FINAL | NOVEMBER 2022

2021 Facilities Plan

PREPARED FOR

South Suburban Sanitary District

PREPARED BY

WEST YOST
Water. Engineered.

2021 Facilities Plan

Prepared for

South Suburban Sanitary District

Project No. 515-50-21-17

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FINAL REPORT | NOVEMBER 2022

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LIST OF ACRONYMS AND ABBREVIATIONS

AACE	Association for the Advancement of Cost Engineering
ABF	Average Base Flow
Ac-Ft	Acre Feet
ADWF	Average Dry Weather Flow
Amsl	Above Mean Sea Level
AWWF	Average Wet Weather Flow
BOD	Biochemical Oxygen Demand
Cfs	Cubic Feet per Second
City	City of Klamath Falls
CMOM	Capacity Management and Operation and Maintenance
County	Klamath County
DEQ	Department of Environmental Quality
District	South Suburban Sanitary District
DMRs	Discharge Monitoring Reports
EFU	Exclusive Farming Use
ENG	Engineering News Record
EPA	U.S. Environmental Protection Agency
ETL	Excess Thermal Load
FAA	Federal Aviation Administration
FY	Fiscal Year
GAD	Gallons Per Acre Per Day
Gcd	Gallons Per Capita Per Day
GPD	Gallons Per Day
GPM	Gallon Per Minute
HP	Horsepower
HUA	Human Use Allowance
IMD	Internal Management Directive
kW	KiloWatt
MBR	Membrane Bioreactor

Mgal	Million Gallons
mgd	Million Gallons Per Day
MMDWF	Maximum Month Dry Weather Flow
MMWWF	Maximum Month Wet Weather Flow
NH3	Ammonia
NO2+NO3	Nitrate/Nitrite
NPDES	National Pollutant Discharge Elimination System
O&M	Operations and Maintenance
OAR	Oregon Administrative Rule
Ortho-P	Organic Phosphorus
Pcd	Pounds Per Capita Per Day
PDF	Peak Day Flow
PLC	Programmable Logic Controller
Ppd	Pounds Per Day
PRC	Population Research Center
PVC	Polyvinyl Chloride
PWWF	Peak Wet Weather Flow
RCAC	Rural Community Assistance Corporation
RDI&D	Rainfall Dependent Infiltration and Inflow
RPA	Reasonable Potential Analysis
SCADA	Supervisory Control and Data Acquisition
SCFM	Standard Cubic Feet Per Minute
SRF	State Revolving Fund
SSO	Sanitary Sewer Overflow
TKN	Total Kjeldahl Nitrogen
TMDL	Total Maximum Daily Load
Total-P	Total Phosphorus
TSS	Total Suspended Solids
UGB	Urban Growth Boundary
USBR	U.S. Bureau of Reclamation
USGS	United States Geological Survey
VFD	Variable Frequency Drive
WIFIA	Water Infrastructure Finance and Innovation Act
WLA	Waste Load Allocation
WRCC	Western Regional Climate Center
WRD	Oregon Water Resources Department
WWTP	Wastewater Treatment Plant

CHAPTER 1
Executive Summary

Improving the health of the Klamath River has long been a goal for Oregon and California regulators, river users and fisheries. The Oregon Department of Environmental Quality (DEQ) has recently renewed the National Pollutant Discharge Elimination System (NPDES) permit for South Suburban Sanitary District's (District's) Wastewater Treatment Plant (WWTP). The renewed permit includes new effluent requirements for nutrients, biochemical oxygen demand, and temperature to conform with the Total Maximum Daily Loads (TMDLs) that have been developed for the Klamath River. To meet the requirements of this new permit, the District will need to make improvements to the WWTP facilities.

This Facilities Plan contains a characterization of the District's service area, an overview of the existing treatment facility, and a narrative for the need to update the existing treatment system (the Project). Four different treatment alternatives designed to satisfy the TMDL requirements are described and evaluated based on economic factors. The chosen alternative involves upgrading the WWTP to allow for surface water discharge either to the Klamath River (Lake Ewauna) or to a local irrigation district.

This Facility Plan outlines two strategies for achieving the project objectives. Both strategies involve constructing an entirely new treatment process to meet the nutrient and biochemical oxygen demand, constructing a new solids treatment process that can meet Class A biosolids treatment requirements, and using the infrastructure and ponds for flow equalization and temperature attenuation. The District will implement this project using an Alternative Delivery procurement approach, and the details of the specific treatment improvements will be defined through by the selected Alternative Delivery team. The Alternative Delivery procurement approach will ensure that DEQ will receive a complete set of plans for review prior to initiation of construction.

1.1 PROJECT OBJECTIVES

The objectives of the Facilities Plan are to evaluate the District's sanitary sewage facilities with respect to existing needs and treatment requirements, to evaluate alternatives, to identify improvements and associated costs necessary to meet these requirements and to satisfy funding agency planning requirements. This will provide the District with a plan for upgrading the District's wastewater facilities. In addition, the plan includes an overview of the financing requirements for the improvements.

1.2 SERVICE AREA CHARACTERIZATION

The Klamath Falls metropolitan area is located approximately 15 miles north of the California border and includes population under the jurisdiction of the City of Klamath Falls (City) as well as Klamath County residents within the City's Urban Growth Boundary (UGB) that are served by the District.

The Klamath Falls area is semiarid and experiences an average annual precipitation of approximately 13 inches. Snow occurs in the winter months, which can influence high peak flow events when accumulated snow from multiple storm events melts.

The District serves primarily a mix of commercial and residential accounts. Most residential services are single-family residential accounts but also includes apartments, manufactured, and commercial units (including motels and recreational vehicles). There are no significant industrial users or industrial sources with high organic loading that discharge to the collection system.

In 2003, an intergovernmental urban service agreement was signed between the District and the City stipulating that the District has the discretion to expand its collection system inside and outside of the UGB but may not enter City limits. The existing population served by the District is estimated to be about 23,000 and projected population is based on modest growth within the UGB from 2021 to 2045 at an annual growth of 0.098 percent.

The Klamath River includes drainage from three Oregon counties as well as five Northern California Counties. Poor water quality in all reaches of the Klamath River have caused regulatory bodies to increase treatment requirements for discharges into the Klamath. Accordingly, the DEQ has prepared TMDL allocations for temperature, nutrients, and organic materials.

The area around the treatment facility includes wetlands to the North and West. The wetland to the West is the location where the WWTP outfall discharges plant effluent. These wetlands empty into Lake Ewauna which is part of the Klamath River. North of Lake Ewauna is the Upper Klamath Lake which has a variety of water quality issues including high arsenic concentrations, low dissolved oxygen levels, and frequent algae blooms in the summer. The District outfall also collects surface drainage from City and County jurisdiction that mixes with District effluent before entering the wetlands. The wetlands at the discharge location have been determined by DEQ to be an important habitat for juvenile fish.

Chapter 2 includes an analysis of the existing wastewater flow rates, organic loadings and solids loading to the WWTP. Population projections are included and are used to estimate future flows and loads. The design flows and loads are used to analyze the existing system and alternatives. Existing and projected (2045) wastewater flows are shown in Table 1-1.

Table 1-1. Design Flow Projection Summary

Flow	Current Value, mgd	Year 2045 Value, mgd
Average Dry Weather Flow	2.1	2.2
Average Wet Weather Flow	2.3	2.4
Maximum Month Wet Weather Flow	4.0	4.1
Peak Wet Weather Flow	6.5	6.7

1.3 EXISTING FACILITIES

The District's treatment facility was originally constructed in 1958 and various improvements have been made since that time. The WWTP includes a bar screen, four treatment ponds, two of which have aeration diffusers, a chlorine contact basin, and an effluent pump station. The existing chlorine contact basin has required investment to maintain its structural integrity. The District recently improved the effluent pump station which discharges WWTP effluent mixed with County and City stormwater into Lake Ewauna.

The District's collection system currently includes 482,000 linear feet of pipeline primarily made of PVC, concrete, and asbestos cement. Five larger diameter main lines convey sewage from the collection system to the WWTP. The District's collection system consists solely of gravity lines, except for one force main that connects the Henley Schools near Highway 39 to the service area and the Skyline neighborhood system, which was constructed in 2021 and is a pressurized system that flows into a gravity main.

The District provides ongoing condition assessment of the collection system using general inspection techniques. Initial results of these inspections indicate infiltration influenced by irrigation canals in the southern end of the service area. Smoke testing and flow metering are being considered to further segregate and understand higher peak flows associated with the northwest areas.

The EPA has provided guidelines for which a collection system can be evaluated to determine if infiltration and inflow (I&I) is excessive. If the measured per capita flow rate of the collection system exceeds EPA guidelines (120 gallons per capita per day, or gcd), then the sources of I&I in the collection system may warrant active management to reduce peak wet weather flows. During periods in the wet season with low precipitation, per capita wastewater flows greater than the EPA guideline of 120 gcd are observed. However, the District's service area has an atypically high pipe length relative to the service population, and engineering convention allows for I&I analysis in several formats other than a per capita basis. The District's base infiltration is on the low end of typical ranges based on I&I flow per inch-diameter mile of pipe and I&I flow per acre of developed land within the District's service area. Additionally, the District's wastewater treatment ponds provide a large amount of peak flow attenuation, and the upstream facilities have adequate capacity to handle the projected peak wet weather flow. For these reasons, a comprehensive program to remove I&I would not be cost-effective. The District has nevertheless implemented a program of I&I identification and collection system improvements as part of their overall maintenance program. Additional discussion of the I&I analysis and program is provided in Chapter 3.

Operations and maintenance (O&M) Costs for FY 2019-20 were approximately $1.8 million, and income was projected to be approximately $5.8 million. O&M costs are expected to increase with treatment improvements. Changes to the operation and maintenance costs are presented in Chapter 6 and a financial analysis is presented in Chapter 7.

1.4 NEED FOR PROJECT

The reach of the Klamath River that receives District discharge has several beneficial uses as listed by OAR 340-041-0180 including both public and private domestic water supplies, salmonid spawning and rearing, fishing, and water contact recreation. Additionally, the Klamath River has a cool water species fish designation. The 2022 DEQ integrated report on water quality shows that Lake Ewauna is water quality limited for:

- pH (Category 4A)
- ammonia (Category 4A)
- harmful algal blooms (Category 4A)
- dissolved oxygen (Category 4A)
- Chlorophyll-a (Category 4A)

DEQ has developed TMDLs to address these impairments. The nutrient TMDL sets nutrient limits for the reach of the Klamath River where the District discharges and allocates a share of the allowable load to the District. The District will have to comply with nitrogen discharge requirements of 318 and 448 pounds per day (ppd) and phosphorous loads of 4.9 and 36 ppd in the dry and wet seasons, respectively. Effluent data gathered in 2021 shows the District's plant effluent would exceed the phosphorus requirements throughout most of the year and has the potential to exceed the nitrogen requirements under some conditions.

DEQ has developed a Temperature TMDL that encompasses the Lake Ewauna portion of the Klamath River. The temperature TMDL has set a year-round human use allowance (HUA) of 0.3°C. With the long residence time inherent with the ponds, the water cools to near-ambient conditions before discharge and the existing system generally complies with the HUA. Modern advanced treatment systems have short residence times which would result in much warmer water entering the Klamath and violations of the HUA especially during the winter months. For the considered alternatives involving river discharge, the existing ponds would likely be needed for cooling of the effluent prior to discharge.

As a part of the NPDES permit process, the DEQ performed a Reasonable Potential Analysis (RPA) based on historical effluent concentrations to evaluate acute and chronic toxicity potential. Since the marsh between the District's outfall and Lake Ewauna has been designated a possible rearing habitat for juvenile salmon, the District is not allocated a dilution factor in the mixing zone for the RPA calculation. The effluent concentrations at the end of the pipe are used evaluate reasonable potential for exceeding a water quality standard.

Effluent ammonia, mercury and chlorine are all indicated a reasonable potential of exceeding acute and/or chronic aquatic toxicity. For the Human Health RPA, which evaluates acceptable concentrations for human ingestion of water and aquatic life, it was determined that additional data are necessary for several toxic pollutants including phthalates and pentachlorophenol. Monitoring these toxics is included in the NPDES permit.

1.5 ALTERNATIVES CONSIDERED

During the development of the draft Facilities Plan, a broad range of alternatives have been considered to ensure that all options available to the District have been evaluated. Not all the alternatives that were identified proved to be viable and these alternatives have not been carried forward. Four alternatives were evaluated in greater detail and include the following:

- **Alternative 1:** Upgrade the Plant for Klamath River Surface Water Discharge
  - 1A. Conventional Treatment Approach Using a Membrane Bioreactor (MBR) Process
  - 1B. Proprietary Technology
- **Alternative 2:** Upgrade the Plant for Irrigation District Surface Water Discharge
  - 2A. Conventional Treatment Approach Using an MBR Process
  - 2B. Proprietary Technology
- **Alternative 3:** Class A Recycled Water for Agricultural Irrigation with Onsite Storage
  - 3A. Chlorine Disinfection
  - 3B. UV Disinfection
- **Alternative 4:** Class A Recycled Water for Agricultural Irrigation with Offsite Storage and Chlorine Disinfection

1.5.1 Alternative 1

With this alternative, the District would effectively build an entirely new treatment plant to meet nutrient removal requirements and maintain the existing ponds for equalization of flows and cooling to meet the temperature requirements. Alternative 1A includes the use of a 3.0 mgd capacity membrane bioreactor (MBR) system to meet treatment requirements and Alternative 1B includes the use of a 3.0 mgd capacity propriety treatment process from E3 Water LLC to meet the limitations. Both alternatives also include the production of Class A biosolids for land application on nearby agricultural properties.

1.5.2 Alternative 2

This alternative would rely on a treatment train that is like those identified for Alternatives 1A or 1B. However, under Alternative 2A and 2B, the effluent would be discharged at a location that it can be beneficially used by a local irrigation district. The exact discharge location has not been defined and the District is currently working to identify whether there are interested parties in the area. It should be noted that the discharge to an irrigation canal would require a modification to the NPDES permit and a water quality assessment. For purposes of this analysis, it is assumed that any costs or facilities associated with discharging at an alternative site would be borne by the recipient of the treated water, either through direct payment or through the purchase of the treated water.

1.5.3 Alternative 3

Alternative 3 involves elimination of discharge to the Klamath River and using recycled water for irrigation of crops on existing farmland. There are two treatment alternatives considered, both of which produce Class A recycled water. One alternative would rely on chlorine for disinfection and the second alternative would rely on ultraviolet light for disinfection.

The recycled water would be stored in a new, approximate 1,500 acre-feet storage pond located on District property north of the WWTP facilities. The Class A recycled water would be conveyed to a property located within the Klamath Drainage District service area. The recycled water would be beneficially reused on at least 1,000 acres of dedicated, irrigated agricultural land. The District would lease the property that receives the recycled water from the landowner and would need to sublease the property for agricultural production.

1.5.4 Alternative 4

This alternative would rely on a Class A recycled water treatment train that uses chlorine disinfection, as identified for Alternative 3. However, under Alternative 4, the recycled water would be stored in a pond that is located near the land application area. The exact location of this storage has not been defined and the District is currently working to identify whether there are available sites located near the identified land application area.

Storing the recycled water near the land application site would allow for the discharge pipeline to serve as the chlorine disinfection system contact basin, which would lower the treatment facilities cost. Second, the discharge facilities capital costs would be lower because the size of the discharge pump station and pipeline could be reduced because the flow would be transferred at a constant, relatively low flow rate.

1.5.5 Screened Alternatives Identified as Not Viable

During the development of the draft Facilities Plan, a broad range of alternatives have been considered to ensure that all options available to the District have been evaluated. Not all the alternatives that were identified proved to be viable and these alternatives are not presented in detail in this chapter but are summarized below.

- **Class B or C Recycled Water Application on District-Owned Property:** In 2000, the District began evaluating the potential for using recycled water for irrigation on District-owned land, including an assessment of potential crops, land requirements, and storage requirements. The evaluation included alternatives for both a District-only recycled water use program as well as a regionalized (District and City of Klamath Falls) reuse program. The District ratepayers rejected this concept through a Board election process. The newly elected Board confirmed that any recycled water produced by the facility would meet Class A standards and the District's preferred strategy will be to deliver recycled water to an existing landowner – not to purchase land for recycled water application. This strategy allows the District to put the water to the highest and best use as opportunities arise.
- **Recycled Water to Lower Klamath National Wildlife Refuge:** Providing water to the Lower Klamath National Wildlife Refuge was considered. The refuge needs additional water and could use recycled water to enhance its refuge management. If the refuge were to accept recycled water, no discharge of recycled water would need to be guaranteed because the refuge drainage is one of the sources of nutrients to the Klamath River. The capital cost for conveyance and management of the recycled water is much greater than the other alternatives. Moreover, there was a low level of interest by the management agencies and the alternative has not been pursued.
- **Pollutant Trading:** Oregon DEQ has a regulatory framework for trading whereby dischargers could fund existing stream system restoration to receive credits for discharge to the receiving stream. Using trading was evaluated. However, with the new year-round limitations for nutrients, BOD, and temperature, trading is not viable for the District system.
- **Discharge of Class A Water to the A Canal:** The concept to produce Class A recycled water for discharge to the A Canal was also assessed. The A Canal does not afford adequate storage of recycled water during the non-irrigation season and the District would be required to construct a storage reservoir. In addition, Oregon administrative rules do not allow for discharge to an irrigation canal without the development of a recycled water use plan for each user of the irrigation water. With the extent of the A Canal use including the discharge into the Lost River, development of a recycled water use plan and implementation would not be feasible. The combination of the TMDL constraints in both the Lost River and the Klamath River and the current recycled water use regulations, discharge of Class A recycled water to the A Canal could not be permitted under current statutes.
- **Regionalization:** A study was performed to evaluate the feasibility of a regionalized treatment option to meet the future needs and responsibilities of the City of Klamath Falls (City) and the District. While both governing bodies have similar future treatment needs, regionalization would be too complex since the City of Klamath Falls would have difficulty meeting the limits established in the draft TMDL if they were to accept District flows.

1.6 SELECTION OF AN ALTERNATIVE

An economic analysis was performed to define the capital and O&M costs of the alternatives. Alternative 1, Upgrade the Plant for Klamath River Surface Water Discharge was identified as the least expensive alternatives. The costs for Alternative 2 could not be defined but are assumed to be equal to or less than Alternative 1. Under Alternative 2, the District would partner with another party who would pay the District to receive the defined effluent discharge for its exclusive use. Similarly, the cost of Alternative 4 could not be defined. It is likely that there would be some savings with this approach as compared to Alternative 3. However, the magnitude of this savings cannot be defined because the location and cost of the property where the offsite storage pond would be sited has not been identified. The economic analysis evaluated the capital costs, annual O&M costs and the total lifecycle cost of each the alternatives that can be evaluated at this time. These are presented in Table 1-2.

Table 1-2. Alternatives Cost Summary

	Description	Capital Cost,[a] dollars, M	Annual O&M,[a] dollars, M	Net Present Worth of O&M,[a,b] dollars, M	Lifecycle Cost,[a] dollars, M
1A	Klamath River Surface Water Discharge – MBR Treatment	74	3.1	49.1	123
1B	Klamath River Surface Water Discharge – E3 Water LLC Treatment System	70	3.9	62.9	132
2A	Irrigation District Surface Water Discharge	74[c]	3.1[c]	49.1[c]	123[c]
2B	Irrigation District Surface Water Discharge	70[c]	3.9[c]	62.9[c]	132[c]
3A	Class A Recycled Water for Agricultural Irrigation with Onsite Storage – Chlorine Disinfection	122	2.0	32.6	155
3B	Class A Recycled Water for Agricultural Irrigation with Onsite Storage UV Disinfection	121	2.0	31.7	153
4	Class A Recycled Water for Irrigation with Offsite Storage – Chlorine Disinfection	< 122[d]	< 2.0[d]	< 32.6[d]	< 155[d]

(a) Costs presented as Millions (M) of dollars. December 2021 dollars (12,480 20-City Average ENR).
(b) 20-year present worth at an annual discount rate of 2.25 percent.
(c) Costs for Alternatives 2A and 2B are assumed to be the same as Alternative 1A and 1B, respectively. It is assumed that any costs for conveyance to an alternative discharge location would be borne by the water user.
(d) Costs for Alternative 4 are expected to be lower than Alternative 3A because the discharge pipeline can be used as a chlorine contact basin. The specific savings cannot be defined, however, until a site is identified for the offsite storage facility.

Alternatives 1 A and 2A have the lowest lifecycle cost. The District will need to upgrade its treatment facility to pursue either alternative. For Alternative 2A to be successful and cost effective, the District will need to identify a project partner that is interested in receiving the District's treated effluent and is willing to cover the costs associated with conveyance to a new discharge location (assuming that is necessary). Therefore, it is recommended that District initially implement Alternative 1A, which will enable the District to continue discharge to Lake Ewauna while the details of a water transfer deal are further developed.

1.7 RECOMMENDED PROJECT

Upgrading the WWTP to allow for surface water discharge would enable the District to continue discharge to Lake Ewauna (Alternative 1A/1B) or discharge to a nearby irrigation district (Alternative 2A/2B). This is the best alternative for the District and its ratepayers from a financial standpoint; additionally, it also has the potential to provide benefits to local water supplies by providing a reliable source of irrigation water. The approach is also the easiest project to implement because the discharge standards are already defined, and the District owns property adjacent to the existing WWTP where the treatment facilities can be constructed. Finally, this approach provides the most long-term flexibility to the District for use of the treated effluent.

1.7.1 Project Overview

The District will effectively need to build an entirely new treatment plant to reliably meet the biochemical oxygen demand and nutrient removal requirements required under the current permit for continued surface water discharge. The District has also determined that the new upgraded facilities will need to produce Class A biosolids so that the solids can be land applied on nearby agricultural properties.

This alternative will be delivered using an Alternative Delivery procurement approach, which will allow the District to secure the following benefits for its customers:

- Delivery of a project that optimizes lifecycle costs;
- Integration of design and construction teams to develop a better and more reliable facility;
- Reducing risk to the District by contracting responsibility to the Alternative Delivery team;
- Incorporation of innovative technology that promote efficiency and wise use of resources; and
- Competitive selection of the best Alternative Delivery team and approach to meeting the project criteria at the lowest lifecycle cost.

Because the Alternative Delivery team will define the project's detailed design criteria, specific details regarding the facilities cannot be defined at this time. Key criteria that would be included in the Alternative Delivery procurement and contracting documents include:

- Effluent water quality requirements;
- Class A biosolids treatment requirements;
- Reliance on existing infrastructure to the extent it reduces overall lifecycle costs;
- Requirements for specific condition-related improvements for existing facilities that will be included in the future treatment process;
- Protection from flooding that would occur in a 1-in-100-year frequency;
- Redundancy and reliability expectations established by DEQ in the Preparing Wastewater Planning Documents and Environmental Reports for Public Utilities (DEQ 2019); and
- New electrical and instrumentation infrastructure needed to support a new advanced treatment facility.

Finally, to achieve the preferred strategy of providing the treated effluent to a local irrigation district, the District will need to identify a project partner that is interested in receiving the District's treated effluent and is willing to cover the costs associated with conveyance to a new discharge location (assuming that is necessary). Given the complexities with developing a partnership agreement and obtaining a new permit for the discharge location (if needed)[1], the District will need to initially implement the treatment improvements to allow for continued discharge to the Klamath River while the details of a water transfer deal are further developed. The discharge can then be relocated, as needed, once the remaining project elements are defined.

1.7.2 Project Schedule

The timeline listed in Table 1-3 has been established by the DEQ as compliance checkpoints for the District to conform with the NPDES permit. The compliance milestones shown below reflect the June 22, 2022 modification to the District's NPDES permit.

Table 1-3. DEQ Established Compliance Milestones for Meeting Final Effluent Limits

Complete By	Requirement
April 1, 2022	Submit a Wastewater Facilities Plan to DEQ for review and approval that includes the improvements achieve compliance with all of the final effluent limits in Schedule A of the permit.
December 1, 2022	Submit a Preliminary Design Report for meeting the limits to DEQ for review and approval.
August 1, 2023	Secure financing for improvements to meet the limits.
August 1, 2024	Submit final design plans that address all of DEQ's previous comments for achieving compliance with all of the final effluent limits in Schedule A of the permit to DEQ for approval.
October 1, 2025	Submit a status report to DEQ outlining the progress made toward completion of the improvements.
Annually by January 15th, until completion of the compliance schedule	Submit a status report to DEQ outlining the progress made toward completion of the improvements.
October 1, 2026	Complete all improvements and achieve compliance with the final effluent limits in Schedule A of the permit.

[1] The District may be able to identify a partner that can simply divert the flow from the Klamath River downstream of the current discharge location. The diversion of water from the Klamath River would require approval by the Oregon Water Resources Department.

The Alternative Delivery process requires significant time to develop and implement the Alternative Delivery team selection process. While this team selection process could include developing some of the preliminary design elements, the final determination of technology and key design features that is critical to completing the preliminary design will be delayed as compared to a traditional design-bid-build approach. Therefore, several of the early milestones identified in the DEQ schedule are not likely appropriate under an Alternative Delivery process. However, a properly managed and executed Alternative Delivery project should be able to readily meet the final compliance date shown in the DEQ schedule.

Ultimately, the schedule for project completion will need to be defined as the details of the Alternative Delivery procurement process are worked out. The District will need to coordinate with DEQ to establish a new compliance schedule once these details are defined.

1.7.3 Financing Considerations

The District has accumulated significant cash reserves which will greatly help in the execution of the wastewater treatment system. Still, supplementary financing sources will need to be pursued and must be secured before the District can contract with an Alternative Delivery team. To support this effort, the District will need to develop a financing plan for this project. Due to modest growth of the service population and therefore income from sewer fees, the District will eventually need to increase its rates to keep up with cost increases due to inflation. However, with the reserves on hand, an immediate rate increase may not be required to fund the project.

The costs associated with implementing the surface water discharge alternatives based on two conceptual strategies evaluated in this Facilities Plan (Alternative 1A/2A and 1B/2B)[2] are outlined in Table 1-4 and Table 1-5.

[2] The cost for Alternative 2A is the same as Alternative 1A and the cost for Alternative 2B is the same as Alternative 1B. Implementation of either Alternative 1A or 1B would enable the District to pursue Alternatives 2A or 2B.

Table 1-4. Summary of Costs for Klamath River Surface Water Discharge – MBR Treatment Concept (Alterative 1A/2A)

Description	Cost[a], dollars
Capital Costs	
Condition Repairs	550,000
Influent Pipeline	580,000
Influent Pump Station	1,870,000
Membrane Bioreactor and Influent Screening	23,580,000
UV Disinfection	2,330,000
FKC Class A biosolids Treatment	7,330,000
Dewatered solids storage and equipment	2,780,000
Pond 4A Rehab	4,330,000
Pond 2 and 3 Solids Removal	810,000
Pond 2 and 3 Solar Bees	220,000
Operations/Lab Building	1,760,000
Plant Utilities	1,330,000
Subtotal	**$47,470,000**
Project Phase-Level OPCC Contingency (20 percent)	9,494,000
Engineer's Preliminary Opinion of Probable Costs	**$56,964,000**
Changes and Unforeseen Conditions During Construction (5 percent)	2,850,000
Engineering Design, Environmental Planning and Studies, Construction Management, ESDC, and Legal and Admin Costs (25 percent)	14,240,000
Engineer's Preliminary Opinion of Probable Total Capital Cost	**$74,050,000**
Annual O&M Costs	
Total Existing Annual O&M[b]	**$1,050,000**
Additional Costs	
Energy[c,d]	610,000
Labor[e]	240,000
Chemicals	700,000
Materials and Services[f]	440,000
Solids Disposal	34,000
Total Additional Annual O&M	**$2,024,000**
Grand Total Annual O&M	**$3,074,000**

(a) December 2021 dollars (12,480 20-City Average ENR).
(b) Estimated costs for continued operation of facilities included in project concept. Based on FY 2020/21 budgeted costs.
(c) Based on an energy cost of $0.085 per kWh.
(d) Offset of electricity costs by solar power generation is not included.
(e) Labor costs assume 1 additional chief plant operator and 2 additional assistant operators.
(f) Materials and Service cost based on 1 percent of mechanical equipment value plus 15 percent of labor costs.

Table 1-5. Summary of Costs for Klamath River Surface Water Discharge – E3 Water LLC Treatment Concept (Alterative 1B/2B)

Description	Cost[a] dollars
Capital Costs	
Pond 4A Rehab	4,330,000
Pond 2 and 3 Solids Removal	810,000
Pond 2 and 3 Solar Bees	280,000
Condition Repairs	550,000
Subtotal	**$5,910,000**
Project Phase-Level OPCC Contingency (20 percent)	1,182,000
Engineer's Preliminary Opinion of Probable Costs	**$7,092,000**
Changes and Unforeseen Conditions During Construction (5 percent)	354,6400
Engineering Design, Environmental Planning and Studies, Construction Management, ESDC, and Legal and Admin Costs (25 percent)	1,773,000
Engineer's Preliminary Opinion of Probable Total Capital Cost	**$9,220,400**
E3 Water LLC Cost Estimate	**$60,326,200**
Engineer's Preliminary Opinion of Probable Total Capital Cost	**$69,546,200**
Annual O&M Costs	
Total Existing Annual O&M[b]	**$1,050,000**
Additional Costs	
Energy[c]	820,000
Discount for solar energy generation[d]	-730,000
Labor[e]	580,000
Chemicals	445,000
Materials and Services	1,740,000
Solids Disposal	34,000
Total Additional Annual O&M	**$2,889,000**
Grand Total Annual O&M	**$3,939,000**

(a) December 2021 dollars (12,480 20-City Average ENR).
(b) Estimated costs for continued operation of facilities included in project concept. Based on FY 2020/21 budgeted costs.
(c) Based on an energy cost of $0.085 per kWh.
(d) Solar power assumed to directly offset energy demand at the same rate of 8.5 cents per kWh.
(e) Labor costs assume 3 additional chief plant operator and 4 additional assistant operators.

CHAPTER 2
Service Area Characterization

The South Suburban Sanitary District's (District's) natural and socioeconomic conditions provide the context for the planning of the wastewater treatment program. Information of interest regarding the natural environment includes characteristics of the local topography, geology, soils, climate, and water resources. Important aspects of the socioeconomic environment include local land use, population levels, and growth projections. These characteristics are summarized in this Chapter so the District can effectively evaluate various alternative strategies for long-term management of the community's wastewater.

2.1 STUDY AREA LOCATION

The District's service area is located in south central Oregon's Klamath County (County), just outside the southern city limits of the City. The District is situated approximately 15 miles north of the California border. A vicinity map is included as Figure 2-1. In conjunction with the City, the District represents the largest urban population center in the County.

2.1.1 Service Area

The study area for this Facilities Plan includes land within the District's service area. The service area limits largely correspond to the unincorporated areas within the City's UGB. The boundaries of the District's service area, illustrated on Figure 2-2, are generally defined by the city limits of Klamath Falls to the north, Hogback Mountain to the east, Kingsley Field Airport to the south, and Lake Ewauna to the west.

The District's WWTP is located at the western edge of the service area boundary. The site is confined by Maywood Street on the east, and the Southern Pacific railroad line and Lake Ewauna to the west. The District owns the undeveloped property immediately north and south of the lagoons.

The service area currently encompasses approximately 5,500 acres of land, all of which are within the City's UGB. The service area boundary has the potential to expand in the future as additional land is annexed into the UGB. In 2010, construction of a force main and pump station was completed connecting the Henley Schools to the District's service area. In 2021, the District also completed construction of a pressurized system to serve the Skyline neighborhood.

2.1.2 Topography

The dominant topographic feature in this part of the County is Upper Klamath Lake, as illustrated on Figure 2-1. With a surface area of 140 square miles, Upper Klamath Lake is the largest lake wholly within Oregon. The lake is located in a large, flat valley with the Cascade Range to the west and fault-block mountains of the Basin and Range Province to the east. Upper Klamath Lake is drained at its southern end by the Link River, which flows southerly through a short reach and enters Lake Ewauna. The much smaller Lake Ewauna discharges into the Klamath River, which flows to the Pacific Ocean through Northern California. The District's service area is in the flat bottomlands of the valley south of Upper Klamath Lake, next to Lake Ewauna and the Klamath River.

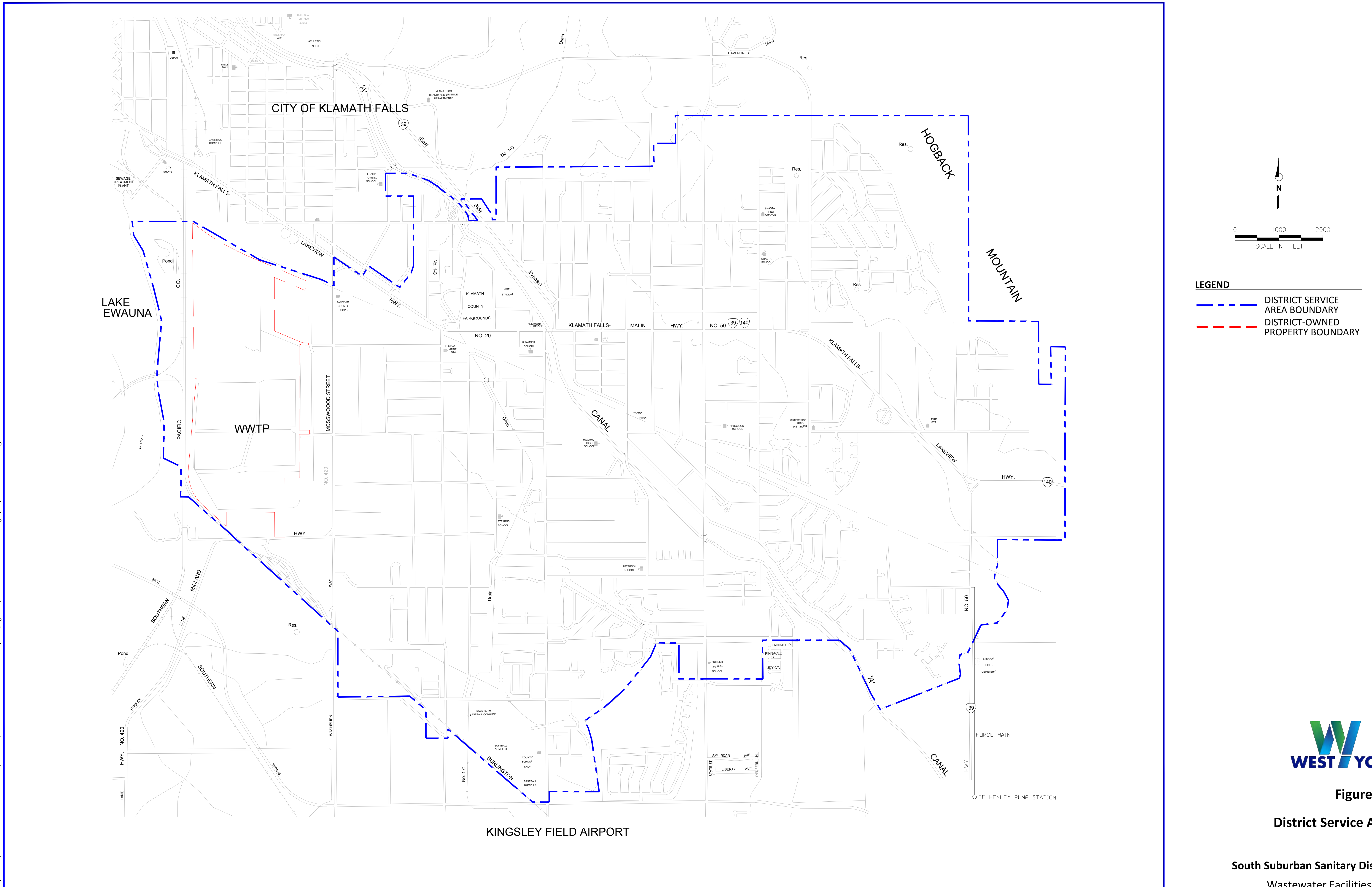
Located between the Cascade Range and the western fringe of the Basin and Range physiographic province, the surrounding region is characterized by strong relief, with many inactive volcanoes, rims, scarps, buttes, and fault-block mountains. Elevations range from about 4,100 feet above mean sea level (amsl) at Upper Klamath Lake and Lake Ewauna to more than 9,000 feet amsl in the Cascade Range. Elevations within the District's service area range between approximately 4,100 and 4,600 feet amsl. Extensive, broad, flat, poorly drained uplands, valleys, and marshlands are located throughout the area.

Figure 2-1

Vicinity Map

WEST YOST

South Suburban Sanitary District
Wastewater Facilities Plan



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WEST YOST

Figure 2-2

District Service Area

South Suburban Sanitary District

Wastewater Facilities Plan

2.1.3 Flood Hazard

Historically, WWTP site has historically been designated with a flood classification of Zone C (currently referred to as Zone X), which represents areas with a minimal flood hazard and above the 500-year flood level. FEMA has completed the engineering analysis and modeling to map floodplains for the purpose of updating the flood maps and April 30, 2020, FEMA provided preliminary maps for Klamath County, Oregon. As part of this update, areas impacted by the non-levee embankments were designated as flood hazard areas. With this update, the WWTP ponds remain in Zone C, but the District-owned property north of the WWTP was updated to a rating of Zone AE, which is the 100-year flood level. The flood elevation in this area is 4,090 (NAVD 88) or approximately 4,086 amsl.

2.2 ENVIRONMENTAL RESOURCES

This section presents a brief overview of these environmental characteristics as they relate to the analysis presented in this Facilities Plan. The District's WWTP discharges to the Klamath River, which is the key environmental factor affected by the Project. The geology and soils of a region can have a significant effect on the design and construction of wastewater collection and treatment systems. Climatic characteristics such as precipitation, temperature, wind, and relative humidity influence the amount of wastewater flow, pond evaporation, and freezing conditions.

2.2.1 Klamath River

Three counties in south central Oregon and five counties in northern California are drained by the Klamath River, which has experienced serious water quality problems. The Oregon DEQ has prepared Total Maximum Daily Load (TMDL) allocations for temperature, nutrients and organic materials for the Klamath River.

Figure 2-3 shows the configuration of the WWTP discharge facilities to Lake Ewauna. Effluent from the District's Chlorine Contact Chamber is discharged into a storm drain channel which merges with other storm drain channels under the jurisdiction of the City and County. The combined drainage flows, along with the treated effluent, are pumped from the Effluent Pump Station to a wetland on the west side of the railroad tracks adjacent to the WWTP western boundary. From the wetland, the water flows northerly before entering Lake Ewauna.

The most significant issue for the continued discharge to Lake Ewauna is the impact to the near field water quality of the lake. Lake Ewauna is a naturally formed lake in the Klamath River but is now undistinguishable from the Keno Reservoir. Water quality in the lake is poor, and low levels of dissolved oxygen have been reported in the lake. The Shortnose Sucker is resident in the lake and has been listed as an endangered species. The U.S. Fish & Wildlife Service has published the "Revised Recovery Plan for the Lost River Sucker and The Shortnose Sucker" (U.S. Fish & Wildlife Service, April 2013).

Figure 2-3

Discharge to Lake Ewauna

Sotuh Suburban Sanitary District
Wastewater Facilities Plan

2.2.2 Wetlands

The existing discharge is into the wetlands located on the west side of the railroad tracks adjacent to the treatment ponds, as shown in Figure 2-3. In addition, the District-owned property north of the plant includes areas that have been designated as wetland. The District completed a wetland delineation for this northern parcel in 2021. In September 2022, the US Army Corps of Engineers provided a jurisdictional determination based on the delineation study. A copy of the US Army Corps of Engineers determination and the Wetland Delineation Report are included in Appendix A.

2.2.3 Water Quality

As detailed in Chapter 4, the Klamath River near the WWTP's outfall at River Mile 250 is listed as water quality limited for pH, ammonia, dissolved oxygen, Chlorophyll a, and harmful algal blooms. Table 2-1 contains general water quality parameters from January 1, 2010, through December 31, 2018, at the Link River DEQ site 10768.

Table 2-1. Water Quality Parameters for the Klamath River Upstream of the District's WWTP

WQ Parameter	Units	Average[(a)]	Maximum	Notes
Alkalinity (as CaCO3)	mg/L	49.5	57	
Ammonia (as N)	mg/L	0.2	0.9	Four samples below detection limit
BOD	mg/L	3.1	> 9.6	Seven samples above detection limit
Chlorophyll a	µg/L	81	81	
Conductivity	µmho/cm	120	148	
Dissolved Oxygen	mg/L	9.5	12.2	
E. Coli	MPN/100 mL	9.7	66	Two non-detect
Nitrate + Nitrite (as N)	mg/L	0.2	0.5	
Organic Carbon	mg/L	6.8	21	
Orthophosphate (as P)	mg/L	0.0	0.2	
Phosphate (as P)	mg/L	0.1	0.4	
pH	--	8.4	10	
Temperature	°C	12	25	
Total Solids	mg/L	143.5	189	
Total Suspended Solids	mg/L	19.5	69	
Turbidity	NTU	22	52	

> = greater than
BOD = Biochemical Oxygen Demand
mg/L = milligrams per liter
µg/L = micrograms per liter
µmhos/cm = micromhos per centimeter
MPN/100 mL = Most Probable Number per 100 milliliter
°C = degrees Celsius
NTU = Nephelometric Turbidity Unit
(a) Data below the detection limits were not included in the calculation of the average.

2.2.4 Geology and Soils

The valley containing Upper Klamath Lake and the District's service area is a fault trough or graben valley, formed by the uplifting of scarps and subsidence between these scarps and the Cascade Range. Known as the Klamath graben, the valley extends north toward Crater Lake in the Cascade Range and is bounded by high, steep escarpments, especially along the eastern rim. Rocks in the area are predominantly of volcanic origin, consisting of unconsolidated and consolidated volcanic materials or unconsolidated sediments derived from volcanic rocks. The region was heavily glaciated during the Pleistocene and glacial runoff flowed into the valleys. During this time, a large pluvial lake (Lake Modoc) covered much of the valley floor. At its maximum extent, Lake Modoc covered 1,100 square miles and extended about 75 miles from Fort Klamath in the north to beyond Tule Lake, California in the south.

The valley floor consists of a variety of sediments deposited by different geological processes. Sedimentary deposits include lacustrine diatomaceous clays and silts; alluvial floodplain deposits of volcanic ash rich clays, silts, and sands; and deposits of peat and other organic materials from marshlands. Large deposits of ash and pumice are derived from volcanic eruptions in the region and are often layered within the other sedimentary materials. The thickness of these sediments reaches hundreds of feet in some areas. The Soil Survey of Klamath County indicates that the majority of the soils in the area are moderately to very deep, poorly to well drained soils derived from alluvial and lacustrine sediment. There are also areas of shallow soils derived from tuff and basalt.

2.2.5 Climate

The semiarid climate in the vicinity of the Upper Klamath Basin is characterized by hot, dry summers and moderately wet winters with moderate to low temperatures. Precipitation is highly variable throughout the area due to the diverse topography and a rain shadow created by the Cascade Range. A summary of important climatic data for the District's service area is provided in Table 2-2. As shown, mean annual precipitation from 1971 to 2018 in southwest Klamath Falls was 12.9 inches.

Table 2-2. Climatic Summary for Klamath Falls, 1971-2018[a]						
	Temperature, degrees Fahrenheit			Precipitation, inches		
Month	Maximum	Mean	Minimum	Mean	24-Hour Maximum[b]	Evaporation, inches[c]
Jan	40.2	31.1	21.8	1.7	2.4	0.70
Feb	45.7	35.5	25.1	1.3	1.7	1.31
Mar	51.6	39.9	28.2	1.4	1.6	2.81
Apr	58.5	44.9	31.2	0.9	1.15	4.73
May	67.6	53.0	38.3	1.1	1.05	7.21
Jun	76.5	60.6	44.6	0.7	1.45	8.79
Jul	85.9	68.5	51.1	0.3	1.37	10.24
Aug	84.7	66.9	49.1	0.4	2.01	9.41
Sep	76.7	59.5	42.1	0.4	2.34	6.30
Oct	64.0	48.9	33.7	1.0	1.75	4.37
Nov	47.8	37.5	27.0	1.8	1.68	0.00
Dec	38.5	29.8	21.0	1.9	2.58	0.67
Annual	**85.9**	**48.0**	**21.0**	**12.9**	**2.58**	**56.54**

(a) Continuous, historical weather data not available from a single weather station. Historical data provided is a composite of several weather stations in the Klamath Falls area. Monthly means and extremes as reported by the Western Regional Climate Center from 1971 – 2000 and combined with recent data from 2002 – 2018 from the Oregon Climate Service.

(b) 24-hour Precipitation maximum reported from 1887-2008 from the Oregon Climate Service.

(c) Evaporation reported from 1949-2004 from the Western Regional Climate Center.

Annual precipitation between 1887 and 2018 ranged from a low of 7.36 inches in 1959 to a high of 21.09 inches in 1948. Nearly three quarters of the annual precipitation occurs during the 6-month period from October through March. Snowfall averages about 40 inches per year and tends to represent 30 percent of the annual precipitation in the region's valleys. The mean maximum temperature during July was 85.9 degrees and the mean minimum temperature during December was 21.0 degrees. The variation in monthly average precipitation over the course of the year is illustrated on Figure 2-4. The historical variation in annual precipitation is shown on Figure 2-5.

The information provided herein only accounts for rainfall data collected through 2018. However, the U.S. Drought Monitor has identified the Klamath Basin as currently experiencing "extreme drought" conditions, while the rest of Oregon is experiencing some level of drought or abnormal dryness. As a result, Upper Klamath Lake is at the lowest level it's been in decades and water curtailments are severely impacting local water users. Like the rest of the west, climate change models predict that the conditions and rainfall patterns of recent years are likely to persist in the future.

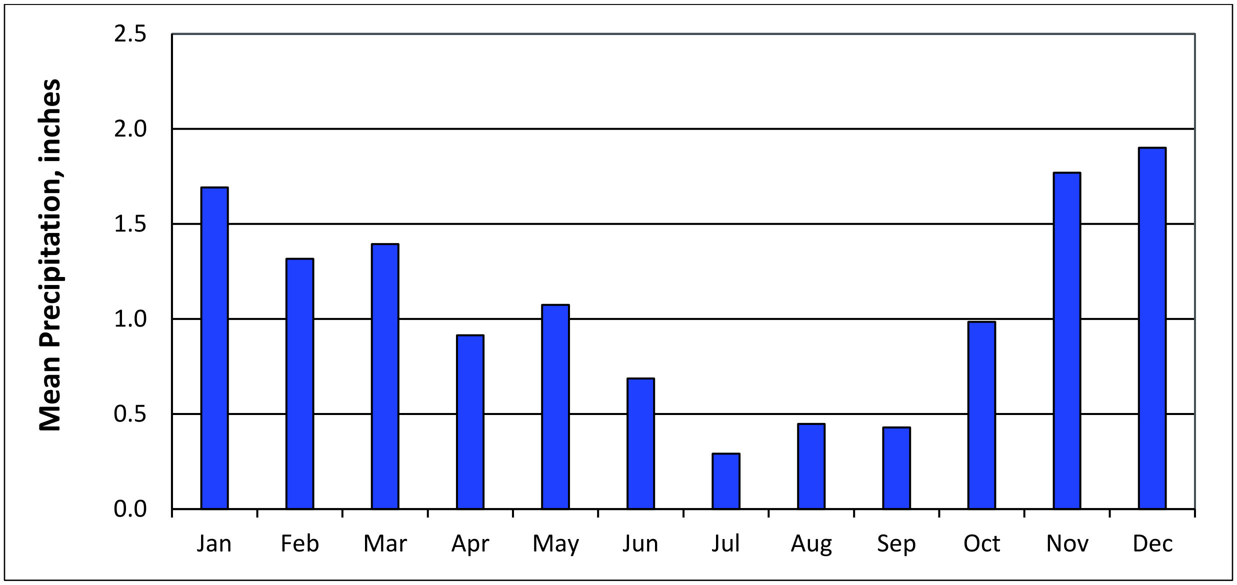
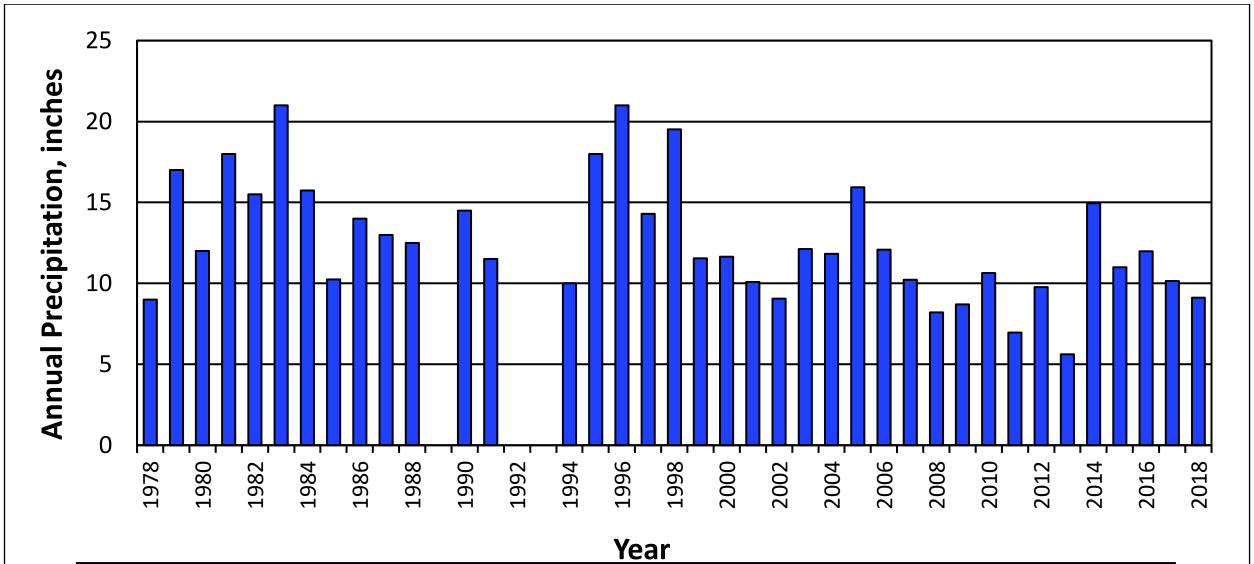


Figure 2-4. Mean Monthly Precipitation



Notes:

1. Continuous historical weather data not available from a single weather station. Historical data provided is a composite of several weather stations in the Klamath Falls area.
2. Incomplete data for years 1989, 1992, and 1993.

Figure 2-5. Historical Annual Precipitation

2.3 POPULATION

To a large extent, population growth and land use patterns within the District's service area will determine future flows and loads to the WWTP. The current population and projected population growth within the service area are key parameters in projecting future wastewater flows and loads. These projections are used to assess the adequacy of existing infrastructure and develop design criteria for future treatment and reuse systems.

2.3.1 Population Projections

In 2020, the County Planning Department published a population background update as part of the Comprehensive Plan and Land Development Code Update. The 2020 census for the County determined that the total population of the County was 69,413 people. The majority of the County's population resides in the City and nearby unincorporated areas. The City, which accounts for approximately 31 percent of the total County population, had a population of 21,813 in 2020 based on the census. The 2020 population served by the District service area is estimated by the District to be 23,000 based on the number of registered voters in the District. This equates to an average of 3.4 residents per residential sewer service account.

The County and cities within it have decided that a moderate growth scenario is the most reasonable forecast given economic realities. The population forecast adopted by the Board of County Commissioners in June of 2009 estimates a growth rate for the County as a whole at 0.59 percent per year and was based on data from the Population Research Center (PRC) at Portland State University. This is significantly smaller than past growth estimates of 1.7 percent. The more recent 2018 PRC forecast suggests even more modest growth of the Klamath Falls UGB, with a 2018 to 2035 rate of 0.185 percent and a 2020 to 2045 rate of 0.98 percent. Figure 2-6 illustrates the population growth anticipated by the PRC through 2045. As shown, the service population is anticipated to grow to 23,500.

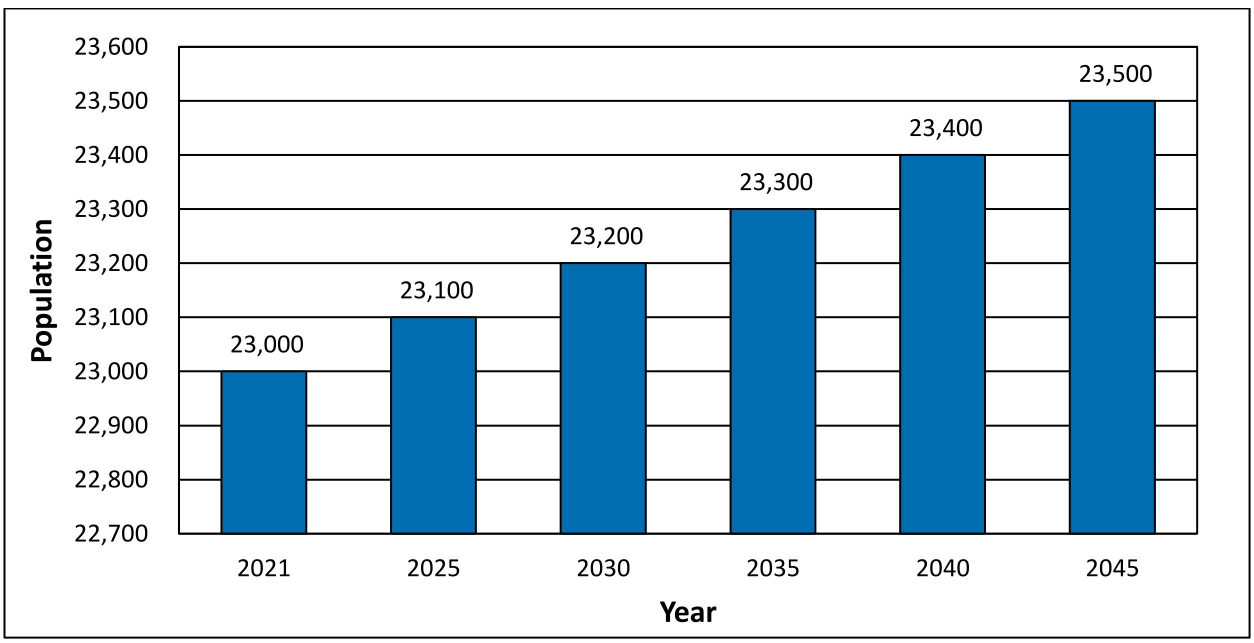


Figure 2-6. Projected Population Growth

2.3.2 Land Use

Land use in the District is dominated by residential and commercial developments. Although the County and City planning departments do not maintain a database of land acreage by zoning designation, a review of the customer account designations for the District is indicative of the land use situation in the service area. Table 2-3 identifies the number of customer accounts for each type of service category as reported by the District on October 21, 2021.

Table 2-3. Customer Account Distribution by Service Category

Service Category	Number
Single Family Residential	6,540
Apartment Units	217
Commercial[a]	553

(a) Includes motels and recreational vehicles (RVs).

2.3.3 Intergovernmental Urban Service Agreement

In 2003, the County, City, and District entered into an intergovernmental urban services agreement for sanitary services provided within the City's UGB. The agreement stipulates the rights and responsibilities of each of the government entities in providing sanitary services.

In this agreement, the areas within the City limits, including future areas annexed into the City limits not currently served by the District are to be served by City sanitary services. Furthermore, the agreement stipulates that the District will not extend sanitary sewer service into the City limits without the express consent of the City. The District's service area shall continue to include lands within the UGB and may expand inside or outside the boundary within the then-existing rules and at the discretion of the District.

The City and District are committed to sharing information, assisting each other in the development of regional facility plans, addressing U.S. Environmental Protection Agency (EPA) and DEQ standards, and combining activities or facilities where feasible.

2.4 WASTEWATER CHARACTERISTICS

The District regularly monitors wastewater influent and effluent parameters and reports these data to the DEQ on a monthly basis as required by their NPDES permit. This section summarizes data from the Discharge Monitoring Reports (DMRs) and analyzes recent data to estimate the flows and loads under current conditions. Current flow and load estimates are used along with the population projections presented in Figure 2-6 to develop flow and load projections for future conditions. The flow and load projections serve as the basis for assessing the adequacy of existing treatment systems and sizing new treatment facilities.

2.4.1 Current Wastewater Flows

Analysis of historical influent flow data forms the basis for developing wastewater flow projections. To estimate current flows, District DMRs from January 2009 through December 2021 were evaluated. Because wastewater flows are typically quite variable, several different flow conditions are important in sizing and evaluating wastewater treatment plants. This section defines the flows of interest and develops a characterization of these flows under current conditions to provide the basis for developing flow projections.

2.4.1.1 Definitions

The flow rates and parameters discussed in this chapter are defined below:

- The average base flow (ABF) is the average flow of the plant during the lowest flow months when rainfall has minimal effect on influent flows.
- The average dry weather flow (ADWF) is the average flow at the plant during the dry weather season, typically May through October. ADWF is used by the DEQ for calculating mass discharge limits for biochemical oxygen demand (BOD) and total suspended solids (TSS) for the dry weather season. ADWF is typically used to rate the capacity of wastewater treatment plants.
- The average wet weather flow (AWWF) is the average flow at the plant during the wet weather season (November through April) during a year with average precipitation.
- The maximum month dry weather flow (MMDWF) is defined as the average monthly flow that would be expected to occur when precipitation is at the 1-in-10-year probability level for the wettest month of the dry weather season. The month of May or October is typically used for this measure.
- The maximum month wet weather flow (MMWWF) is defined as the average daily flow during a 30-day period when precipitation quantities are at the 1-in-5-year probability level during the wet season. MMWWF typically occurs during January through April, when groundwater levels are high due to November and December precipitation.
- The peak weekly flow (PWF) is defined as the largest average flow rate expected to occur over a 7-day period.
- The peak day flow (PDF) is the flow rate that corresponds to a 24-hour storm event with a 1-in-5-year recurrence interval that occurs during a period of high groundwater and saturated soils.
- The peak wet weather flow (PWWF) is expected to occur during the peak day flow. The PWWF is the highest flow at the plant sustained for one hour. The PWWF dictates the hydraulic capacity of the treatment system. This flow is also referred to as the peak instantaneous or peak hour flow.
- Infiltration and inflow (I&I) refers to water that enters sewer lines due to deterioration or drainage connections. Infiltration is groundwater that enters the system from the surrounding soil through defective pipes, joints, or manholes. Inflow is stormwater that directly enters the system from sources such as drainage connections, flooded manhole covers, and sewer defects that respond quickly to saturated ground conditions.

2.4.1.2 Flow Records and Measurement

When analyzing the flow monitoring records, it is important to identify any limitations or inconsistencies in the data or flow measurement equipment. For the District, the following factors must be considered when reviewing historical flow records:

- A new influent pump station and headworks with flow measurement was installed in 2001 and calibrated in 2003.
- A pipe break underneath an irrigation canal was repaired in 2006, resulting in reduced influent flows.
- A significant percentage of the precipitation in the region comes in the form of snow. As a result, there can be a delay between the precipitation event and the corresponding I&I influenced plant flow. Additionally, peak flow events in the late winter and spring often correspond to periods of snow melt.

Figure 2-7 illustrates the average monthly plant influent flow from January 2007 to December 2021. As expected, wastewater flows were somewhat higher during the wet weather seasons. Precipitation can raise the groundwater table, and inflow through system defects increases infiltration. Relative to other municipal wastewater systems in Oregon, the District's wet weather season flow increases are modest.

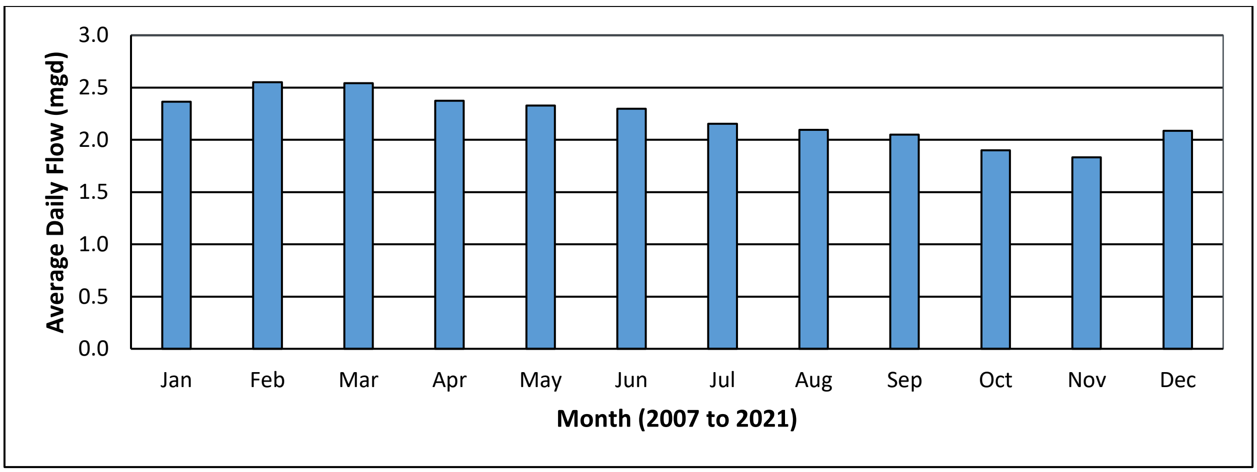


Figure 2-7. Average Monthly Plant Influent Flows (2007 to 2021)

2.4.1.3 Precipitation Records

Since precipitation can affect wastewater treatment plant flow rates, DEQ flow projection guidelines recommend that precipitation be included in statistical analyses of WWTP flows. The Western Regional Climate Center (WRCC) has compiled precipitation data from the Klamath Falls Weather Station and provides a summary of the data from 1887-2001. These data, provided in Table 2-4, demonstrates the typical seasonal distribution of precipitation.

Table 2-4. Statistical Summary for the Klamath Falls Meteorological Station, 1887-2001					
Month	Average Precipitation, inches	Greatest Monthly Precipitation, inches	Greatest Daily Precipitation, inches	1-in-5 Year Monthly Precipitation, inches[(a)]	1-in-10-year Monthly Precipitation, inches[(a)]
January	1.99	5.90	2.4	3.06	4.02
February	1.39	4.66	1.7	2.14	2.80
March	1.27	3.62	1.6	2.24	2.85
April	0.81	2.62	1.15	1.43	1.90
May	0.98	4.83	1.05	1.75	2.46
June	0.77	4.01	1.45	1.08	1.49
July	0.29	2.41	1.37	0.61	0.98
August	0.40	2.93	2.01	0.87	1.44
September	0.55	2.74	2.34	0.97	1.33
October	1.03	4.55	1.75	1.40	1.98
November	1.83	7.94	1.68	2.97	3.92
December	2.10	8.93	2.58	3.10	4.14

(a) 1-in-5-year and 1-in-10-year statistical analysis compiled from 1971-2000 weather data.

2.4.1.4 Average Base Flow (ABF)

The ABF is the average daily flow when precipitation and high groundwater has the least amount of influence on influent flows to the treatment facility. For the District, the lowest flow months on average are September through November; the average of these months serve as the basis for the ABF. Though there is a moderate amount of precipitation in the months of October and November, increased influent flows are not observed until December. Influent flows are more likely to be influenced by elevated groundwater, rather than direct rainfall. An analysis of the District's I&I is further discussed in Chapter 3.

The determined ABF value of 1.9 million gallons per day (mgd) provides the basis for establishing per capita flows and peaking factors.

2.4.1.5 Average Dry Weather Flow (ADWF) and Average Wet Weather Flow (AWWF)

The ADWF is the average flow during the dry weather months of May through October, as defined by the DEQ. Since little precipitation occurs during these months, rain dependent I&I sources do not significantly affect ADWF. The determined ADWF of 2.1 mgd was calculated for each year in the range of 2009 to 2021 based on the arithmetic means of the flows from May 1 to October 31.

The AWWF is the average flow during the wet weather months of November through April during a year with average precipitation. The long-term-average November through April precipitation is 9.39 inches. The AWWF was calculated for each year in the range of 2009 to 2021 based on the arithmetic means of the flows from November 1 to April 30 and was determined to be 2.3 mgd. Chapter 3 includes an evaluation of existing I&I flows in the District's jurisdiction with discussions on wet weather flow phenomena.

2.4.1.6 Maximum Month Dry Weather and Wet Weather Flow (MMDWF and MMWWF)

The MMDWF is defined by DEQ as the flow that would be expected to occur when precipitation is at the 1-in-10-year probability level for the wettest month of the dry weather season. October is the wettest dry weather month for the area, but the average May precipitation was used for this analysis because ground saturation levels are higher in the spring. At the SSW Klamath Falls meteorological station, the 1-in-10-year May precipitation is 2.46 inches (Table 2-4). The DEQ guidelines suggest calculating the MMDWF, by developing a relationship between the monthly average flows for January through May with the total precipitation for each month. Similarly, the MMWWF should correspond to the 1-in-5-year January precipitation total of 3.06 inches.

The 2009-2018 data, shown on Figure 2-8, does not form a linear relationship with wastewater flows. The DEQ methodology for estimating MMDWF, MMWWF, and PDF was developed based on wastewater flow rate and rainfall relationships witnessed in the wet and mild regions of Western Oregon. In Western Oregon, there is a widespread pattern of relatively high wastewater flow rate sensitivity to precipitation events. This general pattern does not hold true to the same extent for the District. The predictable wastewater flow rate versus precipitation relationship is not reliable due to differences in the climatic setting, such as lower overall precipitation volumes, less frequent soil saturation, higher frequencies of precipitation in the form of snow, snow melt and more common and longer duration freezing conditions. Furthermore, DEQ guidance documents indicate a minimum precipitation of 20 to 25 inches annually for their methodology to be correctly applied. This range is substantially larger than the District's annual average of 12.9 inches. Evaluating several years of flow and precipitation data, as shown on Figure 2-9, indicate that daily flow rates in the District system are relatively insensitive to fluctuations in precipitation.

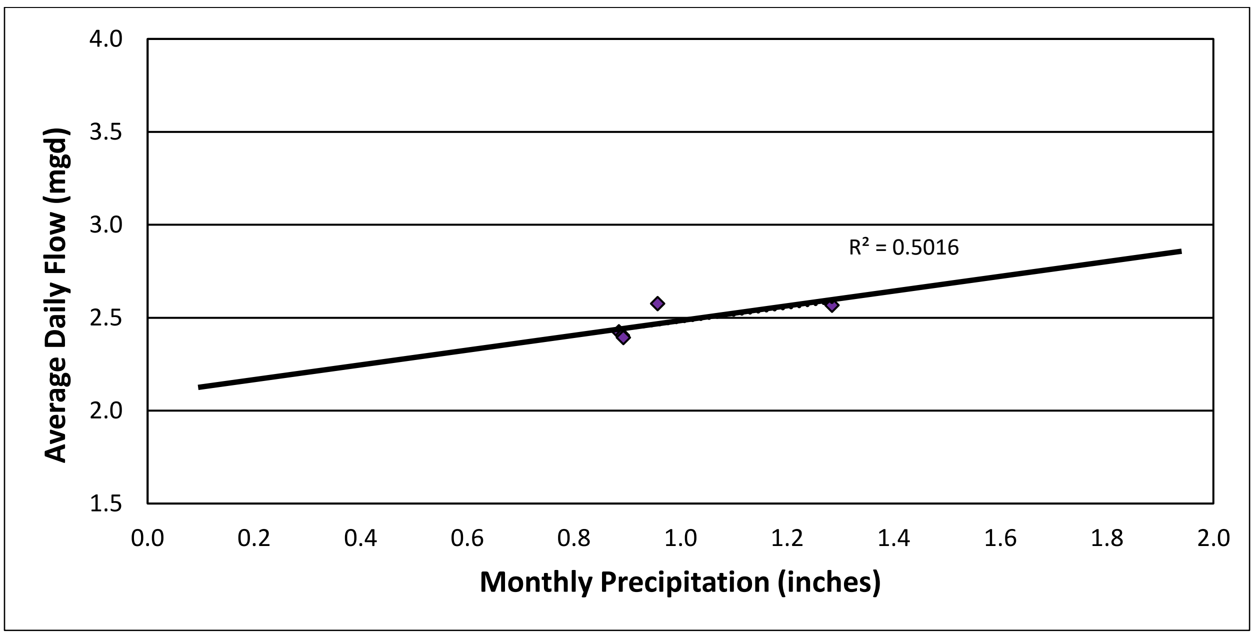


Figure 2-8. Maximum Month Flows (DEQ Methodology)

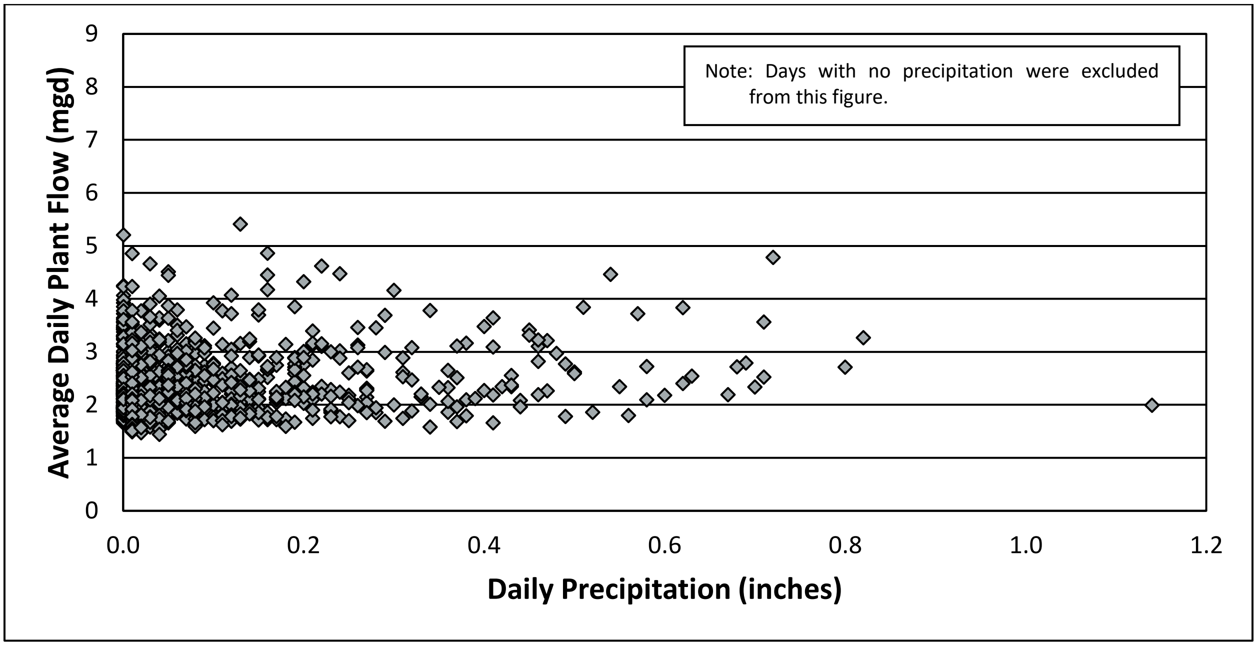


Figure 2-9. Daily Plant Flow vs Precipitation from 2009-2018

Because the available flow data does not appear to be linearly related to the precipitation, direct analysis of monthly average wastewater flows was employed. Direct analysis of wet season data shows that in February of 2017, the District experienced average flows of 4.0 mgd. Based on these data, the MMWWF is estimated to be 4.0 mgd.

Direct analysis of dry season data shows that in May of 2011, the District experienced average flows of 2.9 mgd. Based on these data, the MMDWF is estimated to be 3.0 mgd.

2.4.1.7 Peak Weekly Flow

The PWF was determined by identifying the maximum running seven-day average influent flow from 2009 through 2021. This PWF is 4.7 mgd, which occurred on both February 12 and 13, 2017.

2.4.1.8 Peak Day Flow

The PDF is defined by DEQ as the daily average plant flow rate that occurs during the 1-in-5 year, 24-hour storm event. For the Klamath Falls area, this corresponds to 2.0 inches of precipitation in a 24-hour period. As with the DEQ suggested MMWWF analysis, this approach utilizes a linear correlation between flows and precipitation that significantly underestimates the PDF.

In this case, an analysis of historical flow rates is preferable since it is independent of precipitation conditions. Additionally, Figure 2-9 demonstrates that the District's system does not exhibit a linear correlation between precipitation and influent flows.

To conduct this flow analysis, the daily plant flows were sorted according to magnitude and assigned a recurrence probability. The resulting curve is illustrated on Figure 2-10.

The peak day flow recorded was approximately 5.5 mgd. Based on historical data, the PDF has a 0.023 percent chance of occurring.

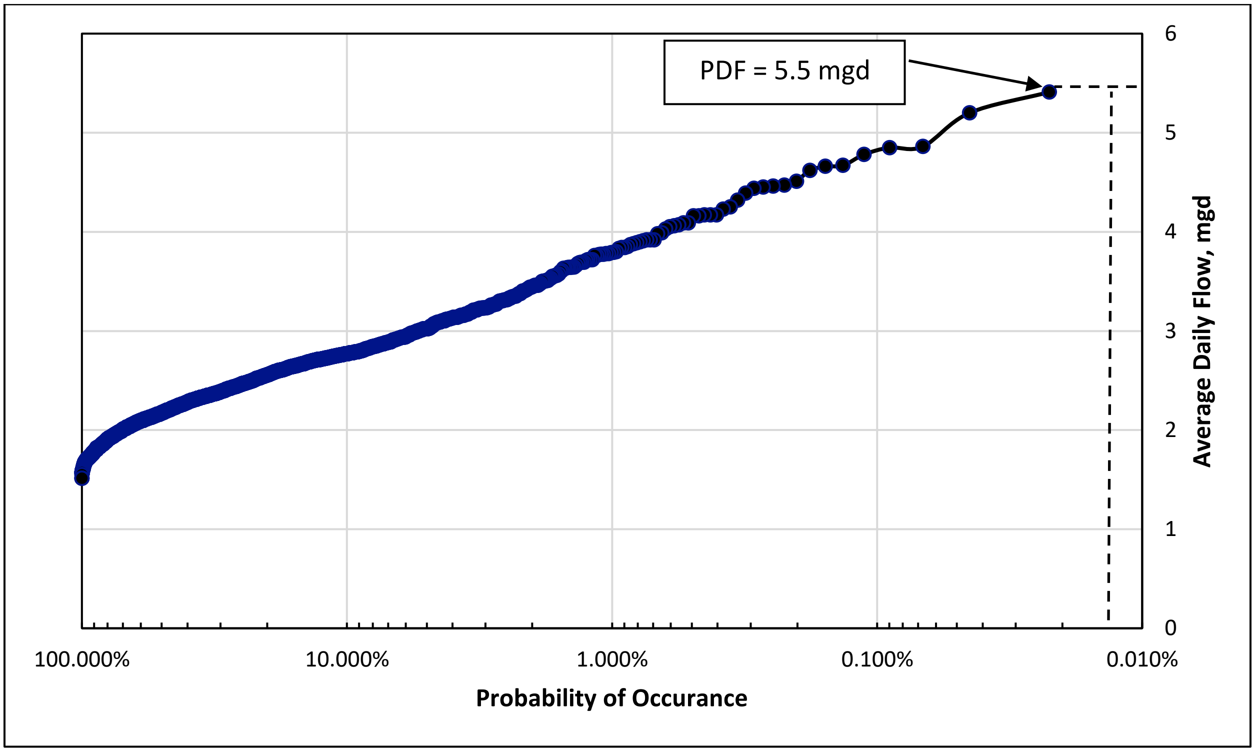


Figure 2-10. Probability of Occurrence Analysis for PDF

2.4.1.9 Peak Wet Weather Flow (PWWF)

The PWWF is determined based on other flows (Average annual flow, MMWWF, PDF and PWF) that have been defined above. These four flows are plotted along with the respective probability of exceedance for each flow (0.27, 1.9 8.3, and 50 and percent) on a log-probability graph per DEQ guidance, and a logarithmic line is fit to the data. Based in this procedure, the existing PWWF would be 7.7 mgd.

However, direct data from the district shows a peak influent flow of 6.3 mgd, which occurred on February 9, 2017. The DEQ methodology that gives a value of 7.7 mgd assumes substantial influence of precipitation on influent flows. As discussed above and evidenced by Figure 2-9, this assumption is not representative of the District's collection system. Adding a small safety factor to the observed 6.3 mgd, the PWWF is assumed to be 6.5 mgd.

2.4.1.10 Summary of Current Flows

Table 2-5 summarizes all the current wastewater flows derived from the analysis detailed above.

Table 2-5. Current Wastewater Flows		
Statistic	Flow Rate, mgd	Peaking Factor[(a)]
ABF	1.9	-
ADWF	2.1	1.0
AWWF	2.3	1.1
MMDWF	3.0	1.4
MMWWF	4.0	1.9
PWF	4.7	2.2
PDF	5.5	2.6
PWWF	6.5	3.1

(a) Peaking factor relative to dry weather flow.

Based on the current estimated service area population of 23,000, the unit ABF of 83 gcd. This value is consistent with typical textbook values, which range from 70 to 120 gcd (*Wastewater Engineering,* Metcalf and Eddy, 4th Edition, 2003).

2.4.2 Current Wastewater BOD and TSS Loads

Analysis of historical influent load data forms the basis for developing wastewater loads projections. BOD and TSS are indicators of the organic loading on a wastewater treatment facility. BOD is a measure of the amount of oxygen required to biologically oxidize the organic material in the wastewater over a specific time period. A 5-day BOD test is conventionally used for wastewater testing. TSS is a measure of the particulate material suspended in the wastewater. The BOD and TSS loading on a WWTP influence the following:

- *Treatment process sizing:* The size of biological treatment units, such as aeration basins and lagoons, is approximately proportional to a plant's organic loading. (Basin sizing is also impacted by nitrogen and phosphorus loading, which is discussed later in this Chapter.)
- *Aeration system sizing:* Treating higher BOD loads requires larger blowers and more aeration diffusers. (Higher nitrogen loading also impacts aeration system sizing.)
- *Biosolids production:* BOD and TSS removed by the plant are converted into biosolids. Higher BOD and TSS loads result in increased biosolids quantities.

To estimate current loads, District DMRs from January 2009 through December 2021 were evaluated. Like flows, several different load conditions are important in sizing and evaluating wastewater treatment plants. This section presents the BOD and TSS concentration data and develops a characterization of the influent BOD and TSS loads under current conditions of interest to provide the basis for developing load projections.

2.4.2.1 BOD and TSS Concentrations

The WWTP recorded influent BOD and TSS test results for three consecutive days, every five days. As such, the data analyzed has five day breaks in-between data sets of three daily values each for BOD and TSS. The recorded influent BOD and TSS concentrations for the period January 2007 to December 2021 are plotted on Figure 2-11 and Figure 2-12, respectively.

As illustrated on Figure 2-11 and Figure 2-12, there is significant seasonal variation in measured BOD and TSS concentrations. As flows increase during the winter months, BOD concentrations decrease as is clear in the wave pattern shown on Figure 2-11. TSS is not as sensitive to seasonal variations; however, a slight decrease in TSS concentrations is evident during the early spring months. In both cases, the seasonal variation is due to increased I&I during the wet season diluting the wastewater strength.

Typical influent concentrations of BOD and TSS range from 200 to 300 mg/L. Figure 2-11 and Figure 2-12 demonstrate that most of the data fall within that band through 2015 (with the exception of periods of high I&I as discussed above). However, starting in 2016 significant variability in influent BOD and TSS data is observed. Because there has not been a significant shift in the service area characteristics over this period, it is suspected that there was a change in sampling practices that has resulted in some samples reporting higher concentrations. This is a typical issue at wastewater plants, where samples collected too close to the bottom of the sampling wet well will selectively include a higher concentration of solids (and thus TSS and BOD) than what are present in the overall wastewater. To avoid a misrepresentation of the actual influent loads to the WWTP, the data used for this analysis is filtered to remove BOD and TSS concentrations above 700 mg/L. The data shown on Figure 2-11 and Figure 2-12 represents this filtered data set.

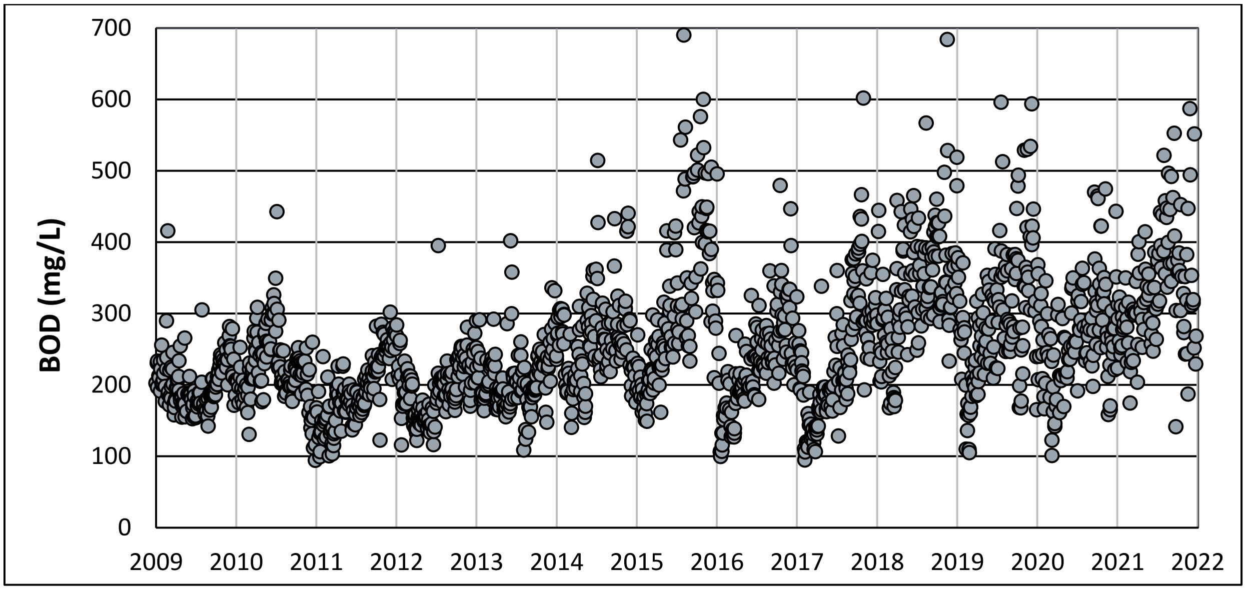


Figure 2-11 Influent BOD Concentrations (January 2009 – December 2021)

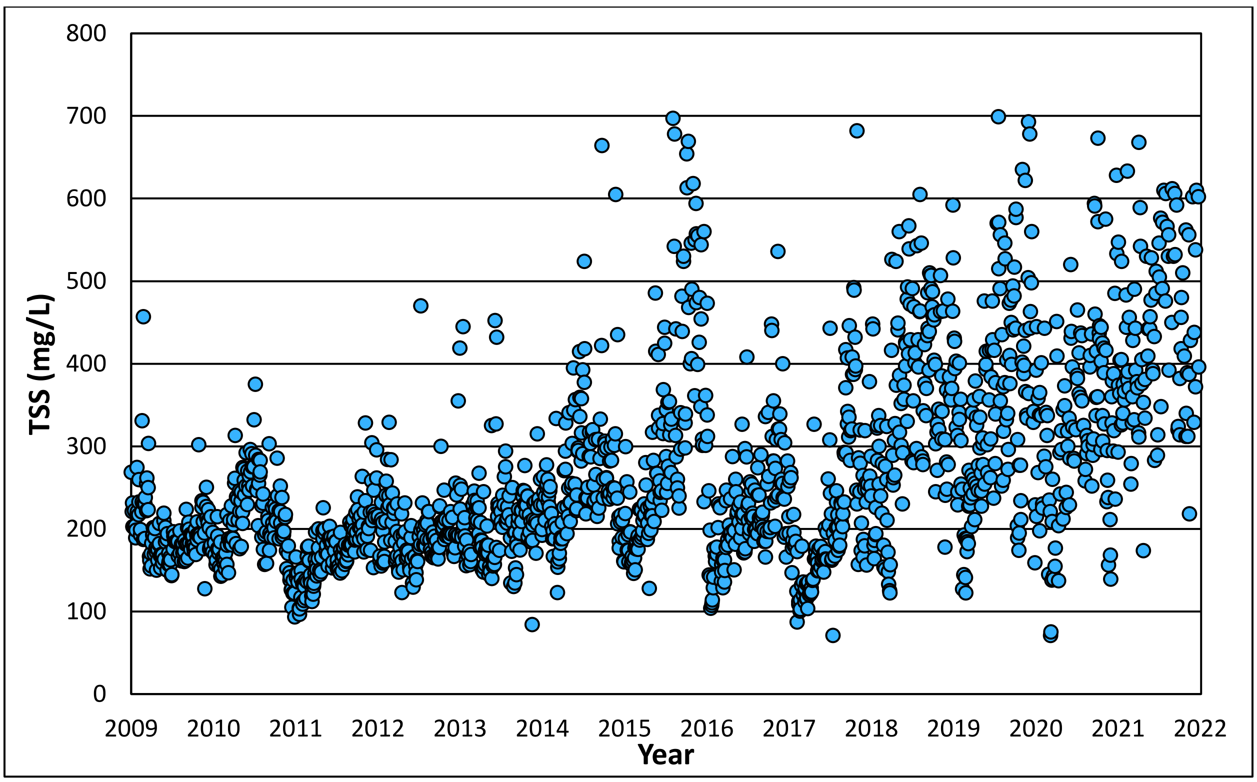


Figure 2-12 Influent TSS Concentrations (January 2009 – December 2021)

2.4.2.2 BOD and TSS Loads

Figure 2-13 depicts measured daily plant influent BOD loads for January 2009 through December 2021. The typical daily load ranges between 4,000 and 6,000 pounds per day and the highest daily BOD load recorded was about 11,100 ppd.

Figure 2-14 shows daily plant influent TSS loadings for January 2009 through December 2021. The typical daily TSS load ranges between 4,000 and 8,000 pounds per day and the highest daily TSS load recorded was about 13,000 ppd.

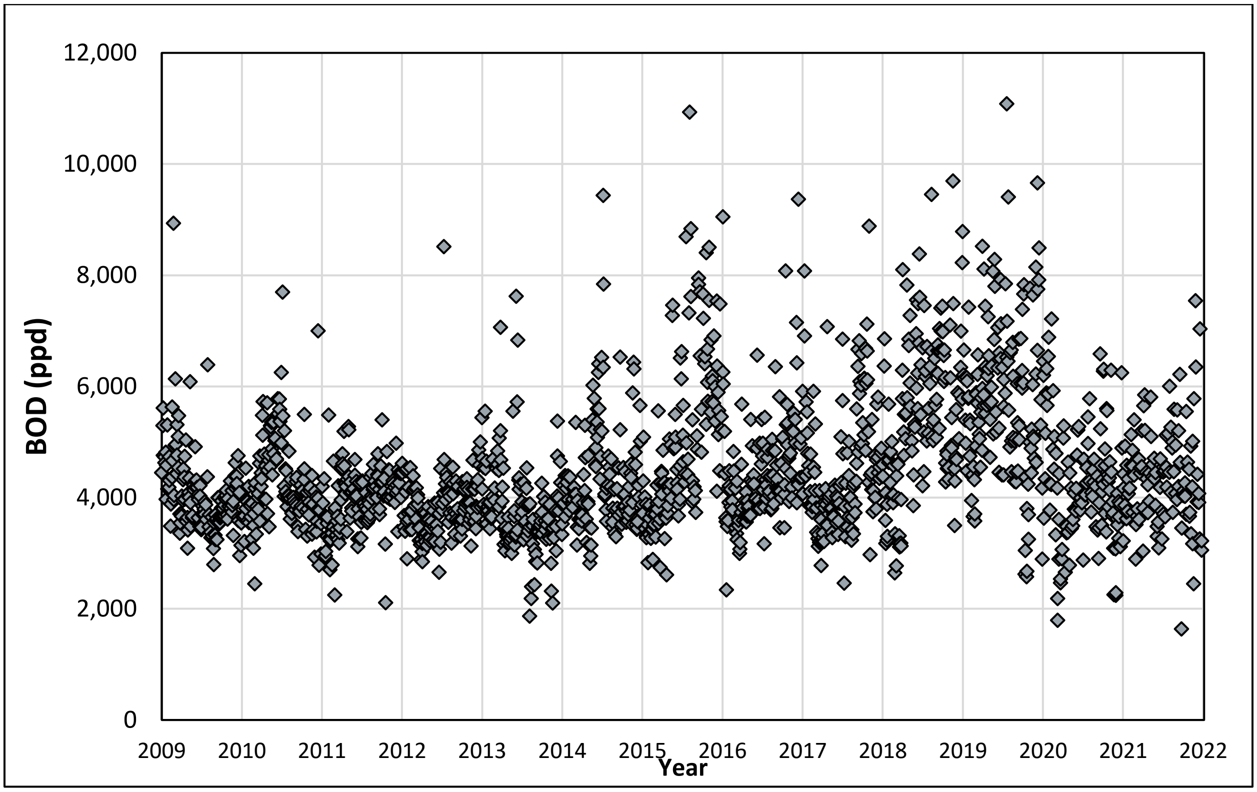


Figure 2-13. Daily Plant Influent BOD Loading (January 2009 to December 2021)

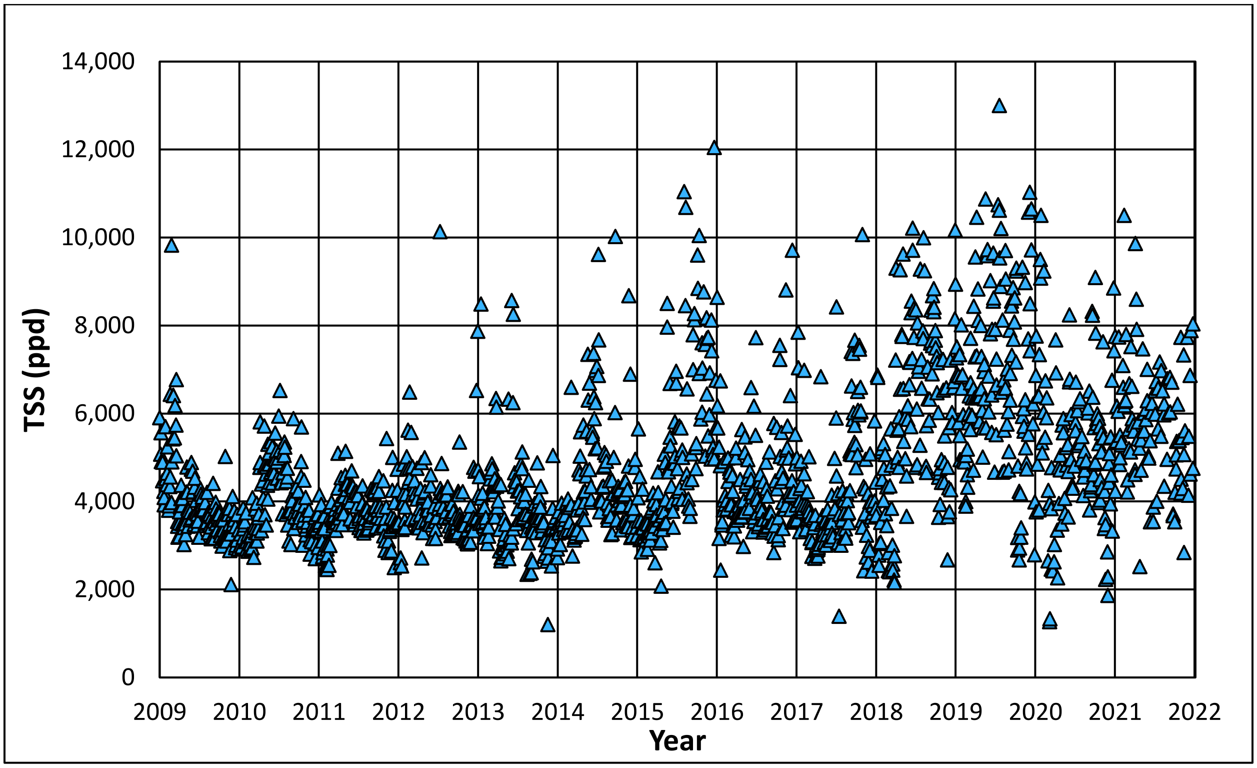


Figure 2-14. Daily Plant Influent TSS Loading (January 2009 to December 2018)

2.4.2.3 Summary of Current Loads

Table 2-6 summarizes plant influent BOD and TSS loads during this same period. For the current sewer service area population of 23,000, the annual average unit BOD and TSS load are 0.20 and 0.21 pounds per capita per day (pcd).

