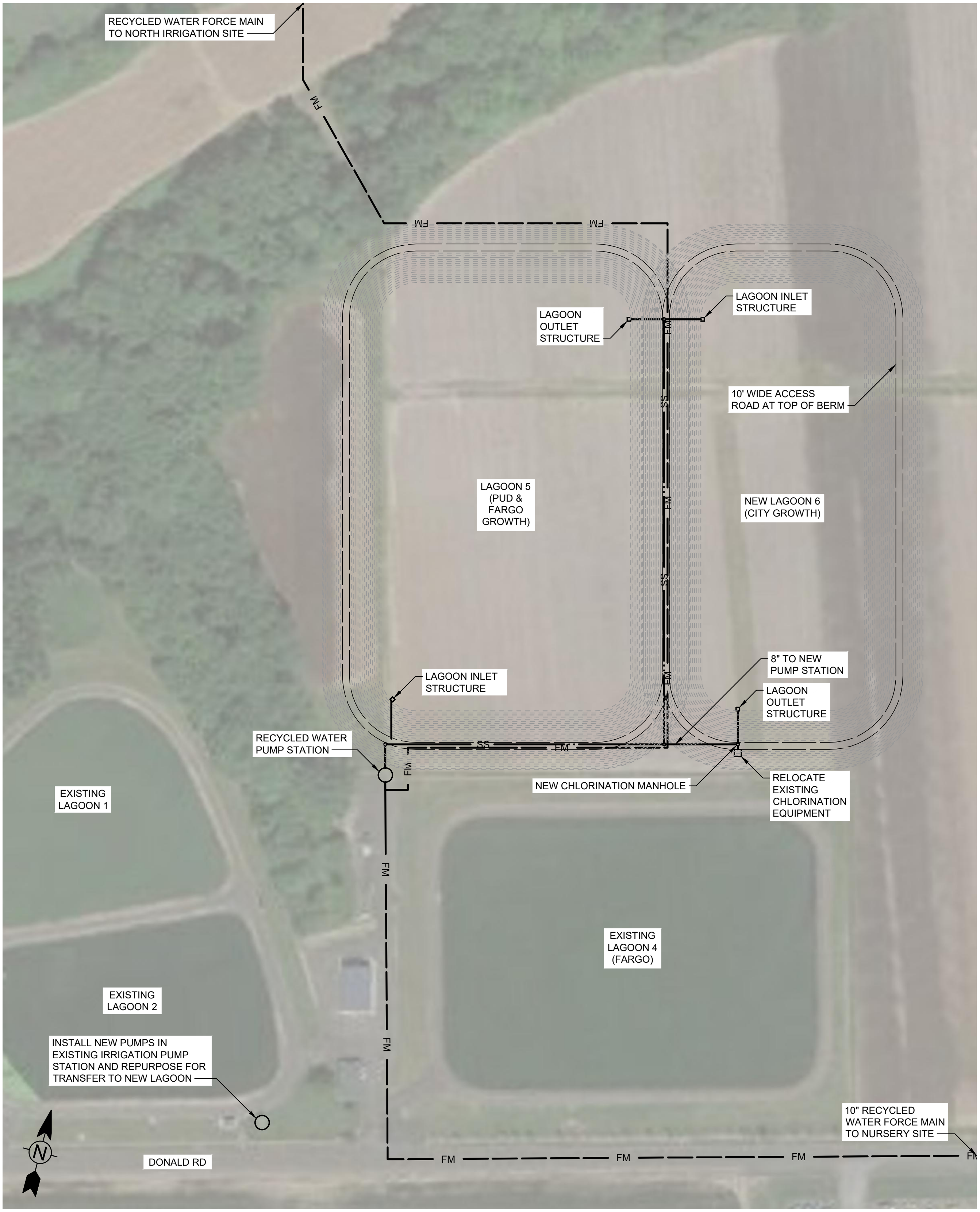

TETRA TECH

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City of Donald

Wastewater Facility Plan Update Amendment

Proposed WWTP Modifications
Phase 2

PROJ:	200-166682-20001
DATE:	March 2021
DESN:	HBD

Figure
2

Bar Measures 1 inch

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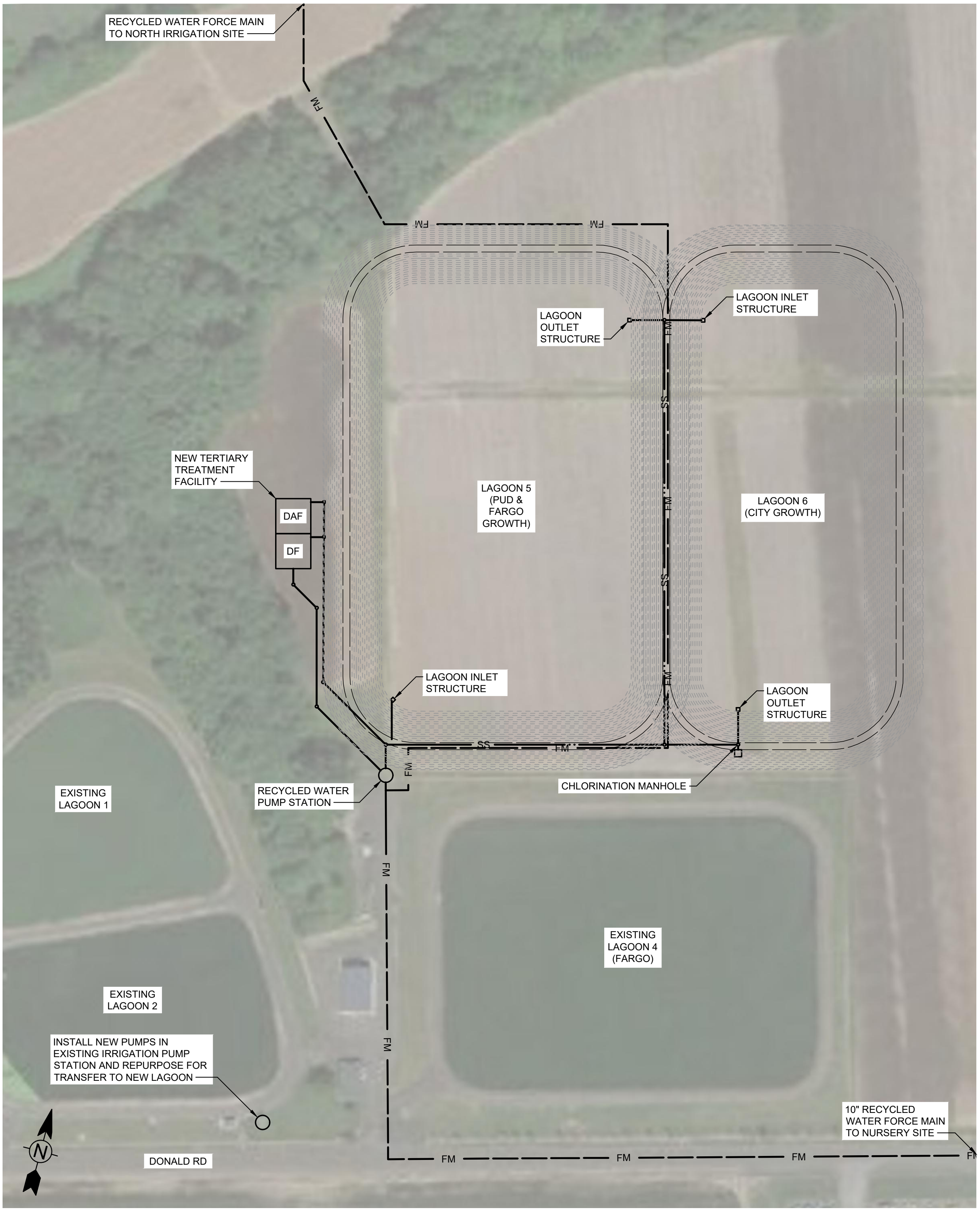

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TETRA TECH www.tetratech.com	City of Donald	PROJ: 200-166682-20001
	Wastewater Facility Plan Update Amendment	DATE: March 2021
	Proposed WWTP Modifications Phase 3	DESN: HBD
		Figure 3

Bar Measures 1 inch

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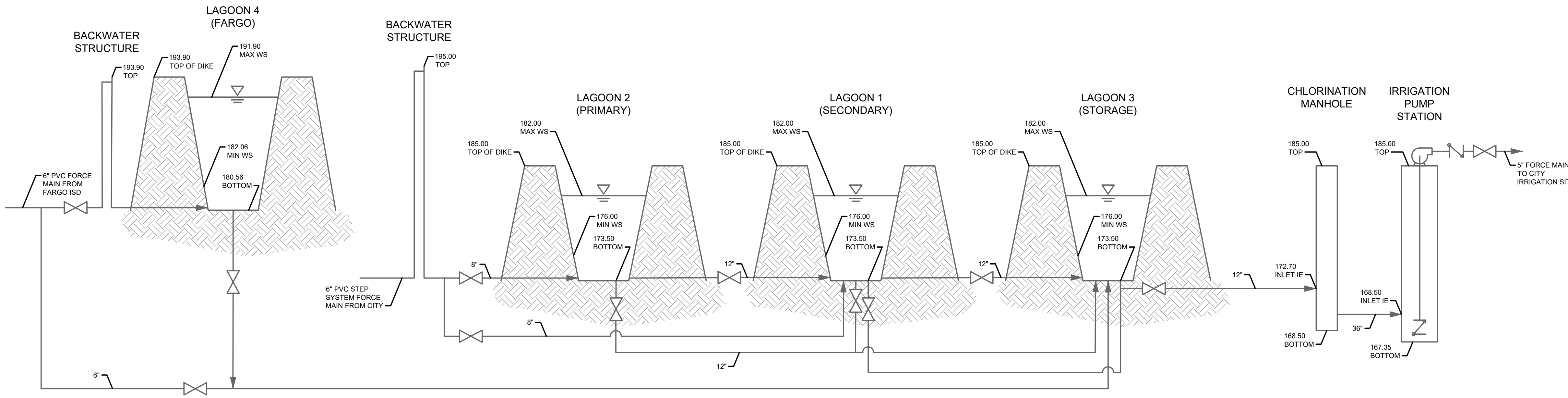

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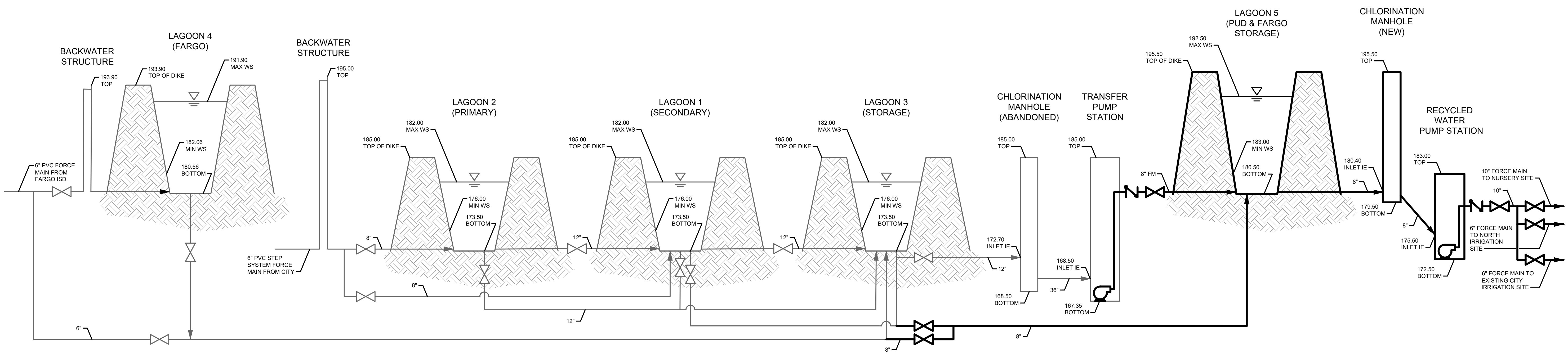
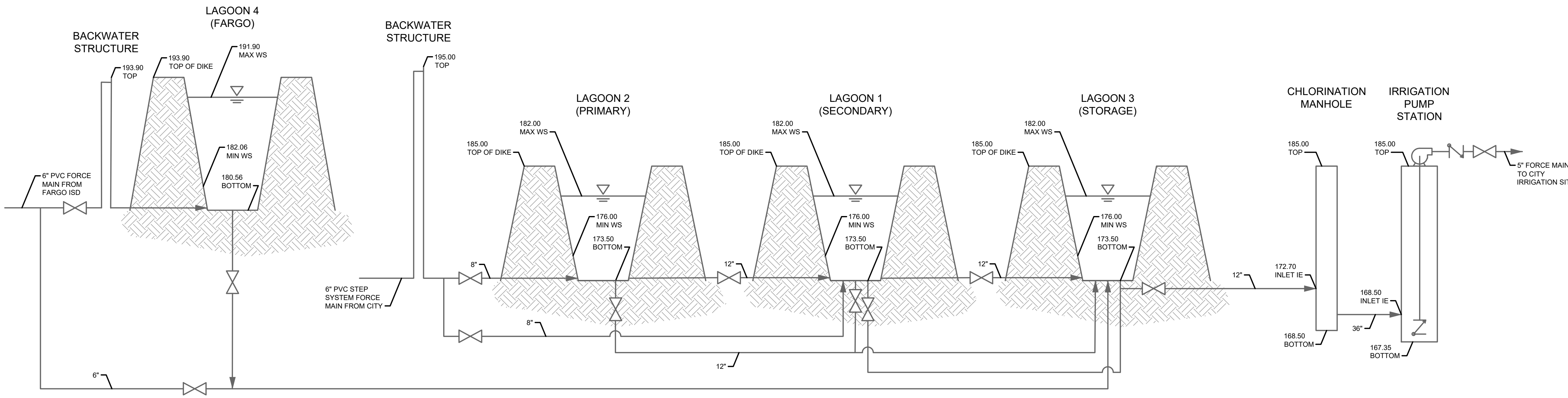


