



State of Oregon
Department of
Environmental
Quality

National Pollutant Discharge Elimination System Permit Fact Sheet City of Joseph

Permittee	City of Joseph 84092 Valley View Road Joseph, Oregon 97846
Existing Permit Information	File Number: 44329 Permit Number: 101602 EPA Reference Number: OR0020605 Category: Domestic Class: Minor Expiration Date: November 30, 2023
Permittee Contact	Levi Tickner Plant Operations Lead 541-760-9362 P.O. Box 15 Joseph, Oregon 97846
Receiving Water Information	Receiving stream/NHD name: Prairie Creek NHD Reach Code & % along reach: 17060105000256 95.2% USGS 12-digit HUC: 170601050105 OWRD Administrative Basin: Grande Ronde ODEQ LLID & River Mile: 1172966454199 RM 4.4 Assessment Unit ID: OR_SR_1706010501_02_103344
Proposed Action	Permit Renewal Application Number: 948283 Date Application Received: May 30, 2023
Permit Writer	Stuart Blois 541-714-0035 Date Prepared: January, 2025

NPDES Permit Fact Sheet

City of Joseph

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NPDES Permit Renewal Fact Sheet

City of Joseph

1. Introduction

As required by Oregon Administrative Rule 340-045-0035, this fact sheet describes the basis and methodology used in developing the permit. The permit is divided into several sections:

- Schedule A – Waste discharge limitations
- Schedule B – Minimum monitoring and report requirements
- Schedule C – Compliance conditions and schedules
- Schedule D – Special conditions
- Schedule E – Pretreatment conditions
- Schedule F – General conditions

A summary of the major changes to the permit are listed below:

- The BOD₅ loading limits (lbs/day) decreased from 94/140/190 to 52/78/100 Average Monthly/Average Weekly/Daily Maximum loading limits (0.334¹ MGD Average Wet Weather Flow year 2043)
- The chlorine maximum daily limit decreased from 0.08 to 0.07 mg/L
- Increased BOD/TSS monitoring from 1 per 2 weeks to 1 per week
- Increased effluent temperature & pH monitoring to continuous
- Increased ammonia monitoring from 2 per month to 1 per week
- Increased *E. coli* monitoring from 1 per 2 weeks to 2 per week
- Increased receiving stream monitoring to monthly (Nov 1 – May 31) for pH, ammonia, alkalinity, temperature, dissolved oxygen, and TKN.
- Increased recycled water *E. coli* monitoring from 1 per 2 weeks to 1 per week (when irrigating)
- Increased recycled water nutrient monitoring from annually to quarterly (when irrigating)
- Added sludge depth survey and lagoon leak test requirements

2. Facility Description

2.1 Wastewater Facility

The City's wastewater treatment facility is shown schematically in Figures 2 and 3 (*City of Joseph, Wallowa County, Oregon, Wastewater Treatment Plant Operations and Maintenance Manual*, HGE Inc., July 1998). The treatment process consists of a headworks (mechanical screen, manual grit chamber), 6-inch Parshall flume followed by a four-cell, 60 mil HPDE lined, facultative lagoon system. Two lagoon cells are mechanically aerated. Total lagoon surface area is 10 acres. Effluent from the second cell is chlorinated and then flows through a 24-inch diameter contact pipe to the third cell. The third and fourth cells are used as dechlorination, storage and polishing ponds.

¹ Joseph Wastewater System Improvements (2022)

Effluent from the fourth cell is measured using a 3-inch Parshall flume and discharged to Prairie Creek near river mile 4.0 through an 8-inch diameter, 9,500 feet long outfall pipe (outfall 001), or is pumped to the land application site (outfall 002). Biosolids are stored in a 60 mil HPDE-lined pond when conditions are unsuitable to land apply (i.e., wet weather months). The facility last removed biosolids in 2023. In 2024 the facility completed a plant upgrade designed to meet final ammonia limits. The facility upgraded its blowers, added a submerged activated growth reactor technology for nitrification, upgraded its headworks barscreen, replaced the influent and effluent composite samplers upgraded its effluent pH and temperature probe to continuous monitoring, installed a new recycled water pump, new effluent flow meter, and new irrigation pivot. During the upgrades the facility also decommissioned the primary clarifier and digester. The upgraded facility is designed to support a projected 2040 population of 1,469 people.

Figure 2-1: Site Map

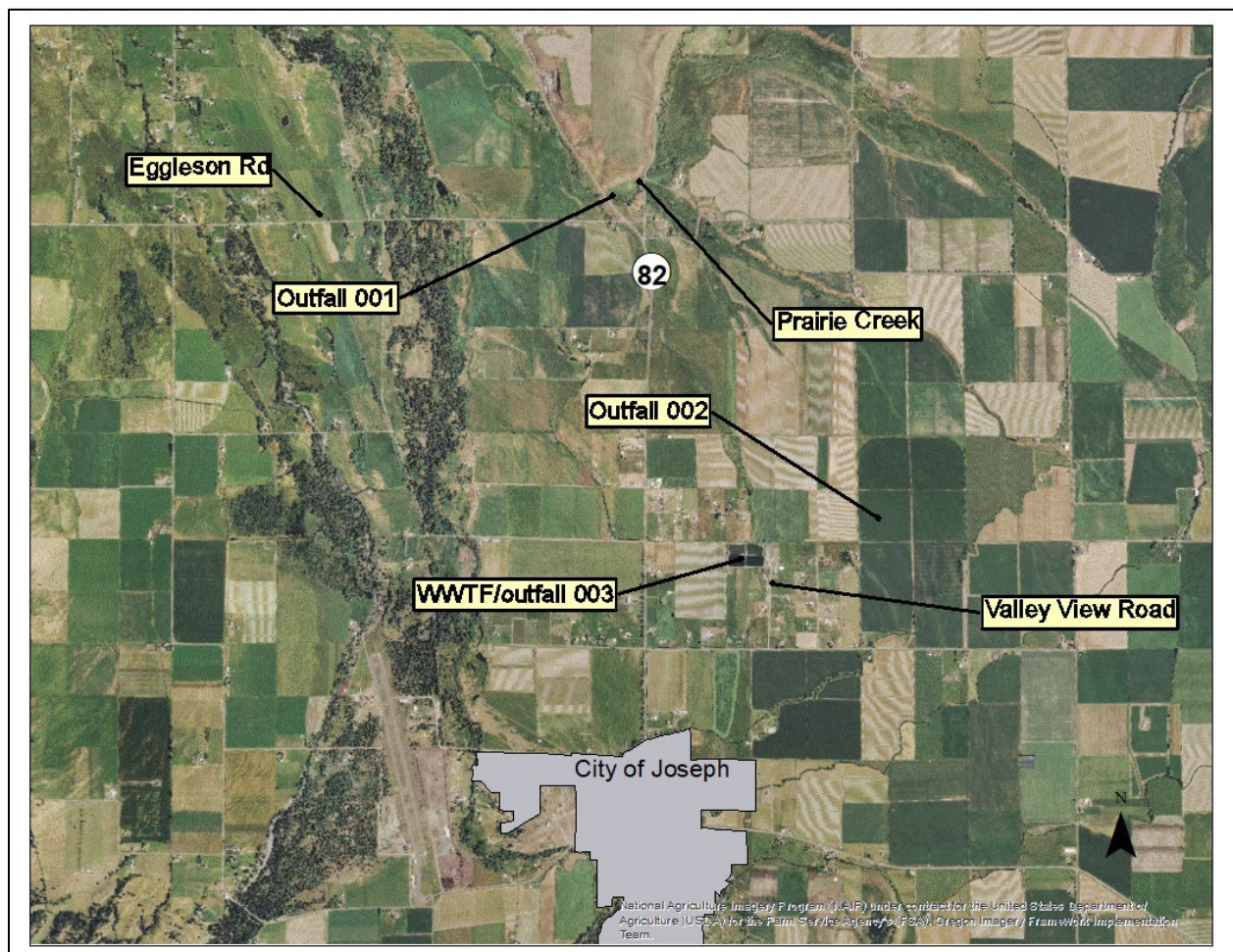


Figure 2-2: Site plan (from City of Joseph, Wallowa County, Oregon, Wastewater System Improvements, 2022)