Table 2-6. Current Plant Influent Loading

Statistic	BOD Load, ppd	Peaking Factor[(a)]	TSS Load, ppd	Peaking Factor[(a)]
Dry weather average	4,600	1.0	4,700	1.0
Wet weather average	4,400	0.96	4,900	0.9
Dry weather maximum 30-day	7,100	1.5	4,500	1.8
Wet weather maximum 30-day	7,100	1.5	8,900	1.7
Maximum 7-day	8,300	1.8	8,300	2.3
Peak Day	11,100	2.4	11,100	2.6

(a) Peaking factor relative to dry weather average loads

2.4.3 Projected Flows and Loads

Flow and load projections are developed using current per capita ADWF flow and average dry weather load, projected future populations, and current peaking factors.

2.4.3.1 Flow Projections

Sanitary sewage generated in the District's service area comes from a combination of residences, businesses, and schools. Businesses and schools can be expected to grow at approximately the same rate as overall population. Therefore, the average unit design flows can be applied to the population increases to project future average flows. Future flows can be projected assuming existing flows can grow at approximately the same rate as population. Given the current per capacity ABF of 83 gcd, the 2045 ABF is estimated at 2.0 mgd for the design population of 23,500.

Historical flow data indicates that the collection system is relatively insensitive to typical storm events (few sources of I&I flows), which results in fairly limited variation in seasonal flow rates. Also, aging of the existing sewers will cause I&I increases that tend to be offset by the improvements of new construction. Therefore, the future peak flows are estimated assuming flows increase proportionally to expected population growth; this is identical to the method used for projecting average flows.

Current flow values are compared with the year 2045 projections in Table 2-7. As discussed above, the flow projections are based on the current per capital flows, the year 2045 population estimate of 23,500 and the flow peaking factors shown in Table 2-5. These projections are significantly lower than previous projections and reflect the lower growth rate anticipated by the PRC.

Table 2-7. Design Influent Flow Projection Summary

Flow Statistic	Current Value, mgd	Year 2045 Value, mgd
ABF	1.9	2.0
ADWF	2.1	2.2
AWWF	2.3	2.4
MMDWF	3.0	3.1
MMWWF	4.0	4.2
PWF	4.7	4.8
PDF	5.5	5.7
PWWF	6.5	6.8

2.4.3.2 Load Projections

Future plant influent loads are estimated using the dry weather per capita loads values for BOD of 0.20 pcd and TSS of 0.21 pcd and the load peaking factors summarized in Table 2-6. These unit design loads are applied to the future population of 23,500, yielding the load projections summarized in Table 2-8.

Table 2-8. Influent Load Projection Summary			
Statistic	Current Value, ppd	Year 2045 Value, ppd	Peaking Factor[(a)]
BOD			
Dry weather average	4,600	4,700	1.00
Wet weather average	4,400	4,500	0.96
Dry weather maximum 30-day	7,100	7,200	1.54
Wet weather maximum 30-day	7,100	7,200	1.54
Maximum 7-day	8,300	8,500	1.80
Peak day	11,100	11,300	2.41
TSS			
Dry weather average	4,900	5,000	1.00
Wet weather average	4,500	4,600	0.92
Dry weather maximum 30-day	8,900	9,100	1.82
Wet weather maximum 30-day	8,300	8,500	1.69
Maximum 7-day	11,100	11,400	2.27
Peak day	13,000	13,300	2.65

(a) Peaking factor based on dry weather average.

2.4.4 Nutrients

Nutrients of primary concern at a wastewater treatment facility are nitrogen and phosphorus. The District collected and tested monthly influent grab samples for ammonia (NH_3), nitrate as N/nitrite as N (NO_2-N+NO_3-N), and Total Kjeldahl Nitrogen (TKN), organic (Ortho-P) and total phosphorus (Total-P) between 2018 and 2020. This available influent nutrient concentration data is shown on Figure 2-15 and Figure 2-16. As shown, NO_2-N+NO_3-N concentrations are very low in the influent. It is generally expected that these concentrations will be non-detect in raw wastewater. Current and projected influent nutrient NH_3, TKN, Total Nitrogen, Ortho-P and Total-P loads are summarized in Table 2-9.

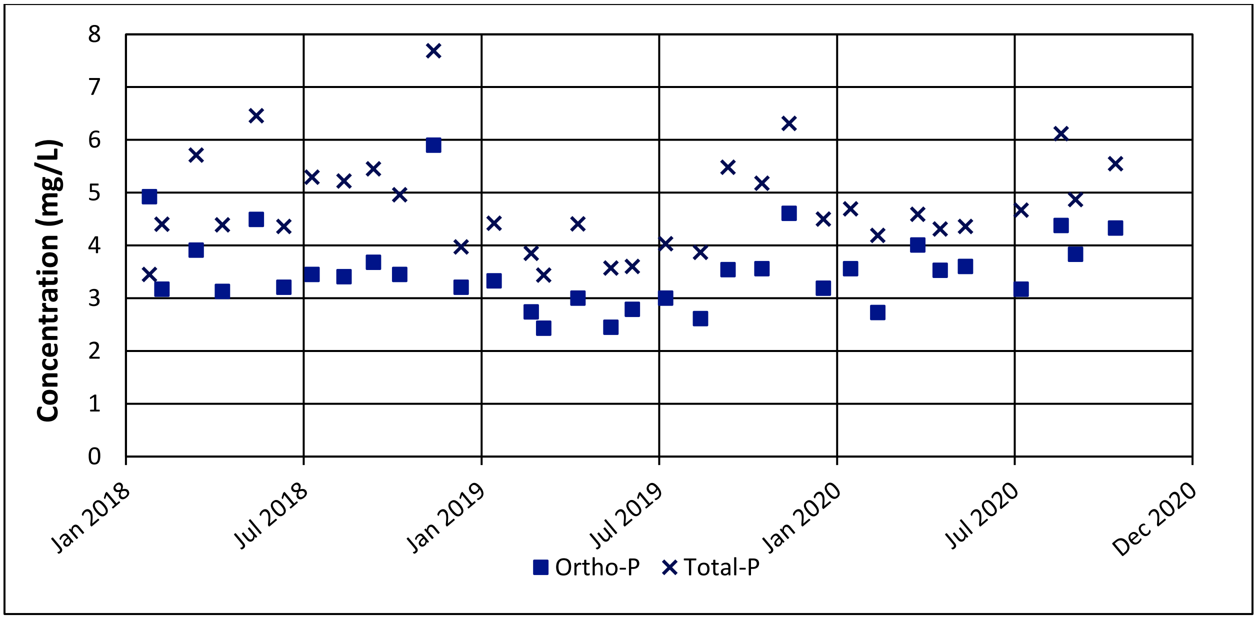


Figure 2-15. Influent Phosphorus Concentrations, Sampled 2018 – 2020

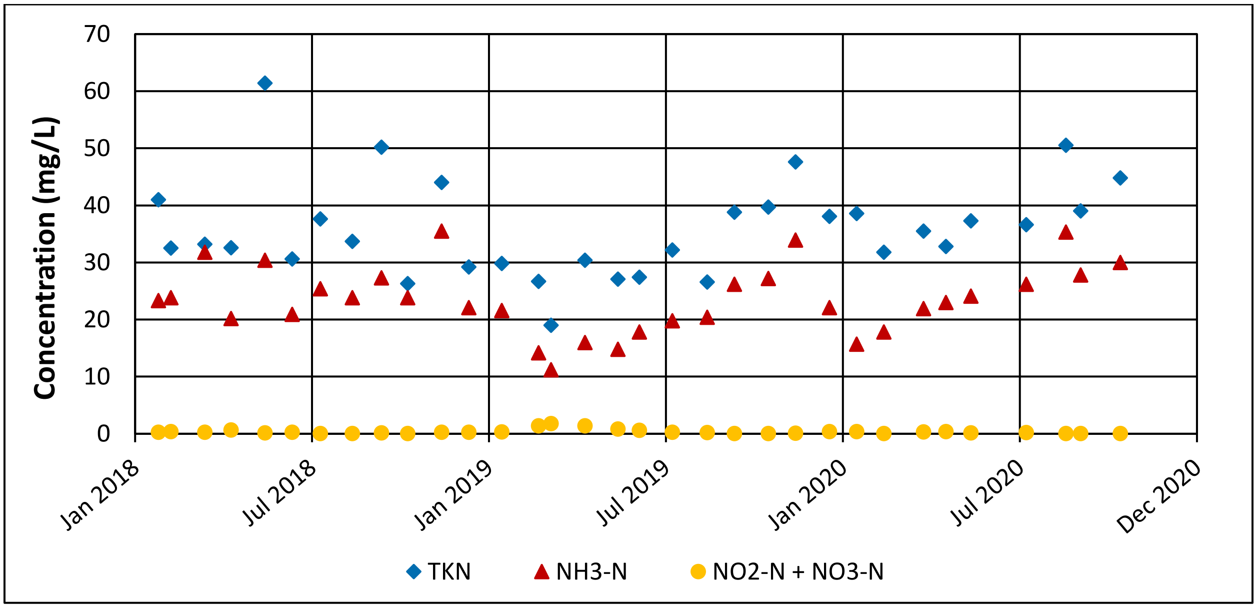


Figure 2-16. Influent Nitrogen Concentrations, Sampled 2018 – 2020

Table 2-9. Influent Nutrient Load Projection Summary

Statistic	Current Value, ppd	Year 2045 Value, ppd	Peaking Factor[(a)]
Orthophosphate			
Dry weather average	59	61	1.0
Wet weather average	65	66	1.10
Max day	73	75	1.13
Total Phosphorus			
Dry weather average	84	86	1.0
Wet weather average	86	88	1.02
Max day	130	133	1.51
Ammonia - Nitrogen			
Dry weather average	420	430	1.0
Wet weather average	400	410	0.95
Max day	580	594	1.45
Total Kjeldahl Nitrogen			
Dry weather average	640	655	1.0
Wet weather average	630	645	0.98
Max day	1000	1024	1.59
Total Nitrogen[(a)]			
Dry weather average	650	666	1.0
Wet weather average	640	655	0.98
Max day	1010	1034	1.58

(a) Total Nitrogen is calculated for each data set as the sum of TKN and Nitrite/Nitrate/-Nitrogen results.

2.4.5 Temperature

DEQ has issued a new TMDL for the Upper Klamath and Lost River Sub-basins making temperature an important wastewater characteristic to monitor and evaluate during this planning cycle. The specifics of this TMDL are discussed in detail in Chapter 4. Figure 2-17 shows the average daily discharge temperature and the average daily influent temperature at the plant during 2021. Gaps in the data indicate where temperature was not available on the DMR.

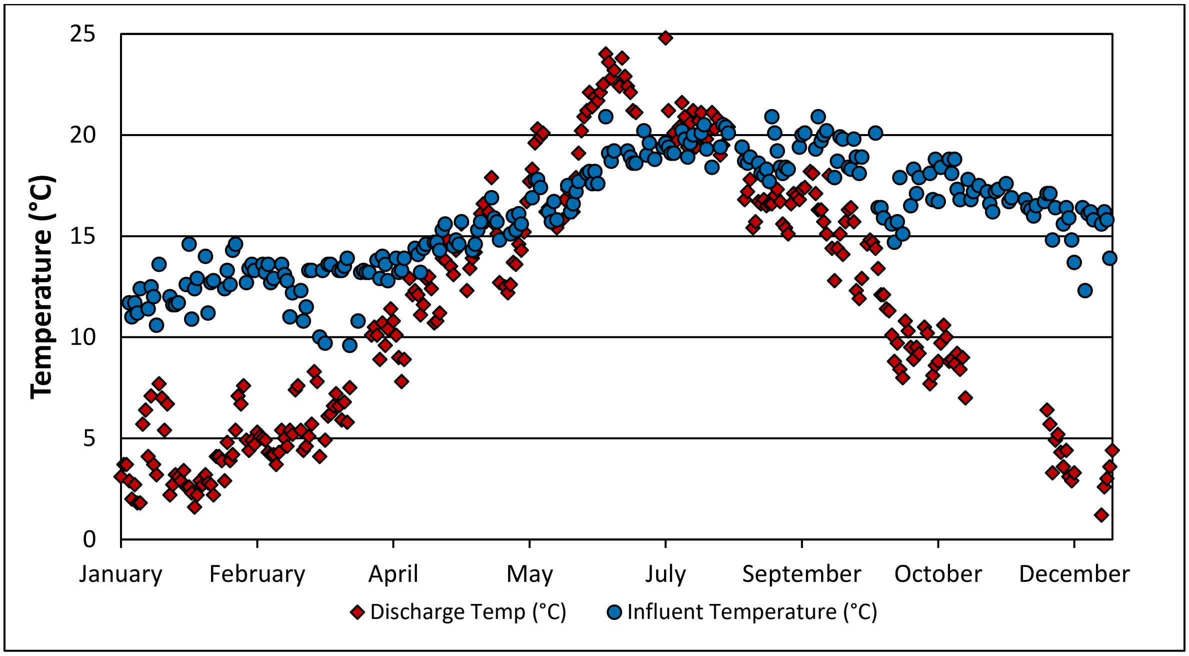


Figure 2-17. Average Daily Plant Discharge Temperature for 2021

2.5 REFERENCES

City of Klamath Falls and Klamath Falls County, prepared by Winterbrook Planning. June 2020. *Klamath Falls Urban Area Comprehensive Plan*.

USDA National Resources Conservation Service. Soil Survey of Klamath County Area. https://www.nrcs.usda.gov/wps/portal/nrcs/surveylist/soils/survey/state/?stateId=OR on February 2022

U.S. Fish & Wildlife Service. April 2013. "*Revised Recovery Plan for the Lost River Sucker and the Shortnose Sucker.*"

Metcalf and Eddy/AECOM. 2014. *Wastewater Engineering: Treatment and Resource Recovery*, 5th Edition.

CHAPTER 3
Existing Facilities

An evaluation of the District's existing wastewater collection and treatment facilities has been completed. The evaluation considers the capacity, performance, and condition of each treatment system component. An overview of the collection system and its conditions are also presented.

3.1 EXISTING TREATMENT FACILITY

This section provides an overview of the WWTP, followed by a more detailed description of the individual facilities and their condition. Finally, a summary of recent performance data is presented.

3.1.1 Facility Overview

The District's original WWTP was constructed at the current site in 1958. This facility consisted of an influent pump station, influent flow measurement flume, four facultative lagoons, a chlorine gas disinfection system, a chlorine contact channel, and an effluent flow meter. In 2001 the plant was upgraded with the construction of a new influent pump station, influent force main, screening system, pond aeration system, pond baffles, and pond levee improvements. In 2013, the aeration diffusers in Pond 4 were replaced with more efficient units. In 2019, the effluent pump station was upgraded to allow for more capacity and redundancy.

The current WWTP layout is shown on Figure 3-1. A simplified plant flow schematic diagram is provided as Figure 3-2. As shown, the District can operate the WWTP in two different modes. The historical mode is how the plant is currently operated and allows for a compact treatment footprint. The energy saving mode relies on all the ponds for treatment and reduces to total aeration requirements.

WEST YOST - W:\Clients\515 South Suburban Sanitary District\50-21-17 2021 Facilities Plan\GIS\MXD\Fig3-1_TreatmentPlantLayout.mxd - aguillebeau - 8/23/2022

Figure 3-1

Treatment Plant Layout

South Suburban Sanitary District

Wastewater Facilities Plan

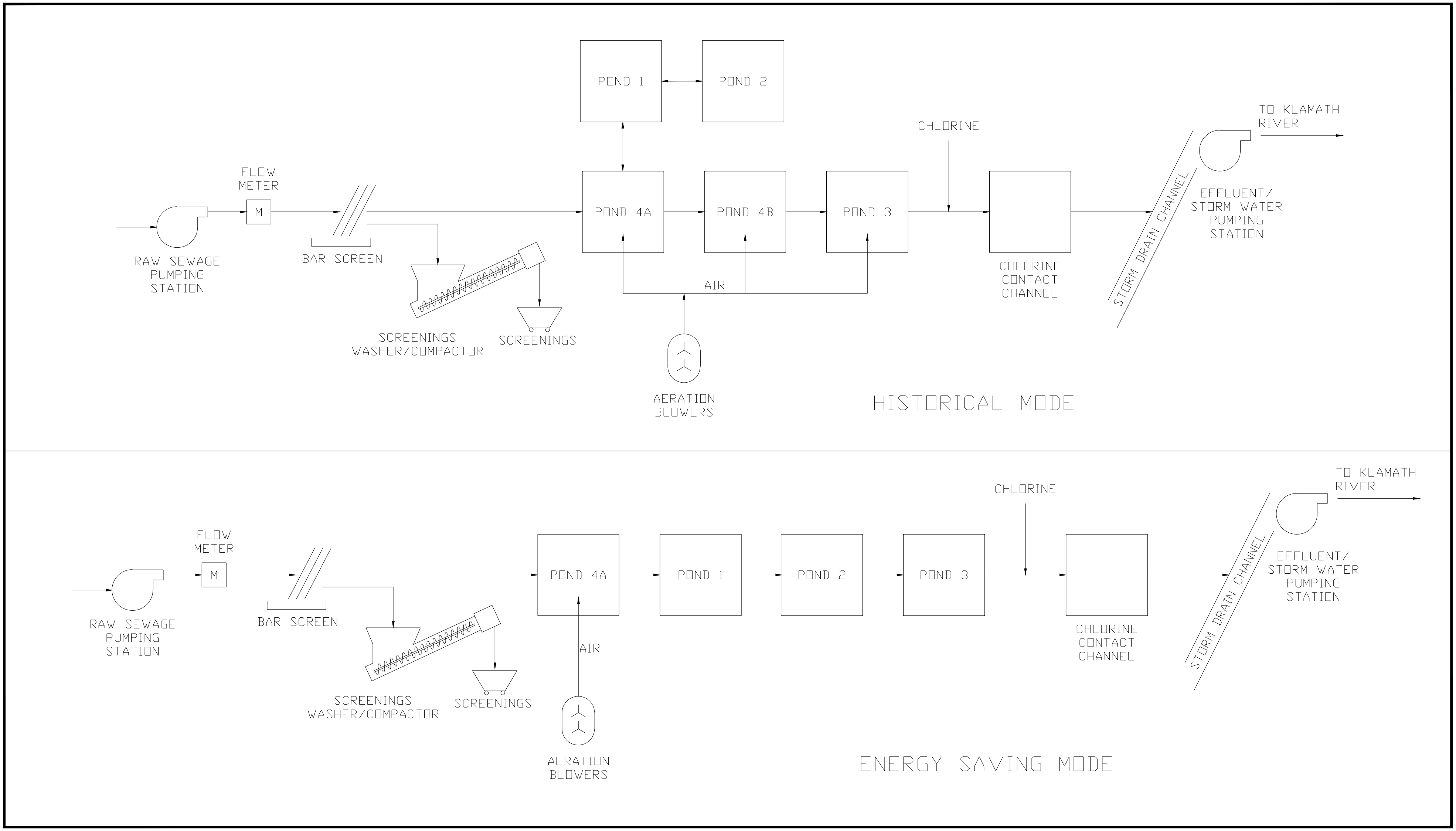


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Figure 3-2

Treatment System Flow Schematic

South Suburban Sanitary District

Wastewater Facilities Plan

3.1.2 Facilities Descriptions

3.1.2.1 Influent Pump Station

The influent pump station is a trench-type, self-cleaning wet well design. The station is equipped with four, 75-horsepower (hp), 2,550- gpm submersible pumps and has a firm capacity (capacity with one pump out of service) of 11 mgd. Space is available for a fifth pump and the structure is sized to accommodate an ultimate peak flow of 30 mgd.

DEQ guidance for reliability indicate the pump station should be able to pump the peak hour flow with one pump out of service but in-system storage for equalization can be considered. The existing station is capable of handling the projected PIF, and the addition of the fifth pump is not necessary unless additional growth occurs.

The station's control system incorporates a programmable logic controller (PLC), ultrasonic level sensors, and variable frequency drives (VFDs). The PLC automatically varies pump speed and number in service to maintain operator-selected water level setpoints.

Influent flow rate is measured with a 14-inch diameter, magnetic flow meter. Flow information is transmitted to the plant computer.

An 18-inch diameter force main conveys wastewater from the pump station to the screen building.

Construction of the pump station was completed in 2001 and the District has continuously maintained the equipment. Routine maintenance will provide continued reliability for the pump station.

Inlet gate rehabilitation was identified as a condition-related improvements at the influent pump station in 2021, and the inlet gate was subsequently repaired. In addition, the assessment identified the need for a new wet well spray system.

3.1.2.2 Screening System

Constructed in 2001, the screening building is located in the widened levee area at the center of the four ponds. The system consists of a single 4-foot wide, mechanically raked bar screen, a screenings washer/compactor, and a bypass channel. In its current configuration, the screen can accommodate a peak flow of 21 mgd. However, by raising the bypass channel weir elevation, the maximum channel water depth, screen capacity can be increased to 30 mgd. The washer/compactor deposits the screenings into a dumpster.

DEQ guidance for reliability allows for a single screen if the facility is equipped with a bypass channel with a manually cleaned bar rack is provided. Consequently, the headworks meets the reliability criteria.

Condition related improvements at the headworks building were identified in 2021. The aeration blower for the headworks post-screen channel and the headworks sump pump needs to be replaced. Ventilation improvements are also needed for the headworks building. To meet the reliability criteria and reduce potential for debris flowing into the lagoons, a manual bar screen should also be added to the bypass channel.

3.1.2.3 Aeration Blowers

Four, 2,300-scfm, 150-hp multistage centrifugal blowers were installed in 2005 to replace the rotary screw blowers that were originally housed in the blower building. The blowers have been performing to expectation and have not experienced the reliability issues that plagued the previous installation. Space is available for a fifth blower.

A plant-wide condition assessment completed in 2021 identified that the blowers were exhibiting excessive vibrations, and the VFDs and valves for the blowers were subsequently replaced.

3.1.2.4 Treatment Ponds

The four ponds were a part of the original treatment plant construction project and have a combined surface area of approximately 130 acres and a total volume of 248 million gallons.

Air from the blowers travels through a ductile iron pipe buried in the levee which separates Ponds 3 and 4. Polyvinyl Chloride (PVC) lateral pipes resting on the pond floors feed air to the individual aerators. The aerators in Pond 4A are designed to provide the air necessary for aerobic treatment of the wastewater. The primary function of the aerators in Ponds 4B and 3 is to prevent ice buildup on the pond surface during cold weather.

An energy audit for the aeration diffusers was sponsored by the Energy Trust of Oregon and completed for the District by Global Energy Partners. This study recommended that the diffusers be replaced, and the District completed a project to replace the diffusers in Pond 4A in 2013. Ponds 3 and 4B are equipped with vertical tube aerators (Ramco) while new MARS™ diffusers manufactured by TriplePoint Environmental have been installed in Pond 4A.

Outlet structures allow effluent to be withdrawn from either Pond 3 or Pond 4 and directed to the disinfection system.

All of the ponds have earthen levees with stone rip-rap protection from wave action. Maintenance on the levees has been provided to maintain the integrity of the levees. Also, all of the lagoons were constructed with a clay liner.

The District has recently indicated a biosolids removal program for the lagoons. Solids were removed from Pond 3 in 2021 and removal of solids from the remaining ponds is planned. Removing biosolids from the lagoons is included in the alternatives analysis presented in Chapter 5.

3.1.2.5 Disinfection

Chlorine gas is used for effluent disinfection. The gas is injected into a carrier water to create a chlorine solution which, in turn, is injected into the pond effluent prior to its discharge to the Chlorine Contact Chamber. The Chlorine Contact Chamber was constructed in 1968. The chamber is 8 feet wide by 3 feet deep and 658 feet long and is made of 6-inch-thick reinforced concrete.

Algae that grows in the ponds is killed by the chlorine and settles in the chlorine contact channel. The channel is cleaned routinely in the summer. Therefore, some BOD reduction is obtained in the channel.

The chamber also has a number of structural issues as noted by Adkins Consulting Engineering, LLP during a 2017 visual analysis. The wall/base connection has zero moment resisting capacity as it is merely grouted. Tie beams support the walls of the channel and are made of either precast concrete, hot dipped galvanized steel, or epoxy coated steel. Nearly all of the concrete tie beams have failed.

Three different types of failure were noted on the walls themselves. These include: 1) excessive deterioration to the top of the wall, causing exposure of reinforcement, 2) continuous longitudinal cracks running along the base of the chamber wall, and 3) shear failure at the tie-beam connection at the top of the chamber walls exhibiting diagonal cracks up to 1-inch long. Adkins declared the defects indicate probable imminent failure of the chamber and recommended replacement of concrete beams with hot dipped galvanized beams as well as galvanizing existing epoxy coated steel beams in addition to a 4-inch thick pour of fiber reinforced concrete along the floor of the entire chamber.

The District has since made investments in stabilizing the chlorine contact channel. Nevertheless, wholesale replacement of this facility is needed within the next 10-year period.

The District also installed interim sodium bisulfite injection facilities to assist with meeting the chlorine residual requirements of the permit. This facility is located at the Texum Effluent Pump Station.

3.1.2.6 Effluent Pump Station

Following disinfection, the effluent passes over a flow measurement weir into a drainage ditch. Effluent and runoff in the ditch are pumped via the Texum Effluent Pump Station to an outfall that empties into Lake Ewauna. The station was constructed in 1976 and was originally equipped with two, 25-hp pumps that discharged to an asphalt-coated cast-iron pipe. The pump station was upgraded in 2019, where the 25-hp pumps were replaced with three, 110-hp, 14.5 mgd vertical drive pumps and the discharge pipe was replaced with a 24-inch diameter cement-lined ductile iron pipe connected to each of the three pumps by 14-inch diameter cement-lined ductile iron (DI) pipe.

The operation of two pumps is required to provide 45 cfs capacity to prevent flooding. Under typical flows, one pump is sufficient. Operation of the three pumps is rotated so that all pumps are regularly operated.

3.1.2.7 Standby Generator

A 150-kiloWatt (kW) diesel-fired generator is available for use during power outages. The power distribution system allows the generator to operate two raw sewage pumps, laboratory building, and screening system. The generator is not large enough to operate the aeration blowers.

3.1.2.8 Unit Process Summary

A summary of the unit process design data for the existing facility are provided in Table 3-1.

Table 3-1. Design Data

Item	Value
Influent Sewer	
Diameter, inches	48
Raw Sewage Pumping Station	
No. pumps	4
Type	Submersible variable speed
Capacity, each, gallon per minute (gpm)	2,550
Motor horsepower, each	75
Station firm capacity, mgd	11
Generator capacity, kilovolt amps	150
Pump Station Valve Vault Sump Pump	
No. pumps	1
Capacity, gpm	95
Horsepower	2
Raw Sewage Force Main	
Diameter, inches	18
Screening System	
Bar Screen	
Number	1
Screen type	Mechanically raked
Screen width, feet	4
Bar spacing, inches	7/16
Capacity, mgd	21
Motor horsepower	3
Screenings-Washer/Compactor	
Number	1
Type	Screw
Capacity, cubic yards per hour	35
Washer motor horsepower	2
Compactor motor horsepower	5
Screen Bypass Channel	
Number	1
Width, feet	6
Capacity, mgd	30
Screen Building Sump Pump	
No. pumps	1
Capacity, gpm	110
Horsepower	2
Blowers	
Number	4
Type	Multistage Centrifugal
Capacity, each, scfm	2,300
Maximum discharge pressure, psig	7.5
Horsepower, each	150
Air Header Pipe	
Diameter, inches	24, 20, 16
Stabilization Ponds	
Number of ponds	4
Total surface area, acres	129
Pond 1	
Surface area, acres	27
Average depth, feet	3.9
Approximate volume, million gallons (Mgal)	34
Aerators	*None*
Pond 2	
Surface area, acres	27
Average depth, feet	4.2
Approximate volume, Mgal	37
Aerators	*None*
Pond 3	
Surface area, acres	31
Average depth, feet	7
Approximate volume, Mgal	71
Aerators	
Type	Vertical tube
Number (Operational)	35
Average air flow, each, standard cubic feet per minute (scfm)	25
Oxygen transfer rate, each, ppd	38

Table 3-1 Design Data	
Item	Value
Pond 4A	
Surface area, acres	17
Average depth, feet	7.4
Approximate volume, Mgal	41
Aerators	
Type	TriplePoint's MARS™
Number	63
Average air flow, each, scfm	48
Oxygen transfer rate, each, ppd	78
Pond 4B	
Surface area, acres	27
Average depth, feet	7.4
Approximate volume, Mgal	65
Aerators	
Type	Vertical tube
Number (Operational)	86
Average air flow, each, scfm	25
Oxygen transfer rate, each, ppd	38
Pond Transfer Pipes	
Number	1
Pond 4B to 3, diameter, inches	30
Pond Outlet Pipes	
Pond 3	
Number	2
Diameter, inches	12
Pond 4B	
Number	2
Diameter, inches	12
Disinfection System	
Chlorinator	
Number	1
Capacity, ppd	100
Chlorine Contact Channel	
Number	1
Length, feet	650
Depth, feet	2.9
Volume, gallons	113,000
Effluent Pumps	
Number	3
Horsepower	110
Capacity, cubic feet per second	22.5
Blower Building Sump Pump	
Number	1
Capacity, gpm	40
Horsepower	1/3

3.1.3 Unit Process Capacity Summary

The capacity of each unit process was determined using design data from the *2001 Wastewater Treatment Facility Upgrade* project and other sources. The capacities are summarized in Table 3-3.

Table 3-3. Unit Process Capacity Summary

Unit Process	Basis for Capacity	Design Criteria	Total Capacity
Raw Sewage Pump Station	PWWF	Firm Capacity	11 mgd[a]
Bar Screens	PWWF	Screen Headloss and Wastewater Velocity	30 mgd
Aeration Blowers	Air Flow Rate	Firm Capacity	6,900 scfm
	Maximum Month BOD Loading	Total Capacity	7,100 ppd
Aerators	Air Flow Rate	48 scfm, each	3,000 scfm
	Oxygen Transfer Rate	78 ppd O_2, each	4,900 ppd
	Maximum Month BOD Loading	Total Capacity	5,900 ppd
Disinfection	Peak Effluent Flow[b]	30 min contact time	5.4 mgd

(a) Firm capacity of pumps. Structure can accommodate PWWF of 30 mgd.

(b) The existing WWTP provides attenuation of peak flows. Therefore, the capacity of the disinfection system is based on this equalization capacity. It is reasonable to assume that the peak effluent flow is approximately equivalent to the maximum month wet weather flow.

The existing capacities of the unit processes can be compared to the projected flows and loads from Chapter 2 to confirm adequate capacity is available through 2045. The future project facilities will include new treatment processes downstream of the influent pump station and headworks. Therefore, a comparison is only needed for the pump station and bar screens. The total capacities from Table 3-3 for these processes are shown with the 2045 projected influent flow from Table 2-7. This comparison shows that these processes have more than adequate capacity for projected flows through 2045; the raw sewage pump station has nearly double the capacity needed, and the bar screens have more than 4 times the capacity required.

Table 3-4. Unit Process Capacity Summary

Unit Process	Basis for Capacity	Total Capacity, mgd	2045 Projected Flow, mgd
Raw Sewage Pump Station	PWWF	11	6.8
Bar Screens		30	

3.1.4 WWTP Performance

The current permit dictates that the monthly average effluent BOD and TSS concentrations cannot exceed 30 mg/L and 85 mg/L, respectively[1]. A review of the plant influent flow and effluent quality provided in Table 3-5 shows that the monthly average effluent BOD concentrations exceeded the permit requirements in June and November but otherwise monthly average effluent BOD and TSS concentrations complied with the effluent limits.

Table 3-5. 2021 Plant Performance Summary

Month	Influent Flow, mgd		Effluent Concentration, mg/L			
	Average	Max Day	Average BOD	Max Day BOD	Average TSS	Max Day TSS
January	1.77	1.85	20	23	39	46
February	1.91	2.12	20	23	53	62
March	1.87	2.00	28	37	83	94
April	1.76	1.85	30	37	70	97
May	1.65	1.76	30	54	45	75
June	1.51	1.60	39	66	48	56
July	1.40	1.49	19	30	32	43
August	1.36	1.42	17	27	30	39
September	1.35	1.43	18	26	35	49
October	1.46	1.78	20	33	38	42
November	1.59	1.72	37	43	43	43
December	1.55	1.66	15	27	38	47
Average	**1.60**	**1.72**	**24**	**35**	**46**	**58**
Maximum	**1.91**	**2.12**	**39**	**66**	**83**	**97**

[1] BOD and TSS monthly average limitations provided in the current NPDES permit issued on September 17, 2020. A copy of the NPDES permit is provided as Appendix B.

3.2 EXISTING COLLECTION SYSTEM

The collection system conveys wastewater from residential, commercial, and public users to the District's wastewater treatment facility. The District is responsible for operating and maintaining the collection system.

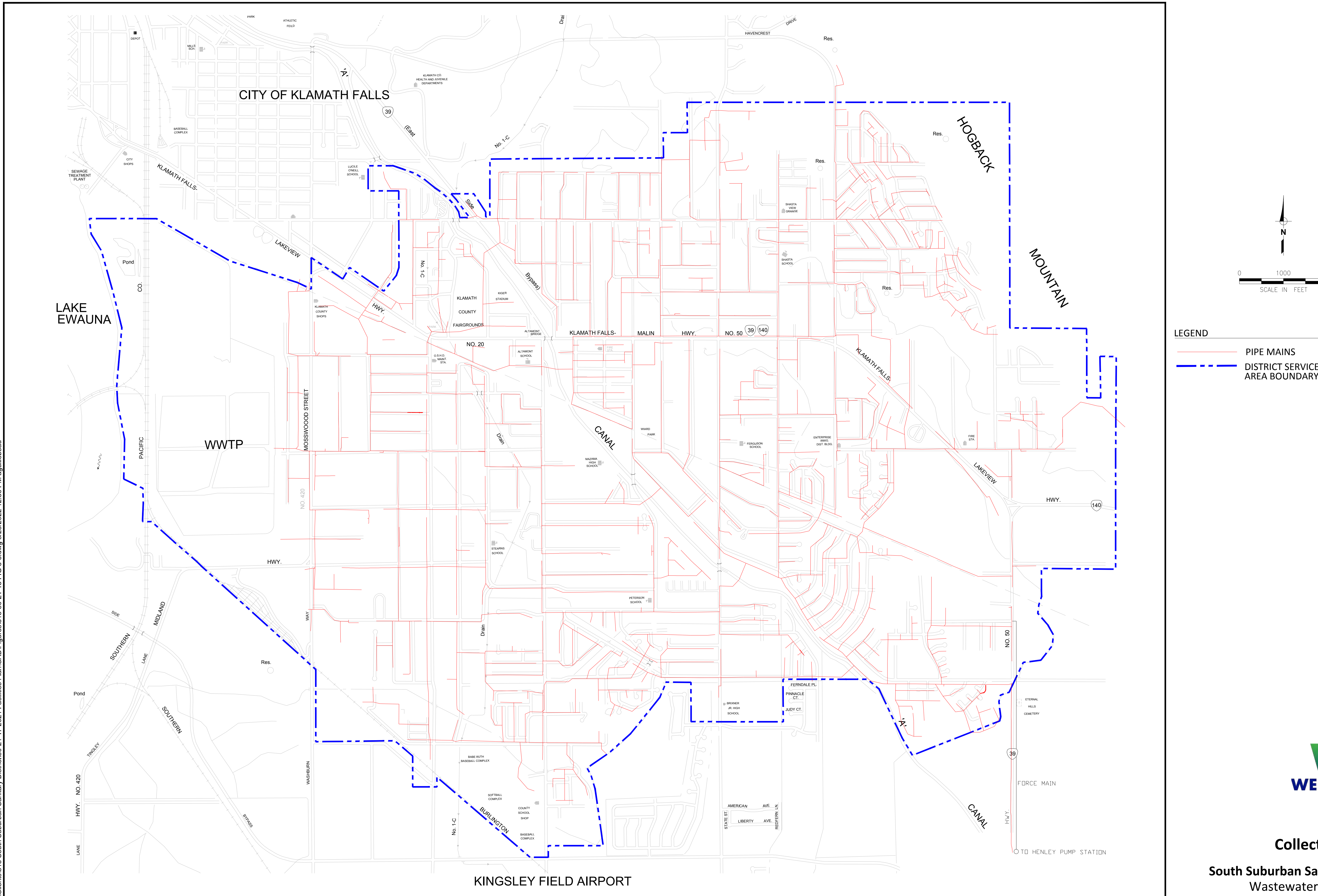
The 5,500-acre service area consists of mainly residential customers. The area is served by a separate storm drain system. The existing collection system is shown on Figure 3-3. Table 3-6 provides an inventory of pipes in the collection system according to size.

Table 3-6. Collection System Inventory

Sewer Pipe Diameter, inches	Pipe Length, feet
2	200
4	1,500
6	42,600
8	347,400
10	33,100
12	23,900
15	5,100
16	9,700
18	3,100
24	7,800
30	3,300
36	2,900
Unspecified	800
Total	**482,000**

The District's collection system is composed of gravity sewers primarily made of PVC, concrete and Transite. The collection system is split such that five "mains" (larger diameter sewer lines) collect wastewater from northeast, northwest, southeast, southwest and central parts of the District. These mains ultimately convey wastewater to the District's wastewater treatment facility.

In 2010, construction was completed on the Henley pump station and force main connecting the schools to the District's service area and a new pressurized system was constructed in 2021 to serve the Skyline neighborhood.



LEGEND

PIPE MAINS

DISTRICT SERVICE AREA BOUNDARY

WEST YOST

Figure 3-3

Collection System

South Suburban Sanitary District

Wastewater Facilities Plan

3.2.1 Condition Overview

District personnel provide ongoing evaluation of the collection system including flow monitoring, television inspection and general inspection, which are being used to develop future improvements.

Data collected indicates that the southern portions of the collection system have more infiltration. This area is lower and is influenced by the irrigation canals. The northwest areas have higher peak flows, and additional flow evaluations are planned for the northwest area, which may include smoke testing.

3.2.2 I&I Analysis

Flows associated with I&I use some of the available capacity of the collection system. I&I is also an indicator of the condition of the system. High peak flows can signify system deterioration.

EPA guidelines for the evaluation of I&I flows in a wastewater collections system are based upon per capita flow rates (EPA, 1985). If the measured per capita flow rate of the collection system exceeds EPA guidelines (120 gcd), then the sources of I&I in the collection system may warrant active management to reduce peak wet weather flows. The 120 gcd flow rate includes domestic wastewater flow, infiltration, and nominal industrial and commercial flows. This guidance indicates that no further I&I analysis work is necessary if the 120 gcd guideline is not exceeded.

The EPA guideline for infiltration is based on a dry weather flow rate defined as the highest 7-day average flow recorded over a seven to fourteen-day period during high groundwater season. For the current analysis, a dry period was defined as seven to fourteen consecutive days where the sum of the precipitation is less than 0.1 inch. In Oregon, this condition typically occurs during the winter months.

For the District's 2021 population of approximately 20,800, the EPA 120 gcd guideline translates into a total system flow of 2.50 mgd. Since the ABF (measured September through November) is 1.9 mgd (91 gcd), the ADWF is 2.1 mgd (101 gcd), and there are no large industrial wastewater dischargers, groundwater infiltration is likely contributing flow to the wastewater during early dry weather months, primarily May when groundwater levels are high.

This trend remains true in January through April of the wet weather flow months after precipitation events when the soil is saturated, and the groundwater is elevated. During wintertime dry periods from 2009 to 2018, the 7-day average flows ranged between 1.65 and 4.08 mgd, as summarized in Table 3-7. The maximum 7-day average flow from each year is presented in Table 3-7. In all but two of the listed periods, the plant flow exceeded the EPA guideline of 2.50 mgd.

Table 3-7. Wet Season Dry Weather Flows			
Period	Seven-Day Average Flow, mgd	Seven-Day Average Flow, gcd	Total Rainfall, inches
March 4 – 13, 2009	3.14	151	0.06
December 30, 2010 – January 11, 2011	3.21	155	0.04
January 17 – 30, 2011	3.38	163	0.00
April 1 – 10, 2012	2.77	133	0.09
February 8 – 18, 2013	2.67	128	0.00
December 25, 2014 – January 7, 2015	2.68	129	0.04
February 10 – 23, 2015	2.53	122	0.00
November 17 – 12, 2015	1.65	79	0.08
January 30 – Feb. 12, 2016	3.65	176	0.00
January 21 – 27, 2017	4.08	196	0.08
April 8 – 14, 2018	2.32	112	0.08
Average	**2.92**	**140**	**0.04**
EPA Guidelines	**2.50**	**120**	**0.00**

The EPA guidelines for evaluating inflow is based on the highest daily flow recorded during a storm event. The EPA suggests that inflow may warrant attention if the measured high daily flow is greater than 275 gcd. For the District, this results in a total system flow of 5.71 mgd. A review of plant records (Table 3-8) shows that the highest recorded daily flow was 5.41 mgd (260 gcd) on February 9, 2017. The current peak day flow is estimated at 5.5 mgd (269 gcd). The District inflow is thus slightly below the EPA guideline.

Table 3-8. High Plant Influent Flows		
Date	Flow, mgd	Flow, gcd
February 9, 2017	5.41	260
February 20, 2017	5.20	250
January 23, 2016	4.86	234
February 8, 2017	4.85	233
February 14, 2019	4.78	230
February 11, 2017	4.67	225
February 21, 2017	4.66	224
January 20, 2017	4.62	222
January24, 2016	4.51	217
January 22, 2016	4.47	215
EPA Guideline	**5.71**	**275**

Because the District's flows exceed EPA guidance regarding infiltration, an analysis has been performed to determine if I&I can be removed cost effectively. The following factors affect the analysis:

- Prior to 2006, there was significant infiltration through a damaged pipe underneath an irrigation canal. This pipe was repaired in 2009, among various other collection system improvements, and flows have dropped substantially. As such, the data in the analysis is no older than 2009.
- Comprehensive potable water use information is not available because (1) the District does not supply water to residents in the service area, and (2) some sewer users obtain their water from wells.
- For western Oregon communities, including the District, I&I is typically associated with precipitation and high groundwater levels experienced during the wet weather season.
- The peak flow attenuation provided by the District's ponds makes the treatment system relatively insensitive to high peak flows. The two-unit processes most affected by high peak flows are the influent pump station and the screening system, and these have adequate capacity to accommodate the anticipated future peak flows. Therefore, reducing peak flows would have little effect on the existing treatment plant costs.

Municipal wastewater can be split into three components: sanitary wastewater, base infiltration, and rainfall dependent infiltration and inflow (RDI&I). Sanitary wastewater is the wastewater produced by residents and business in the service area. Base infiltration is the groundwater that leaks into the collection system during periods of no rainfall and low groundwater levels. RDI&I is normally defined as the flow associated with direct inflow of rainfall and snowmelt, and infiltration due to rainfall-induced high groundwater.

To determine the amount of I&I in the collection system, it is first necessary to estimate sanitary wastewater flows. The District experiences lowest flows during select months when combinations of the following conditions occur:

- Empty irrigation canals
- Low precipitation
- Low temperatures, minimizing runoff from snowmelt

Historically, the lowest flows occur during September, October, and November. Table 3-9 lists flows and rainfall for these months from 2013 to 2021. Based on this information, low flows are in the range of 1.35 to 2.17 mgd. This is representative of the combined sanitary wastewater and base infiltration.

Table 3-9. Winter Wastewater Flows					
Period	Rainfall, inches per month	Average Flow, mgd	Period	Rainfall, inches per month	Average Flow, mgd
September-13	0.11	2.17	September-18	0.24	2.08
October-13	0.01	1.94	October-18	0.47	1.84
November-13	0.34	1.73	November-18	1.13	1.74
September-14	0.95	1.78	September-19	1.52	2.10
October-14	2.21	1.77	October 19	0.53	1.89
November-14	1.01	1.76	November-19	0.13	1.75
September-15	0.08	1.88	September-20	0.00	1.74
Octtober-15	1.01	1.78	October-20	0.00	1.62
November-15	0.68	1.68	November-20	2.01	1.66
Septemer-16	0.12	2.10	September-21	0.00	1.35
October-16	2.48	1.99	Ocobert-21	0.00	1.46
November-16	0.76	1.96	November-21	1.07	1.59
September-17	0.09	2.12			
October-17	0.47	1.90			
November-17	1.45	1.87			

Typical wastewater unit flow for service areas such as the District are 80 to 100 gcd, including an allowance for commercial sources. Multiplying these unit flow rates by the current population of 20,800 gives a sanitary wastewater flow range of 1.7 to 2.1 mgd. A base infiltration of 0.3 mgd can be determined as the difference between the low wintertime flow and the estimated sanitary wastewater flow.

For a population of approximately 20,000 the textbook sanitary wastewater peaking factor is 3.2 (*Wastewater Engineering*, Metcalf and Eddy, 5th Edition, 2014). Applying this factor to the base sanitary flow range of 1.8 to 2.0 mgd indicates a peak sanitary flow range of 5.4 to 6.8 mgd. RDI&I can be estimated as the difference between the peak wet weather flow (PWWF, or peak instantaneous flow) and the sum of the peak sanitary flow and the base infiltration. The current PWWF is listed in Chapter 4 as 6.5 mgd; therefore, RDI&I can be estimated between 0.0 and 0.8 mgd. Wastewater flow component ranges are summarized in Table 3-10.

Table 3-10. Wastewater Flow Component Ranges, mgd		
Item	Low End or Range	High End of Range
Low wintertime flow	1.8	2.0
Base sanitary flow	1.7	2.1
Base infiltration	0.3	0.3
Peak sanitary flow	5.4	6.6
RDI&I	0	0.9

The I&I evaluation presented previously was based on EPA guidelines and uses per capita flow rates. However, the District's service area is unusual in that it is not within a city limit and, as a result, lot sizes are larger than typical. This results in a relatively high pipe length relative to the number of people served. Engineering convention allows for I&I analysis in several formats other than the per capita basis. These include I&I flow per inch-diameter mile of pipe and I&I flow per acre of developed land within the District's service area (Table 3-11).

Table 3-11. I&I Unit Flows

Item	Low End of Flow Range			High End of Flow Range		
	mgd	gpd/in-dia-mile[a]	gad[b]	mgd	gpd/in-dia-mile[a]	gad[b]
Low wintertime flow	1.8	-	-	2.0	-	-
Base sanitary flow	1.7	-	-	2.1	-	-
Base infiltration	0.3	340	70	0.3	410	80
Peak sanitary flow	5.3	-	-	6.6	-	-
RDI&I	0	0	0	0.9	1,100	220
Total Peak I&I	**0.3**	**340**	**70**	**1.2**	**1,510**	**300**

gpd/in-dia-mile = gallons per day per inch-diameter mile
gad = gallons per day per acre
(a) Service area has 791 inch-diameter miles of pipe
(b) Based on the 4,180 acres of developed land in the 5,500-acre service area

Textbook ranges for base infiltration unit flows are 100 to 10,000 gallons per day (gpd) per inch diameter mile of pipe and 20 to 3,000 gallons per acre per day (gad) (*Wastewater Engineering,* Metcalf and Eddy, 5th Edition, 2014). As shown in Table 3-11, the District's base infiltration is on the low end of these ranges. For total I&I during peak flow conditions, new collection systems are typically designed with an allowance of 1,000 to 1,500 gad. Conversely, a peak unit I&I flow rate of 15,000 gad would be representative of an existing system in very poor condition. As shown in Table 3-11, the District's peak I&I is relatively close to a new collection system's I&I allowance.

The District's wastewater treatment ponds provide a large amount of peak flow attenuation. Consequently, the only facilities that are impacted by peak flow are the influent pump station, force main and the screening facility. All of these have adequate capacity for the projected peak wet weather flow. Reducing peak flow would not significantly reduce the cost for the operation of the existing treatment system.

A comprehensive program to remove I&I would not be cost-effective, but the District has nevertheless implemented a program of I&I identification and collection system improvements as part of their overall maintenance program. The following program elements have been implemented:

- Flow monitoring in areas with suspected high I&I
- Systematic sewer televising to identify problem areas
- A collection system maintenance management program that provides a comprehensive database of the system; provides locations and descriptions of I&I sources and structural defects; and helps with work orders, customer complaint tracking, and generates system management
- Repair of structural defects and leaks as part of street reconstruction projects
- Elimination of significant I&I sources

3.3 FINANCIAL STATUS OF THE UTILITY

This section summarizes the characteristics of the District's user base, provides information on the existing rates structure, summarizes revenues and costs, and provides information on long-term debt and available reserves.

3.3.1 User Profile

District users are primarily a mix of residential and commercial users. The number of accounts served by the District are shown in Table 3-12 as reported October 21, 2021.

Table 3-12. Accounts Served by District

Description	Number of Accounts
Single family residential	6,540
Apartment units	217
Commercial[a]	553

(a) Includes motels and RVs

3.3.2 Rate Structure

Wastewater services for the District are funded entirely from service charges that are levied on all system users. Ongoing O&M costs are paid with the revenue from these fees. The District also charges system development charges for all new connections to the system. The revenue from these charges is restricted to capital expenditures.

User fees are generally assessed based on both a flat fee and a commodity charge based on the user's water use during the non-irrigation season from November through April. The existing rates for Fiscal Year (FY) 2021/22 are summarized in Table 3-13.

Table 3-13. Existing Wastewater User Fees	
Description	Monthly Rate,[a] dollars
Single family residential	34.44
Multi-family and mobile home residential per unit	34.44
Hotel and recreational vehicles per unit	17.22
Commercial – flat fee	34.44
Commercial – Water used greater than 2,400 ft^3 per 100 ft^3	2.00

ft^3 = cubic feet
(a) The District also provides senior discounts and full payment discounts.

3.3.3 Revenue and Expenditures

Revenue for the wastewater program is primarily derived from user fees. Table 3-12 shows the revenue and O&M expenditures for FYs 2018/19, 2019/20 and 2020/21 as well as the budgeted revenue and costs for FY 2021/22.

Table 3-14. Wastewater O&M Costs and Resources

Cost Item	Actual, $		Projected, $	Adopted, $
	FY 2018/19	FY 2019/20	FY 2020/21	FY 2021/22
Administration Capital Costs				
Administration	3,821	1,847	0	0
Collection System	449,195	887,865	2,348,713	764,234
Treatment Plant	1,817,072	2,523,612	7,045,111	10,079,681
Total Capital Costs	**$2,270,088**	**$3,413,324**	**$9,393,824**	**$10,843,915**
O&M Costs				
Administration	410,002	445,003	484,322	494,575
Collection System	667,508	806,639	677,578	922,836
Treatment Plant	556,532	551,114	729,858	1,210,338
Total O&M Costs	**$1,634,042**	**$1,802,756**	**$1,891,758**	**$2,627,749**
Resources				
Sewer Fees	4,212,099	4,429,309	4,731,511	4,756,986
Investment Income	909,400	802,043	251,460	225,600
Grants and Incentives	5,000	306,306	49,651	3,000
Miscellaneous	1,279,231	288,966	318,972	223,348
Total Resources	**$6,405,730**	**$5,826,624**	**$5,351,594**	**$5,208,934**

3.3.4 Capital Reserves

The District has anticipated the need for capital expenditures and has accumulated reserves of approximately $25 million. These reserves will be used to implement improvements needed to meet new treatment requirements.

3.4 ENERGY AUDIT

The main energy consumptive process in the District's treatment system is the aeration of Ponds 3 and 4. An energy audit sponsored by Energy Trust of Oregon was performed by Global Energy Partners in 2012 and evaluated retrofitting the existing aeration system with MARS 3000 diffusers from TriplePoint Environmental. It was determined that the improvement would result in a 36-percent reduction in blower energy, or 241,015 kilowatt-hours per year in energy savings. The work proposed in the energy audit was completed in 2013.

The District is continuing to explore ways to decrease energy use. One alternative introduced involves limiting aeration to Ponds 4a and routing the flow from Pond 4a to Ponds 1, 2 and 3. This maximizes pond surface aeration and reduces energy cost. This mode of operation was implemented in 2018 and has significantly reduced the mechanical aeration needs.

The District also recently invested in a solar net metering project with a predicted return on investment of 10 to 13 years and net return of $2M over 25 years.

3.5 REFERENCES

EPA. 1985. *I/I Analysis and Project Certification*. May 1985.

Metcalf and Eddy/AECOM. 2014. *Wastewater Engineering: Treatment and Resource Recovery,* 5th Edition.

CHAPTER 4
Need for Project

This chapter presents information on the need for the Project including the regulatory elements, which are the primary driver for the proposed improvements.

4.1 REGULATORY FRAMEWORK

The DEQ has the responsibility to establish and enforce water quality and waste treatment standards that ensure beneficial uses of receiving waters are preserved. The DEQ's general policy is one of antidegradation of surface water quality. Discharges from WWTPs are regulated through the NPDES program. All discharges of treated wastewater to a surface water receiving stream must comply with the conditions of an NPDES permit. The EPA oversees state regulatory agencies and can intervene if the state agencies do not successfully protect water quality.

4.1.1 Klamath River

Flow data for the Klamath River near the District's treatment plant is available from the United States Geological Survey (USGS) for the Link River monitoring station. The Link River monitoring station (USGS 11507500) is located on the Link River, upstream of Lake Ewauna and the District's wastewater treatment plant. Table 4-1 summarizes the monthly mean, maximum, and minimum flows between the years 1995 and 2018, reported in units of cubic feet per second (cfs).

Table 4-1. Monthly Flow Data for the Link River Monitoring Station[a]

Month	Average Flow, cfs	Maximum Flow, cfs	Minimum Flow, cfs
January	1,271	5,832	372
February	1,264	4,797	288
March	1,571	4,379	318
April	1,728	3,884	803
May	1,706	3,338	784
June	1,380	2,876	779
July	1,076	1,405	676
August	974	1,317	595
September	815	1,205	268
October	837	1,202	507
November	886	1,201	593
December	862	2,117	446

(a) For water years 1995 through 2018.

4.1.2 Beneficial Uses

To assist in the development of water quality standards, a list of beneficial uses is established for each water body in the state. Oregon Administrative Rule (OAR) 340-041-0180 lists the beneficial uses for the Klamath River in the vicinity of the District's treatment plant that are listed in Table 4-2. In addition, the Klamath River has a cool water species fish use designation. This designation determines which aspects of the temperature standard apply.

Table 4-2. Designated Beneficial Uses for the Klamath River from Klamath Lake to Keno Dam (RM 255 to 232.5)

Beneficial Use
Public Domestic Water Supply[(a)]
Private Domestic Water Supply[(a)]
Industrial Water Supply
Irrigation
Livestock Watering
Fish & Aquatic Life including Salmonid Fish Spawning and Rearing
Wildlife & Hunting
Fishing
Boating
Water Contact Recreation
Aesthetic Quality
Hydro Power
Commercial Navigation & Transportation

Source: OAR 340-041-0180

(a) With adequate pretreatment (filtration & disinfection) and natural quality to meet drinking water standards.

4.1.3 Oregon Administrative Rules for Wastewater Treatment

The state surface water quality and waste treatment standards for the Klamath Basin are detailed in the following sections of the OAR:

- OAR 340-041-0004 lists policies and guidelines applicable to all basins. DEQ's policy of antidegradation of surface waters is set forth in this section.
- OAR 340-041-0007 through 340-041-0036 describes the standards that are applicable to all basins.
- OAR 340-041-0180 through 340-041-185 contain requirements specific to the Klamath Basin including beneficial uses, approved Total Maximum Daily Loads (TMDLs) in the basin, and water quality standards and policies.

The surface water quality and waste treatment standards in the OARs are viewed as minimum requirements. Additional, more stringent limits developed through the TMDL process supersede the basin standards.

4.1.4 Clean Water Act 303 (d) Listing

The federal Clean Water Act requires that the responsible regulatory agency establish a list of water bodies that do not meet applicable water quality standards. In Oregon, this responsibility falls to the DEQ. This list, known as the 303 (d) list, is updated every three years. DEQ released the 2022 Integrated Report detailing water body health limitations, which was approved by the EPA in September 2022 (DEQ, 2022).

Lake Ewauna is listed as water quality limited for the following parameters:

- pH (Category 4A)
- ammonia (Category 4A)
- harmful algal blooms (Category 4A)
- dissolved oxygen (Category 4A)
- Chlorophyll a (Category 4A)

4.1.5 Total Daily Maximum Loads

The Clean Water Act requires DEQ to establish TMDLs and corresponding waste load allocations for all water bodies on the 303 (d) list. Because the Lower Klamath Basin starts in Oregon and drains through California, creation of the TMDL was a collaborative effort between Oregon's DEQ and California's North Coast Regional Water Quality Control Board. DEQ developed preliminary TMDLs for the Klamath River in the late 1990s; however, the EPA rejected the work because water quality issues for Upper Klamath Lake, the source of the Klamath River, were not considered fully in the analysis. Additional work was done to more completely determine the water quality issues in Upper Klamath Lake and a new TMDL for nutrients was issued by DEQ in January 2019 (DEQ, 2019a). In September 2019, DEQ issued a TMDL for temperature (DEQ, 2019b).

To stay below the total maximum constituent loading in a watershed, the TMDL process distributes the total allocation among both point and non-point sources. For the upper Klamath River subbasins, the point sources include Klamath Falls WWTP, South Suburban WWTP, Columbia Plywood, and Collins Forest Products. The distribution of these point sources along the Klamath River is shown on Figure 4-1. Non-point sources receive a significant portion of the overall allocation and are separated out through modeling of the watershed's existing conditions.

Figure 4-1. Area Map of the Upper Klamath Basin Including Permitted Point Source Dischargers

The nutrients TMDL provides the allocations for the South Suburban WWTP listed in Table 4-3.

Table 4-3. TMDL Allocation to South Suburban Sanitary District

Parameter	Time Period		Units
	May 15 - October 15	October 16 - May 14	
Total Phosphorous Load	4.9	36	ppd
Total Phosphorous Concentration[a]	0.35	1.9	mg/L
Total Nitrogen Load	318	448	ppd
Total Nitrogen Concentration[a]	23	23	mg/L
BOD Load	251	367	ppd
BOD Concentration[a]	18	19	mg/L

(a) TMDL defines allocation in terms of mass loads ppd. Corresponding concentrations are shown based on the respective average flows of 1.7 mgd (May 15- October 15) and 2.3 mgd (October 16- May 14). The WWTP may need to produce concentrations below these values to reliably meet the load limits.

As noted in Table 4-3, the governing allocations are defined in terms loads ppd while the concentrations (mg/L) are based on the listed flow rates and will change as flowrates change. These new limits would require significant improvements to treatment plant processes, particularly the nutrient limits. These TMDL limits have been incorporated into the NPDES permit as semi-annual averages.

The temperature TMDL allocates to the District a 0.05°C increase from June through September each year and a 0.03°C increase from October through May. This means that the WWTP discharge is not allowed to increase the river temperature by more than these values during the respective periods based on the river temperature at the Link River monitoring station.

4.1.6 Additional Water Quality Requirements

The purpose of the following discussion is to provide a brief summary of additional water quality conditions that are established permit requirements.

4.1.6.1 Senate Bill 737

In 2007, the Oregon Legislature passed Senate Bill 737, which directed DEQ to compile a prioritized list of persistent pollutants. DEQ will use the list to guide their pollution prevention efforts. In addition, the statute required that Oregon’s 52 largest municipal wastewater treatment plants develop plans for reducing priority persistent pollutants through pollution prevention and toxics reduction programs by 2011. The WWTP is part of the program, and two rounds of sampling have been completed. Based on first round results, only cholesterol and coprostanol were detected at levels above the plan initiation level. DEQ has initiated a rulemaking that would temporarily suspend the requirement to develop reduction plans for these two compounds.

The list of persistent pollutants compiled by DEQ includes a total of 118 toxic pollutants divided into two categories: substances that currently persist in the environment or accumulate in the tissues of humans, fish, wildlife or plants; and legacy pollutants that have been banned or restricted for several years but remain at detectable levels in sediment and tissue samples. Persistent pollutants include polycyclic aromatic hydrocarbons, halogenated flame retardants, pesticides, pharmaceuticals, perfluorinated surfactants, and heavy metals, to name a few. If any compounds are found to exceed the action limit, the District would be required to develop a pollution reduction plan for that compound, but no effluent limit would be included in the permit.

4.1.6.2 Sanitary Sewer Overflows

Schedule F, Condition B6 of the NPDES Permit defines overflows and includes a requirement to report overflows to DEQ within 24 hours. Reporting procedures are detailed in Schedule F, Condition D5. The District has reported all SSOs to DEQ. DEQ uses its discretionary power to determine when to issue a notice of violation and when to assess fines. The details of this policy are described in DEQ's IMD on SSOs (DEQ, 2010).

While implementation of the policy is complex, the implications to the District are reasonably clear. First, the potential for third party lawsuits will increase if and when there are overflows under the current permit. Both for protection from such third-party actions and to reduce the likelihood of fines, the District should prepare and implement a Capacity Management and Operation and Maintenance (CMOM) plan for the wastewater collection system.

4.1.7 Reuse Standards

OAR 340-55 details the requirements for using reclaimed water for reuse, which would apply if the District elects to implement a reuse program. An understanding of these standards is crucial in the development of evaluation criteria and the assessment of potential reuse sites. The OAR requirements are summarized in Table 4-4 and a summarization of information is found in the DEQ IMD *Implementing Oregon's Recycled Water Rules* (DEQ, June 2009).

To eliminate the potential for surface runoff and groundwater contamination, water must be applied at agronomic rates. This means that the water and any constituents in the water, such as nitrogen or phosphorus, cannot be applied at rates greater than the uptake rate of the crop. Because municipal wastewater treatment plant effluent has relatively low levels of nitrogen and phosphorus, supplemental nitrogen often must be added as fertilizer to optimize crop yield. Therefore, the water application rate is nearly always the limiting factor.

Table 4.4 Recycled Water Standards Summary

Requirement	Treatment Level: Nondisinfected	Class D	Class C	Class B	Class A
Treatment, Processes Required					
Fully Oxidized	Required				
Disinfection	—[a]	Required			
Filtration	—				Required
Effluent Limits					
Total Coliform (organisms/100 mL)					
Two consecutive samples	—		240	—	
7-day median			23	2.2	
Maximum in any sample			No limit	23	
Monitoring frequency			1 per week	3 per week	1 per day
E. Coli					
30-day log mean	—	126	—		
Maximum in any sample		406			
Monitoring frequency		1 per week			
Turbidity (NTU)					
24-hour mean	—				2
5% of time during a 24-hr period					5
Maximum at any time					10
Monitoring frequency					Hourly
Application Restrictions					
Public access	Prevented (e.g. fences, locked gates)	Restricted during irrigation. Notice required[b]			Notice required[c]
Property line setback for direct soil application, feet	Established in RWUP	10		—	
Property line setback for sprinkler irrigation, feet	Established in RWUP	100	70	10	—
Irrigation setback from water supply source, feet	150	100		50	—
Setback from sprinkler irrigation to food preparation area or drinking founding	Established in RWUP	70		10	No direct spray onto areas of concern
Agricultural Use Restrictions					
Fodder, fiber, and seed crops not for human ingestion	Harvesting restrictions[d]	Harvesting restrictions[e]	Notice required[b]		Allowed
Commercial timber					
Firewood	*Not allowed*				
Ornamental nursery stock		Harvesting restrictions[e] and Notice required[b]			
Christmas trees					
Sod					
Pasture for animals		Animal contact restrictions[f]			
Processed food crops			Harvesting restrictions[e] and Notice required[b,d]		
Orchards and vineyards			Ground restrictions[g]		
Industrial, Commercial, or construction uses			Contact restrictions[h]		
Stand Alone Fire Suppression, non-residential toilet flushing				Allowed	
Agricultural or horticultural					
Landscape Irrigation, residential or accessible to public					
Groundwater Injection[i]					

(a) — indicates a treatment process not required or no limit.
(b) Personnel/Public at use area must be notified that recycled water is not safe for drinking.
(c) For Class A, the public and personnel at the use area must be notified if spray irrigation is used.
(d) Irrigation with undisinfected recycled water is prohibited for 30 days before harvesting.
(e) Irrigation with recycled water is prohibited for three days before harvesting.
(f) Animals used for production of milk must be restricted from direct contact with recycled water.
(g) Edible portion of crop must not contact the ground, and fruit or nuts may not be harvested off the ground.
(h) For certain industrial, commercial or construction uses, the public must be restricted from direct contact with recycled water.
(i) Class A recycled water is only permitted to be discharged into the vadose zone and requires review by Underground Injection Control staff.

4.2 CURRENT DISCHARGE PERMIT

This section provides an overview of the limitations included in the current NPDES permit, followed by a discussion of the WWTPs ability to meet these requirements. The NPDES permit for the District's WWTP was issued on September 17, 2020. The NPDES permit was subsequently modified on June 22, 2022 to allow for additional time to meet the compliance schedule milestone dates. A copy of the NPDES permit and the June 22, 2022 modification are provided as Appendix B.

4.2.1 Limitations Overview

The requirements for discharge to the Klamath River based on the issued NPDES permit, driven largely by the TMDL, are summarized in Table 4-5.

Table 4-5. Discharge Requirements[a]

Parameter	Units	Monthly Average,	Weekly Average	Daily Maximum	Semi-Annual Average	
					May 15 – October 15	October16 – May 14
BOD	mg/L	30[b]	45[b]	-	-	
	ppd	500[b]	750[b]	1,000	251	367
TSS	mg/L	85[b]	130[b]	-	-	-
	ppd	1,400[b]	2,300[b]	2,800	-	-
Phosphorous	ppd	-	-	-	4.9	36
Nitrogen	ppd	-	-	-	318	448
Ammonia as N	mg/L	0.7	-	1.7	-	-
Chlorine residual	mg/L	0.010	-	0.015	-	-
Mercury	µg/L	0.01	-	0.02	-	-
Temperature	°C	-	-	32[c]	-	-
				28[d]		
Other Parameters[c]						
E. coli Bacteria		126 organisms per 100 mL monthly geometric mean no single sample may exceed 406 organisms per 100 mL				
BOD_5 and TSS removal efficiency		Must not be less than 65% monthly average.				
pH (year-round)		Within the range of 6.5 - 9.0 (inclusive).				
Excess Thermal Load (ETL)		Daily calculated ETL Limit.				

(a) See Appendix B for complete permit requirements.
(b) Mass load limits based on 2.0 mgd flow.
(c) June 1 - September 20
(d) October 1 – May 31. Applies when receiving water temperatures exceed 28°C.

The BOD and TSS concentration limits presented above would be revised with the construction of a mechanical treatment facility. The revised limits would be based on basin standards for the Klamath River as specified in OAR 340-041-0185(4). During the dry season (May 1 – October 31), the BOD and TSS limits would be 20 mg/L as a monthly average. During the wet season (November 1 – April 30), the BOD and TSS limits would be 30 mg/l. The corresponding mass limits for BOD and TSS would also be revised to reflect the basin standard concentration limits. Additionally, the BOD and TSS removal efficiency would be revised to 85%. The updates to the BOD and TSS limits do not affect the TMDL-specified, semi-annual mass limits for BOD.

The ETL limit referenced in Table 4-5 is calculated as follows:

<u>June 1 through September 30:</u>

$$ETL = 0.05 \times [(Q_E \times 1.5472) + Q_R] \times 2.4467$$

<u>October 1 through May 30:</u>

$$ETL = 0.03 \times [(Q_E \times 1.5472) + Q_R] \times 2.4467$$

where:

ETL = Daily excess thermal load limit (million kilocalories/day)

Q_E = The daily mean effluent flow (mgd)

Q_R = The daily mean river flow rate, upstream (cfs)

When river flow is ≤ 104 cfs, Q_R = 104 cfs

When river flow > 104 cfs, Q_R is equal to the mean daily river flow, upstream.

The compliance equation to be used to show daily ETL compliance is as follows:

Daily Effluent Excess Thermal Load = $(T_E - T_R) \times Q_{E+} \times C_F$

where:

T_R = The applicable river temperature (°C) measured at Link River (USGS 11507500)

T_E = The daily mean effluent temperature (°C)

Q_E = The daily mean effluent flow (mgd)

C_F = Conversion factor using flow in mgd: 3.785

4.2.2 Nutrient Limits

Figure 4-2 and Figure 4-3 illustrates the nitrogen and phosphorus load requirements in the NPDES permit compared with the current nitrogen and phosphorus effluent loadings, respectively. The data presented is based on the effluent flows and the monthly phosphorous and nitrogen concentrations as reported in the 2018 through 2021 DMRs. As shown in the figure, the phosphorus loads are consistently higher than the loading limit and the nitrogen loads are occasionally higher than the limits.

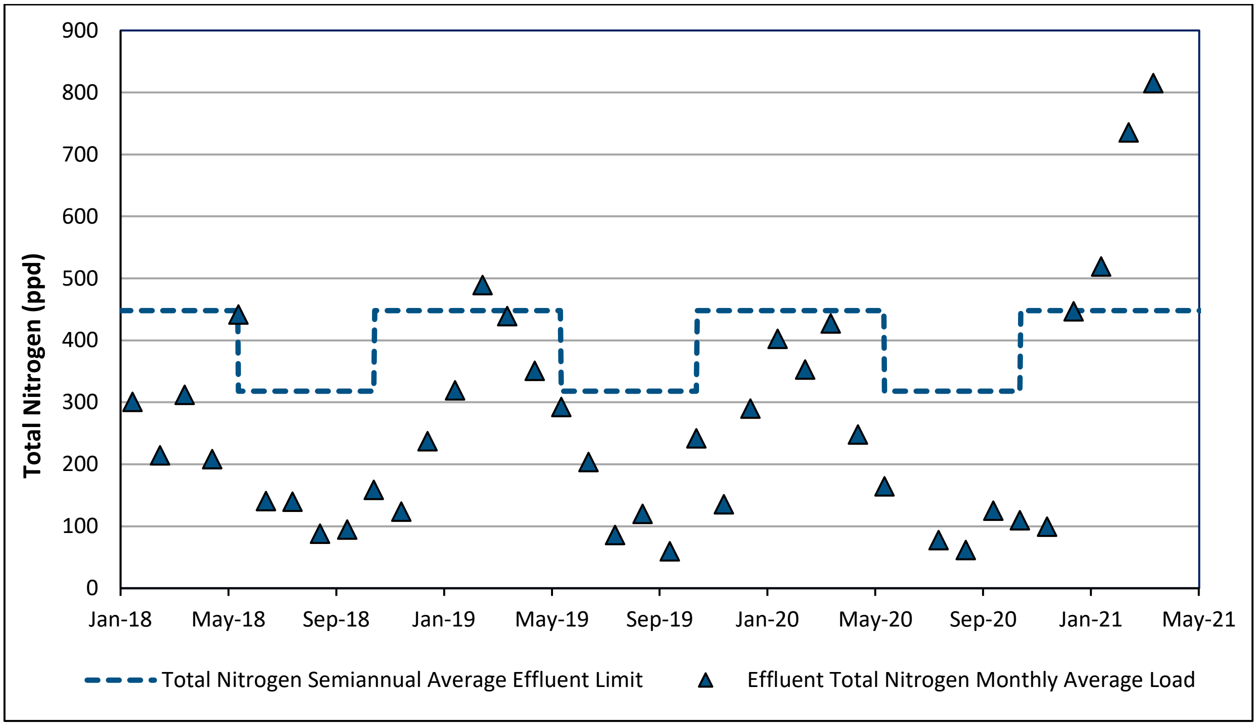


Figure 4-2. 2018 - 2021 Effluent Nitrogen Loading and Associated TMDL Limits

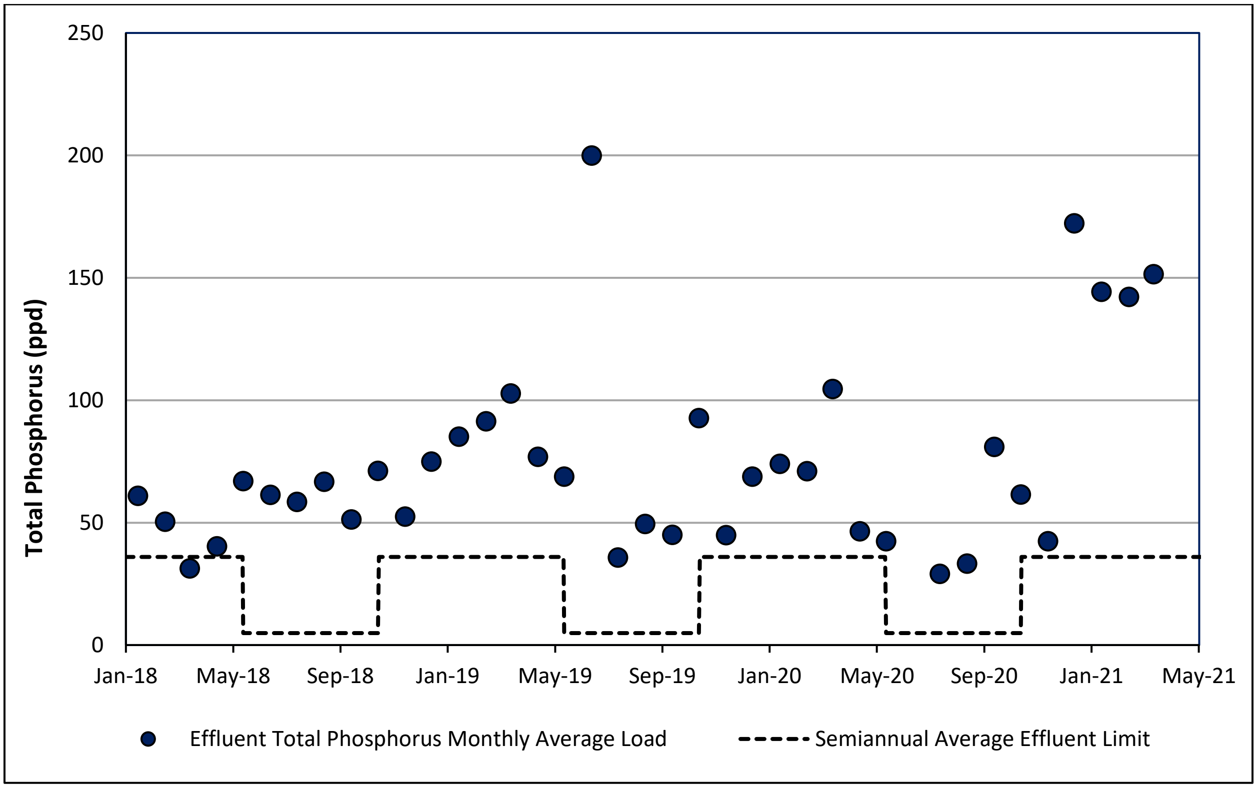


Figure 4-3. 2018 - 2021 Effluent Phosphorous Loading and Associated TMDL Limits

Figure 4-4 presents the effluent ammonia concentrations reported in the DMRs compared to the ammonia limitations. As shown, the maximum daily and average monthly limits both have historically been exceeded during the winter months.

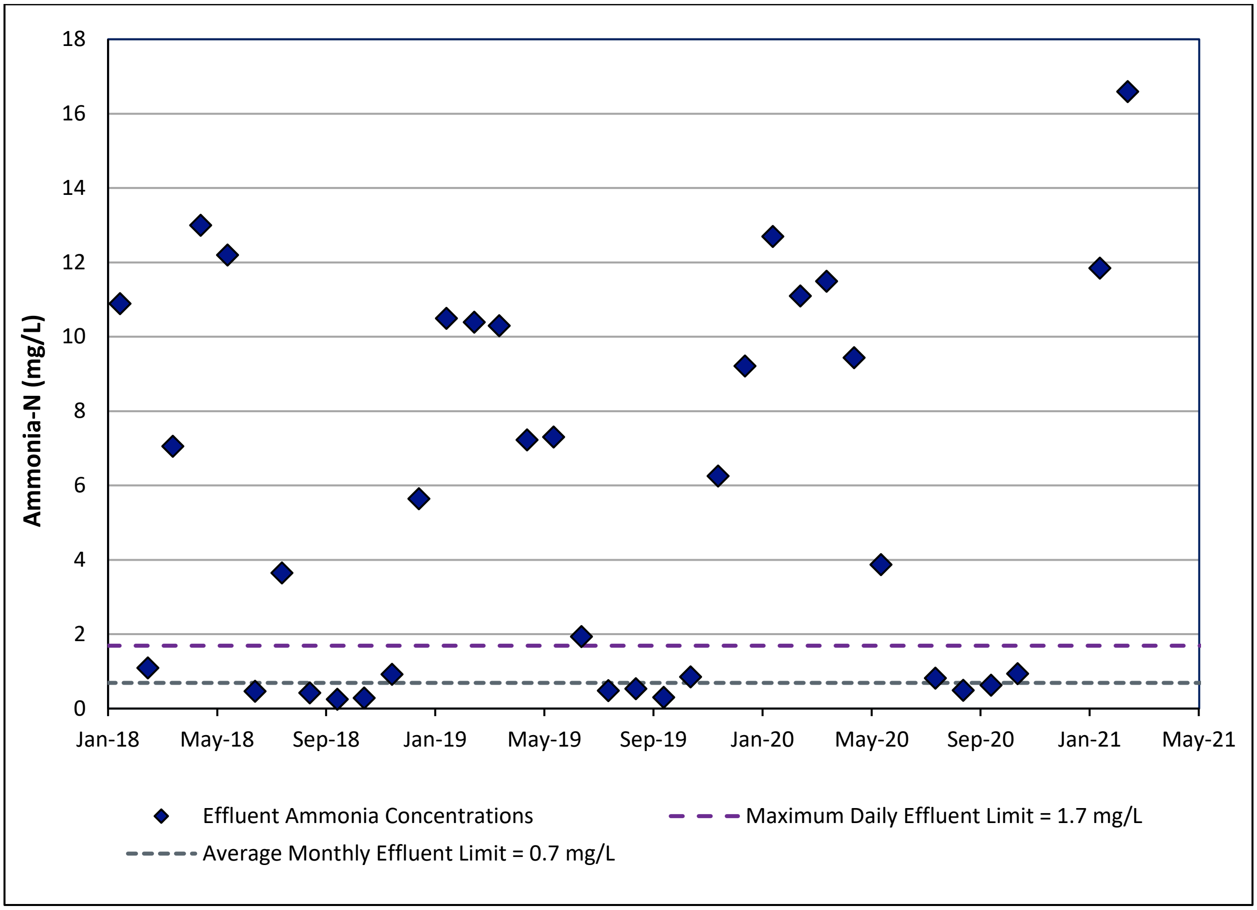


Figure 4-4. 2018 - 2021 Effluent Ammonia Concentrations and Final NPDES Permit Ammonia Limits

Based on the information presented above, continued discharge of the effluent into the Klamath Basin will require more advanced treatment methods to remove nutrients.

4.2.3 BOD Limits

The TMDL-based BOD loading limits result in concentration-based limits that are lower than the 30 mg/L monthly average limit and thus will drive the requirement for the effluent water quality. Figure 4-5 presents the effluent daily and monthly average BOD loads reported in the 2021 DMRs in comparison to these loading limits. As shown, the BOD limit for the current NPDES permit would be exceeded in some dry season months. As flowrates increase in the future, it is expected that these loadings will increase as well. The loadings are projected to rise approximately 5 percent over the next 20 years.

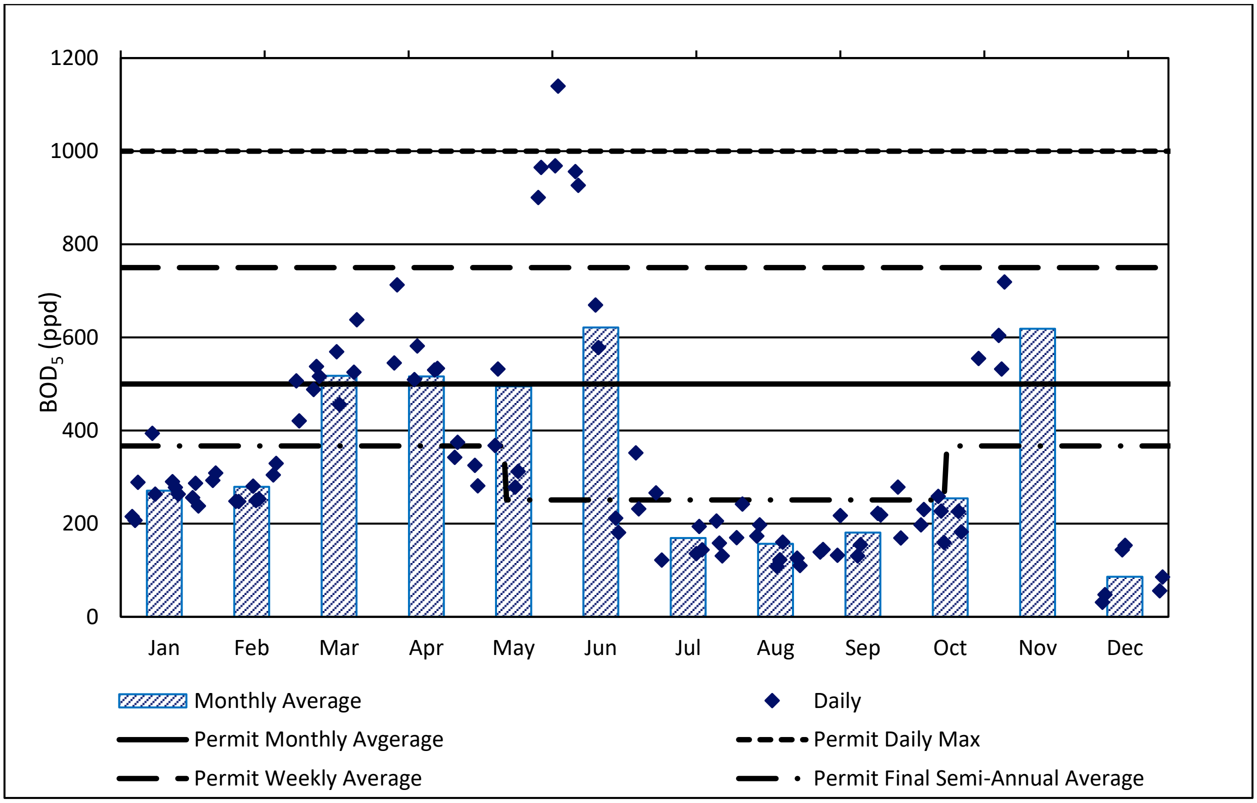


Figure 4-5. 2021 Effluent BOD Loads and the Current and Final NPDES Permit BOD Load Limits[1]

[1] As noted in Section 4.2.1, the current BOD concentration and mass limits would be revised to reflect basin standards for the Klamath River with the construction of a mechanical treatment facility.

4.2.4 TSS Limits

The NPDES permit includes concentration and mass limits for TSS. The TSS concentration limits are based on Oregon-specified adjustments to the secondary treatment standards for waste stabilization ponds as allowed for in 40 CFR 133.105. Figure 4-6 presents the effluent daily and monthly average TSS loads reported in the 2021 DMRs in comparison to the monthly average loading limit. As shown, the wet season TSS limits of 1,400 ppd was exceeded in March 2021.

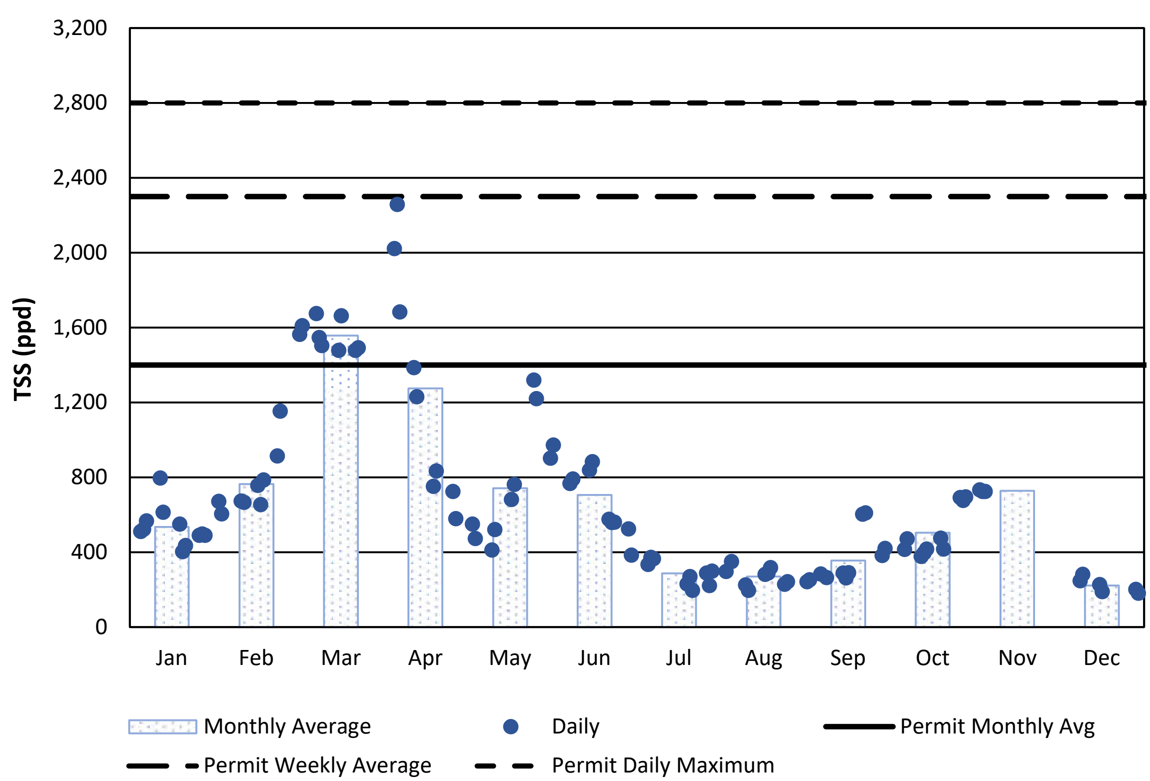


Figure 4-6. 2021 Effluent TSS Loading and Current NPDES Permit TSS Load Limits[2]

4.2.5 Temperature Limits

As noted above, the permit's ETL Limit is calculated daily based on the effluent and receiving water flows. The allowable daily ETLs are then calculated using effluent temperatures and flow data in combination with receiving water temperature data. The existing treatment ponds allow for cooling of the effluent, and thus the effluent ETL does not generally exceed that ETL limit. However, if the ponds were no longer used for treatment, which could be necessary to meet the nutrient limitations previously discussed, then it may be more difficult to meet the ETL limits.

[2] As noted in Section 4.2.1, the TSS concentration and mass limits would be revised to reflect basin standards for the Klamath River with the construction of a mechanical treatment facility).

Figure 4-7 shows the ETL for 2021 compared with the ETL limits. To evaluate the compliance potential with and without the ponds, both influent and effluent conditions are considered. The gaps in the ETL-Influent, ETL-Effluent, and ETL Limit data are where there was not discharge flow or temperature data available to calculate the ETL values. As shown, the effluent reliably meets the ETL limits year-round, while the influent wastewater would exceed the ETL limits during the winter months.