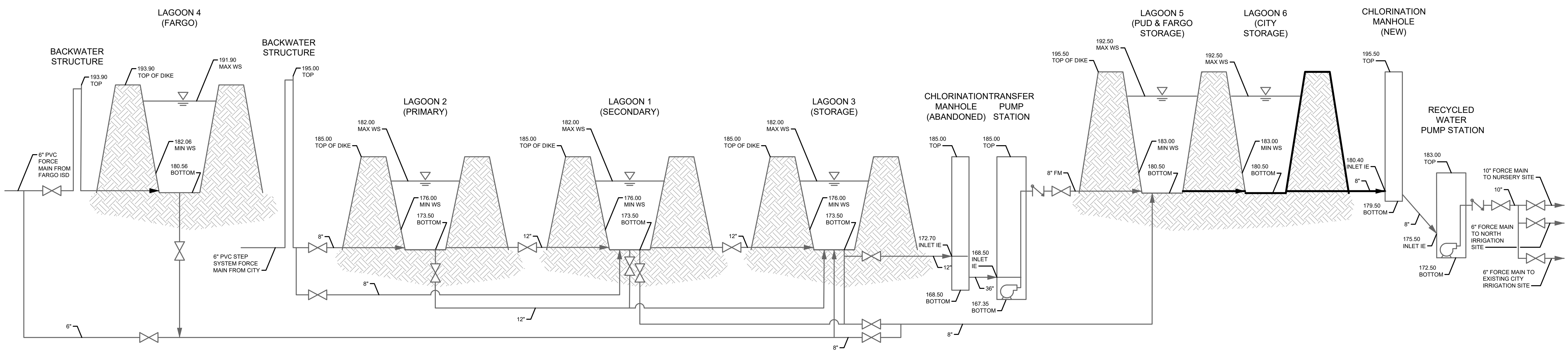
Proposed Phase 1 Improvements

TETRA TECH www.tetratech.com 15350 SW Sequoia Parkway, Suite 220 Portland, OR 97224	City of Donald Wastewater Facility Plan Update Amendment Hydraulic Profile Phase 1	Project No.: 135-48600-16001 Date: March 2021 Designed By: Figure 4

Bar Measures 1 inch



Existing



Proposed Phase 2 Improvements

TETRA TECH www.tetratech.com 15350 SW Sequoia Parkway, Suite 220 Portland, OR 97224	City of Donald Wastewater Facility Plan Update Amendment Hydraulic Profile Phase 2	Project No.: 135-48600-16001 Date: March 2021 Designed By: Figure 5

Bar Measures 1 inch

C. EFFLUENT CHLORINATION IMPROVEMENTS

The 2019 WWFP included one effluent chlorination improvement project, listed as CIP Project 2—the addition of spill containment and a chemical scale. These represented minor upgrades to the effluent chlorination systems. However, with the proposed new lagoon and possible future tertiary treatment system (see Section VI.E.2.b), it will be more practical to relocate the chlorination equipment and existing shelter nearer to these new facilities. The new location will be downstream of the new recycled water pump station, the new effluent point for the overall WWTP. As recommended in the 2019 WWFP, spill containment and a chemical scale will be added to the existing system to enhance safety and improve operations. Preliminary cost estimates for the proposed chlorination improvements are shown in Table 15.

Table 15. Estimated Costs for Chlorination Improvements

Item	Quantity	Units	Unit Price	Total
Mobilization (percentage of total)	8%	LS	$2,000	$2,000
Relocate Existing Equipment	1	LS	$5,000	$5,000
Relocate Existing Shelter	1	LS	$10,000	$10,000
Spill Containment and Scale	1	LS	$5,000	$5,000
			Construction Subtotal	***$22,000***
			Construction Contingencies (20% of Construction Subtotal)	*$4,000*
			Engineering, Architectural, Administrative, and Legal Fees (25% of Construction and Contingency)	*$5,000*
			Total Project Cost	**$40,000**

D. RECYCLED WATER PUMP STATION IMPROVEMENTS

The 2019 WWFP included one recycle pump station improvement project, listed as CIP Project 3—the addition of a second pump and building roof modifications. For this Amendment, updated projections indicate higher flows and substantial increases in the pumping distance required for some recycled water use locations. The addition of the new lagoon will also make it more practical to locate the recycled water pump station adjacent to the new effluent point at the outlet to the new lagoon. As a result, full replacement of the pump station as part of the proposed WWTP improvements appears to be more practical than retrofitting the existing pump station.

The new recycled water pump station will have two pumps to provide redundancy. The pumps will be submersible and installed in a precast wet well to eliminate the need for a building over the station. Variable frequency drives will be provided for each pump to allow pump speed to be adjusted to account for different pumping destinations. Preliminary cost estimates for the new recycled water pump station are shown in Table 16.

Table 16. Estimated Costs for Recycled Water Pump Station

Item	Quantity	Units	Unit Price	Total
Mobilization (percentage of total)	8%	lump sum	$25,000	$25,000
Existing Pump Station Modification	1	lump sum	$5,000	$5,000
Earthwork	1,000	cubic yards	$8	$8,000
Precast Concrete Wet Well	1	each	$20,000	$20,000
Precast Concrete Valve Vault	1	each	$6,000	$6,000
Precast Concrete Meter Vault	2	each	$3,000	$6,000
Piping	200	linear feet	$80	$16,000
Submersible Pumps	2	each	$50,000	$100,000
Variable Frequency Drives	2	each	$22,500	$50,000
Electrical and Controls	1	lump sum	$100,000	$100,000
			Construction Subtotal	***$330,000***
			Construction Contingencies (20% of Construction Subtotal)	*$66,000*
			Engineering, Architectural, Administrative, and Legal Fees (25% of Construction and Contingency)	*$79,000*
			Total Project Cost	**$480,000**

E. EFFLUENT DISPOSAL IMPROVEMENTS

The 2019 WWFP included one effluent disposal improvement project, listed as CIP Project 4—expansion of the irrigation site. For this Amendment, additional methods of modifying or improving effluent were considered.

1. Alternatives Considered

a. Extend Duration of Irrigation

Extending the irrigation period would theoretically allow more recycled water to be disposed of using the same amount of irrigation land. The City's recycled water use records were reviewed to determine if this was possible. On average, the City discharges to its irrigation land six months per year, starting in April or May and ending in September or October. During the period from 2013 to 2020, the average annual irrigation volume was 93 acre-feet. This is lower than the 105 acre-feet that the water budget spreadsheets calculate using the existing irrigation area of 50 acres and irrigation rates for spring grass seed published in the "Oregon Crop Water Use and Irrigation Requirements." However, City staff have said that significant increases in irrigation flow may creating ponding, based on past experience. The City's Water Pollution Control Facility permit requires sound irrigation practices that prevent offsite surface runoff, creation of odors or nuisance conditions, and overloading of land with nutrients or other pollutants. Substantially increased irrigation rates have the potential to violate these restrictions, so this option was eliminated from further consideration.

b. Expand Irrigation Sites

The City's existing disposal method for recycled water is through irrigation, so gaining access to more irrigation land offers a simple method of increasing WWTP capacity. The City currently owns 56 acres of land permitted for irrigation, although only 50 acres are currently in use. Even if the final 6 acres are brought online, substantially more land will be needed. The proposed construction of two new lagoons on existing permitted irrigation land will further increase the need for additional land. The City identified three potential sites:

- A 15-acre site north of the City's existing irrigation sites, north of Ryan Creek and south of Ehlen Road (Tax Lot 041W170000400 located at 10634 Ehlen Road NE, owned by Mark Kiernes). The City has agreed with the leaseholder to provide irrigation water.
- A 6-acre site south of Lagoon 4, on the south side of Donald Road (Tax Lot 041W17CB04500 at 10590 Donald Road NE, owned by GK Properties LLC. The owner has proposed to use recycled water for irrigation.
- Twin Springs Nursery, 1.1 miles southeast of the WWTP and south of the Harvest Gardens PUD area. The nursery occupies 275 acres and is owned by GRC Land Holdings LLC. Owner representatives have indicated that the nursery can use as much recycled water as the City can provide to the site. If this site is used, the owner has requested that the new 15-acre site north of the WWTP also be used, as the same leaseholder operates both properties.

For all sites, a new pump station and new piping will be required to pump recycled water to the site. For the nursery site, the piping requirements are more significant due to the distance and volume of recycled water to be transported—a 10-inch force main approximately 7,200 feet long. Irrigation piping and equipment on each site will be provided by the end users. The City's *Recycled Water Use Plan* will need to be updated to include any new sites. After surveying all three sites in October 2020, DEQ found the sites to be suitable for land application of treated wastewater and gave conditional approval (Appendix B).

c. Construct Class A Tertiary Treatment Facility

Recycled water use is regulated under Oregon Administrative Rules Chapter 340, Division 55. The allowed use of recycled water is based on the level of treatment, which is divided into Classes A, B, C, D, and non-disinfected. The City WWTP currently treats to a Class C standard, which may be used for many irrigation applications as well as some industrial uses. However, discussions with potential recycled water users within the City have indicated that a higher level of treatment, Class A, would open up a variety of other potential uses around the City. Initial discussions with Twin Springs Nursery indicated that irrigation use at its site southeast of the City would require treatment to Class A standards. However, this was later revised, and the nursey has now indicated that Class C can be used at the site, although Class A water may be desirable in the future. Other potential uses include cooling makeup water at the Donald Industrial Park, toilet flushing water at multifamily housing in the Harvest Gardens PUD, and irrigation of parks and other City-owned properties. If Class A recycled water were available as a resource to the City and its residents, City personnel believe that more opportunities would arise to use this resource.

(1) Performance

Producing Class A recycled water will require additional treatment at the WWTP. Oregon's Class A standards require the following (OAR 340-055-0012(7)(c)):

> (A) Before disinfection, unless otherwise approved in writing by the department, the wastewater must be treated with a filtration process, and the turbidity must not exceed an average of 2 nephelometric turbidity units (NTU) within a 24-hour period, 5 NTU more than 5 percent of the time within a 24-hour period, and 10 NTU at any time
>
> (B) After disinfection, Class A recycled water must not exceed a median of 2.2 total coliform organisms per 100 milliliters, based on results of the last seven days that analyses have been completed, and 23 total coliform organisms per 100 milliliters in any single sample.

The WWTP currently produces recycled water that meets the total coliform requirement, so additional treatment is needed only to meet the turbidity standard.

(2) Treatment Methods

The WWTP already disinfects and meets the total coliform numeric criteria for Class A standards. As such, the goal of additional treatment would be to reduce turbidity of the lagoon effluent to meet Class A standards. Even at a higher level of treatment, the majority of recycled water use is expected to be for irrigation, meaning that the treatment would only be needed during the irrigation season. As a result, a packaged treatment facility that could be taken offline when not needed would be a good fit for this future need. A package facility offers the additional benefit of being easily scalable to the expected demand for Class A treated water, which may change as Donald Industrial Park grows and other changes occur in the City. The addition of a tertiary treatment facility would be included as a future phase of the WWTP improvements, as it is not required to meet short-term demands.

Discussions with DEQ staff and wastewater treatment system suppliers indicated that the most widely available, reliable, and cost-effective packaged treatment technologies available for this application are dissolved air flotation (DAF) and disk filters. The DAF process uses micro-bubbles of air to separate suspended materials from wastewater and float to the surface of the treatment tank, where they are removed with a skimmer. Disk filters use a set of cloth disks that are immersed in a tank of water to be treated, which flows into the disks, leaving solids on the outer surface to be removed by backwashing. The two processes are frequently used in tandem, typically with the disk filter treating the effluent from the DAF. Both processes allow continuous operation and can be provided as skid-mounted units with critical equipment and instrumentation included.

d. Permit and Construct Subsurface Disposal

The seasonal nature of the City's current wastewater discharge is a major driver of the need for additional lagoon storage and irrigation land because wastewater must be stored during the winter when discharge is not allowed. An alternative discharge method would reduce the need for additional storage. One method considered was the permitting and construction of a subsurface disposal field. However, soil reports for the land currently owned by the City indicate that high groundwater is common, and discussions with DEQ have indicated that permitting of a subsurface disposal system is unlikely to be successful. Additionally, subsurface disposal is consistent with the City's preferences, as treated wastewater is considered a resource that should be reused. Therefore, this option was eliminated from further consideration.

e. Permit and Construct Surface Water Outfall to Ryan Creek

A reduction in the required additional lagoon storage volume could be achieved through discharge to a surface water. This method would also eliminate or greatly reduce the need for irrigation land. Surface water disposal is contrary to the City's desire to put treated wastewater to beneficial reuse, but an outfall could be advantageous for emergency use or if limits on beneficial reuse options place limits on development. The closest surface water body to the Donald WWTP that could be used for discharge is Ryan Creek. The WWTP was originally designed with an outfall to Ryan Creek, but it is no longer in use or was never installed.

Ryan Creek is not currently listed for total maximum daily loads (TMDLs) but is hydraulically connected to the Willamette River, which is water quality limited for dissolved oxygen. The distance along the creek from the WWTP to the creek's confluence with the Willamette River is 2.4 miles. Any new or additional discharge to the Willamette River cannot contribute additional pollutants until a TMDL for that contributing water source is completed. In general terms, no oxygen-demanding pollutants associated with the Donald WWTP, including ammonia, could be present in Ryan Creek at the confluence with the Willamette River. In order to demonstrate compliance with this requirement, an anti-degradation study would be required.

(1) Anti-Degradation Overview

A high level anti-degradation overview was conducted for this Amendment to determine if further investigation of this alternative is warranted. The overview used online calculators and modeling software; all data input was based on estimates and assumptions for comparable streams. The Streeter-Phelps equation was used to model dissolved oxygen levels along the length of a stream. Table 17 summarizes input data used for this equation in the overview and the data that would be required for a more detailed analysis. Screenshots of the input data and resulting output are shown in Figure 6.