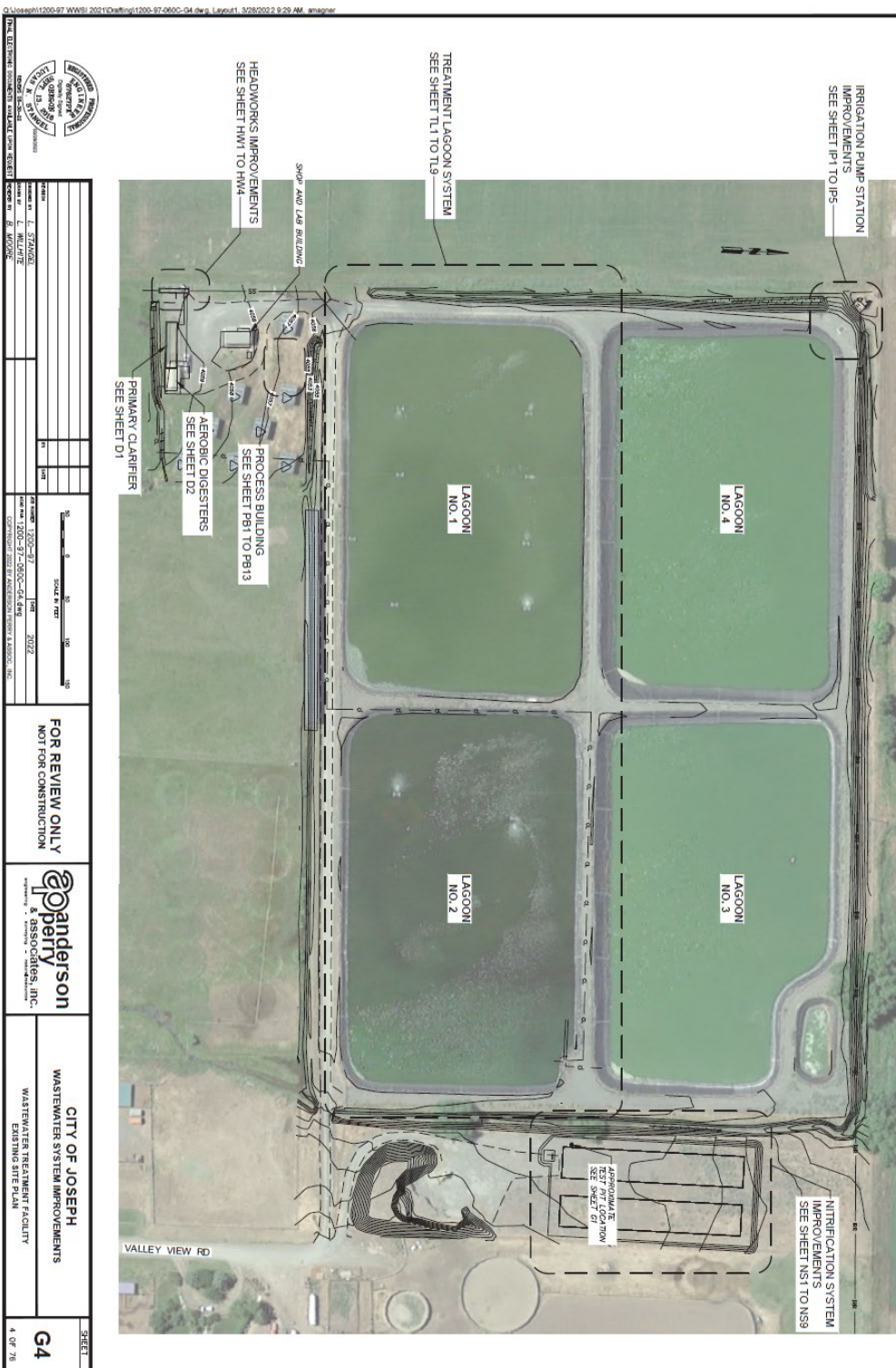


Figure 2-3: Process Flow schematic: (Wastewater System Improvements, 2022)

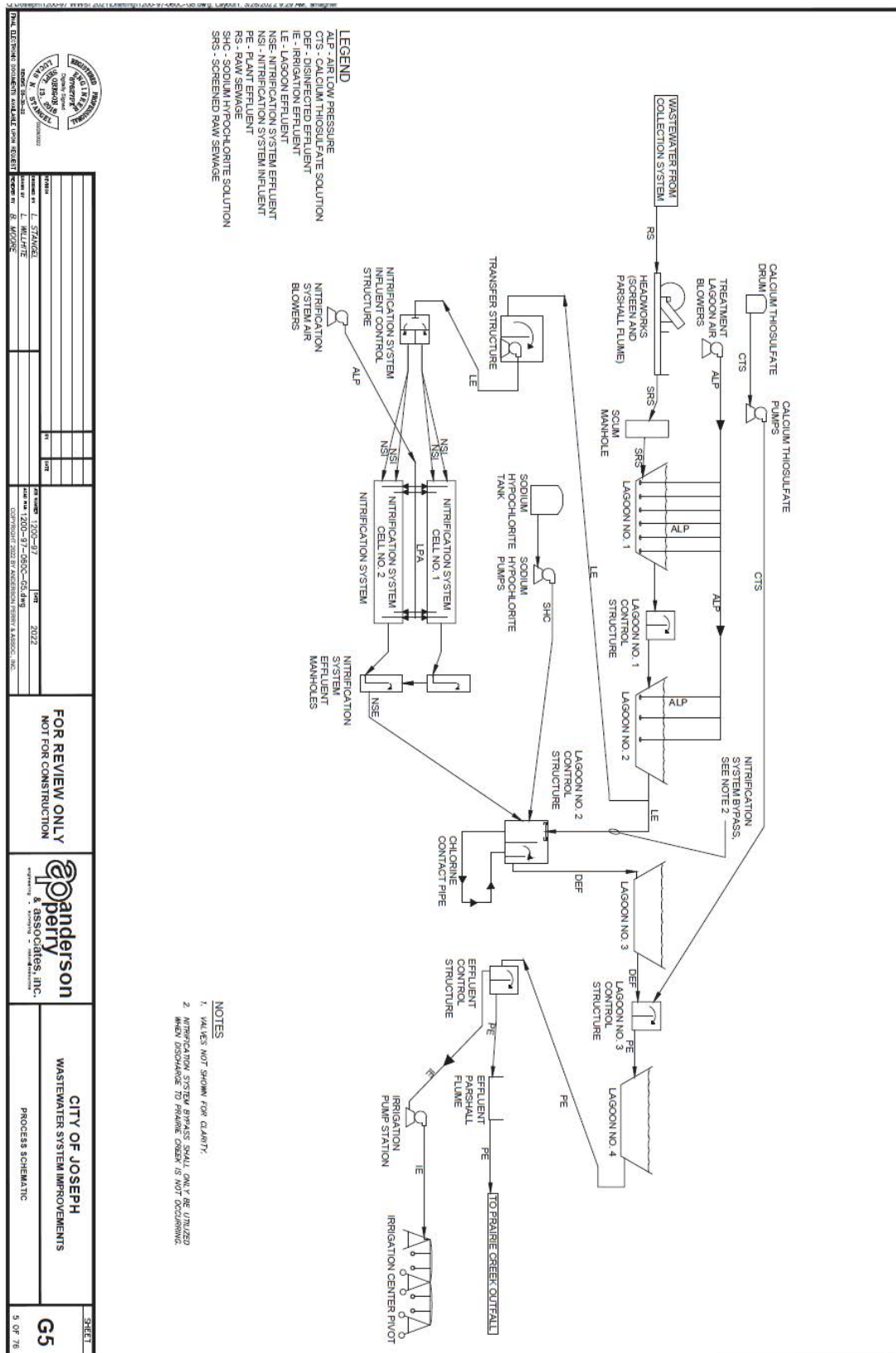


Table 2-1: List of Outfalls

Outfall Number	Type of Waste	Lat/Long	Design Flow¹ (mgd)	Existing Flow² (mgd)
001	Treated Effluent	45.39774/117.23207	0.334	0.204
002	Recycled Water	45.37612/ - 117.20644		
003	Biosolids			
1. Design Flow = design average wet weather flow (A&P Memo, Appendix A) 2. Existing Flow = existing average monthly wet weather flow				

2.2 Compliance History

The current NPDES Permit expired on November 30th, 2023. DEQ received Renewal Application Number 948293 from the city on May 30th, 2023. Because the permittee submitted a complete renewal application to DEQ in a timely manner, the current permit is administratively extended and remains in effect until DEQ takes final action on the renewal application as per OAR 340-045-0040.

The compliance history for the city's Joseph WWTP was reviewed in the file record since the last permit renewal (2018). A compliance inspection was conducted by DEQ on July 24th, 2023. No compliance issues were noted during this inspection.

The permit file record also identified the following compliance assurance activities since the last permit renewal:

Pre-Enforcement Notices

- A June 11th, 2020, Pre-Enforcement Notice (2020-PEN-5584) was issued for failure to complete compliance schedule deliverables in regards to facility planning and future upgrades.

