CONFEDERATED TRIBES OF THE UMATILLA INDIAN RESERVATION

Mission Area Wastewater Treatment and Reuse System Pre-Design Report

Final - July 2025

Prepared by

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PRE-DESIGN REPORT

FOR

CONFEDERATED TRIBES OF THE
UMATILLA INDIAN RESERVATION

MISSION AREA WASTEWATER TREATMENT AND REUSE SYSTEM

JULY 2025

RENEWS 6-30-26
Signed 7-8-25

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Executive Summary

This Executive Summary briefly summarizes the Mission Area Wastewater Treatment and Reuse System Pre-Design Report (PDR) prepared by Anderson Perry & Associates, Inc. (AP) for the Confederated Tribes of the Umatilla Indian Reservation (CTUIR). The recommendations outlined hereafter have been developed in cooperation with CTUIR departmental staff. The focus of this PDR is to refine the overall wastewater treatment and reuse system (WWTRS) design criteria, provide a brief description of the necessary system improvements, and provide updated cost estimates. This PDR includes a brief history of the existing Mission area wastewater conveyance system and the planning criteria used to complete this PDR. Also included are descriptions of:

- The proposed raw wastewater conveyance system
- The proposed wastewater treatment system and processes
- The proposed recycled water conveyance, storage, and irrigation systems
- Ancillary equipment needs, such as on-grid power delivery, backup power systems, and renewable energy sources
- Estimated Capital Improvement costs
- Operational requirements and annual costs
- Steps to implement the recommended improvements

This Executive Summary includes a brief discussion of the proposed WWTRS from the conveyance of raw wastewater to the treatment system through the treatment processes to storage and irrigation of the recycled water. The reader is encouraged to refer to specific chapters of this PDR for a more detailed discussion of the topics briefly outlined hereafter.

Mission Area Wastewater Existing Conditions

Existing Conditions

Construction of the Mission area wastewater collection system occurred in approximately 1972. The CTUIR, in coordination with Indian Health Services (IHS), has completed several improvement projects that targeted repairs on the existing pipelines to reduce infiltration and inflow. These improvement projects have helped to preserve existing system capacity.

The Mission area does not currently operate its own wastewater treatment system and conveys its wastewater to the City of Pendleton's treatment system under a 1978 transfer agreement. The 1978 transfer agreement established a maximum flow conveyance capacity of 1.0 million gallons per day (MGD) of wastewater to the City of Pendleton's treatment system. The design criteria developed in the Mission Area Wastewater Treatment Feasibility Study (AP, June 2023) indicates that the current wastewater peak hourly flow of 1.190 MGD would exceed the existing trunkline's 1.0 MGD conveyance capacity.

Proposed Wastewater Treatment and Reuse System

Raw Wastewater and Conveyance System Improvements

The service area south of Timine Way, which includes the Wildhorse Resort & Casino (WR&C), Arrowhead Travel Plaza, and the Coyote Commercial Business Parks, has excellent growth potential. This PDR has proposed raw wastewater conveyance system improvements as part of the WWTRS project. The improvements include construction of new conveyance system piping to improve capacity for these potential high-growth zones within the service area. The project also proposes extending the service area west of Mission to the Gopher Flats area and installing a lift station. Chapter 3 includes additional information regarding the raw water conveyance system improvements.

Wastewater Treatment Facility

A proposed mechanical treatment facility located north of Mission Road, approximately 1 mile west of the intersection with Highway 331 and Mission Road (near the Mustangers arena), is planned. The treatment facility would produce high-quality recycled water intended for irrigation reuse. The wastewater collection system would route the influent through a headworks system prior to an activated sludge treatment system with aeration and clarification. A tertiary filtration system will help filter out microscopic particles from the recycled water and then pass the tertiary treated effluent through an ultraviolet disinfection system prior to reuse application. The CTUIR plans to be able to treat the wastewater to an U.S. Environmental Protection Agency (EPA) standard of Class A, which is the highest current standard of wastewater.

Chapter 4 provides a detailed description of the treatment process and components evaluated in this pre-design effort and the recommended options for treatment. Recommendations have been developed based on input related to operation and maintenance (O&M) needs in coordination with the CTUIR Public Works Department. Multiple figures in Chapter 4 illustrate the proposed wastewater treatment system.

Recycled Water Conveyance, Storage, and Irrigation Systems

The truly unique aspect of the project that sets this system apart from other wastewater treatment systems is the ability to use the recycled water systems for a variety of community benefits. This would include a conveyance system to transfer the recycled water to the WR&C area. Constructed wetlands are proposed to store the recycled water during the non-irrigation season and then allow application of the recycled water for irrigation through the spring, summer, and fall. It is estimated that by 2042, 444,000 gallons per day (497 acre-feet per year) of recycled water would be available to offset water withdrawals from the regional aquifer. That is equivalent to the annual permitted water production capacity of two to three additional community wells.

Using wetlands and ponds to store the treated wastewater would provide multiple benefits, including:

- Providing new beneficial wildlife habitat
- Creating educational opportunities related to the beneficial use of recycled wastewater

- The ability to tie the Tamástslikt Cultural Institute (TCI) educational programs to the wetland environment
- Create recreational opportunities by expanding the existing walking trail network between the July Grounds and TCI

By treating wastewater and reusing it for beneficial purposes, the CTUIR would be preserving the investment already made in the community water system.

Ancillary Equipment Needs

Chapter 6 provides information related to the ancillary equipment both required and desired to operate the wastewater treatment facility in a beneficial manner. Ancillary equipment needs include everything from the power utility requirements; the potential to implement renewable energy sources; emergency backup power needs; and a proposed supervisory control and data acquisition system that monitors, controls, and analyzes processes and equipment, allowing remote operator monitoring and potential controls.

Operational Requirements

Operational requirements associated with the proposed treatment and reuse systems are discussed in Chapter 7. A permit developed by the CTUIR Department of Natural Resources is anticipated to be issued to guide operation of the WWTRS. EPA staff have indicated that the EPA does not typically establish a permit for a wastewater treatment facility that does not discharge to federal waterways.

A significant consideration related to all of the recommendations presented in this PDR was the staffing and training requirements necessary to ensure that CTUIR Public Works staff will be able to operate and maintain the proposed treatment system. The CTUIR will be required to have a highly certified wastewater treatment operator available to both meet the demands of the system O&M and meet EPA requirements for operator certification. These factors have been incorporated into the estimated annual O&M costs presented in Chapter 7. These O&M considerations should continue during the refinement of the WWTRS in the design process.

Summary of Estimated Costs

The estimated total project costs for the proposed WWTRS are summarized on Figure 8-2 in Chapter 8. Due to the anticipated duration of the environmental assessment, permitting, design processes, and construction, the total project cost has been inflated to the year 2026, when project bidding is anticipated to occur. The total estimated year 2026 project cost, including contingency, is estimated to be $56,300,000 for the new WWTRS. Preliminary cost estimates for each component of the WWTRS are presented at the end of Chapters 3, 4, and 5, and a summary of all anticipated project costs is shown on Figure 8-2 in Chapter 8.

Project Funding

The CTUIR Public Works Department has secured $41 million in funding from the IHS to support development of the project. The EPA has granted an additional $3 million in funding, for a total of $44 million. This is a substantial portion of the projected project costs. The pursuit of additional funding sources is continuing.

Project Implementation

The implementation schedule outlining anticipated key steps for developing the proposed project is shown on Table ES-1. A more detailed project schedule is also presented on Figure 8-1 in Chapter 8. This schedule may be modified to allow for materials procurement prior to a construction contract award and other potential time-saving measures, if desired by the CTUIR.

TABLE ES-1
ESTIMATED WASTEWATER TREATMENT REUSE SYSTEM DESIGN AND CONSTRUCTION SCHEDULE

Key Step No.	Description	Schedule
1	Finalize PDR with Board of Trustees	May 2025
2	Advertise RFP for Project Design, Award, Agreement	July 2025 to August 2025
3	Land Acquisition, Environmental Permitting, Cultural Investigation and Monitoring	August 2025 to December 2027
4	Phase 1 Design (Wetland Storage Ponds)	August 2025 to April 2026
5	Phase 1 Construction	April 2026 to June 2027
6	Phase 2 Design (Conveyance System)	February 2026 to October 2026
7	Phase 2 Construction	November 2026 to October 2027
8	Phase 3 Design (Treatment System)	May 2026 to March 2027
9	Phase 3 Construction	April 2027 to October 2028
10	Project Closeout	November 2028 to December 2028

RFP = Request for Proposals

Chapter 1 - Project Pre-Design Overview

Introduction

This chapter presents background information related to the history and need for the proposed Wastewater Treatment and Reuse System (WWTRS) project. The general project scope and organization of this Pre-Design Report (PDR) are also outlined.

Existing System Background

Construction of the Mission area wastewater collection system occurred in approximately 1972. The existing wastewater collection system consists of an approximate total of 105,600 feet of 6-, 8-, and 10-inch pipelines. The Confederated Tribes of the Umatilla Indian Reservation (CTUIR), in coordination with the Indian Health Service (IHS), has completed several improvement projects that targeted repairs on the existing pipelines to reduce infiltration and inflow (I/I). These improvement projects have helped to preserve existing system capacity.

The Mission area does not currently operate its own wastewater treatment system and conveys its wastewater to the City of Pendleton's treatment system under a 1978 transfer agreement (see Appendix A). The 1978 transfer agreement established a maximum flow conveyance capacity of 1.0 million gallons per day (MGD) of wastewater to the City of Pendleton's treatment system. Design criteria indicate the current wastewater peak hourly flow of 1.190 MGD exceeds the existing trunkline's 1.0 MGD conveyance capacity stated in the 1978 transfer agreement.

Master Plan

The 2006 Water and Wastewater System Master Plan (2006 Plan) determined that community wastewater improvements would be needed prior to the CTUIR wastewater flows reaching the 1.0 MGD capacity of the trunkline. A community treatment and disposal system was recommended to be implemented in the 2006 Plan for the following key reasons:

- Preliminary wastewater flow projections for the Mission area indicated that the capacity of the existing 10-inch trunkline connected to the City could be exceeded in the near future.
- CTUIR leadership desires to become independent from the City's wastewater system and associated City sewer rates.
- A cost analysis indicated that the long-term costs (capital and operation and maintenance [O&M]) could be lower for a tribally owned and operated wastewater system.

Flowmeter Installation

To assist with implementing a new wastewater treatment system, the CTUIR Public Works Department installed a trunkline flowmeter in 2008 and began collecting wastewater flow data. The CTUIR Public Works Department has performed I/I analysis of the system and completed a variety of repair projects to correct system deficiencies that allow I/I to enter the system. Flow data indicate that this effort has been successful in reducing I/I and preserving the wastewater system's capacity for longer than anticipated in the 2006 Plan.

Feasibility Study

A 2023 Wastewater Treatment Feasibility Study (WWTFS) was developed to analyze options for treating and reusing wastewater generated by the Mission community. A planning period of 20 years was utilized with considerations for future system expansion beyond 2042. The WWTFS focused on several important factors, including:

- Consideration of four potential treatment site locations
- Potential wastewater treatment facility (WWTF) system types and components
- The ability of the system to meet reuse objectives that included options for irrigating the golf course at Wildhorse Resort & Casino (WR&C), crops near the treatment system, and turf grass at other tribal and community facilities
- Identification of potential permitting requirements
- Identification of a potential project implementation schedule
- The development of planning-level capital cost estimates
- The determination of annual O&M requirements and associated costs

Project Benefits

The WWTRS project benefits the CTUIR environmentally and economically and strengthens the CTUIR's sovereignty. Some of the specific benefits are listed below.

- The WWTRS would improve tribal sovereignty by eliminating conveyance of wastewater to the City of Pendleton.
- The WWTRS would improve capacity to accommodate future development on tribal lands. Several residential developments are currently in construction or being planned in the Mission area. These developments would allow and entice tribal members to move to CTUIR tribal land.
- The WWTRS would also support the Coyote Business Parks' commercial and light industrial zones through infrastructure development, which would allow future tenant companies to build commercial and industrial businesses.
- The WWTRS would reduce the amount of potable water taken from the regional basalt aquifer for irrigation purposes. Currently, the WR&C golf course is being irrigated using potable water out of the aquifer. The golf course is the largest user of water resources in the Mission community and can use up to one-third of the water delivered to the entire community.
- Implementing a reuse system would mitigate the need for constructing and developing extra potable water wells to satisfy growing demand, thereby bolstering the CTUIR's capacity to withstand drought conditions. According to forecasts, the potable water system is projected to require the development of two additional deep basalt wells over the next 20 years without implementing water recycling.

Safety, Health, and Environmental Considerations

The primary function of a wastewater treatment system is to protect the safety and health of system users and protect the surrounding environment. Should the CTUIR continue to transfer wastewater to the City per the 1978 transfer agreement, no recycled water resource conservation benefits would be seen by the CTUIR. Additionally, negative impacts on the safety and health of the system users and the surrounding environment may occur. These impacts could include:

- The CTUIR exceeding the hydraulic capacity of the existing trunkline, resulting in potential sewer overflows and/or the backing up of raw sewage into residences and/or businesses adjacent to the trunkline. This could result in serious health and safety issues for tribal members living in the vicinity of the trunkline.
- Negative impacts to Umatilla River water quality, riverine habitat, and associated wildlife due to the proximity of the trunkline to the Umatilla River and potential capacity exceedance.
- As noted in the agreement, when a flow of 1.0 MGD is reached, neither the CTUIR nor the City can allow further service connections to the trunkline or extensions of the wastewater collection system. This could effectively stop all residential, commercial, and industrial growth in the Mission area once the 1.0 MGD flow capacity of the trunkline is reached.

Environmental Benefit of Using Recycled Water for Irrigation

With the development of a new state-of-the-art WWTF, the CTUIR will be able to reuse their recycled water for irrigation at the golf course at WR&C and other tribal facilities requiring irrigation. Doing so will allow the CTUIR to conserve a substantial volume of potable water. Because the CTUIR uses six wells to provide water to the Mission community, the reduced water withdrawal from the community water system through wastewater reuse will aid in preserving groundwater stored in the aquifer.

Scope of Pre-Design Report

This PDR aims to refine the concepts presented in the WWTFS, including the WWTF and associated infrastructure for the Mission community. Specific tasks include updating design criteria, refining water balance calculations, optimizing treatment processes, identifying specific routes to increase collection system capacity, identifying lift and booster pump station locations, determining ancillary equipment needs, and updating the project cost estimate.

Refinement of Wastewater Treatment Feasibility Study Concepts

The first phase of the pre-design effort included refining the design criteria presented in the WWTFS. This has been accomplished by incorporating updated flow data and analyzing wastewater testing results based on samples obtained directly from the CTUIR collection system. This allows system flow fluctuations to be understood and chemical and biological makeup of the wastewater to be assessed, which impacts system component sizing.

In addition to the wastewater sampling, this PDR presents updated water balance calculations. This involves using current flow data to update storage and irrigation water balances. The updated water balances are then used to define the needed volume of the wetland storage ponds. Once the needed storage volume is known, the wetland storage ponds are laid out with a three-dimensional topographic model. The model helps to determine the size of each pond and develop construction earthwork volumetric material cut/fill estimates.

The wastewater treatment process design is critical to the success of the WWTF operation. To start the treatment process design, a process design schematic, as well as a treatment hydraulic profile, were developed. In this PDR, key components of several critical steps in the treatment process are identified. Different equipment types for many of the treatment processes are identified with recommendations for implementation made based on past experience with other WWTF operations. Recommended treatment system components are sized based on the updated design criteria.

Infrastructure Development

Another key aspect of the project is the development of key ancillary infrastructure improvements needed to support the new WWTF. This includes re-routing collection system piping to avoid hydraulic overloading of the existing trunkline and avoiding conflicts with existing utilities. Light detection and ranging imagery and topographic data provided by the CTUIR GIS Department were used to develop initial route plans for the collection system improvements.

The pre-design process also included the identification of locations for lift and booster pump stations. These stations would be necessary to convey wastewater from the Gopher Flats area to the proposed treatment site and to convey recycled water from the WWTF to the reuse site at the WR&C golf course. A booster pump station is also proposed to be located near Highway 331 to convey recycled water to facilities to the east and north, such as the native plant nursery.

In addition to the lift and booster pump stations, the project would include installing ancillary equipment at the WWTF. This equipment would include power service, a solar array, and a supervisory control and data acquisition system. Local power providers have been consulted to verify power service needs for the treatment site, Gopher Flats service area lift station, and booster pump station. A scope of work for the solar array is also included in the project.

Project Costs

An updated project cost estimate is presented. This estimate reflects the design refinements and additional scope items identified during the pre-design process.

Recommended Improvements

This PDR includes detailed descriptions of treatment process equipment, options for this equipment, and a recommended improvement implementation plan. An implementation plan is presented to describe the steps required to implement the proposed project. The implementation plan also outlines a strategic approach to optimize the system's performance.

Report Organization

- Chapter 1 provides an overview of the wastewater treatment processes and conveyance system background of the CTUIR. It also describes the history of reports and plans that have been developed and have supported the need for a CTUIR-operated WWTF.

- Chapter 2 provides design criteria information utilized as the basis for design for this PDR.
- Chapters 3 and 4 describe the recommended raw wastewater conveyance system improvements, including a new lift station located near Gopher Flats on Mission Road, as well as the recommended WWTF system, components, and sizing. Cost estimates are provided for both the conveyance system and treatment system.
- Chapter 5 discusses the recycled water conveyance system requirements, the proposed wetland storage ponds, and proposed recycled water reuse sites. Cost estimates are also provided for the recycled water conveyance system.
- Chapters 6 and 7 describe the ancillary equipment requirements and the operation requirements, respectively. Emphasis has been put on development of a solar array to offset the power consumed by the WWTF system. Operational requirements have been separated into the different subsystems, and requirements for treatment, storage/wetlands, and irrigation have been described.
- Lastly, Chapter 8 summarizes the process required to implement the recommended improvements.

Chapter 2 - Planning Criteria

To evaluate the potential needs of a wastewater system, the planning area, the population to be serviced, and the wastewater flows and chemistry to be treated by the wastewater system must be established. This chapter presents the design criteria used to develop the options, alternatives, and basis of design for the wastewater treatment facility (WWTF).

Planning Area

For the purposes of this Pre-Design Report (PDR), the same service area developed for the Wastewater Treatment Feasibility Study (WWTFS) has been utilized. Refer to Figure 2-1 for a depiction of the service area boundaries.

Population Projections

For the purposes of this PDR, the population data established for the WWTFS have been utilized. An extensive process involving the Confederated Tribes of the Umatilla Indian Reservation (CTUIR) Planning Department was undertaken during development of the WWTFS. Since little time has transpired between the development of the WWTFS and the development of this PDR, it is believed that the population to be served by the proposed WWTF has not changed in any meaningful way that would impact the proposed wastewater systems evaluated in this PDR.

Based on previous coordination efforts with the CTUIR Planning Department, it was determined that the population served by the WWTF is expected to almost double in the next 20 years. The current estimated population connected to the wastewater collection system is 1,150 residents. In the year 2042, the population is projected to be 2,127. This represents an average annual increase in population growth of 1.62 percent per year. This is an aggressive growth projection. However, the CTUIR is actively promoting the development of additional housing that is expected to bring this level of growth to the Mission community.

Because other commercial entities in the Mission community are currently included in the annual average flow and per capita flow projections, future commercial growth is anticipated to be directly tied to and proportional to future residential growth and the associated wastewater contributions.

Design Criteria Update

Updated flow data and wastewater sampling directly from the CTUIR wastewater collection system were evaluated to develop the design criteria utilized in this PDR.

Flow Data

Wastewater design criteria were updated by gathering flow data obtained from the Palmer-Bowlus flume structure located on Ishkit Lane. The updated flow data were merged with data already included in the WWTFS to provide as much information as possible to develop the updated design criteria.

The flowmeter data were collected from January 1, 2022, through February 15, 2024. The flow data from June 1, 2023, to October 31, 2023, were omitted from the calculations of average flows due to system operational issues occurring in the wastewater system that would have skewed the data. A graphical presentation of the flow data over this period is shown on Figure 2-2. Beginning on October 11, 2022, a height adjustment was also made to the flowmeter setting, which required adjustments to the flow data based on an adjusted flow depth and manual calculation of the flow associated with the depth of wastewater in the flume.

The graphical plot of average daily flows on Figure 2-2 shows the seasonal fluctuation of flows in the CTUIR wastewater system. The higher flows in the system are generally observed during wet weather or higher groundwater periods, indicating that there is infiltration and inflow (I/I) entering the wastewater collection system. The hourly flow data measurements also indicate a few instances within the noted period of record when the peak hourly flow exceeded 1.0 million gallons per day. This indicates that the hydraulic conveyance capacity of the trunkline to the City of Pendleton may already be being exceeded for short durations.

2024 Wastewater Sampling Results

In the WWTFS, typical system nutrient loadings were assumed based on typical national and regional wastewater guidance documents. For this pre-design effort, wastewater samples were collected directly from the CTUIR wastewater collection system. These samples were then sent to a certified laboratory for testing. The test results were then compared to the previous national and regional standard values presented in the WWTFS and adjusted accordingly, as described below.

Samples obtained were tested for key wastewater chemistry and loading parameters. These included pH, total suspended solids (TSS), five-day biochemical oxygen demand (BOD_5), total alkalinity (TA), ammonia (NH_3), nitrate (NO_2), nitrite (NO_3), total Kjeldahl nitrogen (TKN), and phosphorus (P), as well as a test for the amount of fats, oils, and grease (FOG) in the wastewater stream.

Wastewater sampling was completed by Treatment Equipment Company (TEC) staff using composite samplers that took samples periodically throughout the day. TEC collected the wastewater samples from the inline flowmeter access port on Ishkit Lane in January 2024. The samples were then conveyed to the Umpqua Research Company lab in Pendleton, Oregon, for testing. A member of the Wildhorse Resort & Casino (WR&C) staff confirmed daily occupancies of the hotel varied between 35 and 90 percent during the testing period, which provides a good variation in the potential loads associated with the WR&C.

The results of the wastewater sampling performed from January 14 through 17, 2024, are shown on Table 2-1. Table 2-2 includes data from February 5, 2024, when resampling was required for FOG analysis. The original sample results package delivered by TEC is included in Appendix B. Additional wastewater sampling was slated to occur in summer 2024 but was not able to be incorporated into this PDR.

TABLE 2-1
WASTEWATER TEST RESULT SUMMARY - JANUARY 2024

Test Date	pH	TSS mg/L	BOD_5 mg/L	TA mg/L	NH_3 mg/L	NO_2 mg/L	NO_3 mg/L	TKN mg/L	P mg/L
01/14/2024	7.30	84	78	293	25.10	0.33	0.142	39.2	16.6
01/15/2024	7.37	130	111	267	24.60	0.34	0.126	34.7	17.6
01/16/2024	7.41	103	113	234	18.05	0.38	0.109	29.8	12.1
01/17/2024	7.17	113	114	227	19.40	0.10	0.395	30.2	11.2

mg/L = milligrams per liter

TABLE 2-2
WASTEWATER TEST RESULTS SUMMARY - FATS, OILS, AND GREASE - FEBRUARY 2024

Test Date	Inorganic Analyte	Result	Units	Minimum Reporting Limit
02/05/2024	FOG (total) (Using EPA 1664 method)	32.7	mg/L	5.0

EPA = U.S. Environmental Protection Agency

Due to inclement weather conditions when the samples were taken, some of the samples were not able to meet ideal holding times prior to testing.

Updated Design Criteria

Design criteria from the WWTFS have been reviewed and updated as part of this PDR to help determine the needed capacity, size, and other parameters to be considered in the development of a tribal wastewater treatment and reuse system.

Per the summary of flow data noted above, once available flow data were analyzed, per capita flow rates were updated based on the current estimated population of 1,150 residents connected to the wastewater collection system. This resulted in an average annual flow (AAF) of 272 gallons per person per day being contributed to the wastewater system. This is much higher than most small communities but can likely be attributed to commercial facilities like the WR&C in the Mission area. Another contributing factor that could account for the Mission area residents' higher AAF per person is I/I entering the wastewater collection system. The low concentrations of both TSS and BOD_5 presented on Table 2-1 indicate dilution is occurring below normal levels. Typical concentrations of these parameters are approximately 2.0 to 2.5 times higher than what is being reported. This has been considered in the development of the updated design criteria.

WR&C is a unique entity operating within the Mission community sewer service area. Wastewater contributions associated with WR&C have been calculated to be approximately 67,000 gallons per day (on average). These calculations were based on water meter readings from the cineplex, hotel, golf course clubhouse, RV park, casino, and Arrowhead Travel Plaza from 2018 through 2021. WR&C sewer flow contributions are not shown to increase over the planning period, as additional water conservation measures are anticipated to be implemented with future resort expansions, helping limit any additional wastewater flow contributions.

