State of Oregon
Department of
Environmental
Quality

# National Pollutant Discharge Elimination System
# Permit Renewal Fact Sheet
# City of St. Helens

## Final: October 24, 2024

| | |
|---|---|
| **Permittee** | City of St. Helens<br>City of St. Helens, WWTP<br>451 Plymouth St<br>St. Helens, Oregon 97051 |
| **Existing Permit Information** | File Number: 84069<br>Permit Number: 101173<br>EPA Reference Number: OR0020834<br>Category: Domestic<br>Class: Major<br>Expiration Date: December 31, 2008 |
| **Permittee Contact** | Mouhamad Zaher<br>Public Works Director<br>503-366-8235<br>265 Strand St<br>St. Helens, Oregon 97051 |
| **Receiving Water Information** | Receiving stream/NHD name: Columbia River<br>NHD Reach Code & % along reach: 17080003039206 50.64%<br>USGS 12-dicit HUC: 170800030900<br>OWRD Administrative Basin: Lower Columbia<br>ODEQ LLID and River Mile:1240483462464 RM-84<br>Assessment Unit ID: OR_SR_1708000302_88_100669 |
| **Proposed Action** | Permit Renewal<br>Application Number: 974206<br>Date Application Received: July 27, 2007 |
| **Permit Writer** | Jeff Linzer<br>503-229-5123<br>Date Prepared: April 25, 2024 |

# NPDES Permit Renewal Fact Sheet
# City of St. Helens

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# 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 current permit had Co-Permittees, the proposed permit is issued only to the City of St. Helens, per a permittee change request submitted to DEQ May 3, 2017.
- $BOD_5$ now has concentration limits.
- $BOD_5$ mass load limits have been reduced.
- Total suspended solids now have concentration limits.
- Total suspended solids mass load limits have been reduced.

# 2. Facility Description

## 2.1 Wastewater Facility

A National Pollutant Discharge Elimination System (NPDES) permit was issued by the Department of Environmental Quality (Department) to the City of St. Helens on February 2, 2004 (2004 NPDES permit). The permit expired on December 31, 2008. Since a timely renewal application was submitted to the Department on July 27, 2007, the City of St. Helens has continued to operate under the terms and conditions of the 2004 NPDES permit pending Department action on the renewal application.

In the application for the 2004 permit, the City of St. Helens and the Boise Corporation (Boise) pulp and paper mill requested that they be made co-permittees and the permit be made a joint permit covering both the City's municipal sewage treatment works and Boise's pulp and papermill. On November 18, 2005, a new upgraded outfall came online. The outfall upgrades included a 450-foot extension of the existing outfall pipeline toward the river channel and the addition of a new 144-foot-long diffuser with 7-24" Tideflex ports at 24-foot spacing.

On May 3, 2017, Boise White Paper, L.L.C (Boise) filed a permit transfer request to DEQ. Under this request Boise was removed as co-permittee. As of June 6, 2017, the City of St. Helens has been the only permittee covered under this NPDES permit. Boise White Paper downsized operations in St. Helens and terminated all but three paper machines. The pulping and bleaching operations also ceased, and the associated equipment was removed. The remaining paper machines were purchased and were operated by Cascade Paper. Cascade Paper ceased operations in December 2023. Because this industry is no longer in operation, the internal Outfalls (002, 003, 004, 005, 006, 008, 009, and 010) will be removed from the new permit.

The St. Helens facility is set up with two headworks. One is for primarily domestic influent and the other is primarily for industrial influent. The industrial headworks design flow is 7.1 MGD. However, recent peak flow from the industrial headworks has not exceeded 5.5 MGD and the average flow is 2.5 MGD. By comparison the domestic headworks design flow is 2.3 MGD. The total average dry weather design dry flow is 9.4 MGD combined.

The original facility was constructed in 1971. The domestic portion of the facility was redesigned in 1991 when the original primary treatment clarifiers and digesters were replaced with a primary treatment aerated stabilization basin. New headworks equipment, a chlorine contact tank and new support buildings were also built at that time. In 2011 the domestic headworks were upgraded to replace an existing helical screen in the west channel of the headworks and a bar screen in the east channel with two perforated-plate automated screening systems that include a dedicated screenings washer-compactor for each screen. The major part of the St. Helens facility is the secondary treatment system, which is an aerated stabilization basin (ASB). This system was designed and sized to treat wastewater from the original mill operations; it is far larger than anything required for treating the current flows.