Warning Letters

- A February 8th, 2024, Warning Letter (2024-WLOTC-8979) was issued for failure to complete construction according to the DEQ-approved plans and specifications and construction schedule by January 31, 2024, as required by Schedule C, Item 1(b)(vi).
- An August 29th, 2023, Warning Letter (2023-WL-8658) was issued for failure to submit a required annual progress update for 2022 as required by Schedule C, Item 1(b)(i).
- A January 18th, 2022, Warning Letter (2022-WL-6813) was issued for a November 2020 effluent BOD₅ monthly average concentration exceedance.
- A November 8th, 2022, Warning Letter (2022-WL-7814) was issued for failure to monitor alkalinity and hardness (for effluent characterization purposes) during the first quarter of 2021.

Mutual Agreement and Orders

- On May 11, 2021, the City and the Department entered into Mutual Agreement and Order (MAO) No. WQ/M-ER-2020-113, resolving ongoing violations. On June 7, 2023, DEQ modified the permit to include new dates for the corrective actions required by the MAO. Since the Permit is the controlling authority, DEQ terminated the MAO on November 7, 2023.

2.3 Stormwater

Stormwater discharges are not currently covered under this permit. Refer to the Industrial Stormwater Discharge Permit No. 1200-Z Tables 1 and 2 for stormwater discharge coverage requirements.

2.4 Industrial Pretreatment

The city conducted an Industrial User Survey during the last permit cycle and determined that a DEQ-approved industrial pretreatment program is not needed. No categorical industrial users were identified in the IU survey update submitted with the city's permit renewal application. The proposed permit requires the permittee to conduct and submit to DEQ an updated Industrial User Survey (Survey) within one year of permit issuance. DEQ will review the Survey results and, if DEQ determines that a pretreatment program is required, the permit may be reopened and modified to require development of a pretreatment program.

2.5 Wastewater Classification

OAR 340-049 requires all permitted municipal wastewater collection and treatment facilities receive a classification based on the size and complexity of the systems. DEQ evaluated the classifications for the treatment and collection system, which are publicly available at: <https://www.deq.state.or.us/wq/opcert/Docs/OpcertReport.pdf>.

3. Schedule A: Effluent Limit Development

Effluent limits serve as the primary mechanism in NPDES permits for controlling discharges of pollutants to receiving waters. Effluent limitations can be based on either the technology available to control the pollutants or limits that are protecting the water quality standards for the receiving water. DEQ refers to these two types of permit limits as technology-based effluent limitations (TBELs) and water quality-based effluent limits (WQBELs) respectively. When a TBEL is not restrictive enough to protect the receiving stream, DEQ must include a WQBEL in the permit.

3.1 Existing Effluent Limits

The tables below show the limits contained in the existing permit.

1. Outfall 001 – Permit Limits

a. BOD₅ and TSS

- i. June 1 - October 31. During this time period the permittee must not discharge to waters of the state.

Table A1: Outfall 001 Prohibited Discharge Period

Parameter	Season	Limit
Flow, Total	June 1 to October 31	No discharge (Daily max total flow limit = 0)

- ii. November 1 - May 31: During this time period the permittee must comply with the limits in the following table:

Table A2: BOD₅ and TSS Limits

Parameter	Average Effluent Concentrations, mg/L		Monthly Average lbs/day	Weekly Average lbs/day	Daily Maximum lbs/day
	Monthly	Weekly			
BOD ₅	30	45	94	140	190
TSS	55	85	94	140	190

- iii. Additional information for the limits in Table A2.

(A) Average dry weather design flow to the facility equals 0.44 MGD. Mass load limits are derived using 0.374 MGD flow and are carried over from the previous permit.

b. Additional Parameters.

Permittee must comply with the limits in the following table (year-round except as noted):

Table A3: Limits for Additional Parameters

November 1 – May 31	Limits
BOD ₅ and TSS Removal Efficiency	Must not be less than 65% monthly average for BOD ₅ and TSS.
<i>E. coli</i> (see note a)	Monthly log mean (same as geometric mean) must not exceed 126 organisms per 100 ml. Any single sample must not exceed 406 organisms per 100 ml.
pH	Must not be outside the range of 6.0 to 9.0 S.U.
Final total residual chlorine limits (see note b)	On 1 February 2020 the following water-quality based effluent limits are in effect: The monthly average effluent concentration limit is 0.03 mg/L. The daily maximum effluent concentration limit is 0.08 mg/L.
Interim total residual chlorine limits (see note b)	The following effluent concentration limits from the previous permit are in effect through 31 January 2020: The monthly average effluent concentration limit is 0.06 mg/L.

November 1 – May 31	Limits																		
	The daily maximum effluent concentration limit is 0.15 mg/L.																		
Final ammonia limits	Upon completion of the upgrades described in Schedule C, the following water-quality based effluent limits are in effect: The monthly average effluent concentration limit is 4.2 mg/L. The daily maximum effluent concentration limit is 6.3 mg/L. The final ammonia limits become effective on the dates specified in Schedule C, Condition 1b.																		
Interim ammonia limits	Until the upgrades in Schedule C are complete, the following performance-based effluent concentration limits are in effect: The monthly average effluent concentration limit is 11.6 mg/L. The daily maximum effluent concentration limit is 21.2 mg/L.																		
Excess thermal load (see note c)	Maximum 7 day rolling average must not exceed 7,020 Mcal/day. Excess thermal load limit only applies to discharge during April and May.																		
Notes a. Any single <i>E. coli</i> sample must not exceed 406 organisms per 100 mL; however, DEQ will not cite a violation of this limit if the permittee takes at least 5 consecutive re-samples at 4 hour intervals beginning within 28 hours after the original sample was taken and the log mean of the 5 re-samples is less than or equal to 126 <i>E. coli</i> organisms/100 mL. b. DEQ has established a minimum Quantitation Limit of 0.05 mg/L for Total Residual Chlorine. In cases where the monthly average or daily maximum limit for Total Residual Chlorine is lower than the Quantitation Limit, DEQ will use the reported Quantitation Limit as the compliance evaluation level. c. Calculate excess thermal load (ETL) as follows: ETL = Qe x (Te – Twq) x C The following table defines the variables and expressions used in the equation. <table><tr><td>Expression</td><td>Variable</td><td>Value</td></tr><tr><td>Excess thermal load</td><td>ETL</td><td>Calculation</td></tr><tr><td>Effluent flow</td><td>Qe</td><td>Measurement in cubic feet/second</td></tr><tr><td>Effluent temperature</td><td>Te</td><td>The calculated 7-day rolling average maximum (or the daily maximum if no 7-day rolling average maximum is available)</td></tr><tr><td>Water quality criteria</td><td>Twq</td><td>13°C</td></tr><tr><td>Conversion factor</td><td>C</td><td>2,446,665 kcal/s/ °C·feet³·day</td></tr></table>		Expression	Variable	Value	Excess thermal load	ETL	Calculation	Effluent flow	Qe	Measurement in cubic feet/second	Effluent temperature	Te	The calculated 7-day rolling average maximum (or the daily maximum if no 7-day rolling average maximum is available)	Water quality criteria	Twq	13°C	Conversion factor	C	2,446,665 kcal/s/ °C·feet ³ ·day
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3.2 Technology-Based Effluent Limit Development

40 CFR 122.44(a)(1) requires publicly owned treatment works (POTW) to meet technology-based effluent limits, for five-day biochemical oxygen demand (BOD₅), total suspended solids (TSS) and pH (i.e., federal secondary treatment standards). Substitution of 5-day carbonaceous oxygen demand (CBOD₅) for BOD₅ is allowed. The numeric standards for these pollutants are contained in 40 CFR 133.102. In addition, DEQ has developed minimum design criteria for BOD₅ and TSS that apply to specific watershed basins in Oregon. These are listed in the basin-specific criteria sections under OAR 340-041-0101 to 0350. During the summer low flow months as defined by OAR, these design criteria are more stringent than the federal secondary treatment standards. The basin-specific criteria are not effluent limits but are implemented as design criteria for new or expanded wastewater treatment plants. The table below shows a comparison of the federal secondary treatment standards and the basin-specific design criteria for the Grande Ronde basin.

Table 3-1: Comparison of TBELs for Federal Secondary Treatment Standards and Oregon Basin-Specific Design Criteria

Parameter	Federal Secondary Treatment Standards		Grande Ronde Basin-Specific Design Criteria (OAR 340-041-0156)
	30-Day Average	7-Day Average	Monthly Average
BOD ₅ (mg/L)	30	45	20 mg/L during defined summer months
TSS (mg/L)	30	45	20 mg/L during defined summer months
pH (S.U.)	6.0 – 9.0. (instantaneous)		Not applicable
BOD ₅ and TSS % Removal	85%	Not applicable	Not applicable

40 CFR 133.105 allows less stringent effluent limits for POTWs using waste stabilization ponds or trickling filters as their method of treatment. These facilities are required to achieve a monthly average BOD and TSS concentrations of 45 mg/L, a weekly average limit of 65 mg/L and a removal efficiency of 65%. To be eligible for discharge limitations based on equivalent to secondary standards, a POTW must meet all three of the following criteria:

1. The effluent must consistently exceed secondary treatment standards;
2. The principal treatment process must be a trickling filter or a waste stabilization pond; and
3. The POTW must provide significant biological treatment of the wastewater.