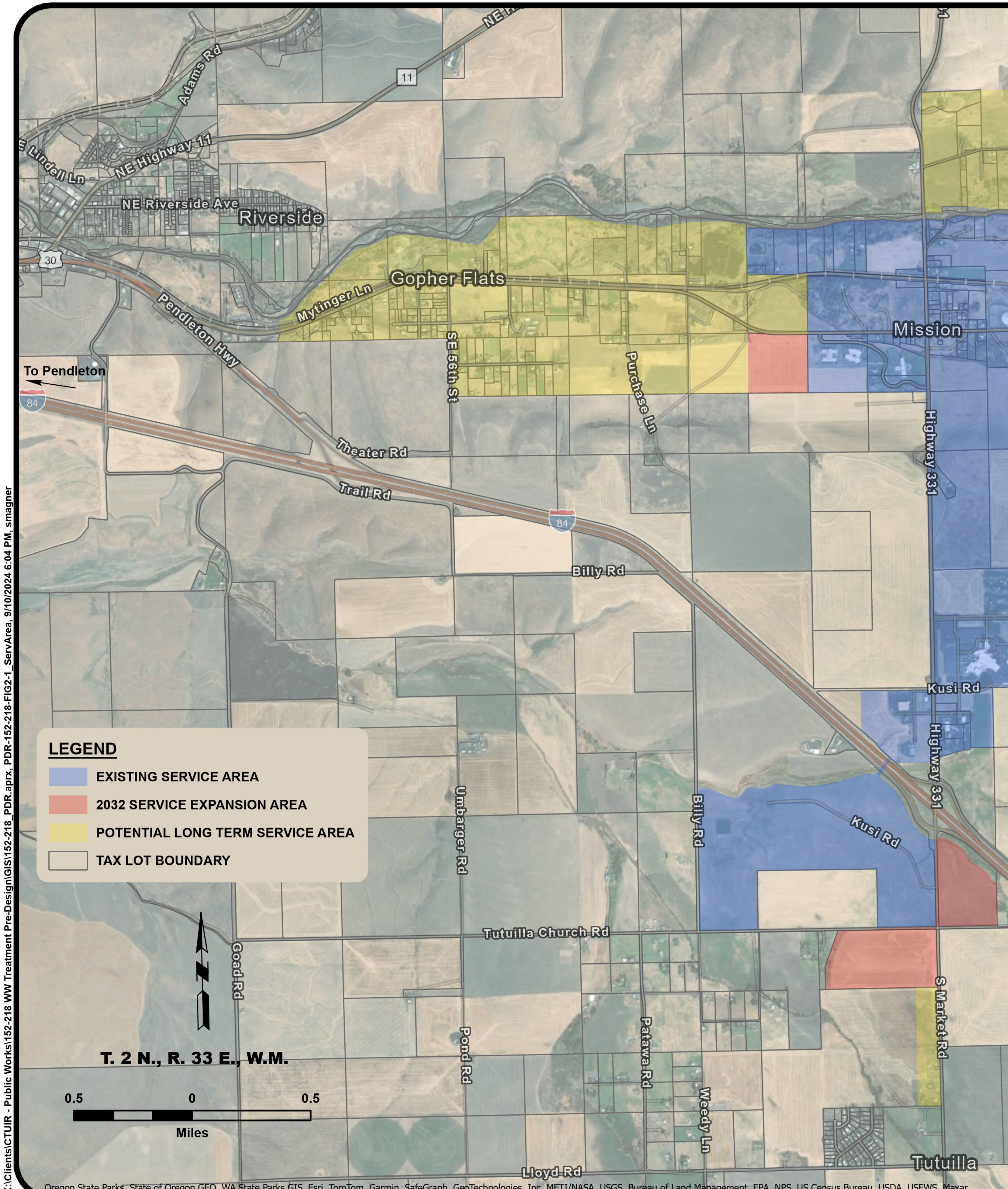
The AAF for this PDR was increased approximately 58 percent more than the AAF noted in the WWTFS. This dramatically impacted the sizing of some wastewater facilities as noted in later chapters of this

PDR. The average annual flow of 272 gallons per person was projected forward to the 2032 and 2042 planning years to estimate potential future usage. This is likely a conservative estimate of future flows that should be revisited in the design process.

The wastewater sampling and testing completed for this PDR show that the estimated concentrations of BOD_5, TSS, and TKN included in the WWTFS were close to actual tested parameters. However, with the higher projected flow contributions, the hydraulic loadings of these constituents entering the WWTF would be increased approximately 58 percent, which impacts the sizing of WWTF components.

The full updated design criteria are presented on Figure 2-3. The updated design criteria are based on the previously mentioned flow data and wastewater testing information. The design criteria include the design flows and design influent wastewater strength characteristics for which the WWTF would be sized.

These design criteria were used to estimate the size of proposed facilities outlined later in this PDR. It is recommended that the design criteria be updated prior to design and construction of the proposed improvements once more flow data and system testing information are available to be analyzed.



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CONFEDERATED TRIBES OF THE UMATILLA INDIAN RESERVATION

MISSION AREA WASTEWATER TREATMENT AND REUSE SYSTEM PRE-DESIGN REPORT

SERVICE AREA

FIGURE 2-1

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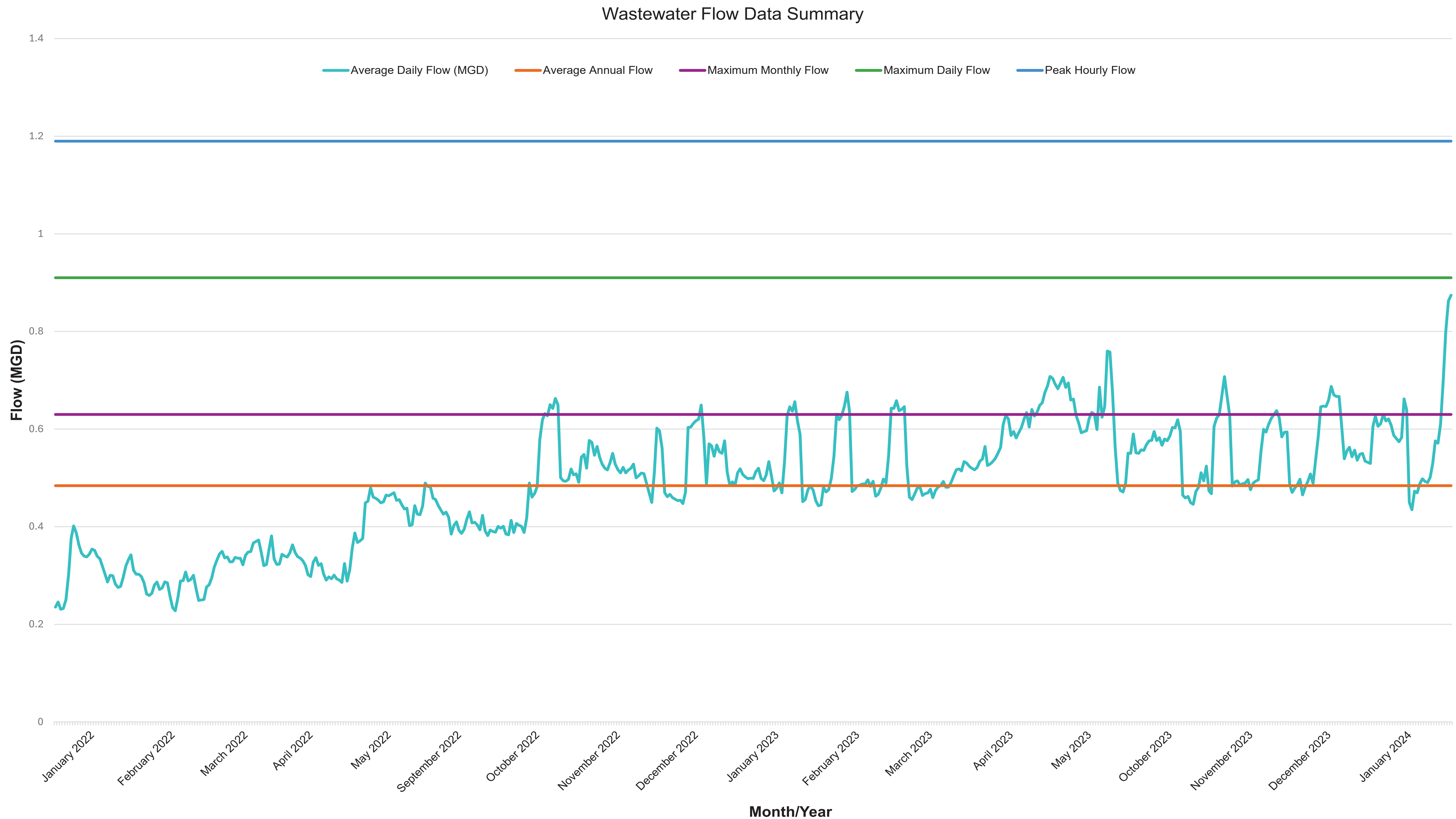

Note: Flow data from May 28, 2022, through August 2022 and June through September 2023 are not depicted due to operational issues that were occurring in the system.

MGD = million gallons per day

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CONFEDERATED TRIBES OF THE UMATILLA INDIAN RESERVATION
MISSION AREA WASTEWATER TREATMENT AND REUSE SYSTEM PRE-DESIGN REPORT
WASTEWATER FLOW DATA SUMMARY

FIGURE
2-2

CONFEDERATED TRIBES OF THE UMATILLA INDIAN RESERVATION
MISSION AREA WASTEWATER TREATMENT AND REUSE PRE-DESIGN REPORT
DESIGN CRITERIA

	Mission 2023	Future 2032	Future 2042
Population[1]	1,150	1,639	2,127
Per Capita Flow (gpcd)	272	272	272
AAF with I/I and WR&C, MGD2	0.484	0.617	0.750
AAF without I/I and WR&C, MGD3	0.313	0.446	0.579
I/I, MGD[3]	0.104	0.104	0.104
Average WR&C Flow, MGD4	0.067	0.067	0.067
Base Wastewater Flow, MGD[5]	0.380	0.541	0.703
Maximum Monthly Flow, MGD[6]	0.630	0.898	1.165
Maximum Daily Flow, MGD[7]	0.910	1.297	1.683
Peak Hourly Flow, MGD[8]	1.190	1.695	2.201
Average BOD_5 concentration, mg/L[9]	115	129	137
Average BOD_5 loading, lbs/day[10]	465	663	860
Maximum Month BOD_5 concentration, mg/L[11]	230	257	275
Maximum Month BOD_5 loading, lbs/day[12]	930	1,325	1,720
Average TSS Concentration, mg/L[9]	121	136	145
Average TSS loading, lbs/day[10]	490	698	906
Maximum Month TSS Concentration, mg/L[11]	243	271	290
Maximum Month TSS loading, lbs/day[12]	980	1,396	1,813
Estimated TKN Concentration, mg/L[13]	38	43	46
Estimated TKN loading, lbs/day[14]	155	221	287

Notes:
1 Current population based on 2022 population as reported by the CTUIR Planning Department. The 2042 population was projected using an average annual increase of 1.62 percent per year.
2 Based on average flow from flowmeter data from January 2022 to February 2024. Data for June through August 2022 and June through September 2023 were not available.
3 I/I assumed not to change from 2022 to 2042. I/I was calculated by subtracting the AAF from the base flow.
4 Average WR&C flow based on flow data provided by the CTUIR for 2018 through 2021. Facilities that contribute to the WR&C flow include the cineplex, hotel, golf course clubhouse, RV park, casino, and Arrowhead Travel Plaza.
5 Based on the minimum wastewater flow values in the 2022 through 2024 available flow data.
6 Approximate flow from May 2023. Note that February 2024 was showing extremely high flows; however, only one half of the month of February data was available.
7 Based on a flow recorded on February 4, 2024.
8 Based on hourly flow data from 2023 through 2024.
9 BOD_5 and TSS concentrations and loadings have been estimated using loads calculated from the January 14 through 17, 2024, sampling data.
10 Calculated from the January 2024 sampling data.
11 Calculated from the maximum month load, using the AAF.
12 Two times the average load.
13 TKN loadings were calculated from the January sampling data. The associated concentrations are those average loads divided by the AAF and 8.34.
14 Calculated from the January 2024 sampling data.

AAF = average annual flow
BOD_5 = five-day biochemical oxygen demand
CTUIR = Confederated Tribes of the Umatilla Indian Reservation
gpcd = gallons per capita per day
I/I = infiltration and inflow
lbs/day = pounds per day
mg/L = milligrams per liter
MGD = million gallons per day
TKN = total Kjeldahl nitrogen
TSS = total suspended solids
WR&C = Wildhorse Resort and Casino

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CONFEDERATED TRIBES OF THE UMATILLA INDIAN RESERVATION
MISSION AREA WASTEWATER TREATMENT AND REUSE SYSTEM
PRE-DESIGN REPORT
DESIGN CRITERIA

FIGURE
2-3

Chapter 3 - Raw Wastewater Conveyance Systems

This chapter of the Pre-Design Report presents information on both the existing wastewater collection system and the proposed improvements to serve the Mission community. Currently, all wastewater from the Mission area is being conveyed to the City of Pendleton for treatment by the City.

Existing Collection System

A sewer conveyance trunkline was constructed in 1972 to serve the Mission area in accordance with the provisions associated with its operation included in the 1978 transfer agreement (see Appendix A) between the Indian Health Service, the Confederated Tribes of the Umatilla Indian Reservation (CTUIR), the Umatilla Reservation Housing Authority, and the City. The trunkline extends approximately 4 miles between the City and the Bureau of Indian Affairs office in Mission. For planning purposes and CTUIR operations, Manhole (MH) 14 at Riverside Avenue and N.E. 42nd Street marks the starting point of the CTUIR's portion of the trunkline. Upstream of MH 14, the main trunkline is a 10-inch polyvinyl chloride (PVC) line that generally travels in an easterly direction until it changes to an 8-inch line at MH 67 (at Confederated Way approximately 320 feet south of Mission Road). In the 4 miles of piping between MH 14 and MH 67, the trunkline picks up multiple service laterals and collectors and conveys sewage via gravity flow to the City. Per the terms of the transfer agreement, the City is responsible for maintaining the trunkline.

Major wastewater system collectors include an 1,800-foot, 8-inch collector line along Short Mile Road; a 650-foot, 8-inch collector line north of the trunkline; and a 1-mile extension of a 10- and 8-inch collector line south of the Mission Road and Highway 331 intersection that connects the Wildhorse Resort & Casino (WR&C) complex to the trunkline. The 8-inch line extending east beyond MH 67 serves as a collector for the existing developments east of the CTUIR fire station. In total, the existing wastewater collection system consists of approximately 105,600 feet of 6-, 8-, and 10-inch pipelines (summarized from GIS data provided by the CTUIR GIS Department). Further information on the wastewater collection system is described in the 2006 Water and Wastewater System Master Plan and in a subsequent 2009 Infiltration and Inflow Assessment prepared by Anderson Perry & Associates, Inc.

Equalization Pond and Pump Station

A 2.5-acre wastewater equalization pond and pump station were constructed in 2008 as part of a larger infrastructure project related to the development of the Coyote South Business Park. The pond and pump station are located at the Coyote South Business Park south of Interstate 84 (I-84) and west of S. Market Road. Flows entering the equalization pond are metered through a 3-inch Parshall flume. The pump station is positioned on the southwest end of the equalization pond. Flows pumped from the pond are also metered. The pump station discharges to a 6-inch PVC pressure pipeline that extends east and north under I-84 across Highway 331 to the east side of the highway and then runs north and ties into the trunkline at the Mission Road and Highway 331 intersection.

Trunkline Flowmeter

A flowmeter manhole was installed on the 10-inch asbestos cement trunkline near Ishkit Lane in 2007. A Palmer-Bowlus flume and ultrasonic level sensor were installed to provide flow data on the trunkline before it connects to the City's wastewater system. The electrical control panel installed in 2007 was updated in 2021-22 to allow remote monitoring of the flow data.

Proposed Collection System Improvements

To meet the anticipated demands on the Mission area collection system as presented in the design criteria in Chapter 2, collection system improvements would be needed. These include both pipe conveyance improvements to serve existing areas with enhanced capacity and improvements to serve projected areas of growth in the Mission area.

South Service Area Conveyance Improvements

A new raw wastewater conveyance pipeline is proposed to be connected to the existing collection system piping on the east side of Highway 331 and along Timine Way and Mission Road to the proposed wastewater treatment facility (WWTF) site. This new pipeline would route all flows from facilities south of Timine Way (including WR&C, Arrowhead, and the Coyote Commercial Business Parks directly to the WWTF on Mission Road. The new conveyance pipeline would reroute flows coming from the south to the new pipeline, providing increased capacity to serve potential high growth areas to the south. This new pipeline would help preserve the existing trunkline's much-needed capacity to convey raw wastewater from the east service area to the WWTF.

A preliminary alignment of the new raw wastewater conveyance pipeline in Timine Way and Mission Road is presented on Figure 3-1. This alignment would require approximately 6,700 feet of 10-inch diameter pipe and 35 new manholes to be installed. The number of manholes to be installed on the pipeline is relatively high due to the curving nature of the existing Timine Way road alignment. This pipeline could also be installed parallel to the pressurized pipeline that would be installed to convey recycled water to the WR&C area for reuse.

The proposed collection and reuse pipeline alignment is located adjacent to Timine Way on the east and north sides of the road to limit the amount of asphalt restoration. However, some areas of excavation for the new pipeline would require excavating and restoring the existing asphalt pedestrian path. Minor areas of disturbance to the existing pedestrian path were selected to help minimize the cost of the pipe installation when compared to the cost of replacing large sections of existing asphalt pavement in Timine Way. Alternative piping alignments could be considered in the design process, but it is anticipated that full street asphalt or concrete sidewalk restoration would be required with any re-routing options, potentially increasing the replacement cost.

Wastewater Treatment Facility Tie-In

As shown on Figure 3-1, a new connection to the existing trunkline in the vicinity of Ishkit Lane east of Davis Lane, near the proposed WWTF site, would be needed. This tie-in would allow wastewater from the existing 10-inch diameter trunkline to be routed to the new WWTF. A new manhole would be installed at this location to eliminate flows from continuing to be conveyed to the City. With this tie-in to the existing trunkline, the pipeline would need to be installed under an active Union Pacific

Railroad line. The cost for this installation under the railroad is included in the cost estimates discussed later in this chapter.

Gopher Flats Service Area

CTUIR staff have indicated that the area southwest of the proposed WWTF is likely to develop further (primarily with residential developments) over the 20-year planning period. This area, referred to hereafter as the Gopher Flats service area, is estimated to be approximately 550 acres, as shown on Figure 3-1.

Additional wastewater contributions from this potential expansion area have been calculated as follows. A sample housing area of approximately 55 acres was taken in the Gopher Flats service area, which reflects an assumed housing density of approximately one home for every 3 acres (19 homes total). An average household size of 2.97 (based on the information provided in the Johnson Economics Market Analysis & Future Land Needs Report provided by the CTUIR) was referenced, which resulted in approximately 57 residents to be served in this representative area. This resulted in approximately one person per acre in the representative housing density for the area. This population density was then extrapolated to the full 550 acres in the service area, which resulted in a potential future population of approximately 572 residents. An average of 69 gallons per person per day contribution was assumed based on the information provided in the Metcalf & Eddy *Wastewater Engineering: Collection and Pumping of Wastewater* textbook. The projected contribution for the Gopher Flats service area is lower than that discussed in Chapter 2 due to the rural residential nature of the area and the lack of any anticipated commercial contributors to the system. This results in an average annual flow of 39,500 gallons per day (gpd) and a peak hourly flow of approximately 97,000 gpd (using the factors described in Chapter 2). These flows are included in the design criteria projections discussed in Chapter 2.

Providing wastewater service to this area is anticipated to require a new lift station with a flow capacity of approximately 67 gallons per minute (gpm) (97,000 gpd). Approximately 7,000 feet of 4-inch diameter pressure sewer pipe is anticipated to be required to convey wastewater from the Gopher Flats service area lift station to the WWTF. Approximate locations of these facilities are shown on Figure 3-1.

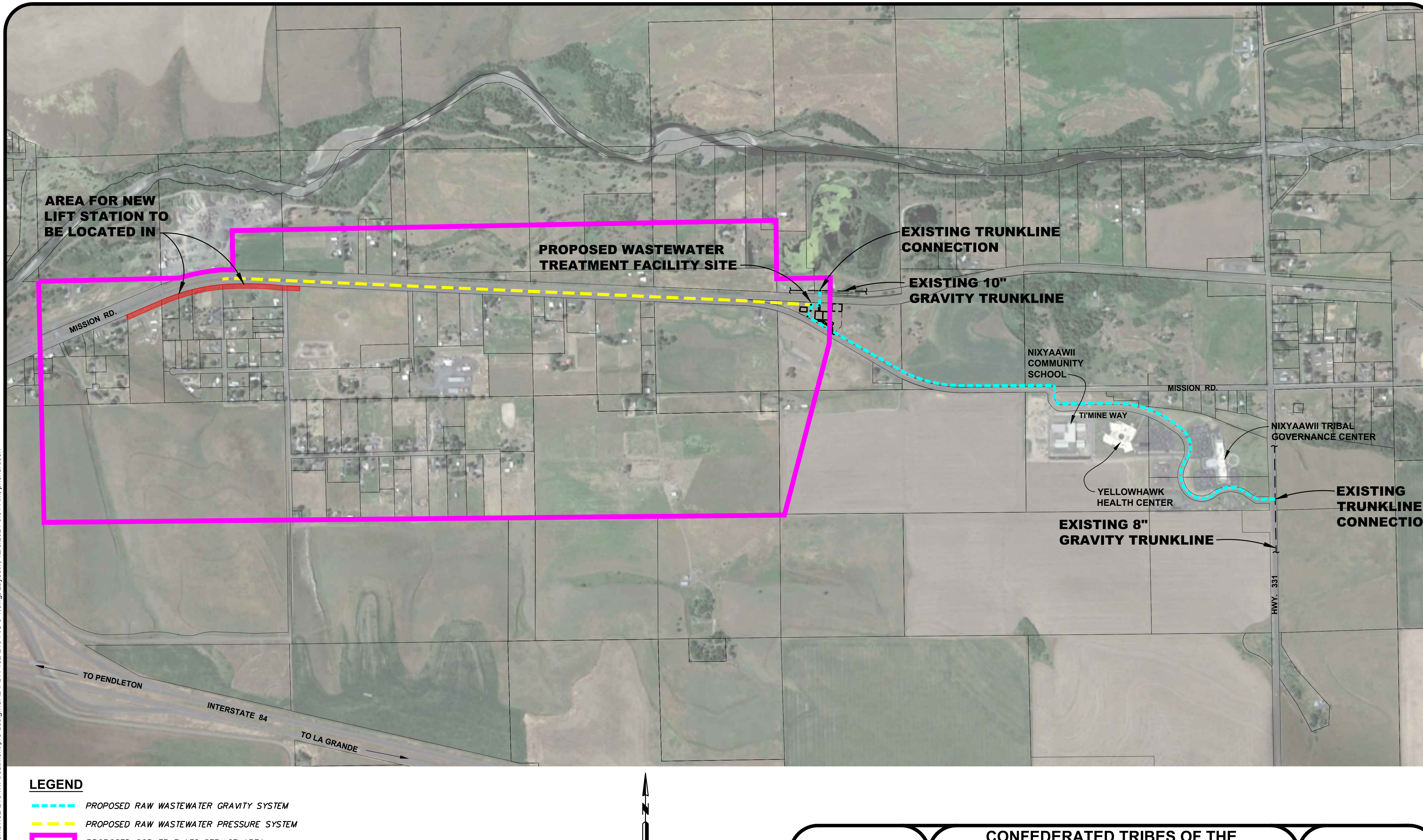
Lift Station Siting and Components

A new wastewater lift station is proposed to be located near American Rock Products on the south side of Mission Road to convey future and existing flows from the area (see Figure 3-1). The potential site for the lift station is shown on Figure 3-1. The lift station site has been selected to be on the south side of Mission Road to avoid having to cross the railroad tracks with the pressure sewer line. It should be noted that the properties in this area are privately owned parcels that would require acquisition of the land or easements by the CTUIR.