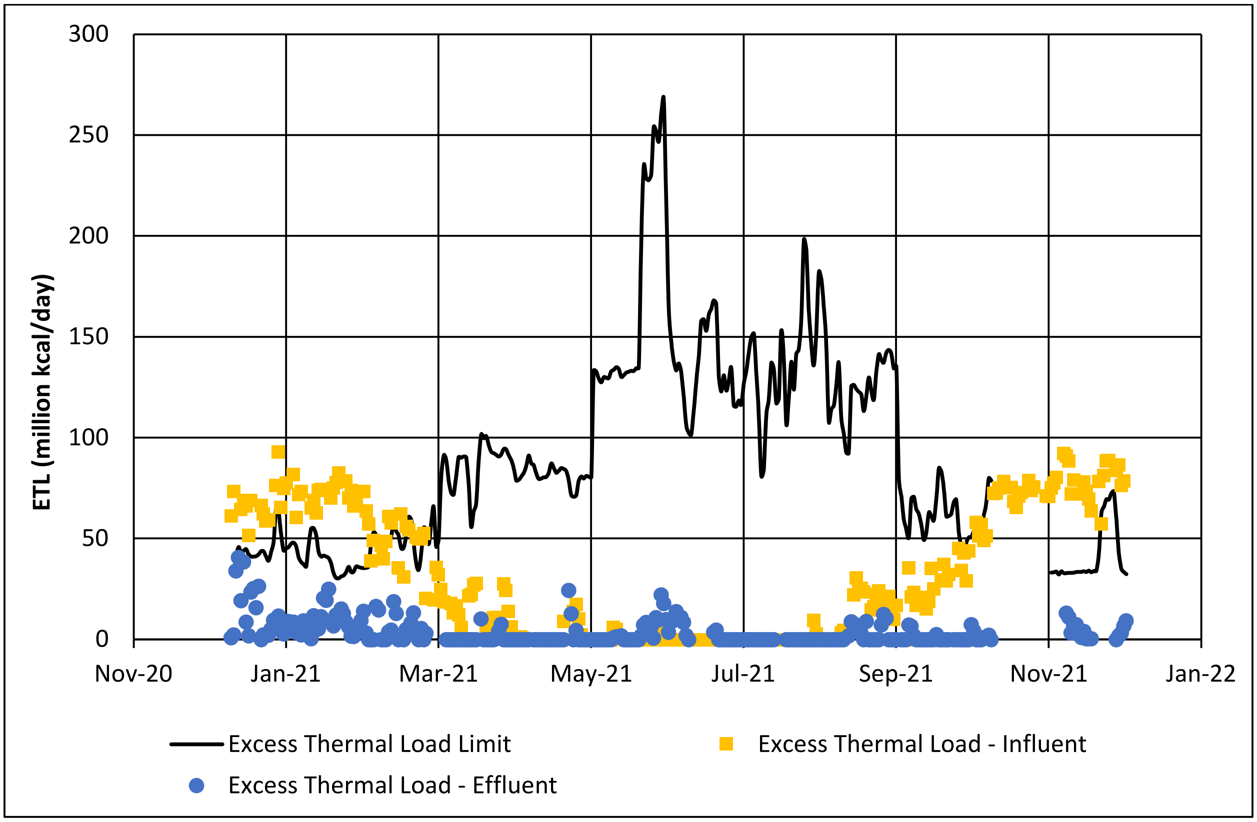


Figure 4-7. 2021 Influent Temperatures, Effluent Temperatures, and Excess Thermal Load Limit

4.3 AGING INFRASTRUCTURE

The existing lagoon treatment system cannot meet the nutrient removal treatment requirements proscribed under the current permit. Consequently, new treatment facilities will be required and the alternatives are assessed as part of this Facilities Plan Update. Some of the existing treatment facilities can be integrated into any of the alternatives including the influent pump station, the screening structure, the lagoons and the effluent pump station and outfall. Improvements required to incorporate these facilities into future treatment trains is discussed in Chapter 5.

4.4 REFERENCES

DEQ. 2009. June 2009. *Internal Management Directive: Implementing Oregon's Recycled Water Rules*. Accessed at https://www.oregon.gov/deq/Filtered%20Library/RecycledWater.pdf.

DEQ. 2010. December 2010. *Internal Management Directive: Sanitary Sewer Overflows (SSOs)*.

DEQ. 2019a. January 2019. *Upper Klamath and Lost River Subbasins Nutrient TMDL and Water Quality Management Plan*. Accessed at https://www.oregon.gov/deq/FilterDocs/UKlamathLostRiverTMDL.pdf.

DEQ. 2019b. September 2019. *Upper Klamath and Lost Subbasins Temperature TMDL and Water Quality Management Plan*. Accessed at https://www.oregon.gov/deq/wq/Documents/tmdlUpKLosttempTMDL.pdf.

DEQ. 2022. September 2022. "EPA Approved Integrated Report." Accessed at https://www.oregon.gov/deq/wq/Pages/epaApprovedIR.aspx . Accessed on September 20, 2022.

CHAPTER 5
Alternatives Considered

A description of the wastewater management alternatives that have been evaluated as part of the facilities planning process are presented in this chapter. The following topics are addressed:

- Alternatives 1A and 1B: Upgrade the WWTP for Klamath River Surface Water Discharge
- Alternative 2A and 2B: Upgrade the WWTP for Irrigation District Surface Water Discharge
- Alternatives 3A and 3B: Class A Recycled Water for Agricultural Irrigation with Onsite Storage
- Alternatives 4A and 4B: Class A Recycled Water for Agricultural Irrigation with Offsite Storage
- Screened Alternatives Identified as Not Viable

The cost estimates and non-economic rating for the alternatives are detailed in Chapter 6 along with a conclusion regarding the preferred alternative. The Recommended Alternative Implementation Plan is detailed in Chapter 7.

5.1 ALTERNATIVE 1A AND 1B: UPGRADE PLANT FOR KLAMATH RIVER SURFACE WATER DISCHARGE

The new nitrogen and phosphorus removal treatment requirements set forth in Chapter 4 are among the most stringent in the state. In addition to the current permit standards, the new advanced treatment system will need to be capable of producing Class A biosolids. Klamath County has placed a ban on land application of Class B biosolids and due to the District's remote location, landfill disposal of biosolids is cost prohibitive. Therefore, production of Class A solids is needed to allow for cost-effective biosolids management.

Several agencies in Oregon, including Clean Water Services of Washington County and the City of McMinnville, comply with nitrogen and phosphorus removal requirements similar to those included in the District's permit using advanced wastewater treatment technologies. Indeed, there are a wide range of approaches that could be employed to achieve the treatment objectives. In addition, there are numerous ways the treatment facilities could be configured to take advantage of the existing infrastructure for treatment or flood protection that could be explored.

The District has decided that an Alternative Delivery approach will be used to identify the most economical approach to meeting the objectives for this alternative. Therefore, if this alterative is selected by the District as the recommended project, the District would pursue an Alternative Delivery contract and the selected Alternative Delivery Contractor will be fully responsible for developing the preferred strategy. By using an Alternative Delivery project delivery approach, the District expects to secure benefits for its customers. These benefits include: cost savings, integration of design and construction teams to develop a better and more reliable facility, reducing the risk to the District by contracting compliance and performance responsibility to the Alternative Delivery team, incorporation of innovative technology, and competitive selection of the best Alternative Delivery team. The Alternative Delivery procurement approach will ensure that DEQ will receive a complete set of plans for review prior to initiation of construction.

For this analysis two potential treatment trains: MBR (combined with a system to produce Class A biosolids) and a propriety system being offered by E3 Water LLC are presented. Both strategies assume the existing ponds will be used for flow equalization upstream of the treatment process and for temperature attenuation downstream of the treatment process. Both of the proposed strategies would comply with all of the current permit requirements and would move away from relying on the existing pond system to achieve the treatment objectives with the exception of temperature. These treatment approaches are example projects that demonstrate a satisfactory, but not necessarily optimal, approach to meeting the stated objectives for this alternative.

5.1.1 Components Common to All Surface Water Discharge Alternatives

As stated above, both treatment strategies evaluated in this Facilities Plan under Alterative 1 assume the existing ponds will be used for flow equalization upstream of the treatment process and for temperature attenuation downstream of the treatment process. This section discusses the improvements needed to the existing facilities to support this approach. A schematic showing a potential strategy for meeting these objectives is provided on Figure 5-1. As detailed in Appendix A, a portion of the site north of the existing treatment ponds was delineated as wetland area. The final layout of the proposed new treatment facilities shown on Figure 5-1 would need to avoid any wetland areas.

5.1.1.1 Peak Flow Treatment and Storage

Significant savings will be realized if Pond 4A and 4B are used to treat and dispose of peak flows that exceed a nominal treatment capacity for the advanced surface water discharge treatment system. When the influent flow exceeds the capacity of the surface water discharge treatment system, excess flows would be conveyed to Pond 4A and 4B for treatment and disposal via evaporation.

A water balance analysis was completed to evaluate whether a 3.0 mgd capacity advanced treatment system is appropriately sized given the treatment and disposal capacity can be provided by Pond 4A and 4B. To ensure adequate treatment, the basis for design is the 2045 projected flow that exceeds 3.0 mgd and the application of a wet year followed by an average year.

An analysis of influent flow data over the last eleven-year period since the District has made major collection system I&I improvements was completed to define how much flow would theoretically be entering Pond 4A and 4B in both a wet and average year. This analysis is shown in Table 5-1. The data shows that there is not a strong correlation between flows entering the WWTP above 3.0 mgd and the total annual rainfall. Nevertheless, over the period of record, the maximum total flow and maximum number of days in a year when flows exceed 3.0 mgd occurred in 2017. The total annual volume of water entering the WWTP in 2017 that exceeded 3.0 mgd is estimated to be approximately 42 Mgal. This condition is assumed to represent the flows entering the WWTP in a wet year. For the average year, the 2016 conditions shown in Table 5-1 are applied.

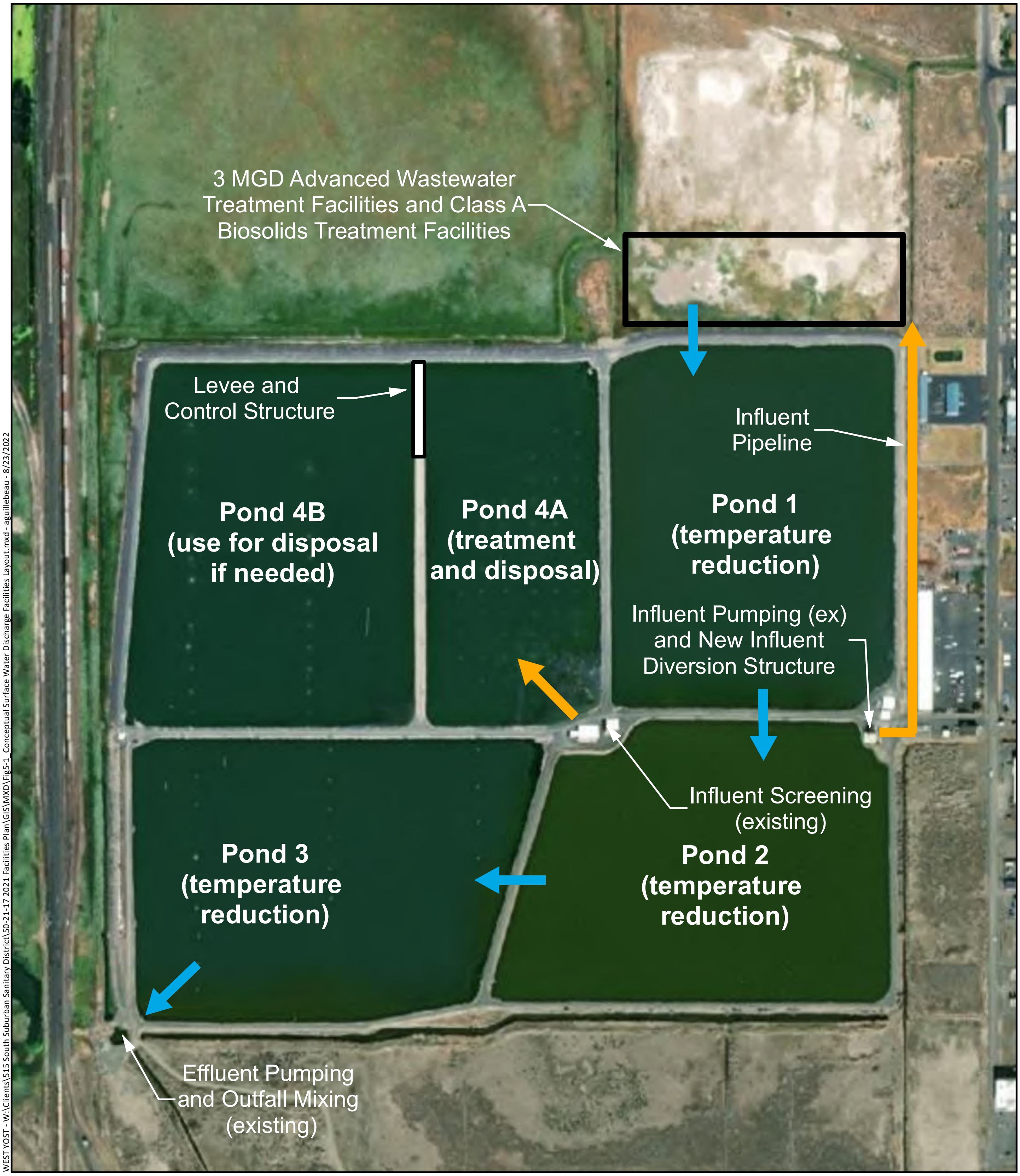


Figure 5-1

Conceptual Surface Water Discharge Facilities Layout

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South Suburban Sanitary District
Wastewater Facilities Plan

Table 5-1. 2045 Influent Flows Exceeding 3.0 mgd				
Year	Total Influent Flow, Mgal	Days Influent Flow Exceeds 3.0 mgd, number	Projected 2045 Influent Flow Exceeding 3.0 mgd[(a)], Mgal	Rainfall, in
2009	884	10	2.6	8.9
2010	840	9	4.1	10.5
2011	944	50	17.5	7.1
2012	883	3	0.6	9.8
2013	782	4	2.1	5.4
2014	737	4	1.5	14.9
2015	726	1	0.1	11.0
2016	880	37	25.4	12.0
2017	900	57	42.0	10.2
2018	725	0	0.0	9.2
2019	891	55	29.6	13.4
2020	709	8	3.1	7.1
(a) Calculated by applying the projected service area growth rate discussed in Chapter 3 to the recorded daily influent flow value.				

A summary of the water balance analysis is shown in Table 5-2 and the detailed water balance model is provided in Appendix C. As shown, the maximum volume needed in Pond 4B is estimated to be approximately half the total volume available. Therefore, even with the uncertainty in the total flows entering the WWTP during a very wet year, there appears to be more than enough disposal capacity in Ponds 4A and 4B to handle the projected influent flows exceeding the capacity of a 3.0 mgd advanced wastewater treatment system. Moreover, the District could use a portable pump divert some flow from Pond 4A to the advanced surface water discharge treatment system during lower-flow periods for treatment and discharge if needed in a very critical water year condition. Therefore, it is concluded that it will be possible to size the advanced treatment system for 3.0 mgd and direct the rest of the flow to Pond 4A/4B for treatment and disposal.

Table 5-2. Alternatives 1A and 1B Flow Equalization Design Criteria		
Item	Value	Units
Design year	2045	--
River discharge	None(a)	--
Design Flows		
Maximum daily flow to advanced treatment system	3.0	mgd
Wet Year flow to pond system	42.0	Million Gallons
Average Year flow to pond treatment system	25.4	Million Gallons
Average annual rainfall (Wet Year)	20.3	inches
Average annual rainfall (Average Year)	13.7	inches
Storage requirements		
Total storage in Pond 4A(b)	53.3	ac-ft
Storage required in Pond 4B(b)	95.2	ac-ft

(a) Discharge will only occur from the new advanced treatment system,
(b) Equals maximum available storage assuming a minimum water depth of 6 feet will be maintained.
(c) Total available storage volume in Pond 4B is 235.7 ac-ft

To allow for the use of Pond 4A and Pond 4B for peak flow attenuation and disposal, these ponds would need to be improved through the installation of a new geomembrane pond liner in Pond 4A[1] and a new flow control structure separating Pond 4A and 4B. The existing partial levee separating ponds 4A and 4B would be extended to separate the ponds and flow control structures constructed between the two ponds so that flow would only enter Pond 4B once the storage capacity of Pond 4A is exceeded. An HDPE liner would be installed in Pond 4A[2]. However, Pond 4B would be storing treated wastewater. Therefore, beyond solids removal, Pond 4B would remain as is except the effluent flow control structure would be modified, as needed, to prevent inadvertent discharges from this pond to Pond 3. The District will also test Pond 4B to confirm it is constructed to provide a minimum coefficient of permeability of 1.0×10^{-7} cm/s.

Before the above-listed improvements could be made, an estimated 23,100 wet tons[3] of sludge from Pond 4A and 4B would first need to be removed and hauled off site. it is assumed the District would be able to land apply these solids on nearby agricultural properties. To allow for land application, the District would either need to test the solids to demonstrate they meet Class A requirements or would need to provide additional treatment using the new advanced treatment facilitates. To accommodate this latter approach, some (or possibly all) of the solids handling facilities described later in this chapter would first need to be constructed. The District could accomplish this through a phased construction approach or by

[1] It may be possible to rely on the existing clay liner for Pond 4A if the coefficient of permeability can be demonstrated to be less than of 1.0×10^{-7} cm/s. Consultation with DEQ will be needed to confirm lining requirements. For purposes of this report, it has been assumed that a membrane liner is required for Pond 4A because it will be holding untreated wastewater.

[2] Existing aerators would need to be removed and replaced to accommodate this installation.

[3] Solids removed from Pond 4 area assumed to be 1.25 the mass removed from Pond 1 in 2021 (approximately 18,500 wet tons).

implementing the project in two phases overall, where the Pond 4 improvements are completed after the advanced treatment facilities are brought online.

5.1.1.2 Temperature Attenuation

As discussed in Chapter 4, the influent to the WWTP cannot comply with the temperature requirements during the winter months and the discharge from the surface water discharge treatment plant would be expected to only a one or two degrees lower than the influent wastewater temperature. However, the required temperature reduction can be achieved using one or more of the existing ponds. For this alternative, it is assumed that the effluent from the surface water treatment system would be discharged to the ponds for temperature reduction and the ponds would also provide conveyance from the treatment system to the existing outfall.

No major improvements are needed to allow for the use of Ponds 1, 2 and/or 3 for temperature attention downstream of the surface water discharge treatment facilities. However, the storage facilities for treated wastewater must be constructed to provide a minimum coefficient of permeability of 1.0×10^{-7} cm/s. Over the next few years, the District will drain Ponds 2 and 3, remove the solids from the ponds, and test the ponds to confirm their permeability. The District will also consult with DEQ to confirm lining requirements. It is also assumed that a solar-mixing system would be installed in the ponds to help mitigate algae growth in the summer and prevent freezing in the winter.

Solids removal from Pond 1 occurred in 2021 and approximately 18,500 wet tons of solids were removed and sent to a landfill for disposal. Pond 1 permeability testing will occur in 2022. Ponds 2 and 3 are expected to be drained and cleaned over the next few years. Pond 1 was historically the primary treatment pond for the facility and thus had significant solids accumulation. Therefore, Ponds 2 and 3 are assumed to have approximately half the mass of solids that were removed in Pond 1, or 9,200 wet tons of solids. The solids removed from Ponds 2 and 3 will need to be disposed of offsite, and it is assumed for this analysis these solids can be land applied on nearby agricultural properties. It is further assumed that the District would be able to test the solids and demonstrate they meet Class A requirements.

5.1.1.3 Influent Pump Station (Existing)

The existing raw sewage pump station was designed to have an ultimate capacity of 30 mgd. The four existing pumps have a capacity of 2,550 gpm each so the firm capacity of the pump station is 7,650 gpm or 11 mgd with one pump out of service. With the PWWF capacity projected at 6.8 mgd, the existing pump station has more than adequate capacity to handle the 2045 flows.

5.1.1.4 Influent Screening (Existing)

The existing mechanically raked bar screen has a capacity of 21 mgd. This system would be maintained and used to screen flows that are pumped directly to the ponds when the influent flow exceeds the capacity of the advanced treatment system. Due to the intermittent use of the screening system under this alterative, no major improvements to the screening facility would be needed and the condition-related improvements discussed below will be adequate to allow for the reliable use of this facility over the life of the Project.

5.1.1.5 Additional Site Improvements

Because the existing infrastructure will be used for flow attenuation and temperature reduction, this alternative also includes improvements at the WWTP to allow for continued and reliable operations over the next 20 years. These improvements, which were identified as through a condition assessment of the facility and discussed in Chapter 3, include:

- Installation of a new wet well spray system at the influent pump station
- Replacement of the blower used for aeration of the channel downstream of the bar screens in the headworks
- Replacement of the headworks sump pump
- Ventilation improvements in the headworks

In addition to these improvements, asphalt repaving is needed in several areas around site.

5.1.2 Alternative 1A – Membrane Bioreactor Treatment

Membrane Bioreactors (MBRs) are a state-of-the-art membrane treatment technology that would be capable of meeting the discharge standards, with the exception of temperature. This system, coupled with continued use of the existing ponds for flow equalization and temperature attenuation, will meet the requirements for surface water discharge as specified in the NPDES permit. In addition, a solids treatment process will be needed to meet the Class A biosolids standards identified for this alternative.

A schematic of the proposed treatment system for Alternative 1 is provided on Figure 5-2. As shown, influent flow not diverted to the equalization ponds would pass through fine screens prior to the MBR treatment system. Ultraviolet (UV) light disinfection would be used for disinfection of the MBR effluent and treated water would be discharged through the ponds for temperature reduction and then to the Klamath River via the existing outfall pump station, pipeline, and diffuser. Additional details regarding these treatment components are provided below.

5.1.2.1 Influent Pipeline and Pump Station Fine Screening System

A new flow control facility would be constructed to divert flow downstream of the influent pump station to a new influent pipeline that would convey flow to the property north of the existing treatment ponds where the new MBR system would be located. The structure would include an automated system for flow control to maintain the desired influent flow to the treatment system.

The pipeline would discharge to a new influent pump station sized for 3.0 mgd firm capacity that would lift the flow through the treatment system and out through Ponds 1, 2 and 3 for temperature attenuation and to the existing effluent pump station.

The discharge from the pump station would be directed to a new headworks/screening facility fitted with two fine screens with a capacity of 3.0 mgd each. Fine screening is required upstream of the MBR process to protect the membranes. MBR plants with fine screens have also been installed without grit removal since the coarser fraction of the grit can be captured by the fine screen. Screenings, grit and fine solids collected on the screens will need to be disposed in a landfill.

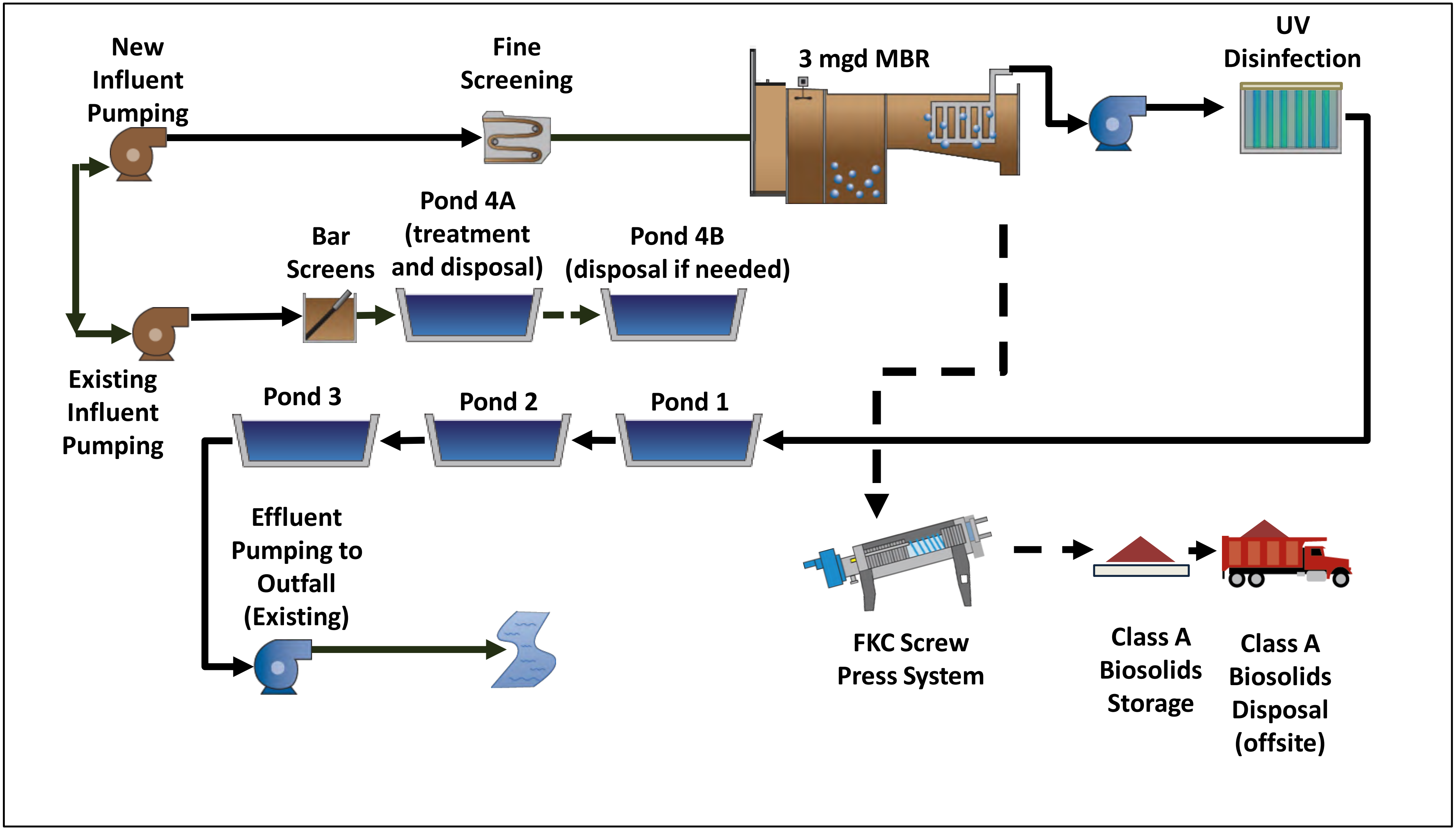

Figure 5-2

Alternative 1A: MBR Treatment for Surface Water Discharge

South Suburban Sanitary District
Wastewater Facilities Plan

5.1.2.2 MBR

The MBR system is assumed to be sized to accommodate a maximum month flow and load associated with 3.0 mgd of flows entering the WWTP. The system is assumed to consist of two parallel aeration basins, followed by three membrane channels, each sized for 1.5 mgd flow. The aeration basins are not assumed to be designed will full redundancy. Given the reliability of the system and the ability to divert flows to Ponds 4A/4B, the District should be able take one unit out of service during the summer, low-flow periods for maintenance. The membranes will have full redundancy under all flow conditions. There are several vendors of MBR technology. The cost and layout of the MBR system is premised on a system provided by Fibracast. The MBR tanks are assumed to be constructed above grade.

5.1.2.3 Disinfection System

Disinfection would be accomplished using UV light. Excellent quality of effluent is anticipated from the MBR plant which makes UV disinfection a preferred approach. Three UV reactors, each equipped with two UV banks, are assumed. Each reactor would have a 1.5 mgd capacity. Under normal operation, two units will be needed and one unit will always be a standby for redundancy. It is assumed that the UV system and associated control panels will be in a building.

5.1.2.4 Solids Management

A solids management program that will produce a Class A biosolids would provide a product that could be used for landscaping, fertilizer for farms and other beneficial uses. While treating sludge to Class A levels is more expensive than Class B, far more avenues for product reuse are available. This is particularly an issue for the District because land application of Class B biosolids is prohibited in Klamath County.

With the extended air activated sludge process and high SRT in an MBR system, the volatile solids will be reduced more than with a conventional activated sludge treatment plant. It is therefore feasible to achieve Class A using a lime stabilization plus heat dewatering system. The system assumed for this analysis is manufactured by FKC and is a skid-mounted unit that provides all of the required treatment system components including:

- Screw Press
- Flocculation Tank
- Conveyor
- Feed Pumps
- Polymer System
- Control Panel
- Rotary Screen Thickener
- Boiler Skid
- Lime Silo
- Lime Conveyor
- Lime Induction Tank
- Recirculation Pumps
- Lime and Sludge Mixing and Holding Tank

The screw press unit can process solids at an influent solids concentration of one percent and produce a Class A biosolids cake at 15 to 20 percent solids. The facility would include a building to house two screw press systems, a boiler for heating, and sludge feed pumps. Lime addition to stabilize the biosolids to Class A is also provided and these facilities include a concrete pad, secondary containment, and chemical feed and mixing system. Each screw press can process 35,000 dry lbs in 140 hours, which is the total hours of operation anticipated in one week.

5.1.2.5 Dewatered Biosolids Storage

Demand for soil amendments is typically greatest during the late spring and late summer (i.e. between cropping cycles). A covered, concrete storage pad would be sized to accommodate biosolids during those periods when production exceeds demand. It is assumed that a total of eight months storage would be required, which is estimated at 2,400 cubic yards of storage. A storage area of 19,000 square feet would be required. An approximate layout would consist of six bays that are 122-foot length, 17-foot width, and have 6-foot high walls three sides of the bay and the third side would be is open for the front loader to access.

5.1.2.6 Plant Utilities

Major plant utilities under this alternate are assumed to consist of the following:

- **Recycled Water (3 Water) Pump Station**: These pumps would provide treated effluent for hose stations, sprays, pump seal water, and other uses within the plant.
- **Plant Sewer**: Connections from new buildings and drains to capture runoff and return to the influent sewer.

5.1.3 Alternative 1B – Proprietary Treatment By E3 Water LLC

This treatment train would rely on technologies that are not currently used in the municipal wastewater industry including activated sludge treatment with nano bubble technology and electrochemical coagulation. These treatment processes would be followed by advanced filtration steps to produce a high-quality effluent. The solids produced by the treatment system would be stored onsite in drying beds before being used for land application. Additional details regarding this system cannot be provided due to is proprietary nature.

Discussions with E3 Water LLC were conducted in conjunction with developing this Facilities Plan. E3 Water LLC has indicated that it will be possible to meet all the water quality limitations applicable to surface water discharge with this treatment train, except for temperature. As noted previously, temperature limitations would be met using the existing ponds. In addition, E3 Water LLC has indicated that the treatment system will produce Class A biosolids. If the District were to pursue this approach to treatment, it is understood that the District would need to coordinate with DEQ for approval. Moreover, because the technologies used to treat the biosolids are also new to the industry, it may be necessary to rely on testing to demonstrate Class A treatment. Additional discussions with EPA will be needed to confirm the biosolids compliance strategy.

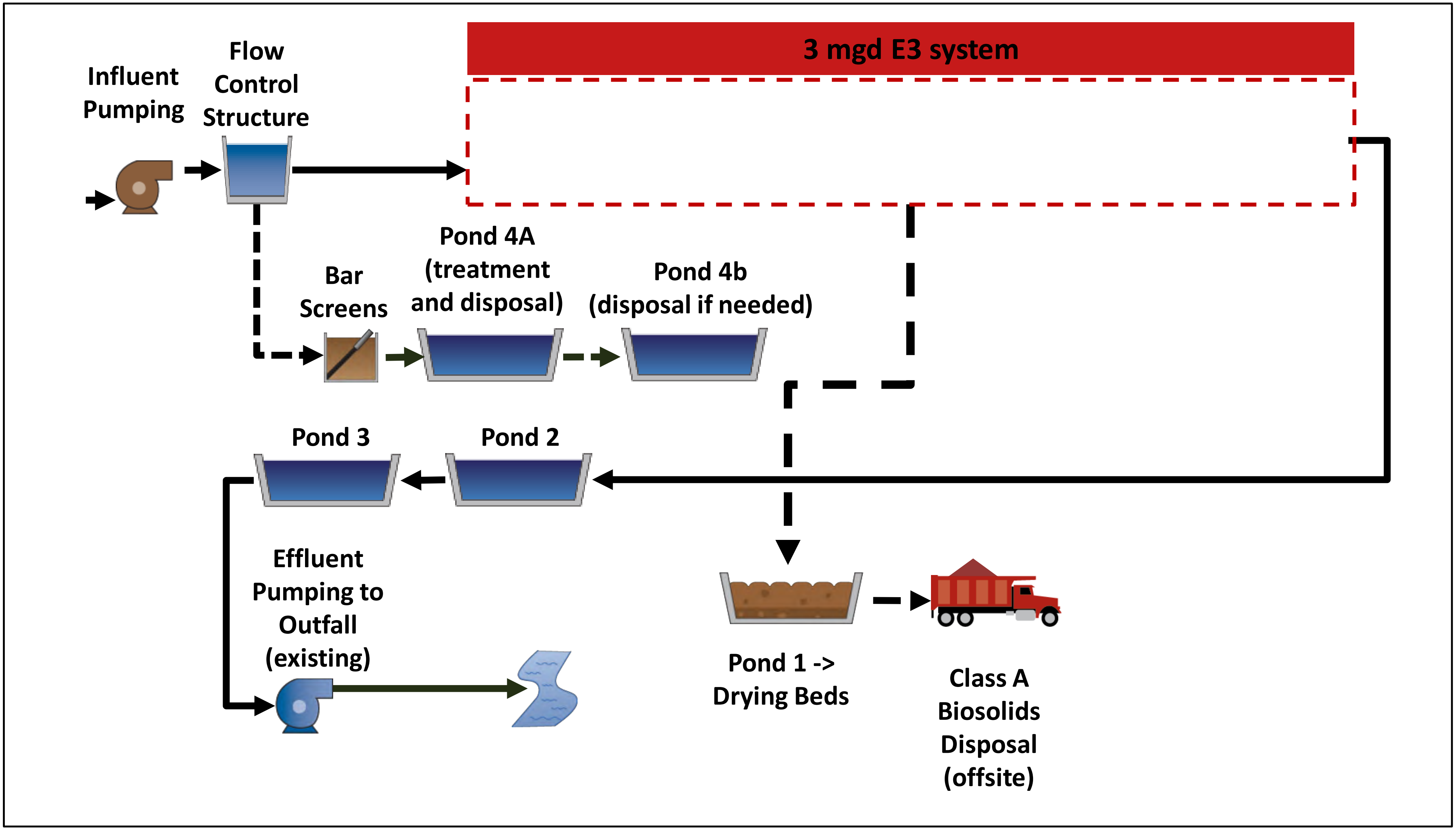

Figure 5-3

Alternative 1B: Proprietary Treatment for Surface Water Discharge

South Suburban Sanitary District
Wastewater Facilities Plan

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5.2 ALTERNATIVE 2A AND 2B: UPGRADE PLANT FOR IRRIGATION DISTRICT SURFACE WATER DISCHARGE

This alternative would rely on an advanced treatment train that is like those identified for Alternative 1A/1B. However, under Alternative 2A/2B, the effluent would be discharged at a location where it can be beneficially reused by a local irrigation district. The exact discharge location has not been defined and the District is currently working to identify whether there are interested parties in the area. The District is also exploring whether it would be possible to continue discharge at the existing location while working with a downstream irrigation district to purchase the rights to divert the discharge from the Klamath River. Note that the diversion of water from the Klamath River would require approval by the Oregon Water Resources Department.

For purposes of this analysis, it is assumed that the limitations applicable to the Klamath River discharge would be the same for the new discharge location. Moreover, it may be necessary for the District to initially implement Alternative 1A/1B while the details of a water transfer deal are developed and then take the additional steps needed to implement Alternative 2A/2B. These steps could include obtaining a an NDPES permit for the new discharge location, development of a water rights agreement, and design and construction of a discharge pump station and pipeline.

5.3 ALTERNATIVES 3A AND 3B: CLASS A RECYCLED WATER FOR AGRICULTURAL IRRIGATION WITH ONSITE STORAGE

Discontinuing discharge to the river by recycling water to irrigate agricultural land would eliminate the need for an NPDES permit and thus, the need to comply with the new TMDLs. For over two decades, the District has been evaluating the potential for using recycled water for irrigation. Following years of evaluation and coordination with local stakeholders, it has been determined that a recycled water alternative will involve production of Class A recycled water for irrigation on local farmland. The District also owns considerable property north of the existing treatment ponds that is large enough for storage of recycled water during periods when there are no irrigation demands.

The District will produce Class A water for recycling based on the Oregon rules regarding the use of recycled water. The present Pond 4A and 4B treatment system would be retained to provide oxidation of the wastewater and the remaining three ponds would provide some of the required recycled water storage. The Class A treatment system would include a dissolved air flotation thickener for algae removal, filtration facilities, disinfection facilities. Two different disinfection alternatives are being considered: chlorine disinfection (Alterative 3A) and UV light disinfection (Alternative 3B).

The District has identified the Henzel property as the preferred reuse location. This property is located approximately 9 miles south of the WWTP and has about 3,800 total acreage of irrigable land split into approximately equally sized halves. An agreement between the District and the property owner would need to be negotiated; however, initial discussions indicate that the District would lease the property from the landowner and then could sublease the property out for farming. The property owner has also indicated that the District could lease the entire property or just one of the halves of the property and that a long-term lease of 50 to 100 years would be feasible.

5.3.1 Recycled Water Storage

Recycled water will need to be applied at agronomic rates to comply with Oregon's recycled water use rules. The storage ponds would fill during the wet weather season when flows are high and crop irrigation is not taking place. Depending on the weather, irrigation would start in the spring and continue through September. The ponds would then need to be empty by the end of September/October to ensure adequate storage capacity for the following season. For this analysis, it is assumed that Ponds 1, 2 and 3 would be used for storage and that a new storage pond would be constructed on District-owned property north of the existing treatment ponds site.

5.3.1.1 Water Balance

A series of water balances have been completed to define the land and storage needs for this alternative. The basis for design for a year-round recycled water use system is the 2045 projected flow for the District and wet-year conditions (assume a 1-in-20-year annual rainfall return period). Like the equalization analysis, the 2017 flows were used to predict the flows entering the WWTP during the wet year conditions. The projected flow entering the WWTP based on the 2017 monthly values is provided in Table 5-3.

Table 5-3. 2045 Influent Flows in 1-in-20 Wet Year Conditions

Year	Total Influent Flow, mgd	Monthly Peaking Factor[(a)]
January	2.8	1.39
February	4.1	2.04
March	3.3	1.63
April	2.8	1.39
May	2.5	1.27
June	2.5	1.23
July	2.3	1.15
August	2.2	1.10
September	2.2	1.08
October	1.9	0.97
November	1.9	0.95
December	1.9	0.95
ABF	**2.0**	-
1-in-20 Year Annual Average Flow	**2.5**[(b)]	-

(a) Based on 2017 conditions.
(b) In an average rainfall year, the AAF would be 2.3 mgd (See Chapter 2).

The water balance summary results are shown in Table 5-4 and the detailed water balances are provided in Appendix D.

Table 5-4. Alternative 3A/3B Design Criteria

Item	Value	Units
Design year	2045	--
River discharge	None	--
Average annual rainfall (1-in-20 Year Wet Year)	20.3	inches
Land and storage requirements		
Irrigation area	640 – 960	acres
Storage volume total	1,580 – 1,800	ac-ft
New storage volume reservoir (minimum)	1,230 – 1,460	ac-ft
Existing storage volume (Ponds 1, 2 & 3)	345	ac-ft
Approximate reservoir size	90	acres
Irrigation system type	Center-Pivot Sprinkler	--

For a wet year, a total of 1,580 to 1,800 ac-ft of storage will be required depending on the crops being grown. The existing ponds can provide 345 ac-ft of storage. Therefore, a new storage ponds ranging in size from 1,230 – 1,460. Based on the land available on the existing property, a new storage reservoir with approximately 1,450 ac-ft of normal storage, plus 2 feet of freeboard would be provided. As discussed later in this section, the District will enter a long-term lease for the irrigated property and will have control over the types of crops grown. Therefore, 1,450 ac-ft volume is anticipated to be adequate meet the District's storage needs. The proposed layout of the treatment and storage facilities is shown on Figure 5-4. As with Figure 5-1, the final layout of the proposed new treatment facilities shown on Figure 5-4 would need to avoid delineated wetland areas.

The water balance model predicts that between 640 and 960 acres of land will be needed depending on the crops grown. The property under consideration for this analysis provides a total of 3,800 acres of irrigated area and will be more than adequate to meet the project needs. In fact, the District would only need to lease half of the property to provide the required irrigation area.

Treated Effluent
Raw Wastewater
Class A Recycled Water Treatment, Effluent Pumping, and Chlorine Dosing Facilities
Onsite Storage

N

0 250 500
Scale in Feet

Figure 5-4

Alternative 3A/3B: Treatment and Storage Pond Configuration

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South Suburban Sanitary District
Wastewater Facilities Plan

5.3.1.2 Use of Existing Ponds 1, 2, and 3 for Storage

Ponds 4A and 4B will needed for treatment; however, the remainder of Ponds 1, 2 and 3 can be used storage. A total of 345-acre feet storage is available in these ponds. However, the bottom elevation of Pond 3 is about 3.2 feet lower than Ponds 1 and 2. Therefore, to access this additional volume, the District will need to use a portable pump to transfer the contents into either Pond 1 or 2. The District recently purchased a portable pump that will allow for such transfers.

As noted for Alternatives 1A and 1B, treated wastewater storage facilities must be constructed to provide a minimum coefficient of permeability of 1.0 x 10^{-7} cm/s and the District is systematically evaluating the permeability of Ponds 1, 2 and 3 for this purpose – including the removal of solids from the ponds[4].

Flow control structures and pipelines would be constructed to allow water to bypass the ponds for further flexibility for operations. Flow leaving Pond 4B could flow directly to Pond 3, then to Pond 2 and finally to Pond 1. Flow leaving Pond 4A could also enter a new pipeline and flow control structure that would allow water directly enter Pond 1 or Pond 2 – thereby allowing for pond bypass. Treated effluent would be pumped from Pond 1 into the new Class A treatment facilities.

5.3.1.3 New Onsite Recycled Water Storage Ponds

As noted previously, approximately 1,450 ac-ft volume of additional storage will be provided onsite. Storage facilities for treated wastewater must be constructed to provide a minimum coefficient of permeability of 1.0 x 10^{-7} cm/s. The most economical storage facility that meets this permeability requirement is an earthen storage reservoir. Synthetic liners meet the permeability requirements but are expensive. A clay liner is sufficient and a less expensive alternative than a synthetic liner. The cost effectiveness of a clay liner depends on the availability of nearby, suitable clay material. The design criteria for the storage lagoon include the following:

- Approximately 1,500 acre-feet of storage capacity (about 489 million gallons)
- Water depth of 15 feet.
- Freeboard of 2 feet above the maximum water level.
- 2:1 (horizontal/vertical) slopes for the outside perimeter reservoir levees, reinforced against wave action with a geosynthetic material.
- 3:1 (horizontal/vertical) slopes for the inside perimeter reservoir levees, reinforced against wave action with a geosynthetic material.
- 3:1 (horizontal/vertical) slopes for the divider wall separating the reuse storage reservoir into two cells, reinforced against wave action with a geosynthetic material. The two cells allow half of the reservoir to be taken out of service for maintenance.
- 12-foot-wide gravel roadway along the top of the levees.
- Clay liner along the bottom of the reservoir.
- HDPE liner along internal levee faces to prevent erosion from wave action.

[4] As previously noted, it is assumed that the District will be able to land apply the solids removed from the ponds on nearby agricultural properties, thus avoiding costly landfill disposal tipping fees. Solids from Pond 1 were removed in 2021 and costs associated with this activity are not included in this analysis.

The onsite storage would also require agitation to prevent excessive algae and ice formation, which would be accomplished with a solar-powered mixing system.

5.3.2 Treatment Facilities

This alternative will continue to rely on existing Pond 4A and 4B for secondary treatment, which would discharge to Ponds 1, 2 and 3 where the flow would be stored. The Class A treatment facilities (i.e. algae removal, filtration and disinfection) would pull flows from Pond 1. Because there would be considerable storage upstream of the Class A treatment system, the facilities could be sized for a flow of 3.0 mgd. As noted previously, two different disinfection systems are being considered (i.e. chlorine and UV).

Oregon's recycled water rules also state that the recycled water system must have a sufficient level of redundant treatment facilities and monitoring equipment to prevent inadequately treated recycled water from being used or discharge to public waters. However, redundancy requirements are site specific based on the Class of water and potential exposure to the public. Given the District's stated goal of providing Class A recycled water, it is assumed that all of the Class A treatment facilities (i.e. algae removal, filtration and disinfection) will need to have a fully redundant treatment unit. If this alternative is identified as the preferred strategy, additional discussions with DEQ is recommended to confirm the redundancy requirements for the Class A treatment system.

A schematic of the proposed treatment system for Alternatives 3A and 3B is shown on Figure 5-5 and Figure 5-6. Additional discussion of treatment facilities provided for these two alternatives is provided below.

5.3.2.1 Headworks Improvements

To allow for the existing headworks to continue to serve the WWTP over the 20-year period of the project, it is recommended that the existing bar screen be replaced with a new multirake bar screen system with 0.25-inch opening size. Capacity for the screen would be 6.8 mgd, which is the 2045 PWWF. The manual bar screen would also be installed at the existing bypass channel, which currently has no screens. The flow from the headworks will continue to be discharged to Pond 4A.

5.3.2.2 Secondary Treatment

Oregon's recycled water rules state that fully oxidized wastewater is wastewater in which organic matter has been stabilized such that the BOD does not exceed 50 mg/L for lagoon treatment systems. Based on modeling developed in support of this Facility Plan, the treatment provided in Pond 4A and 4B is adequate to meet the oxidized wastewater treatment requirement. Discharge from Pond 4B could enter Pond 3, Pond 2 or Pond 1 for storage as discussed previously.

Improvements required for Pond 4A and 4B to allow for their long-term use as a secondary treatment system are similar to the improvements required for using these ponds for peak flow attention (see section 5.1.1.1) except both Pond 4A and 4B would need be lined with an HDPE liner. In addition, the pond improvement project under a reuse alternative would require bypass pumping during construction to allow for continued use of the ponds for treatment during construction.

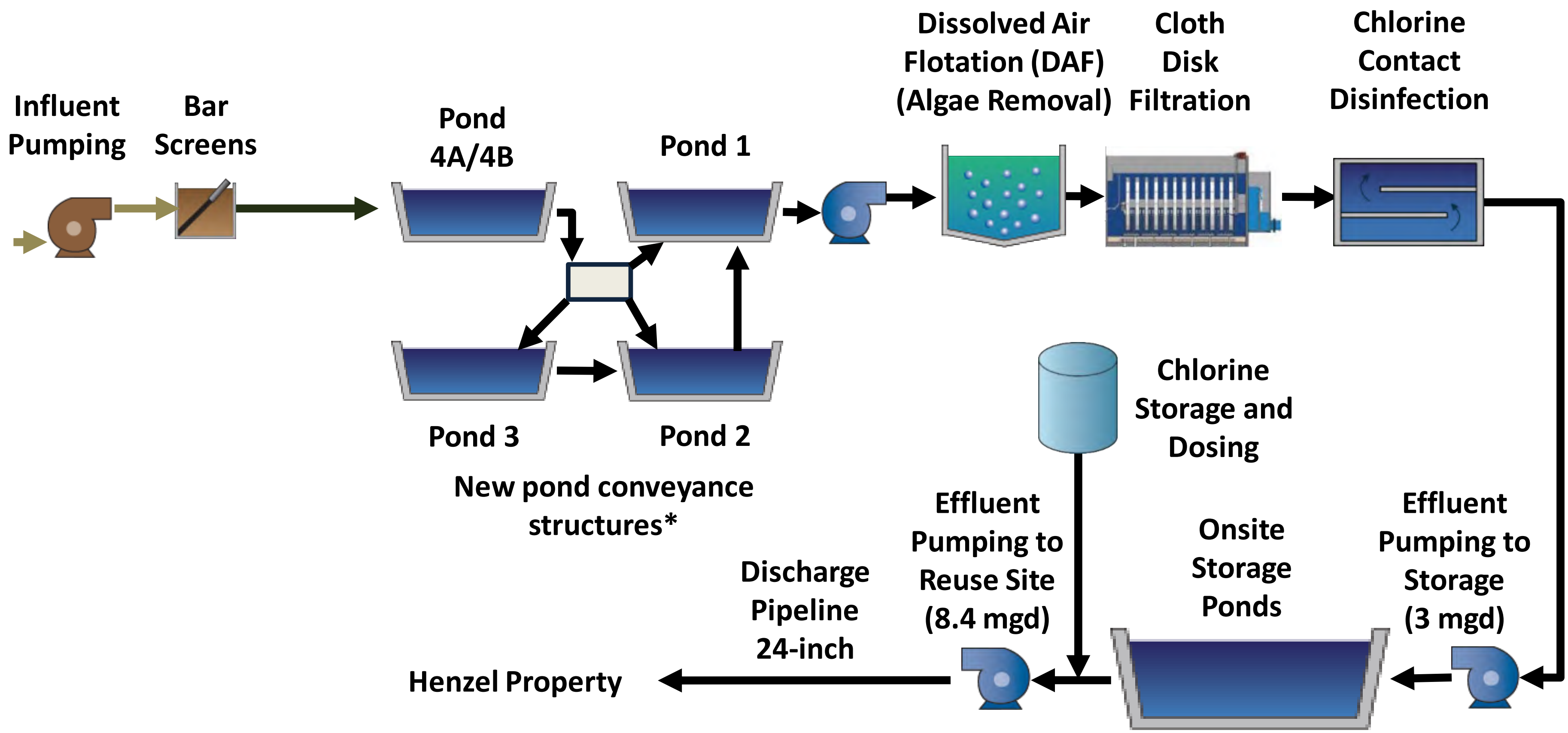

Figure 5-5

Alternative 3A: Class A Recycled Water with Chlorine Disinfection

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Wastewater Facilities Plan

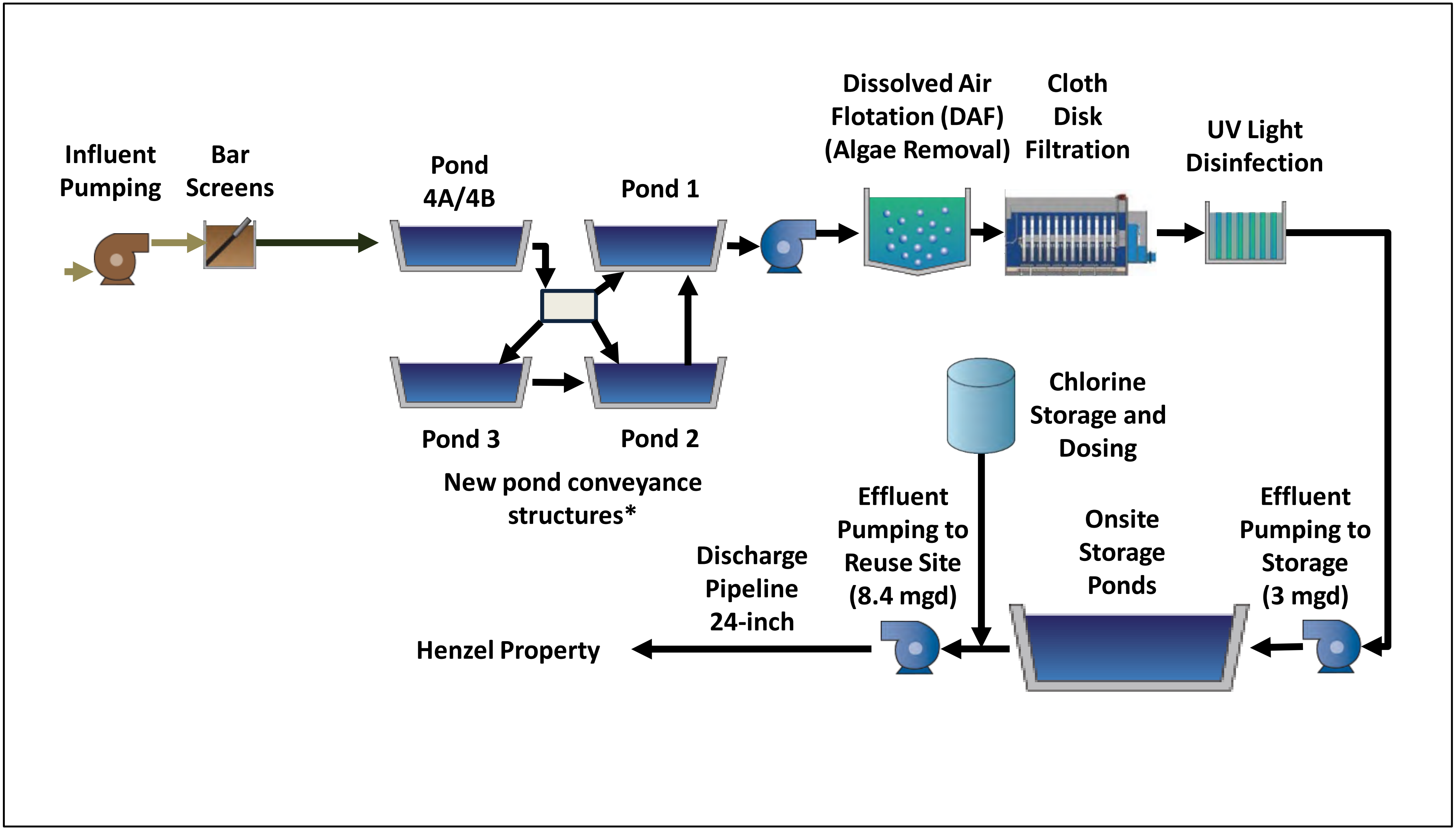


Figure 5-6

Alternative 3B: Class A Recycled Water Treatment with UV Disinfection

5.3.2.3 Treatment Pump Station

A new low-head, 3.0 mgd firm capacity pump station would be provided to pump flow from Pond 1 to the new Class A treatment processes. This pump station would be located north of Pond 1.

5.3.2.4 Algae Removal System

It is necessary to remove the algae and other suspended solids in the pond water to improve the water quality upstream of the filtration process. The pump station will pump the pond water into three, 33-foot diameter dissolved air flotation thickener tanks (DAFT) for algae removal. Each tank would have a 1.5 mgd capacity. The total capacity of the DAFT system would be 4.5 mgd and the firm capacity 3 mgd. The DAFT system would be covered with an awning.

5.3.2.5 Filtration System

A filtration system is required to meet Class A standards. The analysis assumes a cloth disk filtration would be installed due to their lower construction and operating costs. There will be three disk filter units, with 1.5 mgd capacity each, for a total capacity of 4.5 mgd and firm capacity of 3.0 mgd.

5.3.2.6 Chemical Addition System

Alum addition prior to the DAFT is required. This facility will also provide for dosing ahead of the filters to improve performance. This ability to dose coagulant ahead of the filters is a requirement for Class A recycled water production. Chemical storage and a chemical feed system will be required, which includes concrete tank pads, storage tanks, a canopy and metering pumps.

5.3.2.7 Alternative 3A: Class A Recycled Water Treatment with Chlorine Disinfection

One strategy for Class A treatment is to use sodium hypochlorite to provide disinfection. This disinfection approach would require the following features:

- Disinfection with sodium hypochlorite solution, storage tanks with spill containment.
- For chlorine disinfection, DEQ recommends a 1 to 5 mg/L initial dosage, a minimum CT[5] of 90 minute-mg/L, and a contact chamber length to width ratio of 72:1. Three contact basins each with 1.5 mgd capacity for a total capacity of 4.5 mgd is assumed. The footprint is approximately 5,000 square feet to accommodate the estimated 124,000-gallon reactor volume per basin.
- Metering pumps, mixing and an effluent flow meter to allow for control of the chemical feed system.
- Fully automated disinfection control system. The compliance point would be at the exit of the pipeline at the recycled water storage reservoir.

[5] CT value is the product of the concentration of a disinfectant (e.g. free chlorine) and the contact time with the water being disinfected

5.3.2.8 Alternative 3B: Class A Recycled Water Treatment with UV Disinfection

As with the MBR treatment process, UV disinfection could be used for the alternative. The UV system would include three enclosed UV vessel channels with a capacity of 1.5 mgd per unit. A building enclosure is assumed for the UV system.

5.3.2.9 Effluent Pumping to New Onsite Recycled Water Storage Ponds

A 3.0 mgd, firm capacity pump station and pipeline after the disinfection process would convey the finished effluent to the onsite recycled water storage pond described in 5.3.1.3.

5.3.2.10 Condition-Related Improvements

Similar to the surface water discharge alternative, there are improvements required at the WWTP to allow for continued and reliable operations over the next 20 years. These improvements, which were identified as through a condition assessment of the facility and discussed in Chapter 3, include:

- Install a new wet well spray system at the influent pump station
- Replacement of the blower used for aeration of the channel downstream of the bar screens in the headworks
- Replacement of the headworks sump pump
- Ventilation Improvements in the headworks

In addition to these improvements, asphalt repaving is needed in several areas around site.

5.3.2.11 Plant Utilities

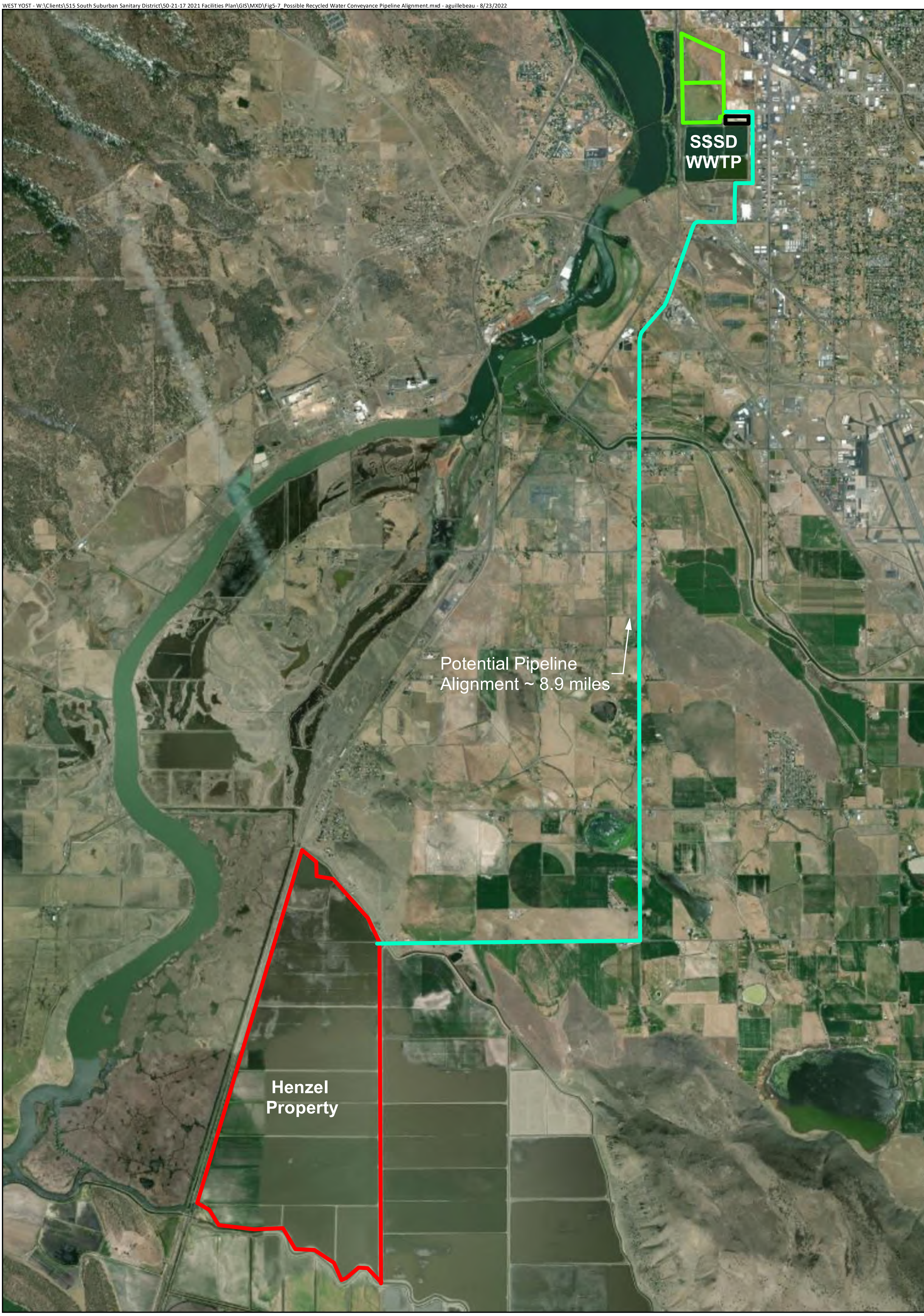
Major plant utilities would consist of the following:

- **Recycled Water (3W) Pump Station:** These pumps would provide treated effluent for hose stations, sprays, pump seal water, and other uses within the plant.
- **Plant Sewer**: Connections from new buildings and drains to capture runoff and return to the influent sewer.

5.3.3 Recycled Water Pumping and Conveyance

The recycled water pumping and conveyance facilities include a new discharge pump station, a discharge pipeline, a chlorine residual system, and the onsite irrigation facilities. The assumed pipeline alignment to the Henzel property is shown on Figure 5-7.

WEST YOST - W:\Clients\515 South Suburban Sanitary District\50-21-17 2021 Facilities Plan\GIS\MXD\Fig5-7_Possible Recycled Water Conveyance Pipeline Alignment.mxd - aguillebeau - 8/23/2022



Forcemain
Recycled Water Treatment Facilities
Proposed Irrigation Site
Onsite Storage

Note: Pipeline system would likely include one or more pigging stations to facilitate maintenance.

N

0 1,500 3,000
Scale in Feet

WEST YOST

Figure 5-7

Possible Recycled Water Conveyance Pipeline Alignment

South Suburban Sanitary District
Wastewater Facilities Plan

5.3.3.1 Pump Station and Conveyance to Reuse Site

An effluent pump station would convey recycled water from the onsite storage to the reuse site. During high irrigation demands, recycled water would bypass the onsite storage and go directly to this pump station. The pump station would be sized based on the maximum month irrigation demands. The peak demand determined by the water balance was for corn during the month of July at 8.4 mgd irrigation demand for the month. The pump station would have an 8.4 mgd firm capacity to meet this demand. The discharge pipeline to the Henzel property would be a 24-inch, 45,000-foot long force main.

5.3.3.2 Chlorine Residual System

It will be necessary to intermittently dose the recycled water with chlorine to prevent biological growth in the discharge pipeline. Chlorine would be provided by totes and a small chemical feed system would be required.

5.3.3.3 Irrigation Site Improvements

As previously discussed, the District would need one to lease half of the Henzel property to provide the required acreage. For ease of maintenance and management, it is recommended that the west side of the property be leased for the irrigation. A new canal would be constructed to receive the recycled water and deliver it to two new center pivot irrigation systems. For this analysis, it is assumed that one pivot would have a 3,300-foot radius and cover approximately 800 acres. Another center pivot would have a 2,240-foot radius and over approximately 360 acres.

5.4 ALTERNATIVE 4: CLASS A RECYCLED WATER FOR AGRICULTURAL IRRIGATION WITH OFFSITE STORAGE

This alternative would rely on a treatment train that is like those identified for Alternative 3A. However, under Alternative 4, the recycled water would be stored in a pond that is located near the land application area. The exact location of this storage has not been defined and the District is currently working to identify whether there are available sites located near the identified land application area.

Storing the recycled water near the land application site could allow for two key benefits: first the discharge pipeline could serve as the disinfection system contact basin. Therefore, the costs for treatment would be reduced. Moreover, the discharge conveyance costs would be lower because the pump station and pipeline would be sized for a 3.0 mgd low flow rate instead of 6.8 mgd. Ultimately, if a property for storage is identified, the District would need to compare the cost for purchase of the land needed for offsite storage to the savings provided by these two benefits to determine if this approach is preferred.

5.5 SCREENED ALTERNATIVES IDENTIFIED AS NOT VIABLE

During the development of the draft Facilities Plan, a broad range of alternatives have been considered to ensure that all options available to the District have been evaluated. Not all the alternatives that were identified proved to be viable and these alternatives are not presented in detail in this chapter but are summarized below.

5.5.1 Class B or C Recycled Water Application on District-Owned Property

In 2000, the District began evaluating the potential for using recycled water for irrigation on District-owned land, including an assessment of potential crops, land requirements, and storage requirements. The evaluation included alternatives for both a District-only recycled water use program as well as a regionalized (District and City of Klamath Falls) reuse program. The following steps were taken in the evaluation:

- Identified the crop types, land areas, and effluent storage requirements.
- Performed a preliminary evaluation of all areas within 15 miles of the District's treatment facility to determine their potential for effluent reuse.
- Identified areas that met the preliminary evaluation criteria. Criteria included topography, groundwater depth, soil type, accessibility and land ownership.
- Prepared design data and cost estimates for developing a reuse program at each of the potential sites.
- For the potential sites, analyzed a system that would reuse effluent from both the District and the City of Klamath Falls' Spring Street Wastewater Treatment Plant.

A total of 21 areas were identified and evaluated based on topography, soils, zoning, groundwater, size and cost. Based on this evaluation, the District proceeded with a more detailed evaluation of the Reeder Rd site and the Poe Valley site. During this more detailed evaluation period, the District ratepayers rejected this concept through a Board election process. The newly elected Board confirmed that any recycled water produced by the facility would meet Class A standards and the Reeder Rd site and the Poe Valley site would no longer be considered. Instead, the District's preferred strategy will be to deliver recycled water to an existing landowner – not to purchase land for recycled water application. This strategy allows the District to put the water to the highest and best use as opportunities arise.

5.5.2 Recycled Water to Lower Klamath National Wildlife Refuge

Providing water to the Lower Klamath National Wildlife Refuge was considered. The refuge needs additional water and could use recycled water to enhance its refuge management. Several meetings with the staff of the refuge, the U.S. Bureau of Reclamation (USBR), Oregon and California regulators and the District were conducted. The evaluation and discussion also addressed inclusion of the effluent from the City's WWTP. Through these meetings it was determined that demand for the recycled water is generally in the southern parts of the refuge where crops are grown for wildlife.

If the refuge were to accept recycled water, no discharge of recycled water would need to be guaranteed because the refuge drainage is one of the sources of nutrients to the Klamath River. The capital cost for conveyance and management of the recycled water is much greater than the other alternatives. There was a low level of interest by the management agencies and the alternative has not been pursued. If the USBR were to obtain a congressional appropriation to fund this project, the concept of providing water to the refuge could be reconsidered.

5.5.3 Pollutant Trading

Oregon DEQ has a regulatory framework for trading whereby dischargers could fund existing stream system restoration to receive credits for discharge to the receiving stream. Using trading was evaluated for phosphorous using preliminary metrics and the approach required more restoration projects than would likely be available. The DEQ may consider BOD trading, but adequate information would need to be available to create pollutant equivalency metrics. Ammonia trading may also be considered with careful attention to potential toxicity in the mixing zone. With the new year-round TMDL for nutrients, BOD, and temperature, trading is not viable for the District system.

5.5.4 Discharge of Class A Water to the A Canal

The concept to produce Class A recycled water for discharge to the A Canal was also assessed. However, water quality and flow in the Klamath River are linked to the Lost River Basin, and the Lost River basin receives water from Upper Klamath Lake and the Klamath River through the A Canal and Lost River Diversion Channel. Therefore, the A Canal is considered a water of the state and would require an NPDES permit for discharge. Given the TMDL constraints in both the Lost and Klamath Rivers, discharge of Class A recycled water to the A Canal could not be permitted under current statutes.

5.5.5 Regionalization

A joint study was performed by HDR and West Yost to evaluate the feasibility of a regionalized treatment option to meet the future needs and responsibilities of the City and the District. This study was reported in two phases: *City of Klamath Falls and South Suburban Sanitary District Joint Operations Study Phase 1 Report* (HDR Engineering and West Yost, June 2014), and *City of Klamath Falls and South Suburban Sanitary District Phase II – Joint Operation Study* (HDR and West Yost, January 2016). It was determined that both governing bodies have similar future treatment needs and that there were five possible courses of action.

The regionalization evaluation was completed prior to the DEQ issuance of the draft temperature TMDL. With the draft TMDL, regionalization would be more complex since the City of Klamath Falls would have difficulty meeting the limits established in the draft TMDL.

5.6 REFERENCES

HDR Engineering and West Yost. June 2014. *City of Klamath Falls and South Suburban Sanitary District Joint Operations Study Phase 1 Report.*

HDR Engineering and West Yost. January 2016. *City of Klamath Falls and South Suburban Sanitary District Phase II – Joint Operation Study*.

CHAPTER 6
Selection of Alternative

The alternatives presented in Chapter 5 are all planned to meet anticipated treatment requirements. This chapter includes an evaluation of the lifecycle costs factors associated with each of the alternatives to select the best alternative for the District.

6.1 LIFECYCLE COST ANALYSIS

This section compares estimated capital and O&M costs for the six (6) alternatives. The net-present values are compared using the current rate, of 2.25 percent for federal water projects published by the USDA with a term of 20 years.

6.1.1 Capital Costs

The capital costs for each alternative are detailed in the following sections.

6.1.1.1 Cost Estimating Approach

The capital costs presented herein represent a planning-level cost estimation indicative of Estimate Class 4, as defined by the Association for the Advancement of Cost Engineering (AACE). The expected accuracy range associated with Estimate Class 4 is typically -15 percent to -30 percent on the low side, and +20 percent to +50 percent on the high side. These costs are associated with new or improved treatment processes and required pumping storage and conveyance facilities. All costs that are presented are based on projected 2022 costs at an Engineering News Record (ENR) Construction Cost Index of 12,683.

The construction costs were based on equipment quotes from manufacturers, quantity takeoff calculations and unit costs for major supporting infrastructure, and estimated costs for other project components using the following percentages (where appropriate):

- Plant Paving, Grading, and Yard Piping – 5 percent
- Mechanical and Piping – 5 percent
- Electrical Improvements – 10 percent
- Instrumentation and Controls – 10 percent
- Contractor’s Markup on Sub-Contractor’s Work – 5 percent
- Contractor’s Overhead and Profit – 10 percent
- Mobilization and Demobilization – 7 percent
- Project Phase-Level OPCC Contingency – 20 percent

Some deviations from these percentages were applied for specific facilities. These deviations are detailed in the cost estimate spreadsheets.

Total Capital costs were determined from the construction costs and the following applied percentages:

- Changes and Unforeseen Conditions During Construction – 5 percent
- Engineering Design, Environmental Planning and Studies, Construction Management, Engineering Services During Construction, and Legal and Admin Costs – 25 percent

6.1.1.2 Alternative 1A and 1B –Klamath River Surface Water Discharge

With this alternative, the District would effectively build an entirely new treatment plant to meet nutrient removal requirements and maintain the existing ponds for equalization of flows and cooling to meet the temperature requirements. Alternative 1A includes the use of a 3.0 mgd capacity MBR system to meet treatment requirements and Alternative 1B includes the use of a 3.0 mgd capacity propriety treatment process from E3 Water LLC to meet the limitations. Both alternatives also include the production of Class A biosolids for land application on nearby agricultural properties.

Table 6-1 details the capital costs for the pond improvements needed to provide the flow equalization and temperature attenuation. These costs are common to both Alternative 1A and 1B. Details supporting these cost estimates are provided in Appendix E-1 and Appendix E-3.

Table 6-1. Estimated Capital Costs for Alternatives 1A and 1B Common Facilities

Description	Cost, dollars
Pond 4A Rehab	4,330,000
Pond 2/3 Solids Removal	810,000
Pond 2/3 Temperature Control Solar Bees	220,000
Condition Repairs	550,000
SUBTOTAL	**$5,910,000**
Project Phase-Level OPCC Contingency (20 percent)	1,182,000
Engineer's Preliminary Opinion of Probable Project Cost	**$7,092,000**
Changes and Unforeseen Conditions During Construction	354,600
Engineering Design, Environmental Planning and Studies, Construction Management, ESDC, and Legal and Admin Costs	1,773,000
Engineer's Preliminary Opinion of Probable Total Capital Cost	**$9,219,600**

Table 6-2 details the capital costs for Alternative 1A. Details supporting these cost estimates are provided in Appendix E-1 and Appendix E-3.

Table 6-2. Estimated Capital Costs for Klamath River Surface Water Discharge – MBR (Alternative 1A)	
Description	Cost, dollars
Condition Repairs	550,000
Influent Pipeline	580,000
Influent Pump Station	1,870,000
MBR and Influent Screening	23,580,000
UV Disinfection	2,330,000
FKC Class A biosolids Treatment	7,330,000
Dewatered solids storage and equipment	2,780,000
Pond 4A Rehab	4,330,000
Pond 2 and 3 Solids Removal	810,000
Pond 2 and 3 Solar Bees	220,000
Operations/Lab Building	1,760,000
Plant Utilities	1,330,000
SUBTOTAL	**$47,470,000**
Project Phase-Level OPCC Contingency (20 percent)	9,494,000
Engineer's Preliminary Opinion of Probable Costs	**$56,964,000**
Changes and Unforeseen Conditions During Construction (5 percent)	2,850,000
Engineering Design, Environmental Planning and Studies, Construction Management, ESDC, and Legal and Admin Costs (25 percent)	14,240,000
Engineer's Preliminary Opinion of Probable Total Capital Cost	**$74,050,000**

The costs for Alternative 1B were provided by E3 Water LLC and are not based on the same cost-estimating approach applied for the other estimates. These costs have also not been verified by the West Yost team. Table 6-3 provides the total cost for the E3 Water LLC, which was developed by adding the costs provided by this vendor to the costs developed by West Yost for flow equalization and temperature attenuation.

Table 6-3. Estimated Capital Costs for Klamath River Surface Water Discharge – E3 Water LLC Treatment System (Alternative 1B)	
Description	Cost, dollars
Pond 4A Rehab	4,330,000
Pond 2 and 3 Solids Removal	810,000
Pond 2 and 3 Solar Bees	220,000
Condition Repairs	550,000
SUBTOTAL	**$5,910,000**
Project Phase-Level OPCC Contingency (20 percent)	1,182,000
Engineer's Preliminary Opinion of Probable Costs	**$7,092,000**
Changes and Unforeseen Conditions During Construction (5 percent)	354,600
Engineering Design, Environmental Planning and Studies, Construction Management, ESDC, and Legal and Admin Costs (25 percent)	1,773,000
Engineer's Preliminary Opinion of Probable Total Capital Cost	**$9,220,000**
E3 Water LLC Cost Estimate	60,326,200
Engineer's Preliminary Opinion of Probable Total Capital Cost	**$69,546,200**

6.1.1.3 Alternative 2A and 2B –Irrigation District Surface Water Discharge

This alternative would rely on a treatment train that is like those identified for Alternatives 1A or 1B. However, under Alternative 2A and 2B, the effluent would be discharged at a location where it can be beneficially reused by a local irrigation district. The exact discharge location has not been defined and the District is currently working to identify whether there are interested parties in the area. For purposes of this analysis, it is assumed that any costs associated with discharging at an alternative site would be borne by the recipient of the treated water, either through direct payment or through the purchase of treated water.

6.1.1.4 Alternative 3A and 3B – Class A Recycled Water for Agricultural Irrigation with Onsite Storage

Alternative 3 involves elimination of discharge to the Klamath River and using recycled water for irrigation of crops on existing farmland. There are two treatment alternatives considered, both of which produce Class A recycled water. Table 6-4 summarizes the capital costs for Alternative 3A. Details supporting these cost estimates are provided in Appendix E-2 and Appendix E-3. Table 6-5 summarizes the capital costs for Alternative 3B. Details supporting these cost estimates are provided in Appendix E-2 and Appendix E-3. The DEQ has defined rules for recycled water use which have been considered in developing these costs. Due to the relative simplicity of this alternative, it is unlikely there are serious potential unforeseen costs that could arise during construction.

Table 6-4. Estimated Capital Costs for Class A Recycled Water for Irrigation with Onsite Storage – Chlorine Disinfection (Alternative 3A)

Description	Cost, dollars
Condition Repairs	550,000
Headworks and Site Improvements	1,000,000
Pond 4A and 4B Rehab	9,220,000
Pond 2 and 3 Solids Removal	810,000
Onsite Pond Conveyance	940,000
Pump Station to Treatment	1,870,000
Pond Algae Removal	5,190,000
Algae Drying Bed	1,330,000
Disk Filters	2,040,000
Chlorine Disinfection	2,750,000
Pump Station to Onsite Storage	1,870,000
Onsite Storage	16,230,000
SolarBee	740,000
Pump Station to Reuse Site	8,890,000
Conveyance Pipeline	20,400,000
Chlorine Residual	100,000
Irrigation Distribution	2,550,000
DAFT and Filter Chemical Feed System	440,000
Plant Utilities	1,330,000
Subtotal	**$78,250,000**
Project Phase-Level OPCC Contingency (20 percent)	15,650,000
Engineer's Preliminary Opinion of Probable Total Capital Cost	**$93,900,000**
Changes and Unforeseen Conditions During Construction (5 percent)	4,700,000
Engineering Design, Environmental Planning and Studies, Construction Management, ESDC, and Legal and Admin Costs (25 percent)	23,480,000
Engineer's Preliminary Opinion of Probable Total Capital Cost	**$122,080,000**

Table 6-5. Estimated Capital Costs for Class A Recycled Water for Irrigation with Onsite Storage – UV Disinfection (Alternative 3B)	
Description	Cost, dollars
Condition Repairs	550,000
Headworks and Site Improvements	1,000,000
Pond 4A and 4B Rehab	9,220,000
Pond 2 and 3 Solids Removal	810,000
Onsite Pond Conveyance	940,000
Pump Station to Treatment	1,870,000
Pond Algae Removal	5,190,000
Algae Drying Bed	1,330,000
Disk Filters	2,040,000
UV Disinfection	2,330,000
Pump Station to Onsite Storage	1,870,000
Onsite Storage	16,230,000
SolarBee	740,000
Pump Station to Reuse Site	8,890,000
Conveyance Pipeline	20,400,000
Chlorine Residual	100,000
Irrigation Distribution	2,550,000
DAFT and Filter Chemical Feed System	440,000
Plant Utilities	1,330,000
Subtotal	**$77,830,000**
Project Phase-Level OPCC Contingency (20 percent)	15,566,000
Engineer's Preliminary Opinion of Probable Total Capital Cost	**$93,396,000**
Changes and Unforeseen Conditions During Construction (5 percent)	4,670,000
Engineering Design, Environmental Planning and Studies, Construction Management, ESDC, and Legal and Admin Costs (25 percent)	23,350,000
Engineer's Preliminary Opinion of Probable Total Capital Cost	**$121,420,000**

6.1.1.5 Alternatives 4 – Class A Recycled Water for Agricultural Irrigation with Offsite Storage

This alternative would rely on a treatment train that is like those identified for Alternative 3A. However, under Alternative 4, the recycled water would be stored in a pond that is located near the land application area. The exact location of this storage has not been defined and the District is currently working to identify whether there are available sites located near the identified land application area.

Storing the recycled water near the land application site could allow for two key benefits with respect to capital costs. First the discharge pipeline could serve as the chlorine disinfection system contact basin, which would lower the treatment facilities cost. Second, the discharge facilities capital costs would be lower because the size of the discharge pump station and pipeline could be reduced because the flow would be transferred at a constant, relatively low flow rate. It is estimated that a several million dollars in savings could be realized through these changes. However, this alternative would require the purchase of land for the storage site.

For purposes of this analysis, it is assumed that cost for purchase of the land would offsite be approximately less than the savings realized by the two benefits described above. However, without a defined land costs the savings cannot be quantified. It is expected that this alternative would only be implemented if significant savings were able to be identified.

6.1.1.6 Summary of Capital Costs

Table 6-6 summarizes the capital costs for the alternatives. Present-value calculations more accurately define future costs associated with each alternative and are presented in section 6.1.3.

Table 6-6. Summary of Estimated Capital Costs

Alternative	Cost, dollars
1A – Klamath River Surface Water Discharge – MBR Treatment	74,050,000
1B – Klamath River Surface Water Discharge – E3 Water LLC Treatment System	69,546,200
2A and 2B – Irrigation District Surface Water Discharge	(a)
3A – Class A Recycled Water for Agricultural Irrigation with Onsite Storage – Chlorine Disinfection	122,080,000
3B – Class A Recycled Water for Agricultural Irrigation with Onsite Storage - UV Disinfection	121,420,000
4 – Class A Recycled Water for Irrigation with Offsite Storage – Chlorine Disinfection	(b)

(a) Capital costs are assumed to be the same as Alternative 1A and 1B, respectively. Any costs for conveyance to an alternative discharge location would be borne by the water user.

(b) Capital costs are expected to be lower than Alternative 3B because the discharge pipeline can be used as a chlorine contact basin. The specific savings cannot be defined, however, until a site is identified for the offsite storage facility.

6.1.2 Annual O&M Costs

The Annual O&M Costs for Alternatives 1A, 1B, 3A and 3B are detailed in this section. These costs are reported in December 2021 dollars (12,480 20-City Average ENR). These includes costs for energy, chemical additions, materials and services, labor, and solids disposal, where appropriate. Additional details regarding the development of these costs estimates is provided in Appendix F.

O&M costs are separated by existing costs reported by the District for the FY 2020/2021 budget and additional costs associated with the respective alternative. Some existing O&M costs are common to all alternatives, as follows:

- **Utility Costs**: $25,000 per year, accounting for laboratory electricity, potable water, natural gas, and phone service at the WWTP[1].
- **Pumping Costs**: For the surface discharge alternatives, the existing influent and effluent pumping costs $35,000 per year are assumed. For the reuse alternatives, a third of these costs (or approximately $12,000 are assumed for influent pumping; effluent pumping costs are associated with the new effluent pump station.
- **Blower Costs:** For the surface discharge alternatives, half of the existing blower energy costs are assumed. For the reuse alternatives, the existing full energy cost of $90,000 per year is assumed.
- **Personnel Services (Labor):** $270,000 per year.
- **Chemical Costs**: There are no chemical costs because none of the alternatives rely on the existing disinfection system.
- **Materials and Services Costs:** $320,000 per year, accounting for laboratory supplies, vehicle maintenance, computer services and equipment maintenance, among other items.
- **Capital Outlay:** These are expenditures on fixed assets, which are $350,000 per year, which accounts for maintenance of ponds, various plant equipment, and computer and phone equipment.

The sections for each alternative in Chapter 5 better detail the processes associated with the O&M costs. Key assumptions used for the additional O&M cost calculations are as follows:

- The unit cost for electricity is $0.085/kWh, based on discussion with District staff
- Materials and Services are assumed to equate to 1 percent of the respective equipment costs and 15 percent of the respective labor costs.
- Labor (salary and benefit) costs are assumed to be rated at $100,000 per year for a chief plant operator level and $70,000 per year for an assistant operator level.
- All solids generated will be land applied on local farmland at no cost to the District. The cost for hauling the solids will be $17.5 per wet ton.
- E3 Water LLC provided O&M costs for Alterative 1B, and these were directly applied except power costs were assumed to equal $0.085/kWh.

[1] Headworks electricity costs were not specifically identified in the information provided by the District and are assumed be included in the utility costs.

6.1.2.1 Alternative 1A – Klamath River Surface Water Discharge with MBR Treatment

Additional O&M costs for Alternative 1A include the following:

- Three additional employees, including one chief plant operator and two assistant operators.
- Electricity for operating the MBR, UV disinfection system and FKC screw press.
- Natural gas for producing steam for the FKC screw press.
- Treatment chemicals for MBR cleaning cycles, as well as solids dewatering and processing.
- Secondary solids analytical testing, off-site hauling and disposal.

A summary of the estimated O&M costs for this alternative is provided in Table 6-7

Table 6-7. Estimated O&M Costs for Klamath River Surface Water Discharge with MBR Treatment (Alternative 1A)

Description	Cost,[a] $1,000
Existing Costs[b]	
Utilities[c]	110
Labor	270
Chemicals[d]	-
Materials and Services	320
Capital Outlay	350
Total Existing Annual O&M	**$1,050**
Additional Costs	
Energy[e,f]	610
Labor[g]	240
Chemicals	700
Materials and Services[h]	440
Solids Disposal	34
Total Additional Annual O&M	**$2,024**
Grand Total Annual O&M	**$3,074**

(a) December 2021 dollars (12,480 20-City Average ENR).
(b) Based on FY 2020/21 budgeted costs.
(c) Excluded from existing utilities is half the existing electricity costs for operating the blowers because pond aeration will only be needed intermittently under this alternative.
(d) Existing chlorine gas and sodium bisulfite costs are excluded because UV disinfection will be used instead and is accounted for in added costs.
(e) Based on an energy cost of $0.085 per kWh.
(f) If a solar facility is installed, some or all these electricity costs could be offset.
(g) Labor costs assume 1 additional chief plant operator and 2 additional assistant operators.
(h) Materials and Services cost based on 1 percent of mechanical equipment value plus 15 percent of labor costs.

6.1.2.2 Alternative 1B –Klamath River Surface Water Discharge with E3 Water LLC Treatment System

Alternative-Specific O&M costs for Alternative 1B were developed by E3 Water LLC. However, their costs did not include labor and costs for biosolids disposal. These costs were defined as follows:

- The E3 Water LLC cost estimate indicates 24-hour per day, 7-day per week staffed operation is required. Given the relatively complex process equipment, a total of seven (7) additional employees are assumed to be needed, three (3) staff that serve at a chief plant operator level and four (4) assistant operators.
- Secondary solids analytical testing, off-site hauling and disposal costs were assumed to equal what was developed for the Alternative 1A, assuming similar solids production.

In addition, the E3 Water's fee estimate included an offset of energy costs with solar power generation. A discount for the indicated solar power generation has been included, based on the estimated solar power generation of 8.6 kwH per year and the same 8.5 cents per kWh rate used for electricity usage. This discount relies on assuming that solar power generation would directly offset electrical power usage or that the District is credited with a one-to-one discount for solar power generation.

A summary of the estimated O&M costs for this alternative is provided in Table 6-8.

Table 6-8. Estimated O&M Costs for Klamath River Surface Water Discharge with E3 Water LLC Treatment System (Alternative 1B)

Description	Cost,[a] $1,000
Existing Costs[b]	
Utilities[c]	110
Labor	270
Chemicals[d]	-
Materials and Services	320
Capital Outlay	350
Total Existing Annual O&M	**$1,050**
Added Alternative Costs	
Energy[e]	820
Discount for solar energy generation[f]	-730
Labor[g]	580
Chemicals	445
Materials and Services	1,740
Solids Disposal	34
Total Annual O&M	**$2,889**
Grand Total Annual O&M	**$3,939**

(a) December 2021 dollars (12,480 20-City Average ENR).
(b) Based on FY 2020/21 budgeted costs.
(c) Excluded from existing utilities is half the existing electricity costs for operating the blowers because pond aeration will only be needed intermittently under this alternative.
(d) Existing chlorine gas and sodium bisulfite costs are excluded because ozone disinfection will be used instead and is accounted for in added costs.
(e) Based on an energy cost of $0.085 per kWh.
(f) Solar power assumed to directly offset energy demand at the same rate of 8.5 cents per kWh.
(g) Labor costs assume 3 additional chief plant operator and 4 additional assistant operators.

6.1.2.3 Alternatives 2A and 2B – Irrigation District Surface Water Discharge

The treatment-related annual O&M Costs for Alternatives 2A and 2B would be the same as the costs defined for Alternatives 3A and 3B, respectively. However, Alternatives 2A and 2B would have pumping costs related to conveying the flow to the new discharge location. However, the costs of this pumping cannot be defined without a defined discharge location. Nevertheless, it is assumed that any added costs associated with conveyance to a new site would be borne by the water recipient.

6.1.2.4 Alternative 3A – Class A Recycled Water for Agricultural Irrigation with Onsite Storage and Chlorine Disinfection

Alternative Specific O&M costs for Alternative 3A include the following:

- Electricity for operating the disk filter process, DAF process, and various pumps
- One (1) additional chief plant operator employee
- Treatment chemical costs for the DAF, filtration, and chlorination facilities
- Maintenance and materials primarily for the disk filters, DAF process, pump stations and irrigation equipment

A summary of the estimated O&M costs for this alternative is provided in Table 6-9.

Table 6-9. Summary of Estimated O&M Costs for Class A Recycled Water for Agricultural Irrigation with Onsite Storage and Chlorine Disinfection (Alternative 3A)	
Description	Cost,[a] $1,000
Existing Costs[b]	
Utilities	130
Labor	270
Chemicals[c]	-
Materials and Services	320
Capital Outlay	350
Total Existing Annual O&M	**$1,070**
Additional Costs	
Energy[d,e,f]	160
Labor[g]	100
Chemicals	400
Materials and Services[h]	300
Solids Disposal	15
Land Lease Differential[i]	0
Total Additional Annual O&M	**$975**
Grand Total Annual O&M	**$2,045**

(a) December 2021 dollars (12,480 20-City Average ENR).
(b) Based on FY 2020/21 budgeted costs.
(c) Existing chlorine gas and sodium bisulfite costs are excluded because liquid chlorine disinfection is accounted for in added costs.
(d) Electricity costs for operating blowers are excluded from added costs because these are included under existing utilities.
(e) Based on an energy cost of $0.085 per kWh.
(f) If a solar facility is installed, some or all these electricity costs could be offset.
(g) Labor costs assume 1 additional chief plant operator.
(h) Materials and Services cost based on 1 percent of mechanical equipment value plus 15 percent of labor costs.
(i) It is assumed that any land lease and associated operating costs would be directly offset by revenue from sub-letting the land for farming.

6.1.2.1 Alternative 3B – Class A Recycled Water for Agricultural Irrigation with Onsite Storage and UV Disinfection

Alternative specific O&M costs for Alternative 3B are estimated to include the following:

- Electricity for operating the disk filter process, DAF process, various pumps and the UV disinfection system
- One additional chief plant operator employee
- Treatment chemicals only for the DAF and filtration processes
- Maintenance and materials primarily for the disk filters, DAF process, UV process, pump stations and irrigation equipment

In addition, this alternative will not require the existing costs for chlorine gas and sodium bisulfite.

A summary of the estimated O&M costs for this alternative is provided in Table 6-10.

Table 6-10. Summary of Estimated O&M Costs for Class A Recycled Water for Agricultural Irrigation with Onsite Storage and Chlorine Disinfection (Alternative 3B)	
Description	Cost,[a] $1,000
Existing Costs[b]	
Utilities	130
Labor	270
Chemicals[c]	-
Materials and Services	320
Capital Outlay	350
Total Existing Annual O&M	**$1,070**
Additional Costs	
Energy[d,e,f]	190
Labor[g]	100
Chemicals	290
Materials and Services[h]	320
Solids Disposal	15
Land Lease Differential[i]	0
Total Additional Annual O&M	**$915**
Grand Total Annual O&M	**$1,985**

(a) December 2021 dollars (12,480 20-City Average ENR).
(b) Based on FY 2020/21 budgeted costs.
(c) Existing chlorine gas and sodium bisulfite costs are excluded because UV disinfection will be used instead and is accounted for in added costs.
(d) Electricity costs for operating blowers are excluded from added costs because these are included under existing utilities.
(e) Based on an energy cost of $0.085 per kWh.
(f) If a solar facility is installed, some or all these electricity costs could be offset.
(g) Labor costs assume 1 additional chief plant operator.
(h) Materials and Services cost based on 1 percent of mechanical equipment value plus 15 percent of labor costs.
(i) It is assumed that any land lease and associated operating costs would be directly offset by revenue from sub-letting the land for farming.

6.1.2.2 Alternative 4 – Class A Recycled Water for Agricultural Irrigation with Offsite Storage

The annual O&M Costs for Alternatives 4 would be the same as the costs defined for Alternatives 3A.

6.1.3 Comparison of Lifecycle Costs

The capital, O&M, and lifecycle cost estimates for each alternative are summarized in Table 6-11. As shown in the table, the Alternative 1A has the lowest estimated lifecycle costs. The next lowest cost option is Alternative 1B, which has a lifecycle cost that is about $10 million higher.