DEQ has evaluated these criteria and has determined that the facility does not meet all three conditions. The facility is consistently meeting secondary treatment standards for BOD.

Special considerations for TSS limits from waste stabilization ponds are described in 40 CFR 133.103(c). These allow less stringent TSS limits for waste stabilization ponds. In the early 1980s, DEQ determined that waste stabilization ponds west of the Cascade Mountains are capable of achieving a monthly average concentration of 50 mg/L and east of the Cascade Mountains a monthly average of 85 mg/L. EPA published these approved alternate TSS requirements in 49 Federal Register (FR) 37005, September 20, 1984. DEQ is proposing to maintain the monthly average TSS limit of 55 mg/L and the weekly limit of 85 mg/L to satisfy antidegradation and antibacksliding.

Federal regulations (40 CFR 133.103(d)) include special considerations for less concentrated influent wastewater from separate sewers. The rule allows substitution of either a lower percent removal requirement or a mass loading limit for the percent removal requirements provided that the permittee satisfactorily demonstrates that:

- The treatment works is consistently meeting, or will consistently meet, its permit effluent concentration limits, but it's percent removal requirements cannot be met due to less concentrated influent wastewater;
- To meet the percent removal requirements, the treatment works would have to achieve significantly more stringent limits (defined as at least 5 mg/l more stringent than the otherwise applicable concentration-based limits) than would otherwise be required by the concentration-based standards; and,
- The less concentrated influent wastewater is not the result of excessive infiltration and inflow (I/I).

DEQ has determined the facility meets all three conditions above. Therefore, DEQ is proposing BOD and TSS percent removal limits of 65%.

The limits for BOD₅ and TSS shown in the table above are concentration-based limits. Mass-based limits are required in addition to the concentration-based limits per OAR 340-041-0061(9). The basin-specific design criteria included in the table above apply to new or expanded facilities (after June 30, 1992). This facility is not new or expanded, so these criteria do not apply. For any facility that has not expanded their average dry weather treatment capacity after June 30, 1992, OAR 340-041-0061(9)(a) requires that the mass load limits be calculated using the following equations:

Monthly Avg Mass Load = Design Flow* x Monthly Concentration Limit x Unit Conversion factor

Weekly Average Mass Load = 1.5 x Monthly Average Mass Load Limit

Daily Maximum Mass Load = 2 x Monthly Average Mass Load Limit

* Design flow is the design average dry weather flow (DADWF) or the design average wet weather flow (DAWWF)

The following table lists the effluent flows and concentration limits used for the calculations.

Table 3-2: Design Flows and Concentrations Limits

Season	Design Flow (mgd)	Monthly TSS Concentration Limit (mg/L)	Monthly BOD ₅ Concentration Limit (mg/L)
Wet Weather	0.334	55	30
Design flow comments: Average Wet Weather Flow (2022 WWTP Drawings)			

BOD Mass Load Calculations:

Monthly Average: $0.334 \text{ MGD} \times 30 \text{ mg/L} \times 8.34 = 51.7$ expressed as 84 lbs/day

Weekly Average: $84 \text{ lbs/day monthly average} \times 1.5 = 126 \text{ lbs/day}$

Daily Maximum: $84 \text{ lbs/day monthly average} \times 2 = 168$ expressed as 170 lbs/day

TSS Mass Load Calculations:

Monthly Average: $0.334 \text{ MGD} \times 55 \text{ mg/L} \times 8.34 = 153.2$ expressed as 150 lbs/day

Weekly Average: $150 \text{ lbs/day monthly average} \times 1.5 = 225$ expressed as 220 lbs/day

Daily Maximum: $150 \text{ lbs/day monthly average} \times 2 = 300$ lbs/day

The proposed BOD₅ and TSS limits are listed in the following table. The reduction in BOD₅ loadings comes from a reduction the wet weather design flows reported by the permittee in their 2024 design flow memo (See Appendix A). The existing permit used a design flow of 0.374 MGD which was granted by the Environmental Quality Commission on December 11th, 1987. Since that date the facility was upgraded in the summer of 2024 to meet ammonia limits. The BOD treatment is limited by oxygen transfer rates at 0.334 MGD². The proposed permit revises the design flow to 0.334 MGD to match the WWTP designs and ensure full treatment to meet limits.

Table 3-3: BOD₅ and TSS Technology Based Effluent Limits

Parameter	Units	Average Monthly	Average Weekly	Daily Maximum
BOD ₅ (November 1 – May 31)	mg/L	30	45	-
	lbs/day	84	126	170
	% removal	65	-	-
TSS (November 1 – May 31)	mg/L	55	85	-
	lbs/day	94	140	190

² A&P Memo (October 17, 2024): Appendix A

Parameter	Units	Average Monthly	Average Weekly	Daily Maximum
	% removal	65	-	-

The TSS loadings of 94 lbs/day, 140 lbs/day Average Weekly, and 190 lbs/day Daily Maximum are retained to satisfy antibacksliding and antidegradation requirements.

3.3 Water Quality-Based Effluent Limit Development

40 CFR 122.44(d) requires that permits include limitations more stringent than technology-based requirements where necessary to meet water quality standards. Water quality-based effluent limits may be in the form of a wasteload allocation required as part of a Total Maximum Daily Load (TMDL). They may also be required if a site specific analysis indicates the discharge has the reasonable potential to cause or contribute to an exceedance of a water quality criterion. DEQ establishes effluent limits for pollutants that have a reasonable potential to exceed a criterion. The analyses are discussed below.

3.3.1 Designated Beneficial Uses

NPDES permits issued by DEQ must protect the following designated beneficial uses of the Prairie Creek. These uses are listed in OAR-340-041-0151 for the Grande Ronde basin.

- Public and private domestic water supply
- Industrial water supply
- Irrigation and livestock watering
- Fish and aquatic life (including salmonid rearing, migration and spawning)
- Wildlife and hunting
- Fishing
- Boating
- Water contact recreation
- Aesthetic quality
- Hydro power

3.3.2 303(d) Listed Parameters and Total Maximum Daily Loads

The following table lists the parameters that are on the 2022 303(d) list (Category 5) within the discharge's stream reach. The table also lists any parameters with a TMDL wasteload allocation assigned to the facility (Category 4).

Table 3-4: 303(d) and TMDL Parameters

Water Quality Limited Parameters (Category 5)	
AU ID:	OR_SR_1706010501_02_103344
AU Name:	Prairie Creek
AU Status:	Impaired
Year Listed	1998
Year Last Assessed	2022

303d Parameters (Category 5)	Habitat Modification, E. coli, Fecal Coliform, Dissolved Oxygen, Sedimentation
TMDL Parameters (Category 4)	
Dissolved Oxygen, pH, Ammonia, Acenaphthene, Anthracene, Antimony, Arsenic, Barium , BHC Alpha, BHC Beta, BHC Gamma (Lindane), Butylbenzyl Phthalate, Chloroisopropyl Ether bis 2, Chloronaphthalene 2, Chlorophenoxy Herbicide (2,4-D), Chlorophenoxy Herbicide (2,4,5,TP), Copper, Di-n-butyl Phthalate, Dichlorobenzene(m) 1,3, Dichlorobenzene(o) 1,2, Dichlorobenzene(p) 1,4, Diethyl Phthalate, Dimethyl Phthalate, Dinitrotoluene 2,4, Endosulfan Alpha, Endosulfan Beta, Endosulfan Sulfate, Endrin, Fluoranthene, Fluorene, Hexachlorobutadiene, Hexachlorocyclopentadiene, Hexachloroethane, Isophorone, Methoxychlor, Nickel, Nitrobenzene, Nitrosodiphenylamine, N, Pentachlorobenzene, Pentachlorophenol, Pyrene, Selenium, Tetrachlorobenzene, 1,2,4,5, Trichlorobenzene 1,2,4, Zinc	

3.3.3 TMDL Wasteload Allocations

DEQ issued a TMDL for the Lower Grande Ronde Basin. WLAs from this TMDL that are applicable to the permittees are listed in the following table.

Table 3-5: Applicable WLAs

Parameter	WLA	Time Period
Thermal Load	0.34 MW/day	April-May

The proposed permit incorporates the WLA for the critical period of April and May. The WLA is expressed as an equivalent effluent limitation equal to 7.02 gigacalories/day (Gcal/day). Dissolved Oxygen and pH concerns were evaluated during the TMDL development; however, wasteload allocations for these parameters were not developed in the current TMDL due to a lack of data at this time.³ Ammonia was also not addressed in the TMDL. The TMDL does address bacteria, however the City WWTP is not likely to cause or contribute to bacteria impairment due to the low frequency of bacteria exceedances.