The lift station is proposed to be a duplex lift station using submersible, non-clog pumps (two for redundancy) capable of passing a 3-inch solid. Each submersible pump motor is anticipated to be approximately 5 horsepower, capable of pumping the estimated peak hourly flow rate of 67 gpm (97,000 gpd). The lift station would have a wetwell (constructed of either pre-cast concrete or fiberglass) with an operating volume of approximately 200 gallons. A depth sensor would be installed in the wetwell to monitor the water level. In addition to the depth sensor, a float system including a potential overflow, high water, lead pump on, and pumps off float would be included. The lift station would be equipped with a valve vault consisting of check valves and plug valves for each pump, as well as a pressure gauge assembly and sewage air release valve. In the event the lift station loses power, a manual transfer switch for connection to backup power would be provided. A typical section of the lift station is shown on Figure 3-2.

Raw Wastewater Conveyance System Cost Estimate

A preliminary estimate in 2024 dollars of the proposed raw wastewater conveyance system improvements is presented on Figure 3-3. The estimated cost for the construction of the lift station and pressure sewer to convey flows from the Gopher Flats service area is approximately $1,096,000. The estimated cost for construction of the south service area improvements and the wastewater treatment facility tie-in is approximately $1,564,000, with a total estimated raw wastewater conveyance system construction cost of approximately $3,060,000.



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CONFEDERATED TRIBES OF THE UMATILLA INDIAN RESERVATION

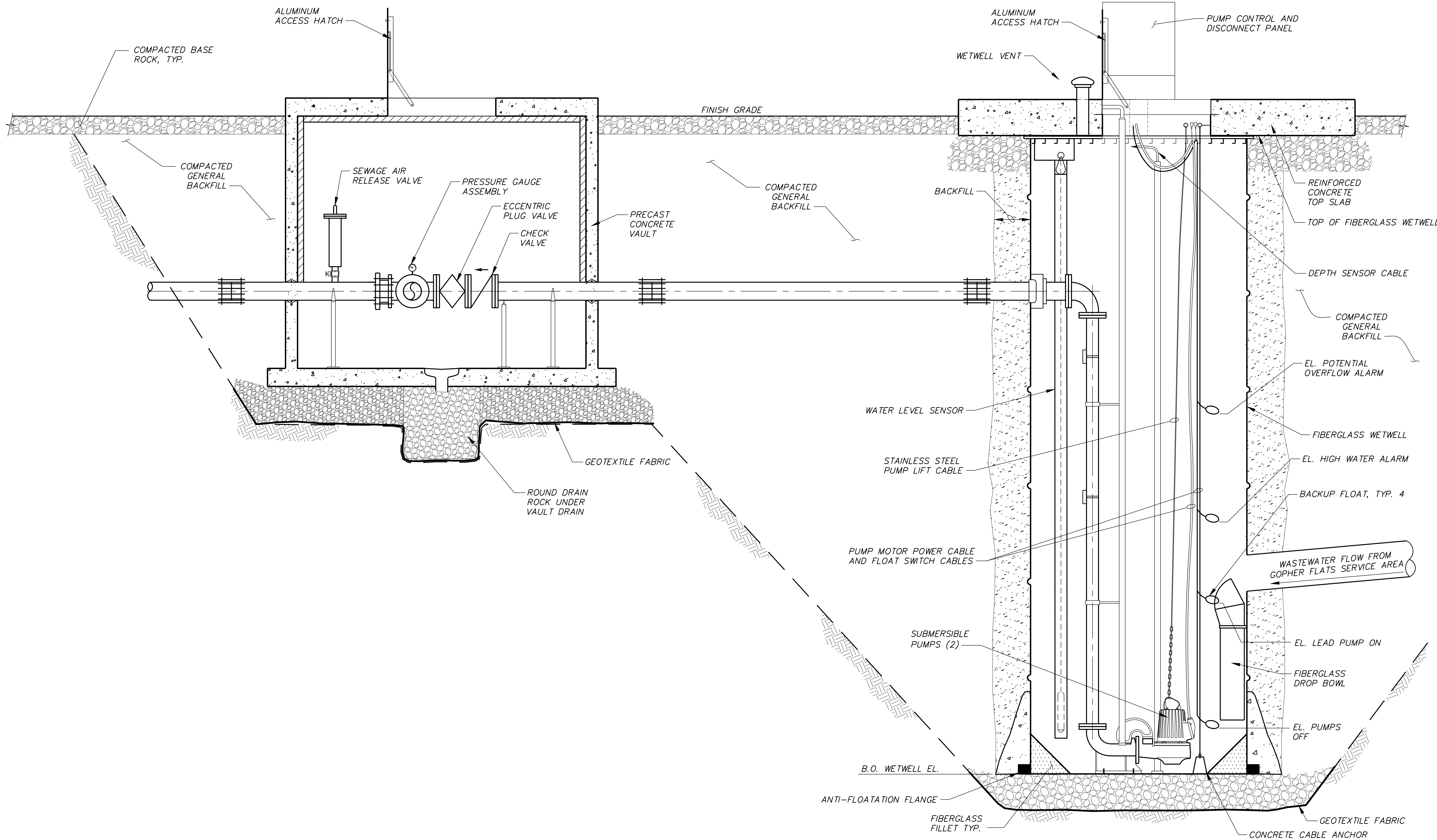
MISSION AREA WASTEWATER TREATMENT AND REUSE SYSTEM

PRE-DESIGN REPORT

PROPOSED RAW WASTEWATER CONVEYANCE SYSTEMS

FIGURE 3-1

X:\Clients\ctuir - public works\152-218 ww treatment pre-design\CAD\PDR-152-218-FIG 3-1.dwg, Layout1, 12/5/2024 9:51 AM, prichardson



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CONFEDERATED TRIBES OF THE UMATILLA INDIAN RESERVATION

MISSION AREA WASTEWATER TREATMENT AND REUSE SYSTEM

PRE-DESIGN REPORT

WASTEWATER LIFT STATION TYPICAL SECTION

FIGURE 3-2

X:\Clients\ctuir - public works\152-218 ww treatment pre-design\CAD\PDR-152-218-FIG 3-2.dwg, Layout1, 12/5/2024 8:58 AM, prichardson

CONFEDERATED TRIBES OF THE UMATILLA INDIAN RESERVATION
MISSION AREA WASTEWATER TREATMENT AND REUSE SYSTEM PRE-DESIGN REPORT
RAW WASTEWATER CONVEYANCE SYSTEM
PRELIMINARY COST ESTIMATE
(YEAR 2024 COSTS)

NO.	DESCRIPTION	UNIT	UNIT PRICE	ESTIMATED QUANTITY	TOTAL PRICE
South Service Area - Raw Wastewater Conveyance System					
1	Mobilization/Demobilization	LS	$ 100,600	All Req'd	$ 100,600
2	Project Safety/Traffic Control	LS	25,000	All Req'd	25,000
3	10-inch Gravity Sewer	LF	90	6,700	603,000
4	Standard Sanitary Sewer Manhole	EA	8,000	35	280,000
5	Connect to Existing Sewer	EA	4,000	3	12,000
6	60-inch Precast Manhole	LS	10,000	All Req'd	10,000
7	Bypass Pumping	HR	620	25	15,500
8	Highway Crossing - Highway 331 at Timine Way	LS	135,000	All Req'd	135,000
9	Railroad Crossing of Trunkline	LS	200,000	All Req'd	200,000
10	Asphalt Surface Restoration	SY	75	900	67,500
11	Gravel Surface Restoration	SY	22	300	6,600
12	Sidewalk Restoration	SF	25	1,100	27,500
13	Asphalt Path Restoration	SY	65	1,250	81,300
				Subtotal	**$ 1,564,000**
Gopher Flats Service Area - Raw Wastewater Conveyance System					
1	Mobilization/Demobilization	LS	$ 69,700	All Req'd	$ 69,700
2	Project Safety/Traffic Control	LS	25,000	All Req'd	25,000
3	Lift Station and Site Work	LS	450,000	All Req'd	450,000
4	4-inch Pressure Sewer	LF	80	6,500	520,000
5	Asphalt Surface Restoration	SY	125	180	22,500
6	Gravel Surface Restoration	SY	22	400	8,800
				Subtotal	**$ 1,096,000**
				Total Estimated Construction Cost	**$ 2,660,000**
				Construction Contingency @ 15%	400,000
				Total Estimated Raw Wastewater Conveyance System Budget (2024)	**$ 3,060,000**
				TOTAL ESTIMATED RAW WASTEWATER CONVEYANCE SYSTEM BUDGET (2026)*	**$ 3,370,000**

*Assumes 5 percent annual inflation.

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CONFEDERATED TRIBES OF THE UMATILLA INDIAN RESERVATION
MISSION AREA WASTEWATER TREATMENT AND REUSE SYSTEM PRE-DESIGN REPORT
RAW WASTEWATER CONVEYANCE SYSTEM PRELIMINARY COST ESTIMATE

FIGURE 3-3

Chapter 4 - Treatment System

As discussed in Chapter 1 of this Pre-Design Report (PDR), one of the primary goals of this PDR is to provide additional process and equipment information as necessary to better inform the design of the proposed new wastewater treatment facility (WWTF). This chapter provides a comparison of specific treatment equipment options for the Confederated Tribes of the Umatilla Indian Reservation (CTUIR) to consider along with recommendations on specific equipment for each of the required unit processes.

Treatment Process Description

As determined in the 2023 Mission Area Wastewater Treatment Feasibility Study (WWTFS), the CTUIR has identified a preferred treatment alternative. Generally, the preferred treatment alternative would consist of the following:

- Headworks, including influent flow metering, mechanical screening, grit removal, and an influent lift station
- Secondary treatment via a packaged activated sludge treatment facility
- Tertiary filtration
- Ultraviolet (UV) light disinfection
- Aerobic digestion for solids stabilization
- Sludge drying beds to dewater and store biosolids for easier handling and disposal

The proposed WWTF is intended to produce high quality recycled water, equivalent to the U.S. Environmental Protection Agency (EPA) and the Oregon Department of Environmental Quality (DEQ) Class A recycled water standard. During winter months when irrigation is not feasible, the recycled water would then be stored in storage wetlands/ponds (SWPs). The SWPs would be laid out and designed to provide a park-like natural environment and add to recreational facilities already in place in the Mission area. During spring, summer, and fall months, the recycled water is intended to be irrigated at the Wildhorse Resort & Casino (WR&C) golf course and other tribal facility landscaped areas. The recycled water conveyance (including the recycled water pump station to deliver recycled water to the proposed SWPs), storage, and irrigation systems are further discussed in Chapter 5.

Proposed Treatment Equipment and Sizing

To provide a general overview of the proposed wastewater treatment process described above, a conceptual process flow diagram for the proposed treatment and disposal facilities has been developed, as shown on Figure 4-1. This process flow diagram is intended to graphically depict wastewater flow through the proposed treatment system, showing the various critical treatment processes to produce Class A recycled water at the end of the treatment process.

In addition to the process flow diagram, a preliminary hydraulic profile has been developed as shown on Figure 4-2. The intent of this hydraulic profile is to show how the wastewater is intended to flow through the full treatment process, commonly referred to as the “treatment train.” This includes graphical depictions of where pumps would be required and where gravity flow would be utilized through the treatment train. As shown on Figure 4-2, the influent piping is anticipated to be relatively deep due to the depth of the existing gravity sewer piping and site topography. At this depth, groundwater dewatering is anticipated to be needed. During design, consideration will be given to potentially locating the headworks screen after the influent lift station as a potential value engineering option to reduce the costs to construct the headworks. However, it should be noted that there are operational advantages to locating the lift station after the influent screen, as doing so helps mitigate the potential for pump clogging due to rags and other inorganic materials.

Additional information about each of the proposed equipment types and processes shown on the process flow diagram and hydraulic profile is discussed in further detail below. When evaluating unit processes and associated equipment options, the greatest weight was given to the operational simplicity and ease of maintenance of the options considered. Though capital cost was also a factor in evaluating options, it was generally understood that the ease of operation and maintenance (O&M) is critical to the CTUIR for the greatest success of the new WWTF.

Headworks

General

Headworks facilities can include a variety of processes and equipment that are often dictated by the downstream unit processes and site layout. Generally, headworks facilities contain flowmeters, lift stations, screens, and grit removal, as applicable, and are referred to as preliminary treatment. The following descriptions outline each of these processes and the associated size and features associated with the proposed treatment system. The general location proposed for the construction of the headworks facility is shown on Figure 4-3.

Flow Metering

Influent flow metering at a WWTF is a critical component for data collection, analysis, and operation. The flow metering data will primarily assist with operator analysis of impacts of flows on treatment efficacy; however, accurate data collection and analysis will also be critical for future planning as the community continues to grow. Flowmeters would be provided and sized based on the design flows from Chapter 2. The flow metering equipment would be sized to measure flows slightly more than the projected 2042 design peak hourly flow of 2.2 million gallons per day (MGD).

Flow Metering Types

Flow metering can be achieved using various devices. Generally, flow metering devices are divided into two categories: gravity (open channel) flow and pressure (closed pipe) flow. Gravity flow can be measured using flumes, weirs, channels, etc., with associated instrumentation to sense the wastewater level and calculate and display the flow rate. Pressure flow is typically measured using electromagnetic flowmeters, ultrasonic flowmeters, propeller flowmeters, etc. Based on the hydraulic evaluation, the headworks facility would not have pressurized flow and, thus, pressure flowmeter devices were not further evaluated.

Two types of gravity (open channel) flow metering devices were considered, including a Parshall flume and a Palmer-Bowlus flume. Other open channel flow measuring devices such as weirs were not considered as they are not designed for sewage influent applications with potentially fibrous solids. Based on the evaluation, it is recommended that a Parshall flume be utilized for the influent flow metering at the headworks facility. When comparing the Parshall flume to the Palmer-Bowlus flume, the main factors are the flow range, solids passage, and configuration requirements. When compared to Parshall flumes, Palmer-Bowlus flumes have a greater minimum flow, reducing the range at which flows can be accurately measured. Because the Palmer-Bowlus flume is not designed for lower flows, when flows are low and solids content high, solids tend to collect upstream of the flume throat and may not dislodge as flows increase. Typical recommendations for the upstream length of straight pipe/channel for the Palmer-Bowlus flume is also greater than that of the Parshall flume. Typically, a Parshall flume requires an upstream straight length of 10 to 20 times the Parshall flume's throat. A Palmer-Bowlus flume typically requires an upstream straight length of approximately 25 times the pipe or channel width. Based on the evaluation, it is recommended that a Parshall flume be utilized for the influent flow metering at the headworks facility.

Flow Metering Flume Sizing

Parshall flumes are sized based on flow and associated head. For each flume size, there is a minimum and maximum flow rate that can be accurately measured and an associated head at each flow rate. As noted above, the flow metering device would be sized to handle the projected 2042 design peak hourly flow of 2.2 MGD (1,528 gallons per minute [gpm]). This design flow results in a minimum Parshall flume size of a 6-inch flume throat width. This flume size has a flow range of 0.035 to 2.53 MGD. At the design flow rate, the head through the 6-inch flume is approximately 1.5 feet. A 9-inch Parshall flume has a flow range of 0.059 to 5.73 MGD, and the head required at the design flow rate would be reduced to a little less than 1.1 feet. It is recommended that a 9-inch Parshall flume be used in the headworks facility, as it would result in less required head, have a higher maximum flow rate to accommodate potential growth beyond the 20-year projections, and would not have a significant reduced minimum flow rate compared to the 6-inch Parshall flume.

Screening System

Screening influent wastewater is a critical process within a treatment system to maintain proper operation and decrease maintenance of downstream processes. A mechanically cleaned screening system is proposed to be constructed directly downstream of the influent flow metering. It is proposed that the influent flow metering and screening systems be integrated within a single concrete structure. Based on the design flows from Chapter 2, the proposed screening system is preliminarily sized to accommodate the projected 2042 design peak hourly flow of 2.2 MGD. Additionally, a bypass channel with a manually cleaned bar screen would be provided to allow larger inorganics to be removed when the mechanically cleaned screening system must be taken offline for maintenance. Screenings removed from the wastewater via the mechanical screening system would be washed and compacted while allowing organic materials to remain in the main wastewater flow for treatment. The washed and compacted screenings would be conveyed to a dumpster for collection and disposal.

Headworks Screen Type

Two types of headworks screen options were considered in this PDR. These options are outlined below. A third option, the spiral screw screen, was briefly considered due to its ability to be installed vertically and reduce capital costs required to accommodate deeper headworks channels. These screens can be beneficial in deeper applications, but there are more components that require periodic replacement. As such, this third option was removed from consideration due to its more labor-intensive O&M requirements.

Perforated Plate Screen

A perforated plate screen uses a track system with perforated screen panels that remove solids. The track rotates the screen panels as they capture solids. The panels form a continuous belt on the track system, which transports screenings to the discharge location, at which point they are cleaned from the screen panels with a brush and spray nozzles. This screen can be housed outdoors as the internal mechanisms are self-contained/enclosed to help protect them from the weather and reduce odors. Freeze protection can be provided by including a Class 1, Division 1-rated radiant heater located under the front cover of the screen just above the operating floor. The heater would need to be corrosion resistant but would require periodic replacement due to the nature of raw wastewater and high corrosion potential. Another potential option for freeze protection would be that of heat tracing and insulating the screen. While this option is expected to be more cost-effective, additional maintenance of the heat tracing would be required. Typical maintenance activities include replacing/unclogging wash nozzles, inspecting the brush for wear, and inspecting moving parts for wear.

Advantages:

- Can be rebuilt periodically to extend the screen life
- Less maintenance than other alternatives
- More easily accommodates deeper installations

Disadvantages:

- Utilizes a screw compactor for solids washing, compacting, and disposal
- Capital cost is higher than other options
- The inclusion of a radiant heater requires additional capital and operation costs

Rotating Drum Screen

Rotating drum screens use a screening basket to collect solids from wastewater. The screening basket is constructed of perforated plate to collect fine solids and minimize clogging. Typical perforation sizes available include 1 to 6 millimeters (mm). The screening basket rotates and lifts the collected solids out of the influent flow. Once the solids reach the top of the basket, they drop into the central screw conveyor with an integral washer and compactor. A spray wash system is used to help ensure all solids are removed from the screening basket and helps clean fecal material from the solids. The screw conveyor transports the solids while compacting and removing water from the solids before discharging. Depending on the system configuration, the screw conveyor typically discharges directly into a dumpster or separate conveyor used to transport the screenings to a remote dumpster. Rotating drum screens must be installed at an approximately 35-degree angle, which typically results in increased costs for deeper installations.

Advantages:

- Integral washer compactor eliminates the need for additional equipment

- Lower capital cost than other options
- Maintenance items are relatively simple
- Can be heat traced for weatherproofing if needed

Disadvantages:

- Less effective at handing substantial flow variations
- More susceptible to grit wear than other options
- Typically requires a gantry crane to lift the basket out of the channel

Of the two screening systems considered, the perforated plate screen is recommended. This screen is anticipated to function better at the proposed depths while still accommodating the anticipated variation in flows. The headworks screen (along with the grit removal equipment discussed below) is anticipated to be housed inside a building. However, it is recommended that the influent screen type be further evaluated during the design phase if the headworks depths or location change substantially or if value engineering results in the need to eliminate the proposed building to house the headworks equipment.

Grit Removal System

Grit removal systems protect downstream mechanical equipment, such as pumps, from abrasion and associated premature wear. Grit removal systems also reduce the formation of heavy grit deposits in the treatment system basins and aeration chambers, helping reduce O&M activities. Various types of grit removal systems are available. Grit removal is generally completed at the headworks facility just downstream of the screening system. Based on the design criteria from Chapter 2, the proposed grit removal system would be sized for the projected 2042 design peak hourly flow of 2.2 MGD. If required, slide gates would be provided within the grit removal system to direct and isolate flow for equipment maintenance. Grit removed from the wastewater would be classified/washed and dewatered before being conveyed to a dumpster for collection and disposal. The liquid flow from the classification/washing and dewatering process associated with the grit removal would be returned to the wastewater flow path for treatment.

The grit removal and screening systems would be integrated to utilize common components. This includes utilizing the same dumpster loading system, dumpster, dumpster building, etc., as the screening system. The concrete structures housing both systems would also be designed to integrate and reduce the overall headworks facility footprint (or square footage of area consumed).

Depending on the secondary treatment process ultimately selected by the CTUIR, the implementation of fine screening (2 mm perforations or smaller) could potentially be used to help remove the larger grit instead of providing separate grit removal equipment. Doing so would result in lower project costs and simpler operational requirements; however, foregoing the inclusion of separate grit removal equipment will likely result in lower grit capture efficiencies. As such, it was generally assumed that grit removal is to be included in the development of cost estimates associated with this preliminary design effort. The potential for using finer screening instead of separate grit removal equipment will be evaluated further during the design process once the secondary treatment equipment and processes have been selected.

Grit Removal Alternatives

Several options are available for grit removal for the CTUIR's consideration. These options include aerated, vortex, and horizontal flow grit chambers.

Aerated Grit Chamber

Aerated grit removal systems generally consist of a concrete grit chamber, air blowers, coarse bubble air diffusers, grit slurry pumps, and grit classifying or washing and dewatering equipment. Wastewater enters the grit chamber in a spiral pattern, while air is introduced in the grit chamber along one side by the air blowers and coarse bubble diffusers. The introduction of air causes a perpendicular spiral velocity pattern to flow through the chamber. The heavier grit particles, typically 65 mesh (0.23 mm) or larger, are accelerated and diverge from the streamlines, dropping to the bottom of the grit chamber. The lighter organic particles remain suspended and eventually pass through the grit chamber. Grit is typically removed from the bottom of the chamber as a slurry using a grit slurry pump. The grit slurry is conveyed and discharged into a grit classifier or washer and dewatering equipment. Dewatered grit is then conveyed to a dumpster for collection and disposal.

Aerated grit chambers with proper air supply adjustment can obtain nearly 100 percent removal. However, unlike some other alternatives, the aerated grit chamber system requires air blowers, resulting in additional equipment that must be maintained. The low velocities through the chamber also result in a larger footprint compared to other alternatives.

Advantages:

- Greatest potential for consistent grit capture

Disadvantages:

- Larger footprint required
- Greatest energy requirements
- Greatest anticipated capital cost

Vortex Grit Chamber

Vortex grit removal systems generally consist of a grit chamber, grit slurry pump, grit dewatering equipment and, depending on the style, could include a vortex drive assembly. Vortex grit removal systems typically come in two styles: mechanically induced and hydraulically induced. The grit chamber for both styles of vortex grit removal systems would be a cylindrical concrete chamber in which flow enters tangentially, creating a vortex flow pattern. The centrifugal and gravitational forces cause the grit to move inward and downward where the grit settles and collects at the bottom of the chamber. With a mechanically induced system, an electric motor vortex propeller assembly is used to assist with the vortex flow within the grit chamber. The lighter organics and water exit the grit chamber of a mechanically induced system tangentially. The hydraulically induced systems flow enters tangentially at the top of the unit to create the vortex flow without the assistance of mechanical equipment. Flow typically exits hydraulically induced systems through the center of the top of the unit. Both the mechanically and hydraulically induced systems can provide 95 percent grit capture for particle sizes greater than 50 mesh (0.29 mm), 85 percent capture for particle sizes between 50 mesh (0.29 mm) and 70 mesh (0.21 mm), and 65 percent capture for particles between 70 mesh (0.21 mm) and 100 mesh (0.15 mm). Grit is typically removed from the bottom of the chamber using a top-mounted air lift or vacuum primer pump or at the bottom of the chamber using a flooded suction-style pump. Both pump types have advantages and disadvantages. Top-mounted pumps typically reduce construction costs and the footprint but are less efficient, include additional equipment (air lift/vacuum primer), and can be susceptible to freezing. Bottom-mounted flooded suction style pumps generally increase construction costs due to an adjacent building or vault to house the pump, which also increases the footprint. However, flooded suction pumps do not require the ancillary equipment for priming the pump and are typically housed within a structure to reduce freeze potential. Pump type is generally selected based on site layout, specifically elevation drop across the site, and climate. The grit slurry removed from the bottom of the grit chamber by the pump is conveyed and discharged into dewatering equipment such as a grit classifier or grit washer.

Advantages:

- Smaller footprint required
- Lower energy requirements
- Relatively high and consistent capture rate

Disadvantages:

- Capture rate can be flow dependent
- Moderate capital cost

Horizontal Flow Grit Chamber

In their most simplistic form, horizontal flow grit removal systems consist of a concrete grit chamber and flow control device. More complex systems can include a means for grit removal from the grit chamber and grit dewatering equipment. A flow control device such as a Parshall flume, weir, etc., is used to control and maintain the velocity through the grit chamber, allowing grit to settle to the bottom of the grit chamber. Typically, a horizontal velocity of 1 foot per second is used for design purposes. The grit chamber must be of sufficient length to allow grit particles to settle from the top of the flow to the bottom. Once grit settles to the bottom of the grit chamber, the grit must be removed. Grit removal can be achieved by dredging, grab buckets (clam shells), chain-and-bucket conveyors, etc. The frequency of grit removal depends on the allowable grit storage volume in the grit chamber. The type of removal would also dictate if dewatering is required. The use of dredging and chain-and-bucket conveyors typically requires some sort of dewatering prior to disposal of the grit. Grab buckets can be used to wash the grit by lifting and dropping the grit through the grit chamber and then remove the grit while allowing the water to drain from the bucket.