Table 6-11. Lifecycle Cost Summary of Alternatives

Description	Capital Cost,[a] $ million	Annual O&M,[a] $ million	Net Present Worth of O&M,[a,b] $ million	Lifecycle Cost,[a] $ million
1A – Klamath River Surface Water Discharge – MBR Treatment	74	3.1	49.1	123
1B – Klamath River Surface Water Discharge – E3 Water LLC Treatment System	70	3.9	62.9	132
2A and 2B – Irrigation District Surface Water Discharge	74/70[c]	3.1/3.9[c]	49.1/62.9[c]	123/132[c]
3A – Class A Recycled Water for Agricultural Irrigation with Onsite Storage – Chlorine Disinfection	122	2.0	32.6	155
3B – Class A Recycled Water for Agricultural Irrigation with Onsite Storage - UV Disinfection	121	2.0	31.7	153
4 – Class A Recycled Water for Irrigation with Offsite Storage – Chlorine Disinfection	< 122[d]	< 2.0[d]	< 32.6[d]	< 155[d]

(a) December 2021 dollars (12,480 20-City Average ENR).

(b) 20-year present worth at an annual discount rate of 2.25 percent.

(c) Costs for Alternatives 2A and 2B are assumed to be the same as Alternative 1A and 1B, respectively. It is assumed that any costs for conveyance to an alternative discharge location would be borne by the water user.

(d) Costs for Alternative 4 are expected to be lower than Alternative 3A because the discharge pipeline can be used as a chlorine contact basin. The specific savings cannot be defined, however, until a site is identified for the offsite storage facility.

6.2 RECOMMENDED PROJECT

A comparison of the lifecycle costs of the alternatives are shown in Table 6-12. As indicated, Alternatives 1A and 2A have the lowest lifecycle cost. However, as discussed previously, the District has decided that an Alternative Delivery approach will be applied if surface water discharge is identified as the recommended project. This Alternative Delivery approach will allow the District to further evaluate and identify the most economical approach to meeting the treatment objectives. Therefore, the District can continue to consider both Alternatives 1A and 1B through this process.

For Alternative 2A (or 2B) to be successful and cost effective, the District will need to identify a project partner that is interested in receiving the District's treated effluent and is willing to cover the costs associated with conveyance to a new discharge location (assuming that is necessary). As discussed in Chapter 5, it may be necessary for the District to initially implement Alternative 1A/1B, which will enable the District to continue discharge to Lake Ewauna while the details of a water transfer deal are further developed.

Table 6-12. Ease of Operation

Ranking	Lifecycle Cost[a]
1A – Klamath River Surface Water Discharge – MBR Treatment	123
1B – Klamath River Surface Water Discharge – E3 Water LLC Treatment System	132
2A – Irrigation District Surface Water Discharge – MBR Treatment	123[b]
2B - Irrigation District Surface Water Discharge – E3 Water LLC Treatment System	132[b]
3A – Class A Recycled Water for Agricultural Irrigation with Onsite Storage – Chlorine Disinfection	155
3B – Class A Recycled Water for Agricultural Irrigation with Onsite Storage - UV Disinfection	153
4 – Class A Recycled Water for Irrigation with Offsite Storage – Chlorine Disinfection	< 155[c]

(a) December 2021 dollars (12,480 20-City Average ENR) and assumes 20-year lifecycle.

(b) Costs for Alternatives 2A and 2B are assumed to be the same as Alternative 1A and 1B, respectively. It is assumed that any costs for conveyance to an alternative discharge location would be borne by the water user.

(c) Costs for Alternative 4 are expected to be lower than Alternative 3A because the discharge pipeline can be used as a chlorine contact basin. The specific savings cannot be defined, however, until a site is identified for the offsite storage facility.

CHAPTER 7
Recommended Project Implementation Plan

Based on a review of alternatives, upgrading the WWTP to allow for surface water discharge for use by a nearby irrigation district is the preferred alternative. This is not only the best alternative for the District and its ratepayers from a financial standpoint, but it also benefits local water supplies by providing a reliable source of irrigation water. The approach is also the easiest project to implement because the discharge standards are already defined, and the District owns property adjacent to the existing WWTP where the treatment facilities can be constructed. Finally, this approach provides the most long-term flexibility to the District for use of the treated effluent. This chapter details the recommended alternative and outlines considerations for project implementation.

7.1 DESCRIPTION AND PROJECT DESIGN CRITERIA

Any surface water discharge within the Klamath River watershed is expected to carry the same discharge requirements as the District's current discharge to the Klamath River. Therefore, the District will effectively need to build an entirely new treatment plant to reliably meet the biochemical oxygen demand and nutrient removal requirements required under the current permit for continued surface water discharge. As discussed in Chapter 5, the District has also determined that the new upgraded facilities will need to produce Class A biosolids so that the solids can be land applied on nearby agricultural properties.

The District has also determined that this alternative will be delivered using an Alternative Delivery approach. This Alternative Delivery strategy will allow the District to secure the following benefits for its customers:

- Delivery of a project that optimizes lifecycle costs;
- Integration of design and construction teams to develop a better and more reliable facility;
- Reducing the risk to the District by contracting responsibility to the Alternative Delivery team;
- Incorporation of innovative technology that promote efficiency and wise use of resources; and
- Competitive selection of the best Alternative Delivery team and approach to meeting the project criteria at the lowest lifecycle cost.

Because the Alternative Delivery team will define the project's detailed design criteria, specific details regarding the facilities cannot be defined at this time. However, there have been several key design criteria established through this Facility Plan that would be included in the Alternative Delivery procurement and contracting documents. These include:

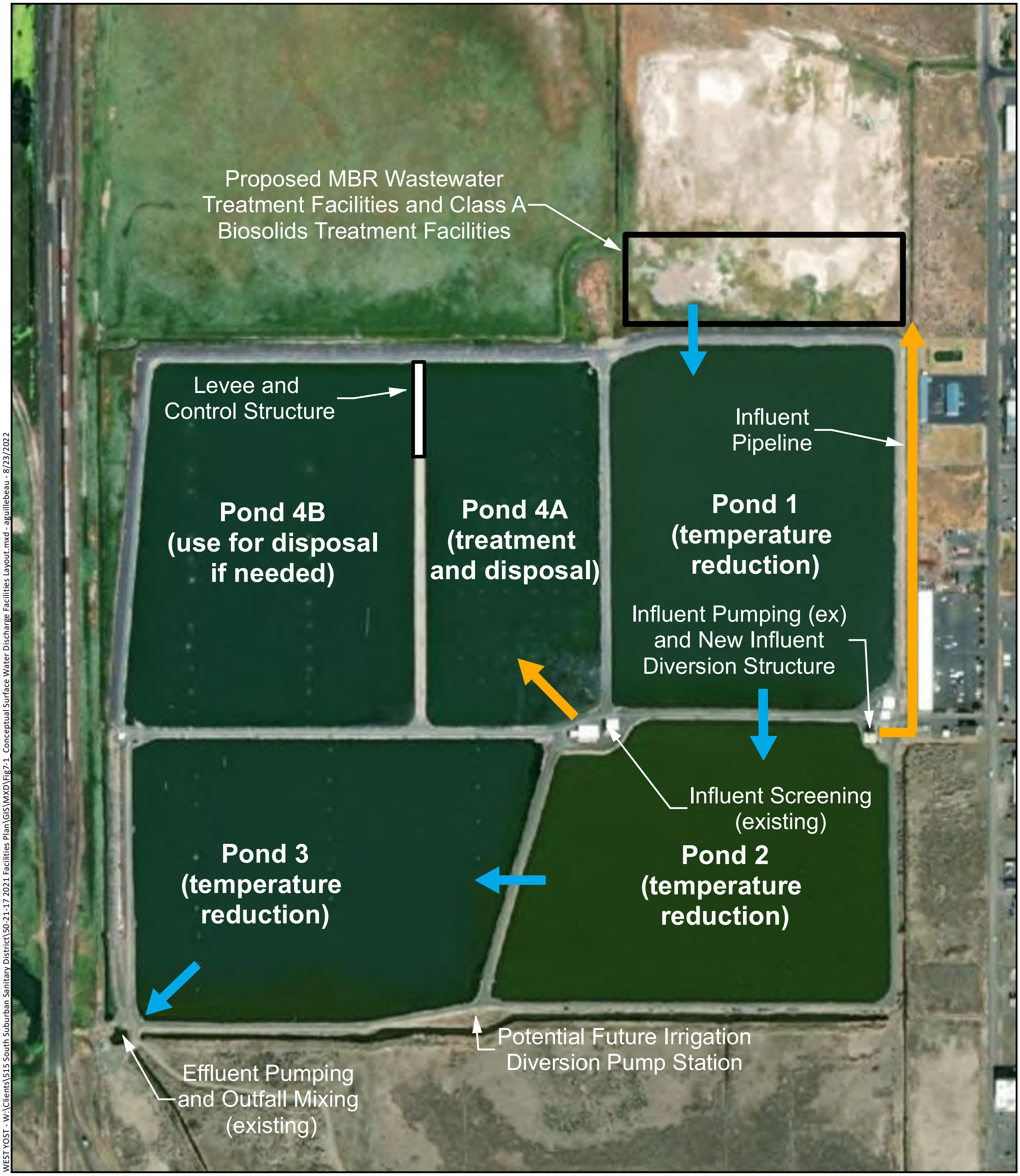
- The wastewater treatment facilities must be capable of meeting the effluent limitations summarized in Chapter 4 and detailed in the permit under the full range of influent flow and load conditions. The selected team will need to carefully review the permit's loading limitations and the range of wastewater flows to define an effluent water quality that must be achieved. The District will clearly define these treatment performance expectations in the Alternative Delivery contract documents.
- The biosolids treatment facilities must be capable of production Class A biosolids, and the completed facility must provide adequate storage to allow for seasonal land application practices. Six to eight months storage should be adequate but the specific storage requirements will need to be confirmed with the owner of the site where the solids will be land applied.

- The preferred strategy will rely on existing infrastructure to the extent it reduces overall lifecycle costs. Options that will be identified as acceptable include using the existing ponds for cooling and using one or more the existing ponds for flow equalization and disposal of peak flows, thereby allowing for a reduced-sized advanced treatment system.
- To the extent the existing infrastructure will be used for flow attention and temperature reduction or other purposes, improvements are needed to allow for continued and reliable operations over the next 20 years. These improvements include:
  - Installation of a new wet well spray system at the influent pump station;
  - Replacement of the blower used for aeration of the channel downstream of the bar screens in the headworks;
  - Replacement of the headworks sump pump; and
  - Ventilation improvements in the headworks.
- The pumping and treatment facilities, as well as the dewatered biosolids storage facility, must be protected from flooding that would occur in a 1-in-100-year frequency.
- The treatment system must provide a level of redundancy and reliability established by DEQ in the Preparing Wastewater Planning Documents and Environmental Reports for Public Utilities (DEQ 2019). For some facilities and process, the District may also establish redundancy and reliability criteria that exceed DEQ requirements.
- The project must deliver all the electrical and instrumentation infrastructure needed to support the new advanced treatment facilities, including a state-of-the-are Supervisory Control and Data Acquisition (SCADA) system.

A conceptual layout of the MBR-based strategy that meets the above objectives that was developed for this Facility Plan is shown on Figure 7-1. This approach assumes that a 3.0 mgd capacity MBR system would be constructed along with a biosolids lime stabilization plus heated dewatering system to produce Class A biosolids. As noted in Chapter 5, a portion of the site north of the existing treatment ponds has been delineated as wetland area, and the final layout of the proposed new treatment facilities would need to avoid delineated wetland areas.

Finally, to achieve the preferred strategy of providing the treated effluent to a local irrigation district, the District will need to identify a project partner that is interested in receiving the District's treated effluent and is willing to cover the costs associated with conveyance to a new discharge location (assuming that is necessary). Given the complexities with developing a partnership agreement and obtaining a new permit for the discharge location (if needed)[1], the District will need to initially implement the treatment improvements to allow for continued discharge to the Klamath River while the details of a water transfer deal are further developed. The discharge can then be relocated, as needed, once the remaining project elements are defined.

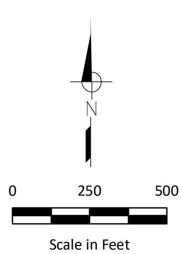
[1] The District may be able to identify a partner that can simply divert the flow from the Klamath River downstream of the current discharge location. The diversion of water from the Klamath River would require approval by the Oregon Water Resources Department.



Raw Wastewater

Treated Effluent

Notes:
Future irrigation diversion pump station location shown on map is shown for illustrative purposes only. Actual location would depend on factors such as recyled water users location, temperature reduction requirements and more.



WEST YOST

Figure 7-1

Conceptual Surface Water Discharge Facilities Layout

South Suburban Sanitary District
Wastewater Facilities Plan

7.2 IMPLEMENTATION

Implementing a project using Alternative Delivery procurement can provide cost and/or schedule advantages over traditional design-bid-build process. Cost advantages depend on how much freedom and flexibility is provided to the Alternative Delivery competitors, allowing them to find and propose a low-cost approach to meeting the specified performance requirements. Once the Alternative Delivery team is under contract, the overall schedule for design plus construction is generally shorter than a design-bid-build schedule; however, developing and executing the procurement process is more time consuming, meaning selection of technology and design typically starts later in the overall project schedule. This section provides an overview of the Alternative Delivery approach highlighting key milestones and procedures, followed by a discussion of the project schedule and a summary of known project permitting requirements.

7.2.1 Alternative Delivery Approach Overview

To successfully execute a large, complex Alternative Delivery project like the one envisioned, the District will first need to retain the services of an Owner Advisor to assist with the Alternative Delivery procurement process. The role of the Owner Advisor is to guide the District through the unique procedural and technical challenges of an Alternative Delivery process. Therefore, solicitation and selection of the District's Owner Advisor will be a critical first step in the implementation process.

Once selected, the Owner Advisor will guide the District through the development of Procurement Documents (Request for Qualifications/Proposals and Draft Contract Documents) and assist the District with selection of the preferred Alternative Delivery team. Development of Procurement Documents will include making key decisions set forth in the documents so that the District's expectations are clearly defined for the Alternative Delivery competitors. The information that will need to be developed is expected to include:

- Treated effluent and biosolids quality Performance Criteria;
- Treatment process performance criteria, such as reliability, maintainability and redundancy requirements;
- Flexibility and constraints with regards to using existing infrastructure to meet the Performance Criteria;
- Specifications detailing quality of materials and other technical requirements that must be achieved by the project;
- Requirements for meeting specific sustainability thresholds;
- Facilities testing and performance demonstration requirements;
- Training and operational support requirements;
- Work review and submittal requirements;
- Construction site and management requirements;
- Permitting requirements that will be the responsibility of the Alternative Delivery team; and
- Performance Guarantee and other contractual terms and requirements.

Once an Alternative Delivery team is under contract, the District and the selected team will work through a Preliminary Design process that results in documentation that provides the details needed to confirm the project will meet the performance standards established in the Contract Documents. Once this milestone is reached, the Alternative Delivery team will move the project toward final design and construction. Under an Alternative Delivery process, the Alternative Delivery team will typically provide a set of plans for District approval that adequately detail the project so the District can confirm the project meets the contract specifications. An Owner Advisor also continues to provide support to an Alternative Delivery project through its completion, helping to ensure the project criteria established in the Contract Documents are met.

7.2.2 Schedule

Table 7-1 lists the milestones that have been established by the DEQ in the June 22, 2022 modification to the NPDES permit.

Table 7-1. DEQ Established Compliance Milestones for Meeting Final Effluent Limits

Requirement	Compliance Date[a,b]
Submit a Wastewater Facilities Plan to DEQ for review and approval that includes the improvements achieve compliance with all of the final effluent limits in Schedule A of the permit.	April 1, 2022
Submit a Preliminary Design Report for meeting the limits to DEQ for review and approval.	December 1, 2022
Secure financing for improvements to meet the limits.	August 1, 2023
Submit final design plans that address all of DEQ's previous comments for achieving compliance with all of the final effluent limits in Schedule A of the permit to DEQ for approval.	August 1, 2024
Submit a status report to DEQ outlining the progress made toward completion of the improvements.	October 1, 2025
Submit a status report to DEQ outlining the progress made toward completion of the improvements.	Annually by January 15th, until completion of the compliance schedule
Complete all improvements and achieve compliance with the final effluent limits in Schedule A of the permit s.	October 1, 2026

(a) Dates shown reflect District-requested eight-month extension.
(b) The permit also requires that the District visually inspect the existing outfall to document its integrity and determine whether it is functioning as designed. An Outfall Inspection Report documenting the inspection must be submitted to the DEQ by December 15, 2024.

The schedule developed by DEQ shown in Table 7-1 reflects a conservative schedule for delivering the project using a traditional design-bid-build approach. However, as previously discussed, the Alternative Delivery process requires significant time to develop and implement Alternative Delivery team selection. While this team selection process could include developing some of the preliminary design elements, the final determination of technology and key design features that is critical to completing the preliminary design will be delayed as compared to a traditional design-bid-build approach. Therefore, several of the early milestones identified in the DEQ schedule are not appropriate under an Alternative Delivery process. However, a property managed and executed Alternative Delivery project should be able to readily meet the final compliance date shown in the DEQ schedule.

Ultimately, the schedule for project completion will need to be defined in partnership with the District's Owner Advisor as the details of the Alternative Delivery procurement process are worked out. Nevertheless, an example of what an Alternative Delivery focused compliance schedule could look like has been developed for illustration purposes and is provided in Table 7-2.

Table 7-2. Example of Potential Compliance Milestones Under an Alternative Delivery Approach

Requirement	Compliance Date
Secure financing for improvements to meet the limits.	March 1, 2023[(a)]
Submit a copy of the executed Alternative Delivery contract	April 1, 2023
Submit a Preliminary Design Report for meeting the limits to DEQ for review and approval.	December 1, 2023
Submit design plans that address all of DEQ's previous comments for meeting the limits to DEQ for approval[(b)]	August 1, 2024
Submit a status report to DEQ outlining the progress made toward completion of the improvements.	October 1, 2025
Submit a status report to DEQ outlining the progress made toward completion of the improvements.	Annually by January 15th, until completion of the compliance schedule
Complete all improvements and achieve compliance with all of the final effluent limits in Schedule A of the permit by meeting the limits.	October 1, 2026

(a) Financing will need to be secured prior to executing the Alternative Delivery contract.
(b) Under an Alternative Delivery process, the Alternative Delivery team will need to provide a set of plans for District approval that adequately detail the project so the District can confirm the project meets the contract specifications. Submittal of this set of plans to DEQ could be established as a project milestone.

7.2.3 Permitting Requirements

To secure low-interest loans or grants through the Oregon's State Revolving Fund (SRF) program, there will need to be an Environmental Assessment completed for the project. Additional requirements could be applicable if federal funds are obtained for the project. The specific requirements will need to be defined once the funding strategy is fully conceptualized.

The project site includes construction near a mapped wetland. However, the U.S. Army Corps recently indicated these wetlands are not jurisdictional. Therefore, 401 permitting may not be necessary for construction.

Prior to distributing biosolids to the public for land application, the District must develop and maintain a Biosolids Management Plan and Land Application Plan meeting the requirements in OAR 340-050-0031. The District must also submit these plans and any significant modification of these plans to DEQ for review and approval with sufficient time to clear DEQ review and a public notice period prior to removing biosolids from the facility.

It should be noted that the permit requires that the District also obtain written authorization from DEQ for each land application site prior to its use unless the biosolids meet Exceptional Quality requirements. As the project is currently envisioned, the biosolids will meet the Exceptional Quality standard and thus would not be subject to the additional authorization requirements.

7.3 SUSTAINABILITY CONSIDERATIONS

With the introduction of a modified treatment process, the District has opportunities to incorporate additional sustainable practices in its treatment system. Specifics related to these opportunities will need to be developed through the Alternative Delivery procurement processes; however, a few of the likely opportunities are as follows:

- The project as envisioned would deliver water to a surface water body where it could be beneficially used. The Klamath Falls area is a farming community with semi-arid conditions. Beneficially using the treated effluent will help alleviate the stress of regional water demands.
- The new treatment facilities would likely include the ability to recycle treated effluent for in-plant use purposes.
- The District recently installed solar panels at the WWTP site, aiming to offset its electrical costs and reduce its carbon footprint. Expansion of this system is likely under the project.
- The selected project will need to meet energy efficiency and resiliency standards established by the District.
- The site could be developed using green infrastructure techniques that minimize new pavement and retains onsite stormwater.

7.4 ESTIMATED COST

Table 7-3 and Table 7-4 show the estimated capital costs for the surface water discharge alternatives based on two conceptual strategies developed under this Facility Plan. Note that costs for Alternatives 1A and 1B are presented as the upgrades to the treatment facility will be necessary to discharge to surface waters. The upgrades to the treatment facility will enable the District to either continue to discharge to the Lake Ewauna or to an irrigation district. As shown, the initial cost of the project is expected to be $70 to $75 million. With annual treatment related O&M costs of $3 to $4 million, the net lifecycle costs of the project through 2045 is expected to range from $124 to $133 million (reported as 2021 dollars – ENR 20-Cities Average Construction Cost Index of 12,480). These cost estimates are further detailed in Chapter 6.

Table 7-3. Estimated Capital Costs for Klamath River Surface Water Discharge – MBR Treatment Concept (Alternative 1A)

Description	Cost, dollars
Condition Repairs	550,000
Influent Pipeline	580,000
Influent Pump Station	1,870,000
Membrane Bioreactor and Influent Screening	23,580,000
UV Disinfection	2,330,000
FKC Class A biosolids Treatment	7,330,000
Dewatered solids storage and equipment	2,780,000
Pond 4A Rehab	4,330,000
Pond 2 and 3 Solids Removal	810,000
Pond 2 and 3 Solar Bees	220,000
Operations/Lab Building	1,760,000
Plant Utilities	1,330,000
Subtotal	**$47,470,000**
Project Phase-Level OPCC Contingency (20 percent)	9,494,000
Engineer's Preliminary Opinion of Probable Costs	**$56,964,000**
Changes and Unforeseen Conditions During Construction (5 percent)	2,850,000
Engineering Design, Environmental Planning and Studies, Construction Management, ESDC, and Legal and Admin Costs (25 percent)	14,240,000
Engineer's Preliminary Opinion of Probable Total Capital Cost	**$74,050,000**

Table 7-4. Estimated Capital Costs for Klamath River Surface Water Discharge – E3 Water LLC Treatment System Concept (Alternative 1B)	
Description	Cost, dollars
Pond 4A Rehab	4,330,000
Pond 2 and 3 Solids Removal	810,000
Pond 2 and 3 Solar Bees	220,000
Condition Repairs	550,000
Subtotal	**$5,910,000**
Project Phase-Level OPCC Contingency (20 percent)	1,182,000
Engineer's Preliminary Opinion of Probable Costs	**$7,092,000**
Changes and Unforeseen Conditions During Construction (5 percent)	354,600
Engineering Design, Environmental Planning and Studies, Construction Management, ESDC, and Legal and Admin Costs (25 percent)	1,773,000
Engineer's Preliminary Opinion of Probable Total Capital Cost	**$9,220,000**
E3 Water LLC Cost Estimate	**$60,326,200**
Engineer's Preliminary Opinion of Probable Total Capital Cost	**$69,546,200**

7.5 DISTRICT FINANCIAL CONSIDERATIONS

The District's will need to develop a financing plan for this project. A discussing of some of the potential financing options is provide below followed by background information for the District's financial position taken from the District's FY 2020/21 budget information.

7.5.1 Project Financing

Because the District has been aware of the pending changes of its permit, it has accumulated significant cash reserves to reduce the burden of financing such a large capital improvement project. The Clean Water SRF is defined by ORS 468.423 and allows intergovernmental entities such as the District the access to below-market rate loans to plan, design, and/or construct water pollution control projects. Based on the rate schedule effective until March 31, 2022, the District could expect rates of 1.68 percent with an annual fee of 0.5 percent of the unpaid balance. However, current rates do not reflect the inflation trends occurring in early 2022.

Other public financing sources such as the United States Department of Agriculture – Rural Development program, are not available to the District due to the population of the District. The Rural Community Assistance Corporation (RCAC) can provide Long-Term environmental infrastructure loans that may be used to supplement an SRF loan. The interest rates for these loans are not published by RCAC and are determined at closing as the secondary market rate. This rate would be higher than the SRF rate and should only be used to supplement the max available from the SRF.

Business Oregon is a state agency that provides loans for water/wastewater and public works programs. These loans are the Water/Wastewater Program and Special Public Works Fund, respectively. These loans have a cap of $10 million at typical market rates. Similar to the RCAC loans, these are useful to supplement available SRF credit lines but should be considered separately. Business Oregon can also assist with obtaining a Community Development Block Grant worth up to $2.5 million. This grant is available to communities for which at least 51 percent of the population is considered low or moderate income per U.S. Department of Housing and Urban Development standards.

Funding through the Water Infrastructure Finance and Innovation Act (WIFIA) is another possibility for the District. The District would qualify as a small community (population of 25,000 or fewer) and be available for up to $5 million in funding. Interest rates for WIFIA loans are equal to or greater than the U.S. Treasury Rate of a similar maturity at the date of closing. To be considered for WIFIA funding, the District would need to submit a letter of interest to the EPA. If selected by the EPA, the District would then prepare an application, which has a fee of at least $100,000.

7.5.2 Historical Revenue, Costs, and Reserves

Historical revenue reported by the District in the FY 2020/21 annual budget was used for cost projections and is shown in Table 7-5. Costs are separated by O&M and capital costs. As shown, the District has collected approximately $5 to $6 million annually in recent years, which has been used to project future costs and reserves by the District. Anticipating the need for capital expenditures associated with this project, the District has accumulated reserves of approximately $25 million. These reserves are available to implement improvements needed to meet new treatment requirements.

The District will need to use other financing sources, such as the SRF, to fully finance the project. To support this effort, the District will need to retain the services of a financial consultant to develop the budget documents needed to define necessity for, and amount of, a potential rate increase. Due to modest growth of the service population and therefore income from sewer fees, the District will eventually need to increase its rates to keep up with cost increases due to inflation. However, with the reserves on hand, an immediate rate increases may not be required to fund the project.

Table 7-5. Wastewater O&M Costs and Resources

Cost Item	Actual, dollars FY 2018/19	Actual, dollars FY 2019/20	Projected, dollars FY 2020/21	Adopted, dollars FY 2021/22
Administration Capital Costs				
Administration	3,821	1,847	0	0
Collection System	449,195	887,865	2,348,713	764,234
Treatment Plant	1,817,072	2,523,612	7,045,111	10,079,681
Total Capital Costs	**$2,270,088**	**$3,413,324**	**$9,393,824**	**$10,843,915**
O&M Costs				
Administration	410,002	445,003	484,322	494,575
Collection System	667,508	806,639	677,578	922,836
Treatment Plant	556,532	551,114	729,858	1,210,338
Total O&M Costs	**$1,634,042**	**$1,802,756**	**$1,891,758**	**$2,627,749**
Resources				
Sewer Fees	4,212,099	4,429,309	4,731,511	4,756,986
Investment Income	909,400	802,043	251,460	225,600
Grants and Incentives	5,000	306,306	49,651	3,000
Miscellaneous	1,279,231	288,966	318,972	223,348
Total Resources	**$6,405,730**	**$5,826,624**	**$5,351,594**	**$5,208,934**

7.5.3 Projected Rates

The impact on rates for the two Alternative 1 options are presented in the following section. The District is currently collecting revenue in anticipation of the improvements and has used these funds for accumulating reserves. In Fiscal Year 2021-22, the total operational costs excluding capital are projected to be $2,069,000 while the budgeted service fee revenue is $4,022,000 which means that $1,953,000 would be available to pay debt service costs.

The current DEQ rate for state revolving funds is 2.18 percent including the annual service fee. Since interest rates are currently expected to increase, a rate of 2.5 percent has been used to estimate annual debt service costs. A term of 30 years has been used. Both options evaluated have been assessed because their respective operation and maintenance costs are different. Table 7-6 shows the projected rate based on the capital costs shown in Table 7-3 and Table 7-4 and the additional operation and maintenance costs shown in Table 6-7 and Table 6-8.

Table 7-6.. Projected Annual Rates

Cost Description	Cost, dollars	
	Alternative 1A - MBR	Alternative 1B - E3 Water
Additional Annual O&M	2,024,000	2,889,000
Existing O&M Without Capital	2,069,000	2,069,000
Subtotal O&M Costs	**4,093,000**	**4,958,000**
Capital Cost	74,050,000	69,546,200
Existing Revenue Available for Debt Service	1,953,000	1,953,000
Debt Service Cost	2,343,000	2,128,000
Net Debt Service Cost	**390,000**	**175,000**
Total Annual Cost	4,483,000	5,133,000
Annual Cost for a Single-Family Dwelling	461	527

The 2021-22 rate for a single-family dwelling is $413.32 per year and on July 1, 2022, the rate will increase to $443.92. A rate increase between 5 and 30 percent will be required depending on which option is selected by the District. This increase is based on the current level of costs. Additional future rate increases will be required depending on the level of inflation that is experienced.

The analysis is also based on the current level of reserves. If reserves are spent that exceed the estimates indicated in Table 7-5 and Table 7-6Table 7-5. Wastewater O&M Costs and Resources, the rate increases will be higher.

7.6 REFERENCE

State of DEQ 2019. *Preparing Wastewater Planning Documents and Environmental Reports for Public Utilities*. Accessed at https://www.oregon.gov/deq/FilterDocs/FacilitiesPlansGuidelines.pdf on March 16, 2022.

Appendix A

South Suburban Sanitary District Wetland Delineation
July 2021

DEPARTMENT OF THE ARMY
U.S. ARMY CORPS OF ENGINEERS, PORTLAND DISTRICT
P.O. BOX 2946
PORTLAND, OR 97208-2946

September 15, 2022

Regulatory Branch
Corps No. NWP-2021-487

Ms. Cindy Oden
South Suburban Sanitary District
2201 Laverne Avenue
Klamath Falls, Oregon 97603
cindyo@sssd.org

Dear Ms. Oden:

The U.S. Army Corps of Engineers (Corps) received your request for an Approved Jurisdictional Determination (AJD) of the aquatic resources, including wetlands, within the review area on the properties located at Maywood Drive (Tax Lot 400, 500, 800, 200, 700, 900, 1000, 600, 18000) in Klamath Falls Klamath County, Oregon at Latitude/Longitude: 42.204742°, -121.768116°. Other aquatic resources, including wetlands, that may occur on this property or on adjacent properties outside the review area are not the subject of this determination.

The Corps has determined that Wetland Ditch 1, Wetland Ditch 2, and Wetland 3 within the review area are waters of the U.S. The Corps has also determined Ditch 3, 4, 5 and Wetland, 1, 2, and 4 are not waters of the U.S. The enclosed *Approved Jurisdictional Determination Form* (Enclosure 1) provides the size, criteria and rationale for jurisdiction for all aquatic resources within the review area. The perimeter of the review area and the boundaries of the delineated waters of the U.S. subject to this AJD are identified on the enclosed drawings (Enclosure 2). A copy of the AJD Form can also be found on our website (https://www.nwp.usace.army.mil/Missions/Regulatory/Determinations/).

If you object to the enclosed AJD, you may request an administrative appeal under 33 CFR Part 331 as described in the enclosed *Notification of Administrative Appeal Options and Process and Request for Appeal* (*RFA*) form (Enclosure 3). To appeal this AJD, you must submit a completed *RFA* form to the Corps Northwestern Division (NWD) office at the address listed on the form. In order for the request for appeal to be accepted, the Corps must determine that the form is complete, that the request meets the criteria for appeal under 33 CFR § 331.5, and the form must be received by the NWD office within 60 days from the date on the form. It is not necessary to submit the form to the NWD office if you do not object to the enclosed AJD.

The delineation included herein has been conducted to identify the location and extent of the aquatic resource boundaries and/or the jurisdictional status of aquatic resources for purposes of the Clean Water Act for the particular site identified in this request. This delineation and/or jurisdictional determination may not be valid for the Wetland Conservation Provisions of the Food Security Act of 1985, as amended. If you or your tenant are U.S. Department of Agriculture (USDA) program participants, or anticipate participation in USDA programs, you should discuss the applicability of a certified wetland determination with the local USDA service center, prior to starting work.

This AJD is valid for a period of five years from the date of this letter unless new information warrants revisions of the determination.

We would like to hear about your experience working with the Portland District, Regulatory Branch. Please complete a customer service survey form available on our website (https://regulatory.ops.usace.army.mil/customer-service-survey/).

If you have any questions regarding our Regulatory Program or permit requirements for work in waters of the U.S., please contact Ms. Katharine A. Mott by telephone at (503) 808-4386 or by email at katharine.a.mott2@usace.army.mil.

Sincerely,

Katharine A. Mott

For: William D. Abadie
Chief, Regulatory Branch

Enclosures

cc with drawings:
Rabe Consulting (Andrea Rabe, andrea@rabeconsulting.com)
Oregon Department of State Lands (Jackson Morgan, Jackson.morgan@dsl.oregon.gov)
Oregon Department of Environmental Quality (401applications@deq.oregon.gov)

APPROVED JURISDICTIONAL DETERMINATION FORM
U.S. Army Corps of Engineers

This form should be completed by following the instructions provided in Section IV of the JD Form Instructional Guidebook.

SECTION I: BACKGROUND INFORMATION

A. REPORT COMPLETION DATE FOR APPROVED JURISDICTIONAL DETERMINATION (JD): September 15, 2022

B. DISTRICT OFFICE, FILE NAME, AND NUMBER: CENWP-ODG, Maywood Drive, NWP-2022-487

C. PROJECT LOCATION AND BACKGROUND INFORMATION:

State: Oregon County/parish/borough: Klamath City: Klamath Falls
Center coordinates of site (lat/long in degree decimal format): Lat. 42.204742° **N**, Long. 121.768116° **W**.
Universal Transverse Mercator:
Name of nearest waterbody: Lake Ewauna
Name of nearest Traditional Navigable Water (TNW) into which the aquatic resource flows: Klamath River
Name of watershed or Hydrologic Unit Code (HUC): Klamath Falls-Klamath River

☒ Check if map/diagram of review area and/or potential jurisdictional areas is/are available upon request.
☐ Check if other sites (e.g., offsite mitigation sites, disposal sites, etc…) are associated with this action and are recorded on a different JD form.

D. REVIEW PERFORMED FOR SITE EVALUATION (CHECK ALL THAT APPLY):

☒ Office (Desk) Determination. Date: August 16, 2022
☐ Field Determination. Date(s):

SECTION II: SUMMARY OF FINDINGS

A. RHA SECTION 10 DETERMINATION OF JURISDICTION.

There **Are no** "*navigable waters of the U.S.*" within Rivers and Harbors Act (RHA) jurisdiction (as defined by 33 CFR part 329) in the review area. [*Required*]

☐ Waters subject to the ebb and flow of the tide.
☐ Waters are presently used, or have been used in the past, or may be susceptible for use to transport interstate or foreign commerce. Explain: .

B. CWA SECTION 404 DETERMINATION OF JURISDICTION.

There **Are** "*waters of the U.S.*" within Clean Water Act (CWA) jurisdiction (as defined by 33 CFR part 328) in the review area. [*Required*]

1. **Waters of the U.S.**
   a. **Indicate presence of waters of U.S. in review area (check all that apply):** [1]
      ☐ TNWs, including territorial seas
      ☐ Wetlands adjacent to TNWs
      ☒ Relatively permanent waters[2] (RPWs) that flow directly or indirectly into TNWs: Wetland Ditch 1
      ☒ Non-RPWs that flow directly or indirectly into TNWs**:** Wetland Ditch 2
      ☐ Wetlands directly abutting RPWs that flow directly or indirectly into TNWs
      ☐ Wetlands adjacent to but not directly abutting RPWs that flow directly or indirectly into TNWs
      ☒ Wetlands adjacent to non-RPWs that flow directly or indirectly into TNWs**:** Wetland 3
      ☐ Impoundments of jurisdictional waters
      ☐ Isolated (interstate or intrastate) waters, including isolated wetlands

   b. **Identify (estimate) size of waters of the U.S. in the review area:**
      Non-wetland waters: linear feet: width (ft) and/or acres.
      Wetlands: 0.15 acres.

   c. **Limits (boundaries) of jurisdiction** based on: **1987 Delineation Manual**
      Elevation of established OHWM (if known): .

2. **Non-regulated waters/wetlands (check if applicable):**[3]
   ☒ Potentially jurisdictional waters and/or wetlands were assessed within the review area and determined to be not jurisdictional. Explain: Wetlands 1, 2 and 4 and Ditch 3, 4, and 5, refer to Section III F.

[1] Boxes checked below shall be supported by completing the appropriate sections in Section III below.
[2] For purposes of this form, an RPW is defined as a tributary that is not a TNW and that typically flows year-round or has continuous flow at least "seasonally" (e.g., typically 3 months).
[3] Supporting documentation is presented in Section III.F.

SECTION III: CWA ANALYSIS

A. TNWs AND WETLANDS ADJACENT TO TNWs

The agencies will assert jurisdiction over TNWs and wetlands adjacent to TNWs. If the aquatic resource is a TNW, complete Section III.A.1 and Section III.D.1. only; if the aquatic resource is a wetland adjacent to a TNW, complete Sections III.A.1 and 2 and Section III.D.1.; otherwise, see Section III.B below.

1. TNW
Identify TNW: .

Summarize rationale supporting determination: .

2. Wetland adjacent to TNW
Summarize rationale supporting conclusion that wetland is "adjacent": .

B. CHARACTERISTICS OF TRIBUTARY (THAT IS NOT A TNW) AND ITS ADJACENT WETLANDS (IF ANY):

This section summarizes information regarding characteristics of the tributary and its adjacent wetlands, if any, and it helps determine whether or not the standards for jurisdiction established under *Rapanos* have been met.

The agencies will assert jurisdiction over non-navigable tributaries of TNWs where the tributaries are "relatively permanent waters" (RPWs), i.e. tributaries that typically flow year-round or have continuous flow at least seasonally (e.g., typically 3 months). A wetland that directly abuts an RPW is also jurisdictional. If the aquatic resource is not a TNW, but has year-round (perennial) flow, skip to Section III.D.2. If the aquatic resource is a wetland directly abutting a tributary with perennial flow, skip to Section III.D.4.

A wetland that is adjacent to but that does not directly abut an RPW requires a significant nexus evaluation. Corps districts and EPA regions will include in the record any available information that documents the existence of a significant nexus between a relatively permanent tributary that is not perennial (and its adjacent wetlands if any) and a traditional navigable water, even though a significant nexus finding is not required as a matter of law.

If the waterbody[4] is not an RPW, or a wetland directly abutting an RPW, a JD will require additional data to determine if the waterbody has a significant nexus with a TNW. If the tributary has adjacent wetlands, the significant nexus evaluation must consider the tributary in combination with all of its adjacent wetlands. This significant nexus evaluation that combines, for analytical purposes, the tributary and all of its adjacent wetlands is used whether the review area identified in the JD request is the tributary, or its adjacent wetlands, or both. If the JD covers a tributary with adjacent wetlands, complete Section III.B.1 for the tributary, Section III.B.2 for any onsite wetlands, and Section III.B.3 for all wetlands adjacent to that tributary, both onsite and offsite. The determination whether a significant nexus exists is determined in Section III.C below.

1. Characteristics of non-TNWs that flow directly or indirectly into TNW

(i) General Area Conditions:
Watershed size: 52,699 **acres**
Drainage area: **Pick List**
Average annual rainfall: 16 inches
Average annual snowfall: 38 inches

(ii) Physical Characteristics:
(a) Relationship with TNW:
☒ Tributary flows directly into TNW.
☐ Tributary flows through **Pick List** tributaries before entering TNW.

Project waters are **30 (or more)** river miles from TNW.
Project waters are **1 (or less)** river miles from RPW.
Project waters are **30 (or more)** aerial (straight) miles from TNW.
Project waters are **1 (or less)** aerial (straight) miles from RPW.
Project waters cross or serve as state boundaries. Explain: The project water flows into the Klamath River, which flows south into California.

[4] Note that the Instructional Guidebook contains additional information regarding swales, ditches, washes, and erosional features generally and in the arid West.

Identify flow route to TNW[5]: The Klamath River is listed as a navigable waterway according to Navigable Waters of California San Francisco District dated August 2, 1971 .
Tributary stream order, if known: .

(b) General Tributary Characteristics (check all that apply):
Tributary is: ☐ Natural
☒ Artificial (man-made). Explain: Wetland Ditch 2 is straight and to not appear to be natural. The ditch was constructed sometime prior to 1956.
☐ Manipulated (man-altered). Explain: .

Tributary properties with respect to top of bank (estimate):
Average width: 6 feet
Average depth: 1 feet
Average side slopes: Vertical

Primary tributary substrate composition (check all that apply):

☒ Silts	☒ Sands	☐ Concrete
☐ Cobbles	☐ Gravel	☐ Muck
☐ Bedrock	☐ Vegetation. Type/% cover:	
☐ Other. Explain: .		

Tributary condition/stability [e.g., highly eroding, sloughing banks]. Explain: Stable.
Presence of run/riffle/pool complexes. Explain: None.
Tributary geometry: Straight
Tributary gradient (approximate average slope): %

(c) Flow:
Tributary provides for: Seasonal Flow
Estimate average number of flow events in review area/year: 11-20
Describe flow regime: Non-RPW.
Other information on duration and volume: .

Surface flow is: Discrete and confined**.** Characteristics: Surface flow is confined within the ditch boundary.

Subsurface flow: **Pick List**. Explain findings: .
☐ Dye (or other) test performed: .

Tributary has (check all that apply):
☒ Bed and banks
☒ OHWM[6] (check all indicators that apply):

☒ clear, natural line impressed on the bank	☐ the presence of litter and debris
☐ changes in the character of soil	☐ destruction of terrestrial vegetation
☐ shelving	☐ the presence of wrack line
☐ vegetation matted down, bent, or absent	☐ sediment sorting
☐ leaf litter disturbed or washed away	☐ scour
☐ sediment deposition	☐ multiple observed or predicted flow events
☐ water staining	☐ abrupt change in plant community
☐ other (list):	

☐ Discontinuous OHWM.[7] Explain: .

If factors other than the OHWM were used to determine lateral extent of CWA jurisdiction (check all that apply):

☐ High Tide Line indicated by:	☐ Mean High Water Mark indicated by:
☐ oil or scum line along shore objects	☐ survey to available datum;
☐ fine shell or debris deposits (foreshore)	☐ physical markings;
☐ physical markings/characteristics	☐ vegetation lines/changes in vegetation types.
☐ tidal gauges	
☐ other (list):	

(iii) Chemical Characteristics:

[5] Flow route can be described by identifying, e.g., tributary a, which flows through the review area, to flow into tributary b, which then flows into TNW.
[6] A natural or man-made discontinuity in the OHWM does not necessarily sever jurisdiction (e.g., where the stream temporarily flows underground, or where the OHWM has been removed by development or agricultural practices). Where there is a break in the OHWM that is unrelated to the waterbody's flow regime (e.g., flow over a rock outcrop or through a culvert), the agencies will look for indicators of flow above and below the break.
[7] Ibid.

Characterize tributary (e.g., water color is clear, discolored, oily film; water quality; general watershed characteristics, etc.).
Explain: The area is subject to high level PH. The water is runoff from surrounding developments.
Identify specific pollutants, if known: .

(iv) Biological Characteristics. Channel supports (check all that apply):

- ☐ Riparian corridor. Characteristics (type, average width): None.
- ☐ Wetland fringe. Characteristics: .
- ☐ Habitat for:
  - ☐ Federally Listed species. Explain findings: .
  - ☐ Fish/spawn areas. Explain findings: .
  - ☐ Other environmentally-sensitive species. Explain findings: .
  - ☐ Aquatic/wildlife diversity. Explain findings: .

2. Characteristics of wetlands adjacent to non-TNW that flow directly or indirectly into TNW

(i) Physical Characteristics:

(a) General Wetland Characteristics:
Properties:
Wetland size: Wetland 3 – 0.15 acres
Wetland type. Explain:Palustrine Emergent.
Wetland quality. Explain: .
Project wetlands cross or serve as state boundaries. Explain: No, wetland is located within the state of Oregon.

(b) General Flow Relationship with Non-TNW:
Flow is: Ephemeral. Explain: .

Surface flow is**:** Overland Sheetflow
Characteristics: Wetland 3 abuts Wetland Ditch 2.

Subsurface flow: **Pick List**. Explain findings: .
☐ Dye (or other) test performed: .

(c) Wetland Adjacency Determination with Non-TNW:
- ☒ Directly abutting
- ☐ Not directly abutting
  - ☐ Discrete wetland hydrologic connection. Explain: .
  - ☐ Ecological connection. Explain: .
  - ☐ Separated by berm/barrier. Explain: .

(d) Proximity (Relationship) to TNW
Project wetlands are 30 (or more) river miles from TNW.
Project waters are 30 (or more) aerial (straight) miles from TNW.
Flow is from: Wetland through a non-RPW to a navigable water.
Estimate approximate location of wetland as within the not located within floodplain.

(ii) Chemical Characteristics:
Characterize wetland system (e.g., water color is clear, brown, oil film on surface; water quality; general watershed characteristics; etc.). Explain: .
Identify specific pollutants, if known: .

(iii) Biological Characteristics. Wetland supports (check all that apply):

- ☐ Riparian buffer. Characteristics (type, average width): .
- ☒ Vegetation type/percent cover. Explain: Sparse vegetation.
- ☐ Habitat for:
  - ☐ Federally Listed species. Explain findings: .
  - ☐ Fish/spawn areas. Explain findings: .
  - ☐ Other environmentally-sensitive species. Explain findings: .
  - ☐ Aquatic/wildlife diversity. Explain findings: .

3. Characteristics of all wetlands adjacent to the tributary (if any)
All wetland(s) being considered in the cumulative analysis: 1
Approximately (0.15) acres in total are being considered in the cumulative analysis.

For each wetland, specify the following:

Directly abuts? (Y/N)	Size (in acres)	Directly abuts? (Y/N)	Size (in acres)
Wetland 3 Y	0.15 acre		

Summarize overall biological, chemical and physical functions being performed: .

C. SIGNIFICANT NEXUS DETERMINATION

A significant nexus analysis will assess the flow characteristics and functions of the tributary itself and the functions performed by any wetlands adjacent to the tributary to determine if they significantly affect the chemical, physical, and biological integrity of a TNW. For each of the following situations, a significant nexus exists if the tributary, in combination with all of its adjacent wetlands, has more than a speculative or insubstantial effect on the chemical, physical and/or biological integrity of a TNW. Considerations when evaluating significant nexus include, but are not limited to the volume, duration, and frequency of the flow of water in the tributary and its proximity to a TNW, and the functions performed by the tributary and all its adjacent wetlands. It is not appropriate to determine significant nexus based solely on any specific threshold of distance (e.g. between a tributary and its adjacent wetland or between a tributary and the TNW). Similarly, the fact an adjacent wetland lies within or outside of a floodplain is not solely determinative of significant nexus.

Draw connections between the features documented and the effects on the TNW, as identified in the *Rapanos* Guidance and discussed in the Instructional Guidebook. Factors to consider include, for example:

- Does the tributary, in combination with its adjacent wetlands (if any), have the capacity to carry pollutants or flood waters to TNWs, or to reduce the amount of pollutants or flood waters reaching a TNW?
- Does the tributary, in combination with its adjacent wetlands (if any), provide habitat and lifecycle support functions for fish and other species, such as feeding, nesting, spawning, or rearing young for species that are present in the TNW?
- Does the tributary, in combination with its adjacent wetlands (if any), have the capacity to transfer nutrients and organic carbon that support downstream foodwebs?
- Does the tributary, in combination with its adjacent wetlands (if any), have other relationships to the physical, chemical, or biological integrity of the TNW?

Note: the above list of considerations is not inclusive and other functions observed or known to occur should be documented below:

1. **Significant nexus findings for non-RPW that has no adjacent wetlands and flows directly or indirectly into TNWs.** Explain findings of presence or absence of significant nexus below, based on the tributary itself, then go to Section III.D:

2. **Significant nexus findings for non-RPW and its adjacent wetlands, where the non-RPW flows directly or indirectly into TNWs.** Explain findings of presence or absence of significant nexus below, based on the tributary in combination with all of its adjacent wetlands, then go to Section III.D:

   Wetland Ditch 2 and Wetland 3: Wetland 3 abuts Wetland Ditch 2 based upon the delineated boundary. Wetland Ditch flows 1553 linear feet Area to the borrow ditch along the east side of the railroad outside of the Review Area. The railroad ditch drains to the south side of the sewer lagoons, through a culvert to the south and then out the Texcum Pump station to the west past the railroad tracks to the channel which connects to Lake Ewauna. Lake Ewauna flows to the Klamath River, which is listed as a navigable waterway to river mile 39. During the wet season, Wetland Ditch 2 and Wetland 3 would have a hydrologic connection through the railroad ditch and pump to the Klamath River. The ditch and Wetland 3 during the wet season would carry pollutants and nutrients downstream to Lake Ewauna which is an RPW and those pollutants and nutrients would be indirectly carried downstream to the Klamath River. The ditch and Wetland 3 have more than a speculative and insubstantial nexus downstream to the Klamath River.

3. **Significant nexus findings for wetlands adjacent to an RPW but that do not directly abut the RPW.** Explain findings of presence or absence of significant nexus below, based on the tributary in combination with all of its adjacent wetlands, then go to Section III.D: .

D. DETERMINATIONS OF JURISDICTIONAL FINDINGS. THE SUBJECT WATERS/WETLANDS ARE (CHECK ALL THAT APPLY):

1. **TNWs and Adjacent Wetlands.** Check all that apply and provide size estimates in review area:
   ☐ TNWs: linear feet width (ft), Or, acres.
   ☐ Wetlands adjacent to TNWs: acres.

2. **RPWs that flow directly or indirectly into TNWs.**

☒ Tributaries of TNWs where tributaries typically flow year-round are jurisdictional. Provide data and rationale indicating that tributary is perennial: Wetland Ditch 1 is determined to be an RPW with more than seasonal flow. Google Earth aerials from August 2011, June 2016, and August 2019 show surface water within Wetland Ditch 1. Wetland Ditch 1 drains to the west to the borrow ditch along the east side of the railroad. The railroad ditch drains to the south side of the sewer lagoons, through a culvert to the south and then out the Texcum Pump station to the west past the railroad tracks to the channel which connects to Lake Ewauna.

☐ Tributaries of TNW where tributaries have continuous flow "seasonally" (e.g., typically three months each year) are jurisdictional. Data supporting this conclusion is provided at Section III.B. Provide rationale indicating that tributary flows seasonally: .

Provide estimates for jurisdictional waters in the review area (check all that apply):

☒ Tributary waters: 4478 linear feet 7 width (ft).

☐ Other non-wetland waters: acres.

Identify type(s) of waters: .

3. **Non-RPWs[8] that flow directly or indirectly into TNWs.**

☒ Waterbody that is not a TNW or an RPW, but flows directly or indirectly into a TNW, and it has a significant nexus with a TNW is jurisdictional. Data supporting this conclusion is provided at Section III.C. Wetland Ditch 2 is determined to be a non-RPW ditch that flows indirectly flow to a TNW and drains Wetland 3.

Provide estimates for jurisdictional waters within the review area (check all that apply):

☒ Tributary waters: 1553 linear feet 5 feet width (ft).

☐ Other non-wetland waters: acres.

Identify type(s) of waters: **.**

4. **Wetlands directly abutting an RPW that flow directly or indirectly into TNWs.**

☐ Wetlands directly abut RPW and thus are jurisdictional as adjacent wetlands.

☐ Wetlands directly abutting an RPW where tributaries typically flow year-round. Provide data and rationale indicating that tributary is perennial in Section III.D.2, above. Provide rationale indicating that wetland is directly abutting an RPW: **.**

☐ Wetlands directly abutting an RPW where tributaries typically flow "seasonally." Provide data indicating that tributary is seasonal in Section III.B and rationale in Section III.D.2, above. Provide rationale indicating that wetland is directly abutting an RPW: .

Provide acreage estimates for jurisdictional wetlands in the review area: acres.

5. **Wetlands adjacent to but not directly abutting an RPW that flow directly or indirectly into TNWs.**

☐ Wetlands that do not directly abut an RPW, but when considered in combination with the tributary to which they are adjacent and with similarly situated adjacent wetlands, have a significant nexus with a TNW are jurisidictional. Data supporting this conclusion is provided at Section III.C.

Provide acreage estimates for jurisdictional wetlands in the review area: acres.

6. **Wetlands adjacent to non-RPWs that flow directly or indirectly into TNWs.**

☒ Wetlands adjacent to such waters, and have when considered in combination with the tributary to which they are adjacent and with similarly situated adjacent wetlands, have a significant nexus with a TNW are jurisdictional. Data supporting this conclusion is provided at Section III.C. Wetland 3 abuts Wetland Ditch 2 and was determined to have a significant nexus downstream to a TNW.

Provide estimates for jurisdictional wetlands in the review area: 0.15 acres.

7. **Impoundments of jurisdictional waters.[9]**

As a general rule, the impoundment of a jurisdictional tributary remains jurisdictional.

☐ Demonstrate that impoundment was created from "waters of the U.S.," or

☐ Demonstrate that water meets the criteria for one of the categories presented above (1-6), or

☐ Demonstrate that water is isolated with a nexus to commerce (see E below).

[8]See Footnote # 3.

[9] To complete the analysis refer to the key in Section III.D.6 of the Instructional Guidebook.

E. ISOLATED [INTERSTATE OR INTRA-STATE] WATERS, INCLUDING ISOLATED WETLANDS, THE USE, DEGRADATION OR DESTRUCTION OF WHICH COULD AFFECT INTERSTATE COMMERCE, INCLUDING ANY SUCH WATERS (CHECK ALL THAT APPLY):[10]

☐ which are or could be used by interstate or foreign travelers for recreational or other purposes.
☐ from which fish or shellfish are or could be taken and sold in interstate or foreign commerce.
☐ which are or could be used for industrial purposes by industries in interstate commerce.
☐ Interstate isolated waters. Explain: .
☐ Other factors. Explain: .

Identify water body and summarize rationale supporting determination: .

Provide estimates for jurisdictional waters in the review area (check all that apply):
☐ Tributary waters: linear feet width (ft).
☐ Other non-wetland waters: acres.
Identify type(s) of waters: **.**
☐ Wetlands: acres.

F. NON-JURISDICTIONAL WATERS, INCLUDING WETLANDS (CHECK ALL THAT APPLY):

☐ If potential wetlands were assessed within the review area, these areas did not meet the criteria in the 1987 Corps of Engineers Wetland Delineation Manual and/or appropriate Regional Supplements.
☒ Review area included isolated waters with no substantial nexus to interstate (or foreign) commerce.
☒ Prior to the Jan 2001 Supreme Court decision in "*SWANCC*," the review area would have been regulated based solely on the "Migratory Bird Rule" (MBR).
☐ Waters do not meet the "Significant Nexus" standard, where such a finding is required for jurisdiction. Explain: **.**
☒ Other: (explain, if not covered above): Ditches 3, 4, and 5 were determined to have non-RPW flow. The ditches were constructed prior to 1956 and there is no evidence documenting the ditches were constructed in an aquatic resource. Historic topographic maps do not map aquatic resources in this area. Based upon historic aerial imagery the ditch was excavated in uplands. In accordance with the preamble to the 1986 regulatory definition of Waters of the U.S., ditches excavated in uplands, draining uplands, and carrying non-RPW flow are not considered waters of the United States.

Provide acreage estimates for non-jurisdictional waters in the review area, where the sole potential basis of jurisdiction is the MBR factors (i.e., presence of migratory birds, presence of endangered species, use of water for irrigated agriculture), using best professional judgment (check all that apply):
☐ Non-wetland waters (i.e., rivers, streams): linear feet width (ft).
☐ Lakes/ponds: acres.
☐ Other non-wetland waters: acres. List type of aquatic resource: .
☒ Wetlands: 15.32 acres.

Wetland 1: Wetland 1 is a palustrine emergent wetland that is 12.23 acres in size. The wetland is sparsely vegetated. Hydrologic inputs are primarily precipitation and minor runoff from adjacent upland areas. The Review Area has high alkalinity in the soils. The nearest waterway is Wetland Ditch 2 which is approximately 90 linear feet away based on Google Earth. There is a rise in topography between the wetland and the ditch, this is documented by the increase in dense vegetation in this area. There are no surface water channels connecting Wetland 1 and the ditch. The mapped soil in the area is Malin clay loam, a hydric soil. Malin characteristics include a slope of 0 to 1 percent and a restrictive layer at more than 80 inches, it is considered poorly drained. The capacity of the most restrictive limiting layer to transmit water (ksat) is 0.06 to 0.20 in/hr. Hydrology does not flow through shallow subsurface to the ditch. Except under the most extreme conditions, the wetland land would not overtop its boundary and sheet flow to the ditch. Hydrology is confined within the wetland and either is absorbed into the ground water or evaporates. Oregon Compass map does not map amphibians in the area. Due to the high levels of alkalinity the area is not subject to high levels of wildlife use that would use both the wetland and the ditch. Wetland 1 lacks an interstate commerce connection. Wetland 1 is not used by interstate or foreign travelers for recreational purposes, and lacks habitat, resources, birds and wildlife of special significance which would attract interstate travelers. Wetland 1 is determined to be isolated.

Wetland 2: Wetland 2 is a palustrine emergent wetland that is 1.41 acres. The wetland is sparsely vegetated. Hydrologic inputs are primarily precipitation and minor runoff from adjacent upland areas. The Review Area has high alkalinity in the soils. The nearest waterway is Wetland Ditch 2 which is approximately 45 linear feet away based on Google Earth. There is a rise in topography between the wetland and the ditch, this is documented by the increase in dense vegetation in this area. There are no surface water channels connecting Wetland 2 and the ditch. The mapped soil in the area is Malin clay loam, a hydric soil. Malin characteristics include a slope of 0 to 1 percent and a restrictive layer at more than 80 inches, it is considered poorly drained. The capacity of the most restrictive limiting layer to transmit water (ksat) is 0.06 to 0.20 in/hr. Hydrology does not flow through shallow subsurface to the ditch. Except

[10] Prior to asserting or declining CWA jurisdiction based solely on this category, Corps Districts will elevate the action to Corps and EPA HQ for review consistent with the process described in the Corps/EPA *Memorandum Regarding CWA Act Jurisdiction Following Rapanos.*

under the most extreme conditions, the wetland land would not overtop its boundary and sheet flow to the ditch. Hydrology is confined within the wetland and either is absorbed into the ground water or evaporates. Oregon Compass map does not map amphibians in the area. Due to the high levels of alkalinity the area is not subject to high levels of wildlife use that would use both the wetland and the ditch. Wetland 2 lacks an interstate commerce connection. Wetland 2 is not used by interstate or foreign travelers for recreational purposes, and lacks habitat, resources, birds and wildlife of special significance which would attract interstate travelers. Wetland 2 is determined to be isolated.

Wetland 4: Wetland 4 is a palustrine emergent wetland that is 1.68 acres. The wetland is sparsely vegetated. Hydrologic inputs are primarily precipitation and minor runoff from adjacent upland areas. The Review Area has high alkalinity in the soils. The nearest waterway is Wetland Ditch 1 which is approximately 218 linear feet away based on Google Earth. There is a rise in topography between the wetland and the ditch, this is documented by the increase in dense vegetation in this area. There are no surface water channels connecting Wetland 4 and the ditch. The mapped soil in the area is Malin clay loam, a hydric soil. Malin characteristics include a slope of 0 to 1 percent and a restrictive layer at more than 80 inches, it is considered poorly drained. The capacity of the most restrictive limiting layer to transmit water (ksat) is 0.06 to 0.20 in/hr. Hydrology does not flow through shallow subsurface to the ditch. Except under the most extreme conditions, the wetland land would not overtop its boundary and sheet flow to the ditch. Hydrology is confined within the wetland and either is absorbed into the ground water or evaporates. Oregon Compass map does not map amphibians in the area. Due to the high levels of alkalinity the area is not subject to high levels of wildlife use that would use both the wetland and the ditch. Wetland 4 lacks an interstate commerce connection. Wetland 4 is not used by interstate or foreign travelers for recreational purposes, and lacks habitat, resources, birds and wildlife of special significance which would attract interstate travelers. Wetland 4 is determined to be isolated.

Provide acreage estimates for non-jurisdictional waters in the review area that do not meet the “Significant Nexus” standard, where such a finding is required for jurisdiction (check all that apply):

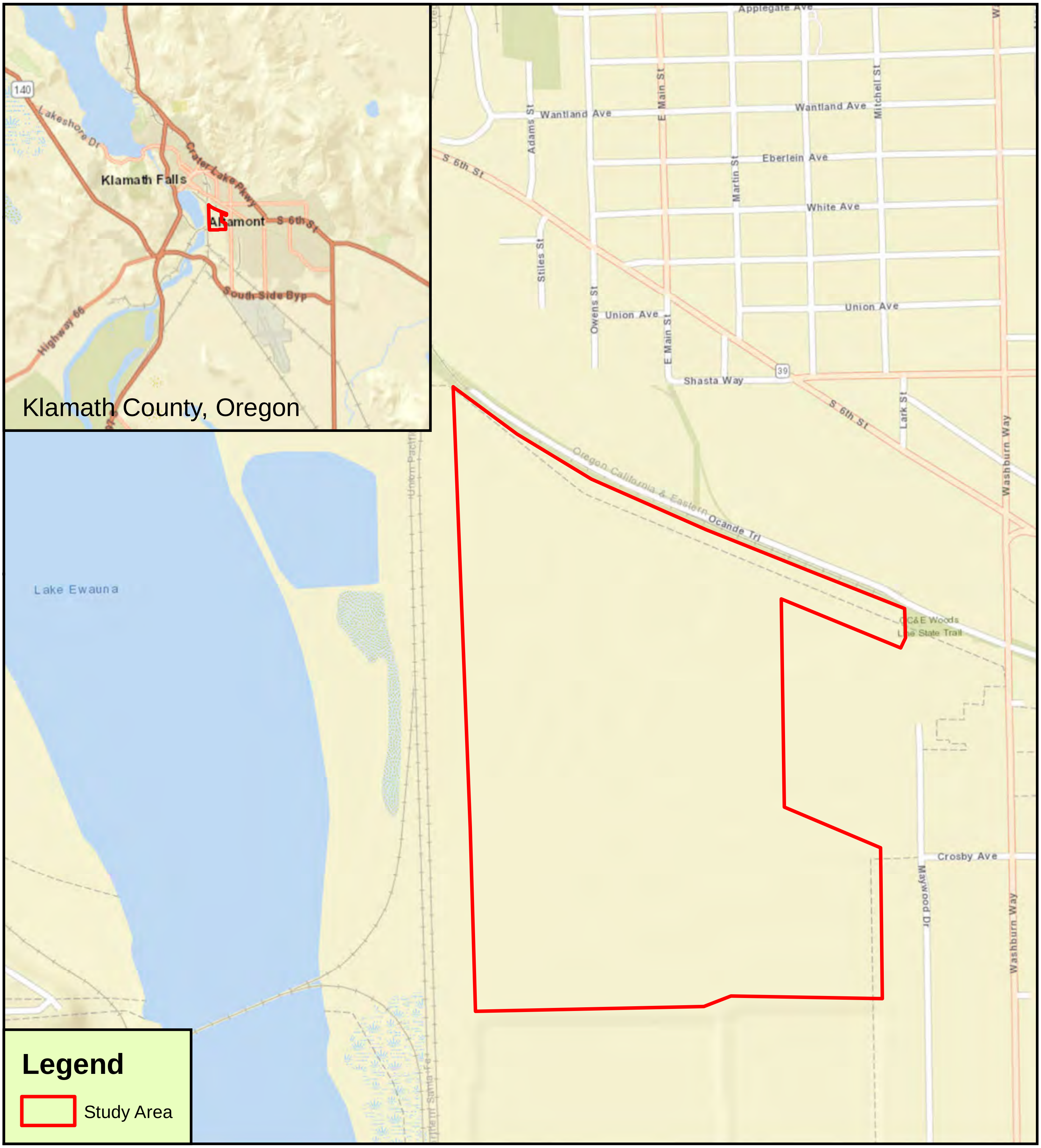
☐ Non-wetland waters (i.e., rivers, streams): linear feet, width (ft).
☐ Lakes/ponds: acres.
☐ Other non-wetland waters: acres. List type of aquatic resource: .
☐ Wetlands: acres.

<u>SECTION IV: DATA SOURCES</u>.

A. SUPPORTING DATA. Data reviewed for JD (check all that apply - checked items shall be included in case file and, where checked and requested, appropriately reference sources below):

☒ Maps, plans, plots or plat submitted by or on behalf of the applicant/consultant: South Suburban Sanitary District dated July 2021.
☒ Data sheets prepared/submitted by or on behalf of the applicant/consultant.
  ☒ Office concurs with data sheets/delineation report.
  ☐ Office does not concur with data sheets/delineation report.
☐ Data sheets prepared by the Corps: .
☐ Corps navigable waters’ study: .
☒ U.S. Geological Survey Hydrologic Atlas: .
  ☒ USGS NHD data. Oregon SFAM mapper accessed August 12, 2022.
  ☐ USGS 8 and 12 digit HUC maps.
☒ U.S. Geological Survey map(s). Cite scale & quad name: USGS Topo viewer accessed March 3, 2022.
☒ USDA Natural Resources Conservation Service Soil Survey. Citation: .
☐ National wetlands inventory map(s). Cite name: .
☐ State/Local wetland inventory map(s): .
☐ FEMA/FIRM maps: .
☐ 100-year Floodplain Elevation is: (National Geodetic Vertical Datum of 1929)
☒ Photographs: ☒ Aerial (Name & Date): Google Earth accessed August 12, 2022.
  or ☐ Other (Name & Date): .
☐ Previous determination(s). File no. and date of response letter: .
☐ Applicable/supporting case law: .
☐ Applicable/supporting scientific literature: .
☒ Other information (please specify): Oregon Department of Fish and Wildlife Compass mapping accessed August 12, 2022. Department of Geology and Mineral Industries Lidar accessed August 12, 2022.

B. ADDITIONAL COMMENTS TO SUPPORT JD: On August 23, 2022, we coordinated this JD with EPA Region 10 and Corps HQ. On September 13, 2022, the EPA concurred with our findings. On August 29, 2022, Corps HQ responded with no comments.



South Suburban Sanitary

Figure #1: Vicinity

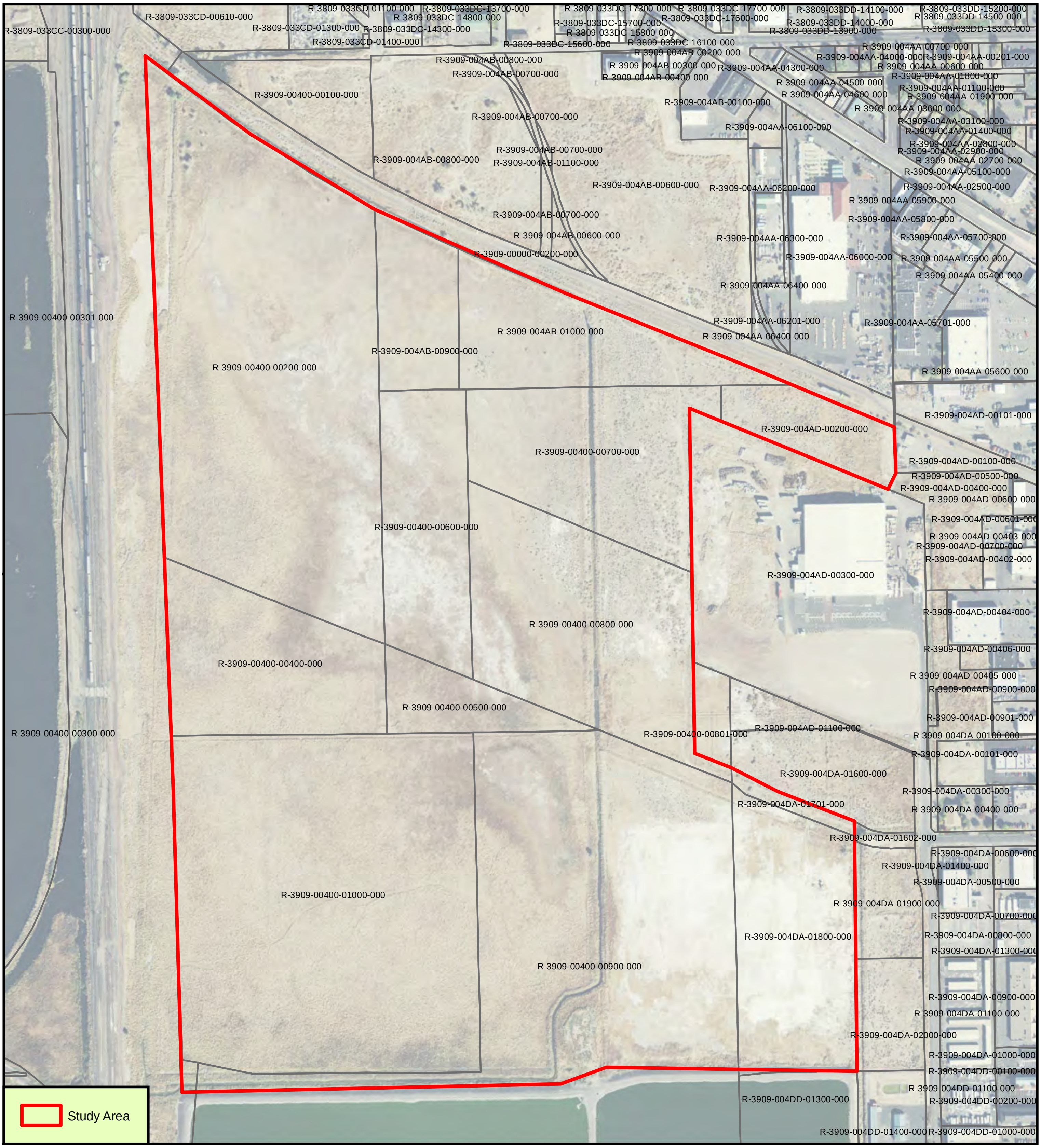
Created By: M. Solus
Created On: June, 2021

Rabe Consulting

N

0 200 400 800 1,200 1,600
Feet

Data Source: National Agriculture Imagery Program (NAIP). Flown in Summer 2018. GPS plots and polygons accquired using an Ashtech MobileMapper 10 GPS unit with submeter accuracy of 0.612m Reproduced by Rabe Consulting for the purpose of this document.



South Suburban Sanitary

Figure #5: Aerial

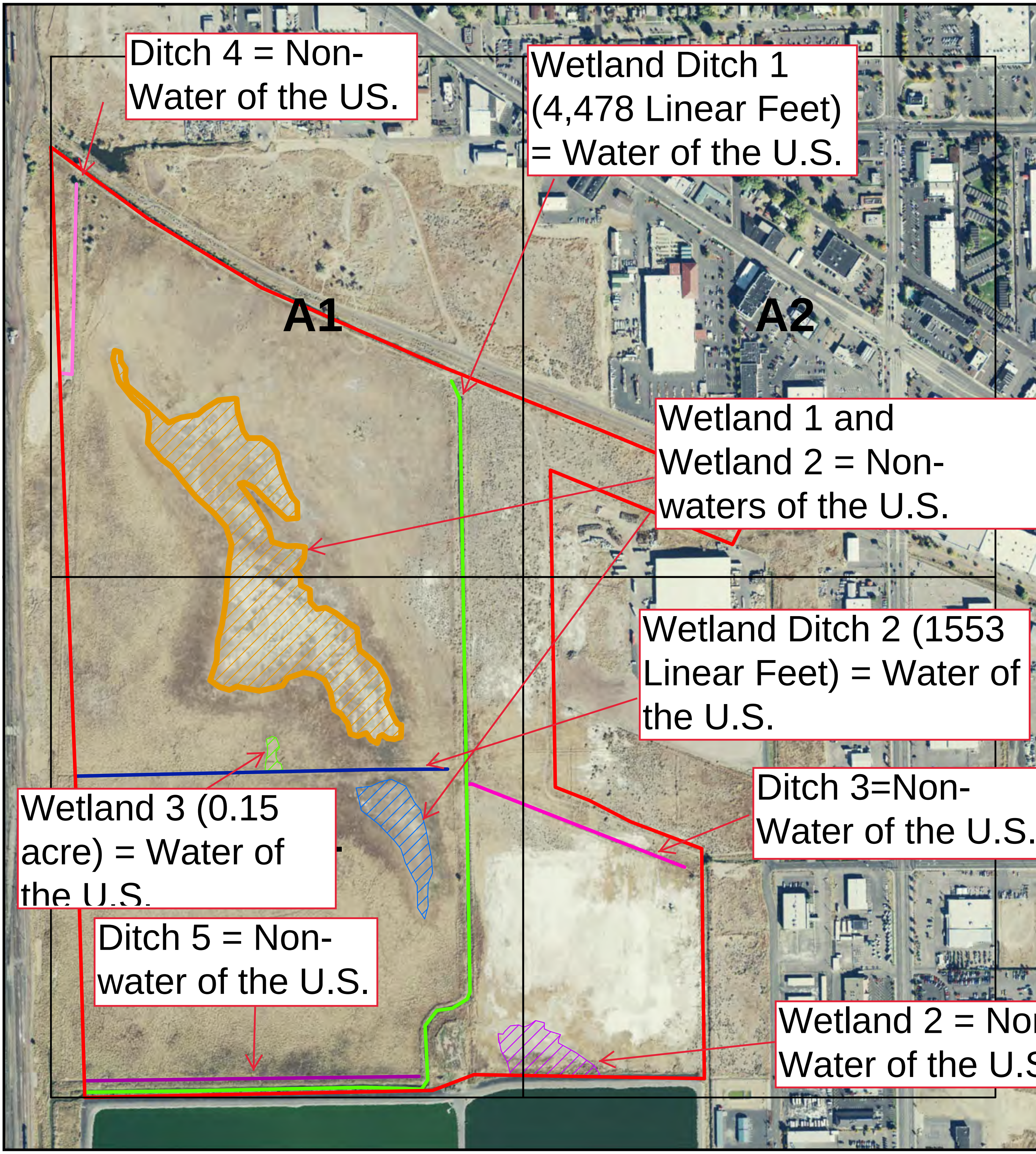
Created By: M. Solus
Created On: June, 2021

Rabe Consulting

N

0 125 250 500 750 1,000
Feet

Data Source: National Agriculture Imagery Program (NAIP). Flown in Summer 2018. GPS plots and polygons accquired using an Ashtech MobileMapper 10 GPS unit with submeter accuracy of 0.612m Reproduced by Rabe Consulting for the purpose of this document.



South Suburban Sanitary

Figure #6: Delineation

Grid
Study Area
Wetland Ditch 1
Wetland Ditch 2
Ditch 3
Ditch 4
Ditch 5
Wetland 1
Wetland 2
Wetland 3
Wetland 4

Rabe Consulting

Created By: M. Solus
Created On: June, 2021

N

0 130 260 520 780 1,040
Feet

Data Source: National Agriculture Imagery Program (NAIP). Flown in Summer 2018. GPS plots and polygons accquired using an Ashtech MobileMapper 10 GPS unit with submeter accuracy of 0.612m Reproduced by Rabe Consulting for the purpose of this document.

South Suburban Sanitary District

Wetland Delineation

July 2021

Rabe Consulting

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Table of Contents

Introduction

Rabe Consulting was contracted by South Suburban Sanitary District to perform a wetland investigation for their property north of the existing wastewater treatment ponds in Klamath Falls, Oregon. Preliminary pre-field investigation showed that there are NWI mapped wetlands in the study area (Appendix A: Figure 3).

This report presents the results of the South Suburban Sanitary District, which was conducted by Andréa Rabe of Rabe Consulting on May 1 and June 30, 2021. The investigation in the middle of the growing season. Andréa Rabe, a Professional Wetland Scientist, has 23 years of experience conducting wetland delineations. She has been trained in the use of the Army Corps of Engineers Arid West Region Supplement for conducting wetland delineations.

This report documents the investigation, best professional judgment, and conclusions of the investigator. It should be considered a Preliminary Jurisdictional Determination and used at your own risk until it has been reviewed and approved in writing by the Oregon Division of State Lands in accordance with OAR 141-090-0005 through 141-090-0055.

A. Landscape Setting and Land Use

The study area is 172.5 acres within the Urban Growth Boundary of Klamath Falls, Oregon in Klamath County (Appendix A: Figure 1, Site Location Map). The legal description of the study area is:

R-3909-004DA-01800-000
R-3909-00400-00900-000 (northern 28 acres surveyed of 94.08 acres)
R-3909-00400-01000-000
R-3909-00400-00400-000
R-3909-00400-00500-000
R-3909-00400-00800-000
R-3909-00400-00600-000
R-3909-00400-00200-000
R-3909-00400-00700-000
R-3909-004AB-00900-000
R-3909-004AD-00200-000
R-3909-004AB-01000-000

The study area is located in T39S R9E Section 4. The study area is located north of the existing wastewater treatment ponds and east of the Burlington Northern railroad tracks. To the west of the railroad tracks is the City of Klamath Falls airport wetland mitigation area and then further to the west is Lake Ewauna. To the north is the OC&E Trail, which is former railroad and now serves as a State Park. To the east the area is developed as industrial or light industrial.

There is very little vegetation within the study area which is considered vacant, open space with the exception of the communications antenna located in the central eastern portion of the site.

The vegetation consists of a couple trees, native shrubs (sagebrush and rabbitbush), native and non-native grasses (quack grass, salt grass, reed canary grass). The study area is a salt flat with extremely high soil pH (greater than 9.4). Historically this area was wetland fringe and lake bottom for Lake Ewauna. With the construction of the railroad more than 120 years ago the study area was cut off of from Lake Ewauna and its hydrology.

The ground water in the study area is not perched. This was also observed in the adjacent mitigation area to the west. To introduce hydrology to the mitigation area, the area needed to be opened to Lake Ewauna which provides direct inflow/outflow of the mitigation area.

B. Site Alterations

Site alterations within the study area include five ditches. These ditches serve as stormwater drains, carrying stormwater from the City of Klamath Falls outside the study area (east and north) to the Lake Ewauna west of the study area. Three of the ditches are carry water year-round. Two of the ditches are shallower, carrying water seasonally during the stormwater runoff season.

Additional site alterations include the communications tower in the central eastern portion of the study area.

C. Precipitation Data and Analysis

The Chiloquin Weather Station is located approximately 28 miles north of the study area. The numbers are all compared to the WETS table for Chiloquin Weather Station, as the Klamath Falls weather station does not have 20 years of data and can therefore not produce a WETS table. The Klamath Falls weather station received 0.69 inches total of precipitation from April 17 to May 1, 2021 and 0.04 inches total of precipitation from June 16 to 30, 2021, the 14 days prior to the field investigation. There was no precipitation on May 1 or June 30, 2021. Chiloquin had a relatively low amount of precipitation over the growing season. The following is based on the WETS Table for Chiloquin Weather Station.

Summary of Precipitation between March and June 2021					
Month	**Total Precipitation (in.)**	**Normal Range WETS**	**Within Normal Range?**	**Monthly Average (in.)**	**Departure From Average**
March	0.15	0.85-2.17 in.	No, Lower	1.94	-1.79 in.
April	0.69	0.78-1.58 in.	No, Lower	1.42	-0.73 in.
May	0.10	0.67-1.63 in.	No, Lower	1.49	-1.39 in.
June	0.07	0.27-0.66 in.	No, Lower	0.61	-0.54 in.

WETS Station: CHILOQUIN 12 NW (FORT KLAMATH), OR

Requested years: 1991 - 2020

Month	Avg Max Temp	Avg Min Temp	Avg Mean Temp	Avg Precip	30% chance precip less than	30% chance precip more than	Avg number days precip 0.10 or more	Avg Snowfall
Jan	39.2	18.6	28.9	3.78	1.90	3.92	8	13.5
Feb	44.1	21.6	32.9	2.25	0.98	2.55	6	10.0
Mar	50.4	24.8	37.6	1.94	0.85	2.17	6	7.6
Apr	56.9	28.4	42.7	1.42	0.78	1.58	4	2.5
May	66.4	33.2	49.8	1.49	0.67	1.63	4	0.3
Jun	75.0	37.4	56.2	0.61	0.27	0.66	2	0.0
Jul	84.9	42.1	63.5	0.24	0.09	0.29	1	0.0
Aug	84.3	40.6	62.5	0.31	0.06	0.25	1	0.0
Sep	77.5	34.2	55.9	0.48	0.14	0.49	1	0.0
Oct	63.9	27.5	45.7	1.37	0.50	1.57	3	0.1
Nov	47.9	23.8	35.9	2.83	1.55	3.04	7	7.9
Dec	38.9	18.9	28.9	4.36	2.52	5.04	10	19.1
Annual:					-	-		
Average	60.8	29.3	45.0	-	-	-	-	-
Total	-	-	-	21.08			52	61.0

GROWING SEASON DATES

Years with missing data:	24 deg = 5	28 deg = 5	32 deg = 3
Years with no occurrence:	24 deg = 0	28 deg = 0	32 deg = 0
Data years used:	24 deg = 25	28 deg = 25	32 deg = 27
Probability	24 F or higher	28 F or higher	32 F or higher
50 percent *	5/6 to 10/1: 148 days	6/10 to 9/11: 93 days	6/30 to 8/27: 58 days
70 percent *	4/28 to 10/9: 164 days	6/2 to 9/20: 110 days	6/23 to 9/3: 72 days

* Percent chance of the growing season occurring between the Beginning and Ending dates.

D. Methods

Rabe Consulting conducted a wetland determination within the study area, which encompasses the portions of T39S R9E Section 4 as listed above. The site is considered problematic due to the high alkalinity which contributes to minimal vegetation, salt crust and lack of redox indicators.

The determination was conducted in May and June during the growing season. The determination was conducted on May 1 and June 30, 2020, using the criteria outlined in the ACOE Manual as supplemented by the Arid West Regional Supplement. Arid West Region wetland data forms were used to record soils, vegetation, and hydrology data at sample plots within the study area (Appendix B).

Multiple data plots were used to test the study area for wetland presence. Plot locations were chosen based on ArcGIS maps created showing topography, aerial imagery, hydrology and observations of vegetation and hydrology during the field visit. Photo points were also taken with the plot number and direction of the photo noted. The study area boundary, photo points, and data plots were identified with a sub-meter accuracy MobileMapper 10 Ashtech GPS unit. The data from the GPS unit was post-processed using Mobile Mapping Office software. Real time accuracy was 1-2 meters, with post-processing bringing accuracy to 0.612 m horizontal error (number of satellites 6).

E. Description of All Wetlands and Other Non-Wetland Waters

Wetland Areas
Four wetlands and 5 ditches were identified within the study area. Three of the ditches continue offsite to the west and none of the wetlands continue offsite.

Wetland 1
Wetland 1 is the largest wetland in the northwestern portion of the study area encompassing 12.23 acres. It is considered a depressional flat wetland (PEM1C). This wetland does not extend offsite or connect with other wetlands or ditches within the study area. The wetland exhibits limited vegetation cover, with no shrubs or trees. The wetland exhibits high alkalinity. Hydrologic inputs appear to be direct precipitation and very localized runoff.

Wetland 2
Wetland 2 is in the southeastern portion of the study area encompassing 1.41 acres. It is considered a depressional flat wetland (PEM1C). This wetland does not extend offsite or connect with other wetlands or ditches within the study area. The wetland exhibits limited vegetation cover, with no shrubs or trees. The wetland exhibits high alkalinity. The southern

edge of the wetland abuts the levee for the wastewater treatment ponds to the south. Hydrologic inputs include direct precipitation, very localized surface runoff and possibly seepage from the wastewater treatment ponds.

Wetland 3

Wetland 3 is a small wetland in the central portion of the study area encompassing 0.15 acres. It is considered a depressional flat wetland (PEM1C). This wetland does not extend offsite but does connect to Wetland Ditch 2 on its southern boundary. Hydrologic input is from ditch overflow, as there is a low point in the ditch dank. Direct precipitation also provides hydrologic input. The wetland exhibits limited vegetation cover, with no shrubs or trees. The wetland exhibits high alkalinity.

Wetland 4

Wetland 4 in the central portion of the study area encompassing 1.68 acres. It is considered a depressional flat wetland (PEM1C). This wetland does not extend offsite or connect with other wetlands or ditches within the study area. The wetland exhibits limited vegetation cover, with no shrubs or trees. The wetland exhibits high alkalinity.

Wetland Ditch 1

Wetland Ditch 1 bisects the north and south halves of the study area. It is 1553.09 ft in length, with the waterway being 6 ft wide (0.2 acres). There is no associated wetland, aside from Wetland 3, as the banks are steep and do not exhibit a wetland fringe. The OHW and waterway boundary are the same. The ditch had water at the time of the survey which was well below the surrounding terrace's soil surface. This ditch continues out of the study area to the west.

Wetland Ditch 2

Wetland Ditch 2 bisects the east and west halves of the study area and then turns along the southern edge and extends to the west past the southern area. It is 4477.90 ft in length, with the waterway being 7 ft wide (0.75 acres). There is no associated wetland, as the banks are steep and do not exhibit a wetland fringe. The OHW and waterway boundary are the same. The ditch had water at the time of the survey which was well below the surrounding terrace's soil surface. This ditch continues out of the study area to the west.

Ditch 3

Ditch 3 runs roughly east west in the central eastern portion of the study area. It is 975.49 ft in length, with the waterway being 5 ft wide (0.12 acres). There is no associated wetland, as the banks are steep and do not exhibit a wetland fringe. The OHW and waterway boundary are the same. The ditch did not have water at the time of the survey. The ditch is non-fish bearing.

Ditch 4

Ditch 4 runs north to south in the northwestern portion of the study area. It is 849.04 ft in length, with the waterway being 5 ft wide (0.10 acres). There is no associated wetland, as the banks are steep and do not exhibit a wetland fringe. The OHW and waterway boundary are the same. The ditch did not have water at the time of the survey. The ditch is non-fish bearing. This ditch extends outside of the study area to the west at its southern end.

Ditch 5

Ditch 5 extends from east to west along the southern edge study area. It is 1395.5 ft in length, with the waterway being 5 ft wide (0.16 acres). There is no associated wetland, as the banks are steep and do not exhibit a wetland fringe. The OHW and waterway boundary are the same. The ditch did not water at the time of the survey. The ditch extends outside of the study area to the west.

Upland Areas

The remainder of the study area consists of an upland area. Historic aerial photography from 1994 to present was used to confirm the hydrology changes similarities over time with the assessment area. The historic photographs do not depict water ponding or standing outside of the mapped wetlands and ditches within this wetland delineation.

F. Deviation from LWI or NWI

The Local Wetland Inventory (LWI) maps for Klamath County does include the study area. It depicts a large wetland in the western half of the study area which appears to encompass Wetlands 1, 3, and 4. The eastern half of the study area depicts a large pond, which encompasses Wetland 2.

The LWI depicts more extensive wetlands than identified in this delineation. Wetland extent may have decreased over time in response to climate change. The current wetland areas are located along the contour lines and appear to be remnants of the historic Ewauna Lake.

A review of the National Wetlands Inventory Map (Appendix A - Figure 3) indicates extensive palustrine emergent and scrub shrub wetland within the western portion of study area. The scale and methodology used to produce the NWI map (high altitude aerial photography interpretation) imposes some limitations on the accuracy of the NWI maps. It is highly recommended to field check NWI map data, as was done in this case.

This determination deviates from the NWI maps in that this delineation did not identify any shrub or tree covered wetlands within the study area. This delineation further deviates in that the mapped wetland are smaller than those mapped in the NWI maps. The NWI maps do not indicate the presence of the pond in the eastern portion of study area. This is consistent with the current field investigation, not consistent with the LWI.

G. Mapping Methods

All data plot and study area boundaries were mapped using a MobileMapper 10 Ashtech GPS unit with sub-meter accuracy. The data from the GPS unit was post-processed using Mobile

Mapping Office software. Real time accuracy was 1-2 meters, with post-processing bringing accuracy to 0.612 m horizontal error (number of satellites 6).

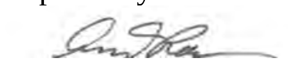
H. Results and Conclusion

Within the 172.5-acre study area 4 wetlands (totaling 15.42 acres) and 5 ditches (totaling 1.3 acres and extending 9251 feet) were identified. The remainder of the study area is upland.

I. Disclaimer

This report documents the investigation, best professional judgment, and conclusions of the investigator. It is correct and complete to the best of my knowledge. It should be considered a Preliminary Jurisdictional Determination and used at your own risk until it has been reviewed and approved in writing by the Oregon Division of State Lands in accordance with OAR 141-090-0005 through 141-090-0055.