3.3.4 Pollutants of Concern

To ensure that a permit is protecting water quality, DEQ must identify pollutants of concern. These are pollutants that are expected to be present in the effluent at concentrations that could adversely impact water quality. DEQ uses the following information to identify pollutants of concern:

- Effluent monitoring data.
- Knowledge about the permittee's processes.
- Knowledge about the receiving stream water quality.
- Pollutants identified by applicable federal effluent limitation guidelines.

Based on EPA's NPDES permit application requirements, toxic pollutants of concern for domestic facilities are listed in the following table.

³ Lower Grande Ronde Subbasins TMDL (September 2010).

Table 3-6: Domestic Toxic Pollutants of Concern

Flow Rate	Pollutants
< 0.1 mgd	Total Residual Chlorine
≥ 0.1 mgd and < 1.0 mgd	Total Residual Chlorine, Total Ammonia Nitrogen
≥ 1.0 mgd	Total Residual Chlorine, Total Ammonia Nitrogen, Metals, Volatile Organic Compounds, Acid Extractable Compounds, Base Neutral Compounds

DEQ identified the following pollutants of concern for this facility listed in the following table.

Table 3-7: Pollutants of Concern

Pollutant	How was pollutant identified?
pH	Effluent Monitoring
Temperature	Effluent Monitoring
E. coli	Effluent Monitoring
Total Residual Chlorine	Effluent Monitoring
Total Ammonia Nitrogen	Application Requirement

The sections below discuss the analyses that were conducted for the pollutants of concern to determine if water quality based effluent limits are needed to meet water quality standards.

3.3.5 Regulatory Mixing Zone

The proposed permit contains a mixing zone as allowed per OAR 340-041-0053. The existing mixing zone is described as follows:

The regulatory mixing zone is that portion of Prairie Creek 150 feet downstream from the outfall (point of discharge). The Zone of Immediate Dilution (ZID) is a portion of the mixing zone that shall not exceed 10 percent of the regulatory mixing zone in any one direction from the point of discharge.

In reviewing the 2008 DEQ MZ study, it was determined that due to the shallow depth (approximately 1-3 ft), small width (approximately 16 ft), and cobbly nature of Prairie Creek near and downstream of the outfall it is not appropriate to model the discharge using CORMIX. Furthermore, the current mixing zone likely does not meet the requirements of the Mixing Zone IMD that ensure a continuous zone of passage that meets water quality criteria for free-swimming and drifting organisms. Therefore, the mixing zone will be revised as follows:

The allowable Regulatory Mixing Zone (RMZ) is defined as 25% of the Prairie Creek flow and the Zone of Initial Dilution (ZID) is defined as 10% of the Prairie Creek flow.

The dilution factors at the edge of the zone of initial dilution and mixing zone are shown in Table 3-8. These dilutions are based on a 2008 mixing zone study reviewed by DEQ. DEQ's mixing

zone assessment is contained in a June 2024 internal memo that is part of the administrative record.

Table 3-8: Dilution Summary

Dilution Summary – November 1 to May 31 (Wet Weather)						
Water Quality Standard	Stream Flow (cfs)		Effluent Flow (mgd)		Dilution Factor	Location
	Statistic	Flow	Statistic	Flow		
Aquatic Life, Acute	1Q10	20	☐ ADWDF x PF ☒ Max Daily Avg ☐ Other	0.497	3.6	ZID
Aquatic Life, Chronic	7Q10	20	☐ ADWDF ☒ Max Monthly Avg ☐ Other	0.263	13	MZ
Human Health, Non-Carcinogen	30Q5	20	☐ ADWDF ☒ Max Monthly Avg ☐ Other	0.263	13	MZ
ADWDF = Average dry weather design flow PF = Peaking factor (1.5)						

3.3.6 pH

The pH criterion for this basin is 6.5 – 9.0 per OAR 340-041-0156. The limit in the current permit is 6.0 - 9.0 and is a TBEL. DEQ determined there is no reasonable potential for the current limits to exceed the pH criterion at the edge of the mixing zone. The proposed limit of 6.0 – 9.0 is a TBEL and is protective of water quality. The following provides a summary of the data used for the analysis.

Table 3-9: pH Reasonable Potential Analysis

INPUT	Lower pH Criteria	Upper pH Criteria
1. Dilution at mixing zone boundary	13.0	13.0
2. Upstream characteristics		
a. Temperature (deg C)	13.6	3.3
b. pH	7.7	8.1
c. Alkalinity (mg CaCO3/L)	88.8	88.8
3. Effluent characteristics		
a. Temperature (°C)	12.0	5.4
b. pH (S.U.)	6.0	9.0
c. Alkalinity (mg CaCO3/L)	210.0	210.0
4. Applicable pH criteria	6.5	9.0
pH at mixing zone boundary	6.7	8.1
Is there reasonable potential?	No	No
Proposed effluent limits	6.0	9.0
Effluent data source: DMRs 2019-2023		
Ambient data source: Alkalinity = 37201-ORDEQ - Prairie Cr at Enterprise SW 2nd St; Temperature = GRR140-PRAIRIEC REEK AT BRIDGE ON CROW CREEK ROAD; pH = GRR140-PRAIRIEC REEK AT BRIDGE ON CROW CREEK ROAD		

3.3.7 Temperature

3.3.7.1 Temperature Criteria OAR 340-041-0028

The following table summarizes the temperature criteria that apply at the discharge location along with whether the receiving stream is water quality-limited for temperature and whether a TMDL wasteload allocation has been assigned. Using this information, DEQ performed several analyses to determine if effluent limits were needed to comply with the temperature criteria.

Table 3-10: Temperature Criteria Information

Applicable Temperature Criterion	Core Cold Water 16°C (OAR 340-041-0028(4)(b))
Applicable dates: June 16 – August 14	
Salmon/Steelhead Spawning 13 °C? OAR 340-041-0028(4)(a)	☒ Yes ☐ No
Applicable dates: August 15 – June 15	
WQ-limited?	☒ Yes ☐ No
TMDL wasteload allocation assigned?	☒ Yes ☐ No
Applicable dates: April 1 – May 31	
TMDL based on natural conditions criterion?	☒ Yes ☐ No
Cold water summer protection criterion applies?	☐ Yes ☒ No
Cold water spawning protection applies?	☐ Yes ☒ No
Comments:	

Since a TMDL has been developed to address the water quality limited listing associated with these criteria, the TMDL assigned a waste load allocation of 0.34 MW/day, which is equivalent to 7.02 million kcal/day (See Section 3.3.3) for the April – May period. The TMDL determined that regulating the facility at existing permitted loads would be protective of the criteria during the remainder of the year. This wasteload allocation was incorporated into the current permit as an excess thermal load limit of 7.02 million kcal/day for the April – May period (which is the portion of the applicable WLA dates when the facility is discharging). The proposed permit includes this same limit. The TMDL also allows for a limit to be expressed as a flow-based excess thermal load. For simplicity, the WLA is addressed in this permit as the static excess thermal load limit of 7.02 million kcal/day.

The actual excess thermal load discharged from the facility is calculated using the following formula:

$$ETL = 3785 * Q_e * \Delta T * C_p * \rho$$

Where:

ETL =	Excess Thermal Load (Kcal/day)
Q_e =	Daily Average Effluent Flow (MGD)
ΔT =	Daily Maximum Effluent Temperature (°C) minus ambient criterion (13 °C)
C_p =	Specific Heat of Water = 1 Kcal/1 Kg °C
ρ =	Density of Water = 1000 Kg/m ³
3785=	Conversion from MGD to m ³ /day (1 MGD = 3785 m ³ /day)

Final effluent limits are listed in the following table.

Table 3-11: Temperature Criterion Effluent Limits

Effluent limit needed? ☒ Yes ☐ No
TMDL WLA Limit: 7.02 million kcalories/day (million kcal/day).
Applicable time period: April 1 – May 31
Temperature Criterion Limit: N/A
Applicable time period: Dates ☒ NA
Comments:

3.3.7.2 Thermal Plume OAR 340-041-0053(2)(d)

In addition to compliance with the temperature criteria, OAR 340-041-0053(2)(d) contains thermal plume limitation provisions designed to prevent or minimize adverse effects to salmonids that may result from thermal plumes. The discharge was evaluated for compliance with these provisions as follows:

- OAR 340-041-0053(2)(d)(A): Impairment of an active salmonid spawning area where spawning redds are located or likely to be located. This adverse effect is prevented or minimized by limiting potential fish exposure to temperatures of 13°C or more for salmon and steelhead, and 9°C or more for bull trout.

Based upon a review of the prior permit cycle effluent data, the maximum effluent temperature at Outfall 001 was around 12.4 °C. Thus, anticipated peak temperatures are expected to be well below 13 °C and impairment of an active salmonid spawning area is not expected to occur.