Advantages:

- Lowest energy requirements
- Simplest equipment operation

Disadvantages:

- Largest footprint required
- Capture rate requires consistent manual cleaning (i.e., increased O&M)
- Most difficult to expand as the CTUIR grows

Of the grit removal systems considered, the vortex grit chamber is recommended. This system is anticipated to provide adequate removal and relatively low maintenance requirements while limiting footprint impacts and providing for the greatest flexibility in expansion.

Influent Lift Station

The need for an influent lift station is based on the site configuration, site topography, and locations (depth) of existing and new infrastructure at the proposed WWTF site. To utilize existing infrastructure to the maximum extent possible, a connection to the existing wastewater trunkline between Mission and the City of Pendleton is proposed to be made just north of the proposed WWTF site, as described in Chapter 3 of this PDR. Due to the depth of the existing trunkline being approximately 10 feet below ground surface, an influent lift station would be needed to raise the grade of water entering the WWTF.

The influent lift station is proposed to consist of a duplex lift station using submersible, non-clog pumps capable of passing a 3-inch solids. Each pump would be capable of pumping at the projected 2042 design peak hourly flow of 2.2 MGD (1,528 gpm). The pumps could be operated in tandem if an unexpectedly high peak flow event occurred. The lift station is proposed to have a wetwell operating volume of approximately 4,000 gallons to allow adequate pump operation cycle times.

Treatment System

As established in the WWTFS process, the CTUIR has indicated a desire to use a packaged activated sludge treatment facility to accomplish the requisite secondary treatment of wastewater for reuse purposes. Furthermore, the CTUIR has expressed a desire to have the option of seasonally providing biological nutrient removal at its WWTF. Several options are available for packaged activated sludge treatment facilities that can consistently meet the needs of the CTUIR. After discussion with CTUIR staff during the development of both the WWTFS and this PDR, two main systems were identified as warranting further evaluation. These options are the Aero-Mod extended aeration system and the biological combined system (BIOCOS) hybrid activated sludge system. Additional information about each of these technologies is summarized below.

Aero-Mod Extended Aeration

The Aero-Mod extended aeration system uses a traditional extended aeration activated sludge configured in a common-wall construction to reduce the overall footprint of the associated WWTF and reduce capital costs. The system is capable of providing biological nutrient removal if desired and is considered to be among the simplest of mechanical treatment facility options. Typical Aero-Mod facilities consist of an anaerobic selector (if biological phosphorus removal is desired), a pre-anoxic selector (for denitrification), two aeration basins in series (i.e., two basins for each potential flow path, four basins total), followed by clarification. In addition, common-wall aerobic digesters are included as a standard part of the Aero-Mod package to allow for sludge stabilization. General advantages and disadvantages of the system are outlined below.

Advantages:

- Lower capital cost
- Simpler to operate and maintain

Disadvantages:

- Less flexible treatment capabilities
- More susceptible to chemical or biological upset

Biological Combined System Hybrid Activated Sludge

The BIOCOS hybrid activated sludge system combines traditional extended aeration activated sludge with sequencing batch reactor (SBR) technology. Like the Aero-Mod system, BIOCOS is also capable of providing biological nutrient removal if desired. Typical BIOCOS facilities consist of an anaerobic selector (if biological phosphorus removal is desired), aeration tanks, then SBR tanks. The system alternates from one treatment train to the other to allow for continuous flow while using the SBR technology. This package system does not include any form of digestion for sludge stabilization as a part of its base package. To make the comparison between systems objective, it is assumed that aerobic digestion would be used for sludge stabilization. General advantages and disadvantages of the BIOCOS system are outlined below.

Advantages:

- More flexible treatment capabilities
- Less susceptible to chemical or biological upset

Disadvantages:

- Higher capital cost
- More challenging to operate and maintain

At this time, the CTUIR is undecided regarding which technology is preferred. During the early courses of the design phase, a decision will need to be made on which technology the CTUIR would like to employ. A Request for Proposals (RFP) from each manufacturer noted herein and potentially other activated sludge treatment processes may be issued by the CTUIR early in the design phase to help determine which treatment technology will best meet the CTUIR's needs, as discussed further in the following section. The selected treatment equipment package will form the basis for the final design of the WWTF.

Wastewater Treatment Facility Operations

A major concern for the CTUIR is operational support, especially bringing the new WWTF online, followed by the first few years of operation of the new WWTF. Because the CTUIR has not historically operated its own WWTF, a few years are anticipated to be needed to train its staff before they will be confident operating the new WWTF independently. It can take eight years or more for a staff person to obtain the certifications needed to operate a mechanical WWTF.

Currently, a major advantage of the BIOCOS system is the familiarity of a local contract operations company with the system and its ability to provide substantial operational support during these critical early years. Considering this, a critical component of a potential RFP to select a preferred treatment process will be the proposer's ability to supply contract operations of the new WWTF for the first few years of operation. The supplier would also need to simultaneously provide training to CTUIR staff in a manner to prepare them to assume WWTF operations. It is recommended that this RFP be prepared in a manner to indicate the importance of promoting CTUIR independence or, in other words, the ability of the proposer to competently prepare CTUIR staff to confidently operate the WWTF independently after the new WWTF is in operation for a few years.

Tertiary Filtration

As determined in the WWTFS, the CTUIR desires to produce high-quality recycled water to consistently meet the Class A standards as classified by the EPA and the DEQ. To consistently produce such a high-quality recycled water, tertiary filtration is required. Though there are several options available, the following three primary options were considered in this PDR: sand filtration, fabric disk filtration, and membrane pressure vessel filtration. Additional information about each of these filter technologies is outlined below.

Sand Filtration

Sand filters typically used for tertiary wastewater treatment offer gravity filtration of the recycled water. Wastewater flows through a bed of sand, and particles not removed as a part of the secondary clarification process are then filtered out through the sand media. As organic matter builds up on the sand media, a backwash cycle is run to clean the media, with the backwash water captured and recycled through the WWTF. Advantages and disadvantages of sand filtration are outlined below.

Advantages:

- Easy to operate
- Relatively low maintenance

Disadvantages:

- Substantially larger footprint requirements
- Loss of filtration media and frequent replacement can be an issue
- Inconsistent flow rates can lead to odor issues
- May require some chemical addition for greater efficiency

Fabric Disk Filtration

Fabric disk filters are commonly used to provide tertiary wastewater filtration. Typical systems use several fabric-covered disks submerged in a basin. Wastewater is filtered through the fabric and sent to downstream processes. Solids are generally captured on the face of the disks. As the disks begin collecting a mat of solids, headloss increases, and the water level in the tank rises. Once the water level of the tank rises to a predetermined setpoint, the disk filter is automatically backwashed while remaining in service by rotating the disks past the backwash shoe. Advantages and disadvantages of fabric disk filtration are outlined below.

Advantages:

- Easy to operate
- Relatively low power requirements
- Small footprint requirements

Disadvantages:

- Susceptible to plugging by filamentous bacteria if upstream clarification is inefficient
- Typically requires a polymer addition and flocculation for maximum efficiency
- More mechanical parts requiring maintenance

Pressure Membrane Filtration

Pressure membranes use micro- or ultra-filtration to provide exceptional quality recycled water. The membrane filter is housed in a pressure vessel. Wastewater flows into the pressure vessel, then permeate pumps pull the wastewater through the membrane. As organic matter builds up on the membranes, the trans-membrane pressure differential rises. At a certain threshold, the membranes are cleaned using a bleach cleaner to slough off the filtered solids, which are then recycled back to the head of the WWTF. Periodically, though less frequently, an acid wash is also used to clean water hardness precipitate off of the membranes. Advantages and disadvantages of pressure membrane filtration are outlined below.

Advantages:

- Consistently produces the highest quality recycled water of all options considered
- The least impacted by chemical or biological upset of all options considered
- Relatively small footprint requirements

Disadvantages:

- Highest capital cost
- Highest operational cost
- Requires the greatest amount of chemicals and power to operate and maintain
- Most expensive to repair/replace
- Most complicated to operate and maintain

Among the options considered, the fabric disk filter appears to be the best fit for the CTUIR. It is anticipated to provide consistent filtration with either of the secondary treatment processes selected, minimize the amount of space required for adequate filtration, and allow for relatively simple O&M. The smaller footprint required would also make future expansion much easier, should the need arise.

Ultraviolet Disinfection

During the development of the WWTFS, the CTUIR determined that a UV disinfection system was much more favorable to include in the wastewater treatment process than disinfection by chemical introduction. Therefore, the following three types of UV disinfection systems are evaluated in this PDR:

- Open channel
- Closed vessel
- Non-contact

Additional information about each type of disinfection system with its associated advantages and disadvantages is noted below. With each type of UV disinfection system outlined below, several options for the UV lamps could be considered. Current industry practice is typically to use either low pressure, high intensity UV lamps or medium pressure, high intensity UV lamps. Ultimately, the type of UV lamp to be used will be determined during design and in coordination with the preferred UV manufacturer's recommendations.

Open Channel

The open channel UV disinfection system is contained in a channel open to the atmosphere. UV lamps are contained in quartz sleeves that protect the lamps from directly contacting the wastewater flow. Automatic wiper rings periodically clean the quartz sleeves to remove scale buildup. Typical maintenance activities include replacing lamps and/or quartz sleeves as needed and inspecting wiper rings for wear. The advantages and disadvantages of the open channel system are summarized below.

Advantages:

- Automatic wiper rings periodically clean the quartz sleeves
- Ease of access to components needing replacement

Disadvantages:

- Greater risk of operator exposure to UV light
- Larger footprint
- Higher rate of algae growth
- Moderately more expensive than closed vessel disinfection systems

Closed Vessel

The closed vessel UV disinfection system is enclosed in a large pipe fitting. UV lamps are contained in quartz sleeves that protect the lamps from directly contacting the wastewater flow. Automatic wiper rings periodically clean the quartz sleeves to remove scale buildup. Typical maintenance activities include replacing lamps and/or quartz sleeves as needed and inspecting wiper rings for wear. The advantages and disadvantages of the closed vessel system are summarized below.

Advantages:

- Smaller overall footprint than other disinfection system options
- Automatic wiper rings periodically clean the quartz sleeves
- Least expensive option
- Less risk of operator exposure to UV light
- Chemical lamp cleaning can be done “in-line”

Disadvantages:

- Must have either pumping or hydraulics favorable to keeping the entirety of the vessel’s interior submerged
- Most challenging unit to maintain

Non-Contact

The non-contact UV disinfection system runs water through transparent “activated fluoropolymer” (AFP) tubes that are transparent to UV light. The AFP tubes are surrounded by UV lamps that disinfect the water. Typical maintenance activities include replacing lamps as needed and manually cleaning the AFP tubes periodically.

Advantages:

- UV lamps are not in contact with water
    - Eliminates the need for quartz sleeves
    - Makes replacing the UV lamps much easier

Disadvantages:

- Highest capital cost among UV options

Of these options, the non-contact UV disinfection system is recommended for the CTUIR. Though the system is more expensive to purchase initially, it is by far the easiest to operate. The lack of submerged mechanical parts makes the system easy to work on and provides the lowest safety risk to operations staff.

Solids Processing

One of the most prevalent byproducts of wastewater treatment is wastewater sludge, or biosolids. These biosolids must be stabilized to reduce pathogens and the potential for vector attraction. Once stabilized, the biosolids must be dried and disposed of. Aerobic digestion and sludge drying beds would be used to stabilize and dry the biosolids produced by the proposed WWTF.

Aerobic Digestion

Aerobic digestion consists of a large concrete basin where the waste activated sludge is pumped. The sludge in the basin (or digester) is aerated to provide oxygen and completely mix the sludge that has accumulated in the digester to promote further decomposition and stabilization of the volatile solids contained in the sludge. After a minimum 60 days of detention time, the stabilized sludge is pumped to the sludge drying beds for dewatering.

Sludge Drying Beds

As noted in the WWTFS, the CTUIR prefers the use of sludge drying beds for the dewatering of its sludge due to the simplicity of O&M. Recently, the City of Pendleton, located approximately 6 miles west of the Mission community, updated its sludge drying beds to improve their function and capacity. The improvements have been successful. Due to the similar climates, it is recommended that a similar system be installed for the CTUIR. The system utilizes concrete beds that have decanting structures to aid in initial dewatering. The decant structures utilize slotted slide gates, and the slide gate slot is positioned just below the liquid level and above the sludge blanket once it has separated for a few hours. The liquid is decanted and recycled back through the WWTF. Because there is potential for the aerobic digestion process to be upset in a manner that negatively impacts settleability of the digested solids, it is recommended that a polymer dosing system be included on the sludge piping that conveys sludge to the drying beds. The polymer would be used as needed to improve the settleability of the digested solids and, as a result, improve the efficiency of the sludge drying beds. The sludge is then air-dried, with periodic raking via a tractor to aid in drying. It is estimated that approximately 8,000 square feet of sludge drying beds would be required to manage the projected volume of sludge produced by the proposed WWTF. Once dried, solids must either be disposed of through a permitted land application site or at a landfill that accepts municipal biosolids. The biosolids produced in this manner are anticipated to be consistent with Class B biosolids and other requirements for land application. The biosolids would need to be tested for the pollutants outlined in the Code of Federal Regulations (CFR) (40 CFR 503) to verify that potential biosolids pollutant loads do not exceed those allowed for land application.

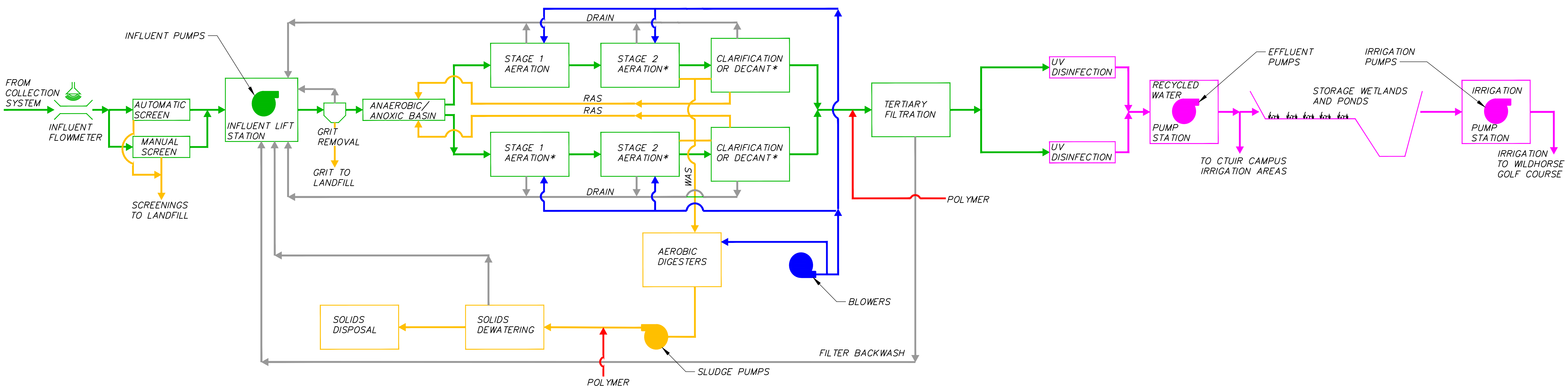
Proposed Treatment System Layout

Based on the treatment components discussed above, a preliminary layout of the proposed WWTF is presented on Figure 4-3. The figure includes the following:

- The tie-in to the existing wastewater trunkline to the City of Pendleton
- Treatment system components including
    - Headworks with screening system, grit removal, and influent pump station
    - Activated sludge treatment chambers with aerobic digester
    - UV disinfection system
    - Recycled water pump station
- Operations building, lab, and visitor center
- The recycled water pipeline conveying water to the wetland/pond storage system near the WR&C
- The termination of the conveyance systems tying both the Gopher Flats and south service areas to the new treatment system

Treatment System Cost Estimate

Based on the recommendations outlined herein, a cost estimate for the new WWTF has been developed and is included on Figure 4-4. This cost estimate is based on the recommended equipment noted in this chapter. However, as a final selection has not yet been made for the secondary treatment system due to the CTUIR's desire to prepare an RFP for the selection of that equipment, the more expensive treatment cost of the two secondary treatment alternatives noted herein (associated with the BIOCOS system) was included in the cost estimate to allow for an adequate project budget for either option.



LEGEND

RAW WASTEWATER	(green line)
RECYCLED WATER	(magenta line)
AIR FLOW	(blue line)
SOLIDS FLOW	(yellow line)
POLYMER	(red line)
DRAIN/RECAPTURED WASTEWATER	(gray line)
FLOW DIRECTION	▶
PUMP	
BLOWER	

ABBREVIATIONS

RAS – RETURN ACTIVATED SLUDGE
WAS – WASTE ACTIVATED SLUDGE
UV – ULTRAVIOLET

* FINAL SECONDARY PROCESS ELEMENTS MAY VARY SLIGHTLY DEPENDING ON FINAL EQUIPMENT SELECTION.

anderson perry

CONFEDERATED TRIBES OF THE UMATILLA INDIAN RESERVATION
MISSION AREA WASTEWATER TREATMENT AND REUSE SYSTEM
PRE-DESIGN REPORT

PROCESS FLOW DIAGRAM

FIGURE 4-1

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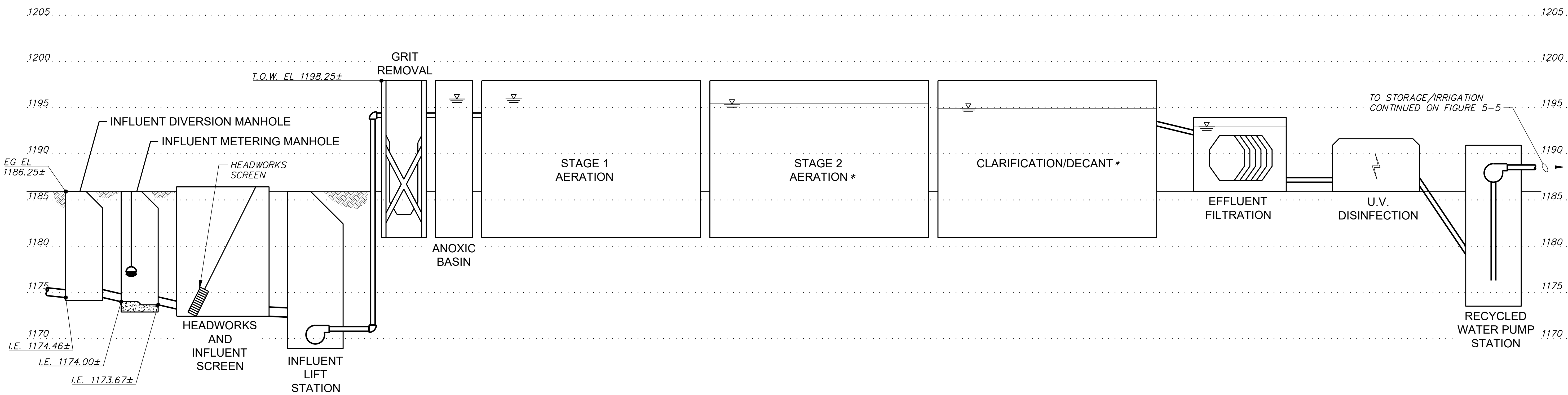

LEGEND

PUMPS

WATER SURFACE ELEVATION MARKER

* FINAL SECONDARY PROCESS ELEMENTS MAY VARY SLIGHTLY DEPENDING ON FINAL EQUIPMENT SELECTION.

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CONFEDERATED TRIBES OF THE UMATILLA INDIAN RESERVATION

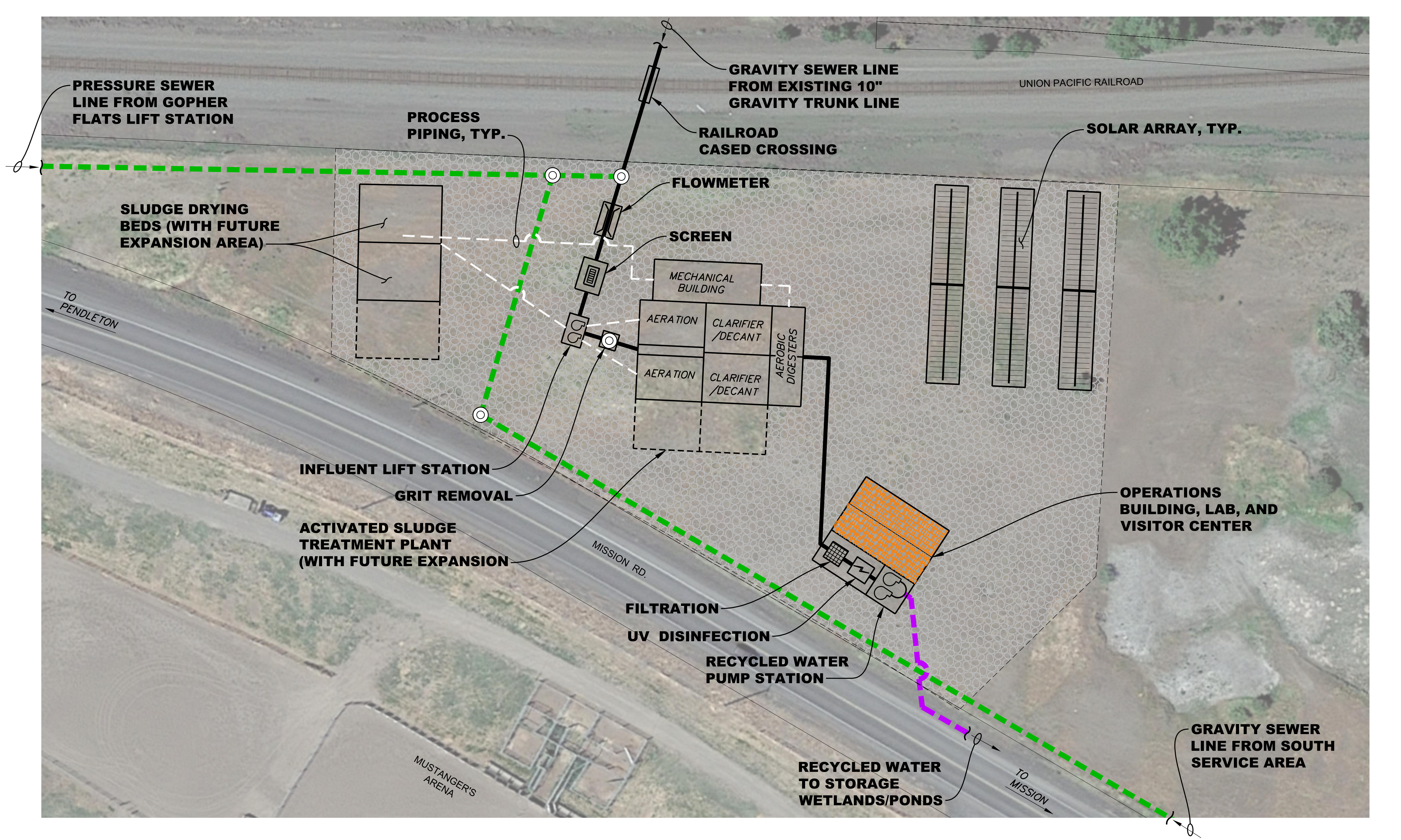
MISSION AREA WASTEWATER TREATMENT AND REUSE SYSTEM

PRE-DESIGN REPORT

PRELIMINARY TREATMENT HYDRAULIC PROFILE

FIGURE

4-2



X:\Clients\ctuir - public works\152-218 ww treatment pre-design\CAD\PDR-152-218-FIG 4-3.dwg, Layout1, 12/5/2024 9:12 AM, prichardson

anderson perry

CONFEDERATED TRIBES OF THE UMATILLA INDIAN RESERVATION
MISSION AREA WASTEWATER TREATMENT AND REUSE SYSTEM
PRE-DESIGN REPORT

PRELIMINARY TREATMENT SITE LAYOUT

FIGURE 4-3

CONFEDERATED TRIBES OF THE UMATILLA INDIAN RESERVATION
MISSION AREA WASTEWATER TREATMENT PRE-DESIGN REPORT
WASTEWATER TREATMENT FACILITY
PRELIMINARY COST ESTIMATE
(YEAR 2024 COSTS)

NO.	DESCRIPTION	UNIT	UNIT PRICE	ESTIMATED QUANTITY	TOTAL PRICE
1	Mobilization/Demobilization	LS	$ 1,170,000	All Req'd	$ 1,170,000
2	Project Safety	LS	$ 75,000	All Req'd	75,000
3	Site Work	LS	300,000	All Req'd	300,000
4	Influent Lift Station	LS	330,000	All Req'd	330,000
5	Headworks Building, Grit Removal, and Screen	LS	1,740,000	All Req'd	1,740,000
6	Secondary Treatment Facility	LS	6,670,000	All Req'd	6,670,000
7	Operations Building and Visitor's Center	LS	1,260,000	All Req'd	1,260,000
8	Tertiary Filtration System	LS	1,690,000	All Req'd	1,690,000
9	Disinfection Equipment	LS	880,000	All Req'd	880,000
10	Mechanical Building	LS	740,000	All Req'd	740,000
11	Polymer Feed and Chemical Storage	LS	150,000	All Req'd	150,000
12	400 Kilowatt Solar Array	LS	1,200,000	All Req'd	1,200,000
13	Supervisory Control and Data Acquisition, Electrical and Controls	LS	900,000	All Req'd	900,000
14	Drying Beds	LS	310,000	All Req'd	310,000
15	Backup Power Generator	LS	250,000	All Req'd	250,000
16	Yard Piping	LS	100,000	All Req'd	100,000
17	Painting	LS	100,000	All Req'd	100,000
				Total Estimated Construction Cost	**$ 17,865,000**
				Construction Contingency @ 15%	2,670,000
				Total Estimated Wastewater Treatment Facility Budget (2024)*	**$ 20,535,000**
				TOTAL ESTIMATED WASTEWATER TREATMENT FACILITY BUDGET (2026)**	**$ 22,640,000**

* Does not include costs for conveyance system improvements or improvements required for disposal/reuse of treated wastewater.