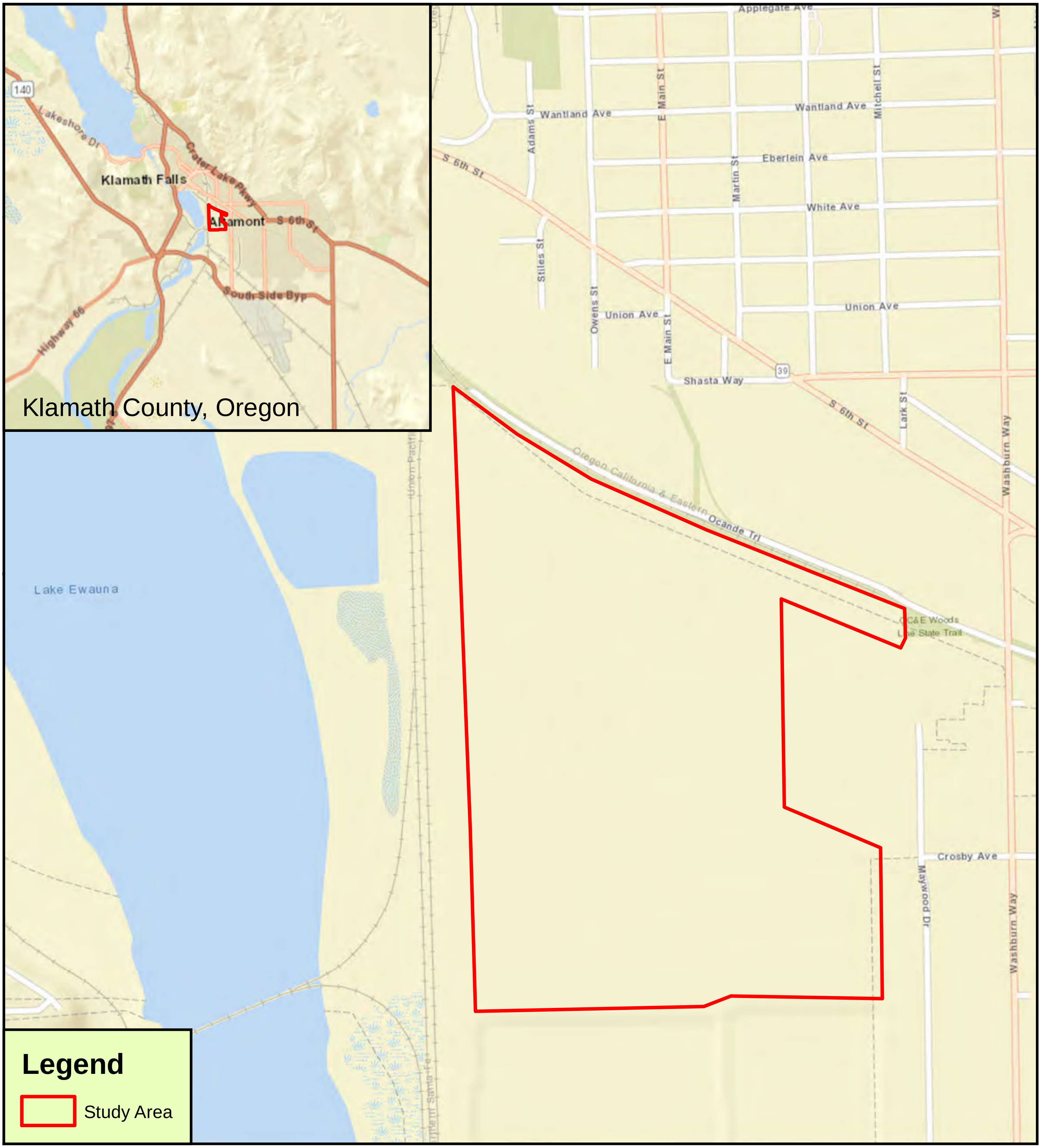
Respectfully submitted,



Andréa Rabe, PWS
Rabe Consulting

Appendix A

Maps



South Suburban Sanitary

Figure #1: Vicinity

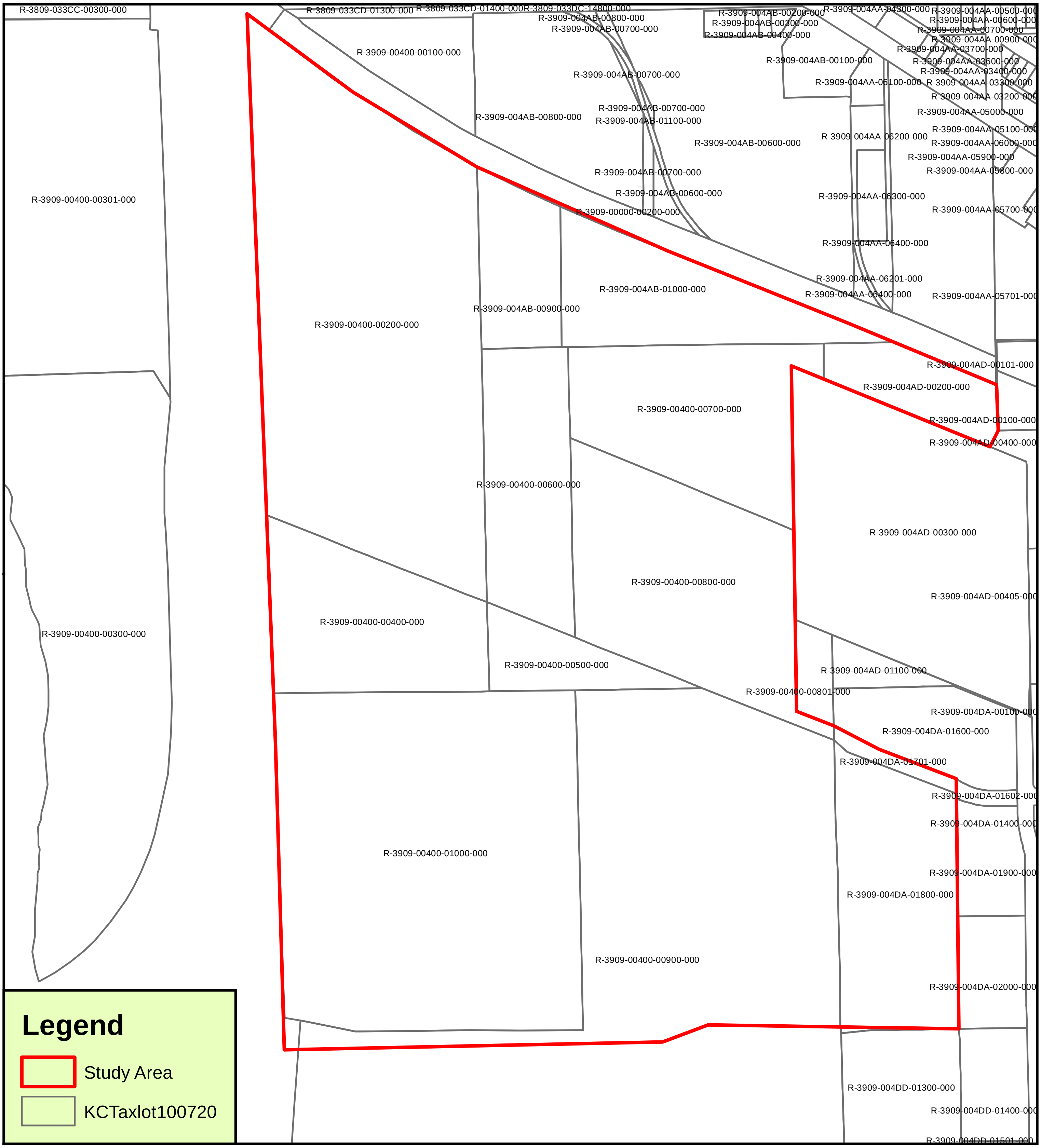
Created By: M. Solus
Created On: June, 2021

Rabe Consulting

N

0 200 400 800 1,200 1,600
Feet

Data Source: National Agriculture Imagery Program (NAIP). Flown in Summer 2018. GPS plots and polygons accquired using an Ashtech MobileMapper 10 GPS unit with submeter accuracy of 0.612m Reproduced by Rabe Consulting for the purpose of this document.



South Suburban Sanitary

Figure #2: Taxlot

Created By: M. Solus
Created On: June, 2021

Rabe Consulting

N

0 125 250 500 750 1,000
Feet

Data Source: National Agriculture Imagery Program (NAIP). Flown in Summer 2018. GPS plots and polygons accquired using an Ashtech MobileMapper 10 GPS unit with submeter accuracy of 0.612m Reproduced by Rabe Consulting for the purpose of this document.

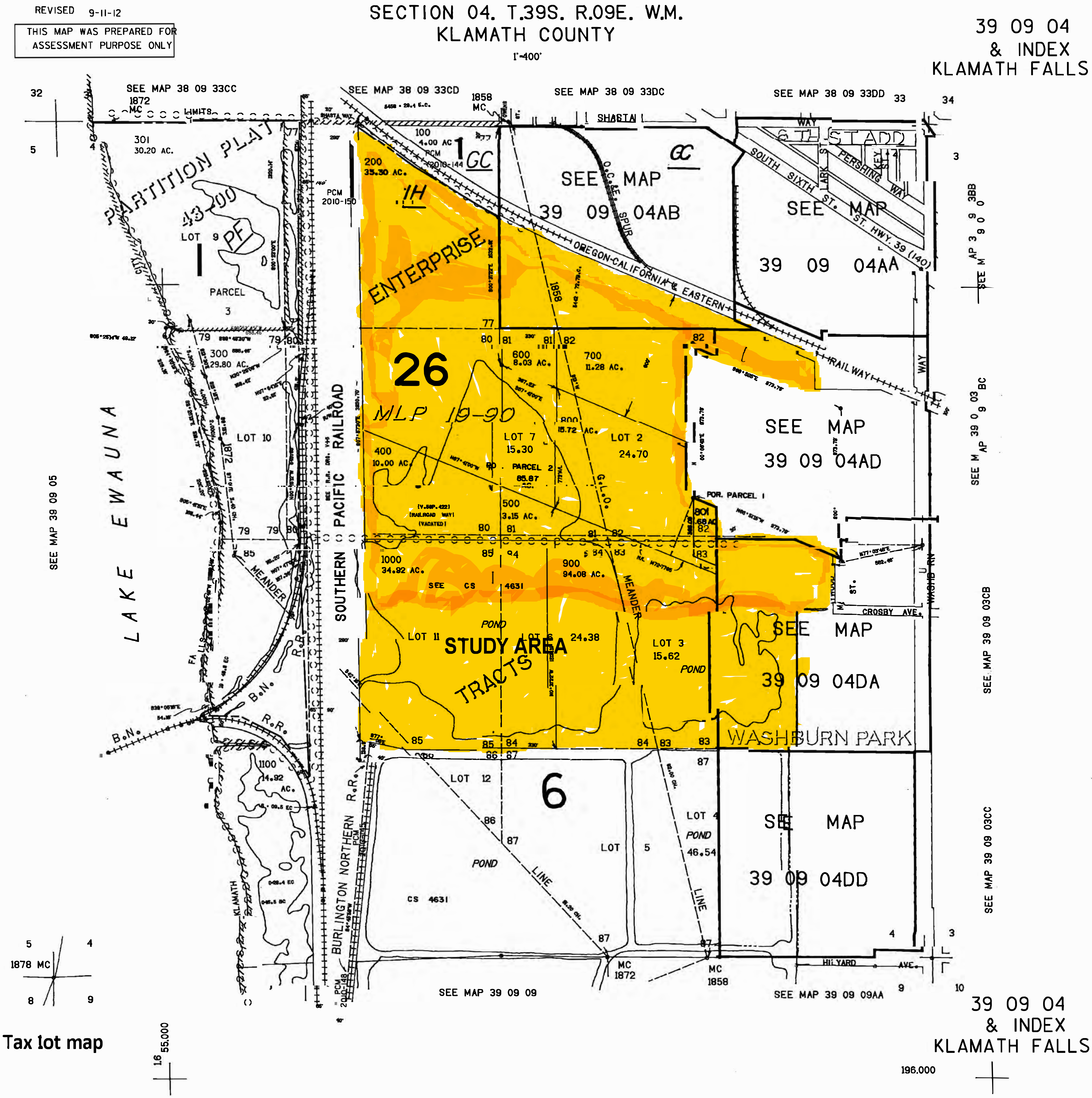


Figure 2a: Tax lot map

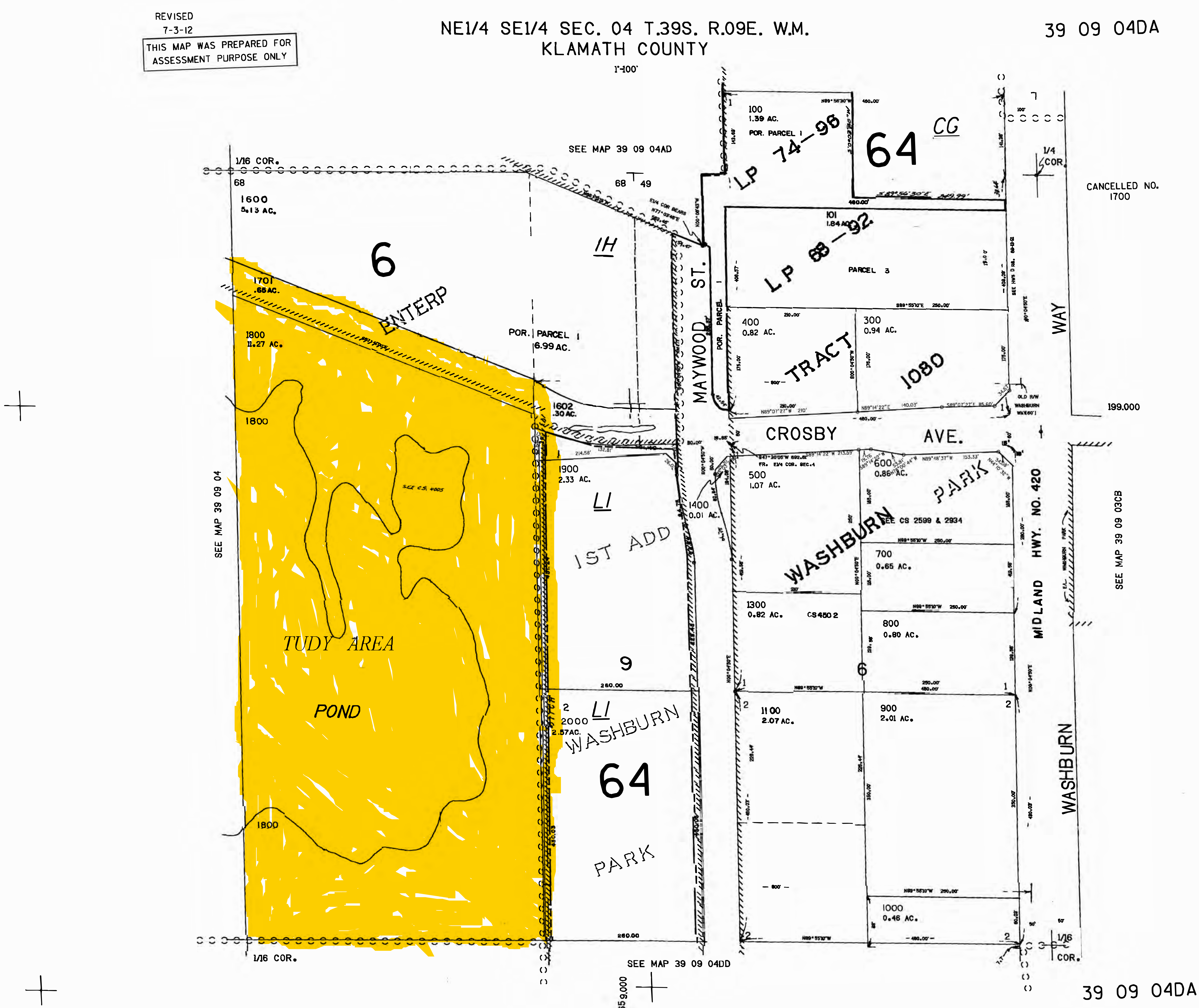


Figure 2b: Tax Lot Map

THIS MAP WAS PREPARED FOR ASSESSMENT PURPOSE ONLY

Revised: 2/5/2020

SE1/4 NE1/4 SEC 04 T.39S. R.09E. W.M.
KLAMATH COUNTY

1 " = 100 '

39 09 04AD

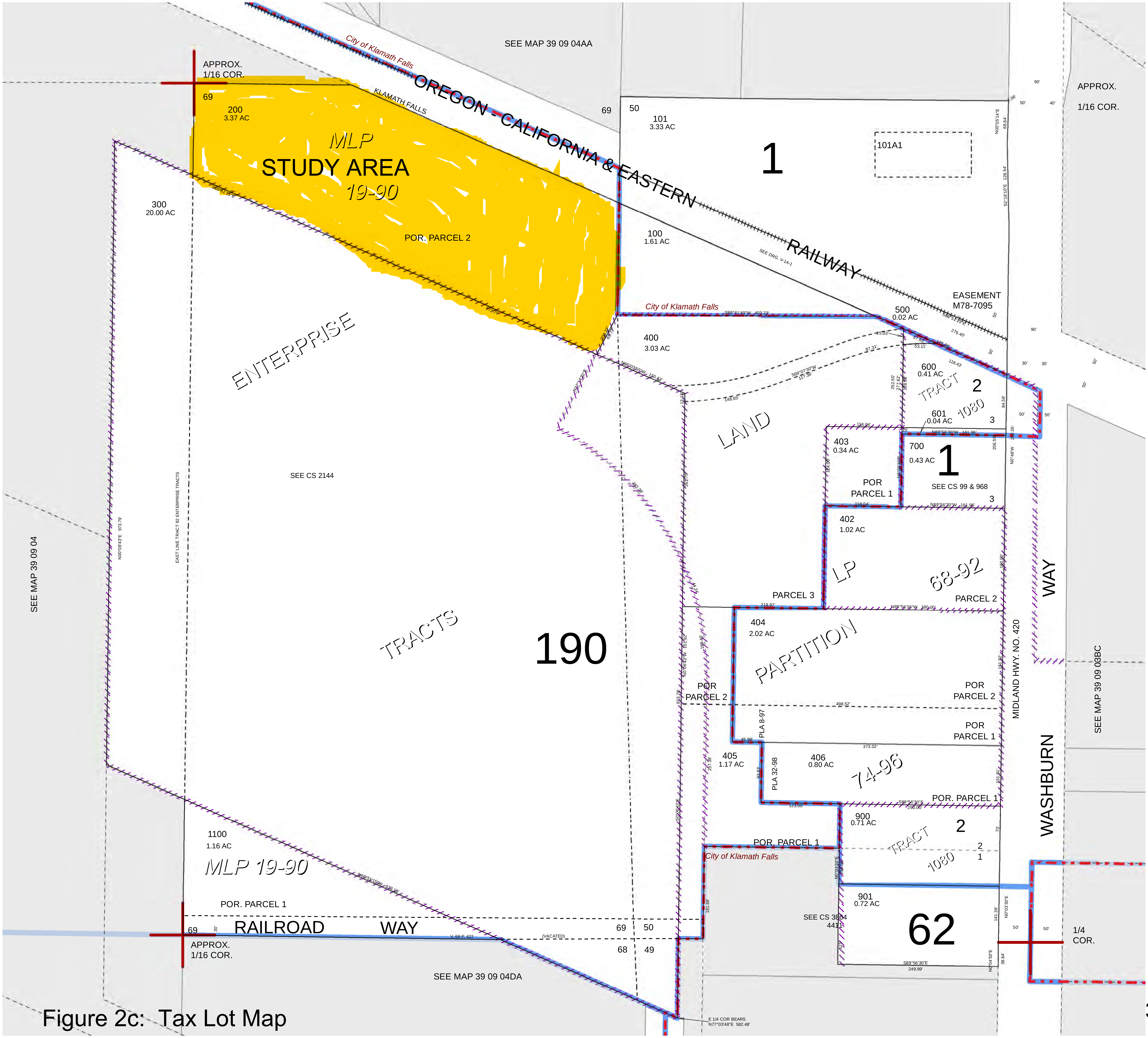
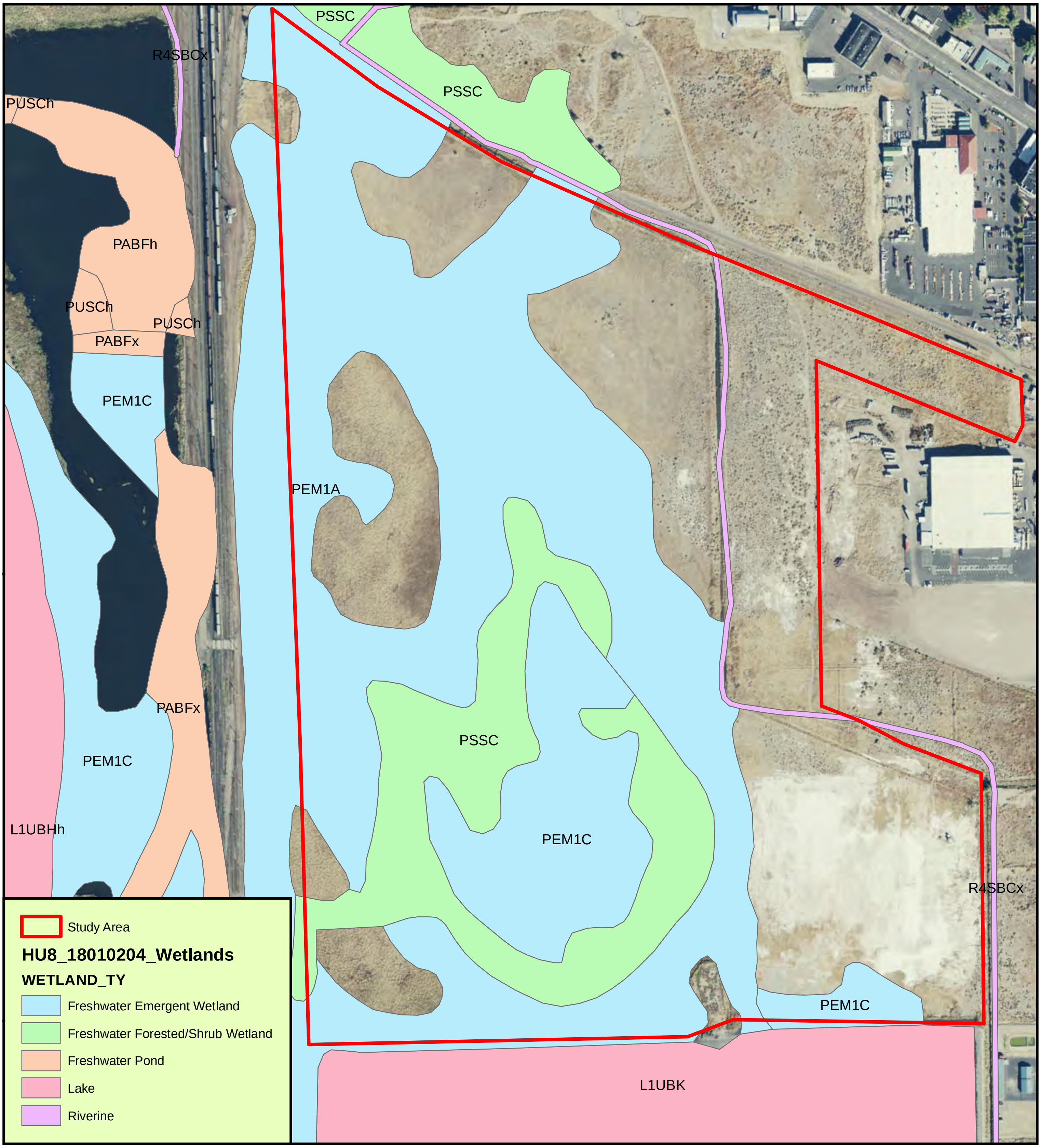


Figure 2c: Tax Lot Map

39 09 04AD



South Suburban Sanitary

Figure #3: NWI

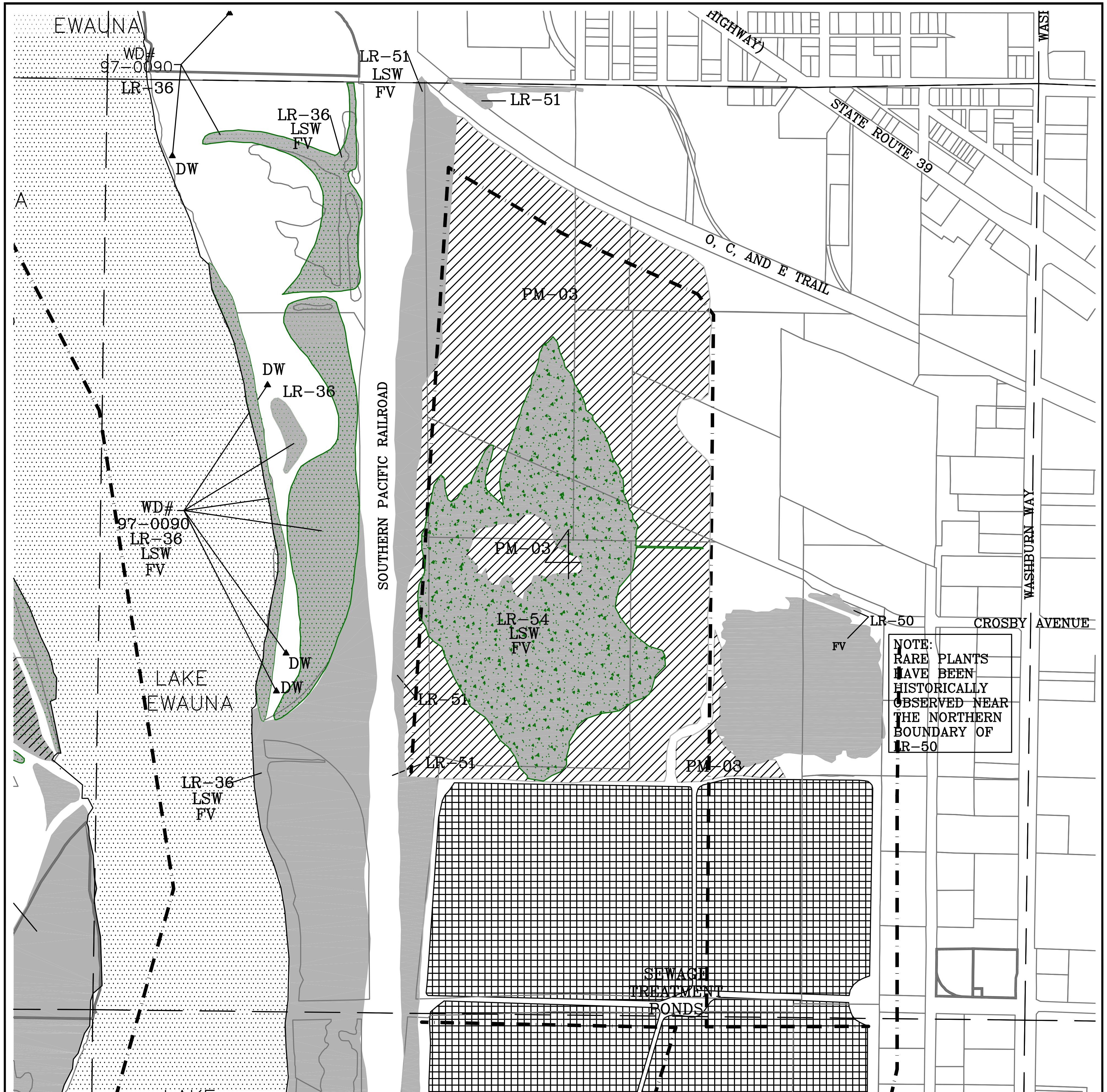
Created By: M. Solus
Created On: June, 2021

Rabe Consulting

N

0 125 250 500 750 1,000
Feet

Data Source: National Agriculture Imagery Program (NAIP). Flown in Summer 2018. GPS plots and polygons accquired using an Ashtech MobileMapper 10 GPS unit with submeter accuracy of 0.612m Reproduced by Rabe Consulting for the purpose of this document.



T 39S R 9E Section 04

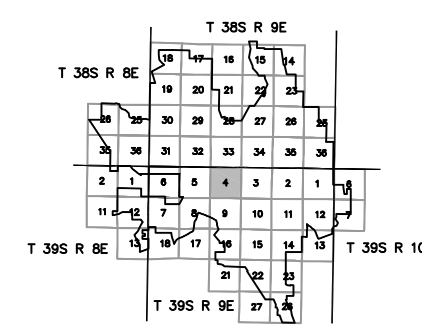
CITY OF KLAMATH FALLS LOCAL WETLAND INVENTORY

July 2004

APPROVED LOCAL WETLANDS INVENTORY
9/1/04
OREGON DEPARTMENT OF STATE LANDS

LEGEND

- Wetland
- Other Waters of the State/ United States
- Created Water Features
- PW Possible wetland
- Delineated wetland
- DW Delineated wetland less than 0.5 acre
- WD# XX-XXXX Delineated wetland, DSL reference number
- Wetland mosaic
- LR-10,UKL-01 Wetland Code
- SWF Storm water facility
- LSW Locally significant wetland
- FV Field verified
- PM-01 Potential mitigation site
- SP-3 Sample point
- RLR-2L Riparian Assessment Reach Code
- Site access granted
- Urban Growth Boundary (approx.)
- Section line
- Tax lot or easement
- Intermittent/Ephemeral Stream
- Irrigation/ Stream Features



1 acre
1/2 acre
1/10th acre

N

0 600
Approximate Scale in Feet

Information shown on this map is for planning purpose only and wetland information is subject to change. There may be unmapped wetlands subject to regulation and all wetland boundary mapping is approximate. In all cases, actual field conditions determine wetland boundaries. No determination has been made on state jurisdiction of irrigation features (canals, drains, laterals) or other created waters or waterways. Irrigation/ stream feature locations are approximate and features are only mapped as lines (not to scale). You are advised to contact the Oregon Division of State Lands and the U.S. Army Corps of Engineers with any regulatory questions.

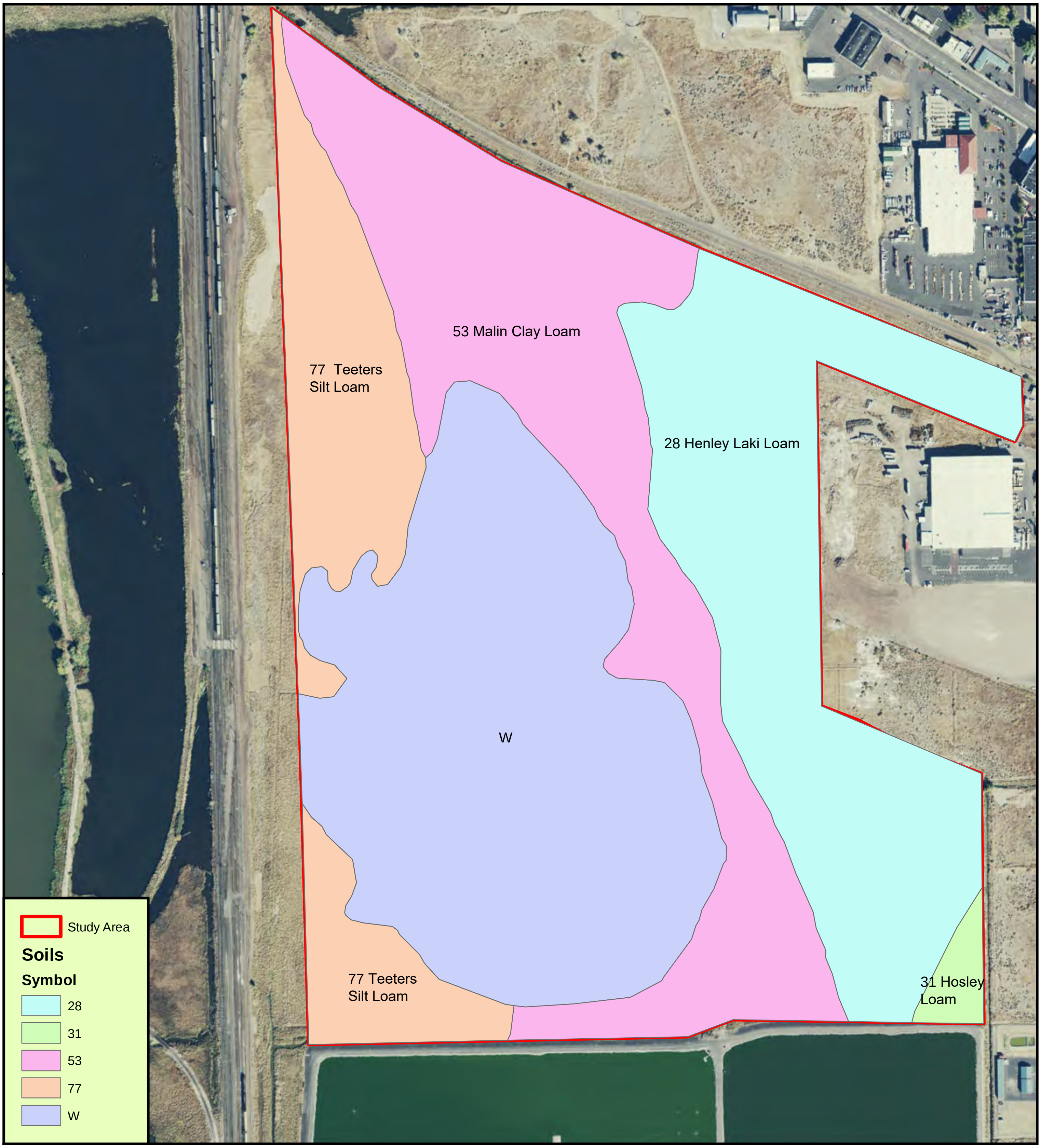
City of Klamath Falls
P.O. Box 237
Klamath Falls, Oregon 97601

SHAPIRO & ASSOCIATES, INC.

2015002.1

Figure 3a: LWI

D:\2015002.1\Klamath_LWI.dwg

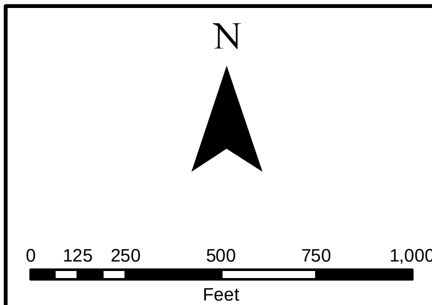


South Suburban Sanitary

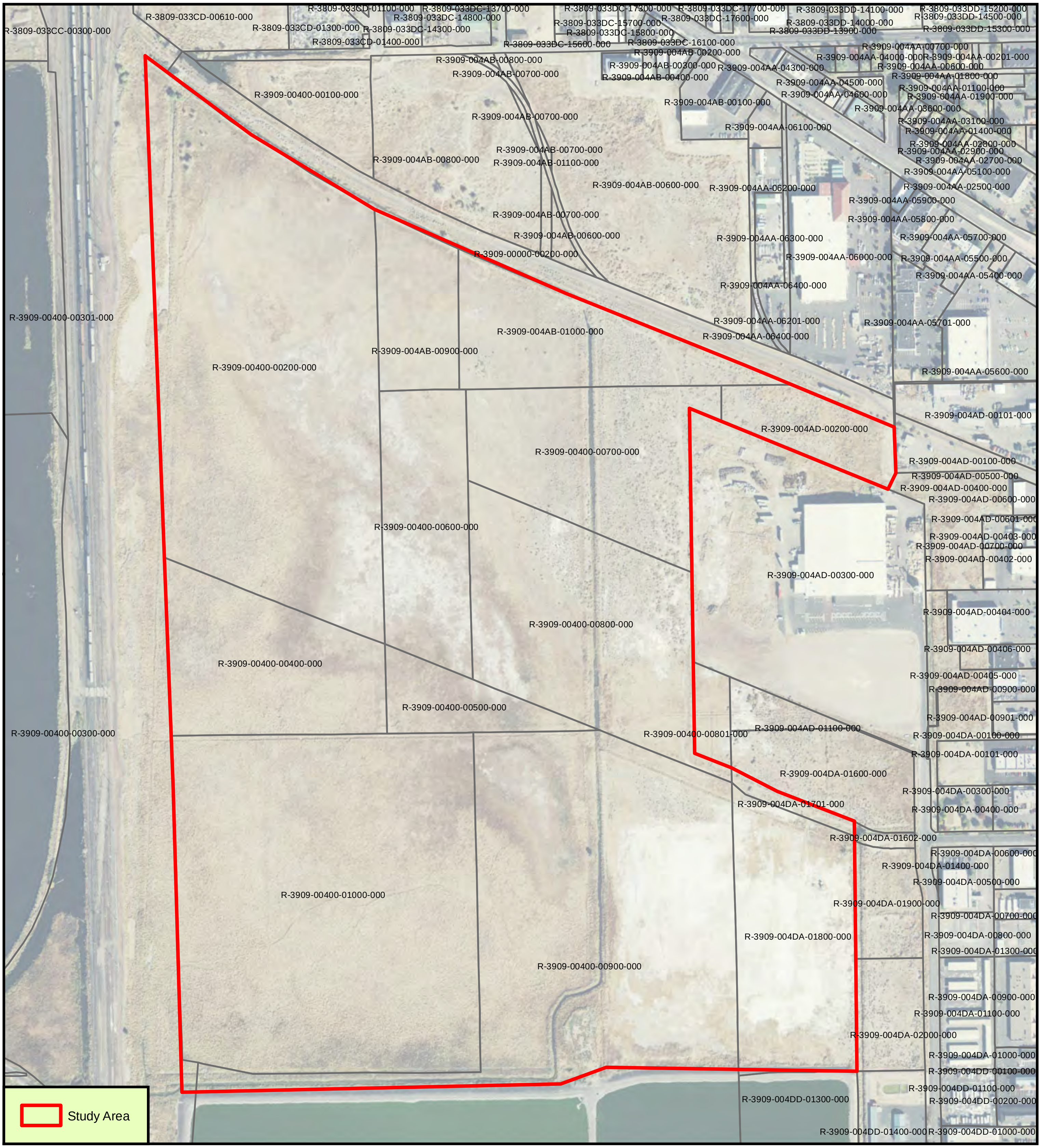
Figure #4: Soils

Created By: M. Solus
Created On: June, 2021

Rabe Consulting



Data Source: National Agriculture Imagery Program (NAIP). Flown in Summer 2018. GPS plots and polygons accquired using an Ashtech MobileMapper 10 GPS unit with submeter accuracy of 0.612m Reproduced by Rabe Consulting for the purpose of this document.

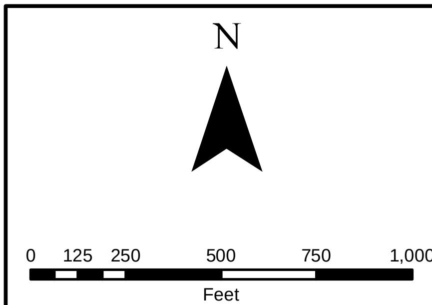


South Suburban Sanitary

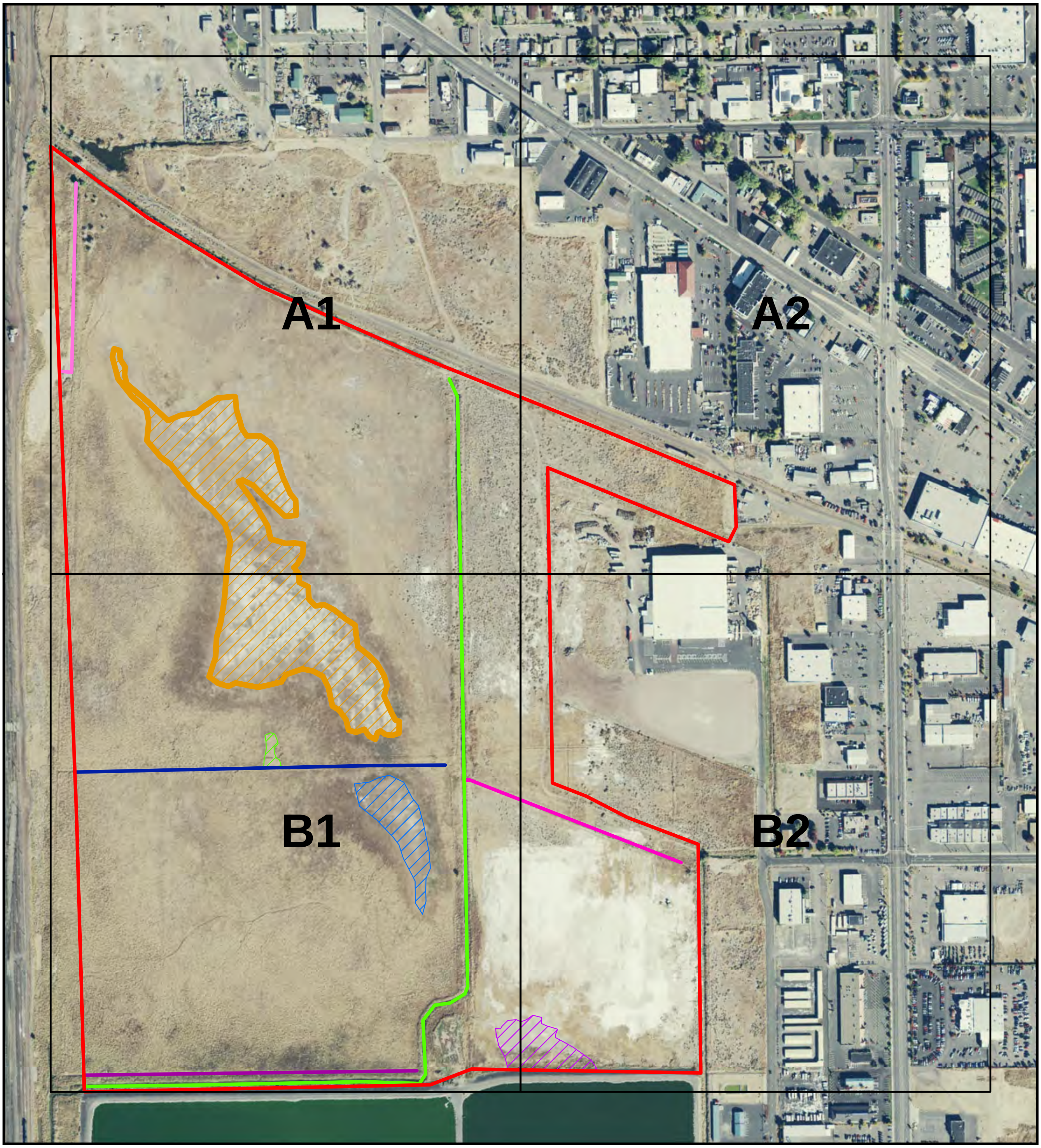
Figure #5: Aerial

Created By: M. Solus
Created On: June, 2021

Rabe Consulting



Data Source: National Agriculture Imagery Program (NAIP). Flown in Summer 2018. GPS plots and polygons accquired using an Ashtech MobileMapper 10 GPS unit with submeter accuracy of 0.612m Reproduced by Rabe Consulting for the purpose of this document.



South Suburban Sanitary

Figure #6: Delineation

Grid
Study Area
Wetland Ditch 1
Wetland Ditch 2
Ditch 3
Ditch 4
Ditch 5
Wetland 1
Wetland 2
Wetland 3
Wetland 4

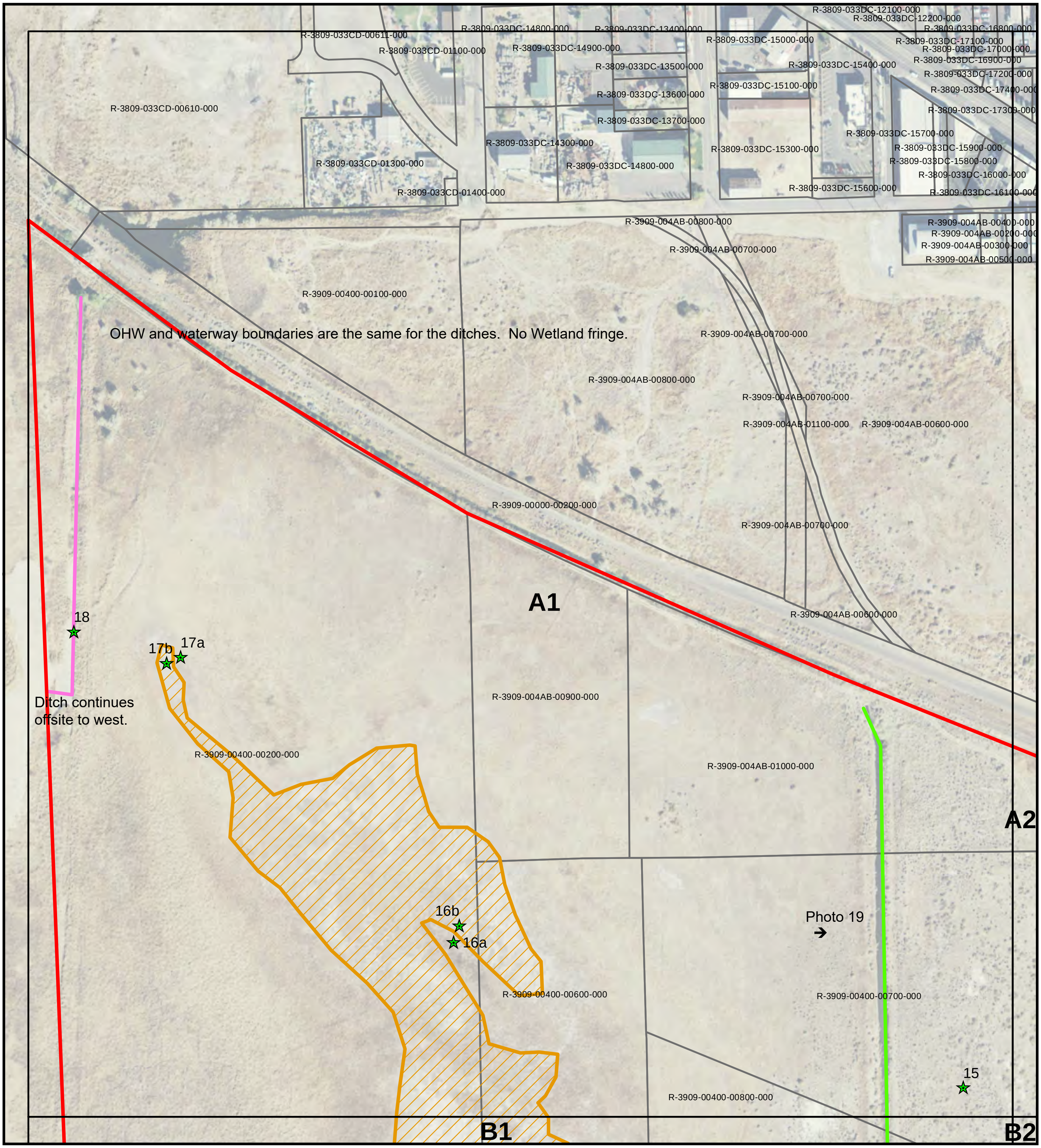
Rabe Consulting

Created By: M. Solus
Created On: June, 2021

N

0 130 260 520 780 1,040
Feet

Data Source: National Agriculture Imagery Program (NAIP). Flown in Summer 2018. GPS plots and polygons accquired using an Ashtech MobileMapper 10 GPS unit with submeter accuracy of 0.612m Reproduced by Rabe Consulting for the purpose of this document.



South Suburban Sanitary

Figure #6a: Delineation

Grid	Wetland 1	Photos Direction	
Study Area	Wetland 2	East	
Wetland Ditch 1	Wetland 3	North	
Wetland Ditch 2	Wetland 4	South	
Ditch 3		West	
Ditch 4			
Ditch 5			

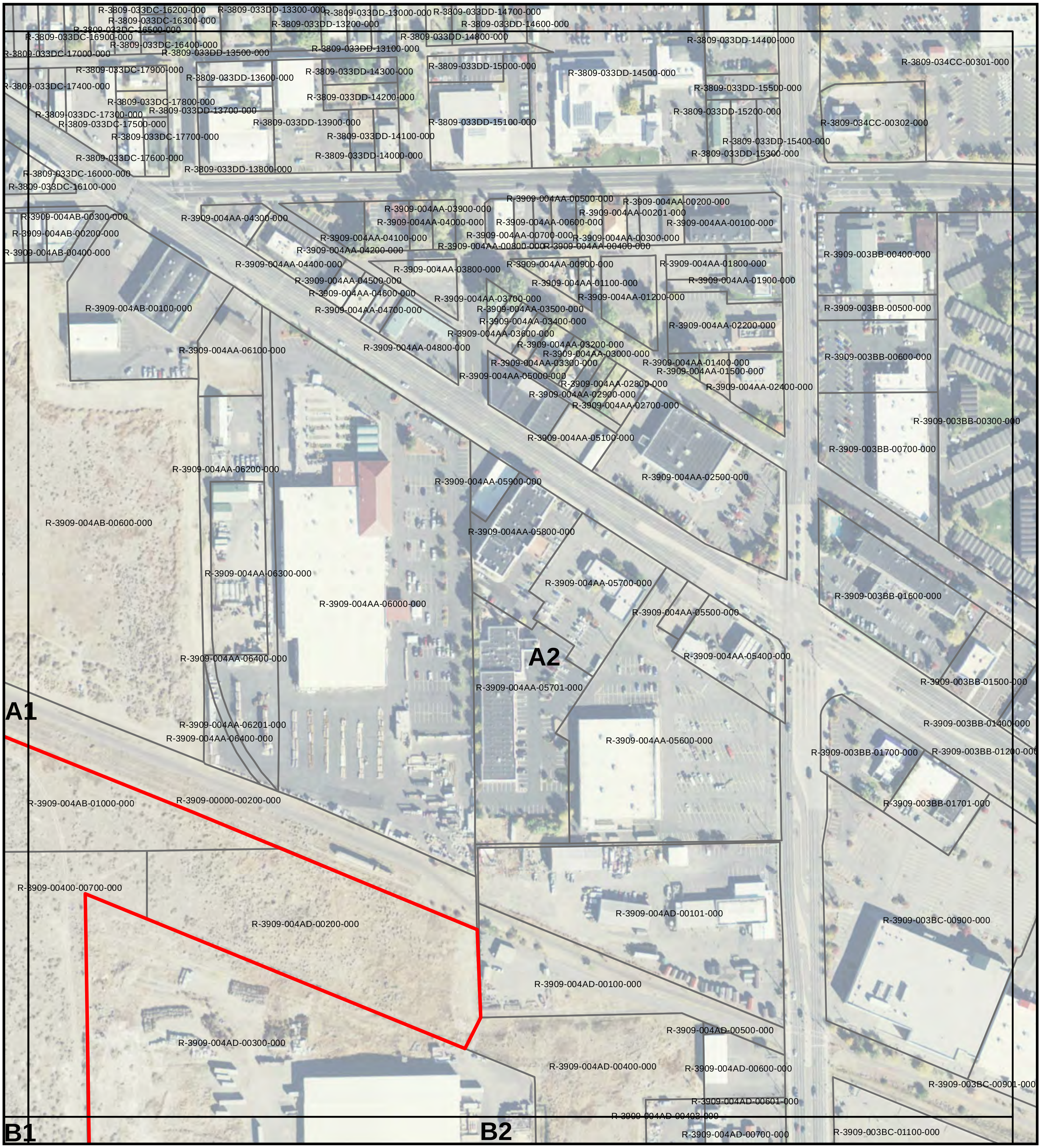
Rabe Consulting

Created By: M. Solus
Created On: June, 2021

N

0 65 130 260 390 520
Feet

Data Source: National Agriculture Imagery Program (NAIP). Flown in Summer 2018. GPS plots and polygons accquired using an Ashtech MobileMapper 10 GPS unit with submeter accuracy of 0.612m Reproduced by Rabe Consulting for the purpose of this document.



South Suburban Sanitary

Figure #6b: Delineation

Grid	Wetland 1	**Photos**	
Study Area	Wetland 2	**Direction**	
Wetland Ditch 1	Wetland 3		East
Wetland Ditch 2	Wetland 4		North
Ditch 3			South
Ditch 4			West
Ditch 5			

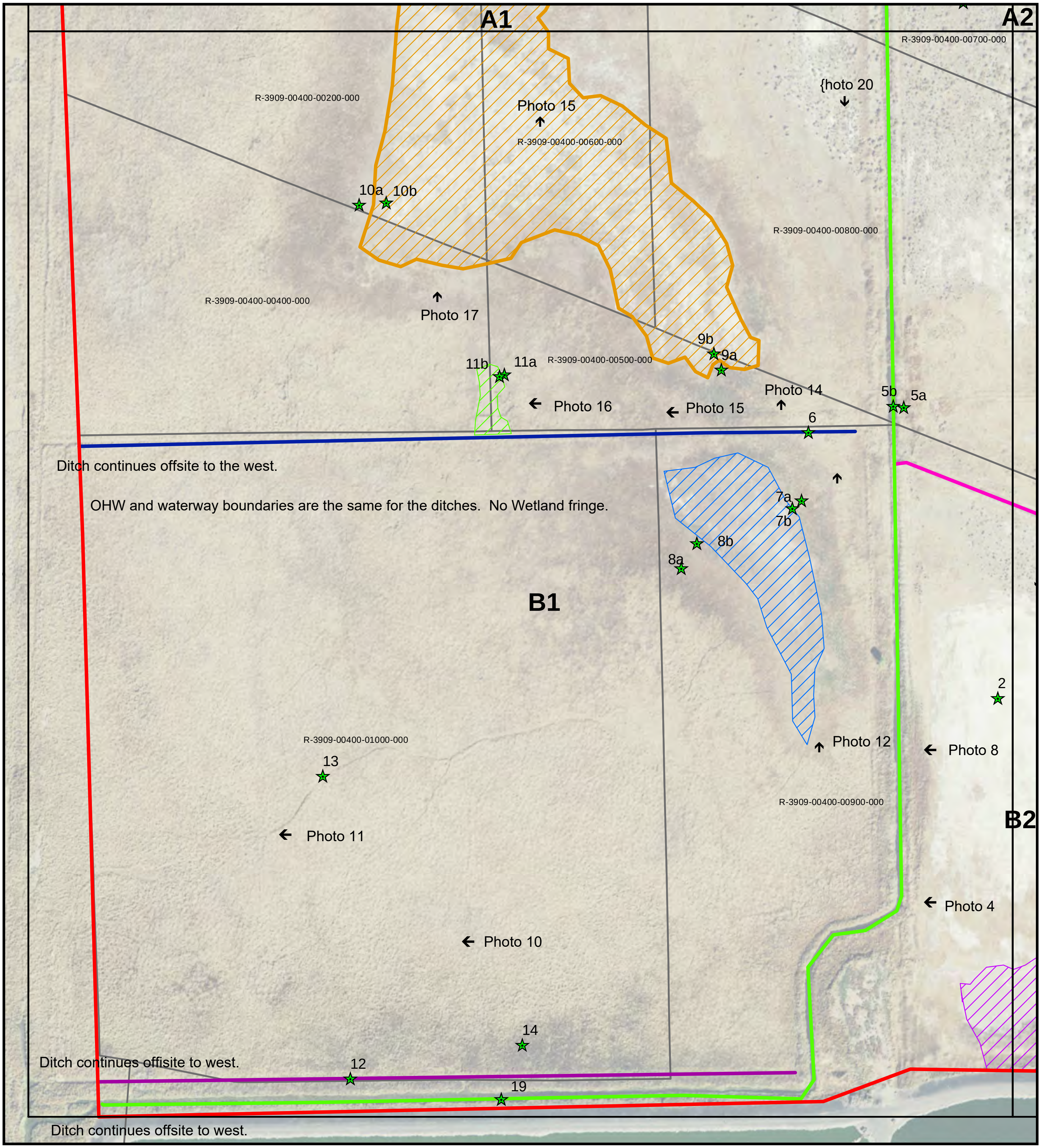
Rabe Consulting

Created By: M. Solus
Created On: June, 2021

N

0 65 130 260 390 520
Feet

Data Source: National Agriculture Imagery Program (NAIP). Flown in Summer 2018. GPS plots and polygons accquired using an Ashtech MobileMapper 10 GPS unit with submeter accuracy of 0.612m Reproduced by Rabe Consulting for the purpose of this document.



South Suburban Sanitary

Figure #6c: Delineation

Grid
Study Area
Wetland Ditch 1
Wetland Ditch 2
Ditch 3
Ditch 4
Ditch 5
Wetland 1
Wetland 2
Wetland 3
Wetland 4

Photos Direction
East
North
South
West

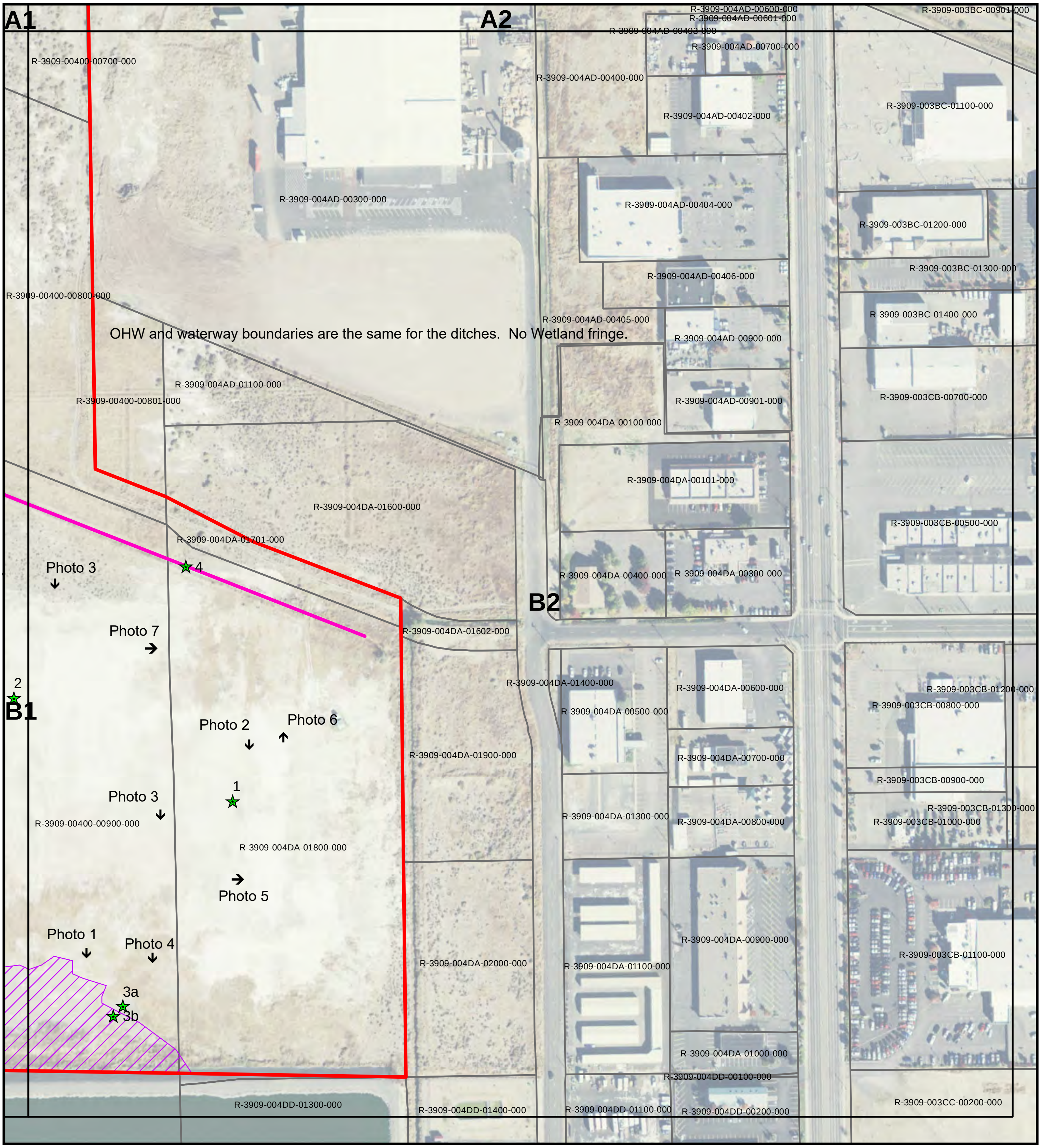
Rabe Consulting

Created By: M. Solus
Created On: June, 2021

N

0 65 130 260 390 520
Feet

Data Source: National Agriculture Imagery Program (NAIP). Flown in Summer 2018. GPS plots and polygons accquired using an Ashtech MobileMapper 10 GPS unit with submeter accuracy of 0.612m Reproduced by Rabe Consulting for the purpose of this document.



South Suburban Sanitary

Figure #6d: Delineation

Legend		
Grid	Wetland 1	**Photos Direction**
Study Area	Wetland 2	East
Wetland Ditch 1	Wetland 3	North
Wetland Ditch 2	Wetland 4	South
Ditch 3		West
Ditch 4		
Ditch 5		

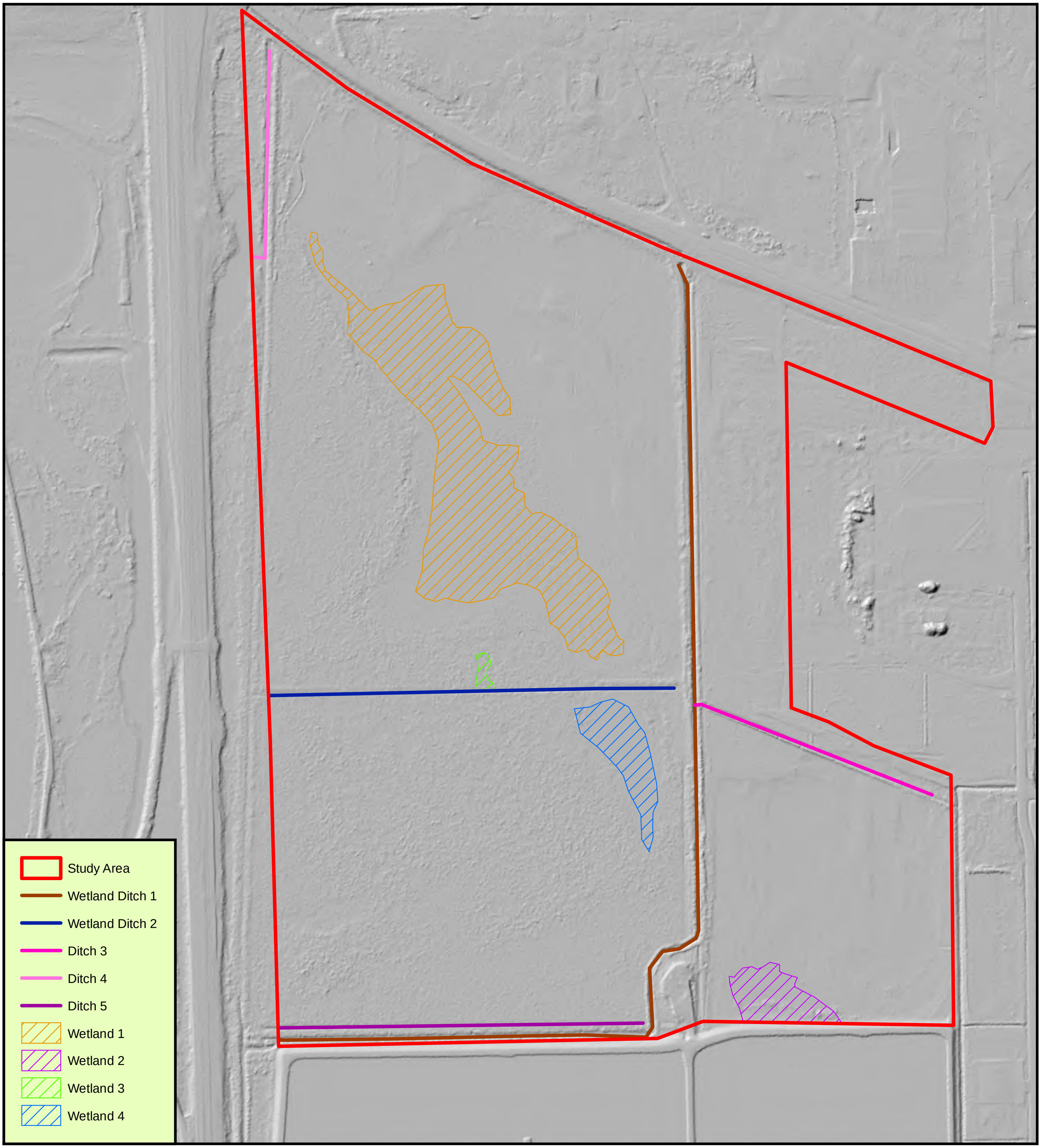
Rabe Consulting

Created By: M. Solus
Created On: June, 2021

N

0 65 130 260 390 520
Feet

Data Source: National Agriculture Imagery Program (NAIP). Flown in Summer 2018. GPS plots and polygons accquired using an Ashtech MobileMapper 10 GPS unit with submeter accuracy of 0.612m Reproduced by Rabe Consulting for the purpose of this document.

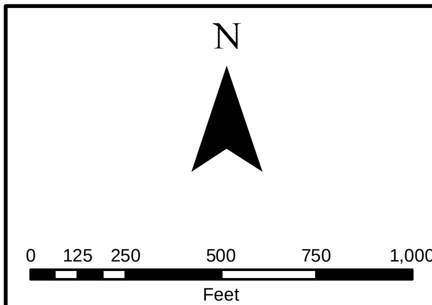


South Suburban Sanitary

Figure #5: Aerial

Created By: M. Solus
Created On: June, 2021

Rabe Consulting



Data Source: National Agriculture Imagery Program (NAIP). Flown in Summer 2018. GPS plots and polygons accquired using an Ashtech MobileMapper 10 GPS unit with submeter accuracy of 0.612m Reproduced by Rabe Consulting for the purpose of this document.

Appendix B

Data Forms

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: South Suburban Sanitary Wetland City/County: Klamath Falls, Klamath Sampling Date: June 13, 2021

Applicant/Owner: South Suburban Sanitary District State: OR Sampling Point: 1

Investigator(s): Rabe Section, Township, Range: T39S R9E Section 4

Landform (hillslope, terrace, etc.): terrace Local relief (concave, convex, none): Convex Slope (%): 1

Subregion (LRR): LRR D Lat: 42.204533 Long: -121.761517 Datum: NAD 83

Soil Map Unit Name: 28 Henleylaki loams NWI classification: N/A

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No ___ (If no, explain in Remarks.)

Are Vegetation ___, Soil ___, or Hydrology ___ significantly disturbed? Are "Normal Circumstances" present? Yes ✓ No ___

Are Vegetation ___, Soil ___, or Hydrology ___ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X No ___	Is the Sampled Area within a Wetland? Yes ___ No X
Hydric Soil Present?	Yes ___ No X	
Wetland Hydrology Present?	Yes ___ No X	

Remarks:
- Salt flat. No pond
- pH > 9.3

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: ___)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
= Total Cover			
Sapling/Shrub Stratum (Plot size: ___)			
1.			
2.			
3.			
4.			
5.			
= Total Cover			
Herb Stratum (Plot size: 1m2)			
1. Elymus repens	10	Y	FAC
2.			
3.			
4.			
5.			
6.			
7.			
8.			
= Total Cover			
Woody Vine Stratum (Plot size: ___)			
1.			
2.			
= Total Cover			

% Bare Ground in Herb Stratum ___ % Cover of Biotic Crust ___

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species		x 1 =
FACW species		x 2 =
FAC species		x 3 =
FACU species		x 4 =
UPL species		x 5 =
Column Totals:	(A)	(B)

Prevalence Index = B/A = ___

Hydrophytic Vegetation Indicators:

- X Dominance Test is >50%
- ___ Prevalence Index is ≤3.0[1]
- ___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes X No ___

Remarks:

SOIL

Sampling Point: 1

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Color (moist)	Redox %	Type[1]	Loc[2]	Texture	Remarks
0-4	10YR 4/2	100					loam	
4-12	10YR 3/2	100					↓	
12-20	10YR 4/3	100						

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR C**)
- ___ 1 cm Muck (A9) (**LRR D**)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- Sandy Redox (S5)
- Stripped Matrix (S6)
- Loamy Mucky Mineral (F1)
- Loamy Gleyed Matrix (F2)
- Depleted Matrix (F3)
- Redox Dark Surface (F6)
- Depleted Dark Surface (F7)
- Redox Depressions (F8)
- Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- 1 cm Muck (A9) (**LRR C**)
- 2 cm Muck (A10) (**LRR B**)
- Reduced Vertic (F18)
- Red Parent Material (TF2)
- Other (Explain in Remarks) based on site position not hydric

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: ______

Depth (inches): ______

Hydric Soil Present? Yes ___ No X

Remarks: Problematic ① yes ② yes ③ convex elevated above adjacent wetlands ④ⓑ① not considered hydric, but likely relic

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1) (**Nonriverine**)
- ___ Sediment Deposits (B2) (**Nonriverine**)
- ___ Drift Deposits (B3) (**Nonriverine**)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- X Salt Crust (B11)
- Biotic Crust (B12)
- Aquatic Invertebrates (B13)
- Hydrogen Sulfide Odor (C1)
- Oxidized Rhizospheres along Living Roots (C3)
- Presence of Reduced Iron (C4)
- Recent Iron Reduction in Tilled Soils (C6)
- Thin Muck Surface (C7)
- X Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- Water Marks (B1) (**Riverine**)
- Sediment Deposits (B2) (**Riverine**)
- Drift Deposits (B3) (**Riverine**)
- Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- Crayfish Burrows (C8)
- Saturation Visible on Aerial Imagery (C9)
- Shallow Aquitard (D3)
- FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ___ No X Depth (inches): ______

Water Table Present? Yes ___ No X Depth (inches): ______

Saturation Present? (includes capillary fringe) Yes ___ No X Depth (inches): ______

Wetland Hydrology Present? Yes ___ No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: Problematic ① yes/no ② convex. elevated above adjacent wetland. Not hydrology indicator because of landscape po

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: South Suburban Sanitary Wetland City/County: Klamath Falls, Klamath Sampling Date: June 13, 2021

Applicant/Owner: South Suburban Sanitary District State: OR Sampling Point: 2

Investigator(s): Rabe Section, Township, Range: T39S R9E Section 4

Landform (hillslope, terrace, etc.): terrace Local relief (concave, convex, none): convex Slope (%): 1

Subregion (LRR): LRR D Lat: 42.251160 Long: -121.763121 Datum: NAD 83

Soil Map Unit Name: 28 Henley Lake Canom NWI classification: N/A

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No ____ (If no, explain in Remarks.)

Are Vegetation____, Soil____, or Hydrology____ significantly disturbed? Are "Normal Circumstances" present? Yes ✓ No ____

Are Vegetation____, Soil____, or Hydrology____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present? Yes X No ____ Hydric Soil Present? Yes ____ No X Wetland Hydrology Present? Yes ____ No X	Is the Sampled Area within a Wetland? Yes ____ No X

Remarks: Salt flat, no pond
PH > 9.2

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: ____)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
= Total Cover			
Sapling/Shrub Stratum (Plot size: ____)			
1.			
2.			
3.			
4.			
5.			
= Total Cover			
Herb Stratum (Plot size: 1m2)			
1. Elymus repens	2	Y	FAC
2.			
3.			
4.			
5.			
6.			
7.			
8.			
= Total Cover			
Woody Vine Stratum (Plot size: ____)			
1.			
2.			
= Total Cover			

% Bare Ground in Herb Stratum ____ % Cover of Biotic Crust ____

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species ____	x 1 = ____
FACW species ____	x 2 = ____
FAC species ____	x 3 = ____
FACU species ____	x 4 = ____
UPL species ____	x 5 = ____
Column Totals: ____ (A)	____ (B)

Prevalence Index = B/A = ____

Hydrophytic Vegetation Indicators:

X Dominance Test is >50%

__ Prevalence Index is ≤3.0[1]

__ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

__ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes X No ____

Remarks:

SOIL

Sampling Point: 2

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-6	10YR 4/2	100					loam	
6-12	10YR 3/2	100					Sandy loam	
12-20	10YR 4/3	100					loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR C**)
- ___ 1 cm Muck (A9) (**LRR D**)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- Sandy Redox (S5)
- Stripped Matrix (S6)
- Loamy Mucky Mineral (F1)
- Loamy Gleyed Matrix (F2)
- Depleted Matrix (F3)
- Redox Dark Surface (F6)
- Depleted Dark Surface (F7)
- Redox Depressions (F8)
- Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- 1 cm Muck (A9) (**LRR C**)
- 2 cm Muck (A10) (**LRR B**)
- Reduced Vertic (F18)
- Red Parent Material (TF2)
- Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: ______

Depth (inches): ______

Hydric Soil Present? Yes ___ No X

Remarks: Problematic ① yes ② yes ③ convex – not considered hydric due to landscape position

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1) (**Nonriverine**)
- ___ Sediment Deposits (B2) (**Nonriverine**)
- ___ Drift Deposits (B3) (**Nonriverine**)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- X Salt Crust (B11)
- Biotic Crust (B12)
- Aquatic Invertebrates (B13)
- Hydrogen Sulfide Odor (C1)
- Oxidized Rhizospheres along Living Roots (C3)
- Presence of Reduced Iron (C4)
- Recent Iron Reduction in Tilled Soils (C6)
- Thin Muck Surface (C7)
- X Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- Water Marks (B1) (**Riverine**)
- Sediment Deposits (B2) (**Riverine**)
- Drift Deposits (B3) (**Riverine**)
- Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- Crayfish Burrows (C8)
- Saturation Visible on Aerial Imagery (C9)
- Shallow Aquitard (D3)
- FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ___ No X Depth (inches): ______

Water Table Present? Yes ___ No X Depth (inches): ______

Saturation Present? (includes capillary fringe) Yes ___ No X Depth (inches): ______

Wetland Hydrology Present? Yes ___ No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: Problematic ① Yes/No ② convex – not hydrology indicator because of landscape position.

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: South Suburban Sanitary Wetland City/County: Klamath Falls, Klamath Sampling Date: June 13, 2021

Applicant/Owner: South Suburban Sanitary District State: OR Sampling Point: 3a

Investigator(s): Rabe Section, Township, Range: T39S R9E Section 4

Landform (hillslope, terrace, etc.): terrace Local relief (concave, convex, none): Convex Slope (%): 1

Subregion (LRR): LRR D Lat: 42.213416 Long: -121.76235 Datum: NAD 83

Soil Map Unit Name: 53 Malin Clay Loam NWI classification: PEM1C

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No ____ (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes ✓ No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X No ____	Is the Sampled Area within a Wetland? Yes ____ No X
Hydric Soil Present?	Yes ____ No X	
Wetland Hydrology Present?	Yes ____ No X	

Remarks: Elevated above wetland, Distinct change in veg and topography

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: ____)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
= Total Cover			
Sapling/Shrub Stratum (Plot size: ____)			
1.			
2.			
3.			
4.			
5.			
= Total Cover			
Herb Stratum (Plot size: 1m²)			
1. Elymus repens	10	Y	FAC
2. Distichlis spicata	10	Y	FAC
3.			
4.			
5.			
6.			
7.			
8.			
= Total Cover	20		
Woody Vine Stratum (Plot size: ____)			
1.			
2.			
= Total Cover			

% Bare Ground in Herb Stratum 80 % Cover of Biotic Crust ____

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species ____	x 1 = ____
FACW species ____	x 2 = ____
FAC species ____	x 3 = ____
FACU species ____	x 4 = ____
UPL species ____	x 5 = ____
Column Totals: ____ (A)	____ (B)

Prevalence Index = B/A = ____

Hydrophytic Vegetation Indicators:

- X Dominance Test is >50%
- __ Prevalence Index is [1]
- __ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- __ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes X No ____

Remarks:

SOIL

Sampling Point: 3a

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture	Remarks
0-5	10YR 2/1	100					Clay loam	
5-12	~~10Y~~ 2.5Y 3/2	100					Silt loam	
12-20	10YR 4/2	100					Clay loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) **(LRR C)**
- ___ 1 cm Muck (A9) **(LRR D)**
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) **(LRR C)**
- ___ 2 cm Muck (A10) **(LRR B)**
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- X Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: ______

Depth (inches): ______

Hydric Soil Present? Yes ___ No X

Remarks: pH 8.9 Problematic: ① yes ② yes ③ convex — due to landscape position not hydric

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1) **(Nonriverine)**
- ___ Sediment Deposits (B2) **(Nonriverine)**
- ___ Drift Deposits (B3) **(Nonriverine)**
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- X Salt Crust (B11)
- ___ Biotic Crust (B12)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water Marks (B1) **(Riverine)**
- ___ Sediment Deposits (B2) **(Riverine)**
- ___ Drift Deposits (B3) **(Riverine)**
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ___ No X Depth (inches): ______

Water Table Present? Yes ___ No X Depth (inches): ______

Saturation Present? (includes capillary fringe) Yes ___ No X Depth (inches): ______

Wetland Hydrology Present? Yes ___ No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: Problematic ① yes/no ② convex - landscape position ~~no~~ hydrology indicator

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: South Suburban Sanitary Wetland City/County: Klamath Falls, Klamath Sampling Date: June 13, 2021

Applicant/Owner: South Suburban Sanitary District State: OR Sampling Point: 3b.

Investigator(s): Rabe Section, Township, Range: T39S R9E Section 4

Landform (hillslope, terrace, etc.): terrace Local relief (concave, convex, none): concave Slope (%): 1

Subregion (LRR): LRR D Lat: 42.203363 Long: -121.76242 Datum: NAD 83

Soil Map Unit Name: 53 Malin Clay loam NWI classification: PEM1C

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✔ No ____ (If no, explain in Remarks.)

Are Vegetation____, Soil____, or Hydrology____ significantly disturbed? Are "Normal Circumstances" present? Yes ✔ No ____

Are Vegetation____, Soil____, or Hydrology____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X No ____	Is the Sampled Area within a Wetland? Yes X No ____
Hydric Soil Present?	Yes X No ____	
Wetland Hydrology Present?	Yes X No ____	

Remarks:

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: ____)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
= Total Cover			
Sapling/Shrub Stratum (Plot size: ____)			
1.			
2.			
3.			
4.			
5.			
= Total Cover			
Herb Stratum (Plot size: 1m2)			
1. Elymus repens	10	Y	FAC
2. Distichlis spicata	10	Y	FAC
3.			
4.			
5.			
6.			
7.			
8.			
= Total Cover	20		
Woody Vine Stratum (Plot size: ____)			
1.			
2.			
= Total Cover			

% Bare Ground in Herb Stratum 80 % Cover of Biotic Crust ____

Remarks:

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species	____	x 1 = ____
FACW species	____	x 2 = ____
FAC species	____	x 3 = ____
FACU species	____	x 4 = ____
UPL species	____	x 5 = ____
Column Totals:	____ (A)	____ (B)

Prevalence Index = B/A = ____

Hydrophytic Vegetation Indicators:

- ✔ Dominance Test is >50%
- ___ Prevalence Index is ≤3.0[1]
- ___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes X No ____

SOIL

Sampling Point: 3b

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture	Remarks
0-6	10YR 2/1	100					clay loam	
6-13	10YR 2/1	100					silt loam	
13-20	10YR 4/2	100					clay loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR C**)
- ___ 1 cm Muck (A9) (**LRR D**)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- Sandy Redox (S5)
- Stripped Matrix (S6)
- Loamy Mucky Mineral (F1)
- Loamy Gleyed Matrix (F2)
- Depleted Matrix (F3)
- Redox Dark Surface (F6)
- Depleted Dark Surface (F7)
- Redox Depressions (F8)
- Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- 1 cm Muck (A9) (**LRR C**)
- 2 cm Muck (A10) (**LRR B**)
- Reduced Vertic (F18)
- Red Parent Material (TF2)
- X Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: ______

Depth (inches): ______

Hydric Soil Present? Yes X No ___

Remarks:

Problematic: ① yes ② yes ③ concave ④ ⓑ ①

pH 8.9

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1) (**Nonriverine**)
- ___ Sediment Deposits (B2) (**Nonriverine**)
- ___ Drift Deposits (B3) (**Nonriverine**)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- / Salt Crust (B11)
- Biotic Crust (B12)
- Aquatic Invertebrates (B13)
- Hydrogen Sulfide Odor (C1)
- Oxidized Rhizospheres along Living Roots (C3)
- Presence of Reduced Iron (C4)
- Recent Iron Reduction in Tilled Soils (C6)
- Thin Muck Surface (C7)
- X Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- Water Marks (B1) (**Riverine**)
- Sediment Deposits (B2) (**Riverine**)
- Drift Deposits (B3) (**Riverine**)
- Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- Crayfish Burrows (C8)
- Saturation Visible on Aerial Imagery (C9)
- Shallow Aquitard (D3)
- FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ___	No X	Depth (inches): ______
Water Table Present?	Yes ___	No X	Depth (inches): ______
Saturation Present? (includes capillary fringe)	Yes ___	No X	Depth (inches): ______

Wetland Hydrology Present? Yes X No ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Problematic ① yes/yes ② concave

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: South Suburban Sanitary Wetland City/County: Klamath Falls, Klamath Sampling Date: June 13, 2021

Applicant/Owner: South Suburban Sanitary District State: OR Sampling Point: 4

Investigator(s): Rabe Section, Township, Range: T39S R9E Section 4

Landform (hillslope, terrace, etc.): terrace Local relief (concave, convex, none): Concave Slope (%): 1

Subregion (LRR): LRR D Lat: 42205827 Long: -121.761838 Datum: NAD 83

Soil Map Unit Name: 28 Henley lakiloam NWI classification: N/A

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No ____ (If no, explain in Remarks.)

Are Vegetation____, Soil____, or Hydrology____ significantly disturbed? Are "Normal Circumstances" present? Yes ✓ No ____

Are Vegetation____, Soil____, or Hydrology____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X No ____	Is the Sampled Area within a Wetland? Yes X No ____
Hydric Soil Present?	Yes X No ____	
Wetland Hydrology Present?	Yes X No ____	

Remarks: ditch. No water. 18in – water in soil pit. Greater than 4ft below surrounding terrace.

VEGETATION – Use scientific names of plants.

	Absolute % Cover	Dominant Species?	Indicator Status
Tree Stratum (Plot size: ____)			
1.			
2.			
3.			
4.			
= Total Cover			
Sapling/Shrub Stratum (Plot size: ____)			
1.			
2.			
3.			
4.			
5.			
= Total Cover			
Herb Stratum (Plot size: 1m2)			
1. Elymus repens	25	Y	FAC
2.			
3.			
4.			
5.			
6.			
7.			
8.			
= Total Cover			
Woody Vine Stratum (Plot size: ____)			
1.			
2.			
= Total Cover			

% Bare Ground in Herb Stratum 75 % Cover of Biotic Crust ____

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species	____	x 1 = ____
FACW species	____	x 2 = ____
FAC species	____	x 3 = ____
FACU species	____	x 4 = ____
UPL species	____	x 5 = ____
Column Totals:	____ (A)	____ (B)

Prevalence Index = B/A = ____

Hydrophytic Vegetation Indicators:

✓ Dominance Test is >50%

__ Prevalence Index is [1]

__ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

__ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes X No ____

Remarks:

- Patchy in channel 25% cover
- looks regularly cleaned out

SOIL

Sampling Point: 4

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-6	10YR 3/2	100					Sand loam	
6-12	10YR 4/3	100					loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR C**)
- ___ 1 cm Muck (A9) (**LRR D**)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- Sandy Redox (S5)
- Stripped Matrix (S6)
- Loamy Mucky Mineral (F1)
- Loamy Gleyed Matrix (F2)
- Depleted Matrix (F3)
- Redox Dark Surface (F6)
- Depleted Dark Surface (F7)
- Redox Depressions (F8)
- Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- 1 cm Muck (A9) (**LRR C**)
- 2 cm Muck (A10) (**LRR B**)
- Reduced Vertic (F18)
- Red Parent Material (TF2)
- X Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: ____________

Depth (inches): ____________

Hydric Soil Present? Yes X No ____

Remarks:

Problematic ① yes ② yes ③ concave ④ 6 ①

pH 8.5

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- X Saturation (A3)
- ___ Water Marks (B1) (**Nonriverine**)
- ___ Sediment Deposits (B2) (**Nonriverine**)
- ___ Drift Deposits (B3) (**Nonriverine**)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- Salt Crust (B11)
- Biotic Crust (B12)
- Aquatic Invertebrates (B13)
- Hydrogen Sulfide Odor (C1)
- Oxidized Rhizospheres along Living Roots (C3)
- Presence of Reduced Iron (C4)
- Recent Iron Reduction in Tilled Soils (C6)
- Thin Muck Surface (C7)
- Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- Water Marks (B1) (**Riverine**)
- Sediment Deposits (B2) (**Riverine**)
- Drift Deposits (B3) (**Riverine**)
- Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- Crayfish Burrows (C8)
- Saturation Visible on Aerial Imagery (C9)
- Shallow Aquitard (D3)
- FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ____ No Ø Depth (inches): ____

Water Table Present? Yes ____ No Ø Depth (inches): ____

Saturation Present? (includes capillary fringe) Yes X No ~~Ø~~ Depth (inches): 18

Wetland Hydrology Present? Yes X No ____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: South Suburban Sanitary Wetland City/County: Klamath Falls, Klamath Sampling Date: June 13, 2021

Applicant/Owner: South Suburban Sanitary District State: OR Sampling Point: 5a

Investigator(s): Rabe Section, Township, Range: T39S R9E Section 4

Landform (hillslope, terrace, etc.): terrace Local relief (concave, convex, none): convex Slope (%): 1

Subregion (LRR): LRR D Lat: 42.206722 Long: -121.763784 Datum: NAD 83

Soil Map Unit Name: ~~42.206722~~ 28 Henley lake Loam NWI classification: N/A

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No ____ (If no, explain in Remarks.)

Are Vegetation____, Soil____, or Hydrology____ significantly disturbed? Are "Normal Circumstances" present? Yes ✓ No ____

Are Vegetation____, Soil____, or Hydrology____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present? Yes____ No X Hydric Soil Present? Yes____ No X Wetland Hydrology Present? Yes____ No X	Is the Sampled Area within a Wetland? Yes____ No X

Remarks: upland terrace

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: ____)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
= Total Cover			
Sapling/Shrub Stratum (Plot size: 1m²)			
1. Chrysothamnus nauseosus	30	y	UPL
2.			
3.			
4.			
5.			
= Total Cover			
Herb Stratum (Plot size: 1m2)			
1. Elymus repens	60	y	FAC
2.			
3.			
4.			
5.			
6.			
7.			
8.			
= Total Cover	100		
Woody Vine Stratum (Plot size: ____)			
1.			
2.			
= Total Cover			

% Bare Ground in Herb Stratum 40 % Cover of Biotic Crust ____

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 50 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species		x 1 =
FACW species		x 2 =
FAC species	60	x 3 = 180
FACU species		x 4 =
UPL species	30	x 5 = 150
Column Totals:	90 (A)	330 (B)

Prevalence Index = B/A = 3.4

Hydrophytic Vegetation Indicators:

__ Dominance Test is >50%

__ Prevalence Index is [1]

__ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

__ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes____ No X

Remarks:

SOIL

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.) Sampling Point: 5a

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture	Remarks
0-5	10YR 4/2	100					loam	
5-10	10YR 3/2	100					↓	
10-20	10YR 4/3	100					↓	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) **(LRR C)**
- ___ 1 cm Muck (A9) **(LRR D)**
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- Sandy Redox (S5)
- Stripped Matrix (S6)
- Loamy Mucky Mineral (F1)
- Loamy Gleyed Matrix (F2)
- Depleted Matrix (F3)
- Redox Dark Surface (F6)
- Depleted Dark Surface (F7)
- Redox Depressions (F8)
- Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- 1 cm Muck (A9) **(LRR C)**
- 2 cm Muck (A10) **(LRR B)**
- Reduced Vertic (F18)
- Red Parent Material (TF2)
- Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: ______________

Depth (inches): ______________

Hydric Soil Present? Yes ______ No X

Remarks:

pH 8.5 Problematic ① yes ② yes ③ convey

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1) **(Nonriverine)**
- ___ Sediment Deposits (B2) **(Nonriverine)**
- ___ Drift Deposits (B3) **(Nonriverine)**
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- Salt Crust (B11)
- Biotic Crust (B12)
- Aquatic Invertebrates (B13)
- Hydrogen Sulfide Odor (C1)
- Oxidized Rhizospheres along Living Roots (C3)
- Presence of Reduced Iron (C4)
- Recent Iron Reduction in Tilled Soils (C6)
- Thin Muck Surface (C7)
- Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- Water Marks (B1) **(Riverine)**
- Sediment Deposits (B2) **(Riverine)**
- Drift Deposits (B3) **(Riverine)**
- Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- Crayfish Burrows (C8)
- Saturation Visible on Aerial Imagery (C9)
- Shallow Aquitard (D3)
- FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ______ No X Depth (inches): ______

Water Table Present? Yes ______ No X Depth (inches): ______

Saturation Present? (includes capillary fringe) Yes ______ No X Depth (inches): ______

Wetland Hydrology Present? Yes ______ No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: South Suburban Sanitary Wetland City/County: Klamath Falls, Klamath Sampling Date: June 13, 2021

Applicant/Owner: South Suburban Sanitary District State: OR Sampling Point: 5b

Investigator(s): Rabe Section, Township, Range: T39S R9E Section 4

Landform (hillslope, terrace, etc.): terrace Local relief (concave, convex, none): Concave Slope (%): 1

Subregion (LRR): LRR D Lat: 42.206592 Long: -121.763863 Datum: NAD 83

Soil Map Unit Name: 28 Henley Lake loam NWI classification: N/A

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✔ No ____ (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes ✔ No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present? Yes X No ____	Is the Sampled Area within a Wetland? Yes X No ____	
Hydric Soil Present? Yes X No ____		
Wetland Hydrology Present? Yes X No ____		

Remarks:
- ~~Wetland~~ Wet ditch. No veg.
- Standing water 4 ft below surrounding terrace

VEGETATION – Use scientific names of plants.

	Absolute % Cover	Dominant Species?	Indicator Status
Tree Stratum (Plot size: ____)			
1.			
2.			
3.			
4.			
= Total Cover			
Sapling/Shrub Stratum (Plot size: ____)			
1.			
2.			
3.			
4.			
5.			
= Total Cover			
Herb Stratum (Plot size: ____)			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
= Total Cover			
Woody Vine Stratum (Plot size: ____)			
1.			
2.			
= Total Cover			

% Bare Ground in Herb Stratum ____ % Cover of Biotic Crust ____

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: ____ (A)

Total Number of Dominant Species Across All Strata: ____ (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: ____ (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species ____	x 1 = ____
FACW species ____	x 2 = ____
FAC species ____	x 3 = ____
FACU species ____	x 4 = ____
UPL species ____	x 5 = ____
Column Totals: ____ (A)	____ (B)

Prevalence Index = B/A = ____

Hydrophytic Vegetation Indicators:

- __ Dominance Test is >50%
- __ Prevalence Index is [1]
- __ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- X Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes X No ____

Remarks: no veg in ditch. Regularly cleaned. Problematic ① 4a ② concave ③ ⓔ surrounding veg hydrophytic in ditch

SOIL

Sampling Point: 5b

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-6	10YR 4/2	100					loam	
6-20	10YR 4/3	100					✓	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

___ Histosol (A1)
___ Histic Epipedon (A2)
___ Black Histic (A3)
___ Hydrogen Sulfide (A4)
___ Stratified Layers (A5) (**LRR C**)
___ 1 cm Muck (A9) (**LRR D**)
___ Depleted Below Dark Surface (A11)
___ Thick Dark Surface (A12)
___ Sandy Mucky Mineral (S1)
___ Sandy Gleyed Matrix (S4)

Sandy Redox (S5)
Stripped Matrix (S6)
Loamy Mucky Mineral (F1)
Loamy Gleyed Matrix (F2)
Depleted Matrix (F3)
Redox Dark Surface (F6)
Depleted Dark Surface (F7)
Redox Depressions (F8)
Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

1 cm Muck (A9) (**LRR C**)
2 cm Muck (A10) (**LRR B**)
Reduced Vertic (F18)
Red Parent Material (TF2)
X Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: ___

Depth (inches): ___

Hydric Soil Present? Yes X No ___

Remarks:

Problematic ① yes ② yes ③ concave ④ 61

pH 8.3

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

X Surface Water (A1)
X High Water Table (A2)
X Saturation (A3)
___ Water Marks (B1) (**Nonriverine**)
___ Sediment Deposits (B2) (**Nonriverine**)
___ Drift Deposits (B3) (**Nonriverine**)
___ Surface Soil Cracks (B6)
___ Inundation Visible on Aerial Imagery (B7)
___ Water-Stained Leaves (B9)

Salt Crust (B11)
Biotic Crust (B12)
Aquatic Invertebrates (B13)
Hydrogen Sulfide Odor (C1)
Oxidized Rhizospheres along Living Roots (C3)
Presence of Reduced Iron (C4)
Recent Iron Reduction in Tilled Soils (C6)
Thin Muck Surface (C7)
Other (Explain in Remarks)

Secondary Indicators (2 or more required)

Water Marks (B1) (**Riverine**)
Sediment Deposits (B2) (**Riverine**)
Drift Deposits (B3) (**Riverine**)
Drainage Patterns (B10)
___ Dry-Season Water Table (C2)
Crayfish Burrows (C8)
Saturation Visible on Aerial Imagery (C9)
Shallow Aquitard (D3)
FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes X No ___ Depth (inches): 2ft
Water Table Present? Yes X No ___ Depth (inches): ___
Saturation Present? (includes capillary fringe) Yes X No ___ Depth (inches): ___

Wetland Hydrology Present? Yes X No ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: South Suburban Sanitary Wetland City/County: Klamath Falls, Klamath Sampling Date: June 13, 2021

Applicant/Owner: South Suburban Sanitary District State: OR Sampling Point: 6

Investigator(s): Rabe Section, Township, Range: T39S R9E Section 4

Landform (hillslope, terrace, etc.): terrace Local relief (concave, convex, none): Concave Slope (%): 1

Subregion (LRR): LRR D Lat: 42.206218 Long: -121.764492 Datum: NAD 83

Soil Map Unit Name: 53 Malin Clay Loam NWI classification: PEM1C

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No ___ (If no, explain in Remarks.)