- OAR 340-041-0053(2)(d)(B): Acute impairment or instantaneous lethality is prevented or minimized by limiting potential fish exposure to temperatures of 32°C or more to less than 2 seconds.

Based upon a review of the prior permit cycle effluent data, the maximum effluent temperature at Outfall 001 was around 12.4 °C. Thus, anticipated peak temperatures are expected to be well below 32 °C and are not expected to cause an acute impairment or instantaneous lethality due to the thermal plume in Prairie Creek.

- OAR 340-041-0053(2)(d)(C): Thermal shock caused by a sudden increase in water temperature is prevented or minimized by limiting potential fish exposure to temperatures of 25°C or more to less than 5% of the cross-section of 100% of the 7Q10 flow of the water body.

Based upon a review of the prior permit cycle effluent data, the maximum effluent temperature at Outfall 001 was around 12.4 °C. Thus, anticipated peak temperatures are expected to be well below 25 °C and are not expected to cause thermal shock due to the thermal plume in Prairie Creek.

- OAR 340-041-0053(2)(d)(D): Unless ambient temperature is 21°C or greater, migration blockage is prevented or minimized by limiting potential fish exposure to temperatures of 21°C or more to less than 25% of the cross-section of 100% of the 7Q10 flow of the water body.

Based upon a review of the prior permit cycle effluent data, the maximum effluent temperature at Outfall 001 was around 12.4 °C. Thus, anticipated peak temperatures are expected to be well below 25 °C and are not expected to cause migration blockage due to the thermal plume in Prairie Creek.

In summary, the analysis indicates that an effluent temperature limit is not needed to meet the temperature thermal plume limits in OAR 340-041-0053(2)(d). Note that the permittee is not permitted to discharge to Prairie Creek from June 1 – October 31.

Effluent limits needed to comply with the thermal plume requirements are shown in the following table.

Table 3-12: Thermal Plume Effluent Limit

Effluent limit needed? ☐ Yes ☒ No
Calculated limit: N/A
Applicable timeframe: N/A
Comments:

3.3.8 Bacteria

OAR 340-041-0009(6)(b) requires discharges of bacteria into freshwaters meet a monthly geometric mean of 126 E. coli per 100 mL, with no single sample exceeding 406 E. coli per 100 mL. If a single sample exceeds 406 E. coli per 100 mL, then the permittee may take five consecutive re-samples. If the geometric mean of the five re-samples is less than or equal to 126, a violation is not triggered. The re-sampling must be taken at four-hour intervals beginning within 28 hours after the original sample was taken. The following table includes the proposed permit limits and apply year round.

Table 3-13: Proposed E. coli Limits

E. coli (#/100 ml)	Geometric Mean	Maximum
Existing Limit	126	406
Proposed Limit	126	406

3.3.9 Toxic Pollutants

DEQ typically performs the reasonable potential analysis for toxics according to EPA guidance provided in the Technical Support Document for Water Quality-Based Toxics Control (TSD) (Office of Water Enforcement and Permits, U.S. EPA, March 1991). The factors incorporated into this analysis include:

1. Effluent concentrations and variability
2. Water quality criteria for aquatic life and human health
3. Receiving water concentrations
4. Receiving water dilution (if applicable)

DEQ performs these analyses using spreadsheets that incorporate EPA's statistical methodology. The following sections describe the analyses for various toxic pollutants below.

3.3.9.1 Total Residual Chlorine

The existing permit contains chlorine limits. The existing limits were evaluated to ensure they were protective of water quality criteria. An analysis showed that there was reasonable potential for the limits to exceed the water quality criteria and therefore new limits are proposed. Proposed limits are listed in the following table.

Table 3-14: Proposed Chlorine Limits

	Chronic (mg/L)	Acute (mg/L)
Chlorine Criteria	0.011	0.019
	Average Monthly Limit (mg/L)	Maximum Daily Limit (mg/L)
Existing Limit	0.03	0.08
Calculated Limit	0.03	0.07
Proposed Limit	0.03	0.07
Effluent data source: Existing maximum daily limit		
Receiving water data source: Assumed to be zero		

3.3.9.2 Total Ammonia Nitrogen

DEQ's ammonia criteria vary with changes in pH and temperature. The existing permit contains ammonia limits. The existing limits were evaluated to ensure they were protective of water quality criteria. An analysis showed that there was no reasonable potential for the limits to exceed the water quality criteria. Therefore, the existing permit limits, of 6.3 mg/L daily maximum and 4.2 mg/L monthly average, are being retained.

Table 3-15: Ammonia Analysis Information - Winter

	Acute	Chronic	
		4-day	30-day
Dilution	3.6	13	13
Ammonia Criteria	3.6	3.3	1.3
Effluent Data Used			
Ammonia (mg/L)	6.3	6.3	
pH (SU)	8.9	8.9	
Temperature (°C)	12.4	12.4	
Alkalinity (mg/L CaCO3)	210.0	210.0	
Receiving Stream Data Used			
Ammonia (mg/L)	0.1	0.1	
pH (SU)	8.1	8.1	
Temperature (°C)	9.1	9.1	
Alkalinity (mg/L CaCO3)	81.0	81.0	
Ammonia Limit Needed?	No		
Calculated Limits	AML	MDL	
Ammonia (mg/L)	NA	NA	
Effluent data source			
DMRS 2019-2023			
Ambient data source			
Alkalinity Data Source = Monitoring Station 37201-ORDEQ; pH data source = Monitoring Station GRR140, Temperature data Source = Monitoring Station GRR140, Ammonia data source = Monitoring Station GRR140			

3.3.9.3 Mercury – Human Health Criterion

DEQ determined that this facility is not a likely source of mercury. Therefore, no additional controls or monitoring will be required.

3.4 Antibacksliding

The proposed permit complies with the antibacksliding provisions of CWA sections 402(o) and 303(d)(4) and 40 CFR 122.44(l). The proposed limits are the same or more stringent than the existing permit so the antibacksliding provision is satisfied.

3.5 Antidegradation

DEQ must ensure the permit complies with Oregon's antidegradation policy found in OAR 340-041-0004. This policy is designed to protect water quality by limiting unnecessary degradation from new or increased sources of pollution.

DEQ has performed an antidegradation review for this discharge. The proposed permit contains the same or more stringent discharge loadings as the existing permit. Permit renewals with the same or more stringent discharge loadings as the previous permit are not considered to lower water quality from the existing condition. DEQ is not aware of any information that existing limits are not protecting the receiving stream's designated beneficial uses. DEQ is also not aware of any existing uses present within the water body that are not currently protected by standards developed to protect the designated uses. Therefore, DEQ has determined that the proposed discharge complies with DEQ's antidegradation policy. DEQ's antidegradation worksheet for this permit renewal is available upon request.

3.6 Whole Effluent Toxicity

DEQ does not require whole effluent toxicity testing (WET) for minor domestic facilities because concentrations of toxics are typically very low and WET testing is not warranted.

3.7 Groundwater

The treatment facility contains four lined lagoons. A lagoon leak test requirement is included as a condition of the proposed permit.

4. Schedule A: Other Limitations

4.1 Mixing Zone

Schedule A describes the regulatory mixing zone as discussed above in section 3.

4.2 Biosolids

The permit holder currently produces a Class B biosolids for land application by distribution or sale, and anticipates continuing to do so. DEQ reviewed the biosolids management plan and land application plan. These are available for public review and comment along with the permit. Once approved after public comment, conditions in the biosolids management plan and land application plan become permit conditions.

Schedule A of the permit requires the facility to apply biosolids according to their biosolids management plan. In addition, Schedule A requires the following:

- Apply at or below agronomic rates

- The permittee must have written site authorization for each location from DEQ before land applying and abide by the restrictions for each site
- Prior to application, the permittee must ensure that biosolids meet one of the pathogen reduction standards under 40 CFR 503.32
- The permittee must not apply biosolids containing pollutants in excess of the ceiling concentrations for the nine metals shown in Schedule A of the permit

4.3 Recycled Water

The permit holder currently operates a recycled water program to produce a Class D recycled water for irrigation uses and anticipates continuing to do so. A recycled water use plan was submitted to DEQ for review and is available for public comment with the permit. Once approved after public comment, conditions in the recycled water use plan become permit conditions.

Schedule A of the permit requires the permittee to apply recycled water according to their recycled water use plan. Schedule A also restricts the application of recycled water to prevent the following:

- Irrigating above agronomic rates,
- Adverse impact to groundwater,
- Offsite surface runoff or subsurface drainage through drainage tile,
- Creation of odors, fly and mosquito breeding, or other nuisance conditions

5. Schedule B: Monitoring and Reporting Requirements

Schedule B of the permit describes the minimum monitoring and reporting necessary to demonstrate compliance with the proposed effluent limits. In addition, monitoring for other parameters is required to better characterize the effluent quality and the receiving stream. This data will be used during the next permit renewal. Detailed monitoring frequency and reporting requirements are in Schedule B of the proposed permit. The required monitoring, reporting and frequency for many of the parameters are based on DEQ's monitoring and reporting matrix guidelines, permit writer judgment, and to ensure the needed data is available for the next permit renewal.