** Assumes 5 percent annual inflation.

Chapter 5 - Recycled Water Conveyance, Storage, and Irrigation System

This chapter is intended to provide information on the equipment anticipated to be part of the new recycled water conveyance, storage, and irrigation system. This system would deliver recycled water from the proposed wastewater treatment facility (WWTF) to the Wildhorse Resort & Casino (WR&C) golf course for irrigation. The anticipated components in this system include:

- A recycled water pump station at the proposed WWTF site
- A 10-inch diameter pipeline to convey recycled water to the proposed storage wetlands/ponds (SWPs) located near Tamástslikt Cultural Institute (TCI)
- An irrigation pump station and pipeline to convey water from the SWPs to the existing WR&C golf course ponds

Currently the golf course at WR&C is irrigated with potable water from community wells (primarily Well No. 5). By irrigating the golf course with recycled water, the Confederated Tribes of Umatilla Indian Reservation (CTUIR) would preserve the capacity of regional basalt groundwater aquifer. According to the 2042 water balance, approximately 750,000 gallons per day of recycled water could be used to offset water withdrawals from the regional aquifer.

Conveyance System

Recycled Water Pump Station

The recycled water pump station is proposed to consist of two 300 horsepower (Hp) pumps using end suction centrifugal or vertical turbine pumps. Each pump would have a pumping capacity equal to the projected 2042 design peak hour flow of 2.2 million gallons per day (1,528 gallons per minute [gpm]) while producing enough pressure to overcome approximately 260 feet of elevation head and up to 230 feet of friction headloss (490 feet of combined head). Two pumps would be provided to always have a backup pump available, installed, and ready to operate in case the other pump fails or needs to be removed from the site for maintenance. The pumps would not be intended to run in tandem. The size of the pump motors could be reduced by putting in larger conveyance piping, but pipe velocities would be reduced below recommended wastewater discharge values of 6 feet per second, potentially creating more maintenance needs for the pipeline. An equalization tank has also been considered to help reduce the size of the recycled water pumps, but this would require more land area at the WWTF and likely increase the project cost. This could be further evaluated in the design phase.

The pumps would be housed in an aboveground heated building. Due to the anticipated declining hydraulic gradient (i.e., headloss) through the wastewater treatment process, it is anticipated that the water conveyed to the recycled water pump station may need to enter a belowground structure to then be pumped out of. Due to this potential constraint, a wetwell pump chamber may need to be constructed under the pump station and has been included in the project cost estimates. Which type of recycled water pumps and whether or not the pumps can be located above ground should be further evaluated during the design process.

Piping Systems

Approximately 16,800 feet of 10-inch diameter piping is proposed to be extended from the WWTF to the SWPs near WR&C to convey recycled water for reuse. To reduce installation costs, the recycled water transmission line is proposed to be installed parallel to the raw wastewater conveyance pipeline from the WWTF to Highway 331, as discussed in Chapter 3. The preliminary layout of the recycled water transmission line alignment is shown on Figure 5-1.

Nixyáawii Area Irrigation

Along the route of the piping system described above, irrigation water service vaults and associated piping are proposed to be constructed. These service vaults are anticipated to be tied into the pressure pipeline that conveys recycled water to the SWP complex, as discussed further in this chapter. These service vaults along the pressure pipeline would allow recycled water to be utilized to irrigate large, landscaped areas, sports fields, nurseries, or other higher demand landscape irrigation areas. Some facilities that have been discussed for potential tie-ins to the new irrigation system are:

- Nixyáawii Tribal Governance Center landscaped areas
- Yellowhawk Health Center landscaped areas
- WR&C landscaped areas
- Coyote North Business Park landscaped areas
- Tribal Native Plant Nursery
- Tribal farming of high water use crops
- Future Nixyáawii Community School sports fields

The potential uses of the Class A recycled water that would be generated by the proposed new WWTF are nearly endless. There would likely be many other areas that could benefit from the use of the recycled water for irrigation purposes throughout the Mission community. Only those sites near the proposed piping systems noted herein have been included in this Pre-Design Report (PDR).

Storage Wetland/Pond Complex

A proposed SWP complex to store the anticipated current and future water storage needs is described in this section. Based on the water balance information shown on Figures 5-2 and 5-3, approximately 109 million gallons (MG), or 335 acre-feet (ac-ft), and 161 MG (494 ac-ft) of recycled water is anticipated to be stored for years 2023 and 2042, respectively. The influent flows used to develop the water balances were taken from the 2023 and 2024 flowmeter data, as described in Chapter 2. Footnotes are provided on the water balance figures to describe other assumptions related to evaporation, precipitation, irrigation, etc., that would affect the volume of wastewater stored from November through March (i.e., winter months) when irrigation water is typically not applied.

Based on the 2023 and 2042 water balances, it is anticipated that approximately 86 MG (264 ac-ft) can be conveyed to the existing golf course ponds for irrigation. In addition to this irrigation use, approximately 62 MG (190 ac-ft) and 148 MG (454 ac-ft) (i.e., equivalent to 67 and 159 acres of lawn irrigation area for reference) are anticipated to be available in the years 2023 and 2042, respectively.

With the development of the updated flow data, as presented in Chapter 2 of this PDR, a 58 percent increase in flow was observed between the development of the Wastewater Treatment Feasibility Study and this PDR. This increased the amount of recycled water anticipated to be stored over the winter months by a similar amount (approximately 48 MG, or 147 ac-ft). The CTUIR should continue to collect daily wastewater flow data so the design criteria presented herein can either be confirmed or adjusted in the design phase of the project and associated storage volumes can be adjusted appropriately.

Preliminary Layout of Storage Wetland/Pond Complex

Figure 5-4 depicts a potential layout of the SWP complex needed to meet the anticipated storage requirements. A three-dimensional model of this layout was created for the basis of the pre-design effort. The layout shown encompasses approximately 65 acres, consisting of three shallower wetland cells to the west and three deeper storage pond cells to the east. An additional future 20-acre storage pond location is also identified in case future system contributions dictate the need for additional storage. The total estimated area needed in 2042 is projected to be approximately 85 acres. Due to some of the unknown variables with the limited amount of flow data available at the time this PDR was developed and the fairly aggressive growth that has been projected, as discussed in Chapter 2, the recommended storage volume to be developed at this time is approximately 20 percent lower than the total estimated volume of storage that may be needed in 2042. This volume has been reduced for the following reasons.

- Site constraints only allow a maximum of 65 acres of storage to be developed without impeding on existing drainage runoff channels
- Data on which the volumes are based is limited
- Developing a future storage pond, provided the land is reserved for this future purpose, is relatively inexpensive compared to the development of the treatment and pumping systems
- Operationally, developing a potential storage pond for projected demands that may or may not occur in 15 to 20 years would likely result in maintenance issues and/or concerns, impacts to the area’s visual aesthetics, and a pond that may not be operational when needed due to lack of use over the years

Each proposed SWP would have a water transfer structure located at its downstream end. This would allow the water depth in any given cell to be raised or lowered or more or less water to be transferred to the next cell in the system.

In addition to the layout shown on Figure 5-4, a preliminary hydraulic profile has been developed to show the anticipated flow path of water through the storage and irrigation system. This is shown on Figure 5-5.

Each cell would have the ability to vary the water depths within any given cell. This would allow a variety of wetland habitat to be developed, with some vegetated areas and some open water in each cell. At a minimum, each cell would have an outside perimeter of 30 to 50 feet with approximately 1 foot of water depth for wetland habitat development. Islands could also be developed within the storage pond cells. However, the drawback to adding islands to the cells is that the amount of water that can be stored would be reduced. The shallow depth areas and natural looking cells would facilitate interpretive trails to be incorporated around the exterior of the wetland cells, which would provide multiple benefits to the surrounding areas. Benefits include:

- New wildlife habitat that can be tied to TCI educational programs
- Expansion of existing walking trail from the July Grounds to TCI and through the SWP complex
- Creation of new habitat that increases the diversity of wildlife species in the area

The proposed approximately 65-acre SWP complex would provide approximately 139 MG of storage volume. With the addition of the future 20-acre storage pond, the SWP complex would provide approximately 190 MG of storage volume.

Water Depths

It should be noted that water depths in the proposed SWP cells would vary annually, with the cells being nearly dry at the end of the summer and full in the spring. The depth of the wetland cells needs to be set to help with operation and maintenance while providing sufficient freeboard. Typical operations of a “manmade” wetland assume that wetland cell depths can vary from approximately 1 to 2 feet to promote vegetation growth. Water depths exceeding this typically restrict vegetative growth. For the wetland cells shown on Figure 5-4, a 50-foot border around each wetland cell, allowing a maximum of 1 foot of water depth (when the SWP is full), has been preliminarily designed to maintain vegetative growth around the perimeter of each wetland cell. For the storage pond cells, shown on Figure 5-4, a 30-foot border around each pond cell, allowing a maximum of 1 foot of water depth (when the pond cell is full), has been preliminarily designed to maintain some vegetative growth around the perimeter of each pond cell while trying to maximize the volume that can be stored.

Interior Slopes

Interior slopes should be set to provide a sound structure for the dike, optimize the amount of fill needed for construction, and not be too steep to facilitate proper construction of the dike and liner. In wetland environments, consideration should also be given to a slope that discourages burrowing animals such as muskrats. Previous consultation with the Oregon Department of Fish and Wildlife on the Ladd Marsh project near La Grande, Oregon, recommended a 5:1 interior slope to help discourage muskrats from burrowing into the dikes. It is assumed that 5:1 interior slopes would be used on these SWPs to discourage burrowing animal activity.

Exterior Slopes

The exterior slopes of dikes typically vary between 2:1 and 3:1. Exterior slopes can depend on the type of structural foundation provided for the dike construction, but these proposed SWP dikes are not proposed to be tall enough to create any significant structural concerns. The exterior slope can be set to provide for vegetation growth while still being maintainable. A 3:1 exterior slope is flat enough to capture rainwater for vegetation growth but steep enough not to take up too much land area. For these reasons, 3:1 exterior slopes have been utilized in the preliminary layout of the SWPs.

Dike Height/Width

When laying out water containment structures, the amount of freeboard needed to address potential wave height during windstorms and allow for appropriate maintenance of the water containment dikes must be accommodated. The SWP layout presented on Figure 5-4 was conservatively estimated to allow 2 feet of freeboard. The required amount of freeboard for each SWP cell would need to be evaluated further during the design phase of the project.

The average proposed height of the wetland dikes is approximately 5 feet. The proposed heights of the storage pond dikes are highest on the north and east sides ranging from 5 to 9 feet. The dikes near TCI are proposed to be lower than the surface elevation to allow free and unobstructed views of the Blue Mountains to the east.

The top of dikes should be constructed to accommodate small maintenance vehicles (e.g., pickup truck) around the perimeter of the cells for maintenance purposes. For this reason, a minimum top of dike width of approximately 15 feet is recommended and incorporated into the preliminary layout. The top of dikes would be graveled to provide year-round access.

Native Soil/Bentonite Liner

Bentonite has successfully been used as a liner material in many applications. Bentonite can generally be blended with on-site soils and compacted to achieve the desired liner impermeability. The amount of bentonite needed for this application can be determined only after completing site-specific testing with the native soils. This liner type requires a minimum of 6 inches of appropriate soil/bentonite mixture lining the SWP cells to develop the liner and restrict infiltration to groundwater. The native soil/bentonite mixture is also conducive for allowing natural wetland vegetation such as reeds and cattails to develop, which would not occur if synthetic lining systems were utilized without additional soil over the liner.

Storage Wetland/Pond Influent Control Structure

The piping allowing recycled water to enter the SWP complex is proposed to first enter a diversion structure. This diversion structure is anticipated to be a square or rectangular concrete structure. That structure would be equipped with slide gates that can be utilized to divert the flows solely to the wetland area, solely to the storage pond area, or to a combination of the two. The intent of this diversion structure is to allow the operators the most flexibility possible to divert flows to any part of the SWP complex.

Storage Wetland/Pond Inlet/Outlet Transfer Structure

As noted previously, each proposed SWP would have a water transfer structure located on the downstream end of the cell. Slide gates or adjustable weirs, as appropriate for the application, within these outlet structures would allow the depth of water in any given cell to be raised or lowered or more or less water to be transferred to the next cell in the system.

The piping entering and exiting the cells would also be equipped to discourage wildlife from frequenting or residing in the pipe. Piping related structures are also needed to keep vegetation from plugging the inlet and outlet of the piping associated with the transfer structures. Flows between cells can also reach velocities that could erode the liner noted above. For these reasons, flap valves or barred outlet screens similar to a trash rack with riprap pads below the piping are recommended at each outlet control structure.

Treatment Wetland Piping

The piping is proposed to be approximately 18-inch diameter between the SWPs. This pipe size is anticipated to accommodate needed peak flows between SWPs. Final pipe sizing would need to be further evaluated during the design phase of the project.

Public Access and Notification

The SWP complex would provide significant recreational benefits to the Mission community as discussed herein. With this proposed project, pedestrian trails are intended to be developed around the exterior of the wetland cells. The SWP complex is anticipated to receive Class A recycled water, which is safe for human contact. However, once the water is stored in the SWPs for a period of time, bacteria, algae, decomposition of wetland plants, and other commonly occurring natural processes may impact the water quality. Some of these naturally occurring biologic processes may not result in a water quality beneficial to human health. Although the public would desire to view the wildlife anticipated to frequent the SWP complex, it is recommended that the area be posted as recycled water with caution signs related to contact with the water. It is also recommended that the perimeter of the wetland cells be provided with a basic barrier such as a simple decorative fence or a two-strand cable barrier to restrict the public from making contact with the water.

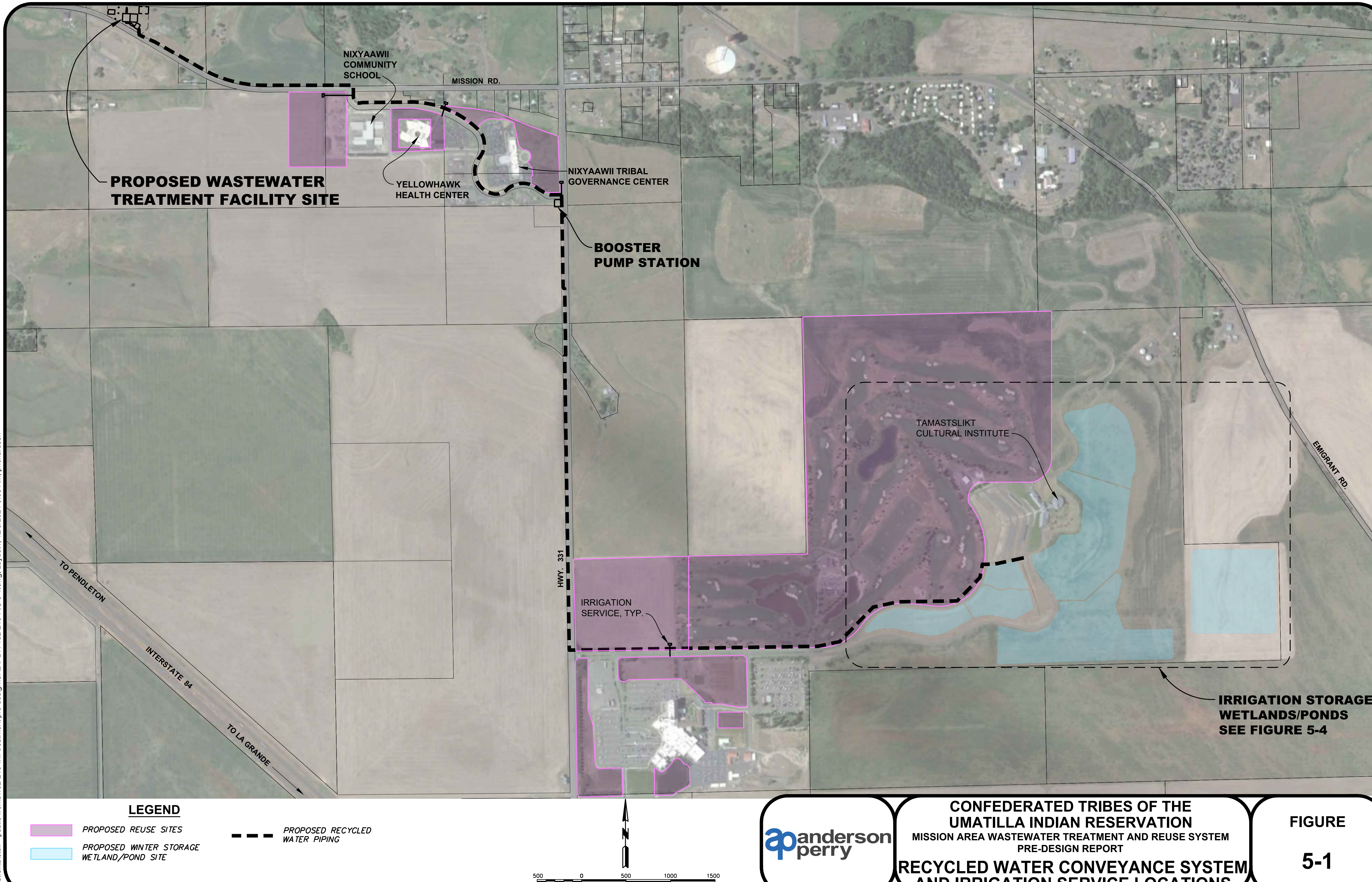
Wildhorse Golf Course Irrigation System

Recycled water stored in the SWP complex is anticipated to be pumped from the SWP complex to the existing golf course ponds at WR&C. This practice is anticipated to be available from when the WR&C starts irrigation in the spring to when the irrigation system is shut off in the fall (generally March through October). Figure 5-4 shows an irrigation pump station located at the low point(s) of the proposed SWP complex at the outlet control structure of both Cells No. 3 and 5. This structure would provide operational flexibility by allowing water to be left in the wetland cells as long as possible while the storage pond volume was depleted, or vice versa.

A wetwell, pumping, and piping system would convey recycled water to the existing golf course ponds. WR&C staff would then use their existing irrigation system to irrigate the golf course with very minimal impact (if any) to their existing operations. The irrigation pump station is proposed to consist of two 40 Hp pumps each capable of pumping 1,700 gpm of flow. The irrigation pumps would also be installed with controls and variable frequency drives to allow the golf course ponds to be filled at certain times of the day or at lower flow rates, as desired. This system will include self-cleaning intake screens on each pump to prevent algae and other natural substances from clogging the pumps.

Recycled Water Conveyance System Cost Estimate

A preliminary estimate in 2024 dollars of the proposed recycled water conveyance system improvements is presented on Figure 5-6. The estimated costs for individual components associated with the SWP complex are based on other recently bid wastewater projects. The estimated recycled water conveyance and storage system construction cost is approximately $17,577,000.



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CONFEDERATED TRIBES OF THE
UMATILLA INDIAN RESERVATION
MISSION AREA WASTEWATER TREATMENT AND REUSE SYSTEM
PRE-DESIGN REPORT

RECYCLED WATER CONVEYANCE SYSTEM
AND IRRIGATION SERVICE LOCATIONS

FIGURE
5-1

X:\Clients\ctuir - public works\152-218 ww treatment pre-design\CAD\PDR-152-218-FIG 5-1.dwg, Layout1, 12/5/2024 9:38 AM, prichardson

Confederated Tribes of the Umatilla Indian Reservation
Mission Area Wastewater Treatment and Reuse System Pre-Design Report
2023 Storage Wetland Water Balance

Month	Influent[1] (MGD)	Influent[1] (MG)	Precipitation[2] (in)	Precipitation[2] (MG)	Evaporation[3] (in)	Evaporation[3] (MG)	Golf Course Irrigation[4] (MG)	Additional Irrigation Crop: Acreage: (in)	Additional Irrigation Lawn 67 (MG)	No. of Wetland Cells with Water Present	Monthly Wetland Storage Balance (+/-) (MG)	Storage Accumulation (MG) Year 1	Storage Accumulation (MG) Year 2
January	0.518	16.06	1.92	3.26	0.70	1.19	0.00	0.00	0.00	5	18.1	18.1	67.8
February	0.525	14.70	1.73	2.94	0.70	1.19	0.00	0.00	0.00	5	16.5	34.6	84.3
March	0.515	15.97	1.89	3.21	2.56	4.35	0.00	0.36	0.65	5	14.2	48.8	98.5
April	0.595	17.85	1.65	2.81	3.41	5.80	1.70	1.84	3.35	5	9.8	58.6	108.3
May	0.627	19.44	1.89	3.21	5.11	8.69	8.28	2.80	5.09	5	0.6	59.1	108.9
June	0.391	11.73	1.15	1.96	6.86	11.66	16.66	4.89	8.90	5	-23.5	35.6	85.3
July	0.348	10.77	0.39	0.43	9.50	10.50	18.66	8.62	15.68	4	-33.6	2.0	51.7
August	0.312	9.69	0.46	0.51	8.67	9.59	22.74	8.39	15.26	4	-37.4	0.0	14.3
September	0.310	9.29	0.64	0.16	5.51	1.37	17.52	5.33	9.70	0	-19.1	0.0	0.0
October	0.539	16.71	1.23	0.70	2.84	1.61	0.23	1.99	3.62	3	11.9	11.9	11.9
November	0.568	17.04	2.35	2.60	0.70	0.77	0.00	0.00	0.00	4	18.9	30.8	30.8
December	0.560	17.36	2.09	2.31	0.70	0.77	0.00	0.00	0.00	4	18.9	49.7	49.7
TOTALS	**0.484**	**176.60**	**17.39**	**24.10**	**47.26**	**57.50**	**85.79**	**34.22**	**62.26**		**57.4**	**349.3**	**711.5**

Pond/Wetland Cell Dimensions

	Sq Ft	Acres	Average Depth (Feet)	Volume (MG)	Accumulative Volume (MG)
Storage Wetland Cell 1	103,885	2	2.84	2.2	2.2
Storage Wetland Cell 2	171,498	4	5.25	6.7	8.9
Storage Wetland Cell 3	233,233	5	3.10	5.4	14.4
Storage Pond Cell 4	866,469	20	7.55	48.9	63.3
Storage Pond Cell 5	953,870	22	7.36	52.5	115.8
Storage Pond Cell 6	510,182	12	6.07	23.2	139.0
TOTALS	**2,839,138**	**65**		**139.0**	

Notes:

[1] October through May influent volumes were derived from the 2023 flowmeter data. June through September flow was calculated by taking the past WWTFS water balance and multiplying the data by a scaling factor equivalent to other monthly flow increases.

[2] Precipitation is based on data obtained from the WRCC 1981 through 2010 records for the Pendleton, Oregon, BR EXP STN (used average precipitation over the time period). Precipitation volumes include the existing golf course ponds with a volume of approximately 9.15 AF.