Table 17. Streeter-Phelps Equation Input Data for Anti-Degradation Overview

Input Parameter	Source Used for Overview	Data Needed for Detailed Analysis
Winter season flow at the lowest volumes in Ryan Creek	U.S. Geological Survey StreamStats online stream flow estimator tool. A 7Q10 statistic, representing the annual 7-day minimum flow with a 10-year recurrence interval, indicated winter flows ranging from 0.3 cubic feet per second (November) to 5 cubic feet per second (February).	Stream flow monitoring
Corresponding flow velocities in Ryan Creek	Online Manning's equation calculator, based on an estimated average stream width of 10 feet	Survey and flow monitoring of Ryan Creek
Dissolved oxygen (DO) levels in Ryan Creek and at the Willamette River confluence	Data from existing U.S. Geological Survey monitoring stations The nearest available DO data was located at the Portland monitoring station	Local DO data for the Ryan Creek and Willamette River confluence
Temperatures in Ryan Creek and at the Willamette River confluence	Data from existing U.S. Geological Survey monitoring stations. The nearest temperature data was located at the Newberg monitoring station	Local temperature data for the Ryan Creek and Willamette River confluence
Deoxygenation constant for treated effluent	Online resources to estimate typical deoxygenation K constants for treated effluent (0.10 to 0.35 milligrams BOD per liter)	
Deoxygenation constant for Ryan Creek	Online resources to estimate typical deoxygenation K constants for unpolluted rivers (<0.05 milligrams BOD per liter)	
Reoxygenation constant for Ryan Creek	Typical reoxygenation K constants (0.4 to 15).	
Effluent BOD loading	BOD loadings were estimated for Donald's STEP system influent and Fargo ISD influent and the weighted average was multiplied by the City of Carlton's average BOD removal rate of 85 percent. This resulted in an estimated BOD effluent loading for Donald of 120 mg/L.	Sample and analyze BOD loading over at least one winter season to determine actual data.
Effluent COD loading	COD loadings were estimated for Donald's STEP system influent and Fargo ISD influent and the weighted average was multiplied by the City of Carlton's average COD removal rate of 85 percent. This resulted in an estimated COD effluent loading for Donald of 120 mg/L.	Sample and analyze COD loading over at least one winter season to determine actual data.
Effluent flow to Ryan Creek	Flow volume from the WWTP to Ryan Creek was based on the projected 2040 average daily flow volume of 161,825 gpd, as described in the 2019 WWFP.	

online_do: Dissolved oxygen (DO) sag curve

$$S_s = f(T) \qquad L = L_r/n$$

$$O_0 = [Q_s/(Q_s + Q_e)]\ O_s$$

$$O_{j+1} = O_j + L\ (k_o/v)\ (S_s - O_j) - L\ (k_d/v)\ D_u\ e^{-(k_d/v)x_{j+1}}$$

Differential equation for DO sag Streeter-Phelps equation

Deoxygenation constant k_d Oxygenation constant k_o

INPUT DATA:

Select: SI units (metric) / U.S. Customary units

[Choose SI or U.S. Customary units]. [Default: SI units; program resets to default units].

Stream (optional): Ryan Creek - November

Stream discharge Q_s (m^3/s) [ft^3/s]: 0.3 ft^3/s

Water temperature T (°C) [°F]: 47 °F

[Saturation dissolved oxygen is at zero salinity and mean sea level].

Dissolved oxygen (upstream) O_s (mg/L): 12

Effluent discharge Q_e (L/s) [ft^3/s]: .25 ft^3/s

Effluent biochemical oxygen demand D_e (mg/L): 120

Stream velocity v [m/s] [ft/s]: 0.5 ft/s

Deoxygenation constant k_d (day^{-1}): .173

Oxygenation constant k_o (day^{-1}): 28

Total reach length L_r (km) [mi]: 2.4 mi

Number of space steps n: 10

(n_{max} = 200)

[Leave blank to choose default n = 10]

OUTPUT:

Space interval j	Distance (mi)	DO (this model) (mg/L)	DO (Streeter-Phelps) (mg/L)	DO difference (mg/L)
0	0.000	12.50	12.50	0.00
1	0.480	12.44	12.46	-0.01
2	0.960	12.42	12.43	-0.01
3	1.440	12.41	12.42	-0.01
4	1.920	12.41	12.41	-0.01
5	2.400	12.41	12.41	0.00

Figure 6. Streeter-Phelps Calculator Example

The Streeter Phelps online calculator indicated zero dissolved oxygen (DO) at the creek's confluence with the Willamette river. However, due to the level of estimation and assumptions used, the model is not considered accurate. Oregon DEQ indicated a low level of probability that an absence of DO could be achieved at Ryan Creek's confluence with the Willamette River because facultative lagoons generally achieve low nitrification.

(2) Additional Analysis Required

Although the results of the overview indicate that Donald may be capable of achieving zero DO at the confluence, this would need to be proven to Oregon DEQ through further analysis. This would require, at a minimum, detailed hydrologic and hydraulic modeling to estimate the 7Q10 stream flow (the annual 7-day minimum flow with a 10-year recurrence interval) in Ryan Creek, extensive sampling of the WWTP effluent, and a full anti-degradation analysis and mixing zone study. Additional work that may be required for further investigation could include the following:

- Coordination with DEQ on development of a TMDL for Ryan Creek
- Creation of a hydraulic model of Ryan Creek to estimate season flows for dilution factors
- Installation and monitoring of stream gauges.
- Modeling and analysis of the lagoon nitrification process, removal efficiency and resulting BOD concentration in the effluent
- A survey of the Ryan Creek configuration
- Sampling and analysis of the City's STEP system and Fargo ISD BOD loading and weighted average
- Sampling and analysis of total Kjeldahl nitrogen concentrations during November
- Interpretation of existing DO and temperature data in existing Willamette River monitoring stations or installation of a new monitoring station at or near the confluence with Ryan Creek

(3) Conclusion

Although construction of a surface water outfall at Ryan Creek may be feasible, the cost to perform the additional analysis required for permitting would be prohibitive, and the time it would take to complete could seriously delay resolution of the City's lagoon storage issues. Additionally, the City's sustainability policy to handle treated wastewater as a resource to be reused conflicts with the permitting and construction of a surface water outfall. Therefore, this option was eliminated from further consideration at this time.

f. Permit and Construct Surface Water Outfall to Seneca Creek

A wet-weather outfall to Seneca Creek was also considered, but the same cost and schedule obstacles discussed in the Ryan Creek outfall section are expected to be encountered for this outfall. In addition, discharging to Seneca Creek would require a longer outfall pipe, incurring additional cost and potentially challenging additional permitting requirements for no apparent benefit.

g. Permit and Construct Hyporheic Discharge to Ryan Creek

Hyporheic discharge is essentially a combination of subsurface and surface water discharge, where treated wastewater is discharged underground adjacent to a riverbank. Additional treatment and filtration is provided as the treated wastewater flows through the soil and into the river. Hyporheic discharge is a relatively new concept in

Oregon and nationwide. This option was evaluated by reviewing other projects that have successfully permitted and constructed hyporheic discharge systems. Hyporheic discharge is expected to encounter schedule obstacles to permitting comparable to those of a surface water outfall directly to the creek, so this option was eliminated.

2. Proposed Projects

a. Expand Irrigation Sites

In order to provide adequate land to for irrigation disposal, a combination of the following sites will be used:

- The portions of the City's existing 56 acres of irrigation land that are not occupied by new lagoons
- The 15-acre site north of the City's irrigation land
- Twin Springs Nursery.

The balance of flow sent to these three sites is expected to vary by year and by season, but in combination these sites will allow disposal of all recycled water produced by the City and the Fargo ISD at full buildout. Use of the new sites will require the following new infrastructure:

- A new recycled water pump station, as discussed in Section VI.D.
- A new 7,200-foot 10-inch force main to the Twin Springs Nursery Site—approximately 3,500 feet in existing streets and the remaining portion across private property
- A new 2,100-foot 6-inch force main to the north irrigation site.

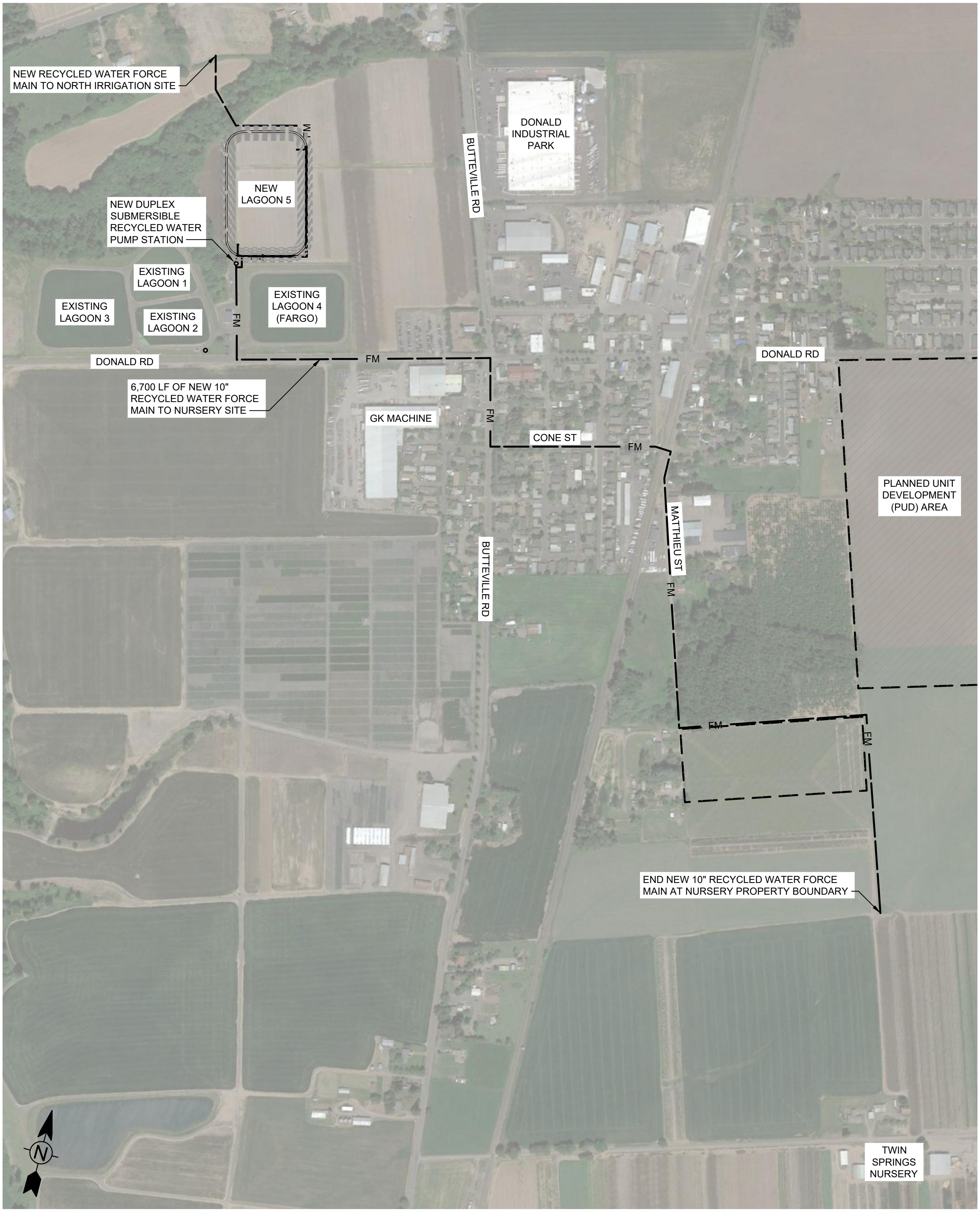
Preliminary cost estimates for the pump station are shown in Table 16. Preliminary costs for the force mains are shown in Table 18 and Table 19. Proposed routes for the force mains are shown in Figure 7.

Table 18. Estimated Costs for Expanded Irrigation Site to North

Item	Quantity	Units	Unit Price	Total
Mobilization (percentage of total)	8%	lump sum	$13,000	$13,000
Recycled Water Pipeline	2,100	LF	$80	$168,000
			Construction Subtotal	***$181,000***
			Construction Contingencies (20% of Construction Subtotal)	*$36,000*
			Engineering, Architectural, Administrative, and Legal Fees (25% of Construction and Contingency)	*$43,000*
			Total Project Cost	**$260,000**

Table 19. Estimated Costs for Recycled Water Force Main to Twin Springs Nursery

Item	Quantity	Units	Unit Price	Total
Mobilization (percentage of total)	8%	lump sum	$46,000	$46,000
10" PVC Force Main - in street	3,500	LF	$100	$350,000
10" PVC Force Main - overland	3,700	LF	$60	$222,000
			Construction Subtotal	***$618,000***
			Construction Contingencies (20% of Construction Subtotal)	*$124,000*
			Engineering, Architectural, Administrative, and Legal Fees (25% of Construction and Contingency)	*$148,000*
			Total Project Cost	**$890,000**



6/8/2021 9:36:53 AM - O:\PROJECTS\PORTLAND\166682\200-166682-20001\CAD\CONCEPTUAL\WWFP AMENDMENT FIGURES.DWG - BENNETTDAGGETT, HUNTER

TETRA TECH

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City of Donald

Wastewater Facility Plan Update Amendment

Proposed Recycled Water Force Main

PROJ:	200-166682-20001
DATE:	March 2021
DESN:	HBD

Figure 7

Bar Measures 1 inch

b. Construct Class A Tertiary Treatment Facility

A potential third phase of construction would include the addition of a tertiary treatment facility to the existing WWTP, allowing the production of Class A recycled water. No time has been set for this future phase construction, as it is expected to be triggered by new demand for recycled water or other changes in the City's patterns of recycled water use, and these are unknown at this time. When tertiary treatment is required, the design of the facility would review applicable treatment methods and desired level of treatment in greater detail. To develop preliminary costs for planning purposes, a packaged DAF and disk filter treatment system is assumed. Design parameters for a new tertiary treatment facility are summarized in Table 20. A preliminary cost estimate is shown in Table 21.

Table 20. Tertiary Treatment Facility Design Parameters

Design Parameter	Value
Maximum Treatment Capacity	600,000 gpd (420 gallons/minute)
Redundancy Requirements	Ability to meet design flow with one treatment unit offline
Influent Turbidity	75 NTU
Effluent Turbidity	2 NTU

Table 21. Estimated Costs for Tertiary Treatment Facility

Item	Quantity	Units	Unit Price	Total
Mobilization (percentage of total)	8%	lump sum	$107,000	$107,000
Earthwork	750	cubic yards	$8	$6,000
Building	1	lump sum	$150,000	$150,000
Packaged Dissolved Air Flotation System	1	lump sum	$500,000	$412,500
Packaged Disc Filter Treatment System	1	lump sum	$350,000	$525,000
Mechanical and Piping	1	lump sum	$100,000	$100,000
Electrical and Controls	1	lump sum	$150,000	$150,000
Construction Subtotal				***$1,451,000***
Construction Contingencies (20% of Construction Subtotal)				*$290,000*
Engineering, Architectural, Administrative, and Legal Fees (25% of Construction and Contingency)				*$348,000*
Total Project Cost				**$2,090,000**

F. INSTRUMENTATION AND CONTROL SCADA IMPROVEMENTS

The 2019 WWFP included one improvement project related to instrumentation and control and SCADA (supervisory control and data acquisition), listed as CIP Project 5—develop a City-wide SCADA system to monitor and control Donald's water and wastewater systems. The need for these improvements remains, but they will now be included in the larger WWTP upgrade. The proposed tertiary treatment facility in particular will include more mechanically and electronically complex equipment, and a full SCADA system that allows detailed monitoring and control of the new and existing treatment systems will be a necessity.

G. FACILITIES PLANNING AND SYSTEM DEVELOPMENT CHARGE METHODOLOGY

The 2019 WWFP included one improvement project related to planning and system development charges, listed as CIP Project 6—regular updates of this facilities plan and of the City's system development charge methodologies. The recommended project has not been revised, but has been renumbered as Project 7.