6. Schedule C: Compliance Schedule

The proposed permit does not contain a compliance schedule.

7. Schedule D: Special Conditions

The proposed permit contains the following special conditions. The conditions include the following:

7.1 Inflow and Infiltration

A requirement to submit an updated inflow and infiltration report in order to reduce groundwater and stormwater from entering the collection system;

7.2 Mixing Zone Study

By no later than the date specified in Schedule B1, the permittee must submit a level 1 study. (Level 1 mixing zone study requirements are described in DEQ's Mixing Zone Internal Management Directive).

7.3 Emergency Response and Public Notification Plan

A requirement to develop and submit an emergency and spill response plan or ensure the existing one is current per General Condition B.8 in Schedule F.

7.4 Recycled Water Use Plan

A condition requiring the permit holder to develop and maintain a recycled water use plan that meet the requirements in OAR 340-055-0025. The plan must also include location-specific information describing where and how recycled water is managed to protect public health and the environment.

7.5 Exempt Wastewater Reuse at the Treatment System

A condition that exempts the permit holder from the recycled water requirements in OAR 340-055, when recycled water is used for landscape irrigation at the treatment facility or for in-plant processes, such as in plant maintenance activities.

7.6 Biosolids Management Plan

A requirement to manage all biosolids in accordance with a DEQ-approved biosolids management plan and land application plan. The biosolids management plan and the land application plan must meet the requirements in OAR 340-050-0031 and describe where and how the land application of biosolids is managed to protect public health and the environment.

7.7 Wastewater Solids Transfers

A condition that allows the facility to transfer treated or untreated wastewater solids to other in-state or out-of-state facilities that are permitted to accept the wastewater solids.

7.8 Hauled Waste Control Plan

A condition that allows the acceptance of hauled waste according to a DEQ-approved hauled waste plan. The hauled waste plan ensures waste is not accepted that could negatively impact the treatment capabilities of the facility.

7.9 Hauled Waste Annual Report

A condition requiring submittal of an annual hauled waste report that summarizes hauled waste accepted at the facility during the previous year.

7.10 Lagoon Solids

A condition requiring the permittee to submit a sludge depth survey report to ensure lagoon solids are maintained within design standards and accumulations do not negatively affect treatment capabilities.

7.11 Lagoon Leak Test

A condition that requires the permittee to conduct a lagoon leak test in accordance with DEQ guidance (<https://www.oregon.gov/deq/FilterRulemakingDocs/div52-estleak.pdf>). If the lagoon is found to be leaking more than ¼ inch per day, then the permittee is required to conduct a preliminary groundwater assessment in accordance with DEQ guidance (<https://www.oregon.gov/deq/wq/Documents/wq-GroundwaterAssessmentGuide.pdf>).

7.12 Operator Certification

The permit holder is required to have a certified operator consistent with the size and type of treatment plant covered by the permit per OAR 340-049-0005. This special condition describes the requirements relating to operator certification.

7.13 Industrial User Survey

This condition requires the permittee to conduct or update an industrial user survey. The purpose of the survey is to identify whether there are any categorical industrial users discharging to the POTW and ensure regulatory oversight of these discharges.

7.14 Outfall Inspection

A condition that requires the permittee to inspect the outfall and submit a report regarding its condition.

8. Schedule F: NPDES General Conditions

Schedule F contains the following general conditions that apply to all NPDES permittees. These conditions are reviewed by EPA on a regular basis.

- Section A. Standard Conditions

- Section B. Operation and Maintenance of Pollution Controls
- Section C. Monitoring and Records
- Section D. Reporting Requirements
- Section E. Definitions

Appendix A: Design Flow Memo

October 17, 2024

Stuart Blois
Oregon Department of Environmental Quality
400 E. Scenic Drive, No. 307
The Dalles, Oregon 97058

RE: City of Joseph, Oregon - Draft National Pollutant Discharge Elimination System (NPDES)
Permit No. 101602, File No. 44329 - Design Flow Rate Review

Dear Stuart:

This letter is in response to the September 18, 2024, discussion regarding the City of Joseph, Oregon's draft NPDES Permit, specifically the flow rate design criteria. As discussed, the "design criteria" presented on Sheet G2 of the Wastewater System Improvements (WWSI) - 2022 Drawings were based on the planning design criteria presented in the 2021 Wastewater Facilities Plan. These planning design criteria were based on historical data (Discharge Monitoring Reports [DMRs]), along with projected population increases to determine anticipated system demands for a 20-year planning period. These planning design criteria are not believed to reflect the current rated capacity of the wastewater treatment facility (WWTF) following the WWSI project.

It is requested that a winter/wet weather (November to May) design flow rate of 0.334 million gallons per day (MGD) and a summer/dry weather (June to October) design flow rate of 0.360 MGD be utilized for the City of Joseph's WWTF and NPDES Permit renewal. These design flow rates are based on a review/evaluation of the loading capacity of the WWTF following completion of the WWSI project. A summary of the review/evaluation completed is presented below.

To review/evaluate the winter design flow rate, the known influent five-day biochemical oxygen demand (BOD₅) concentration, the effluent BOD₅ concentration limit, and water temperature data from the DMRs were utilized. Using these data and the equation for modeling aerated, partial mix lagoons as presented in the U.S. Environmental Protection Agency's Wastewater Technology Fact Sheet for Aerated, Partial Mix Lagoons, the detention time was calculated. The design influent BOD₅ concentration of 238 milligrams per liter (mg/L), effluent BOD₅ concentration limit of 30 mg/L, and a winter water temperature of 3 degrees Celsius were utilized in the calculation, which resulted in an estimated detention time of 31 days required to achieve the permitted BOD₅ effluent concentration limit. Lagoons No. 1 and 2 have a combined volume of approximately 11.4 million gallons. Dividing the total volume of Lagoons No. 1 and 2 by the detention time results in a flow rate of 0.369 MGD. Using this flow rate along with the BOD₅ removal of 208 mg/L, the BOD₅ removal was estimated at 640 pounds of BOD₅ per day (lbs. BOD₅/day). Oxygen is required for the removal of BOD₅ at an assumed ratio of 1.5 pounds of oxygen per 1 pound of BOD₅ (lbs. O₂/lb. BOD₅) removed. At the flow rate of 0.369 MGD and a BOD₅ removal of 640 lbs. BOD₅/day, 906 pounds of oxygen per day (lbs. O₂/day) is required. However, the new lagoon aeration system can only provide approximately 870 lbs. O₂/day. Thus, the system is oxygen limited.

Since the improved system is oxygen limited, the winter design flow rate was then determined based on the system being capable of providing 870 lbs. O₂/day. The 870 lbs. O₂/day results in

580 lbs. BOD₅/day removal using the 1.5 lbs. O₂/lb. BOD₅ ratio. With the known BOD₅ mass and concentration removals of 580 lbs. BOD₅/day and 208 mg/L, respectively, the winter/wet weather (November to May) design flow rate can be calculated at 0.334 MGD.

The City of Joseph's current and proposed draft NPDES Permit does not include loading limits during the summer months, as the City does not discharge to Prairie Creek during this time. Although there are no limits required per the permit, the City strives to provide an effective and consistent operating WWTF. As shown in the City's DMRs and discussed in the Permit Evaluation Report for the 2018 NPDES Permit renewal, the City experiences higher flows in the summer months compared with the winter. To establish a summer (May to October) design flow rate, the same approach was utilized as presented above using a higher effluent BOD₅ concentration goal. To help provide efficient disinfection to meet the recycled water use requirements presented in the draft NPDES Permit, an effluent BOD₅ concentration goal of 45 mg/L was utilized. Again, the 870 lbs. O₂/day is the limiting factor and results in a removal of 580 lbs. BOD₅/day. Utilizing a BOD₅ concentration removal of 193 mg/L (238 mg/L - 45 mg/L), a summer (June to October) design flow rate of 0.360 MGD was established.

It should also be noted that the nitrification system process for ammonia removal constructed as part of the WWSI project utilized a design flow of 0.207 MGD, which is less than the proposed winter design flow rate above. The design of the nitrification system process utilized conservative values for inlet BOD₅, total suspended solids, temperature, etc., when compared with anticipated values, resulting in an oversized system capable of treating a flow exceeding the 0.207 MGD. However, the current system is restricted by the capacity of the transfer pump station, which has a capacity of approximately 0.212 MGD. Lagoons No. 1 and 2 are normally operated with 2.5 feet of freeboard. This gives the City some additional storage if the WWTF influent flow exceeds the capacity of the transfer pump station. It is estimated that at the winter/wet weather design flow rate of 0.344 MGD and a transfer pump station capacity of 0.212 MGD, the City could operate for more than eight days at those flow rates while maintaining a 2-foot freeboard in Lagoons No. 1 and 2 without issue.