**Figure 2-1: Location**

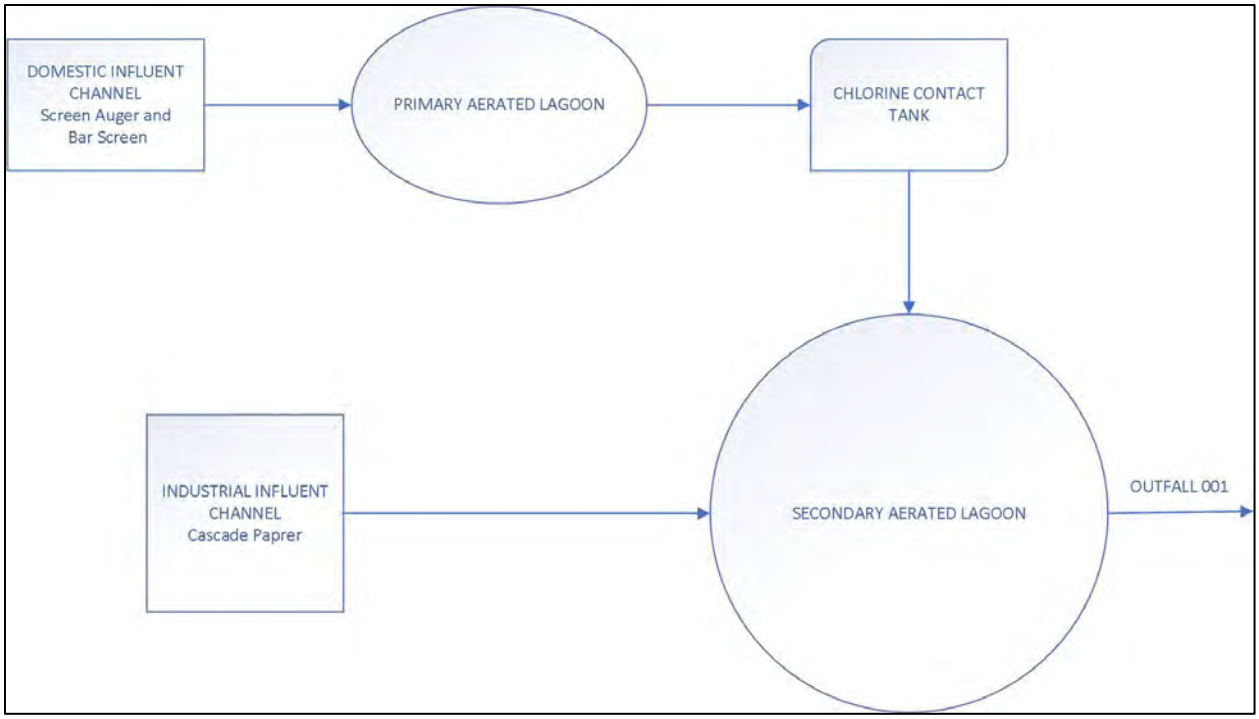


**Figure 2-2: Line Drawing of Wastewater Treatment**

**Table 2-1: List of Outfalls**

| Outfall Number | Type of Waste | Lat/Long | Design Flow[1] (mgd) | Existing Flow[2] (mgd) |
|---|---|---|---|---|
| 001 | Domestic | 45.854812, -122.789140 | 9.4 | 5.2 |
| 007 | Domestic | 45.856253, -122.797316 | 9.4 | 0.0 |

1. Design Flow = maximum monthly average dry weather flow
2. Existing Flow = existing average monthly dry weather flow

## 2.2 Compliance History

The facility was last inspected on February 6, 2017. During the inspection DEQ compliance staff identified that the primary clarifier for the industrial influent was not in operation and wastewater was bypassing the clarifier. This was a class II violation, and the facility was given the opportunity to correct. 2017-WLOTC-2549.

## 2.3 Stormwater

General NPDES permits for stormwater are required for wastewater treatment facilities with a design flow of greater than 1 MGD when stormwater is collected and discharged from the plant site. The permittee will be instructed to investigate any potential stormwater discharges and apply for a 1200-Z accordingly.

## 2.4 Industrial Pretreatment

The city implements an industrial pretreatment program that was approved by DEQ. The current NPDES permit includes federal and state pretreatment requirements.

The city currently permits one significant industrial user (SIUs). The city has submitted annual pretreatment program reports including updated industrial waste surveys. DEQ conducted a Pretreatment Compliance Audit of the industrial pretreatment program on February 26, 2016. The primary focus of the audit was to assess the core pretreatment program functions including legal authorities, inter-jurisdictional agreements, industrial waste survey methods, permitting, and compliance oversight activities.

## 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 table(s) below show the limits contained in the most recent (2004) permit. The 2004 permit lists ten outfalls, numbered 001 through 010. Outfalls 008 and 009 are for emergency overflows from pump stations. These two outfalls are not included in the proposed permit. Outfalls 001, 005, 006, and 007 have limits in the current permit. These are listed below. Outfalls 002, 003, 004, and 010 do not have limits in the current permit and are not included below.