H. CAPITAL IMPROVEMENT PLAN SUMMARY

Table 22 summarizes the recommended CIP as updated in this Amendment. Improvements at the WWTP will be phased, and the project descriptions show the anticipated phasing for each project.

Table 22. Capital Improvement Plan Phasing

Project Number	Project Description	Estimated Cost
Phase 1: 1- to 2-Year Timespan		
1	New Lagoon 5	$2,800,000
3	Chlorination Improvements	$40,000
4	New Recycled Water Pump Station	$480,000
6	Recycled Water Force Main to Twin Springs Nursery	$890,000
	Total Phase 1	**$4,210,000**
Phase 2: 2- to 5-Year Timespan		
2	New Lagoon 6	$2,050,000
5	Expand Irrigation Area to North	$260,000
8	SCADA System Upgrades	$25,000
9	Planning and System Development Charge Updates	$40,000
	Total Phase 2	**$2,375,000**
Phase 3: 6- to 20-Year Timespan		
7	Class A Treatment System	$2,090,000
	Total Phase 3	**$2,090,000**
	Total All Phases	**$8,675,000**

I. OPERATION AND MAINTENANCE

The additional facilities proposed, in particular the tertiary treatment facility, will increase the cost and complexity of operations and maintenance. The current WWTP requires a Class I operator certification; the additional treatment equipment is not expected to change this requirement.

J. PERMIT ISSUES

The *Recycled Water Use Plan* will need to be revised to allow use of additional irrigation sites. When the future phase is initiated to include the proposed use of tertiary treatment and production of Class A recycled water, an additional revision to the *Recycled Water Use Plan* and Water Pollution Control Facility permit will be required.

VII. Funding Program

A. STATE HOUSING INITIATIVE

(This section is unchanged from the 2019 WWFP approved by DEQ.)

B. MARION COUNTY FUNDING REQUIREMENTS

(This section is unchanged from the 2019 WWFP approved by DEQ.)

C. FUNDING BALANCE

1. General Obligation Bonds

(This section is unchanged from the 2019 WWFP approved by DEQ.)

2. Revenue Bonds

(This section is unchanged from the 2019 WWFP approved by DEQ.)

3. Governmental Grant / Load Programs

(This section is unchanged from the 2019 WWFP approved by DEQ.)

4. System Development Charges

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

The Harvest Gardens PUD developer, GGP, has indicated it will fund construction of Phase 1 of the WWTP expansion, including Lagoon 5, the recycled water line to the Twin Springs nursery, and the recycled water pump station. In return, GGP will receive system development charge reimbursement credits for the value of the improvements. The City is currently updating its System Development Charge Plan to incorporate the updated CIPs included in this WWFP amendment.

D. RECOMMENDED FUNDING PROGRAM

(This section replaces the corresponding section in the 2019 WWFP approved by DEQ.)

As stated previously, GGP and Marion County have agreed to partially fund construction of the Phase 1 improvements including Lagoon 5, the recycled water line to the Twin Springs nursery, the recycled water pump station, and the chlorination improvements. The City will apply to Business Oregon for interim financing of the Phase 1 projects construction. Engineering design fees will be funded by the Oregon Workforce Housing Initiative grant and City operating reserves. Funding for future phases is unknown at this time but will likely include a combination of system development charges and rates.

Table 23 summarizes the proposed funding share for the Phase 1 projects.

Table 23. Proposed Funding for Capital Improvement Plan Projects

Project Number	Project Description	Total Construction Cost	Harvest Gardens Developer	Marion County	City of Donald
1	New Lagoon 5	$2,800,000	$2,380,000	$420,000	$0
3	Chlorination Improvements	$40,000	$31,200	$0	$8,800
4	New recycled water pump station	$480,000	$374,400	$0	$105,600
6	Recycled water force main to Twin Springs nursery	$890,000	$694,200	$0	$195,800
	Total	**$4,210,000**	**$3,479,800**	**$420,000**	**$310,200**

E. SCHEDULING

(This section replaces the corresponding section in the 2019 WWFP approved by DEQ.)

The City's wastewater lagoons have a capacity to support an annual average daily flow of 54,900 gpd. Current estimated annual average daily flow is 58,617 gpd. To address existing capacity issues, the lagoons are currently operated with 2 feet of freeboard rather than the recommended 3-foot design freeboard, resulting in a modified capacity of 72,200 gpd. The construction of Lagoon 5 will be required in order to accommodate wastewater from the addition of about 75 single-family homes. Based on the population projections shown in Table 1 this will occur within the next 1 to 2 years with the construction of the Harvest Gardens PUD.

Current flows to the Fargo ISD lagoon (Lagoon 4) show that lagoon is near capacity. With the expansion of the Fargo ISD, the capacity of Lagoon 4 will be exceeded, and Lagoon 5 will be required to provide the necessary additional capacity. The exact timing for the expansion of the Fargo ISD is unknown, but Marion County officials state that it may occur within the next 1 to 2 years.

The existing irrigation area is at capacity when using updated climate data. The addition of Lagoon 5 on City property will reduce the existing irrigation area and available capacity. Expansion of the irrigation area to the neighboring property and Twin Springs nursery will be required prior to construction of Lagoon 5.

In order to ensure the City has sufficient capacity to serve the Harvest Gardens PUD and Fargo ISD, the Phase 1 improvements—including Lagoon 5, new recycled water line, and recycled water pump station—must be completed within a 1 to 2 year timeframe beginning in the late fall of 2021. These improvements have been listed under the 1-2 year timespan in Table 22 to match the scheduling shown in the 2019 WWFP, but will be needed early in that period for the reasons listed above.

In order to ensure the City has sufficient capacity to serve infill growth within the City limits and UGB, the Phase 2 improvements – including Lagoon 6 must be completed within a 2 to 5 year timeframe beginning in fall 2023. This timeframe coincides with the projected population growth presented in Table 1.

The Phase 3 project is not required for any current regulatory or capacity needs. The project will only be required if the City or its customers decide to use the reclaim water for public park irrigation, food crop irrigation, or other beneficial reuse requiring a higher quality water than Class C. The City and its customers have shown interest in broader applications for beneficial reuse besides tree nursery irrigation but the cost to produce and transport Class A water is deemed to be prohibitive unless grant or private funding is made available. At this time no such funding sources have been identified. For the purposes of planning, Phase 3 is considered to be a longer term (5 to 20 year) project.

Wastewater Facilities Plan Amendment

Appendix A. Water Budget Spreadsheets

City of Donald
Water Balance: 2020 (Existing Conditions)

Assumptions				
Precip Increase [6]	1.00		Additional Flow	0 GPD
Evap Increase [7]	1.00		Irrigation Acreage	49.7 acres
Recycled Water Use	0	GPD	Additional Acreage	acres

Lagoon 1 and 2 (Donald Treatment)		
Lagoon Surface Area	4.53	acres
Catchment Area	4.88	acres
Minimum Depth	2.5	ft
Minimum Volume	8.0	ac-ft
Max Water Depth	9.5	ft
Total Berm Height	11.5	ft
Max Volume	35.7	ac-ft
Operational Volume	27.6	ac-ft

Lagoon 3 (Storage)		
Lagoon Surface Area	5.03	acres
Catchment Area	5.29	acres
Minimum Depth	2.5	ft
Minimum Volume	10.1	ac-ft
Max Water Depth	9.5	ft
Total Berm Height	11.5	ft
Max Volume	42.2	ac-ft
Operational Volume	32.1	ac-ft

Lagoon 4 (Fargo Treatment)		
Lagoon Surface Area	4.76	acres
Catchment Area	5.01	acres
Minimum Depth	3.0	ft
Minimum Volume	10.8	ac-ft
Max Water Depth	11.33	ft
Total Berm Height	13.34	ft
Max Volume	46.2	ac-ft
Operational Volume	35.4	ac-ft

All Lagoons Combined		
Lagoon Surface Area	14.32	acres
Catchment Area	15.18	acres
Minimum Volume	28.9	ac-ft
Max Volume	124.1	ac-ft
Operational Volume	95.2	ac-ft

Month	Days	Avg Daily Influent [1]	Monthly Influent Flow		Monthly Precipitation [2]		Monthly Evaporation [3]		Monthly Discharge [4]		Monthly Base Irrigation [5]		Monthly Recycled Water Use			Net Flow	Volume Stored	Status
		MG	MG	ac-ft	in	ac-ft	in	ac-ft	mgd	ac-ft	in	ac-ft	gpd	MG	ac-ft	ac-ft	ac-ft	
																	28.9	Not Reset
Nov	30	0.092	2.8	8.5	6.56	8.3	1.05	-1.3	0.00	0.0	0.04	-0.2	0	0.0	0.0	15.3	44.3	Normal
Dec	31	0.116	3.6	11.0	6.62	8.4	0.57	-0.7	0.00	0.0	0.00	0.0	0	0.0	0.0	18.7	63.0	Normal
Jan	31	0.120	3.7	11.4	6.17	7.8	0.63	-0.8	0.00	0.0	0.00	0.0	0	0.0	0.0	18.5	81.5	Normal
Feb	28	0.133	3.7	11.5	4.57	5.8	1.18	-1.4	0.00	0.0	0.00	0.0	0	0.0	0.0	15.8	97.3	Normal
Mar	31	0.127	3.9	12.0	4.55	5.8	2.29	-2.7	0.00	0.0	0.00	0.0	0	0.0	0.0	15.1	112.3	Normal
Apr	30	0.116	3.5	10.7	3.24	4.1	3.31	-3.9	0.00	0.0	0.59	-2.4	0	0.0	0.0	8.4	120.7	Normal
May	31	0.099	3.1	9.4	2.52	3.2	5.15	-6.1	0.00	0.0	2.01	-8.3	0	0.0	0.0	-1.8	118.9	Normal
Jun	30	0.094	2.8	8.7	1.86	2.4	6.01	-7.2	0.00	0.0	3.82	-15.8	0	0.0	0.0	-12.0	106.9	Normal
Jul	31	0.089	2.8	8.5	0.60	0.8	7.40	-8.8	0.00	0.0	6.42	-26.6	0	0.0	0.0	-26.2	80.7	Normal
Aug	31	0.087	2.7	8.3	0.64	0.8	6.78	-8.1	0.00	0.0	5.94	-24.6	0	0.0	0.0	-23.6	57.1	Normal
Sep	30	0.086	2.6	7.9	1.54	1.9	4.68	-5.6	0.00	0.0	4.25	-17.6	0	0.0	0.0	-13.3	43.8	Normal
Oct	31	0.086	2.7	8.2	3.58	4.5	2.39	-2.9	0.00	0.0	2.17	-9.0	0	0.0	0.0	0.9	44.7	Normal
Total		1.25	38	116	42.5	53.7	41.4	-49.4	0.00	0	25.2	-104.5	0	0.0	0.0	15.8	971	

Notes:

1) Influent flows based on recorded WWTP data Jan 2014 - Dec 2020, sum of Donald and Fargo flows.
2) Precipitation based on historical means for N. Willamette Experiment Station (Aurora), Oregon Climate Service, 1981-2010.
3) Evaporation based on historical means for N. Willamette Experiment Station (Aurora), Oregon Climate Service, 1963-2005.
4) No discharge.
5) Irrigation based on application rates for spring grass seed, Region 5, 19 out of 20 yrs, in "Oregon Crop Water Use and Irrigation Requirements", WRET, 1992.
6) Precipitation projection factor based on average of "Climate Change for Projected Precipitation", Climate Impacts Group, 2013.
7) Evaporation projection factor based on "Climate Change Projections for USFS lands in Oregon and Washington", Climate Impacts Group, 2011.

City of Donald

Water Balance: 2020 (Meeting Full Existing Demand)

Assumptions				
Precip Increase [6]	1.00		Additional Flow	GPD
Evap Increase [7]	1.00		Irrigation Acreage	49.7 acres
Recycled Water Use	0	GPD	Additional Acreage	8.9 acres

All Lagoons Combined		
Lagoon Surface Area	17.1	acres
Catchment Area	18.7	acres
Minimum Volume	35.2	ac-ft
Max Volume	133.9	ac-ft
Operational Volume	98.7	ac-ft

Lagoon 1 and 2 (Donald Treatment)		
Lagoon Surface Area	4.36	acres
Catchment Area	4.88	acres
Bottom Area	132,118	sq ft
Minimum Depth	2.5	ft
Minimum Volume	8.0	ac-ft
Max Water Depth	8.5	ft
Total Berm Height	11.5	ft
Max Volume	31.2	ac-ft
Operational Volume	23.2	ac-ft

Lagoon 3 (Storage)		
Lagoon Surface Area	4.90	acres
Catchment Area	5.29	acres
Bottom Area	168,941	sq ft
Minimum Depth	2.5	ft
Minimum Volume	10.1	ac-ft
Max Water Depth	8.5	ft
Total Berm Height	11.5	ft
Max Volume	37.2	ac-ft
Operational Volume	27.2	ac-ft

Lagoon 4 (Fargo Treatment)		
Lagoon Surface Area	4.63	acres
Catchment Area	5.01	acres
Bottom Area	149,863	sq ft
Minimum Depth	3.0	ft
Minimum Volume	10.8	ac-ft
Max Water Depth	10.33	ft
Total Berm Height	13.34	ft
Max Volume	41.5	ac-ft
Operational Volume	30.7	ac-ft

New Lagoon	5 (PUD)	6 (City)	
Lagoon Surface Area	0.00	3.23	acres
Catchment Area	0.00	3.55	acres
Bottom Area	0	105,000	sq ft
Minimum Depth	2.5	2.5	ft
Minimum Volume	0.0	6.3	ac-ft
Max Water Depth	8.5	8.5	ft
Total Berm Height	11.5	11.5	
Max Volume	0.0	23.9	ac-ft
Operational Volume	0.0	17.6	ac-ft