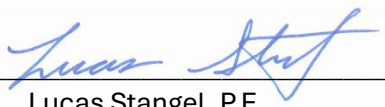
Additionally, the WWTF configuration allows effluent flow from Lagoon No. 2 to be sent to either the transfer pump station, which pumps the water to the nitrification system, or to the Lagoon No. 2 control structure, which diverts flow to the chlorine contact basin. Effluent from the nitrification system also discharges to the Lagoon No. 2 control structure, where it is diverted to the chlorine contact basin. If flows exceed the transfer pump station capacity and Lagoons No. 1 and 2 run out of additional storage, the excess flow could be split between the Lagoon No. 2 control structure and the transfer pump station. The nitrification system effluent could then be blended with the Lagoon No. 2 effluent in the Lagoon No. 2 control structure. Based on the design flows/capacities presented herein and the ammonia limits used for the design of the nitrification system, it is anticipated that the blended ammonia concentration would be approximately 19.1 mg/L, which exceeds the ammonia limit in the draft NPDES Permit. If this is the case, the City has the capacity to increase the disinfection dosage to breakpoint chlorinate for the removal of the ammonia to meet current and anticipated NPDES Permit limits. It should be noted that the blended ammonia concentration is based on conservative ammonia values of 45 mg/L in the Lagoon No. 2 effluent and 4.2 mg/L in the nitrification system effluent. Both the Lagoon No. 2 effluent and nitrification

system effluent ammonia limits are anticipated to be less than the concentrations utilized in these calculations.

In summary, based on the information above, it is requested that a winter/wet weather (November to May) design flow rate of 0.344 MGD and a summer/dry weather (June to October) design flow rate of 0.360 MGD be utilized for the City's WWTF in the renewal of the City of Joseph's NPDES Permit. A copy of the calculations summarized above is attached to this letter for reference.

Sincerely,

ANDERSON PERRY & ASSOCIATES, INC.

By 
Lucas Stangel, P.E.

LS/jg

Enclosure

cc: Levi Tickner, City of Joseph (w/encl.)
File No. 1200-103-002 (w/encl.)

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Given

Lagoon Volume = 11.4 MG (Total Lagoon 1+2)

Influent BODs Concentration = 238 mg/L (WWSI)

Effluent BODs Concentration Limit = 30 mg/L

Winter low Water Temperature = 3°C (2022 DMRs)

Oxygen Requirement = 1.5 lbs O₂/lb BOD₅ Removed

Oxygen Available = 870 lbs O₂/Day (Lagoon Aeration Equipment Data)

$$\frac{C_e}{C_o} = \frac{1}{\left(\frac{1 + (k)(t)}{n}\right)^n} \quad \text{(From EPA's Wastewater Technology Fact Sheet for Aerated, Partial Mix Lagoons)}$$

C_e = Effluent BOD

C_o = Influent BOD

k = first-order reaction rate constant (0.15 @ 3°C)

t = Detention time

n = Number of Cells in series

$$\frac{30}{238} = \frac{1}{\left(\frac{1 + (0.15)(t)}{2}\right)^2} \quad \text{Use Solver to solve for } t. \quad t = 30.8 \text{ days}$$

$$\text{Flowrate (Q)} = \frac{\text{Volume}}{\text{Detention time}} = \frac{11.4 \text{ MG}}{30.8 \text{ days}} = 0.369 \text{ MGD}$$

$$\text{BOD}_5 \text{ Removal} = 238 \text{ mg/L} - 30 \text{ mg/L} = 208 \text{ mg/L}$$

$$\text{Convert to lbs/day: } 208 \text{ mg/L} \cdot 0.369 \text{ MGD} \cdot 8.34 \frac{\text{lb} \cdot \text{L}}{\text{mg} \cdot \text{MG}} = 640 \frac{\text{lbs BOD}_5}{\text{Day}}$$

$$\text{Oxygen Required: } 1.5 \frac{\text{lbs O}_2}{\text{lb BOD}_5} \cdot 640 \frac{\text{lbs BOD}_5}{\text{Day}} = 960 \text{ lbs O}_2/\text{Day}$$

System is restricted by the Oxygen Available

$$\frac{870 \frac{\text{lbs O}_2}{\text{Day}} \text{ Available}}{1.5 \frac{\text{lbs O}_2}{\text{lb BOD}_5}} = 580 \text{ lbs BOD}_5/\text{Day} \text{ Removed}$$

$$\frac{580 \text{ lbs BOD}_5/\text{Day}}{208 \text{ mg/L} \cdot 8.34 \frac{\text{lb} \cdot \text{L}}{\text{mg} \cdot \text{MG}}} = \boxed{0.334 \text{ MGD}} \quad \text{Winter/Wet Weather (November to May)}$$

Summer / Dry Weather

↳ Assume a BODs effluent goal of 45 mg/L

System can provide 580 lbs BODs/Day removal

BODs Concentration Removal: $238 - 45 = 193 \text{ mg/L}$

$$Q = \frac{580 \frac{\text{lbs BODs}}{\text{Day}}}{193 \frac{\text{mg}}{\text{L}} \cdot 8.34 \frac{\text{lb} \cdot \text{L}}{\text{mg} \cdot \text{Mg}}} = \boxed{0.360 \text{ MGD}}$$

Blending

Total Flow = 0.334 MGD

Nitrification System Flow = 0.212 MGD

Lagoon No. 2 Ammonia = 45 mg/L

Nitrification System Ammonia = 4.2 mg/L

$$0.334 \text{ MGD} \cdot X \text{ mg/L} = 0.212 \text{ MGD} \cdot 4.2 \text{ mg/L} + (0.334 \text{ MGD} - 0.212 \text{ MGD}) \cdot 45 \text{ mg/L}$$

$$\text{Blended Ammonia} = \frac{0.212 \text{ MGD} \cdot 4.2 \text{ mg/L} + (0.334 \text{ MGD} - 0.212 \text{ MGD}) \cdot 45 \text{ mg/L}}{0.334 \text{ MGD}} = \boxed{19.1 \text{ mg/L}}$$

Lagoon Additional Storage

Normal Operation = 2.5 ft Freeboard.

Volume per inch $\approx$ 86,000 gallon (Per lagoon)

Min Freeboard = 2.0 ft

$$\begin{aligned} \text{Available storage} &= 0.5 \text{ ft} \Rightarrow 6 \text{ inches} \cdot 86,000 \text{ gal/in} = 516,000 \text{ gal/lagoon} \cdot 2 \text{ lagoons} \\ &= 1,032,000 \text{ gal} \end{aligned}$$

$$\text{Flow difference} = 0.334 \text{ MGD} - 0.212 \text{ MGD} = 0.122 \text{ MGD}$$

$$\text{STORAGE TIME} = \frac{1,032,000 \text{ gal}}{122,000 \text{ gal/Day}} = 8.45 \text{ days}$$

BLOIS Stuart * DEQ

From: EDWARDS Blair * DEQ
Sent: Thursday, October 31, 2024 6:19 PM
To: BLOIS Stuart * DEQ
Cc: STERGER Justin * DEQ
Subject: City of Joseph Design Flow Rate for NPDES Permit renewal

Hi Stuart,

After reviewing the Design Flow Rate requested by the City of Joseph in their NPDES permit renewal, I have no concerns that the BOD effluent concentration limit set in the permit will be achieved. The requested winter/wet weather (November to May) design flow rate of 0.334 million gallons per day (MGD) and a summer/dry weather (June to October) design flow rate of 0.360 MGD can be utilized for the City of Joseph's WWTF and NPDES Permit renewal.

I am concerned that the ammonia limit of the draft NPDES permit will be exceeded due to design flow capacity of the nitrification system. The nitrification system has a maximum design flow rate of 0.212 MGD, which is significantly less than the facilities' requested rates of 0.334 (wet weather) and 0.360 (dry weather) MGD. The undersized nitrification system will require that the City store wastewater if the influent flow rate exceeds the transfer pump station's rate of 0.212 MGD. Storage capacity will allow for approximately 8 days of influent before the minimum 2 f-foot freeboard condition of the permit is exceeded. In addition, the City has the option of increasing disinfection dosage to the break-point and blending of varying ammonia concentration level effluents prior to discharge to meet permit concentration limits. While these contingencies are plausible and may result in an acceptable ammonia concentration, the facility may experience limit exceedances for ammonia concentrations.

Let me know if you have questions or would like to discuss.
Blair

Blair Edwards

Environmental Engineer 3
Eastern Region

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