### Table 3-1: Existing Effluent Limits

**Outfall 001: Combined Discharge from the Aerated Stabilization Basin of Municipal Wastewater and Bleached Kraft Pulp/Paper Mill Wastewater to the Columbia River.**

Boise has primary responsibility for compliance with the following discharge limits at this outfall.

| Parameter | Daily Max | Monthly Ave |
|---|---|---|
| $BOD_5$ | 19,600 lb/d | 12,800 lb/d |
| TSS | 50,057 lb/d | 26,862 lb/d |
| AOX | 2206 lb/d | 1430 lb/d |
| 2,3,7,8-TCDD[1] | 0.57 mg/day (quarterly average) | 0.40 mg/day (annual average) |
| pH | within range 5.0 to 9.0 | |
| Excess Heat Load[2, 3, 4] | 71.2 MW (7-day average of daily maximums) | |
| Turbidity (final) (May – Oct) | 32 NTU | N/A |
| (Nov – April)[5] | 55 NTU | N/A |
| Turbidity (interim)[5] | 206 NTU | N/A |

Boise and the city have joint responsibility for compliance with the following discharge limit from this outfall.

| Parameter | Daily Max | Monthly Ave |
|---|---|---|
| *E. coli* bacteria[6] | 406/100 mL | 126/100 mL |

**Notes:**

1. These 2,3,7,8-TCDD mass discharge limitations (also known as TMDL limits) are based on EPA's total maximum daily load (TMDL) for controlling the discharge of 2,3,7,8-TCDD into the Columbia River Basin promulgated on February 25, 1991. The TMDL waste load allocation for the discharge is 0.27 mg/day. This waste load allocation represents the long-term average limitation that must be met by the permittee and is based on a 70-year exposure period. In addition to complying with the quarterly and annual limitations specified above, the permittees must also demonstrate compliance with the following limitations and exposure periods:

| Exposure Period | Effluent Limit |
|---|---|
| 2 years | 0.37 mg/day |
| 3 years | 0.35 mg/day |
| 4 years | 0.34 mg/day |
| 5 years | 0.33 mg/day |

The discharge from Outfall 001 will be deemed to be in compliance with the quarterly average limit for 2,3,7,8-TCDD if the analytical results at Outfall 001 are less than the minimum level of 10 pg/L and the discharge has met the effluent limitations for 2,3,7,8-TCDD at Outfalls 005 and 006 (bleach plant outfalls). On an annual basis, the permittee must submit a report with effluent 2,3,7,8-TCDD data for the exposure period in question along with an analysis of whether the discharge is meeting the above effluent limits for 2,3,7,8-TCDD. Reports must be submitted one, two, three, four, and five years after permit issuance.

2. The excess heat load limit specified in Schedule A.1 is an interim limit based on historical data. These limits apply from June 1 – September 30. A final excess heat load limit will be established upon completion of the temperature study in Schedule C.2. It should also be noted that the Department is currently reviewing its temperature standard. Upon adoption of a new temperature standard, the permittee may request modification of the excess heat load limits in the permit.

3. The excess heat load limits in Schedules A.1, the temperature monitoring requirements in Schedule B, and the compliance conditions in Schedule C.2 of this permit constitute the permittees' Department-approved surface water temperature management plan (TMP) pursuant to OAR 340-041-0026(3)(a)(D). In accordance with OAR 340-041-0026(3)(a)(D)(vi), the permittee is deemed to be in compliance with in-stream temperature water quality standards and shall not be deemed to be causing or contributing to a violation of the water quality standards for temperature if the permittee is in compliance with this approved TMP.

4. In the event the permittee experiences an exceptional event in which there is unintentional and temporary noncompliance with excess heat load limits in the NPDES permit because of factors beyond the reasonable control of the permittee (i.e., high background stream temperatures), the permittee may claim an affirmative defense to an action brought for noncompliance with the excess heat load limits. The affirmative defense does not include noncompliance to the extent caused by operation error, improperly designed treatment facilities, inadequate treatment facilities, lack of preventative maintenance, or careless or improper operation. In an enforcement proceeding, the permittee seeking to establish the occurrence of an exceptional event has the burden of proof. To claim an affirmative defense, the Permittee must demonstrate through properly signed contemporaneous operating logs, or other relevant evidence that:

   (1) An exceptional event occurred and that the permittee can identify the cause(s) of the event;
   (2) The permitted facility was at the time being properly operated;
   (3) The permittee submitted notice of the exceptional event as required in the General Condition D.5 (24-hour notice); and
   (4) The permittee complied with any remedial measures required under General Condition A.3.