Are Vegetation ___, Soil ___, or Hydrology ___ significantly disturbed? Are "Normal Circumstances" present? Yes ✓ No ___

Are Vegetation ___, Soil ___, or Hydrology ___ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ✓ No ___	Is the Sampled Area within a Wetland? Yes X No ___
Hydric Soil Present?	Yes X No ___	
Wetland Hydrology Present?	Yes X No ___	

Remarks: Wet ditch.. Water four ft or more ~~[illegible]~~ below surrounding terrace

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: ___)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
= Total Cover			
Sapling/Shrub Stratum (Plot size: ___)			
1.			
2.			
3.			
4.			
5.			
= Total Cover			
Herb Stratum (Plot size: ___)			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
= Total Cover			
Woody Vine Stratum (Plot size: ___)			
1.			
2.			
= Total Cover			

% Bare Ground in Herb Stratum ___ % Cover of Biotic Crust ___

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: ___ (A)

Total Number of Dominant Species Across All Strata: ___ (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: ___ (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species	___	x 1 = ___
FACW species	___	x 2 = ___
FAC species	___	x 3 = ___
FACU species	___	x 4 = ___
UPL species	___	x 5 = ___
Column Totals:	___ (A)	___ (B)

Prevalence Index = B/A = ___

Hydrophytic Vegetation Indicators:

- ___ Dominance Test is >50%
- ___ Prevalence Index is [1]
- ___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- X Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes X No ___

Remarks: no veg. ditch cleaned regularly Problematic ① yes ② concave ③ ⓔ surrounding veg hydrophy[illegible]

SOIL

Sampling Point: 6

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-20	10YR2/1	100					loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR C**)
- ___ 1 cm Muck (A9) (**LRR D**)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) (**LRR C**)
- ___ 2 cm Muck (A10) (**LRR B**)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- X Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: ______

Depth (inches): ______

Hydric Soil Present? Yes X No ___

Remarks:

Hard to keep good sample w/ water

PH 8.8 Problematic (1)yes (2)yes (3)concave (4)b 1

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- X Surface Water (A1)
- X High Water Table (A2)
- X Saturation (A3)
- ___ Water Marks (B1) (**Nonriverine**)
- ___ Sediment Deposits (B2) (**Nonriverine**)
- ___ Drift Deposits (B3) (**Nonriverine**)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Biotic Crust (B12)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water Marks (B1) (**Riverine**)
- ___ Sediment Deposits (B2) (**Riverine**)
- ___ Drift Deposits (B3) (**Riverine**)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes X No ___ Depth (inches): 2ft

Water Table Present? Yes X No ___ Depth (inches): ______

Saturation Present? (includes capillary fringe) Yes X No ___ Depth (inches): ______

Wetland Hydrology Present? Yes X No ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: South Suburban Sanitary Wetland City/County: Klamath Falls, Klamath Sampling Date: June 13, 2021

Applicant/Owner: South Suburban Sanitary District State: OR Sampling Point: 79

Investigator(s): Rabe Section, Township, Range: T39S R9E Section 4

Landform (hillslope, terrace, etc.): terrace Local relief (concave, convex, none): convex Slope (%): 1

Subregion (LRR): LRR D Lat: 42.206218 Long: -121.764557 Datum: NAD 83

Soil Map Unit Name: W NWI classification: PSSC

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No ____ (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes ✓ No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X No ____	Is the Sampled Area within a Wetland? Yes ____ No X
Hydric Soil Present?	Yes ____ No X	
Wetland Hydrology Present?	Yes ____ No X	

Remarks: No trees or shrubs. Elevated above adjacent wetland. Distinct transition in topography and veg.

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: ____)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
= Total Cover			
Sapling/Shrub Stratum (Plot size: ____)			
1.			
2.			
3.			
4.			
5.			
= Total Cover			
Herb Stratum (Plot size: 1m^2)			
1. Distichlis spicata	10	Y	FAC
2.			
3.			
4.			
5.			
6.			
7.			
8.			
= Total Cover	10		
Woody Vine Stratum (Plot size: ____)			
1.			
2.			
= Total Cover			

% Bare Ground in Herb Stratum 90 % Cover of Biotic Crust ____

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species ____	x 1 = ____
FACW species ____	x 2 = ____
FAC species ____	x 3 = ____
FACU species ____	x 4 = ____
UPL species ____	x 5 = ____
Column Totals: ____ (A)	____ (B)

Prevalence Index = B/A = ____

Hydrophytic Vegetation Indicators:

- X Dominance Test is >50%
- __ Prevalence Index is [1]
- __ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- __ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes X No ____

Remarks:

SOIL

Sampling Point: 7a

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Color (moist)	Redox %	Type[1]	Loc[2]	Texture	Remarks
0-6	10YR 2/1	100					Clay loam	
6-15	2.5Y 3/2	100					✓	
15-20	10YR 4/2	100						

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR C**)
- ___ 1 cm Muck (A9) (**LRR D**)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- Sandy Redox (S5)
- Stripped Matrix (S6)
- Loamy Mucky Mineral (F1)
- Loamy Gleyed Matrix (F2)
- Depleted Matrix (F3)
- Redox Dark Surface (F6)
- Depleted Dark Surface (F7)
- Redox Depressions (F8)
- Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- 1 cm Muck (A9) (**LRR C**)
- 2 cm Muck (A10) (**LRR B**)
- Reduced Vertic (F18)
- Red Parent Material (TF2)
- Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: ______

Depth (inches): ______

Hydric Soil Present? Yes ___ No X

Remarks: pH 9.1 Problematic ① yes ② yes ③ convex - due to landscape position not hydric

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1) (**Nonriverine**)
- ___ Sediment Deposits (B2) (**Nonriverine**)
- ___ Drift Deposits (B3) (**Nonriverine**)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ✓ Salt Crust (B11)
- Biotic Crust (B12)
- Aquatic Invertebrates (B13)
- Hydrogen Sulfide Odor (C1)
- Oxidized Rhizospheres along Living Roots (C3)
- Presence of Reduced Iron (C4)
- Recent Iron Reduction in Tilled Soils (C6)
- Thin Muck Surface (C7)
- Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- Water Marks (B1) (**Riverine**)
- Sediment Deposits (B2) (**Riverine**)
- Drift Deposits (B3) (**Riverine**)
- Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- Crayfish Burrows (C8)
- Saturation Visible on Aerial Imagery (C9)
- Shallow Aquitard (D3)
- FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ___ No X Depth (inches): ______

Water Table Present? Yes ___ No X Depth (inches): ______

Saturation Present? (includes capillary fringe) Yes ___ No X Depth (inches): ______

Wetland Hydrology Present? Yes ___ No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: Problematic ① yes/no ② convex - landscape position no hydrologic indicators

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: South Suburban Sanitary Wetland City/County: Klamath Falls, Klamath Sampling Date: June 13, 2021

Applicant/Owner: South Suburban Sanitary District State: OR Sampling Point: 7b

Investigator(s): Rabe Section, Township, Range: T39S R9E Section 4

Landform (hillslope, terrace, etc.): terrace Local relief (concave, convex, none): ______ Slope (%): 1

Subregion (LRR): LRR D Lat: 42.206174 Long: -121.76462 Datum: NAD 83

Soil Map Unit Name: W NWI classification: PSSC

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✔ No ______ (If no, explain in Remarks.)

Are Vegetation ______, Soil ______, or Hydrology ______ significantly disturbed? Are "Normal Circumstances" present? Yes ✔ No ______

Are Vegetation ______, Soil ______, or Hydrology ______ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X No ______	Is the Sampled Area within a Wetland? Yes X No ______
Hydric Soil Present?	Yes X No ______	
Wetland Hydrology Present?	Yes X No ______	

Remarks:

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: ______)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
= Total Cover			
Sapling/Shrub Stratum (Plot size: ______)			
1.			
2.			
3.			
4.			
5.			
= Total Cover			
Herb Stratum (Plot size: 1m²)			
1. Distichlis spicata	1	y	FAC
2.			
3.			
4.			
5.			
6.			
7.			
8.			
= Total Cover	1		
Woody Vine Stratum (Plot size: ______)			
1.			
2.			
= Total Cover			

% Bare Ground in Herb Stratum 99 % Cover of Biotic Crust ______

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species	______	x 1 = ______
FACW species	______	x 2 = ______
FAC species	______	x 3 = ______
FACU species	______	x 4 = ______
UPL species	______	x 5 = ______
Column Totals:	______ (A)	______ (B)

Prevalence Index = B/A = ______

Hydrophytic Vegetation Indicators:

- X Dominance Test is >50%
- __ Prevalence Index is ≤3.0[1]
- __ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- __ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes X No ______

Remarks:

SOIL

Sampling Point: 7b

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Color (moist)	Redox %	Type[1]	Loc[2]	Texture	Remarks
0-6	10YR2/1	100					Clay loam	
6-15	10YR2/1	100					Silt	
15-20	10YR4/2	100					Clay loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR C**)
- ___ 1 cm Muck (A9) (**LRR D**)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- Sandy Redox (S5)
- Stripped Matrix (S6)
- Loamy Mucky Mineral (F1)
- Loamy Gleyed Matrix (F2)
- Depleted Matrix (F3)
- Redox Dark Surface (F6)
- Depleted Dark Surface (F7)
- Redox Depressions (F8)
- Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- 1 cm Muck (A9) (**LRR C**)
- 2 cm Muck (A10) (**LRR B**)
- Reduced Vertic (F18)
- Red Parent Material (TF2)
- X Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: ___

Depth (inches): ___

Hydric Soil Present? Yes X No ___

Remarks: Problematic (1) yes (2) yes (3) concave (4) b1

pH 9.0

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1) (**Nonriverine**)
- ___ Sediment Deposits (B2) (**Nonriverine**)
- ___ Drift Deposits (B3) (**Nonriverine**)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- X Salt Crust (B11)
- Biotic Crust (B12)
- Aquatic Invertebrates (B13)
- Hydrogen Sulfide Odor (C1)
- Oxidized Rhizospheres along Living Roots (C3)
- Presence of Reduced Iron (C4)
- Recent Iron Reduction in Tilled Soils (C6)
- Thin Muck Surface (C7)
- X Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- Water Marks (B1) (**Riverine**)
- Sediment Deposits (B2) (**Riverine**)
- Drift Deposits (B3) (**Riverine**)
- Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- Crayfish Burrows (C8)
- Saturation Visible on Aerial Imagery (C9)
- Shallow Aquitard (D3)
- FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ___ No X Depth (inches): ___

Water Table Present? Yes ___ No X Depth (inches): ___

Saturation Present? (includes capillary fringe) Yes ___ No X Depth (inches): ___

Wetland Hydrology Present? Yes X No ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: Problematic (1) yes/yes (2) concave

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: South Suburban Sanitary Wetland City/County: Klamath Falls, Klamath Sampling Date: June 13, 2021

Applicant/Owner: South Suburban Sanitary District State: OR Sampling Point: 8a

Investigator(s): Rabe Section, Township, Range: T39S R9E Section 4

Landform (hillslope, terrace, etc.): terrace Local relief (concave, convex, none): Convex Slope (%): 1

Subregion (LRR): LRR D Lat: 42.205991 Long: -121.765390 Datum: NAD 83

Soil Map Unit Name: W NWI classification: PSSC

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No ___ (If no, explain in Remarks.)

Are Vegetation ___, Soil ___, or Hydrology ___ significantly disturbed? Are "Normal Circumstances" present? Yes ✓ No ___

Are Vegetation ___, Soil ___, or Hydrology ___ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X No ___	Is the Sampled Area within a Wetland? Yes ___ No X
Hydric Soil Present?	Yes ___ No X	
Wetland Hydrology Present?	Yes ___ No X	

Remarks: No trees or Shrubs. Elevated above adjacent wetland.

VEGETATION – Use scientific names of plants.

	Absolute % Cover	Dominant Species?	Indicator Status
Tree Stratum (Plot size: ___)			
1.			
2.			
3.			
4.			
= Total Cover			
Sapling/Shrub Stratum (Plot size: ___)			
1.			
2.			
3.			
4.			
5.			
= Total Cover			
Herb Stratum (Plot size: 1m²)			
1. Distichlis spicata	20	Y	FAC
2.			
3.			
4.			
5.			
6.			
7.			
8.			
= Total Cover	20		
Woody Vine Stratum (Plot size: ___)			
1.			
2.			
= Total Cover			

% Bare Ground in Herb Stratum 80 % Cover of Biotic Crust ___

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species ___	x 1 = ___
FACW species ___	x 2 = ___
FAC species ___	x 3 = ___
FACU species ___	x 4 = ___
UPL species ___	x 5 = ___
Column Totals: ___ (A)	___ (B)

Prevalence Index = B/A = ___

Hydrophytic Vegetation Indicators:

Y Dominance Test is >50%

___ Prevalence Index is [1]

___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes X No ___

Remarks:

SOIL

Sampling Point: 8a

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-5	10YR 2/1	100					Clay loam	
5-15	2.5Y 3/2	100					Silt	
15-20	10YR 4/6	100					Clay loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR C**)
- ___ 1 cm Muck (A9) (**LRR D**)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- Sandy Redox (S5)
- Stripped Matrix (S6)
- Loamy Mucky Mineral (F1)
- Loamy Gleyed Matrix (F2)
- Depleted Matrix (F3)
- Redox Dark Surface (F6)
- Depleted Dark Surface (F7)
- Redox Depressions (F8)
- Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- 1 cm Muck (A9) (**LRR C**)
- 2 cm Muck (A10) (**LRR B**)
- Reduced Vertic (F18)
- Red Parent Material (TF2)
- Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: ______

Depth (inches): ______

Hydric Soil Present? Yes ___ No X

Remarks:

Problematic ① yes ② yes ③ convex due to landscape position not hydric

pH 9.0

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1) (**Nonriverine**)
- ___ Sediment Deposits (B2) (**Nonriverine**)
- ___ Drift Deposits (B3) (**Nonriverine**)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ✓ Salt Crust (B11)
- Biotic Crust (B12)
- Aquatic Invertebrates (B13)
- Hydrogen Sulfide Odor (C1)
- Oxidized Rhizospheres along Living Roots (C3)
- Presence of Reduced Iron (C4)
- Recent Iron Reduction in Tilled Soils (C6)
- Thin Muck Surface (C7)
- Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- Water Marks (B1) (**Riverine**)
- Sediment Deposits (B2) (**Riverine**)
- Drift Deposits (B3) (**Riverine**)
- Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- Crayfish Burrows (C8)
- Saturation Visible on Aerial Imagery (C9)
- Shallow Aquitard (D3)
- FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ___ No X Depth (inches): ______

Water Table Present? Yes ___ No X Depth (inches): ______

Saturation Present? (includes capillary fringe) Yes ___ No X Depth (inches): ______

Wetland Hydrology Present? Yes ___ No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Problematic ① yes no ② convex landscape position no hydrology

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: South Suburban Sanitary Wetland City/County: Klamath Falls, Klamath Sampling Date: June 13, 2021

Applicant/Owner: South Suburban Sanitary District State: OR Sampling Point: 8b

Investigator(s): Rabe Section, Township, Range: T39S R9E Section 4

Landform (hillslope, terrace, etc.): terrace Local relief (concave, convex, none): Concave Slope (%): 1

Subregion (LRR): LRR D Lat: 42.205020 Long: -121.765232 Datum: NAD 83

Soil Map Unit Name: W NWI classification: PSSC

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No ___ (If no, explain in Remarks.)

Are Vegetation___, Soil___, or Hydrology___ significantly disturbed? Are "Normal Circumstances" present? Yes ✓ No ___

Are Vegetation___, Soil___, or Hydrology___ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present? Yes X No ___ Hydric Soil Present? Yes X No ___ Wetland Hydrology Present? Yes X No ___	Is the Sampled Area within a Wetland? Yes X No ___
Remarks: No trees or shrubs	

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: ___)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
= Total Cover			
Sapling/Shrub Stratum (Plot size: ___)			
1.			
2.			
3.			
4.			
5.			
= Total Cover			
Herb Stratum (Plot size: 1m2)			
1. Distichlis spicata	2	Y	FAC
2.			
3.			
4.			
5.			
6.			
7.			
8.			
= Total Cover	2		
Woody Vine Stratum (Plot size: ___)			
1.			
2.			
= Total Cover			
% Bare Ground in Herb Stratum 98	% Cover of Biotic Crust ___		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species		x 1 =
FACW species		x 2 =
FAC species		x 3 =
FACU species		x 4 =
UPL species		x 5 =
Column Totals:	(A)	(B)

Prevalence Index = B/A = ___

Hydrophytic Vegetation Indicators:

X Dominance Test is >50%

__ Prevalence Index is ≤3.0[1]

__ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

__ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes X No ___

Remarks:

SOIL

Sampling Point: 8b

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Color (moist)	Redox %	Type[1]	Loc[2]	Texture	Remarks
0-7	10YR 2/1	100					Clay loam	
7-15	10YR 2/1	100					Silt	
15-20	10YR 4/2	100					Clay loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR C**)
- ___ 1 cm Muck (A9) (**LRR D**)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- Sandy Redox (S5)
- Stripped Matrix (S6)
- Loamy Mucky Mineral (F1)
- Loamy Gleyed Matrix (F2)
- Depleted Matrix (F3)
- Redox Dark Surface (F6)
- Depleted Dark Surface (F7)
- Redox Depressions (F8)
- Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- 1 cm Muck (A9) (**LRR C**)
- 2 cm Muck (A10) (**LRR B**)
- Reduced Vertic (F18)
- Red Parent Material (TF2)
- X Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):
Type: ______
Depth (inches): ______

Hydric Soil Present? Yes X No ______

Remarks:
Problematic: (1) yes (2) yes (3) concave (4) bi
pH 8.9

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1) (**Nonriverine**)
- ___ Sediment Deposits (B2) (**Nonriverine**)
- ___ Drift Deposits (B3) (**Nonriverine**)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ✓ Salt Crust (B11)
- Biotic Crust (B12)
- Aquatic Invertebrates (B13)
- Hydrogen Sulfide Odor (C1)
- Oxidized Rhizospheres along Living Roots (C3)
- Presence of Reduced Iron (C4)
- Recent Iron Reduction in Tilled Soils (C6)
- Thin Muck Surface (C7)
- ✓ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- Water Marks (B1) (**Riverine**)
- Sediment Deposits (B2) (**Riverine**)
- Drift Deposits (B3) (**Riverine**)
- Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- Crayfish Burrows (C8)
- Saturation Visible on Aerial Imagery (C9)
- Shallow Aquitard (D3)
- FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ______ No X Depth (inches): ______
Water Table Present? Yes ______ No X Depth (inches): ______
Saturation Present? (includes capillary fringe) Yes ______ No X Depth (inches): ______

Wetland Hydrology Present? Yes X No ______

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:
Problematic (1) yes (2) concave

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: South Suburban Sanitary Wetland City/County: Klamath Falls, Klamath Sampling Date: June 13, 2021

Applicant/Owner: South Suburban Sanitary District State: OR Sampling Point: 9a

Investigator(s): Rabe Section, Township, Range: T39S R9E Section 4

Landform (hillslope, terrace, etc.): terrace Local relief (concave, convex, none): Convex Slope (%): 1

Subregion (LRR): LRR D Lat: 42.206942 Long: -121.7765129 Datum: NAD 83

Soil Map Unit Name: 53 Malin Clay loam NWI classification: PEM1C

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No ___ (If no, explain in Remarks.)

Are Vegetation ___, Soil ___, or Hydrology ___ significantly disturbed? Are "Normal Circumstances" present? Yes ✓ No ___

Are Vegetation ___, Soil ___, or Hydrology ___ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X No ___	Is the Sampled Area within a Wetland? Yes ___ No X
Hydric Soil Present?	Yes ___ No X	
Wetland Hydrology Present?	Yes ___ No X	

Remarks: elevated above adjacent wetland. District Δ in veg & topography.

VEGETATION – Use scientific names of plants.

	Absolute % Cover	Dominant Species?	Indicator Status
Tree Stratum (Plot size: ___)			
1.			
2.			
3.			
4.			
= Total Cover			
Sapling/Shrub Stratum (Plot size: ___)			
1.			
2.			
3.			
4.			
5.			
= Total Cover			
Herb Stratum (Plot size: 1m²)			
1. Distichlis spicata	10	Y	FAC
2.			
3.			
4.			
5.			
6.			
7.			
8.			
= Total Cover	10		
Woody Vine Stratum (Plot size: ___)			
1.			
2.			
= Total Cover			

% Bare Ground in Herb Stratum 90 % Cover of Biotic Crust ___

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species ___	x 1 = ___
FACW species ___	x 2 = ___
FAC species ___	x 3 = ___
FACU species ___	x 4 = ___
UPL species ___	x 5 = ___
Column Totals: ___ (A)	___ (B)

Prevalence Index = B/A = ___

Hydrophytic Vegetation Indicators:

- X Dominance Test is >50%
- ___ Prevalence Index is ≤3.0[1]
- ___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes X No ___

Remarks:

SOIL

Sampling Point: 9a

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture	Remarks
0-7	10YR 3/1	100					Clay loam	
7-15	2.5Y 3/2	100					Silt	
15-20	10YR 4/2	100					Clay loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- __ Histosol (A1)
- __ Histic Epipedon (A2)
- __ Black Histic (A3)
- __ Hydrogen Sulfide (A4)
- __ Stratified Layers (A5) (**LRR C**)
- __ 1 cm Muck (A9) (**LRR D**)
- __ Depleted Below Dark Surface (A11)
- __ Thick Dark Surface (A12)
- __ Sandy Mucky Mineral (S1)
- __ Sandy Gleyed Matrix (S4)
- Sandy Redox (S5)
- Stripped Matrix (S6)
- Loamy Mucky Mineral (F1)
- Loamy Gleyed Matrix (F2)
- Depleted Matrix (F3)
- Redox Dark Surface (F6)
- Depleted Dark Surface (F7)
- Redox Depressions (F8)
- Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- 1 cm Muck (A9) (**LRR C**)
- 2 cm Muck (A10) (**LRR B**)
- Reduced Vertic (F18)
- Red Parent Material (TF2)
- Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: ____

Depth (inches): ____

Hydric Soil Present? Yes ____ No X

Remarks:

Problematic (1) yes (2) yes (3) convex

pH 8.9

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- __ Surface Water (A1)
- __ High Water Table (A2)
- __ Saturation (A3)
- __ Water Marks (B1) (**Nonriverine**)
- __ Sediment Deposits (B2) (**Nonriverine**)
- __ Drift Deposits (B3) (**Nonriverine**)
- __ Surface Soil Cracks (B6)
- __ Inundation Visible on Aerial Imagery (B7)
- __ Water-Stained Leaves (B9)
- X Salt Crust (B11)
- Biotic Crust (B12)
- Aquatic Invertebrates (B13)
- Hydrogen Sulfide Odor (C1)
- Oxidized Rhizospheres along Living Roots (C3)
- Presence of Reduced Iron (C4)
- Recent Iron Reduction in Tilled Soils (C6)
- Thin Muck Surface (C7)
- Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- Water Marks (B1) (**Riverine**)
- Sediment Deposits (B2) (**Riverine**)
- Drift Deposits (B3) (**Riverine**)
- Drainage Patterns (B10)
- __ Dry-Season Water Table (C2)
- Crayfish Burrows (C8)
- Saturation Visible on Aerial Imagery (C9)
- Shallow Aquitard (D3)
- FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ____ No X Depth (inches): ____

Water Table Present? Yes ____ No X Depth (inches): ____

Saturation Present? (includes capillary fringe) Yes ____ No X Depth (inches): ____

Wetland Hydrology Present? Yes ____ No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Problematic (1) yes/no (2) convex

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: South Suburban Sanitary Wetland City/County: Klamath Falls, Klamath Sampling Date: June 13, 2021

Applicant/Owner: South Suburban Sanitary District State: OR Sampling Point: ~~TOA~~ 9b

Investigator(s): Rabe Section, Township, Range: T39S R9E Section 4

Landform (hillslope, terrace, etc.): terrace Local relief (concave, convex, none): concave Slope (%): 1

Subregion (LRR): LRR D Lat: 42.207032 Long: -121.765129 Datum: NAD 83

Soil Map Unit Name: 53 Malin Clay Loam NWI classification: PEM1C

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No ____ (If no, explain in Remarks.)

Are Vegetation____, Soil____, or Hydrology____ significantly disturbed? Are "Normal Circumstances" present? Yes ✓ No ____

Are Vegetation____, Soil____, or Hydrology____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X No ____	Is the Sampled Area within a Wetland? Yes X No ____
Hydric Soil Present?	Yes X No ____	
Wetland Hydrology Present?	Yes X No ____	

Remarks: No trees or shrubs

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: ____)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
= Total Cover			
Sapling/Shrub Stratum (Plot size: ____)			
1.			
2.			
3.			
4.			
5.			
= Total Cover			
Herb Stratum (Plot size: 1m²)			
1. Distichlis spicata	2	X	FAC
2.			
3.			
4.			
5.			
6.			
7.			
8.			
= Total Cover	2		
Woody Vine Stratum (Plot size: ____)			
1.			
2.			
= Total Cover			

% Bare Ground in Herb Stratum 98 % Cover of Biotic Crust ____

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species	____	x 1 = ____
FACW species	____	x 2 = ____
FAC species	____	x 3 = ____
FACU species	____	x 4 = ____
UPL species	____	x 5 = ____
Column Totals:	____ (A)	____ (B)

Prevalence Index = B/A = ____

Hydrophytic Vegetation Indicators:

X Dominance Test is >50%
__ Prevalence Index is ≤3.0[1]
__ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
__ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes X No ____

Remarks:

SOIL

Sampling Point: 9b

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture	Remarks
0-6	10YR 2/1	100					Clay loam	
6-15	10YR 2/1	100					Silt	
15-20	10YR 4/2	100					Clay loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR C**)
- ___ 1 cm Muck (A9) (**LRR D**)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- Sandy Redox (S5)
- Stripped Matrix (S6)
- Loamy Mucky Mineral (F1)
- Loamy Gleyed Matrix (F2)
- Depleted Matrix (F3)
- Redox Dark Surface (F6)
- Depleted Dark Surface (F7)
- Redox Depressions (F8)
- Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- 1 cm Muck (A9) (**LRR C**)
- 2 cm Muck (A10) (**LRR B**)
- Reduced Vertic (F18)
- Red Parent Material (TF2)
- X Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: ______

Depth (inches): ______

Hydric Soil Present? Yes X No ___

Remarks:

Problematic ① yes ② yes ③ Concave ④ B1

pH 9.0

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1) (**Nonriverine**)
- ___ Sediment Deposits (B2) (**Nonriverine**)
- ___ Drift Deposits (B3) (**Nonriverine**)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- X Salt Crust (B11)
- Biotic Crust (B12)
- Aquatic Invertebrates (B13)
- Hydrogen Sulfide Odor (C1)
- Oxidized Rhizospheres along Living Roots (C3)
- Presence of Reduced Iron (C4)
- Recent Iron Reduction in Tilled Soils (C6)
- Thin Muck Surface (C7)
- X Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- Water Marks (B1) (**Riverine**)
- Sediment Deposits (B2) (**Riverine**)
- Drift Deposits (B3) (**Riverine**)
- Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- Crayfish Burrows (C8)
- Saturation Visible on Aerial Imagery (C9)
- Shallow Aquitard (D3)
- FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ___ No X Depth (inches): ______

Water Table Present? Yes ___ No X Depth (inches): ______

Saturation Present? (includes capillary fringe) Yes ___ No X Depth (inches): ______

Wetland Hydrology Present? Yes X No ______

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Problematic ① yes/yes ② Concave

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: South Suburban Sanitary Wetland City/County: Klamath Falls, Klamath Sampling Date: June 13, 2021

Applicant/Owner: South Suburban Sanitary District State: OR Sampling Point: 10a

Investigator(s): Rabe Section, Township, Range: T39S R9E Section 4

Landform (hillslope, terrace, etc.): terrace Local relief (concave, convex, none): convex Slope (%): 1

Subregion (LRR): LRR D Lat: 42.207877 Long: -121767787 Datum: NAD 83

Soil Map Unit Name: W NWI classification: PEM1C

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No ___ (If no, explain in Remarks.)

Are Vegetation___, Soil___, or Hydrology___ significantly disturbed? Are "Normal Circumstances" present? Yes ✓ No ___

Are Vegetation___, Soil___, or Hydrology___ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X No ___	Is the Sampled Area within a Wetland? Yes ___ No X
Hydric Soil Present?	Yes ___ No X	
Wetland Hydrology Present?	Yes ___ No X	

Remarks:

elevated above adjacent wetland. Δ in Veg & topo.

VEGETATION – Use scientific names of plants.

	Absolute % Cover	Dominant Species?	Indicator Status
Tree Stratum (Plot size: ___)			
1.			
2.			
3.			
4.			
= Total Cover			
Sapling/Shrub Stratum (Plot size: ___)			
1.			
2.			
3.			
4.			
5.			
= Total Cover			
Herb Stratum (Plot size: 1m2)			
1. Distichlis spicata	10	y	FAC
2.			
3.			
4.			
5.			
6.			
7.			
8.			
= Total Cover	10		
Woody Vine Stratum (Plot size: ___)			
1.			
2.			
= Total Cover			

% Bare Ground in Herb Stratum 90 % Cover of Biotic Crust ___

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species	x 1 =
FACW species	x 2 =
FAC species	x 3 =
FACU species	x 4 =
UPL species	x 5 =
Column Totals: (A)	(B)

Prevalence Index = B/A = ___

Hydrophytic Vegetation Indicators:

- X Dominance Test is >50%
- __ Prevalence Index is ≤3.0[1]
- __ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- __ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes X No ___

Remarks:

SOIL

Sampling Point: 10a

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-15	10YR 4/1	100					Clayloam	
15-20	10YR 4/2	100					+	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR C**)
- ___ 1 cm Muck (A9) (**LRR D**)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- Sandy Redox (S5)
- Stripped Matrix (S6)
- Loamy Mucky Mineral (F1)
- Loamy Gleyed Matrix (F2)
- Depleted Matrix (F3)
- Redox Dark Surface (F6)
- Depleted Dark Surface (F7)
- Redox Depressions (F8)
- Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- 1 cm Muck (A9) (**LRR C**)
- 2 cm Muck (A10) (**LRR B**)
- Reduced Vertic (F18)
- Red Parent Material (TF2)
- Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: ____

Depth (inches): ____

Hydric Soil Present? Yes____ No X

Remarks: Problematic ①yes ② yes ③ convex

pH 8.9

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1) (**Nonriverine**)
- ___ Sediment Deposits (B2) (**Nonriverine**)
- ___ Drift Deposits (B3) (**Nonriverine**)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- X Salt Crust (B11)
- Biotic Crust (B12)
- Aquatic Invertebrates (B13)
- Hydrogen Sulfide Odor (C1)
- Oxidized Rhizospheres along Living Roots (C3)
- Presence of Reduced Iron (C4)
- Recent Iron Reduction in Tilled Soils (C6)
- Thin Muck Surface (C7)
- Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- Water Marks (B1) (**Riverine**)
- Sediment Deposits (B2) (**Riverine**)
- Drift Deposits (B3) (**Riverine**)
- Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- Crayfish Burrows (C8)
- Saturation Visible on Aerial Imagery (C9)
- Shallow Aquitard (D3)
- FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes____ No X Depth (inches): ____

Water Table Present? Yes____ No X Depth (inches): ____

Saturation Present? (includes capillary fringe) Yes____ No X Depth (inches): ____

Wetland Hydrology Present? Yes____ No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: Problematic ① yes/yes ③ convex

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: South Suburban Sanitary Wetland City/County: Klamath Falls, Klamath Sampling Date: June 13, 2021

Applicant/Owner: South Suburban Sanitary District State: OR Sampling Point: 106

Investigator(s): Rabe Section, Township, Range: T39S R9E Section 4

Landform (hillslope, terrace, etc.): terrace Local relief (concave, convex, none): concave Slope (%): 1

Subregion (LRR): LRR D Lat: 42.207886 Long: -121.767586 Datum: NAD 83

Soil Map Unit Name: W NWI classification: PEM1C

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✔ No ___ (If no, explain in Remarks.)

Are Vegetation ___, Soil ___, or Hydrology ___ significantly disturbed? Are "Normal Circumstances" present? Yes ✔ No ___

Are Vegetation ___, Soil ___, or Hydrology ___ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X No ___	Is the Sampled Area within a Wetland? Yes X No ___
Hydric Soil Present?	Yes ✔ No ___	
Wetland Hydrology Present?	Yes X No ___	

Remarks:

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: ___)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
= Total Cover			
Sapling/Shrub Stratum (Plot size: ___)			
1.			
2.			
3.			
4.			
5.			
= Total Cover			
Herb Stratum (Plot size: 1m2)			
1. Distichlis spicata	1	Y	FAC
2.			
3.			
4.			
5.			
6.			
7.			
8.			
= Total Cover	1		
Woody Vine Stratum (Plot size: ___)			
1.			
2.			
= Total Cover			

% Bare Ground in Herb Stratum 99 % Cover of Biotic Crust ___

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species ___	x 1 = ___
FACW species ___	x 2 = ___
FAC species ___	x 3 = ___
FACU species ___	x 4 = ___
UPL species ___	x 5 = ___
Column Totals: ___ (A)	___ (B)

Prevalence Index = B/A = ___

Hydrophytic Vegetation Indicators:

- X Dominance Test is >50%
- ___ Prevalence Index is ≤3.0[1]
- ___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes X No ___

Remarks:

SOIL

Sampling Point: 106

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Color (moist)	Redox %	Type[1]	Loc[2]	Texture	Remarks
0-6	10YR 2/1	100					Clay loam	
6-15	10YR 2/1	100					Silt	
15-20	10YR 4/2	100					Clay Loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR C**)
- ___ 1 cm Muck (A9) (**LRR D**)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- Sandy Redox (S5)
- Stripped Matrix (S6)
- Loamy Mucky Mineral (F1)
- Loamy Gleyed Matrix (F2)
- Depleted Matrix (F3)
- Redox Dark Surface (F6)
- Depleted Dark Surface (F7)
- Redox Depressions (F8)
- Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- 1 cm Muck (A9) (**LRR C**)
- 2 cm Muck (A10) (**LRR B**)
- Reduced Vertic (F18)
- Red Parent Material (TF2)
- X Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: ______

Depth (inches): ______

Hydric Soil Present? Yes X No ___

Remarks:

Problematic: ① yes ② yes ③ concave ④ Bl

PH 9.1

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1) (**Nonriverine**)
- ___ Sediment Deposits (B2) (**Nonriverine**)
- ___ Drift Deposits (B3) (**Nonriverine**)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- X Salt Crust (B11)
- Biotic Crust (B12)
- Aquatic Invertebrates (B13)
- Hydrogen Sulfide Odor (C1)
- Oxidized Rhizospheres along Living Roots (C3)
- Presence of Reduced Iron (C4)
- Recent Iron Reduction in Tilled Soils (C6)
- Thin Muck Surface (C7)
- X Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- Water Marks (B1) (**Riverine**)
- Sediment Deposits (B2) (**Riverine**)
- Drift Deposits (B3) (**Riverine**)
- Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- Crayfish Burrows (C8)
- Saturation Visible on Aerial Imagery (C9)
- Shallow Aquitard (D3)
- FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ___ No X Depth (inches): ______

Water Table Present? Yes ___ No X Depth (inches): ______

Saturation Present? (includes capillary fringe) Yes ___ No X Depth (inches): ______

Wetland Hydrology Present? Yes X No ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Problematic ① yes ② concave

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: South Suburban Sanitary Wetland City/County: Klamath Falls, Klamath Sampling Date: June 13, 2021

Applicant/Owner: South Suburban Sanitary District State: OR Sampling Point: 11a

Investigator(s): Rabe Section, Township, Range: T39S R9E Section 4

Landform (hillslope, terrace, etc.): terrace Local relief (concave, convex, none): convex Slope (%): 1

Subregion (LRR): LRR D Lat: 42.207896 Long: -121.766769 Datum: NAD 83

Soil Map Unit Name: W NWI classification: PEM1C

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✔ No ____ (If no, explain in Remarks.)

Are Vegetation____, Soil____, or Hydrology____ significantly disturbed? Are "Normal Circumstances" present? Yes ✔ No ____

Are Vegetation____, Soil____, or Hydrology____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X No ____	Is the Sampled Area within a Wetland? Yes ____ No X
Hydric Soil Present?	Yes ____ No X	
Wetland Hydrology Present?	Yes ____ No X	

Remarks:

elevated above adjacent wetland. Δ in veg & topo

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: ____)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
= Total Cover			
Sapling/Shrub Stratum (Plot size: ____)			
1.			
2.			
3.			
4.			
5.			
= Total Cover			
Herb Stratum (Plot size: 1m2)			
1. Elymus repens	80	Y	FAC
2.			
3.			
4.			
5.			
6.			
7.			
8.			
= Total Cover	80		
Woody Vine Stratum (Plot size: ____)			
1.			
2.			
= Total Cover			

% Bare Ground in Herb Stratum 20 % Cover of Biotic Crust ____

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species	____	x 1 = ____
FACW species	____	x 2 = ____
FAC species	____	x 3 = ____
FACU species	____	x 4 = ____
UPL species	____	x 5 = ____
Column Totals:	____ (A)	____ (B)

Prevalence Index = B/A = ____

Hydrophytic Vegetation Indicators:

X Dominance Test is >50%
__ Prevalence Index is ≤3.0[1]
__ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
__ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes X No ____

Remarks:

SOIL

Sampling Point: 11a

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture	Remarks
0-15	10YR 2/4	100					Clay/loam	
15-20	10YR 4/2	100					clay loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR C**)
- ___ 1 cm Muck (A9) (**LRR D**)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- Sandy Redox (S5)
- Stripped Matrix (S6)
- Loamy Mucky Mineral (F1)
- Loamy Gleyed Matrix (F2)
- Depleted Matrix (F3)
- Redox Dark Surface (F6)
- Depleted Dark Surface (F7)
- Redox Depressions (F8)
- Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- 1 cm Muck (A9) (**LRR C**)
- 2 cm Muck (A10) (**LRR B**)
- Reduced Vertic (F18)
- Red Parent Material (TF2)
- Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: ____________

Depth (inches): ____________

Hydric Soil Present? Yes____ No X

Remarks:

Problematic ① yes ② yes ③ convex

pH 8.7

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1) (**Nonriverine**)
- ___ Sediment Deposits (B2) (**Nonriverine**)
- ___ Drift Deposits (B3) (**Nonriverine**)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- Salt Crust (B11)
- Biotic Crust (B12)
- Aquatic Invertebrates (B13)
- Hydrogen Sulfide Odor (C1)
- Oxidized Rhizospheres along Living Roots (C3)
- Presence of Reduced Iron (C4)
- Recent Iron Reduction in Tilled Soils (C6)
- Thin Muck Surface (C7)
- Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- Water Marks (B1) (**Riverine**)
- Sediment Deposits (B2) (**Riverine**)
- Drift Deposits (B3) (**Riverine**)
- Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- Crayfish Burrows (C8)
- Saturation Visible on Aerial Imagery (C9)
- Shallow Aquitard (D3)
- FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes____ No ✓ Depth (inches): ____

Water Table Present? Yes____ No ✓ Depth (inches): ____

Saturation Present? (includes capillary fringe) Yes____ No ✓ Depth (inches): ____

Wetland Hydrology Present? Yes____ No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Problematic ① yes/no ② convex

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: South Suburban Sanitary Wetland City/County: Klamath Falls, Klamath Sampling Date: June 13, 2021

Applicant/Owner: South Suburban Sanitary District State: OR Sampling Point: 11b

Investigator(s): Rabe Section, Township, Range: T39S R9E Section 4

Landform (hillslope, terrace, etc.): terrace Local relief (concave, convex, none): ____ Slope (%): 1

Subregion (LRR): LRR D Lat: 42.206933 Long: -121.766731 Datum: NAD 83

Soil Map Unit Name: W NWI classification: PEM1C

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No ____ (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes ✓ No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes Y No ____	Is the Sampled Area within a Wetland? Yes Y No ____
Hydric Soil Present?	Yes Y No ____	
Wetland Hydrology Present?	Yes Y No ____	

Remarks: wetland associated w/ ditch to south. Breach in bank

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: ____)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
= Total Cover			
Sapling/Shrub Stratum (Plot size: ____)			
1.			
2.			
3.			
4.			
5.			
= Total Cover			
Herb Stratum (Plot size: 1m²)			
1. Distichlis spicata	10	Y	FAC
2.			
3.			
4.			
5.			
6.			
7.			
8.			
= Total Cover	10		
Woody Vine Stratum (Plot size: ____)			
1. Ø			
2.			
= Total Cover			

% Bare Ground in Herb Stratum 90 % Cover of Biotic Crust ____

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species ____	x 1 = ____
FACW species ____	x 2 = ____
FAC species ____	x 3 = ____
FACU species ____	x 4 = ____
UPL species ____	x 5 = ____
Column Totals: ____ (A)	____ (B)

Prevalence Index = B/A = ____

Hydrophytic Vegetation Indicators:

X Dominance Test is >50%

__ Prevalence Index is ≤3.0[1]

__ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

__ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes X No ____

Remarks:

SOIL

Sampling Point: 11b

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Color (moist)	Redox %	Type[1]	Loc[2]	Texture	Remarks
0-15	10YR 4/1	100					clay loam	
15-20	10YR 4/2	100					"	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR C**)
- ___ 1 cm Muck (A9) (**LRR D**)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- Sandy Redox (S5)
- Stripped Matrix (S6)
- Loamy Mucky Mineral (F1)
- Loamy Gleyed Matrix (F2)
- Depleted Matrix (F3)
- Redox Dark Surface (F6)
- Depleted Dark Surface (F7)
- Redox Depressions (F8)
- Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- 1 cm Muck (A9) (**LRR C**)
- 2 cm Muck (A10) (**LRR B**)
- Reduced Vertic (F18)
- Red Parent Material (TF2)
- X Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: ______

Depth (inches): ______

Hydric Soil Present? Yes X No ____

Remarks:

Problematic ① yes ② yes ③ concave ④ B1

PH 8.9

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1) (**Nonriverine**)
- ___ Sediment Deposits (B2) (**Nonriverine**)
- ___ Drift Deposits (B3) (**Nonriverine**)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- X Salt Crust (B11)
- Biotic Crust (B12)
- Aquatic Invertebrates (B13)
- Hydrogen Sulfide Odor (C1)
- Oxidized Rhizospheres along Living Roots (C3)
- Presence of Reduced Iron (C4)
- Recent Iron Reduction in Tilled Soils (C6)
- Thin Muck Surface (C7)
- X Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- Water Marks (B1) (**Riverine**)
- Sediment Deposits (B2) (**Riverine**)
- Drift Deposits (B3) (**Riverine**)
- Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- Crayfish Burrows (C8)
- Saturation Visible on Aerial Imagery (C9)
- Shallow Aquitard (D3)
- FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes____ No X Depth (inches): ______

Water Table Present? Yes____ No X Depth (inches): ______

Saturation Present? (includes capillary fringe) Yes____ No X Depth (inches): ______

Wetland Hydrology Present? Yes X No ____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Problematic ① yes/yes ② concave

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: South Suburban Sanitary Wetland City/County: Klamath Falls, Klamath Sampling Date: June 13, 2021

Applicant/Owner: South Suburban Sanitary District State: OR Sampling Point: 12

Investigator(s): Rabe Section, Township, Range: T39S R9E Section 4

Landform (hillslope, terrace, etc.): terrace Local relief (concave, convex, none): Concave Slope (%): 1

Subregion (LRR): LRR D Lat: 42.203078 Long: -121.787943 Datum: NAD 83

Soil Map Unit Name: 53 Malin Clayloam NWI classification: PEM1C

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No ___ (If no, explain in Remarks.)

Are Vegetation___, Soil___, or Hydrology___ significantly disturbed? Are "Normal Circumstances" present? Yes ✓ No ___

Are Vegetation___, Soil___, or Hydrology___ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X No ___	Is the Sampled Area within a Wetland? Yes X No ___
Hydric Soil Present?	Yes X No ___	
Wetland Hydrology Present?	Yes X No ___	

Remarks: Shallow ditch. No water. Saturated at 19 in.

VEGETATION – Use scientific names of plants.

	Absolute % Cover	Dominant Species?	Indicator Status
Tree Stratum (Plot size: ___)			
1.			
2.			
3.			
4.			
= Total Cover			
Sapling/Shrub Stratum (Plot size: ___)			
1.			
2.			
3.			
4.			
5.			
= Total Cover			
Herb Stratum (Plot size: 1m²)			
1. Elymus repens	25	y	FAC
2.			
3.			
4.			
5.			
6.			
7.			
8.			
= Total Cover	25		
Woody Vine Stratum (Plot size: ___)			
1.			
2.			
= Total Cover			

% Bare Ground in Herb Stratum 75 % Cover of Biotic Crust ___

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species		x 1 =
FACW species		x 2 =
FAC species		x 3 =
FACU species		x 4 =
UPL species		x 5 =
Column Totals:	(A)	(B)

Prevalence Index = B/A = ___

Hydrophytic Vegetation Indicators:

X Dominance Test is >50%
___ Prevalence Index is [1]
___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes X No ___

Remarks: Patchy ditch is cleaned regularly

SOIL

Sampling Point: 12

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture	Remarks
0-20	10YR 2/1	100					clay loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR C**)
- ___ 1 cm Muck (A9) (**LRR D**)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- Sandy Redox (S5)
- Stripped Matrix (S6)
- Loamy Mucky Mineral (F1)
- Loamy Gleyed Matrix (F2)
- Depleted Matrix (F3)
- Redox Dark Surface (F6)
- Depleted Dark Surface (F7)
- Redox Depressions (F8)
- Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- 1 cm Muck (A9) (**LRR C**)
- 2 cm Muck (A10) (**LRR B**)
- Reduced Vertic (F18)
- Red Parent Material (TF2)
- ✓ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: ___

Depth (inches): ___

Hydric Soil Present? Yes X No ___

Remarks:

Problematic: ① yes ② yes ③ concave ④ B1

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- High Water Table (A2)
- ✓ Saturation (A3)
- ___ Water Marks (B1) (**Nonriverine**)
- ___ Sediment Deposits (B2) (**Nonriverine**)
- ___ Drift Deposits (B3) (**Nonriverine**)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- Salt Crust (B11)
- Biotic Crust (B12)
- Aquatic Invertebrates (B13)
- Hydrogen Sulfide Odor (C1)
- Oxidized Rhizospheres along Living Roots (C3)
- Presence of Reduced Iron (C4)
- Recent Iron Reduction in Tilled Soils (C6)
- Thin Muck Surface (C7)
- ✓ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- Water Marks (B1) (**Riverine**)
- Sediment Deposits (B2) (**Riverine**)
- Drift Deposits (B3) (**Riverine**)
- Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- Crayfish Burrows (C8)
- Saturation Visible on Aerial Imagery (C9)
- Shallow Aquitard (D3)
- FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ___ No ___ Depth (inches): ___

Water Table Present? Yes ___ No ___ Depth (inches): ___

Saturation Present? (includes capillary fringe) Yes ✓ No ___ Depth (inches): 19

Wetland Hydrology Present? Yes X No ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

saturation about 4 ft below surrounding terrace surface

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: South Suburban Sanitary Wetland City/County: Klamath Falls, Klamath Sampling Date: June 13, 2021

Applicant/Owner: South Suburban Sanitary District State: OR Sampling Point: 13

Investigator(s): Rabe Section, Township, Range: T39S R9E Section 4

Landform (hillslope, terrace, etc.): terrace Local relief (concave, convex, none): convex Slope (%): 1

Subregion (LRR): LRR D Lat: 42.204742 Long: -121.768116 Datum: NAD 83

Soil Map Unit Name: W NWI classification: PEM1C

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No ___ (If no, explain in Remarks.)

Are Vegetation___, Soil___, or Hydrology___ significantly disturbed? Are "Normal Circumstances" present? Yes ✓ No ___

Are Vegetation___, Soil___, or Hydrology___ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present? Yes X No ___ Hydric Soil Present? Yes ___ No X Wetland Hydrology Present? Yes ___ No X	Is the Sampled Area within a Wetland? Yes ___ No X
Remarks: appears as channel on aerial. No change in veg at site visit.	

VEGETATION – Use scientific names of plants.

	Absolute % Cover	Dominant Species?	Indicator Status
Tree Stratum (Plot size: ___)			
1.			
2.			
3.			
4.			
= Total Cover			
Sapling/Shrub Stratum (Plot size: ___)			
1.			
2.			
3.			
4.			
5.			
= Total Cover			
Herb Stratum (Plot size: 1m²)			
1. Elymus repens	90	Y	FAC
2.			
3.			
4.			
5.			
6.			
7.			
8.			
= Total Cover	90		
Woody Vine Stratum (Plot size: ___)			
1.			
2.			
= Total Cover			

% Bare Ground in Herb Stratum 10 % Cover of Biotic Crust ___

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species		x 1 =
FACW species		x 2 =
FAC species		x 3 =
FACU species		x 4 =
UPL species		x 5 =
Column Totals:	(A)	(B)

Prevalence Index = B/A = ___

Hydrophytic Vegetation Indicators:

X Dominance Test is >50%
___ Prevalence Index is ≤3.0[1]
___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes X No ___

Remarks:

SOIL

Sampling Point: 13

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Color (moist)	Redox %	Type[1]	Loc[2]	Texture	Remarks
0-6	10YR 2/1	100					Clay loam	
6-14	10YR 2/1	100					Silt	
14-20	10YR 4/2	100					Clay loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR C**)
- ___ 1 cm Muck (A9) (**LRR D**)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- Sandy Redox (S5)
- Stripped Matrix (S6)
- Loamy Mucky Mineral (F1)
- Loamy Gleyed Matrix (F2)
- Depleted Matrix (F3)
- Redox Dark Surface (F6)
- Depleted Dark Surface (F7)
- Redox Depressions (F8)
- Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- 1 cm Muck (A9) (**LRR C**)
- 2 cm Muck (A10) (**LRR B**)
- Reduced Vertic (F18)
- Red Parent Material (TF2)
- X Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: ______

Depth (inches): ______

Hydric Soil Present? Yes ~~X~~ No X

Remarks:

Problematic: ① yes ② yes ③ ~~[illegible]~~ convex

PH 8.8

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1) (**Nonriverine**)
- ___ Sediment Deposits (B2) (**Nonriverine**)
- ___ Drift Deposits (B3) (**Nonriverine**)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- Salt Crust (B11)
- Biotic Crust (B12)
- Aquatic Invertebrates (B13)
- Hydrogen Sulfide Odor (C1)
- Oxidized Rhizospheres along Living Roots (C3)
- Presence of Reduced Iron (C4)
- Recent Iron Reduction in Tilled Soils (C6)
- Thin Muck Surface (C7)
- Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- Water Marks (B1) (**Riverine**)
- Sediment Deposits (B2) (**Riverine**)
- Drift Deposits (B3) (**Riverine**)
- Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- Crayfish Burrows (C8)
- Saturation Visible on Aerial Imagery (C9)
- Shallow Aquitard (D3)
- FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ___ No X Depth (inches): ______

Water Table Present? Yes ___ No X Depth (inches): ______

Saturation Present? (includes capillary fringe) Yes ___ No X Depth (inches): ______

Wetland Hydrology Present? Yes ___ No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Problematic ① yes/no ② convex

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: South Suburban Sanitary Wetland City/County: Klamath Falls, Klamath Sampling Date: June 13, 2021

Applicant/Owner: South Suburban Sanitary District State: OR Sampling Point: 14

Investigator(s): Rabe Section, Township, Range: T39S R9E Section 4

Landform (hillslope, terrace, etc.): terrace Local relief (concave, convex, none): convex Slope (%): 1

Subregion (LRR): LRR D Lat: 42.203249 Long: -121.766671 Datum: NAD 83

Soil Map Unit Name: 53 Malin Clay Loam NWI classification: PEM1C

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✔ No ___ (If no, explain in Remarks.)

Are Vegetation___, Soil___, or Hydrology___ significantly disturbed? Are "Normal Circumstances" present? Yes ✔ No ___

Are Vegetation___, Soil___, or Hydrology___ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X	No ___
Hydric Soil Present?	Yes ___	No X
Wetland Hydrology Present?	Yes ___	No X

Is the Sampled Area within a Wetland? Yes ___ No X

Remarks:

VEGETATION – Use scientific names of plants.

	Absolute % Cover	Dominant Species?	Indicator Status
Tree Stratum (Plot size: ___)			
1.			
2.			
3.			
4.			
= Total Cover			
Sapling/Shrub Stratum (Plot size: ___)			
1.			
2.			
3.			
4.			
5.			
= Total Cover			
Herb Stratum (Plot size: 1m2)			
1. Elymus repens	90	Y	FAC
2.			
3.			
4.			
5.			
6.			
7.			
8.			
= Total Cover	90		
Woody Vine Stratum (Plot size: ___)			
1.			
2.			
= Total Cover			

% Bare Ground in Herb Stratum 10 % Cover of Biotic Crust ___

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species ___	x 1 = ___
FACW species ___	x 2 = ___
FAC species ___	x 3 = ___
FACU species ___	x 4 = ___
UPL species ___	x 5 = ___
Column Totals: ___ (A)	___ (B)

Prevalence Index = B/A = ___

Hydrophytic Vegetation Indicators:

X Dominance Test is >50%

_ Prevalence Index is ≤3.0[1]

_ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

_ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes X No ___

Remarks:

SOIL

Sampling Point: 14

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-15	10 YR 4/1	100					Clay loam	
15-20	10 YR 4/2	100					"	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR C**)
- ___ 1 cm Muck (A9) (**LRR D**)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- Sandy Redox (S5)
- Stripped Matrix (S6)
- Loamy Mucky Mineral (F1)
- Loamy Gleyed Matrix (F2)
- Depleted Matrix (F3)
- Redox Dark Surface (F6)
- Depleted Dark Surface (F7)
- Redox Depressions (F8)
- Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- 1 cm Muck (A9) (**LRR C**)
- 2 cm Muck (A10) (**LRR B**)
- Reduced Vertic (F18)
- Red Parent Material (TF2)
- Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: ____________

Depth (inches): ____________

Hydric Soil Present? Yes ____ No X

Remarks:

Problematic: ① yes ② yes ③ convex

pH 8.8

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1) (**Nonriverine**)
- ___ Sediment Deposits (B2) (**Nonriverine**)
- ___ Drift Deposits (B3) (**Nonriverine**)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- Salt Crust (B11)
- Biotic Crust (B12)
- Aquatic Invertebrates (B13)
- Hydrogen Sulfide Odor (C1)
- Oxidized Rhizospheres along Living Roots (C3)
- Presence of Reduced Iron (C4)
- Recent Iron Reduction in Tilled Soils (C6)
- Thin Muck Surface (C7)
- Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- Water Marks (B1) (**Riverine**)
- Sediment Deposits (B2) (**Riverine**)
- Drift Deposits (B3) (**Riverine**)
- Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- Crayfish Burrows (C8)
- Saturation Visible on Aerial Imagery (C9)
- Shallow Aquitard (D3)
- FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ____ No X Depth (inches): ________

Water Table Present? Yes ____ No X Depth (inches): ________

Saturation Present? (includes capillary fringe) Yes ____ No X Depth (inches): ________

Wetland Hydrology Present? Yes ____ No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Problematic ① yes/no ② convex

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: South Suburban Sanitary Wetland City/County: Klamath Falls, Klamath Sampling Date: June 13, 2021

Applicant/Owner: South Suburban Sanitary District State: OR Sampling Point: 15

Investigator(s): Rabe Section, Township, Range: T39S R9E Section 4

Landform (hillslope, terrace, etc.): terrace Local relief (concave, convex, none): ______ Slope (%): 1

Subregion (LRR): LRR D Lat: 42.208942 Long: -121.763303 Datum: NAD 83

Soil Map Unit Name: 28 Henleylake loam NWI classification: ______

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No ____ (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes ✓ No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ____ No X	Is the Sampled Area within a Wetland? Yes ____ No X
Hydric Soil Present?	Yes ____ No X	
Wetland Hydrology Present?	Yes ____ No X	

Remarks:

VEGETATION – Use scientific names of plants.

	Absolute % Cover	Dominant Species?	Indicator Status
Tree Stratum (Plot size: ____)			
1.			
2.			
3.			
4.			
= Total Cover			
Sapling/Shrub Stratum (Plot size: 1m2)			
1. Chrysothamnus nauseosus	20	Y	UPL
2. Artemisia tridentata	20	Y	UPL
3.			
4.			
5.			
= Total Cover	40		
Herb Stratum (Plot size: 1m2)			
1. Elymus repens	40	Y	FAC
2.			
3.			
4.			
5.			
6.			
7.			
8.			
= Total Cover	40		
Woody Vine Stratum (Plot size: ____)			
1.			
2.			
= Total Cover			

% Bare Ground in Herb Stratum 20 % Cover of Biotic Crust ____

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 3 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 33 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species		x 1 =
FACW species		x 2 =
FAC species	40	x 3 = 120
FACU species		x 4 =
UPL species	40	x 5 = 200
Column Totals:	80 (A)	320 (B)

Prevalence Index = B/A = 4.0

Hydrophytic Vegetation Indicators:

- ___ Dominance Test is >50%
- ___ Prevalence Index is [1]
- ___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ____ No X

Remarks:

SOIL

Sampling Point: 15

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-6	10YR 4/2	100					loam	
6-12	10YR 3/2	100					"	
12-20	10YR 4/3	100					"	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR C**)
- ___ 1 cm Muck (A9) (**LRR D**)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- Sandy Redox (S5)
- Stripped Matrix (S6)
- Loamy Mucky Mineral (F1)
- Loamy Gleyed Matrix (F2)
- Depleted Matrix (F3)
- Redox Dark Surface (F6)
- Depleted Dark Surface (F7)
- Redox Depressions (F8)
- Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- 1 cm Muck (A9) (**LRR C**)
- 2 cm Muck (A10) (**LRR B**)
- Reduced Vertic (F18)
- Red Parent Material (TF2)
- Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: ______

Depth (inches): ______

Hydric Soil Present? Yes ___ No X

Remarks:

Problematic: ① yes ② No ③ convex

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1) (**Nonriverine**)
- ___ Sediment Deposits (B2) (**Nonriverine**)
- ___ Drift Deposits (B3) (**Nonriverine**)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- Salt Crust (B11)
- Biotic Crust (B12)
- Aquatic Invertebrates (B13)
- Hydrogen Sulfide Odor (C1)
- Oxidized Rhizospheres along Living Roots (C3)
- Presence of Reduced Iron (C4)
- Recent Iron Reduction in Tilled Soils (C6)
- Thin Muck Surface (C7)
- Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- Water Marks (B1) (**Riverine**)
- Sediment Deposits (B2) (**Riverine**)
- Drift Deposits (B3) (**Riverine**)
- Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- Crayfish Burrows (C8)
- Saturation Visible on Aerial Imagery (C9)
- Shallow Aquitard (D3)
- FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ___ No X Depth (inches): ______

Water Table Present? Yes ___ No X Depth (inches): ______

Saturation Present? (includes capillary fringe) Yes ___ No X Depth (inches): ______

Wetland Hydrology Present? Yes ___ No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: South Suburban Sanitary Wetland City/County: Klamath Falls, Klamath Sampling Date: June 13, 2021

Applicant/Owner: South Suburban Sanitary District State: OR Sampling Point: 16a

Investigator(s): Rabe Section, Township, Range: T39S R9E Section 4

Landform (hillslope, terrace, etc.): terrace Local relief (concave, convex, none): Convex Slope (%): 1

Subregion (LRR): LRR D Lat: 42.209779 Long: -121.767053 Datum: NAD 83

Soil Map Unit Name: 77 Teeters Silt Loam NWI classification: PEM1C

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No ____ (If no, explain in Remarks.)

Are Vegetation____, Soil____, or Hydrology____ significantly disturbed? Are "Normal Circumstances" present? Yes ✓ No ____

Are Vegetation____, Soil____, or Hydrology____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X No ____	Is the Sampled Area within a Wetland? Yes ____ No X
Hydric Soil Present?	Yes ____ No X	
Wetland Hydrology Present?	Yes ____ No X	

Remarks:
- Δ in veg s/ topography.
- elevated above adjacent wetland.

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: ____)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
= Total Cover			
Sapling/Shrub Stratum (Plot size: ____)			
1.			
2.			
3.			
4.			
5.			
= Total Cover			
Herb Stratum (Plot size: 1m²)			
1. Distichlis spicata	10	Y	FAC
2.			
3.			
4.			
5.			
6.			
7.			
8.			
= Total Cover	10		
Woody Vine Stratum (Plot size: ____)			
1.			
2.			
= Total Cover			

% Bare Ground in Herb Stratum 90 % Cover of Biotic Crust ____

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species ____	x 1 = ____
FACW species ____	x 2 = ____
FAC species ____	x 3 = ____
FACU species ____	x 4 = ____
UPL species ____	x 5 = ____
Column Totals: ____ (A)	____ (B)

Prevalence Index = B/A = ____

Hydrophytic Vegetation Indicators:

X Dominance Test is >50%

__ Prevalence Index is ≤3.0[1]

__ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

__ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes X No ____

Remarks:

SOIL

Sampling Point: 16a

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture	Remarks
0-9	10YR 4/1	100					Silt loam	
9-20	2.5Y 3/1	100					✓	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR C**)
- ___ 1 cm Muck (A9) (**LRR D**)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- Sandy Redox (S5)
- Stripped Matrix (S6)
- Loamy Mucky Mineral (F1)
- Loamy Gleyed Matrix (F2)
- Depleted Matrix (F3)
- Redox Dark Surface (F6)
- Depleted Dark Surface (F7)
- Redox Depressions (F8)
- Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- 1 cm Muck (A9) (**LRR C**)
- 2 cm Muck (A10) (**LRR B**)
- Reduced Vertic (F18)
- Red Parent Material (TF2)
- Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: ______

Depth (inches): ______

Hydric Soil Present? Yes ___ No X

Remarks:

pH 8.9 Problematic ① yes ② yes ③ convex

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1) (**Nonriverine**)
- ___ Sediment Deposits (B2) (**Nonriverine**)
- ___ Drift Deposits (B3) (**Nonriverine**)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ✓ Salt Crust (B11)
- Biotic Crust (B12)
- Aquatic Invertebrates (B13)
- Hydrogen Sulfide Odor (C1)
- Oxidized Rhizospheres along Living Roots (C3)
- Presence of Reduced Iron (C4)
- Recent Iron Reduction in Tilled Soils (C6)
- Thin Muck Surface (C7)
- Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- Water Marks (B1) (**Riverine**)
- Sediment Deposits (B2) (**Riverine**)
- Drift Deposits (B3) (**Riverine**)
- Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- Crayfish Burrows (C8)
- Saturation Visible on Aerial Imagery (C9)
- Shallow Aquitard (D3)
- FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ___ No X Depth (inches): ______

Water Table Present? Yes ___ No X Depth (inches): ______

Saturation Present? (includes capillary fringe) Yes ___ No X Depth (inches): ______

Wetland Hydrology Present? Yes ___ No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Problematic: ① yes/no ② convex

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: South Suburban Sanitary Wetland City/County: Klamath Falls, Klamath Sampling Date: June 13, 2021

Applicant/Owner: South Suburban Sanitary District State: OR Sampling Point: 16B

Investigator(s): Rabe Section, Township, Range: T39S R9E Section 4

Landform (hillslope, terrace, etc.): terrace Local relief (concave, convex, none): concave Slope (%): 1

Subregion (LRR): LRR D Lat: 42.209871 Long: -121.767007 Datum: NAD 83

Soil Map Unit Name: 77 teeters silt loam NWI classification: PEM/C

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No ___ (If no, explain in Remarks.)

Are Vegetation ___, Soil ___, or Hydrology ___ significantly disturbed? Are "Normal Circumstances" present? Yes ✓ No ___

Are Vegetation ___, Soil ___, or Hydrology ___ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X No ___	Is the Sampled Area within a Wetland? Yes X No ___
Hydric Soil Present?	Yes X No ___	
Wetland Hydrology Present?	Yes X No ___	

Remarks:

VEGETATION – Use scientific names of plants.

	Absolute % Cover	Dominant Species?	Indicator Status
Tree Stratum (Plot size: ___)			
1.			
2.			
3.			
4.			
= Total Cover			
Sapling/Shrub Stratum (Plot size: ___)			
1.			
2.			
3.			
4.			
5.			
= Total Cover			
Herb Stratum (Plot size: 1 m²)			
1. Distichlis spicata	1	Y	FAC
2.			
3.			
4.			
5.			
6.			
7.			
8.			
= Total Cover	1		
Woody Vine Stratum (Plot size: ___)			
1.			
2.			
= Total Cover			

% Bare Ground in Herb Stratum 99 % Cover of Biotic Crust ___

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species	___	x 1 = ___
FACW species	___	x 2 = ___
FAC species	___	x 3 = ___
FACU species	___	x 4 = ___
UPL species	___	x 5 = ___
Column Totals:	___ (A)	___ (B)

Prevalence Index = B/A = ___

Hydrophytic Vegetation Indicators:

X Dominance Test is >50%
___ Prevalence Index is [1]
___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes X No ___

Remarks:

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SOIL

Sampling Point: 16b

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-9	10YR 2/1	100					loam	
9-20	5YR 4/1	100					✓	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR C**)
- ___ 1 cm Muck (A9) (**LRR D**)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- Sandy Redox (S5)
- Stripped Matrix (S6)
- Loamy Mucky Mineral (F1)
- Loamy Gleyed Matrix (F2)
- Depleted Matrix (F3)
- Redox Dark Surface (F6)
- Depleted Dark Surface (F7)
- Redox Depressions (F8)
- Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- 1 cm Muck (A9) (**LRR C**)
- 2 cm Muck (A10) (**LRR B**)
- Reduced Vertic (F18)
- Red Parent Material (TF2)
- X Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: ______

Depth (inches): ______

Hydric Soil Present? Yes X No ___

Remarks:

Problematic ① yes ② yes ③ concave ④ B1

pH 8.9

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1) (**Nonriverine**)
- ___ Sediment Deposits (B2) (**Nonriverine**)
- ___ Drift Deposits (B3) (**Nonriverine**)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- X Salt Crust (B11)
- Biotic Crust (B12)
- Aquatic Invertebrates (B13)
- Hydrogen Sulfide Odor (C1)
- Oxidized Rhizospheres along Living Roots (C3)
- Presence of Reduced Iron (C4)
- Recent Iron Reduction in Tilled Soils (C6)
- Thin Muck Surface (C7)
- X Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- Water Marks (B1) (**Riverine**)
- Sediment Deposits (B2) (**Riverine**)
- Drift Deposits (B3) (**Riverine**)
- Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- Crayfish Burrows (C8)
- Saturation Visible on Aerial Imagery (C9)
- Shallow Aquitard (D3)
- FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ___ No X Depth (inches): ______

Water Table Present? Yes ___ No X Depth (inches): ______

Saturation Present? (includes capillary fringe) Yes ___ No X Depth (inches): ______

Wetland Hydrology Present? Yes X No ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Problematic ① yes/yes ② concave

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: South Suburban Sanitary Wetland City/County: Klamath Falls, Klamath Sampling Date: June 13, 2021

Applicant/Owner: South Suburban Sanitary District State: OR Sampling Point: 17a

Investigator(s): Rabe Section, Township, Range: T39S R9E Section 4

Landform (hillslope, terrace, etc.): terrace Local relief (concave, convex, none): Convex Slope (%): 1

Subregion (LRR): LRR D Lat: 42.211367 Long: 121.769037 Datum: NAD 83

Soil Map Unit Name: 77 teeters silt loam NWI classification: PEM1C

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No ____ (If no, explain in Remarks.)

Are Vegetation____, Soil____, or Hydrology____ significantly disturbed? Are "Normal Circumstances" present? Yes ✓ No ____

Are Vegetation____, Soil____, or Hydrology____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present? Yes X No ____	Is the Sampled Area within a Wetland? Yes ____ No X
Hydric Soil Present? Yes ____ No X	
Wetland Hydrology Present? Yes ____ No X	

Remarks:

elevated above adjacent wetland

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: ____)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
= Total Cover			
Sapling/Shrub Stratum (Plot size: ____)			
1.			
2.			
3.			
4.			
5.			
= Total Cover			
Herb Stratum (Plot size: 1 m²)			
1. Distichlis spicata	20	y	FAC
2.			
3.			
4.			
5.			
6.			
7.			
8.			
= Total Cover	20		
Woody Vine Stratum (Plot size: ____)			
1.			
2.			
= Total Cover			

% Bare Ground in Herb Stratum 80 % Cover of Biotic Crust ____

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species	x 1 =
FACW species	x 2 =
FAC species	x 3 =
FACU species	x 4 =
UPL species	x 5 =
Column Totals: (A)	(B)

Prevalence Index = B/A = ____

Hydrophytic Vegetation Indicators:

- X Dominance Test is >50%
- __ Prevalence Index is ≤3.0[1]
- __ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- __ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes X No ____

Remarks:

SOIL

Sampling Point: 17a

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-7	10 YR 2/1	100					Silt	
7-20	5 YR 4/1	100					"	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR C**)
- ___ 1 cm Muck (A9) (**LRR D**)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- Sandy Redox (S5)
- Stripped Matrix (S6)
- Loamy Mucky Mineral (F1)
- Loamy Gleyed Matrix (F2)
- Depleted Matrix (F3)
- Redox Dark Surface (F6)
- Depleted Dark Surface (F7)
- Redox Depressions (F8)
- Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- 1 cm Muck (A9) (**LRR C**)
- 2 cm Muck (A10) (**LRR B**)
- Reduced Vertic (F18)
- Red Parent Material (TF2)
- Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: ______

Depth (inches): ______

Hydric Soil Present? Yes ___ No X

Remarks:

Problematic ① yes ② yes ③ convex

pH 8.9

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1) (**Nonriverine**)
- ___ Sediment Deposits (B2) (**Nonriverine**)
- ___ Drift Deposits (B3) (**Nonriverine**)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- X Salt Crust (B11)
- Biotic Crust (B12)
- Aquatic Invertebrates (B13)
- Hydrogen Sulfide Odor (C1)
- Oxidized Rhizospheres along Living Roots (C3)
- Presence of Reduced Iron (C4)
- Recent Iron Reduction in Tilled Soils (C6)
- Thin Muck Surface (C7)
- Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- Water Marks (B1) (**Riverine**)
- Sediment Deposits (B2) (**Riverine**)
- Drift Deposits (B3) (**Riverine**)
- Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- Crayfish Burrows (C8)
- Saturation Visible on Aerial Imagery (C9)
- Shallow Aquitard (D3)
- FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ___ No X Depth (inches): ______

Water Table Present? Yes ___ No X Depth (inches): ______

Saturation Present? (includes capillary fringe) Yes ___ No X Depth (inches): ______

Wetland Hydrology Present? Yes ___ No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Problematic ① yes/no ② convex

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: South Suburban Sanitary Wetland City/County: Klamath Falls, Klamath Sampling Date: June 13, 2021

Applicant/Owner: South Suburban Sanitary District State: OR Sampling Point: P3

Investigator(s): Rabe Section, Township, Range: T39S R9E Section 4

Landform (hillslope, terrace, etc.): terrace Local relief (concave, convex, none): Concave Slope (%): 1

Subregion (LRR): LRR D Lat: 42.211335 Long: -121.769142 Datum: NAD 83

Soil Map Unit Name: 77 teeters silt loam NWI classification: PEM1C

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No ____ (If no, explain in Remarks.)

Are Vegetation____, Soil____, or Hydrology____ significantly disturbed? Are "Normal Circumstances" present? Yes ✓ No ____

Are Vegetation____, Soil____, or Hydrology____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X No ____	Is the Sampled Area within a Wetland?	Yes X No ____
Hydric Soil Present?	Yes X No ____		
Wetland Hydrology Present?	Yes X No ____		

Remarks:

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: ____)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
= Total Cover			
Sapling/Shrub Stratum (Plot size: ____)			
1.			
2.			
3.			
4.			
5.			
= Total Cover			
Herb Stratum (Plot size: 1 m2)			
1. Distichlis spicata	1	Y	FAC
2.			
3.			
4.			
5.			
6.			
7.			
8.			
= Total Cover	1		
Woody Vine Stratum (Plot size: ____)			
1.			
2.			
= Total Cover			

% Bare Ground in Herb Stratum 99 % Cover of Biotic Crust ____

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species ____	x 1 = ____
FACW species ____	x 2 = ____
FAC species ____	x 3 = ____
FACU species ____	x 4 = ____
UPL species ____	x 5 = ____
Column Totals: ____ (A)	____ (B)

Prevalence Index = B/A = ____

Hydrophytic Vegetation Indicators:

X Dominance Test is >50%

__ Prevalence Index is ≤3.0[1]

__ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

__ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes X No ____

Remarks:

SOIL

Sampling Point: 17B

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Color (moist)	Redox %	Type[1]	Loc[2]	Texture	Remarks
0-9	10YR 4/1	100					loam	
9-20	5YR 4/1	100					loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR C**)
- ___ 1 cm Muck (A9) (**LRR D**)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- Sandy Redox (S5)
- Stripped Matrix (S6)
- Loamy Mucky Mineral (F1)
- Loamy Gleyed Matrix (F2)
- Depleted Matrix (F3)
- Redox Dark Surface (F6)
- Depleted Dark Surface (F7)
- Redox Depressions (F8)
- Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- 1 cm Muck (A9) (**LRR C**)
- 2 cm Muck (A10) (**LRR B**)
- Reduced Vertic (F18)
- Red Parent Material (TF2)
- X Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: ______

Depth (inches): ______

Hydric Soil Present? Yes X No ___

Remarks:

Problematic: ① yes ② yes ③ concave ④ B1

PH8A

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1) (**Nonriverine**)
- ___ Sediment Deposits (B2) (**Nonriverine**)
- ___ Drift Deposits (B3) (**Nonriverine**)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- X Salt Crust (B11)
- Biotic Crust (B12)
- Aquatic Invertebrates (B13)
- Hydrogen Sulfide Odor (C1)
- Oxidized Rhizospheres along Living Roots (C3)
- Presence of Reduced Iron (C4)
- Recent Iron Reduction in Tilled Soils (C6)
- Thin Muck Surface (C7)
- X Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- Water Marks (B1) (**Riverine**)
- Sediment Deposits (B2) (**Riverine**)
- Drift Deposits (B3) (**Riverine**)
- Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- Crayfish Burrows (C8)
- Saturation Visible on Aerial Imagery (C9)
- Shallow Aquitard (D3)
- FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ___ No X Depth (inches): ______

Water Table Present? Yes ___ No X Depth (inches): ______

Saturation Present? (includes capillary fringe) Yes ___ No X Depth (inches): ______

Wetland Hydrology Present? Yes X No ______

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Problematic: ① yes/yes ② concave

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: South Suburban Sanitary Wetland City/County: Klamath Falls, Klamath Sampling Date: June 13, 2021

Applicant/Owner: South Suburban Sanitary District State: OR Sampling Point: 18

Investigator(s): Rabe Section, Township, Range: T39S R9E Section 4

Landform (hillslope, terrace, etc.): terrace Local relief (concave, convex, none): Concave Slope (%): 1

Subregion (LRR): LRR D Lat: 42.211515 Long: -121.766832 Datum: NAD 83

Soil Map Unit Name: 77 Teeters silt loam NWI classification: PEM/C

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✔ No ____ (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes ✔ No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X No ____	Is the Sampled Area within a Wetland? Yes X No ~~X~~
Hydric Soil Present?	Yes X No ~~X~~	
Wetland Hydrology Present?	Yes X No ____	

Remarks: dry, ditch

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: ____)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
= Total Cover			
Sapling/Shrub Stratum (Plot size: ____)			
1.			
2.			
3.			
4.			
5.			
= Total Cover			
Herb Stratum (Plot size: 1m2)			
1. Elymus repens	10	y	FAC
2.			
3.			
4.			
5.			
6.			
7.			
8.			
= Total Cover	10		
Woody Vine Stratum (Plot size: ____)			
1.			
2.			
= Total Cover			

% Bare Ground in Herb Stratum 90 % Cover of Biotic Crust ____

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species	____	x 1 = ____
FACW species	____	x 2 = ____
FAC species	____	x 3 = ____
FACU species	____	x 4 = ____
UPL species	____	x 5 = ____
Column Totals:	____ (A)	____ (B)

Prevalence Index = B/A = ____

Hydrophytic Vegetation Indicators:

✔ Dominance Test is >50%

__ Prevalence Index is ≤3.0[1]

__ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

__ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes X No ____

Remarks: Patchy veg - ditch cleaned regularly

SOIL

Sampling Point: 18

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-15	10YR 2/1	100					loam	
15-20	5YR 4/1	100					loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR C**)
- ___ 1 cm Muck (A9) (**LRR D**)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- Sandy Redox (S5)
- Stripped Matrix (S6)
- Loamy Mucky Mineral (F1)
- Loamy Gleyed Matrix (F2)
- Depleted Matrix (F3)
- Redox Dark Surface (F6)
- Depleted Dark Surface (F7)
- Redox Depressions (F8)
- Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- 1 cm Muck (A9) (**LRR C**)
- 2 cm Muck (A10) (**LRR B**)
- Reduced Vertic (F18)
- Red Parent Material (TF2)
- X Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: ______

Depth (inches): ______

Hydric Soil Present? Yes X No ___

Remarks:

Problematic ① yes ② yes ③ concave ④ B)

pH 8.9

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1) (**Nonriverine**)
- ___ Sediment Deposits (B2) (**Nonriverine**)
- ___ Drift Deposits (B3) (**Nonriverine**)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- X Salt Crust (B11)
- Biotic Crust (B12)
- Aquatic Invertebrates (B13)
- Hydrogen Sulfide Odor (C1)
- Oxidized Rhizospheres along Living Roots (C3)
- Presence of Reduced Iron (C4)
- Recent Iron Reduction in Tilled Soils (C6)
- Thin Muck Surface (C7)
- X Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- Water Marks (B1) (**Riverine**)
- Sediment Deposits (B2) (**Riverine**)
- Drift Deposits (B3) (**Riverine**)
- Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- Crayfish Burrows (C8)
- Saturation Visible on Aerial Imagery (C9)
- Shallow Aquitard (D3)
- FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ___ No X Depth (inches): ______

Water Table Present? Yes ___ No X Depth (inches): ______

Saturation Present? (includes capillary fringe) Yes ___ No X Depth (inches): ______

Wetland Hydrology Present? Yes X No ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Problematic ① yes/yes ② concave

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: South Suburban Sanitary Wetland City/County: Klamath Falls, Klamath Sampling Date: June 13, 2021

Applicant/Owner: South Suburban Sanitary District State: OR Sampling Point: 19

Investigator(s): Rabe Section, Township, Range: T39S R9E Section 4

Landform (hillslope, terrace, etc.): terrace Local relief (concave, convex, none): Concave Slope (%): 1

Subregion (LRR): LRR D Lat: 42.202954 Long: 1 17 1 17 Datum: NAD 83

Soil Map Unit Name: 53 Malin Clay loam NWI classification: PEM1C

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No ___ (If no, explain in Remarks.)

Are Vegetation ___, Soil ___, or Hydrology ___ significantly disturbed? Are "Normal Circumstances" present? Yes ✓ No ___

Are Vegetation ___, Soil ___, or Hydrology ___ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present? Yes 6 No ___ Hydric Soil Present? Yes X No ___ Wetland Hydrology Present? Yes X No ___	**Is the Sampled Area within a Wetland?** Yes 6 No ~~X~~

Remarks: Wet ditch. Water more than 4ft below surrounding terrace surface

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: ___)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
= Total Cover			
Sapling/Shrub Stratum (Plot size: ___)			
1.			
2.			
3.			
4.			
5.			
= Total Cover			
Herb Stratum (Plot size: ___)			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
= Total Cover			
Woody Vine Stratum (Plot size: ___)			
1.			
2.			
= Total Cover			

% Bare Ground in Herb Stratum ___ % Cover of Biotic Crust ___

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: ___ (A)

Total Number of Dominant Species Across All Strata: ___ (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: ___ (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species	___	x 1 = ___
FACW species	___	x 2 = ___
FAC species	___	x 3 = ___
FACU species	___	x 4 = ___
UPL species	___	x 5 = ___
Column Totals:	___ (A)	___ (B)

Prevalence Index = B/A = ___

Hydrophytic Vegetation Indicators:

- ___ Dominance Test is >50%
- ___ Prevalence Index is [1]
- ___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- X Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes X No ___

Remarks: No ~~Patchy~~ veg - ditch cleaned regularly. Problematic (1) yes (2) concave (3) 2

SOIL

Sampling Point: 19

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Color (moist)	Redox %	Type[1]	Loc[2]	Texture	Remarks
0-15	10YR2/1	100					Clay	
15-20	10YR2/1	100					loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR C**)
- ___ 1 cm Muck (A9) (**LRR D**)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- Sandy Redox (S5)
- Stripped Matrix (S6)
- Loamy Mucky Mineral (F1)
- Loamy Gleyed Matrix (F2)
- Depleted Matrix (F3)
- Redox Dark Surface (F6)
- Depleted Dark Surface (F7)
- Redox Depressions (F8)
- Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- 1 cm Muck (A9) (**LRR C**)
- 2 cm Muck (A10) (**LRR B**)
- Reduced Vertic (F18)
- Red Parent Material (TF2)
- X Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: ______

Depth (inches): ______

Hydric Soil Present? Yes X No ___

Remarks:

Problematic: ① yes ② yes ③ Concave ④ B1

PH 8.9 hard to get good sample because of water

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- X Surface Water (A1)
- X High Water Table (A2)
- X Saturation (A3)
- ___ Water Marks (B1) (**Nonriverine**)
- ___ Sediment Deposits (B2) (**Nonriverine**)
- ___ Drift Deposits (B3) (**Nonriverine**)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- Salt Crust (B11)
- Biotic Crust (B12)
- Aquatic Invertebrates (B13)
- Hydrogen Sulfide Odor (C1)
- Oxidized Rhizospheres along Living Roots (C3)
- Presence of Reduced Iron (C4)
- Recent Iron Reduction in Tilled Soils (C6)
- Thin Muck Surface (C7)
- Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- Water Marks (B1) (**Riverine**)
- Sediment Deposits (B2) (**Riverine**)
- Drift Deposits (B3) (**Riverine**)
- Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- Crayfish Burrows (C8)
- Saturation Visible on Aerial Imagery (C9)
- Shallow Aquitard (D3)
- FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes X No ___ Depth (inches): 24

Water Table Present? Yes X No ___ Depth (inches): ___

Saturation Present? (includes capillary fringe) Yes X No ___ Depth (inches): ___

Wetland Hydrology Present? Yes X No ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Appendix C

Ground-Level Color Photographs

Photo 1: Facing south toward Wetland 2.

Photo 2: Facing south

Photo 3: Facing south.

Photo 4: Facing south

Photo 5: Facing east, upland area

Photo 6: Facing north toward Ditch 4.

Photo 7: Facing east.

Photo 8: Facing west across wetland ditch 1, toward Wetland 4.

Photo 9: Facing west across wetland ditch 1.

Photo 10: Facing west.

Photo 11: Facing west.

Photo 12: Facing north, across Wetland 4 and Wetland 1.

Photo 13: Facing north across Wetland Ditch 3, with Wetland Ditch 1 in top right of photo.

Photo 14: Facing north along east edge of Wetland 1. Wetland Ditch 1 in center of photo and Wetland Ditch 3 in bottom of photo.

Photo 15: Facing west along Wetland Ditch 3, with Wetland 1 in right of photo.

Photo 16: Facing east along Wetland Ditch 3, Wetland 3.

Photo 17: Facing north across Wetland 1 with Wetland Ditch 4.

Photo 18: Facing north across Wetland 1

Wetland 1

Wetland Ditch 1

Photo 19: Facing east across upland and Wetland Ditch 1.

Wetland Ditch 1

Photo 20: Facing east acros
Wetland Ditch 1.

Wetland 2

Photo 21: Facing south across Wetland 2.

Appendix D – References

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Appendix B

Final NPDES Permit

DEQ
State of Oregon Department of Environmental Quality

NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM WASTE DISCHARGE PERMIT

Oregon Department of Environmental Quality
Eastern Region – Pendleton Office
800 SE Emigrant, #330
Pendleton, OR 97801
Telephone: 541-276-4063

Issued pursuant to ORS 468B.050 and the Federal Clean Water Act (the Clean Water Act)

ISSUED TO:

South Suburban Sanitary District
2201 Laverne Avenue
Klamath Falls, OR 97603

SOURCES COVERED BY THIS PERMIT:

Type of Waste	Outfall Number	Outfall Location
Treated Domestic Wastewater	001	42.2028, -121.7744
Recycled Water Reuse	002	Specified in Recycled Water Use Plan
Biosolids	N/A	

FACILITY LOCATION:

2980 Maywood Dr.
Klamath Falls, OR 97603
County: Klamath

EPA Permit Type: Major

RECEIVING STREAM INFORMATION:

WRD Basin: Klamath
USGS Sub-Basin: Upper Klamath
Receiving Stream name: Klamath River
NHD Reach Code: 18010204011523 (86.2%)
LLID: 1221913420005 – 251.66

Issued in response to Application No. 994954 received January 13, 1995. This permit is issued based on the land use findings in the permit record.

Chad P. Gubala, Ph.D Eastern Region Water Quality Permitting Manager	September 17, 2020 Issuance Date	November 1, 2020 Effective Date

PERMITTED ACTIVITIES

Until this permit expires or is modified or revoked, the permittee is authorized to: 1) operate a wastewater collection, treatment, control and disposal system; and 2) discharge treated wastewater to waters of the state only from the authorized discharge point or points in Schedule A in conformance with the requirements, limits, and conditions set forth in this permit.

Unless specifically authorized by this permit, by another NPDES or Water Pollution Control Facility permit, or by Oregon statute or administrative rule, any other direct or indirect discharge of pollutants to waters of the state is prohibited.

TABLE OF CONTENTS

Note: Schedule E: Pretreatment Activities is not a part of this permit.

LIST OF TABLES

SCHEDULE A: WASTE DISCHARGE LIMITS

1. Outfall 001 – Permit Limits

During the term of this permit, the permittee must comply with the limits in the following table:

Table A1: Permit Limits

Parameter (Year-Round unless otherwise noted)	Units	Average Monthly	Average Weekly	Daily Maximum	Semiannual Average
BOD_5 (Year-round)	mg/L	30	45	N/A	N/A
	lbs/day	500	750	1000	N/A
	% removal	65	N/A	N/A	N/A
BOD_5 (May 15 – Oct. 15) (Final: See note c.)	lbs/day	N/A	N/A	N/A	251
BOD_5 (Oct 16 – May 14) (Final: See note c.)	lbs/day	N/A	N/A	N/A	367
TSS (May 1 – October 31)	mg/L	85	130	N/A	N/A
	lbs/day	1400	2300	2800	N/A
	%	65	N/A	N/A	N/A
TSS (November 1 – April 30)	mg/L	85	130	N/A	N/A
	lbs/day	1400	2300	2800	N/A
	%	65	N/A	N/A	N/A
Chlorine, Total Residual (Interim; See notes a. and c.)	mg/L	0.5	N/A	1.0	N/A
Chlorine, Total Residual (Final; See notes a. and c.)	mg/L	0.010	N/A	0.015	N/A
Total Ammonia (as N) (Final: See note c.)	mg/L	0.7	N/A	1.7	N/A
pH	SU	Instantaneous limit between a daily minimum of 6.5 and a daily maximum of 9.0			N/A
E. coli See note b.	#/100 mL	Must not exceed a monthly geometric mean of 126, no single sample may exceed 406			N/A
Excess Thermal Load (Final: See note c.)	million kcal/day	Daily Calculated Thermal Load Limit (see notes e. and f.)			N/A
Temperature (June 1 to September 30)	°C	N/A	N/A	32	N/A
Temperature (October 1 to May 31) (See note d.)	°C	N/A	N/A	28	N/A
Total Recoverable Mercury (Final: See note c.)	µg/L	0.01	N/A	0.02	N/A
Phosphorus as P, Total (May 15 – Oct. 15) (Final: See note c.)	lbs/day	N/A	N/A	N/A	4.9

Parameter (Year-Round unless otherwise noted)	Units	Average Monthly	Average Weekly	Daily Maximum	Semiannual Average
Phosphorus as P, Total (Oct. 16 – May 14) (Final: see note c.)	lbs/day	N/A	N/A	N/A	36
Nitrogen as N, Total (May 15 – Oct. 15) (Final: see note c.)	lbs/day	N/A	N/A	N/A	318
Nitrogen as N, Total (Oct. 16 – May 14) (Final: see note c.)	lbs/day	N/A	N/A	N/A	448

Notes:

a. DEQ has established minimum Quantitation Limits of 0.05 mg/L for Total Residual Chlorine. In cases where the average monthly or maximum daily limit for this parameter is lower than the relevant Quantitation Limit, DEQ will use the reported Quantitation Limit as the compliance evaluation level for the parameter.

b. The permittee may take at least 5 consecutive re-samples at 4 hour intervals beginning within 28 hours after the original sample was taken and the geometric mean of the 5 re-samples is less than or equal to 126 *E. coli* organisms/100 mL to demonstrate compliance with the limit.

c. The interim Total Residual Chlorine limits are effective upon permit issuance. The final limits for total recoverable chlorine, the semi-annual average limits for BOD_5, as well as the limits for total mercury, ammonia, nitrogen, phoshorus and excess thermal load are effective after completion of the compliance schedule in Schedule C.

d. The October 1 – May 31 maximum effluent temperature limit applies when daily maximum river temperatures are greater than 28° C.

e. Use this equation to determine the daily ETL Limit for the June 1 – Sept. 30 period:

$$ETL = 0.05 \times [(Q_E \times 1.5472) + Q_R] \times 2.4467$$

Where,

ETL = Excess thermal load limit (million kilocalories/day).
Q_E = The daily mean effluent flow (MGD).
Q_R = The daily mean river flow rate, upstream (cfs). When river flow is <= 104 cfs, Q_R = 104 cfs. When river flow > 104 cfs, Q_R is equal to the mean daily river flow, upstream.

f. Use this equation to determine the daily ETL Limit for the Oct. 1 – May 31 period:

$$ETL = 0.03 \times [(Q_E \times 1.5472) + Q_R] \times 2.4467$$

Where,

ETL = Excess thermal load limit (million kilocalories/day).
Q_E = The daily mean effluent flow (MGD).
Q_R = The daily mean river flow rate, upstream (cfs). When river flow is <= 104 cfs, Q_R = 104 cfs. When river flow > 104 cfs, Q_R is equal to the mean daily river flow, upstream.