[3] Evaporation is based on pan evaporation data obtained from the WRCC 1956 through 2005 records for the Pendleton, Oregon, BR EXP STN, Oregon, with a pan coefficient of 0.70. Evaporation includes the existing golf course ponds with a volume of approximately 9.15 AF.

[4] Irrigation volumes were obtained from the 2018 Wildhorse Golf Course water use data. The highest water use in recent years occurred in 2018.

Abbreviations:
AF = acre-feet
in = inch
MG = million gallons
MGD = million gallons per day
Sq Ft = square feet
WRCC = Western Regional Climate Center
WWTFS = Wastewater Treatment Feasibility Study

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CONFEDERATED TRIBES OF THE UMATILLA INDIAN RESERVATION
MISSION AREA WASTEWATER TREATMENT AND REUSE SYSTEM PRE-DESIGN REPORT

2023 STORAGE WETLAND WATER BALANCE

FIGURE **5-2**

Confederated Tribes of the Umatilla Indian Reservation
Mission Area Wastewater Treatment and Reuse System Pre-Design Report
2042 Storage Wetland Water Balance

Month	Influent[1]		Precipitation[2]		Evaporation[3]		Golf Course Irrigation[4]	Additional Irrigation		No. of Wetland Cells with Water Present	Monthly Wetland Storage Balance (+/-)	Storage Accumulation (MG)	
								Crop: Acreage:	Lawn 159				
	(MGD)	(MG)	(in)	(MG)	(in)	(MG)	(MG)	(in)	(MG)		(MG)	Year 1	Year 2
January	0.803	24.88	1.92	3.26	0.70	1.19	0.00	0.00	0.00	5	27.0	27.0	99.7
February	0.814	22.78	1.73	3.49	0.70	1.41	0.00	0.00	0.00	6	24.9	51.8	124.6
March	0.798	24.74	1.89	4.84	2.56	6.56	0.00	0.36	1.55	7	21.5	73.3	146.1
April	0.922	27.66	1.65	4.23	3.41	8.73	1.70	1.84	7.94	7	13.5	86.8	159.6
May	0.972	30.12	1.89	4.84	5.11	13.09	8.28	2.80	12.09	7	1.5	88.3	161.1
June	0.606	18.18	1.15	2.32	6.86	13.85	16.66	4.89	21.11	6	(31.1)	57.2	130.0
July	0.539	16.70	0.39	0.66	9.50	16.15	18.66	8.62	37.22	5	(54.7)	2.5	75.3
August	0.484	15.01	0.46	0.51	8.67	9.59	22.74	8.39	36.23	4	(53.0)	0.0	22.2
September	0.480	14.39	0.64	0.16	5.51	1.37	17.52	5.33	23.01	0	(27.3)	0.0	0.0
October	0.835	25.89	1.23	1.360	2.84	3.14	0.23	1.99	8.59	4	15.3	15.3	15.3
November	0.880	26.40	2.35	2.60	0.70	0.77	0.00	0.00	0.00	4	28.2	43.5	43.5
December	0.868	26.90	2.09	3.55	0.70	1.19	0.00	0.00	0.00	5	29.3	72.8	72.8
TOTALS	**0.750**	**273.66**	**17.39**	**31.83**	**47.26**	**77.04**	**85.79**	**34.22**	**147.76**		**142.7**	**518.4**	**1,050.1**

Pond/Wetland Cell Dimensions

	Sq Ft	Acres	Average Depth (Feet)	Volume (MG)	Accumulative Volume (MG)
Storage Wetland Cell 1	103,885	2	2.84	2.2	2.2
Storage Wetland Cell 2	171,498	4	5.25	6.7	8.9
Storage Wetland Cell 3	233,233	5	3.10	5.4	14.4
Storage Pond Cell 4	866,469	20	7.55	48.9	63.3
Storage Pond Cell 5	953,870	22	7.36	52.5	115.8
Storage Pond Cell 6	510,182	12	6.07	23.2	139.0
Storage Pond Cell 7 (Future)	871,200	20	7.50	48.9	187.9
TOTALS	**3,710,338**	**85**		**187.9**	

Notes:

[1] October through May influent volumes were derived from the 2023 flowmeter data. June through September flow was calculated by taking the past WWTFS water balance and multiplying the data by a scaling factor equivalent to other monthly flow increases

[2] Precipitation is based on data obtained from the WRCC 1981 through 2010 records for the Pendleton, Oregon, BR EXP STN (used average precipitation over the time period). Precipitation volumes include the existing golf course ponds with a volume of approximately 9.15 AF.

[3] Evaporation is based on pan evaporation data obtained from the WRCC 1956 through 2005 records for the Pendleton, Oregon, BR EXP STN with a pan coefficient of 0.70. Evaporation includes the existing golf course ponds with a volume of approximately 9.15 AF.

[4] Irrigation volumes were obtained from the 2018 Wildhorse Golf Course water use data. The highest water use in recent years occurred in 2018.

Abbreviations:

AF = acre-feet
in = inch
MG = million gallons
MGD = million gallons per day
Sq Ft = square feet
WRCC = Western Regional Climate Center
WWTFS = Wastewater Treatment Feasibility Study

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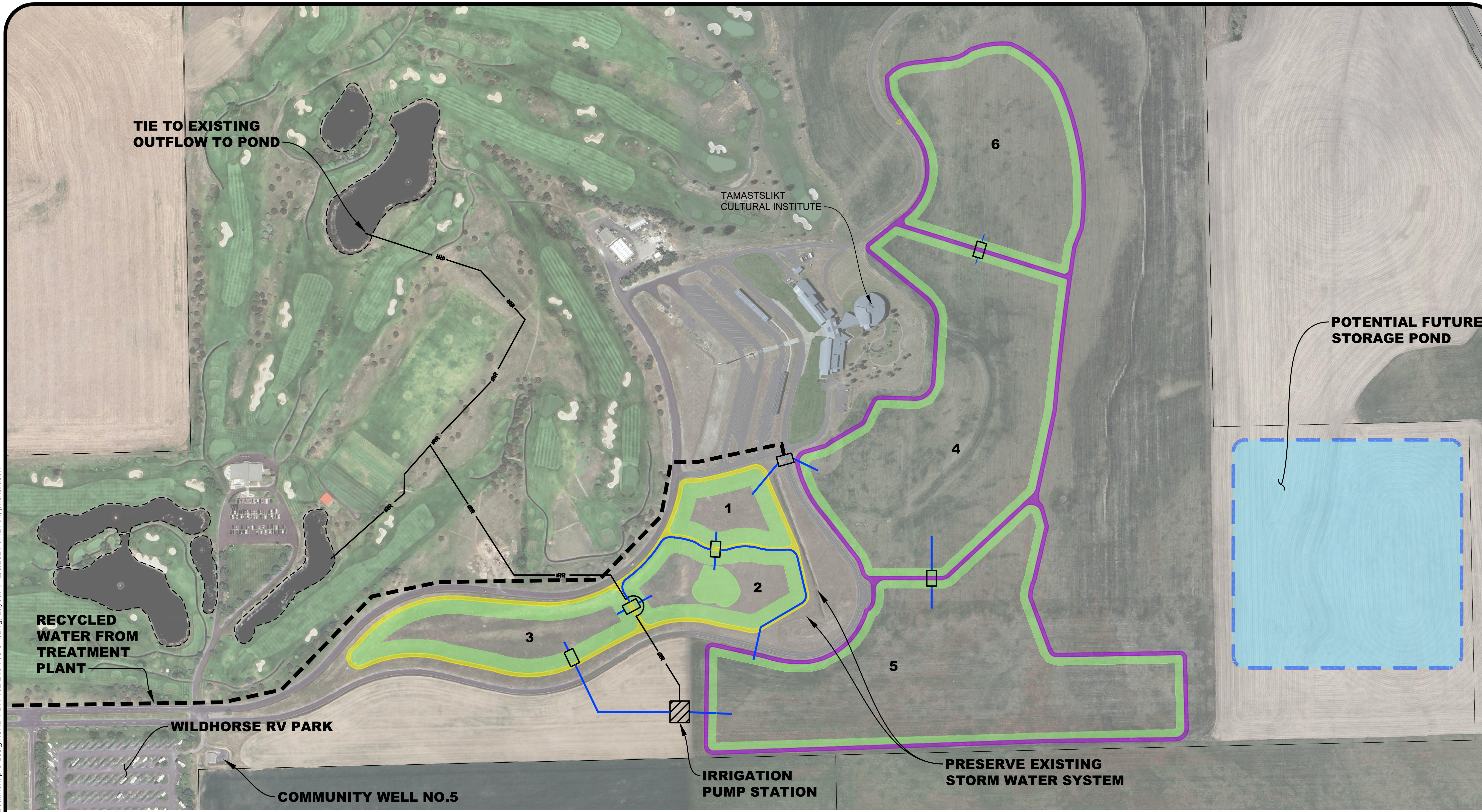
CONFEDERATED TRIBES OF THE UMATILLA INDIAN RESERVATION
MISSION AREA WASTEWATER TREATMENT AND REUSE SYSTEM PRE-DESIGN REPORT
2042 STORAGE WETLAND WATER BALANCE

FIGURE 5-3



LEGEND

- VEGETATIVE AREA
- STORAGE WETLAND DIKE AND ROADWAY
- STORAGE POND DIKE AND ROADWAY
- FUTURE STORAGE POND
- PUMP STATION
- WATER LEVEL CONTROL STRUCTURE
- EXISTING WILDHORSE POND
- CELL CONVEYANCE PIPE
- IRR PRESSURE IRRIGATION PIPE

N

200 0 200 400 600
SCALE IN FEET

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CONFEDERATED TRIBES OF THE UMATILLA INDIAN RESERVATION
MISSION AREA WASTEWATER TREATMENT AND REUSE SYSTEM
PRE-DESIGN REPORT

PROPOSED WETLAND AND STORAGE POND AREA

FIGURE
5-4

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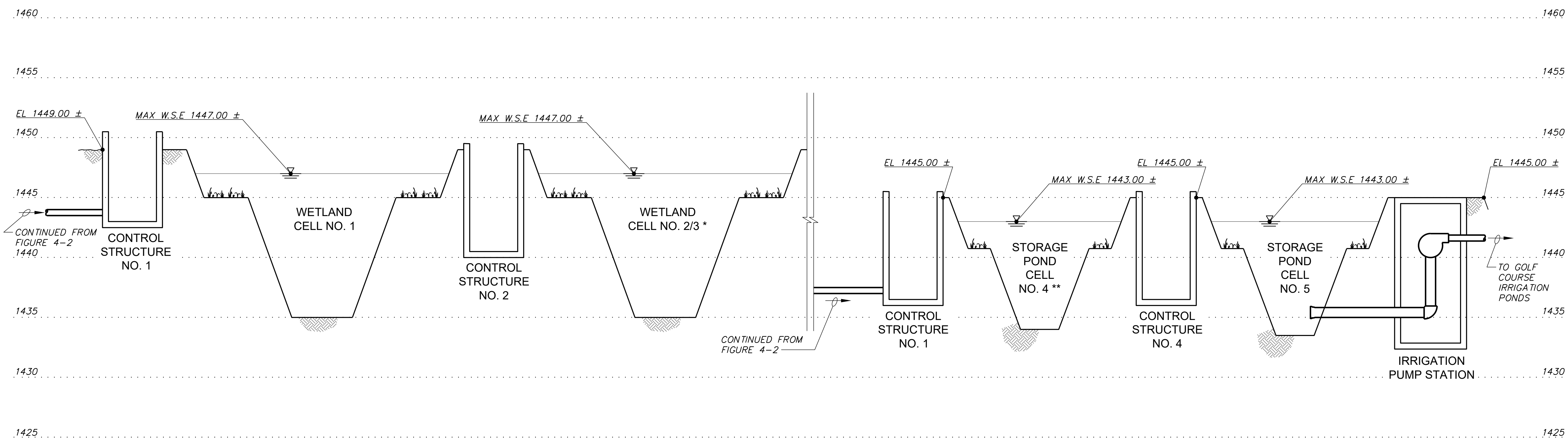

NOTES

* CELL NO. 2 RUNS PARALLEL TO CELL NO. 3

** CELL NO. 6 IS NOT SHOWN FOR CLARITY PURPOSES AS IT RUNS PARALLEL WITH CELL NO. 4

LEGEND

PUMP

WATER SURFACE ELEVATION MARKER

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MISSION AREA WASTEWATER TREATMENT AND REUSE SYSTEM
PRE-DESIGN REPORT

PRELIMINARY STORAGE/IRRIGATION HYDRAULIC PROFILE

FIGURE 5-5

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CONFEDERATED TRIBES OF THE UMATILLA INDIAN RESERVATION
MISSION AREA WASTEWATER TREATMENT AND REUSE SYSTEM
PRE-DESIGN REPORT
RECYCLED WATER CONVEYANCE AND STORAGE SYSTEM
PRELIMINARY COST ESTIMATE
(YEAR 2024 COSTS)

NO.	DESCRIPTION	UNIT	UNIT PRICE	ESTIMATED QUANTITY	TOTAL PRICE
1	Mobilization/Demobilization	LS	$ 995,700	All Req'd	$ 995,700
2	Project Safety and Traffic Control	LS	50,000	All Req'd	50,000
3	Wastewater Treatment Facility Reuse Pump Station	LS	370,000	All Req'd	370,000
4	10-inch Recycled Water Piping	LF	90	16,800	1,512,000
5	10-inch Isolation Valve	EA	3,500	5	17,500
6	6-inch Irrigation Piping	LF	80	4,000	320,000
7	6-inch Isolation Valve	EA	3,000	5	15,000
8	Reuse Water Service Vault	EA	150,000	4	600,000
9	Booster Pump Station	LS	500,000	All Req'd	500,000
10	Highway Crossing - Highway 331 at Timine Way*	LS	30,000	All Req'd	30,000
11	Highway Crossing - Highway 331 at Wildhorse Boulevard	LS	120,000	All Req'd	120,000
12	Storage Wetlands (1 through 3)	AC	136,000	23	3,128,000
13	Storage Ponds (4 through 6)**	AC	116,000	54	6,264,000
14	Irrigation Pump Station and Screen	LS	550,000	All Req'd	550,000
15	Rock/Caliche Excavation	CY	17	17,900	295,400
16	Asphalt Surface Restoration	SY	75	2,600	195,000
17	State Highway Surface Restoration	SY	150	540	81,000
18	Sidewalk Restoration	SY	25	1,100	27,500
19	Asphalt Path Restoration	SY	65	1,250	81,300
20	Gravel Surface Restoration	SY	22	1,800	39,600
21	Grass Surface Restoration	SY	10	8,500	85,000
				Total Estimated Construction Cost	**$ 15,277,000**
				Construction Contingency @ 15%	2,300,000
	Total Estimated Recycled Water Conveyance and Storage System Budget (2024)				**$ 17,577,000**
	TOTAL ESTIMATED RECYCLED WATER CONVEYANCE AND STORAGE SYSTEM BUDGET (2026)* **				**$ 19,380,000**

*Assumes bored casing cost is included in raw wastewater conveyance system costs.

**Does not include costs for future storage pond.

***Assumes 5 percent annual inflation.

Chapter 6 - Ancillary Equipment Needs

This chapter is intended to provide information on other equipment (beyond the treatment, conveyance, and storage systems that have previously been discussed) that will be beneficial to the long-term operation of the proposed wastewater treatment facility (WWTF).

System Power Requirements

It is estimated that 660 horsepower would be needed at the WWTF for the various loads of pumps, aeration system blowers, the ultraviolet disinfection system, building lights and heat, etc. This equates to approximately 492 kilowatts (kW) of power to be provided to the WWTF site. The needed amperage of the power service would be further evaluated during the design phase, but it would likely be between 500 and 800 amps depending on the power draw requirements of each piece of equipment installed at the WWTF. Power to a mechanical treatment plant is usually provided by a regulated power company, such as Pacific Power & Light (PPL). PPL has provided a preliminary description of what would be required to install power to the proposed locations of the WWTF, Gopher Flats service area lift station, and the golf course pump station site.

To serve the WWTF across from the preferred Mustanger Lane site, PPL would need to replace two power poles. PPL would construct a high-voltage wire across Mission Road that would extend to a new power pole on the north side of the WWTF site. The Confederated Tribes of the Umatilla Indian Reservation's (CTUIR) project contractor and PPL would then coordinate to run power from the new power pole to a pad-mounted electrical transformer and vault and extend it to the meter base at the new WWTF building. Preliminary sizing indicates that the transformer would be a 500 kilo-volt-amperes, 277/480-volt pad-mounted transformer with three runs of secondary power service wire to a current transformer (CT) cabinet and meter base and meter located at the WWTF building. The location of the transformer and CT cabinet and meter base locations would be determined during the design process.

The Gopher Flats service area lift station would require installation of a new PPL power pole, overhead transformers, and new overhead service to the lift station location. The CTUIR's project contractor would need to install a meter pole at the lift station site with the location and height to be determined during the design process.

The golf course pump station site would require new power conduit and wiring to be installed by the CTUIR's project contractor and PPL from the existing transformer (No. 155383) to the pump station site. As with the previously mentioned site, the location of the conduits and meter base will be determined during the design process.

Renewable Energy Implementation

Renewable energy systems installed with the WWTF can help offset the power pulled "from the grid" by the WWTF. A renewable energy system would help reduce monthly power costs and provide a more sustainable means of providing power to the WWTF. Generally, a net metering contract is set up with the power provider that tracks the amount of power pulled off the power grid and the amount of power that may be placed back on the power grid through the site's renewable energy generating system. The customer is then provided with a statement that shows the power consumed versus produced and generally pays a reduced power usage charge (due to the power put back on the grid or consumed directly off the solar facility at the site). Power usage versus supplied may be “reconciled” on an annual basis rather than monthly.

The CTUIR has expressed a desire to install renewable energy at the WWTF site. With this intent in mind, solar panel installation at the new WWTF has been considered. Wind power has not been considered in this Pre-Design Report (PDR) for the following reasons:

- The location of the WWTF is near several community facilities and residential homes, which could lead to concerns about windmill placement
- Windmills need a larger footprint to produce the amount of power that the WWTF would require
- The location of the WWTF is not ideal for wind power production as the site is somewhat buffered from the wind

Other forms of renewable energy that have been considered but that do not appear to be available for this site at this time are geothermal power production and hydrogen power production. Geothermal power production has not been considered further as there are no known sources of geothermal water near the WWTF site. Hydrogen production is a potential source of power. Currently, the Pacific Northwest Hydrogen Association is creating a hydrogen network to develop and bring clean hydrogen solutions to the market that leverage the region’s renewable energy sources and help meet clean energy goals. A potential hydrogen production site may be located in the Boardman area in the future. The development of this hydrogen network is currently in the planning phase, and hydrogen production and transmission facilities are not anticipated to be in place in the near future. However, using hydrogen to store or provide backup power may be an option to consider in the future with further developments in hydrogen energy production and distribution.

Solar Array

With a solar array being the preferred option for renewable energy production, the following considerations have been made:

- Fixed-base solar panels
- Solar tracking panels
- Battery backup
- Microgrid power system

Providing a solar energy system would provide renewable energy to aid in powering the WWTF and, at times, potentially fully power the WWTF (at off-peak loading times with full sun exposure), while also providing some redundancy to the WWTF’s power supply. For estimating purposes, a 400 kW solar array system with a net metering system has been included with the implementation of the proposed wastewater treatment and reuse system (WWTRS). A 400 kW system at maximum generating capacity is anticipated to be able to provide approximately 75 to 90 percent of the power consumed by the proposed project components. The potential offset of “grid power” is dependent on power consumption needs at the site and the amount of power that the solar energy system can produce at peak production at any given time.

Pacific Power & Light Renewable Power Interconnection

PPL is the power utility in the Mission area and would be the supplier of power for the WWTF. As described previously, grid power is recommended to be provided to the site to have a dependable power supply for the facilities. Based on current power requirement calculations, the interconnect for a 400 kW solar energy system would be a 500-amp, 3-phase standard connection, which can be provided on a single power meter. Although the proposed solar array should be able to generate enough power to operate the WWTF, PPL would still size any new power service connections for full power draw off the system. Relying on solar to provide all power needs, particularly in winter when days are short and often overcast, would not consistently generate the power required to operate the WWTF. To operate completely on solar in northeast Oregon, the solar array would typically need to be ten times larger than a standard array at peak production time to account for reduced sunlight during the winter. Development of such a large solar array at the proposed WWTF site is not a feasible option at this time.

Solar Array Space Requirements

A 400 kW solar array system is estimated to require approximately 60,000 square feet for stationary panels, not including setbacks and other considerations. Additional space may be required to decrease shading of the panels.

While determining space requirements for solar arrays, there are a couple of approximations that can be made. If an array is equipped with fixed panels, a 3:1 ratio should be used. That equates to 30 feet of space required between every 10 feet of panels (facing east/west). If the array is equipped with rotating panel racks, a 2:1 ratio ground coverage/spacing can be used, which is an approximate 20 feet of space being required between every 10 feet of panels (facing north/south). This amounts to a potential increase of 30 percent more power production over the same space over the fixed-base solar panels on the same size site.

Comparing Fixed-base versus Solar Tracking Panel Installations

Fixed-base solar panels are generally considered for solar energy systems that have full sun exposure for an extended period of time and where cheaper installation costs are more important than the long-term value of increased solar power production. Solar tracking panels can generate up to 40 percent more energy compared to their fixed counterparts. Moreover, this increased efficiency makes them ideal for locations with long or harsh winters where solar radiation may be limited, so they can still capture as much energy as possible[1]. The downside to the solar tracking systems is that they have more moving parts and require some additional maintenance. Considering the potential increased solar production that the solar tracking panel systems have over the fixed-base panel installation, potentially more than offsetting the cost savings of a fixed-based system and more power production within the given site constraints, it is recommended that the CTUIR consider the solar tracking panel system for installation at the new WWTF.

Solar System Battery Backup

Based on the current projected power requirements for the WWTRS, approximately 492 kW of power is anticipated to be required to operate the WWTF. Because the WWTF would need to

[1] https://texassolargroup.com/solar-tracking-vs-fixed-panel-2/, November 2024.

operate 24 hours per day, the capacity of a battery backup system to augment a solar energy system would need to be sized to maintain a fully operational system for a full day, at a minimum, to account for reduced solar exposure during winter with thick cloud cover. Operating an off-grid treatment facility running at the capacity needed to constantly run the system over an extended period would likely require multiple large CONEX containers of batteries. The cost of implementing such a large "battery bank" would also not be feasible. Considering these factors, at this time, a battery backup system at this site does not appear to be feasible.

Microgrids

The concept of a microgrid power system has been discussed as a potential implementation strategy to tie the proposed WWTF site to other tribally owned renewable energy systems.

Currently, regulated power companies are typically not in favor of implementation of microgrid systems as it deviates from the traditional power delivery model and creates operational challenges for the power supplier. Development of a microgrid implies a complete off-grid power system, not connected to the power provider. Understanding this implication, it is reasonable to understand why PPL may not be in favor of such a system. If this system were to be integrated into the development of the WWTF, agreements with PPL would need to be established and a design of a full intertie system with other CTUIR renewable power sources developed. It is beyond the scope of this PDR to investigate the details of how a microgrid system could be laid out to interconnect tribal facilities.

In coordinating with solar energy system developers and contractors related to the potential development of a microgrid associated with the WWTF, it was suggested that a small interconnection between various tribal facilities might be referred to as "solar + battery" backup instead of a microgrid. With such a system, other remote solar sites that are tribally owned may be able to be connected and use a common battery backup system, which would benefit the CTUIR by being able to produce power from one site that might be used at another site. However, the continued interconnection to the PPL system would likely be needed to gain PPL support.

Estimated Cost

Typical costs to develop a solar array system with inverters and a net metering system are generally in the range of approximately $2.00 to $2.50 per watt. For a 400 kW system, this equates to a cost between $800,000 and $1,000,000. Considering some additional site work and potential interconnection requirements of PPL, the estimated cost of installing a solar tracking panel system is $1,200,000. This cost is included in the WWTF cost estimate presented on Figure 4-4 in Chapter 4.

Backup Power Supply

In addition to a connection to the power provider's grid, an emergency diesel or natural gas, powered backup generator is usually provided. A backup power generator is usually sized to provide full backup power to the entire WWTF site in case of a prolonged power outage. Backup power is needed because the wastewater will continuously gravity flow to the treatment system, thus making it critical to always have the ability to provide power to the WWTF. The U.S. Environmental Protection Agency (EPA) would also likely require backup power to be available at the site to maintain all treatment functions during a power outage.