5. The interim turbidity limit is effective upon permit issuance. The final turbidity limit is effective upon completion of the compliance schedule in Schedule C.3 of the permit. Note, however, that the final turbidity limits are based on the existing turbidity standard and existing mixing zone dilution. Both the turbidity standard and the mixing zone dilution are expected to change within this permit cycle. Schedule C.3 of the NPDES permit includes a compliance schedule that requires Boise to implement in-plant controls and relocate the outfall structure, which would result in increased dilution. Additionally, the Department is in the process of reviewing its turbidity standard. Revision to the turbidity standard and outfall 001 relocation will result in changes to the final effluent turbidity limits. The permittees may apply for modification to the NPDES permit to revise the final turbidity limits. Until such time as the Department takes action on the modification request or renews the NPDES permit, the interim limits specified herein would apply.

6. Monthly average must be calculated as 30-day log mean. If the daily maximum is exceeded in any month, the permittee may take at least five consecutive re-samples at four-hour intervals beginning no later than 28 hours after the original sample was taken, or 4 hours after the permittee is notified of the exceedance if notification was made more than 28 hours after the original sample was taken. If the log mean of the five or more re-samples is less than or equal to 126/100 mL, no violation of the daily maximum shall be deemed to have occurred. For a month in which an exceedance of the daily maximum occurred and the permittee performed re-sampling, the re-samples shall replace the exceedance sample in calculating the monthly average, if the log mean of the re-samples is less than

or equal to 126/100 mL. If the log mean of the re-samples is greater than 126/100 mL, then the monthly average shall be calculated as a log mean of all samples for the month.

**Outfall 005 (Internal Monitoring Point): Discharge from the Kraft Mill Bleach Plant Combined "A" Bleach Line**

This is the hypothetical combined Boise "A" bleach line discharge, defined as representative samples from A bleach line acid (005 acid) and A bleach line caustic (005 caustic) sewers, and includes bleaching process filtrates and wastewaters generated at the mill. Boise has primary responsibility for the discharge from this outfall.

| Parameter | Daily Max | Monthly Ave |
|---|---|---|
| 2,3,7,8-TCDD | <10 pg/L | -- |
| 2,3,7,8-TCDF | 31.9 pg/L | -- |
| Trichlorosyringol | <2.5 µg/L | -- |
| 3,4,5-trichlorocatechol | <5.0 µg/L | -- |
| 3,4,6-trichlorocatechol | <5.0 µg/L | -- |
| 3,4,5-trichloroguaiacol | <2.5 µg/L | -- |
| 3,4,6-trichloroguaiacol | <2.5 µg/L | -- |
| 4,5,6-trichloroguaiacol | <2.5 µg/L | -- |
| 2,4,5-trichlorophenol | <2.5 µg/L | -- |
| 2,4,6-trichlorophenol | <2.5 µg/L | -- |
| Tetrachlorocatechol | <5.0 µg/L | -- |
| Tetrachloroguaiacol | <5.0 µg/L | -- |
| 2,3,4,6-tetrachlorophenol | <2.5 µg/L | -- |
| Pentachlorophenol | <5.0 µg/L | -- |
| Chloroform[7] | 7.96 lb/d | 4.76 lb/d |

**Outfall 006 (Internal Monitoring Point): Discharge from the Kraft Mill Bleach Plant Combined "B" Bleach Line**

This is the hypothetical combined Boise "B" bleach line discharge, defined as representative samples from B bleach line acid (006 acid) and B bleach line caustic (006 caustic) sewers, and includes bleaching process filtrates and wastewaters generated at the mill. Boise has primary responsibility for the discharge from this outfall.

| Parameter | Daily Max | Monthly Ave |
|---|---|---|
| 2,3,7,8-TCDD | <10 pg/L | -- |
| 2,3,7,8-TCDF | 31.9 pg/L | -- |
| Trichlorosyringol | <2.5 µg/L | -- |
| 3,4,5-trichlorocatechol | <5.0 µg/L | -- |
| 3,4,6-trichlorocatechol | <5.0 µg/L | -- |
| 3,4,5-trichloroguaiacol | <2.5 µg/L | -- |
| 3,4,6-trichloroguaiacol | <2.5 µg/L | -- |
| 4,5,6-trichloroguaiacol | <2.5 µg/L | -- |
| 2,4,5-trichlorophenol | <2.5 µg/L | -- |
| 2,4,6-trichlorophenol | <2.5 µg/L | -- |
| Tetrachlorocatechol | <5.0 µg/L | -- |
| Tetrachloroguaiacol | <5.0 µg/L | -- |
| 2,3,4,6-tetrachlorophenol | <2.5 µg/L | -- |
| Pentachlorophenol | <5.0 µg/L | -- |
| Chloroform[7] | 7.96 lb/d | 4.76 lb/d |

Notes: 7. On September 19, 2002, EPA published in the Federal Register (67 Fed. Reg. 58990) a final rule allowing mills subject to the Cluster rule effluent discharge monitoring requirements to opt for a certification program, instead of conducting the weekly chloroform monitoring required by the rule. If, after two years of weekly monitoring demonstrating compliance with the chloroform limitation contained in Schedule A.5 and A.6, Boise decides to implement this alternative, it must notify the Department 90 days in advance of its intent to implement the compliance certification alternative as outlined in the rule (40 CFR 430.02(f)). Certification requirements are incorporated into this permit by reference.