2. Regulatory Mixing Zone

There is no regulatory mixing zone for this discharge.

3. Use of Recycled Water

The permittee is authorized to distribute recycled water if it is:

a. Treated and used according to the criteria listed in Table A2.

b. Managed in accordance with its DEQ-approved Recycled Water Use Plan unless exempt as provided in Schedule D.

c. Used in a manner and applied at a rate that does not adversely affect groundwater quality.

d. Applied at a rate and in accordance with site management practices that ensure continued agricultural, horticultural, or silvicultural production and does not reduce the productivity of the site.

e. Irrigated using sound irrigation practices to prevent:

   i. Offsite surface runoff or subsurface drainage through drainage tile;

   ii. Creation of odors, fly and mosquito breeding, or other nuisance conditions; and

   iii. Overloading of land with nutrients, organics, or other pollutants.

Table A2: Recycled Water Limits

Class	Level of Treatment (after disinfection unless otherwise specified)	Beneficial Uses
A.	Class A recycled water must be oxidized, filtered and disinfected. Before disinfection, turbidity may not exceed: • An average of 2 NTUs within a 24-hour period. • 5 NTUs more than five percent of the time within a 24-hour period. • 10 NTUs at any time. After disinfection, total coliform may not exceed: • A median of 2.2 organisms per 100 mL based on daily sampling over the last 7 days that analyses have been completed. • 23 organisms per 100 mL in any single sample.	Class A recycled water may be used for: • Class B, Class C, Class D, and nondisinfected uses. • Irrigation for any agricultural or horticultural use. • Landscape irrigation of parks, playgrounds, school yards, residential landscapes, or other landscapes accessible to the public. • Commercial car washing or fountains when the water is not intended for human consumption. • Water supply source for non-restricted recreational impoundments. • Artificial groundwater recharge by surface infiltration methods or by subsurface injection in accordance with OAR Chapter 340, Division 44.
B.	Class B recycled water must be oxidized and disinfected. Total coliform may not exceed: • A median of 2.2 organisms per 100 mL, based on the last 7 days that analyses have been completed. • 23 total coliform organisms per 100 mL in any single sample.	Class B recycled water may be used for: • Class C, Class D, and nondisinfected uses. • Stand-alone fire suppression systems in commercial and residential building, non-residential toilet or urinal flushing, or floor drain trap priming. • Water supply source for restricted recreational impoundments.

Class	Level of Treatment (after disinfection unless otherwise specified)	Beneficial Uses
C.	Class C recycled water must be oxidized and disinfected. Total coliform may not exceed: • A median of 23 total coliform organisms per 100 mL, based on results of the last 7 days that analyses have been completed. • 240 total coliform organisms per 100 mL in any two consecutive samples.	Class C recycled water may be used for: • Class D and nondisinfected uses. • Irrigation of processed food crops; irrigation of orchards or vineyards if an irrigation method is used to apply recycled water directly to the soil. • Landscape irrigation of golf courses, cemeteries, highway medians, or industrial or business campuses. • Industrial, commercial, or construction uses limited to: industrial cooling, rock crushing, aggregate washing, mixing concrete, dust control, nonstructural firefighting using aircraft, street sweeping, or sanitary sewer flushing.
D.	Class D recycled water must be oxidized and disinfected. *E. coli* may not exceed: • A 30-day geometric mean of 126 organisms per 100 mL. • 406 organisms per 100 mL in any single sample.	Class D recycled water may be used for: • Nondisinfected uses. • Irrigation of firewood, ornamental nursery stock, Christmas trees, sod, or pasture for animals.

4. Mercury Minimization Plan

By the date listed in Table B1, the permittee must submit an MMP (Mercury Minimization Plan) to DEQ for review and approval. At a minimum, the MMP must include the following:

a. Identification and evaluation of current and potential mercury (both methyl mercury [MeHg] and total mercury) sources

b. Identification and evaluation of conditions (e.g., anaerobic conditions) that might contribute to the methylation of elemental mercury in the collection and treatment systems

c. Identification of industrial, commercial and residential sources of mercury

d. A monitoring plan to confirm current or potential sources of mercury (Monitoring Plan)

e. Identification of potential methods for reducing or eliminating mercury. These may include but are not limited to:

   i. BMP requirements or limits for industrial and commercial sources of mercury to a collection system
   ii. Material substitution
   iii. Material recovery
   iv. Spill control and collection
   v. Waste recycling
   vi. Process modifications
   vii. Laboratory housekeeping, use and disposal practices and
   viii. Public education.

f. Ongoing monitoring of effluent to enable evaluation of the effectiveness and implementation of the MMP.

Within 60 days of receiving DEQ comments on the MMP, the permittee must revise the plan to be consistent with DEQ's comments and resubmit for DEQ approval. Before approving the plan, DEQ will put the plan out on public notice. The permittee must use a DEQ-approved template unless authorized in writing by DEQ to use an alternative. The permittee must begin implementation of the approved plan within 30 days of DEQ's approval. If DEQ determines that the MMP is not effective at reducing sources of mercury from entering its collection system, or if a water column translation of the fish tissue criterion is developed, DEQ may reopen the permit to modify the permit conditions. These modifications may include, but are not limited to, the addition of a numeric effluent limit.

SCHEDULE B: MINIMUM MONITORING AND REPORTING REQUIREMENTS

1. Reporting Requirements

The permittee must submit to DEQ monitoring results and reports as listed below.

Table B1: Reporting Requirements and Due Dates

Reporting Requirement	Frequency	Due Date (See Note a.)	Report Form (See Note b.)	Submit To:
Tables B2, B3, and B4 Influent Monitoring, Effluent Monitoring, and receiving stream monitoring	Monthly	By the 15th of the following month	Specified in Schedule B. Section 2 of this permit	Electronic reporting as directed by DEQ
Tables B6 – B9: Effluent Toxics Characterization	Quarterly, for 4 quarters, beginning in January 2023 (see note d)	By the 15th of the month following each quarter	Electronic copy in a DEQ-approved format	Attached via electronic reporting as directed by DEQ
Table B10: WET Test Monitoring	Semiannually, beginning in January 2023 (See note c.)	With the first DMR submittal after receipt of the test results	Electronic copy in a DEQ-approved format	Attached via electronic reporting as directed by DEQ
Table B5: Copper Biotic Ligand Model and Aluminum Sampling Requirements	Monthly, beginning in January 2023 (see note d) for 17 months, then annually	By the 15th of the following month	Electronic copy in a DEQ-approved format	Attached via electronic reporting as directed by DEQ
Recycled Water Annual Report (see Schedule D)	Annually	January 15	Electronic copy in the DEQ-approved format	Attached via electronic reporting as directed by DEQ Electronic copy to DEQ Water Reuse Program Coordinator
Wastewater Solids Annual Report (see Schedule D)	Annually	February 19	Electronic copy in the DEQ-approved format	Attached via electronic reporting as directed by DEQ Electronic copy to DEQ Biosolids Program Coordinator
Sludge Depth Survey Report (See Schedule D – Lagoon Solids)	One Time	Submit by 12/15/2021	Electronic copy in a DEQ-approved format	Attached via electronic reporting as directed by DEQ

Reporting Requirement	Frequency	Due Date (See Note a.)	Report Form (See Note b.)	Submit To:
Inflow and Infiltration report (see Schedule D)	Annually	February 15	Electronic copy in a DEQ-approved format	Attached via electronic reporting as directed by DEQ
Hauled Waste Control Plan (see Schedule D)	One time	Submit by 2/15/2022	Electronic copy in a DEQ-approved format	Attached via electronic reporting as directed by DEQ
Hauled Waste Annual Report (see Schedule D)	Annually	January 15	Electronic copy in the DEQ-approved format	Attached via electronic reporting as directed by DEQ
Industrial User Survey (see Schedule D)	Every 5 years	Submit by no later than 24 months after permit effective date	1 electronic copy and 1 hard copy in a DEQ-approved format	• 1 Hard copy to DEQ Pretreatment Coordinator • 1 Electronic copy to Compliance Officer
Outfall Inspection Report (see Schedule D)	One time	Submit by 12/15/2024	Electronic copy in a DEQ-approved format	Attached via electronic reporting as directed by DEQ
Mercury Minimization Plan (see Schedule A)	One time	Submit by 12/15/2022	One electronic copy in a DEQ-approved format	Attached via electronic reporting as directed by DEQ

Notes:

a. For submittals that are provided to DEQ by mail, the postmarked date must not be later than the due date.

b. All reporting requirements are to be submitted in a DEQ-approved format, unless otherwise specified in writing.

c. Each test must be conducted during a different quarter each year (e.g., Year 1, Qtr. 1). When possible, conduct the first WET testing concurrent with Effluent Toxics Characterization Monitoring in the third year of the permit term. Afterwards all WET testing will be continued semiannually if the Preliminary Design Report (due April 1, 2022) demonstrates that the permittee's chosen alternative is to cease discharging to the Klamath River. All tests must be completed prior to submission of renewal application.

d. Monitoring and reporting requirements can be eliminated if the Preliminary Design Report (due April 1, 2022) demonstrates that the permittee's chosen alternative is to cease discharging to the Klamath River.

2. Monitoring and Reporting Protocols

a. Paper Submissions

i. The permittee must submit to DEQ the results of the monitoring required in Schedule B in a paper format as specified below.Until directed by DEQ, the permittee must submit any required Pretreatment Program Reports, Wastewater Solids and Biosolids Annual Report, Sanitary Sewer Overflow/Bypass Event Reports, and other required information to DEQ.

ii. The permittee must sign and certify submittals of Discharge Monitoring Reports (DMRs), reports, and other information in accordance with the requirements of Section D8 within Schedule F of this permit.

b. Electronic Submissions

The permittee must submit to DEQ the results of monitoring indicated in Schedule B in an electronic format as specified below.

i. When directed by DEQ, the permittee must submit monitoring results required by this permit via DEQ-approved web-based Discharge Monitoring Report (DMR) forms to DEQ via electronic reporting. Any data used to calculate summary statistics must be submitted as a separate attachment approved by DEQ via electronic reporting.

ii. The reporting period is the calendar month.

iii. The permittee must submit monitoring data and other information required by this permit for all compliance points by the 15th day of the month following the reporting period unless specified otherwise in this permit or as specified in writing by DEQ.

c. Test Methods

The permitte must conduct monitoring according to test procedures in 40 CFR part 136 and 40 CFR part 503 for biosolids or other approved procedures as per Schedule F.

d. Detection and Quantitation Limits

i. Detection Level (DL) – The DL is defined as the minimum measured concentration of a substance that can be distinguished from method blank results with 99% confidence. The DL is derived using the procedure in 40 CFR part 136 Appendix B and evaluated for reasonableness relative to method blank concentrations to ensure results reported above the DL are not a result of routine background contamination. The DL is also known as the Method Detection Limit (MDL) or Limit of Detection (LOD).

ii. Quantitation Limits (QLs) – The QL is the minimum level, concentration or quantity of a target analyte that can be reported with a specified degree of confidence. It is the lowest level at which the entire analytical system gives a recognizable signal and acceptable calibration for the analyte. It is normally equivalent to the concentration of the lowest calibration standard adjusted for sample weights, volumes, preparation and cleanup procedures employed. The QL as reported by a laboratory is also sometimes referred to as the Method Reporting Limit (MRL) or Limit of Quantitation (LOQ).

iii. For compliance and characterization purposes, the maximum acceptable QL is stated in this permit.

e. **Implementation**

The Laboratory QLs (adjusted for any dilutions) for analyses performed to demonstrate compliance with permit limits or as part of effluent characterization, must be at or below the QLs specified in the permit unless one of the conditions below is met.

i. The monitoring result shows a detect above the laboratory reported QL.

ii. The monitoring result indicates non-detect at a DL which is less than the QL.

iii. Matrix effects are present that prevent the attainment of QLs and these matrix effects are demonstrated according to procedures described in EPA's "Solutions to Analytical Chemistry Problems with Clean Water Act Methods", March 2007. If using alternative methods and taking appropriate steps to eliminate matrix effects does not eliminate the matrix problems, DEQ may authorize in writing re-sampling or allow a higher QL to be reported. In the case of effluent characterization monitoring, DEQ may allow the re-sampling to be done as part of Tier 2 monitoring. Sections B.? and B.? contain more information on Tier 1 and Tier 2 monitoring.

f. **Quality Assurance and Quality Control**

i. Quality Assurance Plan – The permittee must develop and implement a written Quality Assurance Plan that details the facility sampling procedures, equipment calibration and maintenance, analytical methods, quality control activities and laboratory data handling and reporting. The QA/QC program must conform to the requirements of 40 CFR 136.7.

ii. If QA/QC requirements are not met for any analysis, the permittee must re-analyze the sample. If the sample cannot be re-analyzed, the permittee must re-sample and analyze at the earliest opportunity. If the permittee is unable to collect a sample that meets QA/QC requirements, then the permittee must include the result in the discharge monitoring report (DMR) along with a notation (data qualifier). In addition, the permittee must explain how the sample does not meet QA/QC requirements. The permittee may not use the result that failed the QA/QC requirements in any calculation required by the permit unless authorized in writing by DEQ.

iii. Flow measurement, field measurement, and continuous monitoring devices - The permittee must:

(A) Establish verification and calibration frequency for each device or instrument in the quality assurance plan that conforms to the frequencies recommended by the manufacturer.

(B) Verify at least once per year that flow-monitoring devices are functioning properly according to manufacturer's recommendation. Calibrate as needed according to manufacturer's recommendations.

(C) Verify at least weekly that the continuous monitoring instruments are functioning properly according to manufacturer's recommendation unless the permittee demonstrates a longer period is sufficient and such longer period is approved by DEQ in writing.

iv. The permittee must develop an receiving water sampling and analysis plan that incorporates QA/QC prior to sampling. This plan must be kept at the facility and made available to DEQ upon request.

g. **Reporting Sample Results**

i. The permittee must report the laboratory DL and QL as defined above for each analyte, with the following exceptions: pH, temperature, BOD, CBOD, TSS, Oil & Grease, hardness, alkalinity, bacteriological analytes and nitrate-nitrite. For temperature and pH, neither the QL nor the DL need to be reported. For the other parameters listed above, the permittee is only required to report the QL and only when the result is ND.

ii. The permittee must report the same number of significant digits as the permit limit for a given parameter.

iii. Chemical Abstracts Service (CAS) Numbers. CAS numbers (where available) must be reported along with monitoring results.

iv. (For Discharge Monitoring Reports) If a sample result is above the DL but below the QL, the permittee must report the result as the DL preceded by DEQ's data code "e". For example, if the DL is 1.0 µg/l, the QL is 3.0 µg/L and the result is estimated to be between the DL and QL, the permittee must report "e1.0 µg/L" on the DMR. This requirement does not apply in the case of parameters for which the DL does not have to be reported.

v. (For Discharge Monitoring Reports) If the sample result is below the DL, the permittee must report the result as less than the specified DL. For example, if the DL is 1.0 µg/L and the result is ND, report "<1.0" on the discharge monitoring report (DMR). This requirement does not apply in the case of parameters for which the DL does not have to be reported.

h. **Calculating and Reporting Mass Loads**

The permittee must calculate mass loads on each day the parameter is monitored using the following equation:

Flow (in MGD) X Concentration (in mg/L) X 8.34 = Pounds per day

i. Mass load limits all have two significant figures unless otherwise noted.

ii. When concentration data are below the DL: To calculate the mass load from this result, use the DL. Report the mass load as less than the calculated mass load. For example, if flow is 2 MGD and the reported sample result is <1.0 µg/L, report "<0.02 lb/day" for mass load on the DMR (1.0 µg/L x 2 MGD x conversion factor = 0.017 lb/day, round off to 0.02 lb/day).

iii. When concentration data are above the DL, but below the QL: To calculate the mass load from this result, use the detection level. Report the mass load as the calculated mass load preceded by "e". For example, if flow is 2 MGD and the reported sample result is e1.0 µg/L, report "e0.02 lb/day" for mass load on the DMR (1.0 µg/L x 2 MGD x conversion factor = 0.017 lb/day, round off to 0.02 lb/day).

3. Monitoring and Reporting Requirements

a. The permittee must monitor influent at the bar screen and report results in accordance with the table below:

Table B2: Influent Monitoring Requirements

Item or Parameter	**Units**	**Time Period**	**Minimum Frequency**	**Sample Type / Required Action** See note b.	**Report Statistic** See note a.
Flow (50050)	MGD	Year-round	Daily	Metered	Monthly Average Daily Maximum
BOD_5 (00310)	mg/L	Year-round	2/week	24-hour composite	Daily Maximum Monthly Average
TSS (00530)	mg/L	Year-round	2/week	24-hour composite	Daily Maximum Monthly Average
pH (00400)	SU	Year-round	3/week	Grab	Monthly Maximum Monthly Minimum

Notes:

a. When submitting DMRs electronically, all data used to determine summary statistics shall be submitted in a DEQ-approved format as an attachment via electronic reporting unless otherwise directed by DEQ.

b. In the event of equipment failure or loss, the permittee must notify DEQ and deploy new equipment to minimize interruption of data collection. If new equipment cannot be immediately deployed, the permittee must perform grab measurements until monitoring equipment is redeployed.

b. The permittee must monitor effluent at Outfall 001 at a location between the end of the active chlorine contact channel and prior to the outfall, and report results in accordance with Table B1 and the table below:

Table B3: Effluent Monitoring Requirements

Item or Parameter	**Units**	**Time Period**	**Minimum Frequency**	**Sample Type/ Required Action** See note b.	**Report Statistic** See note a.
Flow (50050)	MGD	Year-round	Daily	Metered	1. Monthly Average 2. Daily Maximum
BOD_5 (00310)	mg/L	Year-round	Daily	24-hour flow-based composite	1. Monthly Average 2. Weekly Average
BOD_5 (00310)	lbs/day	Year-round	Daily	Calculation	1. Daily Maximum 2. Monthly Average 3. Weekly Average 4. Semiannual Average
BOD_5 Percent Removal See note c. (81010)	%	Year-round	Monthly	Calculation based on monthly average BOD_5 concentration values	1. Monthly Average
TSS (00530)	mg/L	Year-round	2/week	24-hour flow-based composite	1. Monthly Average 2. Weekly Average
TSS (00530)	lbs/day	Year-round	2/week	Calculation	1. Daily Maximum 2. Monthly Average 3. Weekly Average
TSS Percent Removal (81011) See note c.	%	Year-round	Monthly	Calculation based on monthly average BOD_5 concentration values	1. Monthly Average

Item or Parameter	Units	Time Period	Minimum Frequency	Sample Type/ Required Action See note b.	Report Statistic See note a.
pH (00400)	SU	Year-round	3/week	Grab	1. Daily Maximum 2. Daily Minimum
Chlorine, Total Residual (50060)	mg/L	Year-round	Daily	Grab	1. Daily Maximum 2. Monthly Average
Temperature (00010)	°C	Year-round	Daily	Continuous	1. Daily Maximum 2. Monthly Average
Excess Thermal Load Limit	Million kcal/day	Year-round	Daily	Calculation (see note f, and also Table A1, notes e. and f.)	1. Daily Maximum
Excess Thermal Load (51405)	Million kcal/day	Year-round	Daily	Calculation (see notes e. and f.)	1. Daily Maximum
E. coli (51040)	#/100 mL	Year-round	2/week	Grab	1. Daily Maximum 2. Monthly Geometric Mean
Hardness (00900)	mg/L	Year-round	1/month	24-hour flow-based composite	1. Monthly Maximum
Chlorine Used (81400)	lbs/day	Year-round	Daily	Scale reading	1. Daily Maximum
Dissolved Oxygen (00300)	mg/L	Year-round	Quarterly	Grab	1. Quarterly Minimum
Total Kjeldahl Nitrogen (TKN) (00625)	mg/L	Third year of permit cycle 2023	Monthly	Grab	1. Monthly Maximum
Mercury, Total Recoverable Mercury (71901)	µg/L	Year-round	Quarterly during 2021 and 2025, then 1/month starting Jan. 2026	24-hour flow-based composite	1. Daily Maximum 2. Monthly Average
Total Nitrate as N (00620)	mg/L	Year-round	Monthly	Calculation	1. Daily Maximum 2. Monthly Average
Thallium, Total (01059)	µg/L	Year-round	Quarterly	24-hour flow-based composite	1. Quarterly Maximum
Bis (2-ethylhexyl) phthalate (31900)	µg/L	Year-round	Quarterly	24-hour flow-based composite	1. Quarterly Maximum
N-nitrosodi-n-propylamine (34428)	µg/L	Year-round	Quarterly	24-hour flow-based composite	1. Quarterly Maximum

Item or Parameter	Units	Time Period	Minimum Frequency	Sample Type/ Required Action See note b.	Report Statistic See note a.
Pentachlorophenol (39032)	µg/L	Year-round	Quarterly	24-hour flow-based composite	1. Quarterly Maximum
Total Nitrogen as N (51425)	lbs/day	Year-round	Daily	Calculation	1. Semiannual Average
Total Nitrogen as N (51425)	mg/L	Year-round	Daily	Grab	1. Daily Maximum 2. Monthly Average 3. Weekly Average 4. Semiannual Average
Total Ammonia as N (00610)	mg/L	Year-round	Monthly	24-hour flow-based composite	1. Daily Maximum 2. Monthly Average
Oil and Grease (00556)	mg/L	Third year of permit cycle 2024	Quarterly	Grab	1. Quarterly Maximum
Total Phosphorus as P (00665)	mg/L	Year-round	Daily	Grab	1. Daily Maximum 2. Monthly Average 3. Weekly Average 4. Semiannual Average
Total Phosphorus as P (00665)	lbs/day	Year-round	Daily	Calculation	1. Semiannual Average
Total Dissolved Solids (70295)	mg/L	Third year of permit cycle 2024	Quarterly	Grab	1. Quarterly Maximum

Item or Parameter	Units	Time Period	Minimum Frequency	Sample Type/ Required Action See note b.	Report Statistic See note a.

Notes:

a. When submitting DMRs electronically, all data used to determine summary statistics shall be submitted in a DEQ-approved format as an attachment via electronic reportingunless otherwise directed by DEQ.

b. In the event of equipment failure or loss, the permittee must notify DEQ and deploy new equipment to minimize interruption of data collection. If new equipment cannot be immediately deployed, the permittee must perform grab measurements. If the failure or loss is for continuous temperature monitoring equipment, the permittee must monitor grab measurements daily between 2 PM and 5 PM until continuous monitoring equipment is redeployed.

c. Percent Removal must be calculated on a monthly basis using the following formula:

$$Percent\ Removal = \frac{[Influent\ Concentration] - [Effluent\ Concentration]}{[Influent\ Concentration]} \times 100$$

Where:

Influent Concentration = Corresponding monthly average influent concentration based on the analytical results of the reporting period.

Effluent Concentration = Corresponding monthly average effluent concentration based on the analytical results of the reporting period.

d. First and last 4 quarters of the permit term. Total of 8 samples.

e. The daily excess thermal load (ETL) discharged must be calculated using the daily average effluent temperature and the corresponding daily average effluent flow using the formula below. If the calculation results in an ETL value less than zero, the results must be recorded as zero.

The daily ETL discharged is calculated as follows: $ETL = (T_E - T_R) * Q_E * 3.785$

Where:

ETL = Excess Thermal Load (million kcal/day) discharged

Q_E = Daily average effluent flow (MGD)

T_E = The daily average effluent temperature (degrees Celcius)

T_R = The applicable river temperature criterion (degrees Celcius), which is the daily average river temperature from the USGS Link River monitoring station (USGS 11507500).

f. The required calculation and reporting of the ETL limit and ETL begin on the scheduled completion date of the compliance schedule, February 1, 2026.

c. The permittee must monitor the Klamath River and report the results in accordance with Table B1 and the following table. The permittee must collect samples such that the effluent does not impact the samples (e.g., upstream for riverine discharges).

Table B4: Receiving Stream Monitoring (Klamath River)

Item or Parameter	Units	Time Period	Minimum Frequency	Sample Type / Required Action See note b.	Report Statistic See note a.
Flow, stream (00056), See note c.	cfs	Year-round	Daily	Calculated	Daily Average
pH (00400)	SU	Year-round	1/month	Grab	Monthly Maximum
Alkalinity as $CaCO_3$ (00410)	mg/L	Year-round	1/month	Grab	Monthly Maximum

Note:

a. When submitting DMRs electronically, all data used to determine summary statistics shall be submitted in a DEQ-approved format as an attachment via electronic reporting unless otherwise directed by DEQ.

b. In the event of equipment failure or loss, the permittee must notify DEQ and deploy new equipment to minimize interruption of data collection. If new equipment cannot be immediately deployed, the permittee must perform grab measurements.

c. Daily average river flow (Q_r) may be calculated using data from USGS station 11507500 plus or minus the daily average flow from or into the Lost River Diversion Channel calculated from discharge data available from the U.S. Bureau of Reclamation's gage on the Lost River Diversion Channel at Tingley (LRVO). With prior DEQ approval, river flow may be calculated using alternative flow data sources or methods as appropriate.

4. Copper Biotic Ligand Model and Aluminum Parameters

The permittee must monitor Klamath River and Outfall 001 for copper biotic ligand model and aluminum parameters per the table below. The permittee must collect upstream samples such that the effluent does not impact the samples (e.g., upstream for riverine discharges).

Table B5: Copper Biotic Ligand Model and Aluminum Sampling Requirements

Parameter See note b.	**Units**	**Sampling Frequency** See note c.	**Sampling Location** See note a.
Copper, Total and Dissolved See note e.	µg/L	1/month	Upstream and Effluent
Aluminum, Total See note d.	µg/L	1/month	Upstream and Effluent
Hardness (as $CaCO_3$)	mg/L	1/month	Upstream and Effluent
Dissolved Organic Carbon	mg/L	1/month	Upstream and Effluent
pH	S.U.	1/month	Upstream and Effluent
Temperature	°C	1/month	Upstream and Effluent
Calcium, dissolved	mg/L	1/month	Upstream and Effluent
Magnesium, dissolved	mg/L	1/month	Upstream and Effluent
Sodium, dissolved	mg/L	1/month	Upstream and Effluent
Potassium, dissolved	mg/L	1/month	Upstream and Effluent
Sulfate, dissolved	mg/L	1/month	Upstream and Effluent
Chloride, dissolved	mg/L	1/month	Upstream and Effluent
Alkalinity, dissolved	mg/L	1/month	Upstream and Effluent

Notes:

a. Samples must be collected upstream (outside the influence of the effluent) and from the effluent between 7:00 AM and 12:00 PM on the same day.

b. All effluent samples must be 24-hr composite samples except grab samples must be collected for pH, alkalinity and temperature. All receiving stream samples must be grab samples.

c. Samples must be collected as noted in Table B1

d. QL is 50.0 µg/L for aluminum

e. QL is 2.0 µg/L for copper

5. Effluent Toxics Monitoring

The permittee must collect and analyze effluent samples for the parameters listed in the tables below. The permittee must collect effluent samples at a location between the end of the active chlorine contact channel and prior to the outfall on the dates in Table B1.

Samples must be 24 hour composites, except as noted in the tables below for total cyanide, free cyanide and volatile organic compounds. Sample results must be submitted to DEQ using approved electronic format.

Table B6: Metals, Cyanide, and Hardness
(µg/L unless otherwise specified)

Pollutant See note a.	**CAS** See note b.	**QL**	**Pollutant** See note a.	**CAS** See note b.	**QL**
Antimony (total)	7440360	0.50	Mercury (total)	7439976	0.001
Arsenic (total)	7440382	0.50	Nickel (total and dissolved)	7440020	1.0
Arsenic (Total Inorganic)	7440382	1.0	Selenium (total and dissolved)	7782492	1.0
Arsenic (Total Inorganic Dissolved)	22541544	50	Silver (total and dissolved)	7440224	1.0
Beryllium (total)	7440417	0.10	Thallium (total)	7440280	0.10
Cadmium (total and dissolved)	7440439	0.10	Zinc (total and dissolved)	7440666	5.0
Chromium (total)	7440473	0.40	Cyanide (Free) See note c. & d.	57125	5.0
Chromium III (total and dissolved)	16065831	2.0	Cyanide (Total) See note d.	57125	5.0
Chromium VI (total and dissolved)	18540299	2.0	Hardness (Total as $CaCO_3$)		
Lead (total and dissolved)	7439921	1.0	Iron (Total)	7439896	100

Notes:

a. The term "total" used in reference to metals is intended to cover all EPA-accepted standard digestion methods and is considered to be equivalent to the term "total recoverable".

b. Chemical Abstract Service

c. There are multiple approved methods for testing for free cyanide. For more information, refer to DEQ's analytical memo on the subject of cyanide monitoring at https://www.oregon.gov/deq/FilterDocs/sToxicscyanide.pdf

d. When sampling for Cyanide (free and total), the permittee must collect at least six discrete grab samples over the operating day with samples collected no less than one hour apart. The aliquot must be at least 100 mL and collected and composited into a larger container that has been preserved with sodium hydroxide to insure sample integrity. If the result for Total Cyanide exceeds 5.0 µg/L, the permittee must monitor for Free Cyanide as part of the Tier 2 monitoring.

Table B7: Volatile Organic Compounds
(µg/L unless otherwise specified)

Pollutant See note a.	CAS	QL	Pollutant See note a.	CAS	QL
Acrolein (See note k).	107028	5.0	1,2-trans-dichloroethylene (See note d.)	156605	0.50
Acrylonitrile (See note k.)	107131	5.0	1,1-dichloroethylene (See note e.)	75354	0.50
Benzene	71432	0.50	1,2-dichloropropane	78875	0.50
Bromoform	75252	0.50	1,3-dichloropropylene (See note f.)	542756	0.50
Carbon Tetrachloride	56235	0.50	Ethylbenzene	100414	0.50
Chlorobenzene	108907	0.50	Methyl Bromide (See note g.)	74839	1.00
Chlorodibromomethane (See note b.)	124481	0.50	Methyl Chloride (See note h.)	74873	1.00
Chloroethane	75003	0.50	Methylene Chloride	75092	2.00
2-Chloroethylvinyl Ether (See note k.)	110758	10	1,1,2,2-tetrachloroethane	79345	0.50
Chloroform	67663	0.50	Tetrachloroethylene (See note i.)	127184	0.50
Dichlorobromomethane (See note c.)	75274	0.50	Toluene	108883	0.50
1,2-Dichlorobenzene (o)	95501	0.50	1,1,1-trichloroethane	71556	0.50
1,3-Dichlorobenzene (m)	541731	0.50	1,1,2-trichloroethane	79005	0.50
1,4-Dichlorobenzene (p)	106467	0.50	Trichloroethylene (See note j.)	79016	0.50
1,1-dichloroethane	75343	0.50	Vinyl Chloride	75014	0.50
1,2-dichloroethane	107062	0.50			

Notes:

a. The permittee must collect six discrete samples (not less than 40 mL) over the operating day at intervals of at least one hour. The samples may be analyzed separately or composited. If analyzed separately, the analytical results for all samples must be averaged for reporting purposes. If composited, they must be composited in the laboratory at the time of analysis in a manner that maintains the integrity of the samples and prevents the loss of volatile analytes. The quantitation limits listed above remain in effect for composite samples.

b. Chlorodibromomethane is identified as Dibromochloromethane in 40 CFR 136.3, Table 1C.

c. Dichlorobromomethane is identified as Bromodichloromethane in 40 CFR 136.3, Table 1C.

d. 1,2-Trans-dichloroethylene is identified as Trans-1,2-dichloroethene in 40 CFR 136.3, Table 1C.

e. 1,1-Dichloroethylene is identified as 1,1-Dichloroethene in 40 CFR 136.3, Table 1C.

f. 1,3-Dichloropropylene consists of both cis-1,3-Dichloropropene and Trans-1,3-dichloropropene. Both should be reported individually.

g. Methyl bromide is identified as Bromomethane in 40 CFR 136.3, Table 1C.

h. Methyl chloride is identified as Chloromethane in 40 CFR 136.3, Table 1C.

i. Tetrachloroethylene is identified as Tetrachloroethene in 40 CFR 136.3, Table 1C.

j. Trichloroethylene is identified as Trichloroethene in 40 CFR 136.3, Table 1C.

k. Acrolein, Acrylonitrile, and 2-Chloroethylvinyl ether must be tested from an unacidified sample.

Table B8: Acid-Extractable Compounds
(μg/L unless otherwise specified)

Pollutant	CAS	QL See note a.	Pollutant	CAS	QL See note a.
p-chloro-m-cresol See note b.	59507	1.0	2-nitrophenol	88755	2.0
2-chlorophenol	95578	1.0	4-nitrophenol	100027	5.0
2,4-dichlorophenol	120832	1.0	Pentachlorophenol	87865	1.0
2,4-dimethylphenol	105679	5.0	Phenol	108952	1.0
4,6-dinitro-o-cresol See note c.	534521	2.0	2,4,5-trichlorophenol See note d.	95954	2.0
2,4-dinitrophenol	51285	5.0	2,4,6-trichlorophenol	88062	1.0

Notes:

a. Some QLs may need methods with modification allowed in 40 CFR 136.6 or EPA's Solutions for Analytical Chemistry Problems with Clean Water Methods, March 2007.
b. p-chloro-m-cresol is identified as 4-Chloro-3-methylphenol in 40 CFR 136.3, Table 1C.
c. 4,6-dinitro-o-cresol is identified as 2-Methyl-4,6-dinitrophenol in 40 CFR 136.3, Table 1C.
d. To monitor for 2,4,5-trichlorophenol, use EPA Method 625.

Table B9: Base-Neutral Compounds
(μg/L unless otherwise specified)

Pollutant	CAS	QL See note a.	Pollutant	CAS	QL See note a.
Acenaphthene	83329	1.0	Dimethyl phthalate	131113	1.0
Acenaphthylene	208968	1.0	2,4-dinitrotoluene	121142	1.0
Anthracene	120127	1.0	2,6-dinitrotoluene	606202	1.0
Benzidine	92875	50.0	1,2-diphenylhydrazine See note d.	122667	5.0
Benzo(a)anthracene	56553	0.5	Fluoranthene	206440	2.0
Benzo(a)pyrene	50328	0.5	Fluorene	86737	1.0
3,4-benzofluoranthene See note b.	205992	0.5	Hexachlorobenzene	118741	1.0
Benzo(ghi)perylene	191242	1.0	Hexachlorobutadiene	87683	2.0
Benzo(k)fluoranthene	207089	0.5	Hexachlorocyclopentadiene	77474	2.0
Bis(2-chloroethoxy)methane	111911	2.0	Hexachloroethane	67721	1.0
Bis(2-chloroethyl)ether	111444	1.0	Indeno(1,2,3-cd)pyrene	193395	0.5
Bis(2-chloroisopropyl)ether See note c.	108601	2.0	Isophorone	78591	5.0
Bis (2-ethylhexyl)phthalate	117817	1.0	Napthalene	91203	1.0
4-bromophenyl phenyl ether	101553	1.0	Nitrobenzene	98953	1.0
Butylbenzyl phthalate	85687	1.0	N-nitrosodi-n-propylamine	621647	2.0

Pollutant	CAS	QL See note a.	Pollutant	CAS	QL See note a.
2-chloronaphthalene	91587	1.0	N-nitrosodimethylamine	62759	2.0
4-chlorophenyl phenyl ether	7005723	1.0	N-nitrosodiphenylamine	86306	1.0
Chrysene	218019	0.5	Pentachlorobenzene See note e.	608935	1.0
Di-n-butyl phthalate	84742	1.0	Phenanthrene	85018	1.0
Di-n-octyl phthalate	117840	1.0	Pyrene	129000	1.0
Dibenzo(a,h)anthracene	53703	0.5	1,2,4-trichlorobenzene	120821	1.0
3,3-Dichlorobenzidine	91941	2.0	Tetrachlorobenzene,1,2,4,5 See note e.	95943	1.0
Diethyl phthalate	84662	1.0			

Notes:

a. Some QLs may need methods with modification allowed in 40 CFR 136.6 or EPA's *Solutions for Analytical chemistry Problems w/Clean Water Methods, March 2007.*

b. 3,4-benzofluoranthene is listed as Benzo(b)fluoranthene in 40 CFR part 136.

c. Bis(2-chloroisopropyl)ether is listed as 2,2'-oxybis(2-chloro-propane) in 40 CFR part 136.

d. 1,2-diphenylhydrazine is difficult to analyze given its rapid decomposition rate in water. Azobenzene (a decomposition product of 1,2-diphenylhydrazine), should be analyzed as an estimate of this chemical.

e. To analyze for Pentachlorobenzene and Tetrachlorobenzene 1,2,4,5, use EPA 625.

6. Ambient and Additional Effluent Characterization Monitoring (Tier 2 Monitoring)

DEQ will evaluate the results of monitoring required under Schedule B condition 3: Effluent Toxics Characterization Monitoring (also referred to as Tier 1 monitoring) to determine whether the permittee will be required to conduct additional ambient water quality and/or effluent monitoring (also referred to as Tier 2 monitoring). DEQ will notify the permittee of its determination through a written "Monitoring Action Letter." The sampling plan must include the following:

a. Characterization of ambient water quality for any pollutants identified as having the reasonable potential to exceed the water quality criterion at Outfall 001.

b. Additional effluent monitoring (six additional samples each) for any pollutants identified by Tier 1 characterization monitoring results as having reasonable potential to exceed the water quality criteria at the point of discharge.

c. Completion of Schedule B sampling requirements that could not be completed due to analytical interferences.

d. Characterization of effluent and ambient water quality for new pollutant parameter(s) adopted by the EQC after permit issuance.

e. Characterization of effluent and ambient water quality, if necessary, when the receiving stream is listed as impaired on the DEQ 303(d) list for new parameter(s).

f. Sampling locations for receiving water must be located at the raw water intake for the South Suburban Sanitary District Municipal water system.

g. Timing of sampling must coincide with the critical period which is: November 1 through April 30.

7. Whole Effluent Toxicity (WET) Requirements

The permittee must monitor final effluent for whole effluent toxicity as described in the table below using the testing protocols specified in Schedule D, Whole Effluent Toxicity Testing for Freshwater for Outfall 001 must be collected at the location specified below.

Table B10: WET Test Monitoring

Parameter	Sample Type/Location	Minimum Frequency	Report
Acute toxicity	For acute toxicity: Grab, collected after dechlorination at Outfall 001.	See Table B1	Report must include test results and backup information such as bench sheets sufficient to demonstrate compliance with permit requirements. Report must include a statement certifying that the results do or do not show toxicity.
Chronic toxicity	For chronic toxicity: 24-hr composite, collected after dechlorination at Outfall 001.		

8. Recycled Water Monitoring Requirements: Outfall 002

The permittee must monitor recycled water for Outfall 002 as listed below. The samples must be representative of the recycled water delivered for beneficial reuse at a location identified in the Recycled Water Use Plan.

Table B11: Recycled Water Monitoring

Item or Parameter	Time Period	Minimum Frequency	Sample Type/ Required Action	Report
Total Flow (MGD)	During use of recycled water	Daily	Measurement	Monthly
Quantity Irrigated (inches/acre)	During use of recycled water	Daily	Measurement	Monthly
Chlorine, Total Residual (mg/L)	During use of recycled water	Daily	Grab	Monthly
pH	During use of recycled water	2/Week	Grab	Monthly
E. coli	During use of recycled water	Weekly	Grab	Monthly
Nitrogen Loading Rate (lbs/acre-year)	During use of recycled water	Annually	Calculation	Monthly
Nutrients (TKN, NO2+NO3-N, Total Ammonia (as N), Total Phosphorus)	During use of recycled water	Quarterly	Grab	Quartertly

SCHEDULE C: COMPLIANCE SCHEDULE

1. Compliance Schedule to Meet Final Effluent Limitations

The permittee must comply with the following schedule to meet the final effluent limits contained in Schedule A, Table A1 for Total Ammonia as N, Total Residual Chlorine, Total Nitrogen as N, Total Phosphorus as P, Total Mercury, Excess Thermal Load and BOD_5:

Complete By	Requirement
February 1, 2021	The permittee must submit to DEQ for review and approval: 1. An evaluation of the existing chlorination system and the ability to better control dosing to meet the interim and final Total Residual Chlorine permit limits, and 2. A plan and schedule for implementing chlorination system upgrades.
August 1, 2021	The permittee must submit a Wastewater Facilities Plan to DEQ for review and approval that includes the improvements to either meet the limits or ceasing the discharge to the Klamath River
April 1, 2022	The permittee must submit a Preliminary Design Report for either meeting the limits or ceasing discharge and removing the outfall to DEQ for review and approval.
December 1, 2022	The permittee must secure financing for improvements to either meet the limits or cease discharge and removing the outfall.
December 1, 2023	The permittee must submit final design plans that address all of DEQ's previous comments for either meeting the limits or ceasing discharge to DEQ for approval.
February 1, 2025	The permittee must submit a status report to DEQ outlining the progress made toward completion of the improvements.
Annually by January 15th, until completion of this compliance schedule.	The permittee must submit a status report to DEQ outlining the progress made toward completion of the improvements.
February 1, 2026	The permittee will complete all improvements and achieve compliance with all of the final effluent limits in Schedule A of the permit (by either meeting the limits or ceasing discharge to the Klamath River).

2. Responsibility to Meet Compliance Dates

No later than 14 days following each compliance date listed in the table above, the permittee must notify DEQ in writing of its compliance or noncompliance with the requirements. Any reports of noncompliance must include the cause of noncompliance, any remedial actions taken, and a discussion of the likelihood of meeting the next scheduled requirement(s).

3. Re-opener Clause

This permit may be re-opened and modified to be consistent with conditions or mitigation measures imposed as a result of EPA's Endangered Species Act consultation with the National Marine Fisheries Service (NMFS) and the US Fish & Wildlife Service (USF&WS) on DEQ's rule authorizing the use of this compliance schedule. If necessary, DEQ will commence modification of this permit by notifying the permittee and seeking public comment on the proposed modifications within two years after the later of (1) the date EPA's re-approval of Oregon's compliance schedules rule becomes final, or (2) the date DEQ completes any required implementation of EPA re-approval, unless the date for completion of implementation exceeds two years from the date of EPA's action, in which case the modifications must commence within a period of four years from the date of EPA's re-approval.

SCHEDULE D: SPECIAL CONDITIONS

1. Inflow Removal

a. By the date listed in Table B1, the permittee must submit to DEQ for approval an Inflow Removal Program. The program must consist of the following:

   i. Identification of all overflow points.

   ii. Verification that sewer system overflows are not occurring up to a 24-hour, 5-year storm event or equivalent.

   iii. Monitoring of all pump station overflow points.

   iv. A process for identifying and removing all inflow sources into the permittee's sewer system over which the permittee has legal control, including a time schedule for identifying and reducing inflow.

   v. If the permittee does not have the necessary legal authority for all portions of the sewer system or treatment facility, a strategy and schedule for gaining legal authority to require inflow reduction and a process and schedule for identifying and removing inflow sources once legal authority has been obtained.

b. Within 60 days of receiving written DEQ comments, the permittee must submit a final approvable program and time schedule.

c. A copy of the program must be kept at the wastewater treatment facility for review upon request by DEQ.

d. An annual inflow and infiltration report must be submitted to the DEQ as directed in Schedule B. The report must include the following:

   i. Details of activities performed in the previous year to identify and reduce inflow and infiltration.

   ii. Details of activities planned for the following year to identify and reduce inflow and infiltration.

   iii. A summary of sanitary sewer overflows that occurred during the previous year.

   iv. Information that demonstrates compliance with the DEQ-approved Inflow Removal Plan required by condition 1.a above.

2. Emergency Response and Public Notification Plan

The permittee must develop an Emergency Response and Public Notification Plan ("plan"), or ensure the facility's existing plan is current and accurate, per Schedule F, Section B, and Condition 8 within 6 months of permit effective date. The permittee must update the plan annually to ensure all information contained in the plan, including telephone and email contact information for applicable public agencies, is current and accurate. An updated copy of the plan must be kept on file at the facility for DEQ review. The latest plan revision date must be listed on the plan cover along with the reviewer's initials or signature.

3. Recycled Water Use Plan

In order to distribute recycled water, the permittee must develop and maintain a DEQ-approved Recycled Water Use Plan meeting the requirements in OAR 340-055-0025. The permittee must submit this plan or any significant modifications to DEQ for review and approval with sufficient time to clear DEQ review and a public notice period prior to distribution of recycled water. The permittee is prohibited from distributing recycled water prior to receipt of written approval of its Recycled Water Use Plan from DEQ. The permittee must keep the plan updated. All plan revisions require written authorization from DEQ and are effective upon permittee's receipt of DEQ written approval. No significant modifications can be made to a plan for an administratively extended permit (after the permit expiration date). Conditions in the plan are enforceable requirements under this permit. DEQ will provide an opportunity for public review and comment on any significant plan modifications prior to approving or denying. Public review is not required for minor modifications, changes to utilization dates or changes in use within the recycled water class.

After the plan is approved by DEQ, the permittee must maintain the Recycled Water Use Plan meeting the requirements in OAR 340-055-0025. The permittee must submit this plan or any significant modifications to DEQ for review and approval with sufficient time to clear DEQ review and a public notice period prior to implementing changes to the recycled water program. The permittee must keep the plan updated. All plan revisions require written authorization from DEQand are effective upon permittee's receipt of DEQ written approval. No significant modifications can be made to a plan for an administratively extended permit (after the permit expiration date). Conditions in the plan are enforceable requirements under this permit. DEQ will provide an opportunity for public review and comment on any significant plan modifications prior to approving or denying. Public review is not required for minor modifications, changes to utilization dates or changes in use within the recycled water class.

a. Recycled Water Annual Report – The permittee must submit a recycled water annual report by the date specified in Table B1: Reporting Requirements and Due Dates. The permittee must use the DEQ-approved recycled water annual report form. This report must include the monitoring data and analytical laboratory reports for the previous year's monitoring required under Schedule B.

4. Exempt Wastewater Reuse at the Treatment System

Recycled water used for landscape irrigation within the property boundary or in-plant processes at the wastewater treatment system is exempt from the requirements of OAR 340-055 if all of the following conditions are met:

a. The recycled water is an oxidized and disinfected wastewater.

b. The recycled water is used at the wastewater treatment system site where it is generated or at an auxiliary wastewater or sludge treatment facility that is subject to the same NPDES or WPCF permit as the wastewater treatment system. Land that is contiguous to the property upon which the treatment system is located is considered to be part of the wastewater treatment system site if under the same ownership.

c. Spray and/or drift from the use does not migrate off the site.

d. Public access to the site is restricted.

5. Wastewater Solids Annual Report

The permittee must submit a Wastewater Solids Annual Report by February 19 each year documenting removal of wastewater solids from the facility during the previous calendar year. The permittee must use the DEQ-approved wastewater solids annual report form. This report must include the volume of material removed and the name of the permitted facility that received the solids.

6. Biosolids Management Plan

Prior to distributing biosolids to the public, the permittee must develop and maintain a Biosolids Management Plan and Land Application Plan meeting the requirements in OAR 340-050-0031. The permittee must submit these plans and any significant modification of these plans to DEQ for review and approval with sufficient time to clear DEQ review and a public notice period prior to removing biosolids from the facility. The permittee must keep the plans updated. All plan revisions require written authorization from DEQ and are effective upon permittee's receipt of DEQ written approval. No significant modifications can be made to a plan for an administratively extended permit (after the permit expiration date). Conditions in the plans are enforceable requirements under this permit.

7. Wastewater Solids Transfers

a. *Within state.* The permittee may transfer wastewater solids including Class A and Class B biosolids, to another facility permitted to process or dispose of wastewater solids, including but not limited to: another wastewater treatment facility, landfill, or incinerator. The permittee must satisfy the requirements of the receiving facility. The permittee must report the name of the receiving facility and the quantity of material transferred in the wastewater solids annual report identified in Schedule B.

b. *Out of state.* If wastewater solids, including Class A and Class B biosolids, are transferred out of state for use or disposal, the permittee must obtain written authorization from DEQ, meet Oregon requirements for the use or disposal of wastewater solids, notify in writing the receiving state of the proposed use or disposal of wastewater solids, and satisfy the requirements of the receiving state.

8. Hauled Waste Control Plan

The permittee may accept hauled wastes at discharge points designated by the POTW. The permittee must submit a written Hauled Waste Control Plan by the date listed in Table B1. Within 60 days of receiving DEQ comments, the permittee must submit hauled waste control plan revised to be consistent with DEQ's comments. Hauled wastes may include wastewater solids from another wastewater treatment facility, septage, grease trap wastes, portable and chemical toilet wastes, landfill leachate, groundwater remediation wastewaters and commercial/industrial wastewaters. The permittee must keep the plan updated and submit substantial modifications to an existing plan to DEQ for approval at least 60 days prior to making the proposed changes. Plan modifications are effective upon receipt of written DEQ approval.

9. Hauled Waste Annual Report

By the date listed in Table B1, the permittee must submit a report of hauled waste received by the POTW. This report must include the date, time, type, and amount received each time the POTW accepts hauled waste. Hauled waste is described in the permittee's Hauled Waste Control Plan.

10. Lagoon Solids

By the date listed in Table B1, the permittee must submit to DEQ a sludge depth survey report. The report must include a comparison of the design sludge depth to the actual sludge depth. If the actual sludge depth exceeds the design sludge depth, the permittee must submit a plan to reduce or remove the sludge. Prior to the removal of accumulated solids from the lagoon, the permittee must submit to DEQ a biosolids management plan as required in conditions 6 and 7 respectively. The permittee must follow the conditions in the approved plan.

11. Whole Effluent Toxicity Testing for Freshwater

a. The permittee must conduct whole effluent toxicity (WET) tests as specified here and in Schedule B of this permit.

b. Acute Toxicity Testing - Organisms and Protocols

   i. The permittee must conduct 48-hour static renewal tests with *Ceriodaphnia dubia* (water flea) and 96-hour static renewal tests with *Pimephales promelas* (fathead minnow).

   ii. All test methods and procedures must be in accordance with *Methods for Measuring the Acute Toxicity of Effluents and Receiving Waters to Freshwater and Marine Organisms, Fifth Edition, EPA-821-R-02-012, October 2002*, or the most recent version of this publication if such edition is available. If the permittee wants to deviate from the bioassay procedures outlined in this method, the permittee must submit a written request to DEQ for review and approval prior to use.

   iii. Treatments to the final effluent samples (for example, dechlorination, ammonia removal), except those included as part of the methodology, may not be performed by the laboratory unless approved by DEQ in writing prior to analysis.

   iv. WET acute testing must be conducted using a dilution series based upon the effluent percentage at the ZID (EPZID) in the following manner: 100%; 50%; 25%; 12.5%, 6.25%;and a control (0% effluent).

   v. An acute WET test shows toxicity if there is a statistically significant difference in survival between the control and 100% effluent reported as the NOEC < 100% effluent.

c. Chronic Toxicity Testing - Organisms and Protocols

   i. The permittee must conduct tests with *Ceriodaphnia dubia* (water flea) for reproduction and survival test endpoint, *Pimephales promelas* (fathead minnow) for growth and survival test endpoint, and *Raphidocelis subcapitata* (green alga formerly known as *Selanastrum capricornutum*) for growth test endpoint.

   ii. All test methods and procedures must be in accordance with *Short-Term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Freshwater Organisms, Fourth Edition, EPA-821-R-02-013, October 2002*, or the most recent version of that document. If the permittee wants to deviate from the bioassay procedures outlined in the applicable method, the permittee must submit a written request to DEQ for review and approval prior to use.

   iii. Treatments to the final effluent samples (for example, dechlorination, ammonia removal), except those included as part of the methodology, may not be performed by the laboratory unless approved by DEQ in writing prior to analysis.

iv. WET chronic testing must be conducted using a dilution series based upon the effluent in the following manner: 100% effluent; 55%; 10%; 5%; 2.5% and a control (0% effluent).

v. A chronic WET test shows toxicity if the IC25 (25% inhibition concentration) occurs at dilutions equal to or less than the dilution that is known to occur at the edge of the mixing zone, that is, IC25 ≤ 100%.

d. Dual End-Point Tests

i. WET tests may be dual end-point tests in which both acute and chronic end-points can be determined from the results of a single chronic test. The acute end-point will be based on 48-hours for the *Ceriodaphnia dubia* (water flea) and 96-hours for the *Pimephales promelas* (fathead minnow).

ii. All test methods and procedures must be in accordance with *Short-Term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Freshwater Organisms, Fourth Edition, EPA-821-R-02-013, October 2002*. If the permittee wants to deviate from the bioassay procedures outlined in this method, the permittee must submit a written request to DEQ for review and approval prior to use.

iii. Tests run as dual end-point tests must be conducted on a control (0%) and the following dilution series: 6.25%, 12.5%, 25%, 50%, and 100% effluent.

iv. Toxicity determinations for dual end-point tests must correspond to the acute and chronic tests described in conditions 12.b.v and 12.c.v above.

e. Sampling Requirements

At the time of WET sampling, the permittee must collect and analyze effluent samples for Total Recoverable Silver, Free Cyanide, and Total Ammonia.

f. Evaluation of Causes and Exceedances

i. If any test exhibits toxicity as described in conditions 12.b.v. and 12.c.v. above, the permittee must conduct another toxicity test using the same species and DEQ-approved methodology within two weeks unless an extension is granted by DEQ in writing.

ii. If two consecutive WET test results indicate acute or chronic toxicity as described in conditions 12.b.v. and 12.c.v. above, the permittee must immediately notify DEQ of the results. DEQ will work with the permittee to determine the appropriate course of action to evaluate and address the toxicity.

g. Quality Assurance and Reporting

i. Quality assurance criteria, statistical analyses, and data reporting for the WET tests must be in accordance with the EPA documents stated in this condition.

ii. For each test, the permittee must provide a bioassay laboratory report according to the EPA method documents referenced in this Schedule. The report must include all QA/QC documentation, statistical analysis for each test performed, standard reference toxicant test (SRT) conducted on each species required for the toxicity tests, and completed Chain of Custody forms for the samples including time of sample collection and receipt. The permittee must submit reports to DEQ within 60 days of test completion.

iii. The report must include all endpoints measured in the test: NOEC (No Observed Effects Concentration), LOEC (Lowest Observed Effects Concentration), and IC_{25} (chronic effect 25% inhibition concentration).

iv. The permittee must make available to DEQ upon request the written standard operating procedures they, or the laboratory performing the WET tests, use for all toxicity tests required by DEQ.

h. Reopener

DEQ may reopen and modify this permit to include new limits, monitoring requirements, and/or conditions as determined by DEQ to be appropriate, and in accordance with procedures outlined in OAR Chapter 340, Division 45 if:

i. WET testing data indicate acute and/or chronic toxicity.

ii. The facility undergoes any process changes.

iii. Discharge monitoring data indicate a change in the reasonable potential to cause or contribute to an exceedance of a water quality standard.

i. Circumstances not addressed in this section, or that require deviation from the requirements of this section, must be approved in writing by DEQ before changes are implemented.

12. Operator Certification

a. Definitions

i. “Supervise” means to have full and active responsibility for the daily on site technical operation of a wastewater treatment system or wastewater collection system.

ii. “Supervisor” or “designated operator”, means the operator delegated authority by the permittee for establishing and executing the specific practice and procedures for operating the wastewater treatment system or wastewater collection system in accordance with the policies of the owner of the system and any permit requirements.

iii. “Shift Supervisor” means the operator delegated authority by the permittee for executing the specific practice and procedures for operating the wastewater treatment system or wastewater collection system when the system is operated on more than one daily shift.

iv. “System” includes both the collection system and the treatment systems.

b. The permittee must comply with OAR Chapter 340, Division 49, “Regulations Pertaining to Certification of Wastewater System Operator Personnel" and designate a supervisor whose certification corresponds with the classification of the collection and/or treatment system as specified on the Wastewater System Classification Worksheet in the fact sheet for this permit (including renewals and modifications). DEQ may revise the permittee’s classification in writing at any time to reflect changes in the collection or treatment system. This reclassification is not considered a permit modification and may be made after the permit expiration date provided the permit has been administratively extended by DEQ. If a facility is re-classified, a certified letter will be mailed to the system owner from the DEQ Operator Certification

Program. Current system classifications are publicized on the DEQ Supervisory Wastewater Operator Status Report found on the **DEQ Wastewater Operator Certification Homepage.**

c. The permittee must have its system supervised full-time by one or more operators who hold a valid certificate for the type of wastewater treatment or wastewater collection system, and at a grade equal to or greater than the wastewater system's classification.

d. The permittee's wastewater system may be without the designated supervisor for up to 30 consecutive days if another person who is certified at no more than one grade lower than the classification of the wastewater system supervises. The permittee must delegate authority to this operator to supervise the operation of the system.

e. If the wastewater system has more than one daily shift, the permittee must have another properly certified operator available to supervise operation of the system. Each shift supervisor must be certified at no more than one grade lower than the system classification.

f. The permittee is not required to have a supervisor on site at all times; however, the supervisor must be available to the permittee and operator at all times.

g. The permittee must notify DEQ in writing of the name of the system supervisor by completing and submitting the Supervisory Wastewater System Operator Designation Form along with the Delegated Authority form. The most recent version of this form may be found on the **DEQ Wastewater Operator Certification homepage** *NOTE: This form is different from the Delegated Authority form. The permittee may replace or re-designate the system supervisor with another properly certified operator at any time and must notify DEQ in writing within 30 days of replacement or re-designation of the operator in charge. As of this writing, the notice of replacement or re-designation must be sent to Water Quality Division, Operator Certification Program, 700 NE Multnomah St, Suite 600, Portland, OR 97232-4100. This address may be updated in writing by DEQ during the term of this permit.

h. When compliance with item (e) of this section is not possible or practicable because the system supervisor is not available or the position is vacated unexpectedly, and another certified operator is not qualified to assume supervisory responsibility, the Director may grant a time extension for compliance with the requirements in response to a written request from the system owner. The Director will not grant an extension longer than 120 days unless the system owner documents the existence of extraordinary circumstances.

13. Industrial User Survey

a. By the date listed in Table B1, the permittee must conduct an industrial user survey as described in 40CFR 403.8(f)(2)(i-iii) to determine the presence of any industrial users discharging wastewaters subject to pretreatment and submit a report on the findings to DEQ. The purpose of the survey is to identify whether there are any industrial users discharging to the POTW, and ensure regulatory oversight of these discharges to state waters.

b. Should the DEQ determine that a pretreatment program is required, the permit must be reopened and modified in accordance with 40 CFR 403.8(e)(1) to incorporate a compliance schedule for development of a pretreatment program. The compliance schedule must be developed in accordance with the provisions of 40 CFR 403.12(k), and must not exceed twelve (12) months.

14. Outfall Inspection

By the date in Table B1, the permittee must visually inspect Outfall 001 to document its integrity and to determine whether it is functioning as designed. The inspection must verify the latitude and longitude of the diffuser. The permittee must submit a written report to DEQ regarding the results of the outfall inspection by the date in Table B1. The report must include a description of the outfall as originally constructed, photographs of the outfall, and the condition of the current outfall and identify any repairs needed to return the outfall to satisfactory condition.

SCHEDULE E: PRETREATMENT ACTIVITIES

There are no pretreatment requirements included in this permit.

SCHEDULE F: NPDES GENERAL CONDITIONS

October 1, 2015 Version

SECTION A. STANDARD CONDITIONS

A1. Duty to Comply with Permit

The permittee must comply with all conditions of this permit. Failure to comply with any permit condition is a violation of Oregon Revised Statutes (ORS) 468B.025 and the federal Clean Water Act and is grounds for an enforcement action. Failure to comply is also grounds for DEQ to terminate, modify and reissue, revoke, or deny renewal of a permit.

A2. Penalties for Water Pollution and Permit Condition Violations

The permit is enforceable by DEQ or EPA, and in some circumstances also by third-parties under the citizen suit provisions of 33 USC § 1365. DEQ enforcement is generally based on provisions of state statutes and Environmental Quality Commission (EQC) rules, and EPA enforcement is generally based on provisions of federal statutes and EPA regulations.

ORS 468.140 allows DEQ to impose civil penalties up to $25,000 per day for violation of a term, condition, or requirement of a permit.

Under ORS 468.943, unlawful water pollution in the second degree, is a Class A misdemeanor and is punishable by a fine of up to $25,000, imprisonment for not more than one year, or both. Each day on which a violation occurs or continues is a separately punishable offense.

Under ORS 468.946, unlawful water pollution in the first degree is a Class B felony and is punishable by a fine of up to $250,000, imprisonment for not more than 10 years, or both.

The Clean Water Act provides that any person who violates permit condition, or any requirement imposed in a pretreatment program approved under sections 402(a)(3) or 402(b)(8) of the Act, is subject to a civil penalty not to exceed $25,000 per day for each violation.

The Clean Water Act provides that any person who negligently violates any condition, or any requirement imposed in a pretreatment program approved under section 402(a)(3) or 402(b)(8) of the Act, is subject to criminal penalties of $2,500 to $25,000 per day of violation, or imprisonment of not more than 1 year, or both.

In the case of a second or subsequent conviction for a negligent violation, a person shall be subject to criminal penalties of not more than $50,000 per day of violation, or by imprisonment of not more than 2 years, or both.

Any person who knowingly violates such sections, or such conditions or limitations is subject to criminal penalties of $5,000 to $50,000 per day of violation, or imprisonment for not more than 3 years, or both.

In the case of a second or subsequent conviction for a knowing violation, a person shall be subject to criminal penalties of not more than $100,000 per day of violation, or imprisonment of not more than 6 years, or both.

Any person who knowingly violates section any permit condition, and who knows at that time that he thereby places another person in imminent danger of death or serious bodily injury, shall, upon conviction, be subject to a fine of not more than $250,000 or imprisonment of not more than 15 years, or both.

In the case of a second or subsequent conviction for a knowing endangerment violation, a person shall be subject to a fine of not more than $500,000 or by imprisonment of not more than 30 years, or both.

An organization, as defined in section 309(c)(3)(B)(iii) of the CWA, shall, upon conviction of violating the imminent danger provision, be subject to a fine of not more than $1,000,000 and can be fined up to $2,000,000 for second or subsequent convictions.

Any person may be assessed an administrative penalty by the Administrator for violating any permit condition or limitation implementing any of such sections in a permit issued under section 402 of this Act.

Administrative penalties for Class I violations are not to exceed $10,000 per violation, with the maximum amount of any Class I penalty assessed not to exceed $25,000.

Penalties for Class II violations are not to exceed $10,000 per day for each day during which the violation continues, with the maximum amount of any Class II penalty not to exceed $125,000.

A3. Duty to Mitigate

The permittee must take all reasonable steps to minimize or prevent any discharge or sludge use or disposal in violation of this permit. In addition, upon request of DEQ, the permittee must correct any adverse impact on the environment or human health resulting from noncompliance with this permit, including such accelerated or additional monitoring as necessary to determine the nature and impact of the noncomplying discharge.

A4. Duty to Reapply

If the permittee wishes to continue an activity regulated by this permit after the expiration date of this permit, the permittee must apply for and have the permit renewed. The application must be submitted at least 180 days before the expiration date of this permit.

DEQ may grant permission to submit an application less than 180 days in advance but no later than the permit expiration date.

A5. Permit Actions

This permit may be modified, revoked and reissued, or terminated for cause including, but not limited to, the following:

a. Violation of any term, condition, or requirement of this permit, a rule, or a statute.
b. Obtaining this permit by misrepresentation or failure to disclose fully all material facts.
c. A change in any condition that requires either a temporary or permanent reduction or elimination of the authorized discharge.
d. The permittee is identified as a Designated Management Agency or allocated a wasteload under a total maximum daily load (TMDL).
e. New information or regulations.
f. Modification of compliance schedules.
g. Requirements of permit reopener conditions
h. Correction of technical mistakes made in determining permit conditions.
i. Determination that the permitted activity endangers human health or the environment.
j. Other causes as specified in 40 CFR §§ 122.62, 122.64, and 124.5.
k. For communities with combined sewer overflows (CSOs):

(1) To comply with any state or federal law regulation for CSOs that is adopted or promulgated subsequent to the effective date of this permit.

(2) If new information that was not available at the time of permit issuance indicates that CSO controls imposed under this permit have failed to ensure attainment of water quality standards, including protection of designated uses.

(3) Resulting from implementation of the permittee's long-term control plan and/or permit conditions related to CSOs.

The filing of a request by the permittee for a permit modification, revocation or reissuance, termination, or a notification of planned changes or anticipated noncompliance does not stay any permit condition.

A6. Toxic Pollutants

The permittee must comply with any applicable effluent standards or prohibitions established under Oregon Administrative Rule (OAR) 340-041-0033 and section 307(a) of the federal Clean Water Act for toxic pollutants, and with standards for sewage sludge use or disposal established under section 405(d) of the federal Clean Water Act, within the time provided in the regulations that establish those standards or prohibitions, even if the permit has not yet been modified to incorporate the requirement.

A7. Property Rights and Other Legal Requirements

The issuance of this permit does not convey any property rights of any sort, or any exclusive privilege, or authorize any injury to persons or property or invasion of any other private rights, or any infringement of federal, tribal, state, or local laws or regulations.

A8. Permit References

Except for effluent standards or prohibitions established under section 307(a) of the federal Clean Water Act and OAR 340-041-0033 for toxic pollutants, and standards for sewage sludge use or disposal established under section 405(d) of the federal Clean Water Act, all rules and statutes referred to in this permit are those in effect on the date this permit is issued.

A9. Permit Fees

The permittee must pay the fees required by OAR.

SECTION B. OPERATION AND MAINTENANCE OF POLLUTION CONTROLS

B1. Proper Operation and Maintenance

The permittee must at all times properly operate and maintain all facilities and systems of treatment and control (and related appurtenances) that are installed or used by the permittee to achieve compliance with the conditions of this permit. Proper operation and maintenance also includes adequate laboratory controls and appropriate quality assurance procedures. This provision requires the operation of back-up or auxiliary facilities or similar systems that are installed by a permittee only when the operation is necessary to achieve compliance with the conditions of the permit.

B2. Need to Halt or Reduce Activity Not a Defense

For industrial or commercial facilities, upon reduction, loss, or failure of the treatment facility, the permittee must, to the extent necessary to maintain compliance with its permit, control production or all discharges or both until the facility is restored or an alternative method of treatment is provided. This requirement applies, for example, when the primary source of power of the treatment facility fails or is reduced or lost. It is not a defense for a permittee in an enforcement action that it would have been necessary to halt or reduce the permitted activity in order to maintain compliance with the conditions of this permit.

B3. Bypass of Treatment Facilities

a. Definitions

(1) "Bypass" means intentional diversion of waste streams from any portion of the treatment facility. The permittee may allow any bypass to occur which does not cause effluent limitations to be exceeded, provided the diversion is to allow essential maintenance to assure efficient operation. These bypasses are not subject to the provisions of paragraphs b and c of this section.

(2) "Severe property damage" means substantial physical damage to property, damage to the treatment facilities which causes them to become inoperable, or substantial and permanent loss of natural resources that can reasonably be expected to occur in the absence of a bypass. Severe property damage does not mean economic loss caused by delays in production.

b. Prohibition of bypass.

(1) Bypass is prohibited and DEQ may take enforcement action against a permittee for bypass unless:

i. Bypass was unavoidable to prevent loss of life, personal injury, or severe property damage;

ii. There were no feasible alternatives to the bypass, such as the use of auxiliary treatment facilities, retention of untreated wastes, or maintenance during normal periods of equipment downtime. This condition is not satisfied if adequate backup equipment should have been installed in the exercise of reasonable engineering judgment to prevent a bypass that occurred during normal periods of equipment downtime or preventative maintenance; and

iii. The permittee submitted notices and requests as required under General Condition B3.c.

(2) DEQ may approve an anticipated bypass, after considering its adverse effects and any alternatives to bypassing, if DEQ determines that it will meet the three conditions listed above in General Condition B3.b.(1).

c. Notice and request for bypass.

(1) Anticipated bypass. If the permittee knows in advance of the need for a bypass, a written notice must be submitted to DEQ at least ten days before the date of the bypass.

(2) Unanticipated bypass. The permittee must submit notice of an unanticipated bypass as required in General Condition D5.

B4. Upset

a. Definition. "Upset" means an exceptional incident in which there is unintentional and temporary noncompliance with technology based permit effluent limitations because of factors beyond the reasonable control of the permittee. An upset does not include noncompliance to the extent caused by operation error, improperly designed treatment facilities, inadequate treatment facilities, lack of preventative maintenance, or careless or improper operation.

b. Effect of an upset. An upset constitutes an affirmative defense to an action brought for noncompliance with such technology-based permit effluent limitations if the requirements of General Condition B4.c are met. No determination made during administrative review of claims that noncompliance was caused by upset, and before an action for noncompliance, is final administrative action subject to judicial review.

c. Conditions necessary for a demonstration of upset. A permittee who wishes to establish the affirmative defense of upset must demonstrate, through properly signed, contemporaneous operating logs, or other relevant evidence that:

(1) An upset occurred and that the permittee can identify the causes(s) of the upset;

(2) The permitted facility was at the time being properly operated;

(3) The permittee submitted notice of the upset as required in General Condition D5, hereof (24-hour notice); and

(4) The permittee complied with any remedial measures required under General Condition A3 hereof.

d. Burden of proof. In any enforcement proceeding the permittee seeking to establish the occurrence of an upset has the burden of proof.

B5. Treatment of Single Operational Upset

For purposes of this permit, a single operational upset that leads to simultaneous violations of more than one pollutant parameter will be treated as a single violation. A single operational upset is an exceptional incident that causes simultaneous, unintentional, unknowing (not the result of a knowing act or omission), temporary noncompliance with more than one federal Clean Water Act effluent discharge pollutant parameter. A single operational upset does not include federal Clean Water Act violations involving discharge without a NPDES permit or noncompliance to the extent caused by improperly designed or inadequate treatment facilities. Each day of a single operational upset is a violation.

B6. Overflows from Wastewater Conveyance Systems and Associated Pump Stations

a. Definition. "Overflow" means any spill, release or diversion of sewage including:
   (1) An overflow that results in a discharge to waters of the United States; and
   (2) An overflow of wastewater, including a wastewater backup into a building (other than a backup caused solely by a blockage or other malfunction in a privately owned sewer or building lateral), even if that overflow does not reach waters of the United States.

b. Reporting required. All overflows must be reported orally to DEQ within 24 hours from the time the permittee becomes aware of the overflow. Reporting procedures are described in more detail in General Condition D5.

B7. Public Notification of Effluent Violation or Overflow

If effluent limitations specified in this permit are exceeded or an overflow occurs that threatens public health, the permittee must take such steps as are necessary to alert the public, health agencies and other affected entities (for example, public water systems) about the extent and nature of the discharge in accordance with the notification procedures developed under General Condition B8. Such steps may include, but are not limited to, posting of the river at access points and other places, news releases, and paid announcements on radio and television.

B8. Emergency Response and Public Notification Plan

The permittee must develop and implement an emergency response and public notification plan that identifies measures to protect public health from overflows, bypasses, or upsets that may endanger public health. At a minimum the plan must include mechanisms to:

a. Ensure that the permittee is aware (to the greatest extent possible) of such events;
b. Ensure notification of appropriate personnel and ensure that they are immediately dispatched for investigation and response;
c. Ensure immediate notification to the public, health agencies, and other affected public entities (including public water systems). The overflow response plan must identify the public health and other officials who will receive immediate notification;
d. Ensure that appropriate personnel are aware of and follow the plan and are appropriately trained;
e. Provide emergency operations; and
f. Ensure that DEQ is notified of the public notification steps taken.

B9. Removed Substances

Solids, sludges, filter backwash, or other pollutants removed in the course of treatment or control of wastewaters must be disposed of in such a manner as to prevent any pollutant from such materials from entering waters of the state, causing nuisance conditions, or creating a public health hazard.

SECTION C. MONITORING AND RECORDS

C1. Representative Sampling

Sampling and measurements taken as required herein must be representative of the volume and nature of the monitored discharge. All samples must be taken at the monitoring points specified in this permit, and must be taken, unless otherwise specified, before the effluent joins or is diluted by any other waste stream, body of water, or substance. Monitoring points must not be changed without notification to and the approval of DEQ. Samples must be collected in accordance with requirements in 40 CFR part 122.21 and 40 CFR part 403 Appendix E.

C2. Flow Measurements

Appropriate flow measurement devices and methods consistent with accepted scientific practices must be selected and used to ensure the accuracy and reliability of measurements of the volume of monitored discharges. The devices must be installed, calibrated and maintained to insure that the accuracy of the measurements is consistent with the accepted capability of that type of device. Devices selected must be capable of measuring flows with a maximum deviation of less than ± 10 percent from true discharge rates throughout the range of expected discharge volumes.

C3. Monitoring Procedures

Monitoring must be conducted according to test procedures approved under 40 CFR part 136 or, in the case of sludge (biosolids) use and disposal, approved under 40 CFR part 503 unless other test procedures have been specified in this permit.

For monitoring of recycled water with no discharge to waters of the state, monitoring must be conducted according to test procedures approved under 40 CFR part 136 or as specified in the most recent edition of Standard Methods for the Examination of Water and Wastewater unless other test procedures have been specified in this permit or approved in writing by DEQ.

C4. Penalties for Tampering

The federal Clean Water Act provides that any person who falsifies, tampers with, or knowingly renders inaccurate any monitoring device or method required to be maintained under this permit may, upon conviction, be punished by a fine of not more than $10,000 per violation, imprisonment for not more than two years, or both. If a conviction of a person is for a violation committed after a first conviction of such person, punishment is a fine not more than $20,000 per day of violation, or by imprisonment of not more than four years, or both.

C5. Reporting of Monitoring Results

Monitoring results must be summarized each month on a discharge monitoring report form approved by DEQ. The reports must be submitted monthly and are to be mailed, delivered or otherwise transmitted by the 15th day of the following month unless specifically approved otherwise in Schedule B of this permit.

C6. Additional Monitoring by the Permittee

If the permittee monitors any pollutant more frequently than required by this permit, using test procedures approved under 40 CFR part 136 or, in the case of sludge (biosolids) use and disposal, approved under 40 CFR part 503, or as specified in this permit, the results of this monitoring must be included in the calculation and reporting of the data submitted in the discharge monitoring report. Such increased frequency must also be indicated. For a pollutant parameter that may be sampled more than once per day (for example, total residual chlorine), only the average daily value must be recorded unless otherwise specified in this permit.

C7. Averaging of Measurements

Calculations for all limitations that require averaging of measurements must utilize an arithmetic mean, except for bacteria which must be averaged as specified in this permit.

C8. Retention of Records

Records of monitoring information required by this permit related to the permittee's sewage sludge use and disposal activities must be retained for a period of at least 5 years (or longer as required by 40 CFR part 503). Records of all monitoring information including all calibration and maintenance records, all original strip chart recordings for continuous monitoring instrumentation, copies of all reports required by this permit and records of all data used to complete the application for this permit must be retained for a period of at least 3 years from the date of the sample, measurement, report, or application. This period may be extended by request of DEQ at any time.

C9. Records Contents

Records of monitoring information must include:

a. The date, exact place, time, and methods of sampling or measurements;
b. The individual(s) who performed the sampling or measurements;
c. The date(s) analyses were performed;
d. The individual(s) who performed the analyses;
e. The analytical techniques or methods used; and
f. The results of such analyses.

C10. Inspection and Entry

The permittee must allow DEQ or EPA upon the presentation of credentials to:

a. Enter upon the permittee's premises where a regulated facility or activity is located or conducted, or where records must be kept under the conditions of this permit;
b. Have access to and copy, at reasonable times, any records that must be kept under the conditions of this permit;
c. Inspect at reasonable times any facilities, equipment (including monitoring and control equipment), practices, or operations regulated or required under this permit; and
d. Sample or monitor at reasonable times, for the purpose of assuring permit compliance or as otherwise authorized by state law, any substances or parameters at any location.

C11. Confidentiality of Information

Any information relating to this permit that is submitted to or obtained by DEQ is available to the public unless classified as confidential by the Director of DEQ under ORS 468.095. The permittee may request that information be classified as confidential if it is a trade secret as defined by that statute. The name and address of the permittee, permit applications, permits, effluent data, and information required by NPDES application forms under 40 CFR § 122.21 are not classified as confidential [40 CFR § 122.7(b)].

SECTION D. REPORTING REQUIREMENTS

D1. Planned Changes

The permittee must comply with OAR 340-052, "Review of Plans and Specifications" and 40 CFR § 122.41(l)(1). Except where exempted under OAR 340-052, no construction, installation, or modification involving disposal systems, treatment works, sewerage systems, or common sewers may be commenced until the plans and specifications are submitted to and approved by DEQ. The permittee must give notice to DEQ as soon as possible of any planned physical alternations or additions to the permitted facility.

D2. Anticipated Noncompliance

The permittee must give advance notice to DEQ of any planned changes in the permitted facility or activity that may result in noncompliance with permit requirements.

D3. Transfers

This permit may be transferred to a new permittee provided the transferee acquires a property interest in the permitted activity and agrees in writing to fully comply with all the terms and conditions of the permit and EQC rules. No permit may be transferred to a third party without prior written approval from DEQ. DEQ may require modification, revocation, and reissuance of the permit to change the name of the permittee and incorporate such other requirements as may be necessary under 40 CFR § 122.61. The permittee must notify DEQ when a transfer of property interest takes place.

D4. Compliance Schedule

Reports of compliance or noncompliance with, or any progress reports on interim and final requirements contained in any compliance schedule of this permit must be submitted no later than 14 days following each schedule date. Any reports of noncompliance must include the cause of noncompliance, any remedial actions taken, and the probability of meeting the next scheduled requirements.

D5. Twenty-Four Hour Reporting

The permittee must report any noncompliance that may endanger health or the environment. Any information must be provided orally (by telephone) to the DEQ regional office or Oregon Emergency Response System (1-800-452-0311) as specified below within 24 hours from the time the permittee becomes aware of the circumstances.

a. Overflows.
   - (1) Oral Reporting within 24 hours.
     - i. For overflows other than basement backups, the following information must be reported to the Oregon Emergency Response System (OERS) at 1-800-452-0311. For basement backups, this information should be reported directly to the DEQ regional office.
       - *(a)* The location of the overflow;
       - *(b)* The receiving water (if there is one);
       - *(c)* An estimate of the volume of the overflow;
       - *(d)* A description of the sewer system component from which the release occurred (for example, manhole, constructed overflow pipe, crack in pipe); and
       - *(e)* The estimated date and time when the overflow began and stopped or will be stopped.
     - ii. The following information must be reported to the DEQ regional office within 24 hours, or during normal business hours, whichever is earlier:
       - *(a)* The OERS incident number (if applicable); and
       - *(b)* A brief description of the event.
   - (2) Written reporting postmarked within 5 days.

i. The following information must be provided in writing to the DEQ regional office within 5 days of the time the permittee becomes aware of the overflow:
   (a) The OERS incident number (if applicable);
   (b) The cause or suspected cause of the overflow;
   (c) Steps taken or planned to reduce, eliminate, and prevent reoccurrence of the overflow and a schedule of major milestones for those steps;
   (d) Steps taken or planned to mitigate the impact(s) of the overflow and a schedule of major milestones for those steps; and
   (e) For storm-related overflows, the rainfall intensity (inches/hour) and duration of the storm associated with the overflow.

DEQ may waive the written report on a case-by-case basis if the oral report has been received within 24 hours.

b. Other instances of noncompliance.
   (1) The following instances of noncompliance must be reported:
      i. Any unanticipated bypass that exceeds any effluent limitation in this permit;
      ii. Any upset that exceeds any effluent limitation in this permit;
      iii. Violation of maximum daily discharge limitation for any of the pollutants listed by DEQ in this permit; and
      iv. Any noncompliance that may endanger human health or the environment.
   (2) During normal business hours, the DEQ regional office must be called. Outside of normal business hours, DEQ must be contacted at 1-800-452-0311 (Oregon Emergency Response System).
   (3) A written submission must be provided within 5 days of the time the permittee becomes aware of the circumstances. The written submission must contain:
      i. A description of the noncompliance and its cause;
      ii. The period of noncompliance, including exact dates and times;
      iii. The estimated time noncompliance is expected to continue if it has not been corrected;
      iv. Steps taken or planned to reduce, eliminate, and prevent reoccurrence of the noncompliance; and
      v. Public notification steps taken, pursuant to General Condition B7.
   (4) DEQ may waive the written report on a case-by-case basis if the oral report has been received within 24 hours.

D6. Other Noncompliance

The permittee must report all instances of noncompliance not reported under General Condition D4 or D5 at the time monitoring reports are submitted. The reports must contain:

a. A description of the noncompliance and its cause;
b. The period of noncompliance, including exact dates and times;
c. The estimated time noncompliance is expected to continue if it has not been corrected; and
d. Steps taken or planned to reduce, eliminate, and prevent reoccurrence of the noncompliance.

D7. Duty to Provide Information

The permittee must furnish to DEQ within a reasonable time any information that DEQ may request to determine compliance with the permit or to determine whether cause exists for modifying, revoking and reissuing, or terminating this permit. The permittee must also furnish to DEQ, upon request, copies of records required to be kept by this permit.

Other Information: When the permittee becomes aware that it has failed to submit any relevant facts or has submitted incorrect information in a permit application or any report to DEQ, it must promptly submit such facts or information.

D8. Signatory Requirements

All applications, reports or information submitted to DEQ must be signed and certified in accordance with 40 CFR § 122.22.

D9. Falsification of Information

Under ORS 468.953, any person who knowingly makes any false statement, representation, or certification in any record or other document submitted or required to be maintained under this permit, including monitoring reports or reports of compliance or noncompliance, is subject to a Class C felony punishable by a fine not to exceed $125,000 per violation and up to 5 years in prison per ORS chapter 161. Additionally, according to 40 CFR § 122.41(k)(2), any person who knowingly makes any false statement, representation, or certification in any record or other document submitted or required to be maintained under this permit including monitoring reports or reports of compliance or non-compliance will, upon conviction, be punished by a federal civil penalty not to exceed $10,000 per violation, or by imprisonment for not more than 6 months per violation, or by both.

D10. Changes to Indirect Dischargers

The permittee must provide adequate notice to DEQ of the following:

a. Any new introduction of pollutants into the POTW from an indirect discharger which would be subject to section 301 or 306 of the federal Clean Water Act if it were directly discharging those pollutants and;
b. Any substantial change in the volume or character of pollutants being introduced into the POTW by a source introducing pollutants into the POTW at the time of issuance of the permit.
c. For the purposes of this paragraph, adequate notice must include information on (i) the quality and quantity of effluent introduced into the POTW, and (ii) any anticipated impact of the change on the quantity or quality of effluent to be discharged from the POTW.

SECTION E. DEFINITIONS

E1. *BOD* or *BOD_5* means five-day biochemical oxygen demand.

E2. *CBOD* or *$CBOD_5$* means five-day carbonaceous biochemical oxygen demand.

E3. *TSS* means total suspended solids.

E4. *Bacteria* means but is not limited to fecal coliform bacteria, total coliform bacteria, *Escherichia coli* (*E. coli*) bacteria, and *Enterococcus* bacteria.

E5. *FC* means fecal coliform bacteria.

E6. *Total residual chlorine* means combined chlorine forms plus free residual chlorine

E7. *Technology based permit effluent limitations* means technology-based treatment requirements as defined in 40 CFR § 125.3, and concentration and mass load effluent limitations that are based on minimum design criteria specified in OAR 340-041.

E8. *mg/l* means milligrams per liter.

E9. *µg/l* means microgram per liter.

E10. *kg* means kilograms.

E11. *m^3/d* means cubic meters per day.

E12. *MGD* means million gallons per day.

E13. *Average monthly effluent limitation* as defined at 40 CFR § 122.2 means the highest allowable average of daily discharges over a calendar month, calculated as the sum of all daily discharges measured during a calendar month divided by the number of daily discharges measured during that month.

E14. *Average weekly effluent limitation* as defined at 40 CFR § 122.2 means the highest allowable average of daily discharges over a calendar week, calculated as the sum of all daily discharges measured during a calendar week divided by the number of daily discharges measured during that week.

E15. *Daily discharge* as defined at 40 CFR § 122.2 means the discharge of a pollutant measured during a calendar day or any 24-hour period that reasonably represents the calendar day for purposes of sampling. For pollutants with limitations expressed in units of mass, the daily discharge must be calculated as the total mass of the pollutant discharged over the day. For pollutants with limitations expressed in other units of measurement, the daily discharge must be calculated as the average measurement of the pollutant over the day.

E16. *24-hour composite sample* means a sample formed by collecting and mixing discrete samples taken periodically and based on time or flow.

E17. *Grab sample* means an individual discrete sample collected over a period of time not to exceed 15 minutes.

E18. *Quarter* means January through March, April through June, July through September, or October through December.

E19. *Month* means calendar month.

E20. *Week* means a calendar week of Sunday through Saturday.

E21. *POTW* means a publicly-owned treatment works.