Based on power consumption requirements at the WWTF, an estimated 500 kW standby backup generator will be required. The size of the generator will likely limit the fuel supply to diesel, as most natural gas-powered generators are 200 kW or less. The cost to provide a 500 kW backup generator with a diesel fuel tank at the WWTF site is estimated to be approximately $250,000, including an automatic transfer switch (ATS) to transfer to backup power when grid power is lost. This cost is included in the WWTF cost estimate presented on Figure 4-4 in Chapter 4.

Generators are generally installed in an enclosed room of the WWTF to provide a controlled temperature and humid environment. This prolongs the life of the generator components as well as provides a hospitable environment to perform maintenance and any needed repairs to the generator in inclement weather conditions.

Inside the WWTF, an ATS is generally located next to the motor control center (MCC). The ATS allows power to be transferred from public utility power to generator power automatically in the event of a power outage and allows power to be transferred back to the public utility power once the power is restored.

With the generator being tied to the MCC through the ATS, any alarms produced by the generator's onboard operational monitoring system can be relayed to the supervisory control and data acquisition (SCADA) system, as described below, and relayed to the system operators. The generator's ATS will also be programmed to start periodically, typically once every week or two, and run for a set amount of time to ensure it is in operating condition when needed.

A generator would also need to be available to provide backup power at the Gopher Flats service area lift station location. To operate the lift station in the event of a power outage, it is recommended that a receptacle with a manual transfer switch be provided at the lift station to accommodate a portable generator connection. A diesel engine-driven portable trailer-mounted generator with a capacity of approximately 20 kW would need to be available to power the lift station site. It is believed that a portable generator of this size would be beneficial to other public works functions or would potentially be readily available from a nearby rental company.

A backup power generator is not recommended to be installed at the proposed irrigation pump station due to the water storage volume available at the storage wetland/pond site. The volume of water that can be stored at the site should be able to accommodate any recycled water discharged to the storage wetlands/ponds over an extended period of time without needing to pump during a power outage.

The backup power facilities noted herein are intended to provide the CTUIR with reliable operation of the WWTF and the Gopher Flats service area lift station with little impact on system operations.

Automated Control and Monitoring Systems

This section outlines the needs, functions, and benefits of including a SCADA system. To simplify the terminology, the term "SCADA" encompass the equipment automation platform, instrumentation, motor starters, process control functionality, and operator interface system. While the SCADA system has not been developed as part of this PDR, this section is intended to provide an overview of the ultimate design goal for the WWTRS SCADA system.

A SCADA system is needed to support several functions within the WWTRS. The following bullet points highlight the purpose, function, and benefit of the SCADA system.

- The SCADA system collects data and monitors system components. Sensors throughout the WWTF are used to monitor flow rates, water quality parameters (pH, dissolved oxygen), water levels, equipment status (operating or in standby), and general operational status. The SCADA system can provide a real-time, comprehensive overview via a visual interface that provides information to the operator or supervisor.
- The SCADA system will also be designed to allow secure remote access and limited system control by operators. The CTUIR's fiber optic network could be utilized to connect the various sites included in the scope of the proposed WWTRS project. If fiber optic lines are not available in all areas of the project, high frequency spread-spectrum radio technology or cellular communications can be utilized to securely transmit data between project sites. It is possible to use fiber optic where available and radio/cellular data transmission where it is not. SCADA interface via a virtual private network would typically be used to access the SCADA system using high-level security protocols. SCADA operator interfaces can be used simply for monitoring or to potentially be able to physically control some aspects of the treatment system remotely at the customer's discretion.
- Another function of the SCADA system is early detection and alarming. The system would alert operators to irregular conditions like sudden flow changes or water quality changes. These alarms, or alerts, would allow the wastewater operator to proactively address potential problems and to maintain compliance with the standards set by the CTUIR's Department of Natural Resources and/or the EPA.

A SCADA system allows for more efficient wastewater treatment operation. It provides real-time monitoring and remote access, allowing the system to be monitored continually from almost anywhere. The data collected by the SCADA system would allow the operator to see trends and adjust system operations appropriately. Both historic and real-time data would be readily available for the operator to assess the status of the treatment system, pump stations, and other components of the system. This allows the operator to more effectively predict issues that may arise before they occur. This results in better data collection, operator reaction time, jurisdictional compliance, and reduced labor costs.

Chapter 7 - Operational Requirements

This chapter is intended to provide information on the operation and maintenance (O&M) of equipment anticipated to be part of the new recycled water conveyance, storage, and irrigation systems.

Treatment

It is generally anticipated that the majority of the O&M effort required will occur at the new wastewater treatment facility (WWTF). Anticipated maintenance requirements are outlined below. While these requirements are not intended to be comprehensive, they are intended to help assist the Confederated Tribes of the Umatilla Indian Reservation (CTUIR) with planning for the long-term staffing for the WWTF. Initial staffing requirements would be higher than those listed here due to the greater impact required to train new staff and provide them with the experience necessary to confidently and competently operate the WWTF on their own. Typical O&M activities are outlined by facility type below.

Headworks

Due to the nature of material being removed at the headworks, a significant portion of total WWTF O&M effort would be devoted to the headworks. While the amount of required effort would vary depending on the amount of rags, grit, grease, and other problematic materials found in the CTUIR's wastewater, operators should plan to spend a significant portion of their time maintaining the headworks. A properly maintained and functioning headworks should result in easier and less frequent maintenance of downstream equipment and processes. Operational staff should be prepared to regularly perform the following tasks:

- Regularly maintain the influent flowmeter and record/report influent flow data
- Perform regular sampling of raw wastewater influent for testing of critical parameters, such as five-day biochemical oxygen demand, total suspended solids, total Kjeldahl nitrogen, alkalinity, pH, and any other parameters required by permit or conducive to proper operations of the secondary and tertiary treatment processes
- Lubricate chains, bearings, and other moving parts associated with the headworks screen, washer compactor, grit cyclone, and grit classifier
- Change the oil in gearboxes associated with headworks equipment
- Clean the flume, channels, and lift station wetwell as required
- Maintain bearings, seals, and controls systems associated with lift station pumps
- Maintain valves and piping systems

Treatment System

As the treatment of wastewater is primarily a biological process involving bacteria growth suitable for removing pollutants from the wastewater, care must be given in maintaining an environment suitable for the optimal growth of these bacteria. Though the specific treatment system has not yet been selected, the general maintenance items would be the same across technologies. Typical O&M tasks associated with the treatment system are as follows:

- Regularly maintain aeration blowers, including lubricating bearings, changing the oil, replacing or cleaning filters, and monitoring and replacing belts as required
- Replace diffuser heads as needed
- Maintain sludge pumps and motors
- Sample and monitor mixed liquor suspended solids and associated sludge age
- Adjust sludge wasting rates as needed to maintain sludge inventory
- Calibrate and maintain dissolved oxygen probes and other process control instrumentation equipment as required
- Monitor clarification/decant performance
- Maintain valves and valve actuators and piping systems
- Maintain electrical and control equipment

Filtration System

The amount of effort and maintenance required for the filtration system would depend on the efficacy of the clarifiers/decant systems associated with the final selected treatment process. If excessive solids are passing through the treatment system due to treatment process upset or filamentous bacteria bloom (i.e., sludge bulking), the filtration system may be susceptible to clogging and result in more frequent maintenance needs or filter bypass. Additionally, proper function of the filter is instrumental in promoting efficient disinfection by the ultraviolet (UV) system. As such, operators should be prepared for the following maintenance items:

- Replace filter fabric as needed
- Inspect filter seals to identify the potential for inadvertent bypass
- Maintain coagulant dosing and mixing systems as required
- Regularly maintain backwash pumps and/or solenoid valves
- Maintain drive motors and gearboxes
- Maintain piping systems

Disinfection System

The proposed UV disinfection system is considered to be among the most easily maintained available on the market. However, some regular O&M must still be performed to promote effective disinfection. These tasks include the following:

- Replace UV lamps as needed
- Periodically clean the fluoropolymer tubes
- Replace/repair UV ballast components as needed
- Maintain mechanical tube cleaning devices and chemicals
- Maintain electrical, process instruments, and control equipment

Solids Processing

Many of the maintenance activities associated with the solids processing components of the WWTF would overlap with those of the treatment system. The proposed solids processing options are generally considered the least maintenance-intensive options available. Typical O&M activities include the following:

- Maintain blowers as discussed previously for the treatment system
- Maintain sludge pumps, including the lubrication of bearings and replacing of belts, seals, and oil as required for the pump motors
- Maintain decant control gates, valves, and piping systems
- Perform required manual decant procedures and periodically stir the drying beds sludge by dragging it with a tractor rake or other appropriate implement
- Excavate drying beds sludge for storage/haul
- Sample drying beds sludge for testing in accordance with disposal site requirements
- Haul biosolids to landfill

In addition to the maintenance of the individual unit processes as discussed herein, the full WWTF site would require general maintenance and seasonal upkeep to maintain a pleasantly landscaped site. The planting and maintenance of turf grass can help minimize the amount of weed spraying and upkeep while maintaining a clean appearance. Additionally, snow removal would be required as the weather warrants.

Permitting

A permit developed by the CTUIR Department of Natural Resources is anticipated to be issued to guide operation of the wastewater treatment and reuse system. EPA staff have indicated that the EPA does not typically establish a permit for a wastewater treatment facility that does not discharge to federal waterways.

Staffing

Based on the proposed systems' anticipated O&M requirements and discussion with a third-party WWTF operations group, it is estimated that approximately two to three full-time employees (FTEs) would be required to operate the new WWTP initially, with the potential to reduce the number of FTEs required over time. The initial greater need for FTEs is primarily due to the additional efforts anticipated with training CTUIR staff in the O&M of the new WWTF. Once the CTUIR staff are trained and capable of operating the WWTF on their own, it is anticipated that the total FTE requirement would be reduced to one and a half to two operators.

Storage Wetlands/Ponds Complex

When compared to the wastewater treatment system, operational demand of the storage wetlands/ponds (SWP) complex is anticipated to be much less. Due to the minimization of mechanical components associated with these facilities, regular O&M is expected to be minimal. That being said, the recycled water pump station would require regular maintenance of the pumps and motors, and there would need to be some maintenance of the wetlands themselves. Pumps and motors would require lubrication, instrumentation would require periodic calibration, and the access roads would need to be maintained.

When the system is first put into operation, it is anticipated that not all of the SWP cells would need to be filled with recycled water. The cells are sized to accommodate projected recycled water volumes over the next 15 to 20 years, so the current contributions to the system may not be great enough to have water in all of the cells. Rotation of the water to different cells would be needed to help minimize weed growth. Over time, wetland vegetation would develop and may need to be cut back or burned off during late fall months to minimize overgrowth in the wetland/pond cells. It should also be noted that raising the water depths of the SWPs to a higher sustained depth for a yet to be determined time could help with vegetation overgrowth.

Irrigation

Existing irrigation practices associated with the Wildhorse Resort & Casino (WR&C) golf course are not anticipated to be impacted in any significant way with the use of recycled water. However, with the change in water quality that may occur in shifting from basalt well water to recycled water with a higher nutrient content and the increased volume of water being stored in the SWP complex, some additional measures to reduce algae blooms or similar biologic activity may be needed. The proposed irrigation pump station at the SWP pump station is proposed to be equipped with self-cleaning intake screens on each pump. This will help avoid any debris from the SWP being pulled into the pumps. The screening system is intended to be as maintenance-free as possible. However, annual maintenance will likely require a full pressure washing of the screens and potentially unclogging spray nozzles. The existing filter system at the irrigation intake pump station operated by WR&C is intended to remain in place to filter out any pond debris that could accumulate in the existing golf course ponds.

With the potential addition of irrigation users along the recycled water conveyance pipeline, additional maintenance of common irrigation control valves, pumps (where needed), or other common irrigation equipment may be needed. It would be important for the CTUIR to verify that no potential cross connections with the potable water system exist with the conversion of existing irrigation systems to the new recycled water irrigation.

Summary

CTUIR public works staff have intentionally selected a wastewater treatment system that minimizes O&M while providing the desired Class A recycled water. As noted previously in this PDR, the process for selecting equipment for each step of the treatment process all the way through to irrigation has kept ease of maintenance at the top of the priority list when evaluating different options. The intent is to provide the CTUIR with operational flexibility and ease of maintenance while providing a high level of treatment that would protect public health and the natural environment.

Chapter 8 - Implementation of Recommended Improvements

Community Engagement

During the development of this Pre-Design Report (PDR), various staff from departments and business interests associated with the Confederated Tribes of the Umatilla Indian Reservation (CTUIR) have provided input and direction related to the scope, location, and operation of the proposed wastewater treatment and reuse system identified herein.

CTUIR tribal members also need to be aware of the proposed improvements and the benefits associated with them. The CTUIR recently held a signing ceremony at the Nixyáawii Tribal Governance Center to celebrate the historic level of funding that the Indian Health Service and the U.S. Environmental Protection Agency dedicated to the development of this project. This was a publicly advertised event that garnered much attention for the proposed project. Continuing to promote this project to the public will be critical to the public's acceptance of the project.

Report Review and Finalization

Various tribal committees have also been engaged in project development. Their input has been included in the recommendations included in this PDR.

A final draft of this PDR will be presented by the CTUIR Public Works Department to the CTUIR Board of Trustees. The Board of Trustees will provide input on the PDR and submit any requests for modification to the Public Works Department. A resolution will be drafted to adopt the recommendations of the PDR when the Board of Trustees is prepared to do so. Once the Board of Trustees adopts the resolution, the findings of the PDR will be presented to the General Council (which is open to all tribal members). Input from the General Council meeting will be considered by the Public Works Department as it seeks to move forward with the implementation of the proposed project.

Project Implementation Schedule

The implementation schedule outlining anticipated key steps for developing the project is shown on Figure 8-1. This schedule is split into three construction phases, including Phase 1 - Wetlands and Storage Ponds, Phase 2 - Pumping and Piping Conveyance Systems, and Phase 3 - Wastewater Treatment System. By phasing the project, it is anticipated that a variety of contractors, including local contractors, may be able to bid on certain phases of the project and project construction will be able to start earlier using a phased approach rather than trying to bid the entire project under one general contractor. It should be noted that this proposed implementation schedule may be modified to allow for materials procurement prior to a construction contract award, alternate phasing of the project, and other potential time-saving measures, if desired by the CTUIR.

Total Project Cost Estimate (Engineer's Opinion of Probable Cost)

A preliminary summary of the proposed project's total estimated cost is presented on Figure 8-2. Figure 8-2 includes costs for wastewater treatment (as presented in Chapter 4); pumping and piping of recycled water to the Wildhorse Resort & Casino (WR&C) site; development of winter recycled water storage wetlands/ponds; and pumping, piping, and screening facilities to convey the recycled water to the existing WR&C golf course ponds. Additionally, costs for the two collection system conveyance capacity improvements discussed in Chapter 3, tying both the Gopher Flats and south service areas to the new treatment system, are presented on Figure 8-2.

Allowances for construction contingency, administration, legal, permitting, environmental reporting, cultural resource evaluation/monitoring, and engineering as a percentage of construction cost have been included in the cost estimate.

The cost for land acquisition has also been included. The wastewater treatment facility (WWTF) site and storage wetlands/ponds have intentionally been located on tribally owned properties to avoid land acquisition processes and costs. Pipeline routing has also been located in existing road rights-of-way of Umatilla County, Oregon Department of Transportation, and the CTUIR to avoid further land acquisition processes and costs. However, the Gopher Flats lift station location and, potentially, small sections of pipeline locations may require land acquisition, so an allowance for additional land and/or easements is provided on Figure 8-2.

All of the “Other Project Costs” included on Figure 8-2 are intended to provide a conservative budgetary estimate. However, these costs will need to be refined in the design phase.

A project of this magnitude takes time to develop. Site layouts and detailed pump station and piping layouts will need to be determined before project permitting needs can be identified. Based on project funding the CTUIR is currently pursuing through the Economic Development Administration, an Environmental Assessment (EA) is being developed. The EA may indicate other environmental permitting that is needed. If the CTUIR pursues funding from other sources, those funding agencies may also have their own requirements for environmental permitting and reporting.

Cultural resource investigations will also need to be conducted along proposed land that would be impacted by the project. This would be followed by cultural resource monitoring during the construction phase. Based on the results of the cultural resource investigations, the proposed project layout may need to be adjusted before the detailed project design can proceed. Due to the anticipated duration of the EA, permitting, and design processes, the total proposed project cost shown on Figure 8-2 has been inflated by 5 percent per year to year 2026, when bidding of multiple phases of the project is anticipated to occur. It should be noted that this cost does not include annual costs for continued infiltration and inflow monitoring and repairs in the collection system.

Annual Operation and Maintenance Costs

To aid the CTUIR in its budgeting efforts required to operate and maintain the WWTF and associated pump stations, annual operation and maintenance (O&M) costs have been estimated. A summary of the O&M costs is presented on Table 8-1. Additional information about the items listed on Table 8-1 is provided below.

TABLE 8-1
SELECTED ALTERNATIVE ESTIMATED ANNUAL OPERATION AND MAINTENANCE COSTS

Item	Description	Annual Cost
ANNUAL O&M		
1	Contracted Certified Operator Labor	$ 600,000
2	Utilities	100,000
3	Supplies, Parts, Maintenance, and Repairs	80,000
4	Sampling, Testing, and Permit Fees	40,000
5	Operator Training and Certification	10,000
6	Biosolids Disposal	20,000
	Total Annual WWTF O&M* (Year 2023 Cost)	**$ 850,000**

**Note that existing collection system maintenance is not included in this estimate.*

Labor estimates were developed assuming an average price for the first several years of WWTF operation based on contracted labor for a part-time certified operator and two full-time operations staff. CTUIR staff are anticipated to be trained and developed over the course of four to five years to take on more responsibility for the WWTF operations and help reduce this annual cost.

The utility estimates were developed based on anticipated power usage for the activated sludge treatment system and assuming $0.09 per kilowatt-hour. This estimate also includes an estimate for the polymer equipment needs for the tertiary filtration system and the Gopher Flats lift station.

The items for supplies, parts, maintenance, and repairs; sampling, testing, and permit fees; and operator training and certification are estimates to aid the CTUIR in budgeting to maintain both the physical aspects of the WWTF and the “soft” costs associated with running the WWTF and managing its permit.

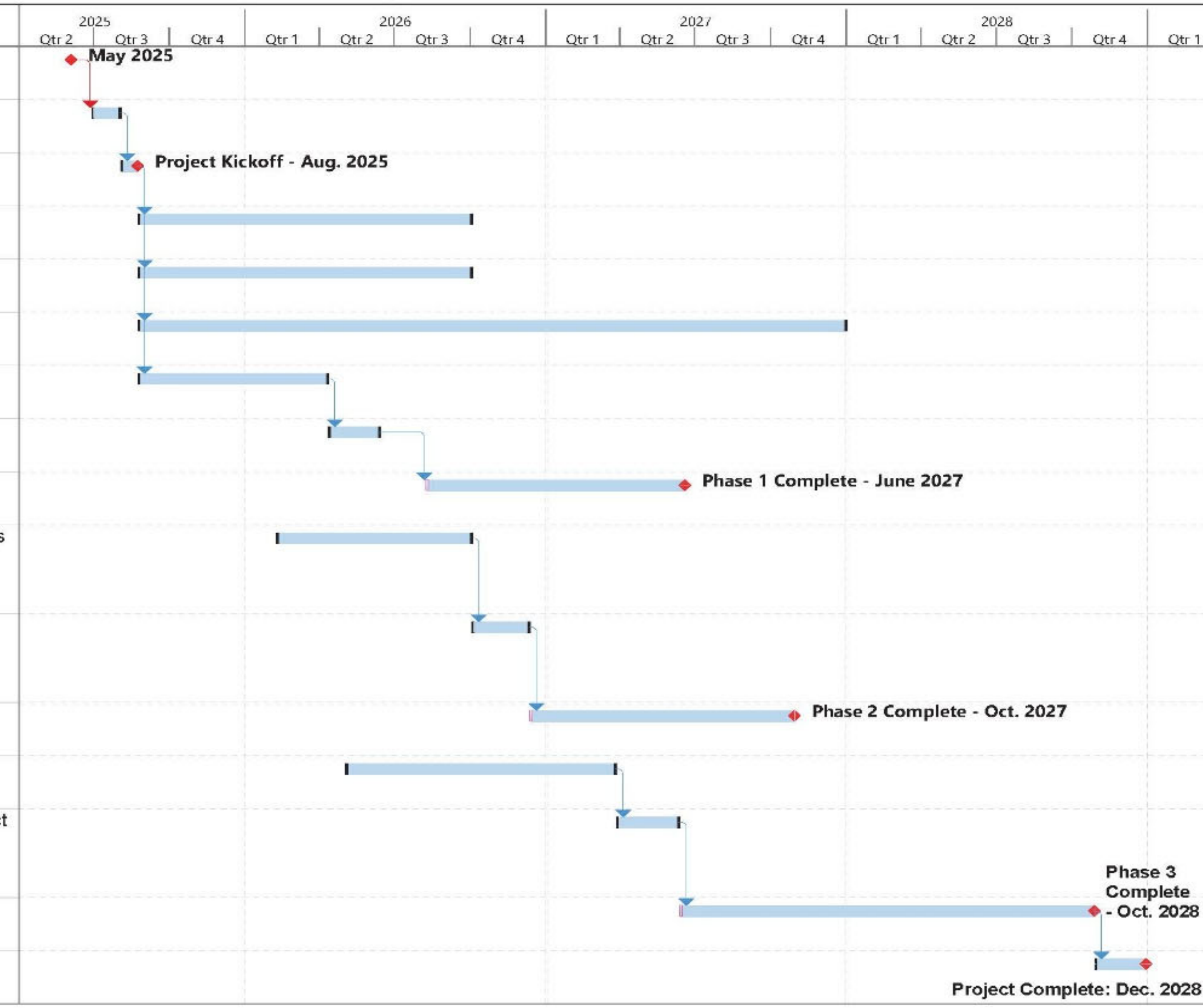
Lastly, the biosolids disposal line item was developed based on dewatering the generated biosolids to at least 50 percent solids via the drying beds, then hauling them to the Finley Butte landfill. The cost includes estimates for both the tipping fees and hauling costs based on current costs.

Implementation Overview

The key to implementing part or all of the wastewater treatment and reuse components described in this PDR is the CTUIR’s ability to acquire funding to implement the improvements, provide appropriate annual O&M budgets, and develop staff who can effectively operate the system. The CTUIR will have to work closely with its tribal members to inform them of the many benefits of the new system. The wastewater treatment and reuse system outlined in this PDR is anticipated to provide the CTUIR with a reliable, quality wastewater system that will meet the needs of the Mission area for many years to come. The new system will allow the CTUIR to improve tribal sovereignty by not sending tribal wastewater to the City of Pendleton, develop additional housing and businesses, reduce groundwater withdrawals for irrigation, expand existing recreation trail systems, and provide educational opportunities supporting existing Tamástslikt Cultural Institute education programs.

Mission Community Wastewater Treatment & Reuse System Design and Construction Schedule

ID	Task Name
1	Finalize Pre-Design Report with Board of Trustees
2	Advertise RFP for Project Design Phase
3	Develop Scope of Work/Agreement for Design Phase
4	Land Negotiation/Acquisition including Easements
5	Environmental Permitting
6	Cultural Resource Investigation & Monitoring
7	Phase 1- Wetland/Storage Pond - Final Design and Contract Documents
8	Phase 1 - Wetland/Storage Pond - Advertise for Bid and Award Construction Contract
9	Phase 1 - Wetland/Storage Pond - Project Construction
10	Phase 2- Pumping and Piping Conveyance Systems - Final Design and Contract Documents
11	Phase 2 - Pumping and Piping Conveyance Systems - Advertise for Bid and Award Construction Contract
12	Phase 2 - Pumping and Piping Conveyance Systems - Project Construction
13	Phase 3- Wastewater Treatment System - Final Design and Contract Documents
14	Phase 3 - Wastewater Treatment System - Advertise for Bid and Award Construction Contract
15	Phase 3 - Wastewater Treatment System - Project Construction
16	Project Closeout



Task | Milestone

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CONFEDERATED TRIBES OF THE UMATILLA INDIAN RESERVATION
MISSION AREA WASTEWATER TREATMENT AND REUSE SYSTEM PRE-DESIGN REPORT
PROPOSED DESIGN AND CONSTRUCTION SCHEDULE

FIGURE 8-1

CONFEDERATED TRIBES OF THE UMATILLA INDIAN RESERVATION
MISSION AREA WASTEWATER TREATMENT AND REUSE SYSTEM
PRE-DESIGN REPORT
PRELIMINARY SUMMARY OF ESTIMATED COSTS

DESCRIPTION		2024 ESTIMATED CONSTRUCTION COST WITH CONTINGENCY
Raw Wastewater Conveyance System Improvements	$	3,060,000
Wastewater Treatment Facility Improvements		20,535,000
Recycled Water Conveyance and Storage System Improvements		17,577,000
TOTAL CONSTRUCTION COST WITH CONTINGENCY	**$**	**41,172,000**
Other Project Costs		
Administration/Legal	$	200,000
Land Acquisition		100,000
Permitting		250,000
Environmental Reporting		300,000
Cultural Resource Evaluation/Monitoring*		500,000
Power Supply to Sites**		300,000
Design Engineering (10%)		4,120,000
Construction Administration and Engineering (10%)		4,120,000
Subtotal, Other Project Costs	**$**	**9,890,000**
TOTAL ESTIMATED COST (YEAR 2024)	**$**	**51,062,000**
TOTAL ESTIMATED COST (YEAR 2026)* **	**$**	**56,300,000**

* To be confirmed by Confederated Tribes of the Umatilla Indian Reservation Cultural Resources Protection Program.