**Outfall 007: Emergency Discharge from the Aerated Stabilization Basin**

This is the emergency discharge from the aerated stabilization basin to the Multnomah Channel. Waste sources include all of the sources that are normally included in Outfall 001. Use of this outfall is restricted to emergency situations during periods of high Columbia River level when there is insufficient hydraulic head to discharge the entire secondary ASB effluent flow through the normal Outfall 001 diffuser. The effluent limitations that apply at Outfall 001 also apply to Outfall 007. Boise and the City have joint responsibility for the discharge from this outfall.

**Outfalls 008 and 009: Emergency Overflows from Pump Stations**

The City of St. Helens has the primary responsibility for the discharge from these outfalls. Except as otherwise provided by law, no wastes shall be discharged from these outfalls and no activities shall be conducted which violate water quality standards as adopted in OAR 340-041-0205 and OAR 340- 041-0445, unless the cause of the discharge is due to storm events as allowed under OAR 340-041- 0120 (13) and (14) as follows: City of St. Helens/Boise Cascade Corporation File No. 84069 Permit No. 101173 Expiration Date: 12/31/2008 Page 7 of 39 Emergency overflow discharges are prohibited to Waters of the State from May 22 through October 31, except during a storm event greater than the one-in-ten-year, 24-hour duration storm event. In the wet season, emergency overflow discharges are allowed until December 31, 2009. On and after January 1, 2010, overflows are prohibited from November 1 through May 21 except during a storm event greater than a one-in-five-year, 24-hour storm event. If an overflow occurs between May 22 and June 1, and if the permittee demonstrates to the Department's satisfaction that no increase in risk to beneficial uses occurred because of the overflow, no violation shall be triggered if the storm associated with the overflow was greater than the one-in-five-year, 24-hour duration storm event.

## 3.2 Technology-Based Effluent Limit Development

As discussed in Section 2.1 above, the current permit was drafted to address discharges that included effluent from a pulp and paper mill. In particular, the facility at that time was subject to the effluent limit guidelines set forth in 40 CFR § 430.22(a) for bleached kraft mills using a bleaching process. Since the issuance of the current permit, the pulping and bleaching operations at the mill have ceased and paper making operations have been significantly reduced. In addition, under the proposed permit the mill will no longer be a co-permittee. The city will be the sole permittee, with the mill as a permitted pretreatment industry under the city's pretreatment program. In this type of permitting scenario, the federal technology-based effluent limits applicable to the facility are the secondary standards for publicly owned treatment works (POTWs).

40 CFR 122.44(a)(1) requires POTWs to meet technology-based effluent limits for five-day biochemical oxygen demand ($BOD_5$), total suspended solids (TSS) and pH (i.e., federal secondary treatment standards). Substitution of 5-day carbonaceous oxygen demand ($CBOD_5$) for $BOD_5$ is allowed. The numeric standards for these pollutants are contained in 40 CFR 133.102. In addition, DEQ has developed minimum design criteria for $BOD_5$ 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 Main Stem Columbia River basin.

**Table 3-2: Comparison of TBELs for Federal Secondary Treatment Standards and Oregon Basin-Specific Design Criteria**

| Parameter | Federal Secondary Treatment Standards | | Main Stem Columbia Basin-Specific Design Criteria (OAR 340-041-0104) |
|---|---|---|---|
| | 30-Day Average | 7-Day Average | Monthly Average |
| $BOD_5$ (mg/L) | 30 | 45 | 20 mg/L during defined summer months, 30 mg/L during winter |
| TSS (mg/L) | 30 | 45 | |
| 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 $BOD_5$ 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 meets all three.

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 include the monthly average TSS limit of 50 mg/L and the weekly limit of 75 mg/L.

The limits for $BOD_5$ and TSS noted in the discussion 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)

OAR 340-041-0061(9)(a)(C) allows an exception to the daily maximum mass load when the daily flow exceeds the lesser hydraulic capacity of the secondary treatment portion of the facility or twice the design average dry weather flow, the daily mass load limit does not apply.