Appendix C

Flow Equalization Balance

APPENDIX C. SOUTH SUBURBAN SANITARY DISTRICT POND 4A/4B TREATMENT AND DISPOSAL WATER BALANCE - INFLUENT FLOW > 3.0 MGD

Wet Year: 5% Frequency High Monthly Rainfall (20.3 inches), Average Year: Average Year Rainfall (13.7 inches)

	Month	(1) Rainfall (in./mo)	(2) Reference E.T. (in./mo)	(3) EQ Pond (Pond 4A) To Pond (ac-ft./mo)	(4) EQ Pond (Pond 4A) Rainfall (ac-ft./mo)	(5) EQ Pond (Pond 4A) Evaporation (ac-ft./mo)	(6) EQ Pond (Pond 4A) Discharge (ac-ft./mo)	(7) EQ Pond (Pond 4A) Cumulative Storage (ac-ft.)	(8) EQ Pond (Pond 4B) To Pond (ac-ft./mo)	(9) EQ Pond (Pond 4B) Rainfall (ac-ft./mo)	(10) EQ Pond (Pond 4B) Evaporation (ac-ft./mo)	(11) EQ Pond (Pond 4B) Discharge (ac-ft./mo)	(12) EQ Pond (Pond 4B) Cumulative Storage (ac-ft.)	No. of Days
Wet Year	Jan.	3.0	0.7	5.3	4.2	-1.0	0.0	16.3	0.0	6.4	-1.5	0.0	9.7	31
20.3	Feb.	2.0	1.3	97.4	2.8	-1.9	0.0	53.3	61.2	4.2	-2.9	0.0	72.3	28
	Mar.	2.0	2.7	25.6	2.8	-3.9	0.0	53.3	24.6	4.2	-5.8	0.0	95.2	31
	Apr.	1.2	4.1	1.4	1.8	-5.8	0.0	50.7	0.0	2.7	-8.8	0.0	89.1	30
	May	1.5	6.4	0.0	2.2	-9.1	0.0	43.8	0.0	3.3	-13.8	0.0	78.7	31
	June	1.2	8.1	0.0	1.7	-11.5	0.0	34.0	0.0	2.5	-17.4	0.0	63.8	30
	July	0.4	9.3	0.0	0.6	-13.1	0.0	21.5	0.0	1.0	-19.9	0.0	44.9	31
	Aug.	0.7	7.7	0.0	1.0	-10.8	0.0	11.6	0.0	1.5	-16.4	0.0	29.9	31
	Sept.	0.8	5.3	0.0	1.1	-7.5	0.0	5.3	0.0	1.7	-11.4	0.0	20.2	30
	Oct.	1.5	2.9	0.0	2.2	-4.1	0.0	3.3	0.0	3.3	-6.3	0.0	17.3	31
	Nov.	2.6	1.1	0.0	3.7	-1.6	0.0	5.4	0.0	5.6	-2.5	0.0	20.4	30
	Dec.	3.3	0.6	0.0	4.7	-0.9	0.0	9.2	0.0	7.1	-1.4	0.0	26.2	31
Average Year	Jan.	2.0	0.7	52.2	2.9	-1.0	0.0	53.3	10.0	4.3	-1.5	0.0	39.0	31
13.7	Feb.	1.3	1.3	11.1	1.9	-1.9	0.0	53.3	11.1	2.9	-2.9	0.0	50.1	28
	Mar.	1.3	2.7	10.4	1.9	-3.9	0.0	53.3	8.4	2.9	-5.8	0.0	55.6	31
	Apr.	0.8	4.1	0.0	1.2	-5.8	0.0	48.7	0.0	1.8	-8.8	0.0	48.6	30
	May	1.1	6.4	0.0	1.5	-9.1	0.0	41.2	0.0	2.3	-13.8	0.0	37.1	31
	June	0.8	8.1	0.0	1.1	-11.5	0.0	30.8	0.0	1.7	-17.4	0.0	21.4	30
	July	0.3	9.3	0.0	0.4	-13.1	0.0	18.1	0.0	0.6	-19.9	0.0	2.1	31
	Aug.	0.5	7.7	0.0	0.7	-10.8	0.0	7.9	0.0	1.0	-16.4	0.0	0.0	31
	Sept.	0.5	5.3	0.0	0.8	-7.5	0.0	1.2	0.0	1.2	-11.4	0.0	0.0	30
	Oct.	1.0	2.9	0.0	1.5	-4.1	0.0	0.0	0.0	2.2	-6.3	0.0	0.0	31
	Nov.	1.8	1.1	0.0	2.5	-1.6	0.0	0.9	0.0	3.8	-2.5	0.0	1.4	30
	Dec.	2.3	0.6	4.6	3.2	-0.9	0.0	7.8	0.0	4.8	-1.4	0.0	4.8	31
Wet Year	Jan.	3.0	0.7	5.3	4.2	-1.0	0.0	16.3	0.0	6.4	-1.5	0.0	9.7	31
20.3	Feb.	2.0	1.3	97.4	2.8	-1.9	0.0	53.3	61.2	4.2	-2.9	0.0	72.3	28
	Mar.	2.0	2.7	25.6	2.8	-3.9	0.0	53.3	24.6	4.2	-5.8	0.0	95.2	31
	Apr.	1.2	4.1	1.4	1.8	-5.8	0.0	50.7	0.0	2.7	-8.8	0.0	89.1	30
	May	1.5	6.4	0.0	2.2	-9.1	0.0	43.8	0.0	3.3	-13.8	0.0	78.7	31
	June	1.2	8.1	0.0	1.7	-11.5	0.0	34.0	0.0	2.5	-17.4	0.0	63.8	30
	July	0.4	9.3	0.0	0.6	-13.1	0.0	21.5	0.0	1.0	-19.9	0.0	44.9	31
	Aug.	0.7	7.7	0.0	1.0	-10.8	0.0	11.6	0.0	1.5	-16.4	0.0	29.9	31
	Sept.	0.8	5.3	0.0	1.1	-7.5	0.0	5.3	0.0	1.7	-11.4	0.0	20.2	30
	Oct.	1.5	2.9	0.0	2.2	-4.1	0.0	3.3	0.0	3.3	-6.3	0.0	17.3	31
	Nov.	2.6	1.1	0.0	3.7	-1.6	0.0	5.4	0.0	5.6	-2.5	0.0	20.4	30
	Dec.	3.3	0.6	0.0	4.7	-0.9	0.0	9.2	0.0	7.1	-1.4	0.0	26.2	31
Average Year	Jan.	2.0	0.7	52.2	2.9	-1.0	0.0	53.3	10.0	4.3	-1.5	0.0	39.0	31
13.7	Feb.	1.3	1.3	11.1	1.9	-1.9	0.0	53.3	11.1	2.9	-2.9	0.0	50.1	28
	Mar.	1.3	2.7	10.4	1.9	-3.9	0.0	53.3	8.4	2.9	-5.8	0.0	55.6	31
	Apr.	0.8	4.1	0.0	1.2	-5.8	0.0	48.7	0.0	1.8	-8.8	0.0	48.6	30
	May	1.1	6.4	0.0	1.5	-9.1	0.0	41.2	0.0	2.3	-13.8	0.0	37.1	31
	June	0.8	8.1	0.0	1.1	-11.5	0.0	30.8	0.0	1.7	-17.4	0.0	21.4	30
	July	0.3	9.3	0.0	0.4	-13.1	0.0	18.1	0.0	0.6	-19.9	0.0	2.1	31
	Aug.	0.5	7.7	0.0	0.7	-10.8	0.0	7.9	0.0	1.0	-16.4	0.0	0.0	31
	Sept.	0.5	5.3	0.0	0.8	-7.5	0.0	1.2	0.0	1.2	-11.4	0.0	0.0	30
	Oct.	1.0	2.9	0.0	1.5	-4.1	0.0	0.0	0.0	2.2	-6.3	0.0	0.0	31
	Nov.	1.8	1.1	0.0	2.5	-1.6	0.0	0.9	0.0	3.8	-2.5	0.0	1.4	30
	Dec.	2.3	0.6	4.6	3.2	-0.9	0.0	7.8	0.0	4.8	-1.4	0.0	4.8	31
Wet Year	Jan.	3.0	0.7	5.3	4.2	-1.0	0.0	16.3	0.0	6.4	-1.5	0.0	9.7	31
20.3	Feb.	2.0	1.3	97.4	2.8	-1.9	0.0	53.3	61.2	4.2	-2.9	0.0	72.3	28
	Mar.	2.0	2.7	25.6	2.8	-3.9	0.0	53.3	24.6	4.2	-5.8	0.0	95.2	31
	Apr.	1.2	4.1	1.4	1.8	-5.8	0.0	50.7	0.0	2.7	-8.8	0.0	89.1	30
	May	1.5	6.4	0.0	2.2	-9.1	0.0	43.8	0.0	3.3	-13.8	0.0	78.7	31
	June	1.2	8.1	0.0	1.7	-11.5	0.0	34.0	0.0	2.5	-17.4	0.0	63.8	30
	July	0.4	9.3	0.0	0.6	-13.1	0.0	21.5	0.0	1.0	-19.9	0.0	44.9	31
	Aug.	0.7	7.7	0.0	1.0	-10.8	0.0	11.6	0.0	1.5	-16.4	0.0	29.9	31
	Sept.	0.8	5.3	0.0	1.1	-7.5	0.0	5.3	0.0	1.7	-11.4	0.0	20.2	30
	Oct.	1.5	2.9	0.0	2.2	-4.1	0.0	3.3	0.0	3.3	-6.3	0.0	17.3	31
	Nov.	2.6	1.1	0.0	3.7	-1.6	0.0	5.4	0.0	5.6	-2.5	0.0	20.4	30
	Dec.	3.3	0.6	0.0	4.7	-0.9	0.0	9.2	0.0	7.1	-1.4	0.0	26.2	31
Average Year	Jan.	2.0	0.7	52.2	2.9	-1.0	0.0	53.3	10.0	4.3	-1.5	0.0	39.0	31
13.7	Feb.	1.3	1.3	11.1	1.9	-1.9	0.0	53.3	11.1	2.9	-2.9	0.0	50.1	28
	Mar.	1.3	2.7	10.4	1.9	-3.9	0.0	53.3	8.4	2.9	-5.8	0.0	55.6	31
	Apr.	0.8	4.1	0.0	1.2	-5.8	0.0	48.7	0.0	1.8	-8.8	0.0	48.6	30
	May	1.1	6.4	0.0	1.5	-9.1	0.0	41.2	0.0	2.3	-13.8	0.0	37.1	31
	June	0.8	8.1	0.0	1.1	-11.5	0.0	30.8	0.0	1.7	-17.4	0.0	21.4	30
	July	0.3	9.3	0.0	0.4	-13.1	0.0	18.1	0.0	0.6	-19.9	0.0	2.1	31
	Aug.	0.5	7.7	0.0	0.7	-10.8	0.0	7.9	0.0	1.0	-16.4	0.0	0.0	31
	Sept.	0.5	5.3	0.0	0.8	-7.5	0.0	1.2	0.0	1.2	-11.4	0.0	0.0	30
	Oct.	1.0	2.9	0.0	1.5	-4.1	0.0	0.0	0.0	2.2	-6.3	0.0	0.0	31
	Nov.	1.8	1.1	0.0	2.5	-1.6	0.0	0.9	0.0	3.8	-2.5	0.0	1.4	30
	Dec.	2.3	0.6	4.6	3.2	-0.9	0.0	7.8	0.0	4.8	-1.4	0.0	4.8	31
							Max	**53.3**				**Max**	**95.2**	
		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	

MAIN INPUT PARAMETERS

	Surface Area	Available Storage Volume	
Ponds 4A surface area (ac.):	17.0 ac	17.4 MG	53.3 ac-ft
Ponds 4B surface area (ac.):	25.8 ac	76.8 MG	235.7 ac-ft

(1) Rainfall data is from Climatology of the United States, No. 20, for Klamath Falls.
(2) Average monthly (1999-2010) reference evapotranspiration data is from the Bureau of Reclamation's AgriMet station for Klamath Falls (KFLO).
(3) Wet Year: Based on projection for 2017 flows. Average Year: Based on projection from 2016 flows.
(4) Col. 1 x (Surface Area for Treatment Ponds) ÷ 12 in/ft
(5) Col. 2 x (Surface Area for Treatment Ponds) ÷ 12 in/ft; usage shown as a negative number.
(6) Assumed to be 0
(7) Previous month Pond 4A cumulative volume (Col. 7) + Col. 3 + Co. 4 + Col. 5 = Col. 7. If value exceeds 53.3, then 53.3.
(8) If previous month Pond 4A volume (Col. 7) + Col. 3 + Co. 4 + Col. 5 + Col. 6 exceeds 61.8, then previous month Pond 4A volume (Col. 7) + Col. 3 + Co. 4 + Col. 5 + Col 6 - 61.8. Otherwise 0.
(9) Col. 1 x (Surface Area for Storage Ponds) ÷ 12 in/ft
(10) - Col. 2 x (Surface Area for Storage Ponds) ÷ 12 in/ft; usage shown as a negative number.
(11) Assumed to be 0
(12) Previous month Pond 4B cumulative volume (Col. 12) + Col. 8 + Co. 9 + Col. 10 + Col. 11. If value less than 0, then 0.

Appendix D

Class A Reuse Water Balances

SOUTH SUBURBAN SANITARY DISTRICT WATER BALANCE - 2017 MONTHLY FLOW FACTORS - ALFALFA

5% Frequency High Monthly Rainfall, Zero River Discharge

	(1)	(2)	(3a)	(3b)	(4)	(5)	(6a)	(6b)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
					Treatment Ponds				Alfalfa				Storage Ponds			
Month	Rainfall (in./mo)	Reference E.T. (in./mo)	Wastewater Inflow (ac-ft./mo)	Wastewater Inflow (ac-ft./mo)	Rainfall (ac-ft./mo)	Evaporation (ac-ft./mo)	WW Outflow (ac-ft./mo)	WW Outflow (mgd)	Rainfall (ac-ft./mo)	ET (ac-ft./mo)	Irrigation (ac-ft./mo)	To/From Storage (ac-ft./mo)	Rainfall (ac-ft./mo)	Evaporation (ac-ft./mo)	Discharge (ac-ft./mo)	Cumulative Storage (ac-ft.)
Jan.	3.0	0.71	266	2.8	11	(3)	274	2.89	159	0	0	274	40	(10)	0	889
Feb.	2.0	1.34	352	4.1	7	(5)	355	4.13	105	0	0	355	27	(18)	0	1,252
Mar.	2.0	2.72	314	3.3	7	(10)	311	3.27	105	0	0	311	26	(37)	0	1,553
Apr.	1.2	4.08	258	2.8	4	(15)	248	2.69	66	(207)	(188)	60	17	(55)	0	1,575
May	1.5	6.4	238	2.5	6	(23)	221	2.32	83	(324)	(322)	(102)	21	(86)	0	1,408
June	1.2	8.09	230	2.5	4	(29)	206	2.23	63	(410)	(463)	(257)	16	(109)	0	1,058
July	0.4	9.27	219	2.3	2	(33)	187	1.97	24	(470)	(595)	(407)	6	(125)	0	532
Aug.	0.7	7.65	209	2.2	2	(27)	184	1.94	36	(388)	(469)	(284)	9	(103)	0	154
Sept.	0.8	5.28	203	2.2	3	(19)	187	2.03	42	(268)	(300)	(114)	11	(71)	0	0
Oct.	1.5	2.91	181	1.9	5	(10)	176	1.85	82	0	0	176	21	(39)	0	157
Nov.	2.6	1.14	175	1.9	9	(4)	180	1.96	139	0	0	180	35	(15)	0	357
Dec.	3.3	0.63	181	1.9	12	(2)	190	2.00	177	0	0	190	45	(8)	0	584
Totals	20.3	50.2	2,826		72	(179)	2,719		1,081	(2,066)	(2,336)	382.9	272.5	(675.5)		

Peak Cumulative Storage (ac-ft.): 1,575

MAIN INPUT PARAMETERS

	Treatment Ponds	Alfalfa	Storage Ponds
Overall Irr. Eff:		0.75	
Evapotranspiration Coefficient:		0.95	1
Surface Areas (ac.):		640	161
Ponds 1, 2 and 3 storage, acre feet			345
Ponds 4A and 4B surface area (ac.):	42.8		
Required new storage, acre feet			1,230
Land Required based on 15-foot depth of storage, acres			82.0
Winter Discharge Flow (mgd):		0.0	

(1) Rainfall data is from Climatology of the United States, No. 20, for Klamath Falls.
(2) Average monthly (1999-2010) reference evapotranspiration data is from the Bureau of Reclamation's AgriMet station for Klamath Falls (KFLO).
(3) (Wastewater flow rate in mgd) x 3.07 ac-ft/mgd x (number of days in the month)
(3a) Wastewater flow rate in mgd
(4) Col. 1 x (Surface Area for Treatment Ponds) ÷ 12 in/ft
(5) Col. 2 x (Surface Area for Treatment Ponds) ÷ 12 in/ft; usage shown as a negative number.
(6a) Col. 4 + Col. 5 ; negative number indicates water drawn from storage.
(6b) Column 6a converted to mgd
(7) Col. 1 x (crop area) ÷ 12 in/ft
(8) - (Col. 2 x (Evapotranspiration Coefficient) x (Surface Area))/(Irrigation Efficiency) ; usage shown as a negative number.
(9) For months allowing irrigation (Apr.-Sep.), Col. 7 + Col. 8; otherwise, set equal to 0.
(10) Col. 6 + Col. 9 ; negative number indicates water drawn from storage.
(11) Col. 1 x (Surface Area for Storage Ponds) ÷ 12 in/ft
(12) - Col. 2 x (Surface Area for Storage Ponds) ÷ 12 in/ft; usage shown as a negative number.
(13) Assumed allowable river discharge; discharge amounts shown as a negative number (if applicable).
(14) Sum of columns 10 through 13 plus previous month's storage, cannot be negative. Field and pond surface areas can be adjusted to have a zero balance in September.

SOUTH SUBURBAN SANITARY DISTRICT WATER BALANCE - 2017 MONTHLY FLOW FACTORS - PASTURE

5% Frequency High Monthly Rainfall, Zero River Discharge

	(1)	(2)	(3a)	(3b)	(4)	(5)	(6a)	(6b)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
					Treatment Ponds				Pasture				Storage Ponds			
Month	Rainfall (in./mo)	Reference E.T. (in./mo)	Wastewater Inflow (ac-ft./mo)	Wastewater Inflow (ac-ft./mo)	Rainfall (ac-ft./mo)	Evaporation (ac-ft./mo)	WW Outflow (ac-ft./mo)	WW Outflow (mgd)	Rainfall (ac-ft./mo)	ET (ac-ft./mo)	Irrigation (ac-ft./mo)	To/From Storage (ac-ft./mo)	Rainfall (ac-ft./mo)	Evaporation (ac-ft./mo)	Discharge (ac-ft./mo)	Cumulative Storage (ac-ft.)
Jan.	3.0	0.71	266	2.8	11	(3)	274	2.89	238	0	0	274	40	(10)	0	889
Feb.	2.0	1.34	352	4.1	7	(5)	355	4.13	158	0	0	355	27	(18)	0	1,252
Mar.	2.0	2.72	314	3.3	7	(10)	311	3.27	157	0	0	311	27	(37)	0	1,553
Apr.	1.2	4.08	258	2.8	4	(15)	248	2.69	99	(222)	(164)	84	17	(55)	0	1,599
May	1.5	6.4	238	2.5	6	(23)	221	2.32	124	(348)	(299)	(79)	21	(87)	0	1,455
June	1.2	8.09	230	2.5	4	(29)	206	2.23	94	(440)	(461)	(255)	16	(109)	0	1,106
July	0.4	9.27	219	2.3	2	(33)	187	1.97	35	(504)	(625)	(438)	6	(125)	0	548
Aug.	0.7	7.65	209	2.2	2	(27)	184	1.94	54	(416)	(483)	(298)	9	(104)	0	156
Sept.	0.8	5.28	203	2.2	3	(19)	187	2.03	64	(287)	(298)	(111)	11	(71)	0	0
Oct.	1.5	2.91	181	1.9	5	(10)	176	1.85	123	0	0	176	21	(39)	0	157
Nov.	2.6	1.14	175	1.9	9	(4)	180	1.96	209	0	0	180	35	(15)	0	357
Dec.	3.3	0.63	181	1.9	12	(2)	190	2.00	265	0	0	190	45	(9)	0	584
Totals	20.3	50.2	2,826		72	(179)	2,719		1,621	(2,218)	(2,330)	389.1	274.2	(679.6)		

Peak Cumulative Storage (ac-ft.): 1,599

MAIN INPUT PARAMETERS

	Treatment Ponds	Pasture	Storage Ponds
Overall Irr. Eff:		0.75	
Evapotranspiration Coefficient:		0.68	1
Surface Areas (ac.):		960	162
Ponds 1, 2 and 3 storage, acre feet			345
Ponds 4A and 4B surface area (ac.):	42.8		
Required new storage, acre feet			1,254
Land Required based on 15-foot depth of storage, acres			83.0
Winter Discharge Flow (mgd):			0.0

(1) Rainfall data is from Climatology of the United States, No. 20, for Klamath Falls.
(2) Average monthly (1999-2010) reference evapotranspiration data is from the Bureau of Reclamation's AgriMet station for Klamath Falls (KFLO).
(3) (Wastewater flow rate in mgd) x 3.07 ac-ft/mgd x (number of days in the month)
(3a) Wastewater flow rate in mgd
(4) Col. 1 x (Surface Area for Treatment Ponds) ÷ 12 in/ft
(5) Col. 2 x (Surface Area for Treatment Ponds) ÷ 12 in/ft; usage shown as a negative number.
(6a) Col. 4 + Col. 5 ; negative number indicates water drawn from storage.
(6b) Column 6a converted to mgd
(7) Col. 1 x (crop area) ÷ 12 in/ft
(8) - (Col. 2 x (Evapotranspiration Coefficient) x (Surface Area))/(Irrigation Efficiency) ; usage shown as a negative number.
(9) For months allowing irrigation (Apr.-Sep.), Col. 7 + Col. 8; otherwise, set equal to 0.
(10) Col. 6 + Col. 9 ; negative number indicates water drawn from storage.
(11) Col. 1 x (Surface Area for Storage Ponds) ÷ 12 in/ft
(12) - Col. 2 x (Surface Area for Storage Ponds) ÷ 12 in/ft; usage shown as a negative number.
(13) Assumed allowable river discharge; discharge amounts shown as a negative number (if applicable).
(14) Sum of columns 10 through 13 plus previous month's storage, cannot be negative. Field and pond surface areas can be adjusted to have a zero balance in September.

SOUTH SUBURBAN SANITARY DISTRICT WATER BALANCE - 2017 MONTHLY FLOW FACTORS - CORN

5% Frequency High Monthly Rainfall, Zero River Discharge

	(1)	(2)	(3a)	(3b)	(4)	(5)	(6a)	(6b)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
					Treatment Ponds				Corn				Storage Ponds			
Month	Rainfall (in./mo)	Reference E.T. (in./mo)	Wastewater Inflow (ac-ft./mo)	Wastewater Inflow (ac-ft./mo)	Rainfall (ac-ft./mo)	Evaporation (ac-ft./mo)	WW Outflow (ac-ft./mo)	WW Outflow (mgd)	Rainfall (ac-ft./mo)	ET (ac-ft./mo)	Irrigation (ac-ft./mo)	To/From Storage (ac-ft./mo)	Rainfall (ac-ft./mo)	Evaporation (ac-ft./mo)	Discharge (ac-ft./mo)	Cumulative Storage (ac-ft.)
Jan.	3.0	0.71	266	2.8	11	(3)	274	2.89	201	0	0	274	44	(10)	0	895
Feb.	2.0	1.34	352	4.1	7	(5)	355	4.13	133	0	0	355	29	(20)	0	1,259
Mar.	2.0	2.72	314	3.3	7	(10)	311	3.27	132	0	0	311	29	(40)	0	1,559
Apr.	1.2	4.08	258	2.8	4	(15)	248	2.69	84	(84)	(1)	247	18	(60)	0	1,764
May	1.5	6.4	238	2.5	6	(23)	221	2.32	105	(186)	(109)	112	23	(94)	0	1,805
June	1.2	8.09	230	2.5	4	(29)	206	2.23	80	(440)	(481)	(275)	17	(119)	0	1,428
July	0.4	9.27	219	2.3	2	(33)	187	1.97	30	(627)	(796)	(609)	7	(136)	0	690
Aug.	0.7	7.65	209	2.2	2	(27)	184	1.94	46	(472)	(569)	(384)	10	(112)	0	203
Sept.	0.8	5.28	203	2.2	3	(19)	187	2.03	54	(297)	(325)	(138)	12	(78)	0	0
Oct.	1.5	2.91	181	1.9	5	(10)	176	1.85	104	0	0	176	23	(43)	0	156
Nov.	2.6	1.14	175	1.9	9	(4)	180	1.96	176	0	0	180	38	(17)	0	357
Dec.	3.3	0.63	181	1.9	12	(2)	190	2.00	224	0	0	190	49	(9)	0	587
Totals	20.3	50.2	2,826		72	(179)	2,719		1,368	(2,106)	(2,279)	439.8	297.8	(738.2)		

Peak Cumulative Storage (ac-ft.): 1,805

MAIN INPUT PARAMETERS

	Treatment Ponds	Corn	Storage Ponds	Month	Evapotranspiration Coefficient.
Overall Irr. Eff:		0.75			
Evapotranspiration Coefficient:		Varies	1		
Surface Areas (ac.):		810	176	April	0.31
Ponds 1, 2 and 3 storage, acre feet			345	May	0.43
Ponds 4A and 4B surface area (ac.):	42.8			June	0.81
Required new storage, acre feet			1,460	July	1.00
Land Required based on 15-foot depth of storage, acres			97.0	August	0.91
Winter Discharge Flow (mgd):			0.0	September	0.83

(1) Rainfall data is from Climatology of the United States, No. 20, for Klamath Falls.
(2) Average monthly (1999-2010) reference evapotranspiration data is from the Bureau of Reclamation's AgriMet station for Klamath Falls (KFLO).
(3) (Wastewater flow rate in mgd) x 3.07 ac-ft/mgd x (number of days in the month)
(3a) Wastewater flow rate in mgd
(4) Col. 1 x (Surface Area for Treatment Ponds) ÷ 12 in/ft
(5) Col. 2 x (Surface Area for Treatment Ponds) ÷ 12 in/ft; usage shown as a negative number.
(6a) Col. 4 + Col. 5 ; negative number indicates water drawn from storage.
(6b) Column 6a converted to mgd
(7) Col. 1 x (crop area) ÷ 12 in/ft
(8) - (Col. 2 x (Evapotranspiration Coefficient) x (Surface Area))/(Irrigation Efficiency) ; usage shown as a negative number.
(9) For months allowing irrigation (Apr.-Sep.), Col. 7 + Col. 8; otherwise, set equal to 0.
(10) Col. 6 + Col. 9 ; negative number indicates water drawn from storage.
(11) Col. 1 x (Surface Area for Storage Ponds) ÷ 12 in/ft
(12) - Col. 2 x (Surface Area for Storage Ponds) ÷ 12 in/ft; usage shown as a negative number.
(13) Assumed allowable river discharge; discharge amounts shown as a negative number (if applicable).
(14) Sum of columns 10 through 13 plus previous month's storage, cannot be negative. Field and pond surface areas can be adjusted to have a zero balance in September.

Appendix E

Capital Cost Estimates

E1: Klamath River Surface Water Discharge

E2: Class A Recycled Water for Agricultural Irrigation with Onsite Storage

E3: Facility Element Cost Estimate Details

E1. Klamath River Surface Water Discharge

PROJECT:	**WWTP Facilities Plan**
OWNER:	**South Suburban Sanitary District**
LOCATION:	**Klamath Falls, OR**
WYA Project #:	515-50-21-17
OPCC Manager:	Kathryn Gies
Reviewer:	Walt Meyer
Description of Work:	Capital Costs for Common Facilities
Type of Estimate:	Class 4
Date of This Estimate:	15-Feb-22

ELEMENT #	DESCRIPTION	UNIT COST	ANTICIPATED COST
21	Pond 4A Rehab	$4,330,000	$4,330,000
4	Pond 2/3 Solids Removal	$810,000	$810,000
22	Pond 2/3 Temperature Control Solar Bees	$220,000	$220,000
1	Condition Repairs	$550,000	$550,000
	SUBTOTAL		**$5,910,000**
	Project Phase-Level OPCC Contingency	20%	$1,182,000
	ENGINEER'S PRELIMINARY OPINION OF PROBABLE PROJECT COST		**$7,092,000**
	Changes and Unforeseen Conditions During Construction	5%	$354,600
	Engineering Design, Environmental Planning and Studies, Construction Management, ESDC, and Legal and Admin Costs	25%	$1,773,000
	ENGINEER'S PRELIMINARY OPINION OF PROBABLE TOTAL CAPITAL COST		**$9,219,600**

PROJECT:	**WWTP Facilities Plan**
OWNER:	**South Suburban Sanitary District**
LOCATION:	**Klamath Falls, OR**
WYA Project #:	515-50-21-17
OPCC Manager:	Kathryn Gies
Reviewer:	Walt Meyer
Description of Work:	Alternative 1A: MBR Treatment
Type of Estimate:	Class 4
Date of This Estimate:	15-Feb-22

ELEMENT #	DESCRIPTION	UNIT COST	ANTICIPATED COST
1	Condition Repairs	$550,000	$550,000
17	Influent Pipeline	$580,000	$580,000
6	Influent Pump Station	$1,870,000	$1,870,000
18	Membrane Bioreactor and Influent Screening	$23,580,000	$23,580,000
10	UV Disinfection	$2,330,000	$2,330,000
19	FKC Class A biosolids Treatment	$7,330,000	$7,330,000
20	Dewatered solids storage and equipment	$2,780,000	$2,780,000
21	Pond 4A Rehab	$4,330,000	$4,330,000
4	Pond 2 and 3 Solids Removal	$810,000	$810,000
22	Pond 2 and 3 Solar Bees	$220,000	$220,000
23	Operations/Lab Building	$1,760,000	$1,760,000
26	Plant Utilities	$1,330,000	$1,330,000
	SUBTOTAL		**$47,470,000**
	Project Phase-Level OPCC Contingency	20%	$9,494,000
	ENGINEER'S PRELIMINARY OPINION OF PROBABLE PROJECT COST		**$56,964,000**
	Changes and Unforeseen Conditions During Construction	5%	$2,850,000
	Engineering Design, Environmental Planning and Studies, Construction Management, ESDC, and Legal and Admin Costs	25%	$14,240,000
	ENGINEER'S PRELIMINARY OPINION OF PROBABLE TOTAL CAPITAL COST		**$74,050,000**

PROJECT:	**WWTP Facilities Plan**
OWNER:	**South Suburban Sanitary District**
LOCATION:	**Klamath Falls, OR**
WYA Project #:	515-50-21-17
OPCC Manager:	Kathryn Gies
Reviewer:	Walt Meyer
Description of Work:	Alternative 1B: E3 Treatment
Type of Estimate:	Class 4
Date of This Estimate:	15-Feb-22

ELEMENT #	DESCRIPTION	UNIT COST	ANTICIPATED COST
21	Pond 4A Rehab	$4,330,000	$4,330,000
4	Pond 2 and 3 Solids Removal	$810,000	$810,000
22	Pond 2 and 3 Solar Bees	$220,000	$220,000
1	Condition Repairs	$550,000	$550,000
	SUBTOTAL		**$5,910,000**
	Project Phase-Level OPCC Contingency	20%	$1,182,000
	ENGINEER'S PRELIMINARY OPINION OF PROBABLE PROJECT COST		**$7,092,000**
	Changes and Unforeseen Conditions During Construction	5%	$354,600
	Engineering Design, Environmental Planning and Studies, Construction Management, ESDC, and Legal and Admin Costs	25%	$1,773,000
	ENGINEER'S PRELIMINARY OPINION OF PROBABLE TOTAL CAPITAL COST		**$9,220,000**
	E3 Proposal		**$60,326,200**
	ENGINEER'S PRELIMINARY OPINION OF PROBABLE TOTAL CAPITAL COST		**$69,546,200**

E2. Class A Recycled Water for Agricultural Irrigation with Onsite Storage

PROJECT:	**WWTP Facilities Plan**
OWNER:	**South Suburban Sanitary District**
LOCATION:	**Klamath Falls, OR**
WYA Project #:	515-50-21-17
OPCC Manager:	Kathryn Gies
Reviewer:	Walt Meyer
Description of Work:	Alternative 3A: Recycled Water Chlorine
Type of Estimate:	Class 4
Date of This Estimate:	15-Feb-22

ELEMENT #	DESCRIPTION	UNIT COST	ANTICIPATED COST
1	Condition Repairs	$550,000	$550,000
2	Headworks and Site Improvements	$1,000,000	$1,000,000
3	Pond 4A and 4B Rehab	$9,220,000	$9,220,000
4	Pond 2 and 3 Solids Removal	$810,000	$810,000
5	Onsite Pond Conveyance	$940,000	$940,000
6	Pump Station to Treatment	$1,870,000	$1,870,000
7	Pond Algae Removal	$5,190,000	$5,190,000
8	Algae Drying Bed	$1,330,000	$1,330,000
9	**Disk Filters**	$2,040,000	$2,040,000
11	**Chlorine Disinfection**	$2,750,000	$2,750,000
6	Pump Station to Onsite Storage	$1,870,000	$1,870,000
12	Onsite Storage	$16,230,000	$16,230,000
13	SolarBee	$740,000	$740,000
14	Pump Station to Reuse Site	$8,890,000	$8,890,000
15	Conveyance Pipeline	$20,400,000	$20,400,000
16	Chlorine Residual	$100,000	$100,000
24	Irrigation Distribution	$2,550,000	$2,550,000
25	DAFT and Filter Chemical Feed System	$440,000	$440,000
26	Plant Utilities	$1,330,000	$1,330,000
	SUBTOTAL		**$78,250,000**
	Project Phase-Level OPCC Contingency	20%	$15,650,000
	ENGINEER'S PRELIMINARY OPINION OF PROBABLE PROJECT COST		**$93,900,000**
	Changes and Unforeseen Conditions During Construction	5%	$4,700,000
	Engineering Design, Environmental Planning and Studies, Construction Management, ESDC, and Legal and Admin Costs	25%	$23,480,000
	ENGINEER'S PRELIMINARY OPINION OF PROBABLE TOTAL CAPITAL COST		**$122,080,000**

	PROJECT:	**WWTP Facilities Plan**
	OWNER:	**South Suburban Sanitary District**
WEST YOST Water. Engineered.	**LOCATION:**	**Klamath Falls, OR**
	WYA Project #:	515-50-21-17
	OPCC Manager:	Kathryn Gies
	Reviewer:	Walt Meyer
	Description of Work:	Alternative 3B: Recycled Water UV
	Type of Estimate:	Class 4
	Date of This Estimate:	15-Feb-22

ELEMENT #	DESCRIPTION	UNIT COST	ANTICIPATED COST
1	Condition Repairs	$550,000	$550,000
2	Headworks and Site Improvements	$1,000,000	$1,000,000
3	Pond 4A and 4B Rehab	$9,220,000	$9,220,000
4	Pond 2 and 3 Solids Removal	$810,000	$810,000
5	Onsite Pond Conveyance	$940,000	$940,000
6	Pump Station to Treatment	$1,870,000	$1,870,000
7	Pond Algae Removal	$5,190,000	$5,190,000
8	Pond Algae Bed	$1,330,000	$1,330,000
9	**Disk Filters**	$2,040,000	$2,040,000
10	**UV Disinfection**	$2,330,000	$2,330,000
6	Pump Station to Onsite Storage	$1,870,000	$1,870,000
12	Onsite Storage	$16,230,000	$16,230,000
13	SolarBee	$740,000	$740,000
14	Pump Station to Reuse Site	$8,890,000	$8,890,000
15	Conveyance Pipeline	$20,400,000	$20,400,000
16	Chlorine Residual	$100,000	$100,000
24	Irrigation Distribution	$2,550,000	$2,550,000
25	DAFT and Filter Chemical Feed System	$440,000	$440,000
26	Plant Utilities	$1,330,000	$1,330,000
	SUBTOTAL		**$77,830,000**
	Project Phase-Level OPCC Contingency	20%	$15,566,000
	ENGINEER'S PRELIMINARY OPINION OF PROBABLE PROJECT COST		**$93,396,000**
	Changes and Unforeseen Conditions During Construction	5%	$4,670,000
	Engineering Design, Environmental Planning and Studies, Construction Management, ESDC, and Legal and Admin Costs	25%	$23,350,000
	ENGINEER'S PRELIMINARY OPINION OF PROBABLE TOTAL CAPITAL COST		**$121,420,000**

E3. Facility Element Cost Estimate Details

PROJECT:	WWTP Facilities Plan
OWNER:	South Suburban Sanitary District
LOCATION:	Klamath Falls, OR
WYA Project #:	515-50-21-17
Sheet Title:	CondRepair
Element #:	1

OPPC PROVIDED BY: Kathryn Gies
OPPC PREPARATION DATE: 15-Feb-22
REVIEWED BY: Walt Meyer

	DESCRIPTION	MATERIAL QTY	UNIT	COST	MATERIAL COST	INSTALL COST	TOTAL COST
1	Asphalt repaving	10,000	SF	$22	$220,000	$0	$220,000
2	Headworks Channel aeration blower	1	LS	$30,000	$30,000	$15,000	$45,000
3	Headworks Sump Pump replacement	1	LS	$5,000	$5,000	$1	$5,000
4	Ventilation Improvements	1	LS	$50,000	$50,000	$0	$50,000
5	Wet well spray system	1	LS	$15,000	$15,000	$7,500	$23,000
6							
7							
8							
9							
10							
	SUBTOTAL						**$343,000**
	Plant Paving, Grading, and Yard Piping				0%		$0
	Mechanical and Piping				5%		$17,000
	Electrical				10%		$34,000
	Instrumentation and Controls				10%		$34,000
	SUBTOTAL						**$430,000**
	Tax on Materials				0%		$0
	Contractor's Markup on Sub-Contractors' Work				5%		$3,000
	Contractor's Overhead and Profit				10%		$43,000
	Mobilization and Demobilization				7%		$30,000
	Contractor's General Conditions				10%		$43,000
	SUBTOTAL						**$550,000**
	Project Phase-Level OPCC Contingency				20%		$110,000
	ENGINEER'S PRELIMINARY OPINION OF PROBABLE CONSTRUCTION COST						**$660,000**
	Changes and Unforeseen Conditions During Construction				5%		$33,000
	Engineering Design, Environmental Planning and Studies, Construction Management,				25%		$165,000
	ENGINEER'S PRELIMINARY OPINION OF PROBABLE TOTAL CAPITAL COST						**$860,000**

PROJECT:	WWTP Facilities Plan
OWNER:	South Suburban Sanitary District
LOCATION:	Klamath Falls, OR
WYA Project #:	515-50-21-17
Sheet Title:	HW_Improve
Element #:	2

OPPC PROVIDED BY: Kathryn Gies
OPPC PREPARATION DATE: 15-Feb-22
REVIEWED BY: Walt Meyer

	DESCRIPTION	MATERIAL QTY	UNIT	COST	MATERIAL COST	INSTALL COST	TOTAL COST
1	Demo existing equipment	1	LS	$100,000	$100,000	$0	$100,000
2	Bar screen and Washer Compactor	1	LS	$250,000	$250,000	$125,000	$375,000
3	Headworks Bypass manual bar screen	1	LS	$100,000	$100,000	$50,000	$150,000
4							
5							
6							
7							
8							
9							
10							
	SUBTOTAL						**$625,000**
	Plant Paving, Grading, and Yard Piping				5%		$31,000
	Mechanical and Piping				5%		$31,000
	Electrical				7.5%		$47,000
	Instrumentation and Controls				7.5%		$47,000
	SUBTOTAL						**$780,000**
	Tax on Materials				0%		$0
	Contractor's Markup on Sub-Contractors' Work				5%		$5,000
	Contractor's Overhead and Profit				10%		$78,000
	Mobilization and Demobilization				7%		$55,000
	Contractor's General Conditions				10%		$78,000
	SUBTOTAL						**$1,000,000**
	Project Phase-Level OPCC Contingency				20%		$200,000
	ENGINEER'S PRELIMINARY OPINION OF PROBABLE CONSTRUCTION COST						**$1,200,000**
	Changes and Unforeseen Conditions During Construction				5%		$60,000
	Engineering Design, Environmental Planning and Studies, Construction Management, ESDC, and				25%		$300,000
	ENGINEER'S PRELIMINARY OPINION OF PROBABLE TOTAL CAPITAL COST						**$1,560,000**

PROJECT:	WWTP Facilities Plan
OWNER:	South Suburban Sanitary District
LOCATION:	Klamath Falls, OR
WYA Project #:	515-50-21-17
Sheet Title:	Pond Rehab_R
Element #:	3

OPPC PROVIDED BY: Kathryn Gies
OPPC PREPARATION DATE: 15-Feb-22
REVIEWED BY: Walt Meyer

	DESCRIPTION	MATERIAL QTY	UNIT	COST	MATERIAL COST	INSTALL COST	TOTAL COST
1	Temporary Flow Control Between 4A/4B	1	ls	$150,000	$150,000	$0	$150,000
2	4A HDPE Liner	700,000	SF	$3	$2,163,000	$0	$2,163,000
3	4B HDPE Liner	1,100,000	SF	$3	$3,399,000	$0	$3,399,000
4	Removal and Replacement of Aerators	1	LS	$50,000	$50,000	$0	$50,000
5	2" Sand	41	AC	$4,000	$164,000	$0	$164,000
6	Pond 4A and 4B Solids Removal	1	LS	$810,000	$810,000	$0	$810,000
7	4A/4B Levee	5,600	CY	$40	$224,000	$0	$224,000
8	Flow Control Structures	2	EA	$50,000	$100,000	$0	$100,000
9	24" Pipe (4A bypass)	500	LF	$400	$200,000	$0	$200,000
10							
	SUBTOTAL						**$7,260,000**
	Plant Paving, Grading, and Yard Piping				0%		$0
	Mechanical and Piping				0%		$0
	Electrical				0%		$0
	Instrumentation and Controls				0%		$0
	SUBTOTAL						**$7,260,000**
	Tax on Materials				0%		$0
	Contractor's Markup on Sub-Contractors' Work				5%		$0
	Contractor's Overhead and Profit				10%		$726,000
	Mobilization and Demobilization				7%		$508,000
	Contractor's General Conditions				10%		$726,000
	SUBTOTAL						**$9,220,000**
	Project Phase-Level OPCC Contingency				20%		$1,844,000
	ENGINEER'S PRELIMINARY OPINION OF PROBABLE CONSTRUCTION COST						**$11,060,000**
	Changes and Unforeseen Conditions During Construction				5%		$553,000
	Engineering Design, Environmental Planning and Studies, Construction Management,				25%		$2,765,000
	ENGINEER'S PRELIMINARY OPINION OF PROBABLE TOTAL CAPITAL COST						**$14,380,000**

PROJECT:	**WWTP Facilities Plan**
OWNER:	**South Suburban Sanitary District**
LOCATION:	**Klamath Falls, OR**
WYA Project #:	**515-50-21-17**
Sheet Title:	**Pond 2_3 Solids**
Element #:	**4**

OPPC PROVIDED BY: Kathryn Gies
OPPC PREPARATION DATE: 15-Feb-22
REVIEWED BY: Walt Meyer

	DESCRIPTION	MATERIAL QTY	UNIT	COST	MATERIAL COST	INSTALL COST	TOTAL COST
1	Removal of Pond 2 and 3 Solids Removal	1	LS	$640,000	$640,000	$0	$640,000
2							
3							
4							
5							
6							
7							
8							
9							
10							
	SUBTOTAL						**$640,000**
	Plant Paving, Grading, and Yard Piping				0%		$0
	Mechanical and Piping				0%		$0
	Electrical				0%		$0
	Instrumentation and Controls				0%		$0
	SUBTOTAL						**$640,000**
	Tax on Materials				0%		$0
	Contractor's Markup on Sub-Contractors' Work				5%		$0
	Contractor's Overhead and Profit				10%		$64,000
	Mobilization and Demobilization				7%		$45,000
	Contractor's General Conditions				10%		$64,000
	SUBTOTAL						**$810,000**
	Project Phase-Level OPCC Contingency				20%		$162,000
	ENGINEER'S PRELIMINARY OPINION OF PROBABLE CONSTRUCTION COST						**$970,000**
	Changes and Unforeseen Conditions During Construction				5%		$49,000
	Engineering Design, Environmental Planning and Studies, Construction Management,				25%		$243,000
	ENGINEER'S PRELIMINARY OPINION OF PROBABLE TOTAL CAPITAL COST						**$1,260,000**

PROJECT:	**WWTP Facilities Plan**
OWNER:	**South Suburban Sanitary District**
LOCATION:	**Klamath Falls, OR**
WYA Project #:	**515-50-21-17**
Sheet Title:	**Pond Conveyance R**
Element #:	**5**

OPPC PROVIDED BY: Kathryn Gies
OPPC PREPARATION DATE: 15-Feb-22
REVIEWED BY: Walt Meyer

	DESCRIPTION	MATERIAL QTY	UNIT	COST	MATERIAL COST	INSTALL COST	TOTAL COST
1	Pond 4/3 Effluent Structure	16	cy	$1,200	$19,000	$19,000	$38,000
2	Pond 1 Effluent Structure	13	cy	$1,200	$15,000	$15,000	$30,000
3	Pond 2/3 Effluent Structure	16	cy	$1,200	$19,200	$19,200	$38,000
4	Slide gate	3	EA	$25,000	$75,000	$75,000	$150,000
5	Access hatch	2	EA	$10,000	$20,000	$0	$20,000
6	Pond 4->3 Conveyance Pipe (14" diameter)	50	LF	$240	$12,000	$0	$12,000
7	Pond 3->2 Conveyance Pipe (14" diameter)	50	LF	$240	$12,000	$0	$12,000
8	Pond 2->1 Conveyance Pipe (14" diameter)	50	LF	$240	$12,000	$0	$12,000
9	Pond 1 Effluent Pipe to control structure (14" diameter)	30	LF	$240	$7,200	$0	$7,000
10	Pond 1 Effluent Pipe to Pond 2/3	1,600	LF	$240	$384,000	$0	$384,000
	SUBTOTAL						**$703,000**
	Plant Paving, Grading, and Yard Piping				5%		$35,000
	Mechanical and Piping				0%		$0
	Electrical				0%		$0
	Instrumentation and Controls				0%		$0
	SUBTOTAL						**$740,000**
	Tax on Materials				0%		$0
	Contractor's Markup on Sub-Contractors' Work				5%		$0
	Contractor's Overhead and Profit				10%		$74,000
	Mobilization and Demobilization				7%		$52,000
	Contractor's General Conditions				10%		$74,000
	SUBTOTAL						**$940,000**
	Project Phase-Level OPCC Contingency				20%		$188,000
	ENGINEER'S PRELIMINARY OPINION OF PROBABLE CONSTRUCTION COST						**$1,130,000**
	Changes and Unforeseen Conditions During Construction				5%		$57,000
	Engineering Design, Environmental Planning and Studies, Construction Management, ESDC, and				25%		$283,000
	ENGINEER'S PRELIMINARY OPINION OF PROBABLE TOTAL CAPITAL COST						**$1,470,000**

PROJECT:	WWTP Facilities Plan
OWNER:	South Suburban Sanitary District
LOCATION:	Klamath Falls, OR
WYA Project #:	515-50-21-17
Sheet Title:	LowHeadPS
Element #:	6

OPPC PROVIDED BY: Kathryn Gies
OPPC PREPARATION DATE: 15-Feb-22
REVIEWED BY: Walt Meyer

	DESCRIPTION	MATERIAL QTY	UNIT	COST	MATERIAL COST	INSTALL COST	TOTAL COST
1	4 mgd Pump Station Cost Curve	1	LS	$1,124,178	$1,124,178	$0	$1,124,000
2							
3							
4							
5							
6							
7							
8							
9							
10							
	SUBTOTAL						**$1,124,000**
	Plant Paving, Grading, and Yard Piping				5%		$56,000
	Mechanical and Piping				5%		$56,000
	Electrical				10%		$112,000
	Instrumentation and Controls				10%		$112,000
	SUBTOTAL						**$1,460,000**
	Tax on Materials				0%		$0
	Contractor's Markup on Sub-Contractors' Work				5%		$11,000
	Contractor's Overhead and Profit				10%		$146,000
	Mobilization and Demobilization				7%		$102,000
	Contractor's General Conditions				10%		$146,000
	SUBTOTAL						**$1,870,000**
	Project Phase-Level OPCC Contingency				20%		$374,000
	ENGINEER'S PRELIMINARY OPINION OF PROBABLE CONSTRUCTION COST						**$2,240,000**
	Changes and Unforeseen Conditions During Construction				5%		$112,000
	Engineering Design, Environmental Planning and Studies, Construction Management,				25%		$560,000
	ENGINEER'S PRELIMINARY OPINION OF PROBABLE TOTAL CAPITAL COST						**$2,910,000**

PROJECT:	**WWTP Facilities Plan**
OWNER:	**South Suburban Sanitary District**
LOCATION:	**Klamath Falls, OR**
WYA Project #:	**515-50-21-17**
Sheet Title:	**Pond Algae Removal**
Element #:	**7**

OPPC PROVIDED BY: Kathryn Gies
OPPC PREPARATION DATE: 15-Feb-22
REVIEWED BY: Walt Meyer

	DESCRIPTION	MATERIAL QTY	UNIT	COST	MATERIAL COST	INSTALL COST	TOTAL COST
1	Slab on Grade	170	CY	$700	$119,000	$119,000	$238,000
2	Tank Structure	210	CY	$1,100	$231,000	$231,000	$462,000
3	DAFT Equipment	1	unit	$860,000	$860,000	$430,000	$1,290,000
4	Solids Pump	2	unit	$25,000	$50,000	$25,000	$75,000
5	10' x 10' Building	100	sf	$400	$40,000	$40,000	$80,000
6	Influent Flow Meter	1	meter	$12,000	$12,000	$6,000	$18,000
7	Awning	3,200	sf	$126	$402,963	$402,963	$806,000
8	External Feed Pump	3	pumps	$25,000	$75,000	$75,000	$150,000
9							
11							
12							
	SUBTOTAL						**$3,119,000**
	Plant Paving, Grading, and Yard Piping				5%		$156,000
	Mechanical and Piping				5%		$156,000
	Electrical				10%		$312,000
	Instrumentation and Controls				10%		$312,000
	SUBTOTAL						**$4,060,000**
	Tax on Materials				0%		$0
	Contractor's Markup on Sub-Contractors' Work				5%		$31,000
	Contractor's Overhead and Profit				10%		$406,000
	Mobilization and Demobilization				7%		$284,000
	Contractor's General Conditions				10%		$406,000
	SUBTOTAL						**$5,190,000**
	Project Phase-Level OPCC Contingency				20%		$1,038,000
	ENGINEER'S PRELIMINARY OPINION OF PROBABLE CONSTRUCTION COST						**$6,230,000**
	Changes and Unforeseen Conditions During Construction				5%		$312,000
	Engineering Design, Environmental Planning and Studies, Construction Management, ESDC, and				25%		$1,558,000
	ENGINEER'S PRELIMINARY OPINION OF PROBABLE TOTAL CAPITAL COST						**$8,100,000**

WEST YOST Water. Engineered.

PROJECT: WWTP Facilities Plan
OWNER: South Suburban Sanitary District
LOCATION: Klamath Falls, OR
WYA Project #: 515-50-21-17
Sheet Title: Pond Algae Bed
Element #: 8

OPPC PROVIDED BY: Kathryn Gies
OPPC PREPARATION DATE: 15-Feb-22
REVIEWED BY: Walt Meyer

	DESCRIPTION	MATERIAL QTY	UNIT	COST	MATERIAL COST	INSTALL COST	TOTAL COST
1	HDPE Liner	32,400	SF	$3	$100,116	$0	$100,000
2	6" Sand	600	CY	$15	$9,000	$0	$9,000
3	9" Gravel	900	CY	$20	$18,000	$0	$18,000
4	4" Asphalt	32,400	SF	$23	$754,596	$0	$755,000
5	Berm	3,480	CY	$20	$69,600	$0	$70,000
6							
7							
8							
9							
11							
12							
	SUBTOTAL						**$952,000**
	Plant Paving, Grading, and Yard Piping				5%		$48,000
	Mechanical and Piping				5%		$48,000
	Electrical				0%		$0
	Instrumentation and Controls				0%		$0
	SUBTOTAL						**$1,050,000**
	Tax on Materials				0%		$0
	Contractor's Markup on Sub-Contractors' Work				5%		$0
	Contractor's Overhead and Profit				10%		$105,000
	Mobilization and Demobilization				7%		$74,000
	Contractor's General Conditions				10%		$105,000
	SUBTOTAL						**$1,330,000**
	Project Phase-Level OPCC Contingency				20%		$266,000
	ENGINEER'S PRELIMINARY OPINION OF PROBABLE CONSTRUCTION COST						**$1,600,000**
	Changes and Unforeseen Conditions During Construction				5%		$80,000
	Engineering Design, Environmental Planning and Studies, Construction Management, ESDC, and				25%		$400,000
	ENGINEER'S PRELIMINARY OPINION OF PROBABLE TOTAL CAPITAL COST						**$2,080,000**

PROJECT:	WWTP Facilities Plan
OWNER:	South Suburban Sanitary District
LOCATION:	Klamath Falls, OR
WYA Project #:	515-50-21-17
Sheet Title:	Disk Filters
Element #:	9

OPPC PROVIDED BY: Kathryn Gies
OPPC PREPARATION DATE: 15-Feb-22
REVIEWED BY: Walt Meyer

	DESCRIPTION	MATERIAL QTY	UNIT	COST	MATERIAL COST	INSTALL COST	TOTAL COST
1	Slab on Grade	56	cu. yd.	$700	$39,400	$39,400	$79,000
2	Cloth Disk Filter Equipment (includes shipping)	3	units	$237,207	$712,000	$356,000	$1,068,000
3	10' x 10' Building (for chemical storage)	100	sf	$400	$40,000	$40,000	$80,000
4							
5							
6							
7							
8							
9							
10							
	SUBTOTAL						**$1,227,000**
	Plant Paving, Grading, and Yard Piping				5%		$61,000
	Mechanical and Piping				5%		$61,000
	Electrical				10%		$123,000
	Instrumentation and Controls				10%		$123,000
	SUBTOTAL						**$1,600,000**
	Tax on Materials				0%		$0
	Contractor's Markup on Sub-Contractors' Work				5%		$12,000
	Contractor's Overhead and Profit				10%		$160,000
	Mobilization and Demobilization				7%		$112,000
	Contractor's General Conditions				10%		$160,000
	SUBTOTAL						**$2,040,000**
	Project Phase-Level OPCC Contingency				20%		$408,000
	ENGINEER'S PRELIMINARY OPINION OF PROBABLE CONSTRUCTION COST						**$2,450,000**
	Changes and Unforeseen Conditions During Construction				5%		$123,000
	Engineering Design, Environmental Planning and Studies, Construction Management, ESDC, and				25%		$613,000
	ENGINEER'S PRELIMINARY OPINION OF PROBABLE TOTAL CAPITAL COST						**$3,190,000**

PROJECT:	**WWTP Facilities Plan**
OWNER:	**South Suburban Sanitary District**
LOCATION:	**Klamath Falls, OR**
WYA Project #:	**515-50-21-17**
Sheet Title:	**UV**
Element #:	**10**

OPPC PROVIDED BY: Kathryn Gies
OPPC PREPARATION DATE: 15-Feb-22
REVIEWED BY: Walt Meyer

	DESCRIPTION	MATERIAL QTY	UNIT	COST	MATERIAL COST	INSTALL COST	TOTAL COST
1	Concrete Channel	25	CY	$700	$17,500	$0	$18,000
2	Calgon Carbon UV System	1	LS	$758,000	$758,000	$379,000	$1,137,000
3	30' x 10' building	300	SF	$400	$120,000	$120,000	$240,000
4							
5							
6							
7							
8							
9							
10							
	SUBTOTAL						**$1,395,000**
	Plant Paving, Grading, and Yard Piping				5%		$70,000
	Mechanical and Piping				5%		$70,000
	Electrical				10%		$140,000
	Instrumentation and Controls				10%		$140,000
	SUBTOTAL						**$1,820,000**
	Tax on Materials				0%		$0
	Contractor's Markup on Sub-Contractors' Work				5%		$14,000
	Contractor's Overhead and Profit				10%		$182,000
	Mobilization and Demobilization				7%		$127,000
	Contractor's General Conditions				10%		$182,000
	SUBTOTAL						**$2,330,000**
	Project Phase-Level OPCC Contingency				20%		$466,000
	ENGINEER'S PRELIMINARY OPINION OF PROBABLE CONSTRUCTION COST						**$2,800,000**
	Changes and Unforeseen Conditions During Construction				5%		$140,000
	Engineering Design, Environmental Planning and Studies, Construction Management,				25%		$700,000
	ENGINEER'S PRELIMINARY OPINION OF PROBABLE TOTAL CAPITAL COST						**$3,640,000**

PROJECT:	**WWTP Facilities Plan**
OWNER:	**South Suburban Sanitary District**
LOCATION:	**Klamath Falls, OR**
WYA Project #:	**515-50-21-17**
Sheet Title:	**ChlorCont**
Element #:	**11**

OPPC PROVIDED BY: Kathryn Gies
OPPC PREPARATION DATE: 15-Feb-22
REVIEWED BY: Walt Meyer

	DESCRIPTION	MATERIAL QTY	UNIT	COST	MATERIAL COST	INSTALL COST	TOTAL COST
1	Excavation	375	CY	$12	$4,505	$0	$5,000
2	Chlorine contactor concrete volume	828	CY	$700	$579,791	$0	$580,000
3	Steel cover	4,856	SF	$16	$79,639	$0	$80,000
4	On-site Hypochlorite Generation System	1	LS	$175,000	$175,000	$87,500	$263,000
5	Chemical Induction Mixer	1	LS	$25,000	$25,000	$12,500	$38,000
6	Building	726	SF	$400	$290,400	$290,400	$581,000
7	Clorine Residual Monitoring	1	LS	$25,000	$25,000	$25,000	$50,000
8	Slide Gates	2	EA	$25,000	$50,000	$0	$50,000
9	8" Drain Valve	2	EA	$1,500	$3,000	$0	$3,000
10							
	SUBTOTAL						**$1,650,000**
	Plant Paving, Grading, and Yard Piping				5%		$83,000
	Mechanical and Piping				5%		$83,000
	Electrical				10%		$165,000
	Instrumentation and Controls				10%		$165,000
	SUBTOTAL						**$2,150,000**
	Tax on Materials				0%		$0
	Contractor's Markup on Sub-Contractors' Work				5%		$17,000
	Contractor's Overhead and Profit				10%		$215,000
	Mobilization and Demobilization				7%		$151,000
	Contractor's General Conditions				10%		$215,000
	SUBTOTAL						**$2,750,000**
	Project Phase-Level OPCC Contingency				20%		$550,000
	ENGINEER'S PRELIMINARY OPINION OF PROBABLE CONSTRUCTION COST						**$3,300,000**
	Changes and Unforeseen Conditions During Construction				5%		$165,000
	Engineering Design, Environmental Planning and Studies, Construction Management, ESDC, and				25%		$825,000
	ENGINEER'S PRELIMINARY OPINION OF PROBABLE TOTAL CAPITAL COST						**$4,290,000**

PROJECT:	**WWTP Facilities Plan**
OWNER:	**South Suburban Sanitary District**
LOCATION:	**Klamath Falls, OR**
WYA Project #:	**515-50-21-17**
Sheet Title:	**Storage**
Element #:	**12**

OPPC PROVIDED BY: Kathryn Gies
OPPC PREPARATION DATE: 15-Feb-22
REVIEWED BY: Walt Meyer

	DESCRIPTION	MATERIAL QTY	UNIT	COST	MATERIAL COST	INSTALL COST	TOTAL COST
1	Storage Pond Cost						$14,031,127
2	24" Pipeline Storage to Force Main Pump Station	200	LF	$410	$82,000	$0	$82,000
3							
4							
5							
6							
7							
8							
9							
10							
	SUBTOTAL						**$14,113,000**
	Plant Paving, Grading, and Yard Piping				0%		$0
	Mechanical and Piping				0%		$0
	Electrical				0%		$0
	Instrumentation and Controls				0%		$0
	SUBTOTAL						**$14,110,000**
	Tax on Materials				0%		$0
	Contractor's Markup on Sub-Contractors' Work				5%		$0
	Contractor's Overhead and Profit				15%		$2,117,000
	Mobilization and Demobilization				0%		$0
	Contractor's General Conditions				0%		$0
	SUBTOTAL						**$16,230,000**
	Project Phase-Level OPCC Contingency				20%		$3,246,000
	ENGINEER'S PRELIMINARY OPINION OF PROBABLE CONSTRUCTION COST						**$19,480,000**
	Changes and Unforeseen Conditions During Construction				5%		$974,000
	Engineering Design, Environmental Planning and Studies, Construction Management,				25%		$4,870,000
	ENGINEER'S PRELIMINARY OPINION OF PROBABLE TOTAL CAPITAL COST						**$25,320,000**

PROJECT:	**WWTP Facilities Plan**
OWNER:	**South Suburban Sanitary District**
LOCATION:	**Klamath Falls, OR**
WYA Project #:	**515-50-21-17**
Sheet Title:	**SolarBee**
Element #:	**13**

OPPC PROVIDED BY: Kathryn Gies
OPPC PREPARATION DATE: 15-Feb-22
REVIEWED BY: Walt Meyer

	DESCRIPTION	MATERIAL QTY	UNIT	COST	MATERIAL COST	INSTALL COST	TOTAL COST
1	Solar Bee	14	units	$41,282	$577,953	$0	$578,000
2							
3							
4							
5							
6							
7							
8							
9							
10							
	SUBTOTAL						**$578,000**
	Plant Paving, Grading, and Yard Piping				0%		$0
	Mechanical and Piping				0%		$0
	Electrical				0%		$0
	Instrumentation and Controls				0%		$0
	SUBTOTAL						**$580,000**
	Tax on Materials				0%		$0
	Contractor's Markup on Sub-Contractors' Work				5%		$0
	Contractor's Overhead and Profit				10%		$58,000
	Mobilization and Demobilization				7%		$41,000
	Contractor's General Conditions				10%		$58,000
	SUBTOTAL						**$740,000**
	Project Phase-Level OPCC Contingency				20%		$148,000
	ENGINEER'S PRELIMINARY OPINION OF PROBABLE CONSTRUCTION COST						**$890,000**
	Changes and Unforeseen Conditions During Construction				5%		$45,000
	Engineering Design, Environmental Planning and Studies, Construction Management, ESDC, and				25%		$223,000
	ENGINEER'S PRELIMINARY OPINION OF PROBABLE TOTAL CAPITAL COST						**$1,160,000**

PROJECT:	WWTP Facilities Plan
OWNER:	South Suburban Sanitary District
LOCATION:	Klamath Falls, OR
WYA Project #:	515-50-21-17
Sheet Title:	HenzelEffPS
Element #:	14

OPPC PROVIDED BY: Kathryn Gies
OPPC PREPARATION DATE: 15-Feb-22
REVIEWED BY: Walt Meyer

	DESCRIPTION	MATERIAL QTY	UNIT	COST	MATERIAL COST	INSTALL COST	TOTAL COST
1	8.4 mgd Pump Station Cost Curve	1	LS	$5,355,454	$5,355,454	$0	$5,355,000
2							
3							
4							
5							
6							
7							
8							
9							
10							
	SUBTOTAL						**$5,355,000**
	Plant Paving, Grading, and Yard Piping				5%		$268,000
	Mechanical and Piping				5%		$268,000
	Electrical				10%		$536,000
	Instrumentation and Controls				10%		$536,000
	SUBTOTAL						**$6,960,000**
	Tax on Materials				0%		$0
	Contractor's Markup on Sub-Contractors' Work				5%		$54,000
	Contractor's Overhead and Profit				10%		$696,000
	Mobilization and Demobilization				7%		$487,000
	Contractor's General Conditions				10%		$696,000
	SUBTOTAL						**$8,890,000**
	Project Phase-Level OPCC Contingency				20%		$1,778,000
	ENGINEER'S PRELIMINARY OPINION OF PROBABLE CONSTRUCTION COST						**$10,670,000**
	Changes and Unforeseen Conditions During Construction				5%		$534,000
	Engineering Design, Environmental Planning and Studies, Construction Management,				25%		$2,668,000
	ENGINEER'S PRELIMINARY OPINION OF PROBABLE TOTAL CAPITAL COST						**$13,870,000**

PROJECT:	WWTP Facilities Plan
OWNER:	South Suburban Sanitary District
LOCATION:	Klamath Falls, OR
WYA Project #:	515-50-21-17
Sheet Title:	Henzel Pipeline-B
Element #:	15

OPPC PROVIDED BY: Kathryn Gies
OPPC PREPARATION DATE: 15-Feb-22
REVIEWED BY: Walt Meyer

	DESCRIPTION	MATERIAL QTY	UNIT	COST	MATERIAL COST	INSTALL COST	TOTAL COST
1	24-IN Forcemain	45,200	LF	$400	$18,080,000	$0	$18,080,000
2	Trenchless Crossings	1,700	LF	$1,100	$1,870,000	$0	$1,870,000
3	Air Relief Valves	15	LF	$30,000	$450,000	$0	$450,000
4							$0
5							$0
6							$0
7							$0
8							$0
9							$0
10							$0
							$0
	SUBTOTAL						**$20,400,000**
	Plant Paving, Grading, and Yard Piping				0%		$0
	Mechanical and Piping				0%		$0
	Electrical				0%		$0
	Instrumentation and Controls				0%		$0
	SUBTOTAL						**$20,400,000**
	Tax on Materials				0%		$0
	Contractor's Markup on Sub-Contractors' Work				5%		$0
	Contractor's Overhead and Profit				0%		$0
	Mobilization and Demobilization				0%		$0
	Contractor's General Conditions				0%		$0
	SUBTOTAL						**$20,400,000**
	Project Phase-Level OPCC Contingency				20%		$4,080,000
	ENGINEER'S PRELIMINARY OPINION OF PROBABLE CONSTRUCTION COST						**$24,480,000**
	Changes and Unforeseen Conditions During Construction				5%		$1,224,000
	Engineering Design, Environmental Planning and Studies, Construction Management,				25%		$6,120,000
	ENGINEER'S PRELIMINARY OPINION OF PROBABLE TOTAL CAPITAL COST						**$31,820,000**

PROJECT:	WWTP Facilities Plan
OWNER:	South Suburban Sanitary District
LOCATION:	Klamath Falls, OR
WYA Project #:	515-50-21-17
Sheet Title:	Chlrne Rsdl
Element #:	16

OPPC PROVIDED BY: Kathryn Gies
OPPC PREPARATION DATE: 15-Feb-22
REVIEWED BY: Walt Meyer

	DESCRIPTION	MATERIAL QTY	UNIT	COST	MATERIAL COST	INSTALL COST	TOTAL COST
1	10' x 10' Tank Pad 24" Thickness	10	CY	$700	$7,000	$0	$7,000
2	Peristaltic Chemical Feed Pump	2	EA	$6,148	$12,296	$3,074	$15,000
3	Emergency Shower	1	EA	$2,000	$2,000	$2,000	$4,000
4	10' x 10' Building	100	SF	$225	$22,500	$0	$23,000
5	Piping, Valving, Operators	1	LS	$10,000	$10,000	$0	$10,000
6							
7							
8							
9							
10							
	SUBTOTAL						**$59,000**
	Plant Paving, Grading, and Yard Piping				5%		$3,000
	Mechanical and Piping				5%		$3,000
	Electrical				10%		$6,000
	Instrumentation and Controls				10%		$6,000
	SUBTOTAL						**$80,000**
	Tax on Materials				0%		$0
	Contractor's Markup on Sub-Contractors' Work				5%		$1,000
	Contractor's Overhead and Profit				10%		$8,000
	Mobilization and Demobilization				7%		$6,000
	Contractor's General Conditions				10%		$8,000
	SUBTOTAL						**$100,000**
	Project Phase-Level OPCC Contingency				20%		$20,000
	ENGINEER'S PRELIMINARY OPINION OF PROBABLE CONSTRUCTION COST						**$120,000**
	Changes and Unforeseen Conditions During Construction				5%		$6,000
	Engineering Design, Environmental Planning and Studies, Construction Management,				25%		$30,000
	ENGINEER'S PRELIMINARY OPINION OF PROBABLE TOTAL CAPITAL COST						**$160,000**

PROJECT:	WWTP Facilities Plan
OWNER:	South Suburban Sanitary District
LOCATION:	Klamath Falls, OR
WYA Project #:	515-50-21-17
Sheet Title:	Influent Pipe
Element #:	17

OPPC PROVIDED BY: Kathryn Gies
OPPC PREPARATION DATE: 15-Feb-22
REVIEWED BY: Walt Meyer

	DESCRIPTION	MATERIAL QTY	UNIT	COST	MATERIAL COST	INSTALL COST	TOTAL COST
1	Influent Pipe (14" diameter)	2,250	LF	$204	$459,000	$0	$459,000
2							
3							
4							
5							
6							
7							
8							
9							
10							
	SUBTOTAL						**$459,000**
	Plant Paving, Grading, and Yard Piping				0%		$0
	Mechanical and Piping				0%		$0
	Electrical				0%		$0
	Instrumentation and Controls				0%		$0
	SUBTOTAL						**$460,000**
	Tax on Materials				0%		$0
	Contractor's Markup on Sub-Contractors' Work				5%		$0
	Contractor's Overhead and Profit				10%		$46,000
	Mobilization and Demobilization				7%		$32,000
	Contractor's General Conditions				10%		$46,000
	SUBTOTAL						**$580,000**
	Project Phase-Level OPCC Contingency				20%		$116,000
	ENGINEER'S PRELIMINARY OPINION OF PROBABLE CONSTRUCTION COST						**$700,000**
	Changes and Unforeseen Conditions During Construction				5%		$35,000
	Engineering Design, Environmental Planning and Studies, Construction Management, ESDC, and				25%		$175,000
	ENGINEER'S PRELIMINARY OPINION OF PROBABLE TOTAL CAPITAL COST						**$910,000**

PROJECT:	WWTP Facilities Plan
OWNER:	South Suburban Sanitary District
LOCATION:	Klamath Falls, OR
WYA Project #:	515-50-21-17
Sheet Title:	MBR
Element #:	18

OPPC PROVIDED BY: Kathryn Gies
OPPC PREPARATION DATE: 15-Feb-22
REVIEWED BY: Walt Meyer

	DESCRIPTION	MATERIAL QTY	UNIT	COST	MATERIAL COST	INSTALL COST	TOTAL COST
1	Excavation	3,000	CY	$12	$36,000	$0	$36,000
2	Filter Fabric	2,500	SF	$2	$5,000	$0	$5,000
3	Drain Rock	855	CY	$25	$21,375	$0	$21,000
4	Wall Concrete	630	CY	$1,100	$693,000	$0	$693,000
5	Slab on Grade	2,500	CY	$700	$1,750,000	$0	$1,750,000
6	Fibracast 4 MGD MBR System	1	LS	$3,500,000	$3,500,000	$1,050,000	$4,550,000
7	Permeate Pumps	3	EA	$75,000	$225,000	$225,000	$450,000
8	Slide Gates	10	EA	$25,000	$250,000	$250,000	$500,000
9	Submersible High Speed Mixers for Anaerobic/Anoxic Zones	8	EA	$10,000	$80,000	$80,000	$160,000
10	Feed Forward Submersible Pumps	4	EA	$60,000	$240,000	$240,000	$480,000
11	MBR Process Aeration Blowers	3	EA	$300,000	$900,000	$900,000	$1,800,000
12	Huber Rotary Drum Fine Screens	2	EA	$150,000	$300,000	$300,000	$600,000
13	2nd Return Stream Pump	4	EA	$40,000	$160,000	$160,000	$320,000
14	MBR Process Aeration Diffusers in Aerobic Zones	4	EA	$150,000	$600,000	$600,000	$1,200,000
15	Building	300	SF	$400	$120,000	$0	$120,000
	SUBTOTAL						**$12,685,000**
	Plant Paving, Grading, and Yard Piping				5%		$634,000
	Mechanical and Piping				5%		$634,000
	Electrical				25%		$3,171,000
	Instrumentation and Controls				10%		$1,269,000
	SUBTOTAL						**$18,390,000**
	Tax on Materials				0%		$0
	Contractor's Markup on Sub-Contractors' Work				5%		$222,000
	Contractor's Overhead and Profit				10%		$1,839,000
	Mobilization and Demobilization				7%		$1,287,000
	Contractor's General Conditions				10%		$1,839,000
	SUBTOTAL						**$23,580,000**
	Project Phase-Level OPCC Contingency				20%		$4,716,000
	ENGINEER'S PRELIMINARY OPINION OF PROBABLE CONSTRUCTION COST						**$28,300,000**
	Changes and Unforeseen Conditions During Construction				5%		$1,415,000
	Engineering Design, Environmental Planning and Studies, Construction Management, ESDC, and				25%		$7,075,000
	ENGINEER'S PRELIMINARY OPINION OF PROBABLE TOTAL CAPITAL COST						**$36,790,000**

PROJECT:	WWTP Facilities Plan
OWNER:	South Suburban Sanitary District
LOCATION:	Klamath Falls, OR
WYA Project #:	515-50-21-17
Sheet Title:	FKC
Element #:	19

OPPC PROVIDED BY: Kathryn Gies
OPPC PREPARATION DATE: 15-Feb-22
REVIEWED BY: Walt Meyer

	DESCRIPTION	MATERIAL QTY	UNIT	COST	MATERIAL COST	INSTALL COST	TOTAL COST
1	50' x 20' Tank Pad 24" Thickness	70	CY	$700	$49,000	$0	$49,000
2	FKC Screw Press Equipment Package	2	EA	$1,384,300	$2,768,600	$692,150	$3,461,000
3	42' x 54' Dewatering Building	2,268	SF	$400	$907,200	$0	$907,000
4							
5							
6							
7							
8							
9							
10							
	SUBTOTAL						**$4,417,000**
	Plant Paving, Grading, and Yard Piping				5%		$221,000
	Mechanical and Piping				5%		$221,000
	Electrical				10%		$442,000
	Instrumentation and Controls				10%		$442,000
	SUBTOTAL						**$5,740,000**
	Tax on Materials				0%		$0
	Contractor's Markup on Sub-Contractors' Work				5%		$44,000
	Contractor's Overhead and Profit				10%		$574,000
	Mobilization and Demobilization				7%		$402,000
	Contractor's General Conditions				10%		$574,000
	SUBTOTAL						**$7,330,000**
	Project Phase-Level OPCC Contingency				20%		$1,466,000
	ENGINEER'S PRELIMINARY OPINION OF PROBABLE CONSTRUCTION COST						**$8,800,000**
	Changes and Unforeseen Conditions During Construction				5%		$440,000
	Engineering Design, Environmental Planning and Studies, Construction Management,				25%		$2,200,000
	ENGINEER'S PRELIMINARY OPINION OF PROBABLE TOTAL CAPITAL COST						**$11,440,000**

PROJECT:	**WWTP Facilities Plan**
OWNER:	**South Suburban Sanitary District**
LOCATION:	**Klamath Falls, OR**
WYA Project #:	**515-50-21-17**
Sheet Title:	**Dewatered Store&Equip**
Element #:	**20**

OPPC PROVIDED BY: Kathryn Gies
OPPC PREPARATION DATE: 15-Feb-22
REVIEWED BY: Walt Meyer

	DESCRIPTION	MATERIAL QTY	UNIT	COST	MATERIAL COST	INSTALL COST	TOTAL COST
1	Concrete Pad	1,160	CY	$700	$812,000	$0	$812,000
2	Concrete Divider Walls, 6'	140	CY	$1,100	$154,000	$0	$154,000
3	Concret Exterior Walls	210	CY	$1,100	$231,000	$0	$231,000
4	Front End Loader	1	LS	$420,000	$420,000	$0	$420,000
5	Canopy	18,780	SF	$20	$375,600	$0	$376,000
6							
7							
8							
9							
10							
	SUBTOTAL						**$1,993,000**
	Plant Paving, Grading, and Yard Piping				5%		$100,000
	Mechanical and Piping				5%		$100,000
	Electrical				0%		$0
	Instrumentation and Controls				0%		$0
	SUBTOTAL						**$2,190,000**
	Tax on Materials				0%		$0
	Contractor's Markup on Sub-Contractors' Work				5%		$0
	Contractor's Overhead and Profit				10%		$219,000
	Mobilization and Demobilization				7%		$153,000
	Contractor's General Conditions				10%		$219,000
	SUBTOTAL						**$2,780,000**
	Project Phase-Level OPCC Contingency				20%		$556,000
	ENGINEER'S PRELIMINARY OPINION OF PROBABLE CONSTRUCTION COST						**$3,340,000**
	Changes and Unforeseen Conditions During Construction				5%		$167,000
	Engineering Design, Environmental Planning and Studies, Construction Management,				25%		$835,000
	ENGINEER'S PRELIMINARY OPINION OF PROBABLE TOTAL CAPITAL COST						**$4,340,000**

PROJECT:	WWTP Facilities Plan
OWNER:	South Suburban Sanitary District
LOCATION:	Klamath Falls, OR
WYA Project #:	515-50-21-17
Sheet Title:	Pond Rehab_S
Element #:	21

OPPC PROVIDED BY: Kathryn Gies
OPPC PREPARATION DATE: 15-Feb-22
REVIEWED BY: Walt Meyer

	DESCRIPTION	MATERIAL QTY	UNIT	COST	MATERIAL COST	INSTALL COST	TOTAL COST
1	4A HDPE Liner	700,000	SF	$3	$2,163,000	$0	$2,163,000
2	Removal and Replacement of Aerators	1	LS	$50,000	$50,000	$0	$50,000
3	2" Sand	16	AC	$4,000	$64,000	$0	$64,000
4	Pond 4A and 4B Solids Removal	1	LS	$810,000	$810,000	$0	$810,000
5	4A/4B Levee	5,600	CY	$40	$224,000	$0	$224,000
6	Flow Control Structures	2	EA	$50,000	$100,000	$0	$100,000
7							
8							
9							
10							
	SUBTOTAL						**$3,411,000**
	Plant Paving, Grading, and Yard Piping				0%		$0
	Mechanical and Piping				0%		$0
	Electrical				0%		$0
	Instrumentation and Controls				0%		$0
	SUBTOTAL						**$3,410,000**
	Tax on Materials				0%		$0
	Contractor's Markup on Sub-Contractors' Work				5%		$0
	Contractor's Overhead and Profit				10%		$341,000
	Mobilization and Demobilization				7%		$239,000
	Contractor's General Conditions				10%		$341,000
	SUBTOTAL						**$4,330,000**
	Project Phase-Level OPCC Contingency				20%		$866,000
	ENGINEER'S PRELIMINARY OPINION OF PROBABLE CONSTRUCTION COST						**$5,200,000**
	Changes and Unforeseen Conditions During Construction				5%		$260,000
	Engineering Design, Environmental Planning and Studies, Construction Management,				25%		$1,300,000
	ENGINEER'S PRELIMINARY OPINION OF PROBABLE TOTAL CAPITAL COST						**$6,760,000**

PROJECT:	WWTP Facilities Plan
OWNER:	South Suburban Sanitary District
LOCATION:	Klamath Falls, OR
WYA Project #:	515-50-21-17
Sheet Title:	SolarBee S
Element #:	22

OPPC PROVIDED BY: Kathryn Gies
OPPC PREPARATION DATE: 15-Feb-22
REVIEWED BY: Walt Meyer

	DESCRIPTION	MATERIAL QTY	UNIT	COST	MATERIAL COST	INSTALL COST	TOTAL COST
1	SolarBee Temp. Control	4	EA	$41,282	$165,129	$0	$165,000
2							
3							
4							
5							
6							
7							
8							
9							
10							
	SUBTOTAL						**$165,000**
	Plant Paving, Grading, and Yard Piping				0%		$0
	Mechanical and Piping				0%		$0
	Electrical				0%		$0
	Instrumentation and Controls				0%		$0
	SUBTOTAL						**$170,000**
	Tax on Materials				0%		$0
	Contractor's Markup on Sub-Contractors' Work				5%		$0
	Contractor's Overhead and Profit				10%		$17,000
	Mobilization and Demobilization				7%		$12,000
	Contractor's General Conditions				10%		$17,000
	SUBTOTAL						**$220,000**
	Project Phase-Level OPCC Contingency				20%		$44,000
	ENGINEER'S PRELIMINARY OPINION OF PROBABLE CONSTRUCTION COST						**$260,000**
	Changes and Unforeseen Conditions During Construction				5%		$13,000
	Engineering Design, Environmental Planning and Studies, Construction Management,				25%		$65,000
	ENGINEER'S PRELIMINARY OPINION OF PROBABLE TOTAL CAPITAL COST						**$340,000**

PROJECT:	WWTP Facilities Plan
OWNER:	South Suburban Sanitary District
LOCATION:	Klamath Falls, OR
WYA Project #:	515-50-21-17
Sheet Title:	Operations_Lab
Element #:	23

OPPC PROVIDED BY: Kathryn Gies
OPPC PREPARATION DATE: 15-Feb-22
REVIEWED BY: Walt Meyer

	DESCRIPTION	MATERIAL QTY	UNIT	COST	MATERIAL COST	INSTALL COST	TOTAL COST
1	Building	2,000	sf	$400	$800,000	$0	$800,000
2	LAB	500	sf	$800	$400,000	$0	$400,000
3							
4							
5							
6							
7							
8							
9							
10							
	SUBTOTAL						**$1,200,000**
	Plant Paving, Grading, and Yard Piping				5%		$60,000
	Mechanical and Piping				0%		$0
	Electrical				10%		$120,000
	Instrumentation and Controls				0%		$0
	SUBTOTAL						**$1,380,000**
	Tax on Materials				0%		$0
	Contractor's Markup on Sub-Contractors' Work				5%		$6,000
	Contractor's Overhead and Profit				10%		$138,000
	Mobilization and Demobilization				7%		$97,000
	Contractor's General Conditions				10%		$138,000
	SUBTOTAL						**$1,760,000**
	Project Phase-Level OPCC Contingency				20%		$352,000
	ENGINEER'S PRELIMINARY OPINION OF PROBABLE CONSTRUCTION COST						**$2,110,000**
	Changes and Unforeseen Conditions During Construction				5%		$106,000
	Engineering Design, Environmental Planning and Studies, Construction Management,				25%		$528,000
	ENGINEER'S PRELIMINARY OPINION OF PROBABLE TOTAL CAPITAL COST						**$2,740,000**

PROJECT:	WWTP Facilities Plan
OWNER:	South Suburban Sanitary District
LOCATION:	Klamath Falls, OR
WYA Project #:	515-50-21-17
Sheet Title:	Irrigation Facilities
Element #:	24

OPPC PROVIDED BY: Kathryn Gies
OPPC PREPARATION DATE: 15-Feb-22
REVIEWED BY: Walt Meyer

	DESCRIPTION	MATERIAL QTY	UNIT	COST	MATERIAL COST	INSTALL COST	TOTAL COST
1	Irrigation Channels	8,000	LF	$200	$1,600,000	$0	$1,600,000
2	Irrigation Pivot 1900' Radius	1,900	LF	$64	$122,208	$0	$122,000
3	Irrigation Pivot 1300' Radius	1,300	LF	$64	$83,616	$0	$84,000
4	Irrigation Pivot Fixed Costs	2	EA	$7,141	$14,282	$0	$14,000
5							
6							
7							
8							
9							
10							
	SUBTOTAL						**$1,820,000**
	Plant Paving, Grading, and Yard Piping				0%		$0
	Mechanical and Piping				0%		$0
	Electrical				10%		$182,000
	Instrumentation and Controls				0%		$0
	SUBTOTAL						**$2,000,000**
	Tax on Materials				0%		$0
	Contractor's Markup on Sub-Contractors' Work				5%		$9,000
	Contractor's Overhead and Profit				10%		$200,000
	Mobilization and Demobilization				7%		$140,000
	Contractor's General Conditions				10%		$200,000
	SUBTOTAL						**$2,550,000**
	Project Phase-Level OPCC Contingency				20%		$510,000
	ENGINEER'S PRELIMINARY OPINION OF PROBABLE CONSTRUCTION COST						**$3,060,000**
	Changes and Unforeseen Conditions During Construction				5%		$153,000
	Engineering Design, Environmental Planning and Studies, Construction Management,				25%		$765,000
	ENGINEER'S PRELIMINARY OPINION OF PROBABLE TOTAL CAPITAL COST						**$3,980,000**

PROJECT:	**WWTP Facilities Plan**
OWNER:	**South Suburban Sanitary District**
LOCATION:	**Klamath Falls, OR**
WYA Project #:	**515-50-21-17**
Sheet Title:	**Chem Feed**
Element #:	**25**

OPPC PROVIDED BY: Kathryn Gies
OPPC PREPARATION DATE: 15-Feb-22
REVIEWED BY: Walt Meyer

	DESCRIPTION	MATERIAL QTY	UNIT	COST	MATERIAL COST	INSTALL COST	TOTAL COST
1	15' x 15' Concrete Pad	30	CY	$700	$21,000	$0	$21,000
2	Canopy	1	LS	$106,500	$106,500	$0	$107,000
3	5000 gal SS tank	1	LS	$95,100	$95,100	$0	$95,000
4	Metering Pump Skid	1	LS	$35,850	$35,850	$0	$36,000
5							
6							
7							
8							
9							
10							
	SUBTOTAL						**$259,000**
	Plant Paving, Grading, and Yard Piping				5%		$13,000
	Mechanical and Piping				5%		$13,000
	Electrical				10%		$26,000
	Instrumentation and Controls				10%		$26,000
	SUBTOTAL						**$340,000**
	Tax on Materials				0%		$0
	Contractor's Markup on Sub-Contractors' Work				5%		$3,000
	Contractor's Overhead and Profit				10%		$34,000
	Mobilization and Demobilization				7%		$24,000
	Contractor's General Conditions				10%		$34,000
	SUBTOTAL						**$440,000**
	Project Phase-Level OPCC Contingency				20%		$88,000
	ENGINEER'S PRELIMINARY OPINION OF PROBABLE CONSTRUCTION COST						**$530,000**
	Changes and Unforeseen Conditions During Construction				5%		$27,000
	Engineering Design, Environmental Planning and Studies, Construction Management,				25%		$133,000
	ENGINEER'S PRELIMINARY OPINION OF PROBABLE TOTAL CAPITAL COST						**$690,000**

PROJECT:	**WWTP Facilities Plan**
OWNER:	**South Suburban Sanitary District**
LOCATION:	**Klamath Falls, OR**
WYA Project #:	**515-50-21-17**
Sheet Title:	**Plant Util**
Element #:	**26**

OPPC PROVIDED BY: Kathryn Gies
OPPC PREPARATION DATE: 15-Feb-22
REVIEWED BY: Walt Meyer

	DESCRIPTION	MATERIAL QTY	UNIT	COST	MATERIAL COST	INSTALL COST	TOTAL COST
1	Recycled Water System	1	LS	$400,000	$400,000	$0	$400,000
2	Plant Sewer	1	LS	$400,000	$400,000	$0	$400,000
3							
4							
5							
6							
7							
8							
9							
10							
	SUBTOTAL						**$800,000**
	Plant Paving, Grading, and Yard Piping				5%		$40,000
	Mechanical and Piping				5%		$40,000
	Electrical				10%		$80,000
	Instrumentation and Controls				10%		$80,000
	SUBTOTAL						**$1,040,000**
	Tax on Materials				0%		$0
	Contractor's Markup on Sub-Contractors' Work				5%		$8,000
	Contractor's Overhead and Profit				10%		$104,000
	Mobilization and Demobilization				7%		$73,000
	Contractor's General Conditions				10%		$104,000
	SUBTOTAL						**$1,330,000**
	Project Phase-Level OPCC Contingency				20%		$266,000
	ENGINEER'S PRELIMINARY OPINION OF PROBABLE CONSTRUCTION COST						**$1,600,000**
	Changes and Unforeseen Conditions During Construction				5%		$80,000
	Engineering Design, Environmental Planning and Studies, Construction Management,				25%		$400,000
	ENGINEER'S PRELIMINARY OPINION OF PROBABLE TOTAL CAPITAL COST						**$2,080,000**

Appendix F

Summary of O&M Cost Assumptions

Table F-1. Summary of O&M Cost Assumptions

Item	Units	Class A Reuse (disk filters+chlorine)	Class A Reuse (disk filters+UV)	MBR + Surface Discharge	E3 Water + Surface Discharge
Energy					
Electricity Needed @	million kWh per year Total	**3.00**	**3.33**	**7.25**	**9.64**
Component 1 (blowers)	million kWh per year	1.094		0.547	3.25
Component 2 (Disc Filter/MBR/proprietary process)	million kWh per year	0.010		6.14	2.52
Component 3 (DAF/Eff. PS/Various Pumps)	million kWh per year	1.05		0.039	2.61
Component 4 (Eff. PS/FKC Solids/Air Chillers)	million kWh per year	0.168		0.195	0.163
Component 5 (Irrigation PS/*not used* /electrocoagulators)	million kWh per year	0.678			1.10
Component 6 (Chlorination or UV system)	million kWh per year	0	0.331	0.331	
Solar Generation	million kWh per year	n/a[a]	n/a[a]	n/a[a]	8.58
Net Electricity Needed	million kWh per year	3.00	3.33	7.25	1.06
Net Annual Electricity Cost	Cents per kWh	8.5	8.5	8.5	8.5
	$ million per year	**$0.25**	**$0.28**	**$0.62**	**$0.09**
Natural Gas (for FKC Class A screw press)	hours per day	*not applicable (n/a)*		20	*n/a*
	days per week			7	
	lb steam per hour			780	
	BTU per steam			1,000	
	BTU per natural gas CF			1,015	
	natural gas CF per hour			770	
	1,000 CF (TCF) per year			5,606	
	$ per TCF			5.26	
	Annual Natural Gas Cost, $ million per year			**0.029**	
Total Annual Energy Cost	**$ million per year**	**$0.25**	**$0.28**	**$0.65**	**$0.09**
Additional Labor					
Chief Operator annual salary+benefits	$ per year	$100,000			
Asst Operator annual salary+benefits	$ per year	$70,000			
Chief Operator	number of staff	1	1	1	3[b]
Asst Operator	number of staff	n/a	n/a	2	4[b]
Total Annual Labor Cost	**$ million per year**	**$0.10**	**$0.10**	**$0.24**	**$0.58**

Table F-1. Summary of O&M Cost Assumptions

Item	Units	Class A Reuse (disk filters+chlorine)	Class A Reuse (disk filters+UV)	MBR + Surface Discharge	E3 Water + Surface Discharge
Chemicals					
DAF Polymer	gallons per hour (gph) polymer	1.5		*n/a*	*n/a*
	density, grams per mL	1.2			
	pounds per hour polymer	15			
	operational hours per day	24			
	Operational days per year	365			
	Operational hours per year	8,760			
	Annual pounds of polymer	130,000			
	$ per pound of polymer	2.3			
	Total annual DAF polymer cost, $ per year	**290,000**			
Chlorination[c]	mg/L	7	*n/a*	*n/a*	*n/a*
	mgd AAF	2.3			
	gallons per year	49,000			
	12.5% sodium hypochlorite, $ per gallon	3.15			
	Total chlorine annual cost, $ per year	**154,000**			
	Annual cost minus existing, $ per year[d]	**111,500**			
Membrane Cleaning	cleanings per basin per year	*n/a*		2	*Not listed*
	number of basins			5	
	gallons Oxalic acid per cleaning			20	
	Oxalic acid, gallons per year			200	
	10% Oxalic Acid, $ per gallon			5.68	
	gallons hypochlorite per cleaning			169	
	Hypochlorite, gallons per year			1690	
	12.5% Sodium Hypochlorite, $ per gallon			3.15	
	Total Annual Membrane Cleaning Cost, $ per year			**6,500**	
Solids Dewatering Polymer	lb polymer/dry ton solids processed	*n/a*		100	*Not listed*
	lb polymer per year			91,300	
	$ per lb polymer			1.5	
	Total Annual Solids Polymer Cost, $ per year			**140,000**	
Lime for Solids	lb lime/dry ton solids processed	*n/a*		400	*Not listed*
	lb lime per year			365,000	
	$ per lb lime			1.5	
	Total Annual Lime Cost, $ per year			**550,000**	
Other Process Chemicals	$ per year	*n/a*			$444,960.72
Total Annual Chemical Cost	**$ million per year**	**$0.40**	**$0.29**	**$0.70**	**$0.44**
Materials and Services					
Methodology	percent of mechanical equipment	1	1	1	1.38
	percent of labor	15	15	15	363,000
Total Annual Materials and Services	**$ million per year**	**$0.30**	**$0.32**	**$0.44**	**$1.74**[e]

Table F-1. Summary of O&M Cost Assumptions

Item	Units	Class A Reuse (disk filters+chlorine)	Class A Reuse (disk filters+UV)	MBR + Surface Discharge	E3 Water + Surface Discharge
Solids Disposal					
DAF Solids	mg/L influent TSS to DAF	50		*n/a*	*n/a*
	mg/L effluent TSS from DAF	10			
	mgd Max Day Flow (to MBR/E3)	3.0			
	lb/day TSS in DAF reject stream	1,000			
	percent solids when hauling (DAF solids)	30			
	Annual solids, wet tons per year	608			
	$ per wet ton hauling fee	$17.5			
	Total Annual DAF solids disposal fee	$10,600			
Secondary Solids	lb/day secondary solids generation	*n/a during project lifetime*		5,000	
	percent capture at solids thickener			95	
	lb/day solids needing disposal			4,750	
	dry tons per year needing disposal			867	
	percent solids when hauling			50	
	wet tons per year needing disposal			1,734	
	$ per wet ton hauling fee			$17.5	
	$ per year			$30,300	
Analytical Testing	$ per year solids analysis fees	$4,000			
Solids Total	**$ million per year**	**$0.015**	**$0.015**	**$0.034**	**$0.034**
Other					
Land Lease Differential	**$ million per year**	**$0**[f]	**$0**[f]	*n/a*	*n/a*
Discount Rate for Present Value	percent	2.25			

(a) Solar power has not been evaluated for the Class A Reuse or MBR alternatives.
(b) E3 Water has not provided specific staffing requirements, but has proposed that 24-hour staffing is needed.
(c) The chlorination chemicals do not apply to the UV disinfection alternative. The only chemical required for the Class A Reuse with UV alternative is DAF polymer.
(d) The District's Fiscal Year 2019/2020 chlorine and chemical costs of $42,500 are subtracted out of the total cost allocated to chlorination/dechlorination for Class A Reuse alternatives.
(e) E3 Water proposal included the total for "Annualized Equipment Maintenance & Replacement Costs" and the two-component breakdown shown. These numbers likely exclude maintenance of solids equipment. The quote states that "estimated O&M costs include only the new aeration facility and the new building."
(f) It is assumed that any land lease and associated operating costs would be directly offset by revenue from sub-letting the land for farming.

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