		Avg Daily Influent [1]	Monthly Influent Flow		Monthly Precipitation [2]		Monthly Evaporation [3]		Monthly Discharge [4]		Monthly Base Irrigation [5]		Monthly Recycled Water Use			Net Flow	Volume Stored	
Month	Days	MG	MG	ac-ft	in	ac-ft	in	ac-ft	mgd	ac-ft	in	ac-ft	gpd	MG	ac-ft	ac-ft	ac-ft	Status
																	35.2	Normal
Nov	30	0.092	2.8	8.5	6.56	10.2	1.05	-1.5	0.00	0.0	0.04	-0.2	0	0.0	0.0	17.0	52.2	Normal
Dec	31	0.116	3.6	11.0	6.62	10.3	0.57	-0.8	0.00	0.0	0.00	0.0	0	0.0	0.0	20.6	72.8	Normal
Jan	31	0.120	3.7	11.4	6.17	9.6	0.63	-0.9	0.00	0.0	0.00	0.0	0	0.0	0.0	20.1	92.9	Normal
Feb	28	0.133	3.7	11.5	4.57	7.1	1.18	-1.7	0.00	0.0	0.00	0.0	0	0.0	0.0	16.9	109.8	Normal
Mar	31	0.127	3.9	12.0	4.55	7.1	2.29	-3.3	0.00	0.0	0.00	0.0	0	0.0	0.0	15.9	125.7	Normal
Apr	30	0.116	3.5	10.7	3.24	5.1	3.31	-4.7	0.00	0.0	0.59	-2.9	0	0.0	0.0	8.1	133.9	Normal
May	31	0.099	3.1	9.4	2.52	3.9	5.15	-7.3	0.00	0.0	2.01	-9.8	0	0.0	0.0	-3.8	130.1	Normal
Jun	30	0.094	2.8	8.7	1.86	2.9	6.01	-8.6	0.00	0.0	3.82	-18.7	0	0.0	0.0	-15.7	114.4	Normal
Jul	31	0.089	2.8	8.5	0.60	0.9	7.40	-10.6	0.00	0.0	6.42	-31.4	0	0.0	0.0	-32.5	81.9	Normal
Aug	31	0.087	2.7	8.3	0.64	1.0	6.78	-9.7	0.00	0.0	5.94	-29.0	0	0.0	0.0	-29.4	52.5	Normal
Sep	30	0.086	2.6	7.9	1.54	2.4	4.68	-6.7	0.00	0.0	4.25	-20.8	0	0.0	0.0	-17.1	35.4	Normal
Oct	31	0.086	2.7	8.2	3.58	5.6	2.39	-3.4	0.00	0.0	2.17	-10.6	0	0.0	0.0	-0.2	35.2	Normal
Total		1.25	38	116	42.5	66.2	41.4	-59.1	0.00	0	25.2	-123.3	0	0.0	0.0	-0.1	1037	

Notes:

1) Influent flows based on recorded WWTP data Jan 2014 - Dec 2020, sum of Donald and Fargo flows.
2) Precipitation based on historical means for N. Willamette Experiment Station (Aurora), Oregon Climate Service, 1981-2010.
3) Evaporation based on historical means for N. Willamette Experiment Station (Aurora), Oregon Climate Service, 1963-2005.
4) No discharge.
5) Irrigation based on application rates for spring grass seed, Region 5, 19 out of 20 yrs, in "Oregon Crop Water Use and Irrigation Requirements", WRET, 1992.
6) Precipitation projection factor based on average of "Climate Change for Projected Precipitation", Climate Impacts Group, 2013.
7) Evaporation projection factor based on "Climate Change Projections for USFS lands in Oregon and Washington", Climate Impacts Group, 2011.

City of Donald

Water Balance: 2021 flows, Phase 1 construction (new lagoon for PUD and Fargo only)

Assumptions					
Precip Increase [6]	1.00		Additional Flow	79,300	GPD
Evap Increase [7]	1.00		Irrigation Acreage	15.0	acres
Recycled Water Use	0	GPD	Additional Acreage		acres
Nursery Water Use	324,000	GPD			

All Lagoons Combined		
Lagoon Surface Area	29.2	acres
Catchment Area	31.1	acres
Minimum Volume	63.1	ac-ft
Max Volume	232.0	ac-ft
Operational Volume	168.8	ac-ft

Lagoon 1 and 2 (Donald Treatment)		
Lagoon Surface Area	4.36	acres
Catchment Area	4.88	acres
Bottom Area	132,118	sq ft
Minimum Depth	2.5	ft
Minimum Volume	8.0	ac-ft
Max Water Depth	8.5	ft
Total Berm Height	11.5	ft
Max Volume	31.2	ac-ft
Operational Volume	23.2	ac-ft

Lagoon 3 (Storage)		
Lagoon Surface Area	4.90	acres
Catchment Area	5.29	acres
Bottom Area	168,941	sq ft
Minimum Depth	2.5	ft
Minimum Volume	10.1	ac-ft
Max Water Depth	8.5	ft
Total Berm Height	11.5	ft
Max Volume	37.2	ac-ft
Operational Volume	27.2	ac-ft

Lagoon 4 (Fargo Treatment)		
Lagoon Surface Area	4.63	acres
Catchment Area	5.01	acres
Bottom Area	149,863	sq ft
Minimum Depth	3.0	ft
Minimum Volume	10.8	ac-ft
Max Water Depth	10.33	ft
Total Berm Height	13.34	ft
Max Volume	41.5	ac-ft
Operational Volume	30.7	ac-ft

New Lagoon	5 (PUD)	6 (City)	
Lagoon Surface Area	15.28	0.00	acres
Catchment Area	15.96	0.00	acres
Bottom Area	585,000	0	sq ft
Minimum Depth	2.5	2.5	ft
Minimum Volume	34.2	0.0	ac-ft
Max Water Depth	8.5	8.5	ft
Total Berm Height	11.5	11.5	
Max Volume	121.9	0.0	ac-ft
Operational Volume	87.7	0.0	ac-ft

		Avg Daily Influent [1]	Monthly Influent Flow		Monthly Precipitation [2]		Monthly Evaporation [3]		Monthly Discharge [4]		Monthly Base Irrigation [5]		Monthly Recycled Water Use			Net Flow	Volume Stored	
Month	Days	MG	MG	ac-ft	in	ac-ft	in	ac-ft	mgd	ac-ft	in	ac-ft	gpd	MG	ac-ft	ac-ft	ac-ft	Status
																	63.1	Normal
Nov	30	0.171	5.1	15.8	6.56	17.0	1.05	-2.6	0.00	0.0	0.04	-0.1	0	0.0	0.0	30.2	93.3	Normal
Dec	31	0.195	6.1	18.6	6.62	17.2	0.57	-1.4	0.00	0.0	0.00	0.0	0	0.0	0.0	34.4	127.7	Normal
Jan	31	0.199	6.2	19.0	6.17	16.0	0.63	-1.5	0.00	0.0	0.00	0.0	0	0.0	0.0	33.4	161.2	Normal
Feb	28	0.213	6.0	18.3	4.57	11.9	1.18	-2.9	0.00	0.0	0.00	0.0	0	0.0	0.0	27.3	188.4	Normal
Mar	31	0.206	6.4	19.6	4.55	11.8	2.29	-5.6	0.00	0.0	0.00	0.0	0	0.0	0.0	25.8	214.2	Normal
Apr	30	0.195	5.9	18.0	3.24	8.4	3.31	-8.0	0.00	0.0	0.59	-0.7	0	0.0	0.0	17.6	231.9	Normal
May	31	0.179	5.5	17.0	2.52	6.5	5.15	-12.5	0.00	0.0	2.01	-2.5	324,000	-10.0	-30.8	-22.3	209.5	Normal
Jun	30	0.173	5.2	16.0	1.86	4.8	6.01	-14.6	0.00	0.0	3.82	-4.8	324,000	-9.7	-29.8	-28.4	181.1	Normal
Jul	31	0.168	5.2	16.0	0.60	1.6	7.40	-18.0	0.00	0.0	6.42	-8.0	324,000	-10.0	-30.8	-39.3	141.8	Normal
Aug	31	0.166	5.2	15.8	0.64	1.7	6.78	-16.5	0.00	0.0	5.94	-7.4	324,000	-10.0	-30.8	-37.3	104.6	Normal
Sep	30	0.166	5.0	15.2	1.54	4.0	4.68	-11.4	0.00	0.0	4.25	-5.3	324,000	-9.7	-29.8	-27.3	77.3	Normal
Oct	31	0.165	5.1	15.7	3.58	9.3	2.39	-5.8	0.00	0.0	2.17	-2.7	324,000	-10.0	-30.8	-14.3	63.1	Normal
Total		2.20	67	205	42.5	110.2	41.4	-100.7	0.00	0	25.2	-31.6	1,944,000	-59.6	-183.0	-0.2	1794	

Notes:

1) Influent flows based on recorded WWTP data Jan 2014 - Dec 2020, sum of Donald and Fargo flows.
2) Precipitation based on historical means for N. Willamette Experiment Station (Aurora), Oregon Climate Service, 1981-2010.
3) Evaporation based on historical means for N. Willamette Experiment Station (Aurora), Oregon Climate Service, 1963-2005.
4) No discharge.
5) Irrigation based on application rates for spring grass seed, Region 5, 19 out of 20 yrs, in "Oregon Crop Water Use and Irrigation Requirements", WRET, 1992.
6) Precipitation projection factor based on average of "Climate Change for Projected Precipitation", Climate Impacts Group, 2013.
7) Evaporation projection factor based on "Climate Change Projections for USFS lands in Oregon and Washington", Climate Impacts Group, 2011.

City of Donald

Water Balance: 2040 flows with PUD, single new lagoon for non-PUD City growth

Assumptions				
Precip Increase [6]	1.05		Additional Flow	99,060 GPD
Evap Increase [7]	1.03		Irrigation Acreage	15.0 acres
Recycled Water Use	0	GPD	Additional Acreage	0.0 acres
Nursery Water Use	369,000	GPD		

All Lagoons Combined	
Lagoon Surface Area	32.9 acres
Catchment Area	35.0 acres
Minimum Volume	72.1 ac-ft
Max Volume	262.9 ac-ft
Operational Volume	190.9 ac-ft

Lagoon 1 and 2 (Donald Treatment)		
Lagoon Surface Area	4.36	acres
Catchment Area	4.88	acres
Bottom Area	132,118	sq ft
Minimum Depth	2.5	ft
Minimum Volume	8.0	ac-ft
Max Water Depth	8.5	ft
Total Berm Height	11.5	ft
Max Volume	31.2	ac-ft
Operational Volume	23.2	ac-ft

Lagoon 3 (Storage)		
Lagoon Surface Area	4.90	acres
Catchment Area	5.29	acres
Bottom Area	168,941	sq ft
Minimum Depth	2.5	ft
Minimum Volume	10.1	ac-ft
Max Water Depth	8.5	ft
Total Berm Height	11.5	ft
Max Volume	37.2	ac-ft
Operational Volume	27.2	ac-ft

Lagoon 4 (Fargo Treatment)		
Lagoon Surface Area	4.63	acres
Catchment Area	5.01	acres
Bottom Area	149,863	sq ft
Minimum Depth	3.0	ft
Minimum Volume	10.8	ac-ft
Max Water Depth	10.33	ft
Total Berm Height	13.34	ft
Max Volume	41.5	ac-ft
Operational Volume	30.7	ac-ft

New Lagoon	5 (PUD)	6 (City)	
Lagoon Surface Area	19.04	0.00	acres
Catchment Area	19.80	0.00	acres
Bottom Area	739,000	0	sq ft
Minimum Depth	2.5	2.5	ft
Minimum Volume	43.2	0.0	ac-ft
Max Water Depth	8.5	8.5	ft
Total Berm Height	11.5	11.5	
Max Volume	152.9	0.0	ac-ft
Operational Volume	109.8	0.0	ac-ft

		Avg Daily Influent [1]	Monthly Influent Flow		Monthly Precipitation [2]		Monthly Evaporation [3]		Monthly Discharge [4]		Monthly Base Irrigation [5]		Monthly Recycled Water Use			Net Flow	Volume Stored	
Month	Days	MG	MG	ac-ft	in	ac-ft	in	ac-ft	mgd	ac-ft	in	ac-ft	gpd	MG	ac-ft	ac-ft	ac-ft	Status
																	72.1	Normal
Nov	30	0.191	5.7	17.6	6.89	20.1	1.08	-3.0	0.00	0.0	0.04	-0.1	0	0.0	0.0	34.6	106.7	Normal
Dec	31	0.215	6.7	20.5	6.95	20.3	0.59	-1.6	0.00	0.0	0.00	0.0	0	0.0	0.0	39.1	145.8	Normal
Jan	31	0.219	6.8	20.8	6.48	18.9	0.65	-1.8	0.00	0.0	0.00	0.0	0	0.0	0.0	37.9	183.8	Normal
Feb	28	0.232	6.5	20.0	4.80	14.0	1.22	-3.3	0.00	0.0	0.00	0.0	0	0.0	0.0	30.6	214.4	Normal
Mar	31	0.226	7.0	21.5	4.78	13.9	2.36	-6.5	0.00	0.0	0.00	0.0	0	0.0	0.0	28.9	243.3	Normal
Apr	30	0.215	6.5	19.8	3.40	9.9	3.41	-9.4	0.00	0.0	0.59	-0.7	0	0.0	0.0	19.6	262.9	Normal
May	31	0.198	6.1	18.9	2.65	7.7	5.30	-14.6	0.00	0.0	2.01	-2.5	369,000	-11.4	-35.1	-25.6	237.4	Normal
Jun	30	0.193	5.8	17.8	1.95	5.7	6.19	-17.0	0.00	0.0	3.82	-4.8	369,000	-11.1	-34.0	-32.3	205.1	Normal
Jul	31	0.188	5.8	17.9	0.63	1.8	7.62	-20.9	0.00	0.0	6.42	-8.0	369,000	-11.4	-35.1	-44.3	160.8	Normal
Aug	31	0.186	5.8	17.7	0.67	2.0	6.98	-19.2	0.00	0.0	5.94	-7.4	369,000	-11.4	-35.1	-42.0	118.7	Normal
Sep	30	0.185	5.6	17.1	1.62	4.7	4.82	-13.2	0.00	0.0	4.25	-5.3	369,000	-11.1	-34.0	-30.7	88.0	Normal
Oct	31	0.185	5.7	17.6	3.76	11.0	2.46	-6.8	0.00	0.0	2.17	-2.7	369,000	-11.4	-35.1	-16.0	72.1	Normal
Total		2.43	74	227	44.6	129.9	42.7	-117.1	0.00	0	25.2	-31.6	2,214,000	-67.9	-208.4	-0.1	2039	

Notes:

1) Influent flows based on recorded WWTP data Jan 2014 - Dec 2020, sum of Donald and Fargo flows.
2) Precipitation based on historical means for N. Willamette Experiment Station (Aurora), Oregon Climate Service, 1981-2010.
3) Evaporation based on historical means for N. Willamette Experiment Station (Aurora), Oregon Climate Service, 1963-2005.
4) No discharge.
5) Irrigation based on application rates for spring grass seed, Region 5, 19 out of 20 yrs, in "Oregon Crop Water Use and Irrigation Requirements", WRET, 1992.
6) Precipitation projection factor based on average of "Climate Change for Projected Precipitation", Climate Impacts Group, 2013.
7) Evaporation projection factor based on "Climate Change Projections for USFS lands in Oregon and Washington", Climate Impacts Group, 2011.