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

**Table 3-3: Design Flows and Concentrations Limits**

| Season | Design Flow (mgd) | Monthly TSS Concentration Limit (mg/L) | Monthly $BOD_5$ Concentration Limit (mg/L) |
|---|---|---|---|
| **Dry Weather** | 9.4 | 50 | 45 |
| **Wet Weather** | 9.4 | 50 | 45 |
| Design flow comments: maximum monthly average | | | |

Mass Load Calculations BOD:

Monthly Average: 9.4 mgd x 45 mg/L x 8.34 = 3528 lbs/day (3,500 rounded to two significant figures)

Weekly Average: 3500 lbs/day monthly average x 1.5 = 5250 lbs/day (5,300 rounded to two significant figures)

Daily Maximum: 3500 lbs/day monthly x 2 = 7000 lbs/day

Mass Load Calculations TSS:

Monthly Average: 9.4 mgd x 50 mg/L x 8.34 = 3919 lbs/day (3,900 rounded to two significant figures)

Weekly Average: 3900 lbs/day monthly average x 1.5 = 5850 lbs/day (5,900 rounded to two significant figures)

Daily Maximum: 3900 lbs/day monthly x 2 = 7800 lbs/day

The proposed $BOD_5$ and TSS limits are listed in the following table. These limits are significantly more stringent than the $BOD_5$ and TSS limits in the current permit (see Section 3.1, above).

**Table 3-4: Technology Based Effluent Limits**

| Parameter | Units | Average Monthly | Average Weekly | Daily Maximum |
|---|---|---|---|---|
| $BOD_5$ (year-round) | mg/L | 45 | 65 | NA |
| | lbs/day | 3,500 | 5,300 | 7,000 |
| | % removal | 65 | NA | NA |
| TSS (year-round) | mg/L | 50 | 75 | NA |
| | lbs/day | 3,900 | 5,900 | 7,800 |
| | % removal | 65 | NA | NA |

# 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 Columbia River. These uses are listed in OAR-340-041-0101 for the Main Stem Columbia River.

- 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
- Commercial navigation and transportation

## 3.3.2 Water Quality-Limited Parameters and Total Maximum Daily Loads

The following table lists the parameters in the 2022 303(d) list for which the receiving stream is water quality-limited (Category 5) within the discharge's stream reach. The table also lists any parameters covered by a TMDL.

**Table 3-5: WQ-Limited and TMDL Parameters**

| Water Quality Limited Parameters (Outfall 001) |
|---|
| **AU ID:** OR_SR_1708000302_88_100669<br>**AU Name:** Columbia River<br>**AU Description:** Willamette River to Frogmore Slough<br>**Year Last Assessed:** 2022<br>**AU Status:** Impaired<br>**Impaired Uses:** Fish And Aquatic Life; Fishing; Private Domestic Water Supply; Public Domestic Water Supply<br>**Year Listed:** 1998<br>**Category 5:** pH, Arsenic, Inorganic- Human Health Toxics, DDE 4,4'- Human Health Toxics, Polychlorinated Biphenyls (PCBs)- Human Health Toxics |
| **TMDL Parameters** |
| Temperature- year-round, Total Dissolved gas, Dioxin (2,3,7,8-TCDD)- Human Health Toxics |

Outfall 007 discharges at the mouth of the Multnomah Channel. However, because it is only used in flood scenarios it is assumed that the outfall will essentially be discharging into the Columbia River when it is in use and therefore the same parameters apply to both Outfall 001 and 007.

### 3.3.3 TMDL Wasteload Allocations

DEQ and/or EPA issued TMDLs for the Columbia River for Temperature (2020), Total Dissolved Gas (2002), and 2,3,7,8-TCDD (1991). WLAs from these TMDLs that are applicable to the permittee are listed in the following table.

**Table 3-6: Applicable WLAs**

| Parameter | WLA | Time Period |
|---|---|---|
| Thermal Discharge | 1370 Mkcal/Day | June 1 – Sept. 30 |
| Note: The thermal load WLA is expressed as an average monthly value. | | |

The total dissolved gas TMDL focuses entirely on the hydropower dams and the creation of total dissolved gas due to the spillways. Because the St. Helens POTW is not a hydropower dam and is not expected to affect total dissolved gas, the permittee is not expected to be a source of total dissolved gas. The 1991 2,3,7,8-TCDD TMDL specifically indicated that the sources of dioxin were paper mills and includes a WLA for the Boise Cascade paper mill. The paper mill no longer operates. Since the WLA applied specifically to the paper mill, which is no longer in operation and not part of this permit, the limit for 2,3,7,8-TCDD has been removed from this permit and is no longer a pollutant of concern.