** Does not include any substation improvements.

*** Assumes 5 percent annual inflation.

Appendices Table of Contents

APPENDIX A
1978 Transfer Agreement

TRANSFER AGREEMENT
BETWEEN
THE INDIAN HEALTH SERVICE
AND
THE CONFEDERATED TRIBES OF THE UMATILLA INDIAN RESERVATION
AND
THE CITY OF PENDLETON
PO 72-942

WHEREAS, the Indian Health Service, acting through the Director, Portland Area Indian Health Service, Department of Health, Education and Welfare, under and pursuant to the provisions of Public Law 86-121 (73 Stat. 267); and the Confederated Tribes of the Umatilla Indian Reservation, hereinafter called the Tribe, acting through the Chairman, Board of Trustees; and the Umatilla Reservation Housing Authority, hereinafter called the Authority, acting through the Chairman, Umatilla Reservation Housing Authority; and the City of Pendleton, acting through the Mayor of Pendleton, hereinafter called the City; entered into an Agreement executed for the Indian Health Service on September 15, 1972, for the Tribe on August 11, 1972; for the Authority on August 15, 1972; for the City on September 5, 1972, regarding the provision of community sewage and collection systems for the Indians participating in the fifty (50) home HUD Housing Project, on the Umatilla Indian Reservation; and

WHEREAS, the community sewer facilities and appurtenances thereto and the materials, supplies and equipment provided for and incorporated therein pursuant to that Agreement have been provided and the project has been completed; and

WHEREAS, the parties are desirous of providing for and assuring the proper and efficient maintenance and continued operation of said community sewage disposal facilities; and

WHEREAS, under Section 7(A) of Public Law 86-121, the Director of the Indian Health Service, on behalf of the Indian Health Service, is authorized to transfer the completed facilities with or without a money consideration, under such terms and conditions as set forth under that Agreement, having regard for the contributions made and the maintenance responsibility undertaken, and the special health needs of the Indians,

NOW THEREFORE, in accordance with the terms of said Agreement and pursuant to Section 7(A)(4) of Public Law 86-121, it is agreed by the parties hereto:

1. That in consideration of the contributions made and the responsibilities undertaken by the City,

The Indian Health Service hereby transfers, assigns and conveys to the City, without a money consideration, and under the terms and conditions set forth in the aforesaid Agreement and as hereinafter set forth, all the right, title and interest of the Indian Health Service in the completed sewer trunkline as detailed in the plans and specifications of Project No. WSF-OR-10-16-1006, including all materials, supplies and equipment provided for and incorporated in such trunkline sanitary sewer.

2. The City hereby accepts such transfer under the terms and conditions set forth in the aforesaid Memorandum of Agreement and as hereinafter set forth and agrees to operate, maintain and repair the trunkline sanitary sewer so as to keep it in an effective and operating condition. Nothing herein shall be construed or interpreted to apply to any service line, lateral line or trunk sewer or collector sewer extension connected to the trunkline during the period of construction or subsequently attached thereto. The City shall not have any responsibility with respect to operation, maintenance or repair of any such service lines, lateral lines, or trunk sewer or collector sewer extensions connected to the trunkline sanitary sewer.

3. The Indian Health Service hereby waives all financial interest to the head of each household, without a money consideration, in all service lines and appurtenances thereto constructed and installed on his premises.

4. In consideration of the contributions and the responsibilities undertaken by the Tribe, the City and the Tribe agree as follows concerning the administration of the sewer trunkline:

A. The City shall be entitled to all permit fees and the Tribe to all hook-on fees, to be collected as hereinafter provided. The fees are defined in Paragraph 7 of the aforementioned Agreement between the parties. The fees shall be as follows until further amended by the Tribe and the City:

HOOK-ON CONNECTION FEES

	DIRECT		INDIRECT	
Single Residence				
Hook-On	$ 500.00		$ 200.00	
Permit	75.00		100.00	
TOTAL	$ 575.00		$ 300.00	
Multi-Family Residence	Hook-On	Permit	Hook-On	Permit
First Unit	$ 500.00	$ 75.00	$ 200.00	$100.00
2nd, 3rd & 4th Units	200.00/ea	30.00/ea	80.00/ea	40.00/ea
Each Additional Unit Over Four	50.00/ea	7.50/ea	20.00/ea	10.00/ea
Single Commercial				
Hook-On	$ 600.00		$ 300.00	
Permit	75.00		100.00	
TOTAL	$ 675.00		$ 400.00	
Multi-Unit Commercial				
First Unit	$ 600.00	$ 75.00	$ 300.00	$100.00
2nd, 3rd & 4th Units	200.00/ea	30.00/ea	80.00/ea	40.00/ea
Each Additional Unit Over Four	50.00/ea	7.50/ea	20.00/ea	10.00/ea
Single Industrial (specific industry, single utility connection)				
Hook-On	$1,500.00		$ 900.00	
Permit	250.00		350.00	
TOTAL	$1,750.00		$1,250.00	
Multi-Unit Industrial (varied industry, multiple utility connections; e.g. an industrial park)				
First Unit	$1,500.00	$250.00	$ 900.00	$350.00
2nd, 3rd & 4th Units	1,100.00/ea	125.00/ea	700.00/ea	175.00/ea
Each Additional Unit Over Four	800.00/ea	100.00/ea	450.00/ea	150.00/ea

For the purposes of this Agreement, the word "Commercial" shall include all installations where goods or services or both are offered to the public for sale. "Industrial" shall include manufacturing or production of raw materials normally sold wholesale rather than to the public. "Residential" shall have its usual meaning of personal living units only.

B. The hook-on connection fees set forth above shall apply to each and every service line connected to the trunkline or to any lateral line which is connected to the trunkline.

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Permits for hook-ons shall be issued only by the City, regardless of the location of the property to be served with reference to being within or outside the boundaries of the Umatilla Indian Reservation. In accordance with Paragraph 7 of the basic Agreement, the City shall remit the 'hook-on' portion of the fee to the Tribe and retain the 'permit' portion of the fee.

C. Before issuing a permit to serve property situated within the Umatilla Indian Reservation, but lying outside the City limits, the City shall have written approval from the Tribe indicating that all requirements as to zoning, land use, sanitary and building codes have been met or satisfactory arrangements have been made to comply with them.

D. The parties hereto recognize that the ten (10") inch line from Station No. 54+72.99 (Riverside and N. E. 42nd) to Station No. 265+57 (end of trunkline) has a maximum carrying capacity of 1,000,000 gallons per day, including any infiltration that might occur. It is understood that the 1,000,000 gallons per day capacity of the line at Station No. 54+72.99 shall be maintained and available for inflow from points east of that station. When the capacity of the line has been reached as determined by measurements taken at Station No. 54+72.99, neither the Tribe nor the City shall approve any additional hook-ons to the trunkline sanitary sewer or extension thereof, east of said section. The criteria for determining the sewage inflow shall be the latest edition, as periodically up-dated, of the publication entitled Design and Construction of Sanitary and Storm Sewers prepared by the Water Pollution Control Federation (W.P.C.F.) and the American Society of Civil Engineers (A.S.C.E.). The point at which the inflow will be tested is Station No. 54+72.99.

5. Both the Tribe and the Authority recognize that the sanitary sewer system and the sewage treatment facility for the City and environs are controlled and regulated by ordinances of the City and laws of the State of Oregon and agree to abide by such ordinances and laws as they now exist or may hereafter be modified with particular reference to the portions thereof regarding strength and type of sewage inflow that may be introduced into the system.

6. It is recognized by all parties that the City has heretofore established a policy in connection with the furnishing of sanitary sewer service outside the limits of the City whereby the users residing outside the City limits pay a service rate equal to one-hundred fifty (150%) percent of the in-city user rate. In this instance, the local housing Authority agrees to collect, guarantee the payment thereof, and pay the City in one lump sum each month for all sanitary sewer user charges chargeable to Indian homes or other non-commercial Indian facilities. The City in consideration of such service and such guarantee agrees that the rate to be charged the several users contemplated by the Project Summary or Indian users added after completion of the project shall be at a rate of one-hundred ten (110%) percent of the in-city user rate.

7. The City and Tribe retain authority to approve industrial hook-ons within their respective jurisdictions, subject to the terms of this Agreement. Industrial hook-ons in the area lying outside of both the City and Reservation Boundaries, and Southeast of State Highway 11, shall require joint City and Tribal approval.

8. It is understood that the City has waived conditions 2 and 3 as set forth in the memorandum of May 2, 1972, from the Special Policy Committee to the Mayor and City Council insofar as lands within the Umatilla Indian Reservation are concerned, and a connection to the sewer within the Reservation will not be interpreted by the City as a consent of the property owner to annex his property to the City.

9. Participation by the Confederated Tribes in this outlined sanitary sewer agreement shall in no way affect or abridge any rights or powers of the Indian Tribes participating which may be vested in said Tribes through or by the Constitution of the United

States, by Treaty, Federal or State law, or otherwise, except as herein specifically provided.

10. It is understood that the Union Pacific Railroad Company will be relocating sections of the Mission Sewer Line on right of ways which they will acquire within the Reservation, that the newly relocated line shall remain the property of the City, and further that the City retains authority in the areas of plans review, placement, inspection and final approval of railroad work, including enlargement or parallel line construction if necessary for the proper functioning of this system. The City shall not authorize or approve any modification or changes in the sewer line by the Railroad which will decrease the quality, volume capabilities or functional efficiency of the existing line.

IN WITNESS WHEREOF, the parties have subscribed their names.

FOR THE CONFEDERATED TRIBES OF
THE UMATILLA INDIAN RESERVATION

Date: 5-10-78

William D. Johnson
Chairman, Board of Trustees, having been duly authorized to enter into this Agreement on behalf of the Confederated Tribes of the Umatilla Indian Reservation as evidenced by the attached certified copy of the resolution made by said Board of Trustees.

FOR THE UMATILLA RESERVATION
HOUSING AUTHORITY

Date: 5-10-78

Michael J. Farrow
Chairman, Umatilla Reservation Housing Authority, having been duly authorized to enter into this Agreement on behalf of the Umatilla Reservation Housing Authority as evidenced by the attached certified copy of the resolution made by the Umatilla Reservation Housing Authority.

FOR THE CITY OF PENDLETON

Date: 7-31-78

Joe McLaughlin
Mayor, City of Pendleton, having been duly authorized to enter into this Agreement on behalf of the City of Pendleton, as evidenced by the attached certified copy of the resolution made by the City of Pendleton.

FOR THE INDIAN HEALTH SERVICE

Date: 7/17/78

Director, Portland Area Indian Health Service,
Department of Health, Education and Welfare

RESOLUTION NO. 1065

WHEREAS, the Indian Health Service, the Confederated Tribes of the Umatilla Indian Reservation, the Umatilla Reservation Housing Authority, and the City of Pendleton entered into an Agreement in the fall of 1972 regarding the provision of community sewage and collection systems for the Indians participating in the fifty home HUD Housing Project on the Umatilla Indian Reservation,

AND WHEREAS, the community sewer facilities and appurtenances thereto and the materials, supplies and equipment provided for have all been supplied pursuant to such Agreement,

AND WHEREAS, the parties are desirous of providing for and assuring the proper and efficient maintenance and continued operation of said community sewage disposal facility,

AND WHEREAS, the Director of the Indian Health Service is authorized to transfer the completed facilities pursuant to Public Law 86-121,

AND WHEREAS, a Transfer Agreement has been prepared to accomplish the transfer of said facilities to the ownership of the City of Pendleton,

NOW THEREFORE THE CITY OF PENDLETON RESOLVES AS FOLLOWS:

THAT upon execution by the Indian Health Service of the attached Transfer Agreement, the Mayor and City Recorder are hereby authorized to execute the attached Transfer Agreement on behalf of the City of Pendleton,

FURTHER THAT, inasmuch as it is necessary for the immediate preservation of the peace, health and safety of the City of Pendleton that this Resolution shall have immediate effect, an emergency is hereby declared to exist, and this Resolution shall be in full force and effect from and after its passage by the Council and approval by the Mayor.

PASSED by the vote of the Council Members present and approved by the Mayor this 16th day of May, 1978.

APPROVED: Joe McLaughlin
Mayor

ATTEST: [illegible]
City Recorder

RESOLUTION NO. 78-40

CERTIFICATE

The undersigned William D. Johnson and Kenneth Bill hereby certify that they are the Chairman and Secretary, respectively, of the Board of Trustees of the Confederated Tribes of the Umatilla Indian Reservation in Oregon, that at a duly called and held regular meeting of said Board at the Conference Room of the Nicht-Yow-Way Community Center, Pendleton, Mission, Oregon, on May 8, 1978, a quorum of said Board was present and the following resolution was regularly moved, seconded and adopted by a vote of 4 to 3.

RESOLUTION

WHEREAS, the Confederated Tribes of the Umatilla Indian Reservation entered into an agreement in August of 1972 regarding the transfer of the Mission Sewer Trunkline upon its completion, AND

WHEREAS, the trunkline has been completed, AND

WHEREAS, the Board of Trustees is desirous of providing adequate sewer services to houses on the Umatilla Indian Reservation and insuring that said trunkline is properly operated and maintained in an efficient working condition, AND

WHEREAS, discussions and negotiations have taken place regarding the terms and provisions of the transfer agreement, AND

WHEREAS, the Board of Trustees of the Confederated Tribes of the Umatilla Indian Reservation has reviewed the attached transfer agreement and finds it satisfactory, NOW THEREFORE BE IT

RESOLVED, that the Board of Trustees of the Confederated Tribes of the Umatilla Indian Reservation hereby authorizes the Chairman of the Board of Trustees to sign and execute said document on behalf of the Confederated Tribes of the Umatilla Indian Reservation.

AND that said resolution has not been modified, amended nor repealed and is still in full force and effect.

DATED this 8th day of May, 1978.

William D. Johnson

William D. Johnson, Chairman
Board of Trustees

A T T E S T:

Kenneth Bill

Kenneth Bill, Secretary
Board of Trustees

UMATILLA RESERVATION
HOUSING AUTHORITY

P. O. BOX 520
PENDLETON, OREGON 97801

RESOLUTION #78-3

WHEREAS, The Umatilla Reservation Housing Authority was a party to a 1972 agreement regarding the transfer of the Mission Sewer Trunkline to the City of Pendleton upon it's completion, AND

WHEREAS, The sewer trunkline has now been completed, AND

WHEREAS, Negotiations and discussions have taken place regarding the terms and conditions of the transfer of the trunkline, AND

WHEREAS, The Umatilla Reservation Housing Authority is desirous of insuring that said trunkline will be properly and adequately operated and maintained to insure proper sewer service to housing on the Umatilla Indian Reservation, AND

WHEREAS, The Umatilla Reservation Housing Authority has reviewed the attached Transfer Agreement and finds it to be satisfactory, NOW THEREFORE BE IT

RESOLVED, That the Umatilla Reservation Housing Authority hereby authorizes the Chairman of the Umatilla Reservation Housing Authority to sign and execute said transfer agreement on behalf of the Umatilla Reservation Housing Authority.

DATED this 19 day of April, 1978.

Michael J. Farrow
MICHAEL FARROW, CHAIRMAN
UMATILLA RESERVATION HOUSING
AUTHORITY

A T T E S T:

Elzie Farrow
ELZIE FARROW, ACTING SECRETARY
UMATILLA RESERVATION HOUSING
AUTHORITY

APPENDIX B
Treatment Equipment Company Sample Results Package

February 22, 2024

Mr. Dave Wildman, P.E.
Senior Engineer
Anderson Perry & Associates
dwildman@andersonperry.com

SENT VIA EMAIL

RE: WATER SAMPLE TESTING (RE-TEST) AND RESULTS FOR THE CONFEDERATED TRIBES OF THE UMATILLA INDIAN RESERVATION (CTUIR)

Dear Mr. Wildman:

I'm writing regarding the samples we took and sent to the Pendleton Wastewater Laboratory for testing for the Confederated Tribes of the Umatilla Indian Reservation (CTUIR). The sampling evolution was conducted on January 13, 2024, and continued through January 16, 2024.

The composite sampler was set-up to grab representative flow samples every 15-minutes (achieving 4 samples per hour) daily and fill the 2.2-gallon sample jug. Samples were quickly shuttled to Pendleton WWTP lab to meet the pH sample hold times. The samples over the weekend were held in the incubator for normal scheduled testing during the week. FOG samples were taken as grab samples and ran to Umpqua environmental lab in Pendleton for the four (4) days of testing. Unfortunately, the original samples were frozen and broken after they were turned over from the chain of custody to the lab. They did come back and retest the samples and results are included. Below are the results: Temperatures did present sampling freezing issues and we had to add space heaters into the sampling Manhole to safeguard proper pump operations. **Note that testing for 1/15 sample document was replaced after investigating initial reported tests. The numbers were incorrectly transposed from the official testing results into the test report by Pendleton's lab.** Please feel free to contact me at (206) 909-1546 regarding any questions on any of the data or general sampling operations.

Regards,

Chris McCalib
President

ctm/sdm

TEST DATE 1/14/24 (PENDLETON WWTP):

Sample ID	pH	TSS mg/l	BOD mg/l	Alkalinity mg/l	Ammonia mg/l	Nitrate mg/l	Nitrite mg/l	TKN mg/l	Phosphorus mg/l
CTUIR	7.3	84	78	293	25.10	0.33	0.142	39.2	16.6
		Note 1	Note 2	Note 6	Note 5	Note 8	Note 9	Note 12	Note 10

***original report with notes attached at the end of this document**

TEST DATE 1/15/24 (PENDLETON WWTP) (RE-TEST RESULTS IN YELLOW):

Sample ID	pH	TSS mg/l	BOD mg/l	Alkalinity mg/l	Ammonia mg/l	Nitrate mg/l	Nitrite mg/l	TKN mg/l	Phosphorus mg/l
CTUIR	7.37	130	111	267	46.40	0.34	0.126	34.7	17.6
CTUIR	**7.37**	**130**	**111**	**267**	**24.6**	**0.34**	**0.126**	**34.7**	**17.6**
		Note 1	Note 2	Note 6	Note 5	Note 8	Note 9	Note 12	Note 10

***original report with notes attached at the end of this document**

TEST DATE 1/16/24 (PENDLETON WWTP):

Sample ID	pH	TSS mg/l	BOD mg/l	Alkalinity mg/l	Ammonia mg/l	Nitrate mg/l	Nitrite mg/l	TKN mg/l	Phosphorus mg/l
CTUIR	7.41	103	113	234	18.05	0.38	0.109	29.8	12.1
		Note 1	Note 2	Note 6	Note 5	Note 8	Note 9	Note 12	Note 10

***original report with notes attached at the end of this document**

TEST DATE 1/17/24 (PENDLETON WWTP):

Sample ID	pH	TSS mg/l	BOD mg/l	Alkalinity mg/l	Ammonia mg/l	Nitrate mg/l	Nitrite mg/l	TKN mg/l	Phosphorus mg/l
CTUIR	7.17	113	114	227	19.40	0.10	0.395	30.2	11.2
		Note 1	Note 2	Note 6	Note 5	Note 8	Note 9	Note 12	Note 10

***original report with notes attached at the end of this document**

TEST DATE 1/17/24 (UMPQUA RESEARCH COMPANY):

Inorganic Analyte	Code	Result	Units	MRL	BML	Prepared	Analyzed	Analyst	Qualifier
EPA 1664 Oil & Grease (total)		32.7	mg/L	5.0		02/05/24	02/05/24	JBN	

***original report with notes attached at the end of this document**


Global Water
WS700

Sample Analysis 2024

Pendleton Wastewater Lab
4300 SW Houtama Rd
Pendleton OR, 97801

Facility Name: **TEC - Chris McCalib**

Date Received: 1/14/2024

RESULTS

Sample ID	pH	TSS mg/l	BOD mg/l	Alkalinity mg/l	Ammonia mg/l	Nitrate mg/l	Nitrite mg/l	TKN mg/l	Phosphorus mg/l
CTUIR	7.30	84	78	293	25.10	0.33	0.142	39.2	16.6
		Note 1	Note 2	Note 6	Note 5	Note 8	Note 9	Note 12	Note 10

Comments: Samples run per customer request. Does not meet holding times.

Method detection limits: (MDL)

TSS: at least 5 milligrams/volume retained on filter
BOD: 2 milligrams/liter
Ammonia: 0.004 mg/L NH3-N
Alkalinity: 1 mg/L CaCO3
Nitrate: 0.05mg/L NO3-N
Nitrite: 0.004 mg/L NO2-N
Phosphorus: 0.003 mg/L P
TKN: 0.08 mg/L NH3-N as TKN

ND is a non detect

Notes: "Standard Methods for the Examination of Water and Wastewater" 24th edition 2023

Note 1: SM 2540 D Total suspended solids dried at 103-105 C
Note 2: SM 5210 5 Day BOD test: all effluent samples are seeded and dechlorinated
Note 5: Hach Method 10205 (TNTplus 830/831/832) equivalent to EPA 350.1, 351.1 and 351.2, SM 4500
Note 6: Hach Method 10239 (TNTplus 870), SM 2320
Note 8: Hach Method 10206 (TNTplus 835/836) equivalent to SM 4500-E Nitrogen, EPA 353.2, SM 4500
Note 9: Hach Method 10207/10237 (TNTplus 839/840), SM 4500
Note 10: Hach Method 10209/10210 (TNTplus 843/844/845) equivalent to EPA 365.3
Note 12: Hach Method 10242 R1.2 (TNTplus 880) equivalent to EPA 351.2, SM 4500

Sample Analysis 2024

Pendleton Wastewater Lab
4300 SW Houtama Rd
Pendleton OR, 97801

Facility Name: **TEC - Chris McCalib**

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UMPQUA Research Company
626 NE Division St. - P.O. Box 609
Myrtle Creek, Oregon 97457
(541) 863-5201 Fax: (541) 863-6199
E-mail: Lab@URCmail.net
Internet: http://ChemLab.cc
ORELAP ID# OR100031

ANALYSIS REPORT
URC # 4012308

Treatment Equipment Company (TEC)	Project: No Project	Date Reported: 02/06/24
21364 SE 299th Way	Project #: Wildhorse Casino	Date Sampled: 01/17/24 13:00
Kent, OR 98042		Date Received: 01/23/24 12:20
	Client Contact: Chris McCalib	Sampled By: Austin McCalib

Sample Location: Casino   URC Sample #: 4012308-01   Matrix: Aqueous

Inorganics

Analyte	Code	Result	Units	MRL	BML	Prepared	Analyzed	Analyst	Qualifier
EPA 1664									
Oil & Grease (Total)		**32.7**	mg/L	5.0		02/05/24	02/05/24	JBN	

UMPQUA Research Company/MC

The results in this report apply to the samples analyzed in accordance with the chain of custody document.
This analytical report must be reproduced in its entirety.

Dan Phillips, Laboratory Manager

UMPQUA Research Company
626 NE Division St. - P.O. Box 609
Myrtle Creek, Oregon 97457
(541) 863-5201 Fax: (541) 863-6199
E-mail: Lab@URCmail.net
Internet: http://ChemLab.cc
ORELAP ID# OR100031

Qualifiers and Definitions

DET	Analyte DETECTED
ND	Analyte NOT DETECTED at or above the MRL (minimum reporting limit)
NA	Not Applicable
NR	Not Reported
dry	Sample results reported on a dry weight basis
RPD	Relative Percent Difference
MRL	Minimum Reporting Limit
MDL	Minimum Detection Limit
BML	Benchmark Level
(‡)	ORELAP Accredited Analyte
(~)	Due to rounding of individual analytes, the "total" may vary slightly from the sum of the individual analyte values.

UMPQUA Research Company/MC

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Dan Phillips, Laboratory Manager