City of Donald

Water Balance: 2040 PSU flows only plus 13k gpd extra flow from Fargo

Assumptions					
Precip Increase [6]	1.05		Additional Flow	59,800	GPD
Evap Increase [7]	1.03		Irrigation Acreage	15.0	acres
Recycled Water Use	0	GPD	Additional Acreage	0.0	acres
Nursery Water Use	289,000	GPD			

All Lagoons Combined		
Lagoon Surface Area	27.2	acres
Catchment Area	29.1	acres
Minimum Volume	58.5	ac-ft
Max Volume	215.8	ac-ft
Operational Volume	157.3	ac-ft

Lagoon 1 and 2 (Donald Treatment)		
Lagoon Surface Area	4.36	acres
Catchment Area	4.88	acres
Bottom Area	132,118	sq ft
Minimum Depth	2.5	ft
Minimum Volume	8.0	ac-ft
Max Water Depth	8.5	ft
Total Berm Height	11.5	ft
Max Volume	31.2	ac-ft
Operational Volume	23.2	ac-ft

Lagoon 3 (Storage)		
Lagoon Surface Area	4.90	acres
Catchment Area	5.29	acres
Bottom Area	168,941	sq ft
Minimum Depth	2.5	ft
Minimum Volume	10.1	ac-ft
Max Water Depth	8.5	ft
Total Berm Height	11.5	ft
Max Volume	37.2	ac-ft
Operational Volume	27.2	ac-ft

Lagoon 4 (Fargo Treatment)		
Lagoon Surface Area	4.63	acres
Catchment Area	5.01	acres
Bottom Area	149,863	sq ft
Minimum Depth	3.0	ft
Minimum Volume	10.8	ac-ft
Max Water Depth	10.33	ft
Total Berm Height	13.34	ft
Max Volume	41.5	ac-ft
Operational Volume	30.7	ac-ft

New Lagoon	5 (PUD)	6 (City)	
Lagoon Surface Area	0.00	13.32	acres
Catchment Area	0.00	13.95	acres
Bottom Area	0	505,000	sq ft
Minimum Depth	2.5	2.5	ft
Minimum Volume	0.0	29.6	ac-ft
Max Water Depth	8.5	8.5	ft
Total Berm Height	11.5	11.5	
Max Volume	0.0	105.8	ac-ft
Operational Volume	0.0	76.2	ac-ft

		Avg Daily Influent [1]	Monthly Influent Flow		Monthly Precipitation [2]		Monthly Evaporation [3]		Monthly Discharge [4]		Monthly Base Irrigation [5]		Monthly Recycled Water Use			Net Flow	Volume Stored	
Month	Days	MG	MG	ac-ft	in	ac-ft	in	ac-ft	mgd	ac-ft	in	ac-ft	gpd	MG	ac-ft	ac-ft	ac-ft	Status
																	58.5	Normal
Nov	30	0.152	4.6	14.0	6.89	16.7	1.08	-2.5	0.00	0.0	0.04	-0.1	0	0.0	0.0	28.2	86.7	Normal
Dec	31	0.176	5.5	16.7	6.95	16.9	0.59	-1.3	0.00	0.0	0.00	0.0	0	0.0	0.0	32.3	119.0	Normal
Jan	31	0.180	5.6	17.1	6.48	15.7	0.65	-1.5	0.00	0.0	0.00	0.0	0	0.0	0.0	31.4	150.3	Normal
Feb	28	0.193	5.4	16.6	4.80	11.6	1.22	-2.8	0.00	0.0	0.00	0.0	0	0.0	0.0	25.5	175.8	Normal
Mar	31	0.186	5.8	17.7	4.78	11.6	2.36	-5.3	0.00	0.0	0.00	0.0	0	0.0	0.0	24.0	199.8	Normal
Apr	30	0.176	5.3	16.2	3.40	8.3	3.41	-7.7	0.00	0.0	0.59	-0.7	0	0.0	0.0	16.0	215.8	Normal
May	31	0.159	4.9	15.1	2.65	6.4	5.30	-12.0	0.00	0.0	2.01	-2.5	289,000	-9.0	-27.5	-20.5	195.3	Normal
Jun	30	0.154	4.6	14.2	1.95	4.7	6.19	-14.0	0.00	0.0	3.82	-4.8	289,000	-8.7	-26.6	-26.5	168.8	Normal
Jul	31	0.149	4.6	14.1	0.63	1.5	7.62	-17.3	0.00	0.0	6.42	-8.0	289,000	-9.0	-27.5	-37.1	131.7	Normal
Aug	31	0.147	4.5	14.0	0.67	1.6	6.98	-15.8	0.00	0.0	5.94	-7.4	289,000	-9.0	-27.5	-35.2	96.5	Normal
Sep	30	0.146	4.4	13.4	1.62	3.9	4.82	-10.9	0.00	0.0	4.25	-5.3	289,000	-8.7	-26.6	-25.5	71.0	Normal
Oct	31	0.146	4.5	13.9	3.76	9.1	2.46	-5.6	0.00	0.0	2.17	-2.7	289,000	-9.0	-27.5	-12.8	58.5	Normal
Total		1.96	60	183	44.6	108.2	42.7	-96.8	0.00	0	25.2	-31.6	1,734,000	-53.2	-163.2	-0.2	1669	

Notes:

1) Influent flows based on recorded WWTP data Jan 2014 - Dec 2020, sum of Donald and Fargo flows.
2) Precipitation based on historical means for N. Willamette Experiment Station (Aurora), Oregon Climate Service, 1981-2010.
3) Evaporation based on historical means for N. Willamette Experiment Station (Aurora), Oregon Climate Service, 1963-2005.
4) No discharge.
5) Irrigation based on application rates for spring grass seed, Region 5, 19 out of 20 yrs, in "Oregon Crop Water Use and Irrigation Requirements", WRET, 1992.
6) Precipitation projection factor based on average of "Climate Change for Projected Precipitation", Climate Impacts Group, 2013.
7) Evaporation projection factor based on "Climate Change Projections for USFS lands in Oregon and Washington", Climate Impacts Group, 2011.

City of Donald

Water Balance: 2040 flows with PUD, Phased construction (new lagoon for non-PUD City growth)

Assumptions					
Precip Increase [6]	1.05		Additional Flow	99,060	GPD
Evap Increase [7]	1.03		Irrigation Acreage	15.0	acres
Recycled Water Use	0	GPD	Additional Acreage	0.0	acres
Nursery Water Use	367,000	GPD			

All Lagoons Combined		
Lagoon Surface Area	25.0	acres
Catchment Area	27.2	acres
Minimum Volume	50.0	ac-ft
Max Volume	225.4	ac-ft
Operational Volume	175.4	ac-ft

Lagoon 1 and 2 (Donald Treatment)		
Lagoon Surface Area	4.36	acres
Catchment Area	4.88	acres
Bottom Area	132,118	sq ft
Minimum Depth	2.5	ft
Minimum Volume	8.0	ac-ft
Max Water Depth	8.5	ft
Total Berm Height	11.5	ft
Max Volume	31.2	ac-ft
Operational Volume	23.2	ac-ft

Lagoon 3 (Storage)		
Lagoon Surface Area	4.90	acres
Catchment Area	5.29	acres
Bottom Area	168,941	sq ft
Minimum Depth	2.5	ft
Minimum Volume	10.1	ac-ft
Max Water Depth	8.5	ft
Total Berm Height	11.5	ft
Max Volume	37.2	ac-ft
Operational Volume	27.2	ac-ft

Lagoon 4 (Fargo Treatment)		
Lagoon Surface Area	4.63	acres
Catchment Area	5.01	acres
Bottom Area	149,863	sq ft
Minimum Depth	3.0	ft
Minimum Volume	10.8	ac-ft
Max Water Depth	10.33	ft
Total Berm Height	13.34	ft
Max Volume	41.5	ac-ft
Operational Volume	30.7	ac-ft

New Lagoon	5 (PUD)	6 (City)	
Lagoon Surface Area	6.59	4.57	acres
Catchment Area	7.04	4.95	acres
Bottom Area	215,000	140,000	sq ft
Minimum Depth	2.5	2.5	ft
Minimum Volume	12.7	8.4	ac-ft
Max Water Depth	12	12	ft
Total Berm Height	15	15	
Max Volume	68.9	46.5	ac-ft
Operational Volume	56.2	38.1	ac-ft

Month	Days	Avg Daily Influent [1]	Monthly Influent Flow		Monthly Precipitation [2]		Monthly Evaporation [3]		Monthly Discharge [4]		Monthly Base Irrigation [5]		Monthly Recycled Water Use			Net Flow	Volume Stored	Status
		MG	MG	ac-ft	in	ac-ft	in	ac-ft	mgd	ac-ft	in	ac-ft	gpd	MG	ac-ft	ac-ft	ac-ft	
																	50.0	Not Reset
Nov	30	0.191	5.7	17.6	6.89	15.6	1.08	-2.3	0.00	0.0	0.04	-0.1	0	0.0	0.0	30.9	80.9	Normal
Dec	31	0.215	6.7	20.5	6.95	15.7	0.59	-1.2	0.00	0.0	0.00	0.0	0	0.0	0.0	35.0	115.9	Normal
Jan	31	0.219	6.8	20.8	6.48	14.7	0.65	-1.4	0.00	0.0	0.00	0.0	0	0.0	0.0	34.1	150.0	Normal
Feb	28	0.232	6.5	20.0	4.80	10.9	1.22	-2.5	0.00	0.0	0.00	0.0	0	0.0	0.0	28.3	178.3	Normal
Mar	31	0.226	7.0	21.5	4.78	10.8	2.36	-4.9	0.00	0.0	0.00	0.0	0	0.0	0.0	27.4	205.7	Normal
Apr	30	0.215	6.5	19.8	3.40	7.7	3.41	-7.1	0.00	0.0	0.59	-0.7	0	0.0	0.0	19.7	225.3	Normal
May	31	0.198	6.1	18.9	2.65	6.0	5.30	-11.1	0.00	0.0	2.01	-2.5	367,000	-11.4	-34.9	-23.6	201.7	Normal
Jun	30	0.193	5.8	17.8	1.95	4.4	6.19	-12.9	0.00	0.0	3.82	-4.8	367,000	-11.0	-33.8	-29.3	172.4	Normal
Jul	31	0.188	5.8	17.9	0.63	1.4	7.62	-15.9	0.00	0.0	6.42	-8.0	367,000	-11.4	-34.9	-39.5	132.9	Normal
Aug	31	0.186	5.8	17.7	0.67	1.5	6.98	-14.6	0.00	0.0	5.94	-7.4	367,000	-11.4	-34.9	-37.7	95.2	Normal
Sep	30	0.185	5.6	17.1	1.62	3.7	4.82	-10.1	0.00	0.0	4.25	-5.3	367,000	-11.0	-33.8	-28.4	66.7	Normal
Oct	31	0.185	5.7	17.6	3.76	8.5	2.46	-5.1	0.00	0.0	2.17	-2.7	367,000	-11.4	-34.9	-16.7	50.1	Normal
Total		2.43	74	227	44.6	100.9	42.7	-89.1	0.00	0	25.2	-31.6	2,202,000	-67.5	-207.2	0.0	1675	

Notes:

1) Influent flows based on recorded WWTP data Jan 2014 - Dec 2020, sum of Donald and Fargo flows.
2) Precipitation based on historical means for N. Willamette Experiment Station (Aurora), Oregon Climate Service, 1981-2010.
3) Evaporation based on historical means for N. Willamette Experiment Station (Aurora), Oregon Climate Service, 1963-2005.
4) No discharge.
5) Irrigation based on application rates for spring grass seed, Region 5, 19 out of 20 yrs, in "Oregon Crop Water Use and Irrigation Requirements", WRET, 1992.
6) Precipitation projection factor based on average of "Climate Change for Projected Precipitation", Climate Impacts Group, 2013.
7) Evaporation projection factor based on "Climate Change Projections for USFS lands in Oregon and Washington", Climate Impacts Group, 2011.

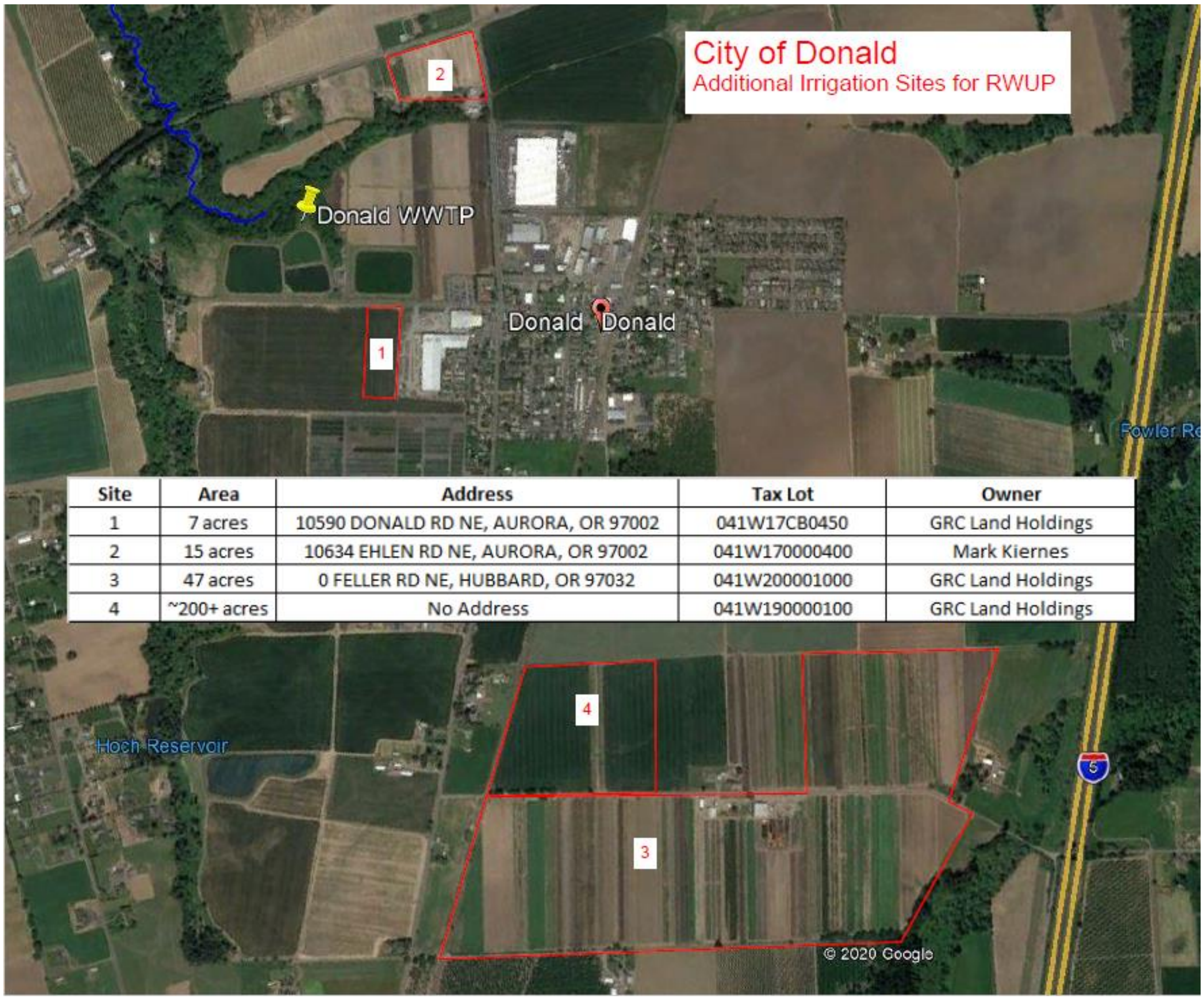
Wastewater Facilities Plan Amendment

Appendix B. DEQ Irrigation Site Conditional Approval

City of Donald
FN4600
PN 101978

PRELIMINARY DEQ
RECYCLE WATER LAND APPLICATION SITE
SUITABILITY AND CONDITIONS REVIEW

On September 22, 2020 I met with Alonso Limones, Public Works Director with the City of Donald. We reviewed five potential recycle water use sites. Four of the site are shown in the figure below.