### 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.

**Table 3-7: Domestic Toxic Pollutants of Concern**

| Flow Rate | Pollutants |
|---|---|
| > 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 3-8: Pollutants of Concern**

| Pollutant | How was pollutant identified? |
|---|---|
| pH | Effluent Monitoring |
| Temperature | Effluent Monitoring |
| Fecal Coliform | Effluent Monitoring |
| E. coli | Effluent Monitoring |
| Enterococcus | Effluent Monitoring |
| Total Residual Chlorine | Effluent Monitoring |
| Total Ammonia Nitrogen | Application Requirement |
| Metals | Application Requirement |
| Volatile Organic Compounds | Application Requirement |
| Acid Extractable Compounds | Application Requirement |
| Base-Neutral Compounds | Application Requirement |
| Base-Neutral Compounds | 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 mixing zone for Outfall 001 in the expiring permit is:

> *The allowable mixing zone is that portion of the Columbia River within a parallelogram shaped area extending 100 feet upstream and 400 feet*

*downstream and 100 feet off each end of the diffuser. The Zone of Immediate Dilution (ZID) is that portion of the Columbia River within 24 feet of any part of the diffuser between and including the end-most discharge ports.*

Outfall 001 is located at 45.854812, -122.789140. In 2007, the permittee requested that DEQ change the 24-foot ZID to 40 feet. Setting the ZID at 10% of the mixing zone size (in this case, 400 feet) is DEQ's standard practice. Therefore, with this memo and renewal, DEQ grants that request. Also, the way the parallelogram is described in the mixing zone study (Mixing Zone/Dilution Technical Evaluation Report, CH2MHill, January 2007) is the same as saying 100 feet upstream and 400 feet downstream. Therefore, DEQ is changing this to the typical "upstream and downstream" language. Finally, the permittee requested that the upstream RMZ be extended to 400 ft to align with RMZs allocated to other NPDES permittees in the area. Environmental mapping showed that an increase in RMZ size would not impact fish habitat or public health. The Columbia River is 2,600 ft wide at the point of Outfall 001. Therefore, the request to extend the RMZ to 400 ft upstream is granted. Together, these changes result in the following mixing zone:

*The allowable mixing zone is that portion of the Columbia River within a band extending 400 feet upstream and 400 feet downstream of the diffuser, and 100 feet off each end of the diffuser. The Zone of Immediate Dilution (ZID) is that portion of the Columbia River within 40 feet of any part of the diffuser between and including the end-most discharge ports.*

The permit also has a mixing zone for Outfall 007. Outfall 007 (located at 45.856253, -122.797316) is an emergency outfall used during periods of high Columbia River level and high tide, when there is insufficient hydraulic head to discharge the entire secondary aerated stabilization basin effluent flow through the normal Outfall 001 diffuser. It appears that 007 has not flowed in the past 5 years because there is no monitoring data. The regulatory mixing zone for Outfall 007 is defined in the existing permit as follows:

*The allowable mixing zone is that portion of Multnomah Channel within a radius of 100 ft from the end of the discharge pipe. A Zone of Immediate Dilution (ZID) is that portion of the Multnomah Channel within a 10-foot radius from the end of the discharge pipe.*

Outfall 010 (located at 45.843542, -122.803103) has historically been discharge from the Boise mill's raw water intake screens, which are continually flushed. The screens used Multnomah Channel river water to flush debris back to the Multnomah Channel. The water is taken out of the Multnomah Channel and immediately discharged back to the channel. There were no limits at 010 in the previous permit. The outfall is being removed from the proposed permit.