Site	Area	Address	Tax Lot	Owner
1	7 acres	10590 DONALD RD NE, AURORA, OR 97002	041W17CB0450	GRC Land Holdings
2	15 acres	10634 EHLEN RD NE, AURORA, OR 97002	041W170000400	Mark Kiernes
3	47 acres	0 FELLER RD NE, HUBBARD, OR 97032	041W200001000	GRC Land Holdings
4	~200+ acres	No Address	041W190000100	GRC Land Holdings

Figure 1 City of Donald proposed recycle water use fields (1-4)

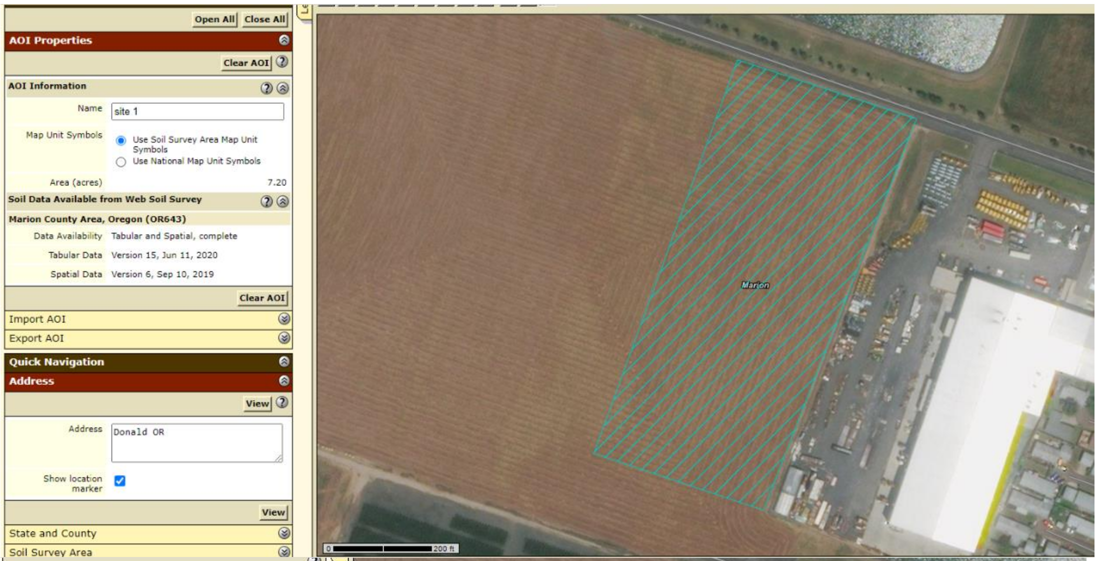
All the sites are in agriculture.

Table 1 City of Donald proposed recycle water use fields (1-5)

Site #	Soil types	crop	Neighbor considerations	Limitations
1	Amity(Am) poorly drained Woodburn(WuA) moderately well drained	grass	Fenced area next to a business	Small acreage wind shut off, wind drift onto neighboring business employees
2	Amity(Am) poorly drained Woodburn(WuA) moderately well drained	plowed field grass	Bordering parcel 2 residences with wells setback to food preparation area and wells	Small acreage wind shut off, Hwy
3	Amity(Am) poorly drained Concord(Co) poorly drained Dayton (Da) poorly drained Woodburn(WuA) moderately well drained Woodburn(WuC) moderately well drained	grass nursery stock	County road separates sites 3 & 4. Leakage of recycled water to stormwater roadside drainage (irrigation stub outs and pipe gaskets) Wells on the property?	Employee training recycled water don't drink Signage 2 languages
4	Amity(Am) poorly drained Concord(Co) poorly drained Dayton (Da) poorly drained Woodburn(WuA) moderately well drained Woodburn(WuC) moderately well drained	grass nursery stock	County road separates sites 3 & 4. Leakage of recycled water to stormwater roadside drainage (irrigation stub outs and pipe gaskets) Wells on the property?	Employee training recycled water don't drink Signage 2 languages

5	Amity(Am) poorly drained Concord(Co) poorly drained Dayton (Da) poorly drained Woodburn(WuA) moderately well drained	grass field proposed subdivision	Setbacks to drinking water faucets and food prep	Residences and employee training recycled water don’t drink Signage 2 languages

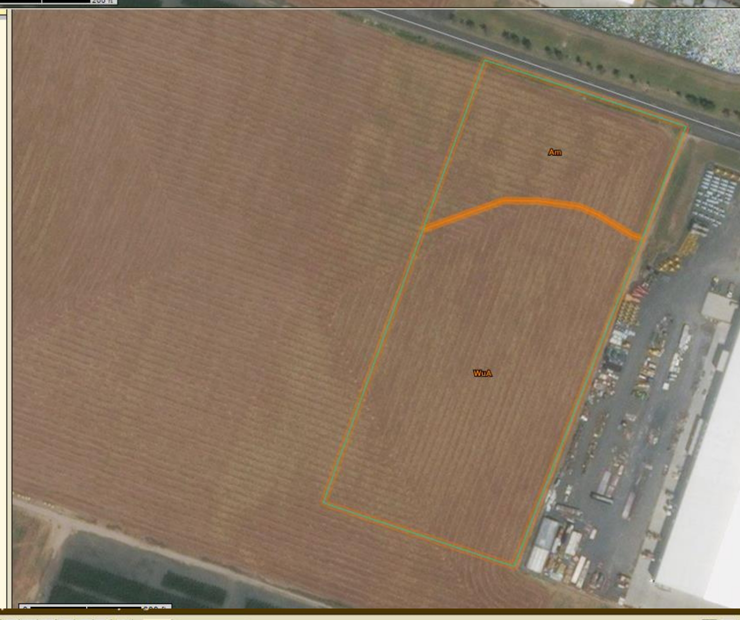
Site 1

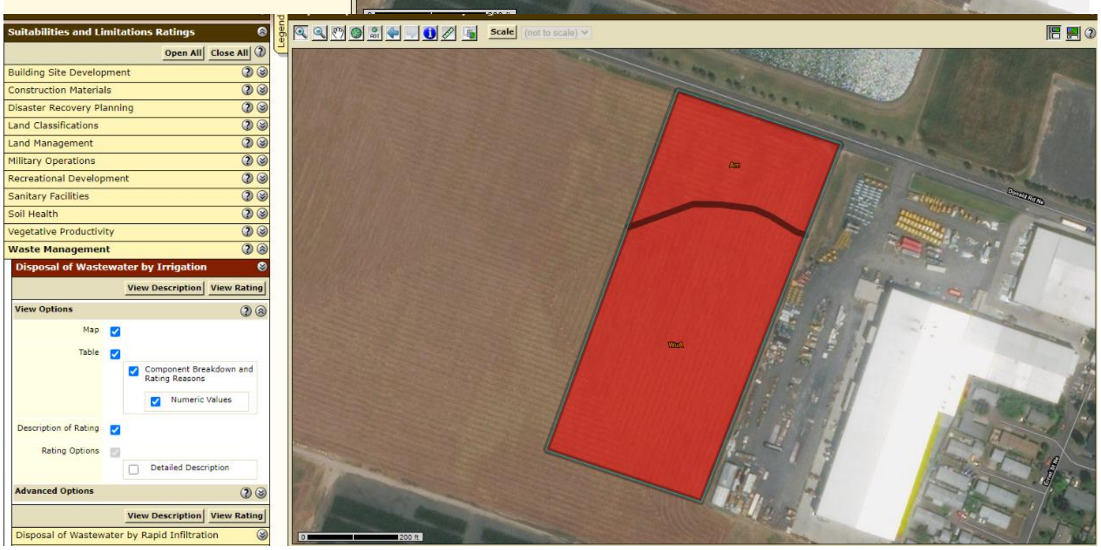


Marion County Area, Oregon (OR643)

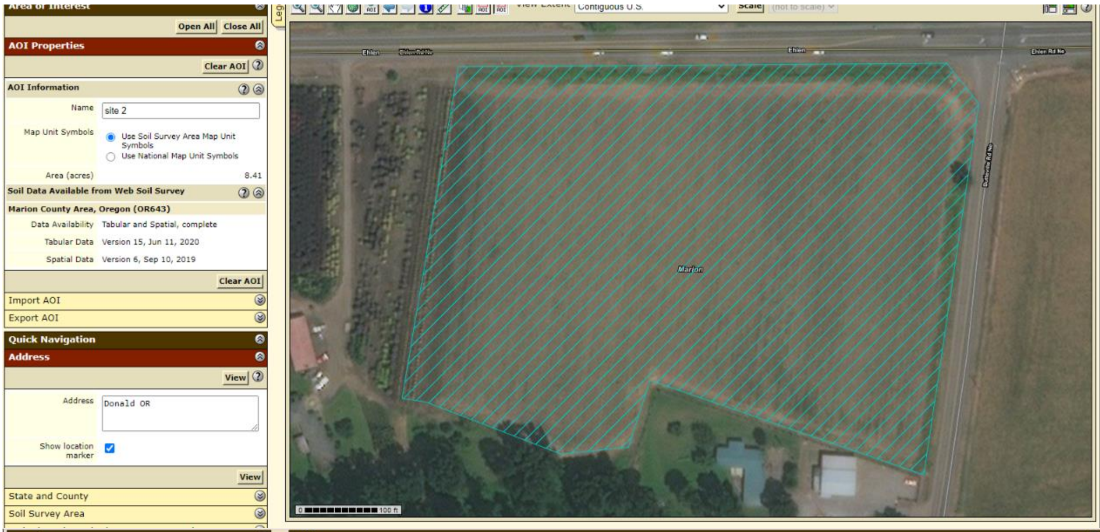
Marion County Area, Oregon (OR643)

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
Am	Amity silt loam	2.0	27.7%
WuA	Woodburn silt loam, 0 to 3 percent slopes	5.2	72.3%
Totals for Area of Interest		**7.2**	**100.0%**





Site 2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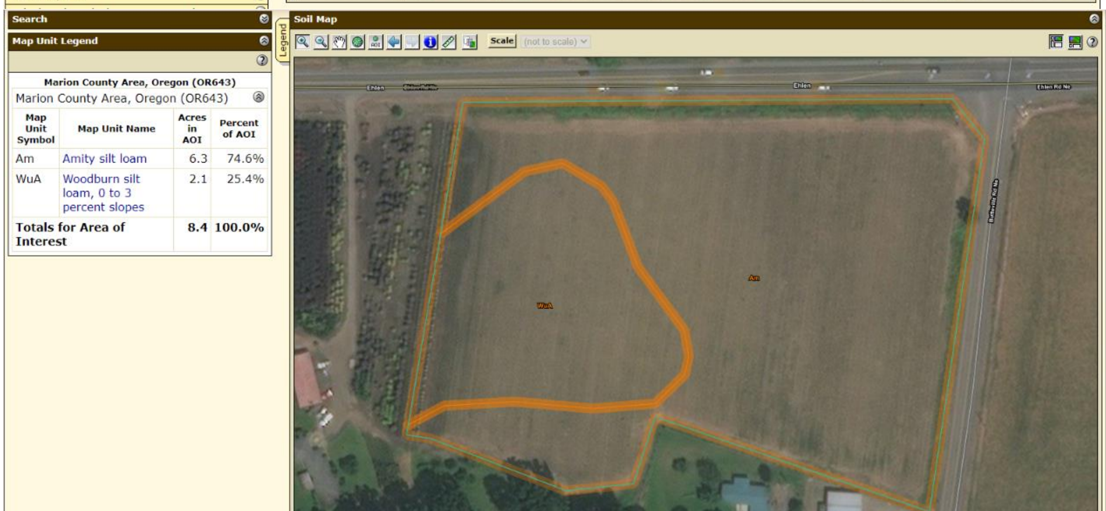
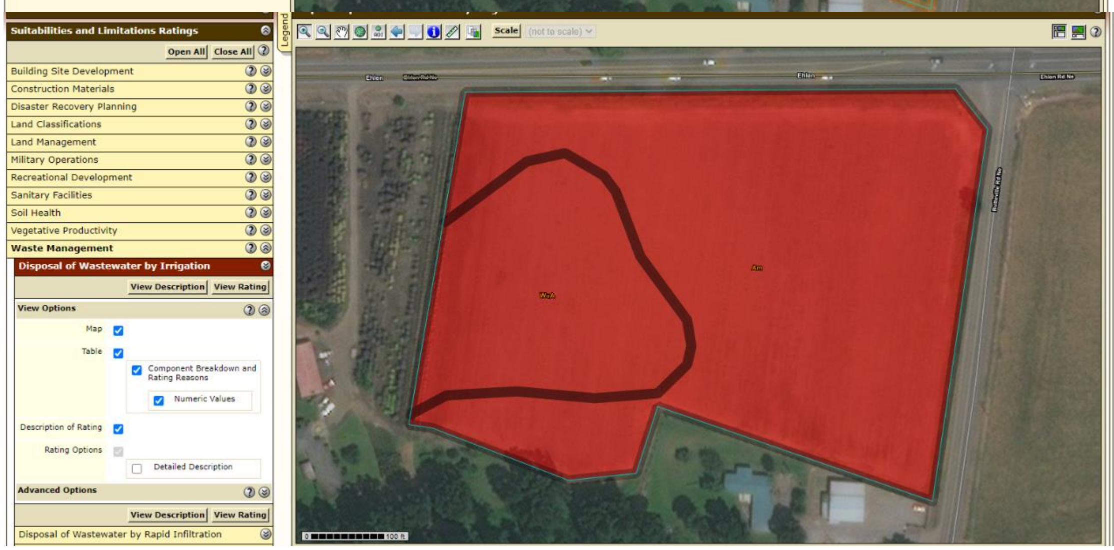
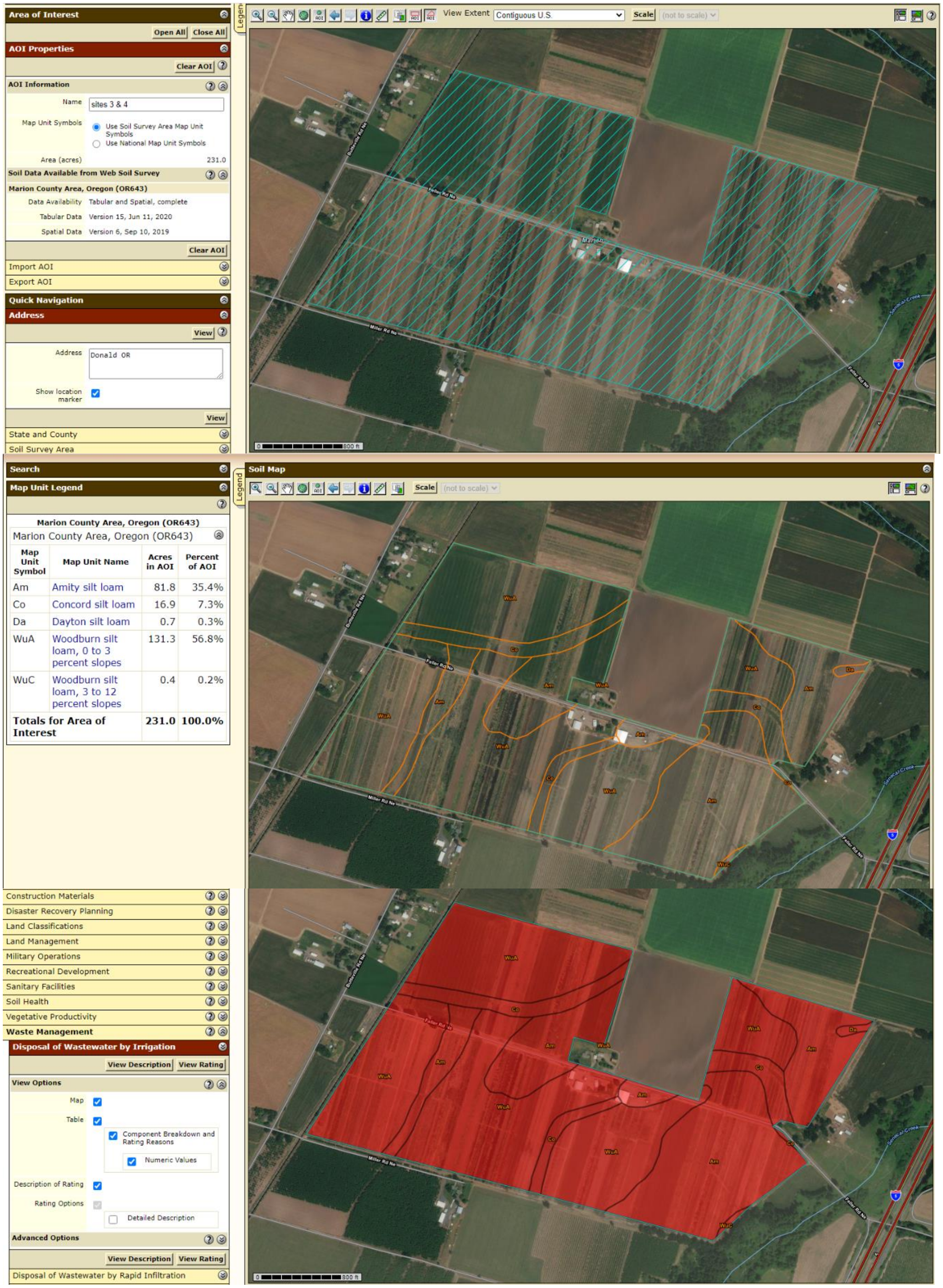
Close All
AOI Properties
Clear AOI
AOI Information
Name
site 2
Map Unit Symbols
Use Soil Survey Area Map Unit Symbols
Use National Map Unit Symbols
Area (acres)
8.41
Soil Data Available from Web Soil Survey
Marion County Area, Oregon (OR643)
Data Availability
Tabular and Spatial, complete
Tabular Data
Version 15, Jun 11, 2020
Spatial Data
Version 6, Sep 10, 2019
Clear AOI
Import AOI
Export AOI
Quick Navigation
Address
View
Address
Donald OR
Show location marker
View
State and County
Soil Survey Area
Contiguous U.S.
Scale
(not to scale)
Marion


Search
Map Unit Legend
Marion County Area, Oregon (OR643)
Marion County Area, Oregon (OR643)
Map Unit Symbol
Map Unit Name
Acres in AOI
Percent of AOI
Am
Amity silt loam
6.3
74.6%
WuA
Woodburn silt loam, 0 to 3 percent slopes
2.1
25.4%
Totals for Area of Interest
8.4
100.0%
Soil Map
Legend
Scale
(not to scale)
WuA
Am

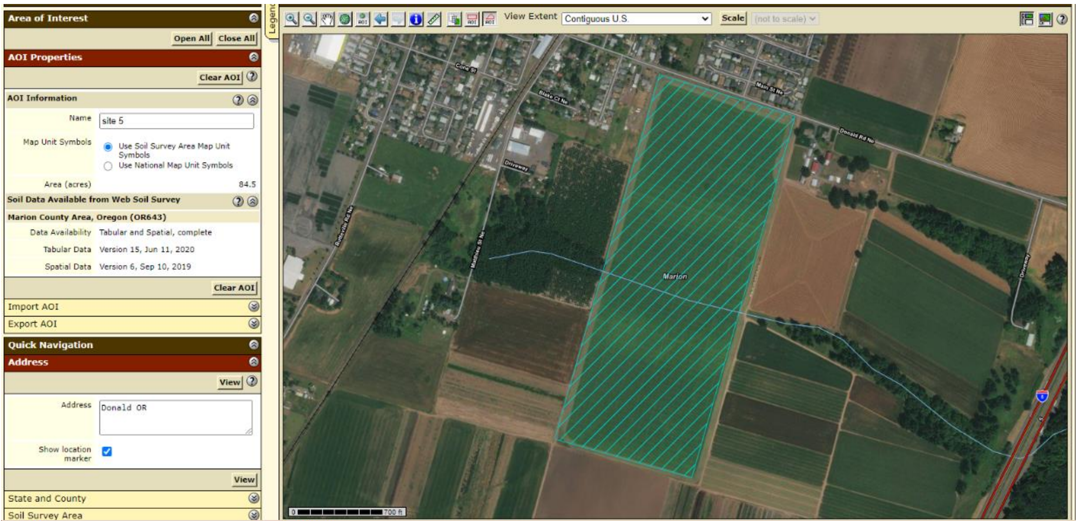

Suitabilities and Limitations Ratings
Open All
Close All
Building Site Development
Construction Materials
Disaster Recovery Planning
Land Classifications
Land Management
Military Operations
Recreational Development
Sanitary Facilities
Soil Health
Vegetative Productivity
Waste Management
Disposal of Wastewater by Irrigation
View Description
View Rating
View Options
Map
Table
Component Breakdown and Rating Reasons
Numeric Values
Description of Rating
Rating Options
Detailed Description
Advanced Options
View Description
View Rating
Disposal of Wastewater by Rapid Infiltration
Legend
Scale
(not to scale)
WuA
Am

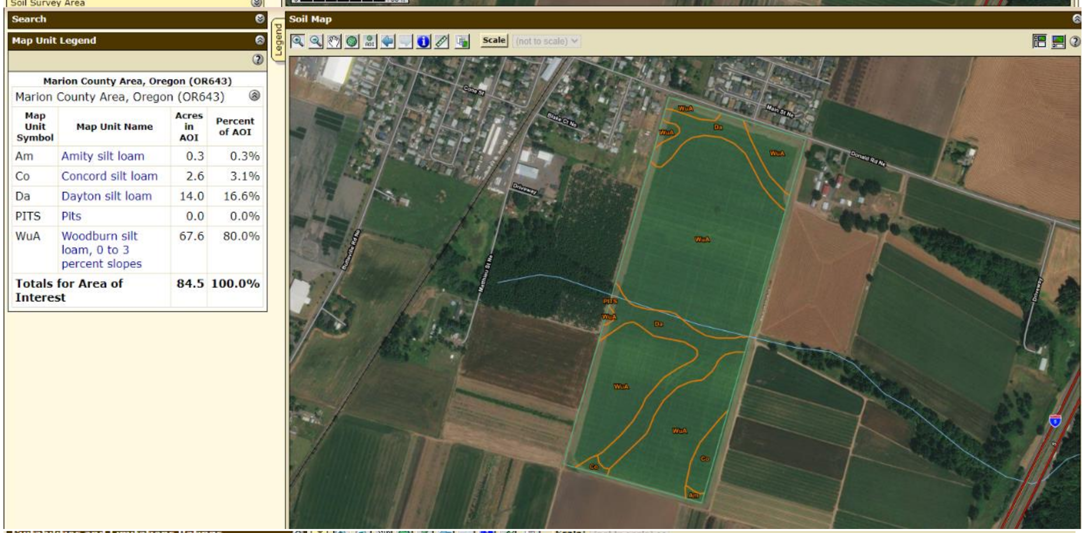
Sites 3 & 4



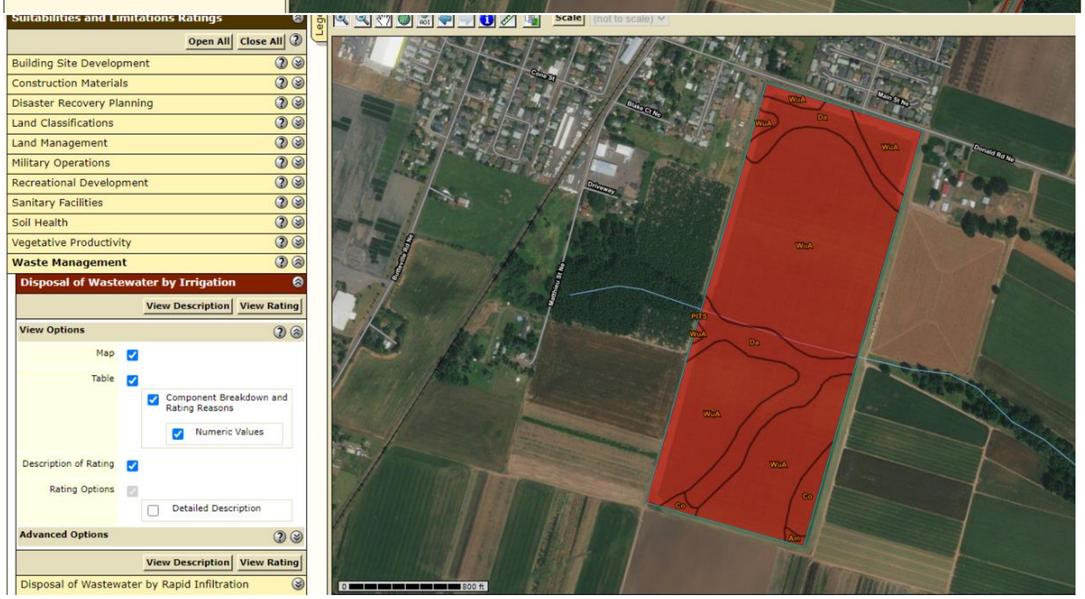
Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
Am	Amity silt loam	81.8	35.4%
Co	Concord silt loam	16.9	7.3%
Da	Dayton silt loam	0.7	0.3%
WuA	Woodburn silt loam, 0 to 3 percent slopes	131.3	56.8%
WuC	Woodburn silt loam, 3 to 12 percent slopes	0.4	0.2%
Totals for Area of Interest		231.0	100.0%

Site 5





Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
Am	Amity silt loam	0.3	0.3%
Co	Concord silt loam	2.6	3.1%
Da	Dayton silt loam	14.0	16.6%
PITS	Pits	0.0	0.0%
WuA	Woodburn silt loam, 0 to 3 percent slopes	67.6	80.0%
Totals for Area of Interest		**84.5**	**100.0%**



Tables — Disposal of Wastewater by Irrigation — Summary By Map Unit

Summary by Map Unit — Marion County Area, Oregon (OR643)

Summary by Map Unit — Marion County Area, Oregon (OR643)

Map unit symbol	Map unit name	Rating	Component name (percent)	Rating reasons (numeric values)	Acres in AOI	Percent of AOI
Am	Amity silt loam	Very limited	Amity (85%)	Depth to saturated zone (1.00)	6.3	74.6%
				Too acid (0.42)		
				Slow water movement (0.22)		
			Concord (5%)	Ponding (1.00)		
				Depth to saturated zone (1.00)		
				Slow water movement (1.00)		
				Too acid (0.14)		
WuA	Woodburn silt loam, 0 to 3 percent slopes	Very limited	Woodburn (85%)	Slow water movement (1.00)	2.1	25.4%
				Depth to saturated zone (0.99)		
				Too acid (0.14)		
Totals for Area of Interest					**8.4**	**100.0%**

Table — Disposal of Wastewater by Irrigation — Summary by Rating Value

Summary by Rating Value

Summary by Rating Value

Rating	Acres in AOI	Percent of AOI
Very limited	8.4	100.0%
Totals for Area of Interest	**8.4**	**100.0%**

All the sites, one through five are suitable for land application of some level of recycled water. Use of Class A, B and C water comes with limitations and restrictions that will need to be determined as sites are developed.

Conveyance lines from the wastewater treatment plant to the recycle water use sites will need plans and specifications as well, with potentially stormwater construction permits.

Each site has be developed in terms of crop types nutrient management monitoring and sampling plan as well as irrigation systems used.

Once the irrigation system design and specifications have been finalized for a site then it can be added to the Recycled Water Plan (includes signage and annual training). Changes in the RWUP is a permit modification and requires public notice.