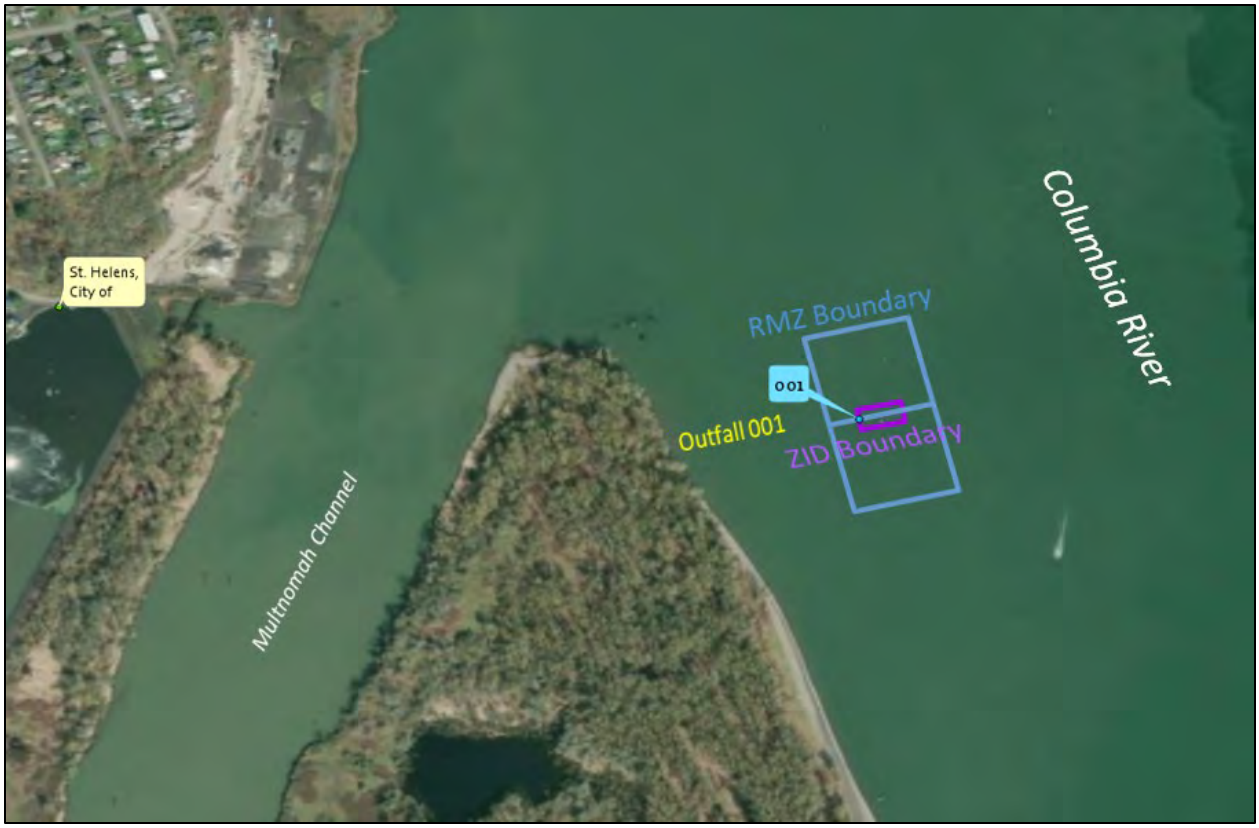


**Figure 3-1: Mixing Zone Location**

**Table 3-9: Dilution Summary for Outfall 001**

| Outfall 001 Dilution Summary | | | | | | |
|---|---|---|---|---|---|---|
| **Water Quality Standard** | **Stream Flow (cfs)** | | **Effluent Flow (mgd)** | | **Dilution** | **Location** |
| | **Statistic** | **Flow** | **Statistic** | **Flow** | | |
| Aquatic Life, Acute | 1Q10 | 68,893 | ☐ ADWDF x PF<br>☒ Max Daily Avg<br>☐ Other | 11.4 | 22 | ZID |
| Aquatic Life, Chronic | 7Q10 | 85,346 | ☐ ADWDF<br>☒ Max Monthly Avg<br>☐ Other | 9.4 | 249 | MZ |
| Human Health, Non-Carcinogen | 30Q5 | 98,768 | ☐ ADWDF<br>☒ Max Monthly Avg<br>☐ Other | 9.4 | 260 | MZ |
| Human Health, Carcinogen | Harmonic Mean | 186,218 | ☐ Annual Avg Design<br>☒ Annual Avg<br>☐ Other | 7.6 | 190 | MZ |
| *ADWDF = Average dry weather design flow* | | | | | *PF = Peaking factor* | |

### 3.3.6 pH

The pH criterion for this basin is 7.0 – 8.5 per OAR 340-041-0104. The Columbia River is listed as impaired for the low bound of pH in this assessment unit. When a waterbody is impaired, no assimilative capacity is allowed for that impairment. Therefore, no dilution was used when assessing the lower bound of the pH range in the RPA. The RPA indicates reasonable potential for the secondary treatment standards of 6.0 – 9.0 to cause or contribute to an exceedance of a water quality criteria on the low end. The lower pH limit in the proposed permit has been adjusted to 7.0 and is a WQBEL. The upper pH limit will remain at 9.0 and is a TBEL. The following provides a summary of the data used for the analysis.

**Table 3-10: pH Reasonable Potential Analysis**

| INPUT | Lower pH Criteria | Upper pH Criteria |
|---|---|---|
| 1. Dilution at mixing zone boundary | 1 | 249 |
| 2. Upstream characteristics | | |
| a. Temperature (deg C) | 21.6 | 5.1 |
| b. pH | 7.2 | 8.2 |
| c. Alkalinity (mg CaCO3/L) | 50 | 50 |
| 3. Effluent characteristics | | |
| a. Temperature (° C) | 25.9 | 10.7 |
| b. pH (S.U.) | 6.0 | 9.0 |
| c. Alkalinity (mg CaCO3/L) | 134.6 | 134.6 |
| 4. Applicable pH criteria | 7.0 | 8.5 |
| **pH at mixing zone boundary** | **6.0** | **8.2** |
| **Is there reasonable potential?** | **Yes** | **No** |
| **Proposed effluent limits** | **7.0** | **9.0** |
| Effluent data source:<br>DMRs 2018-2022 | | |
| Ambient data source:<br>AWQMS database monitoring location: Columbia River at Marker 14 | | |

## 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 3-11: Temperature Criteria Information**

| | |
|---|---|
| **Applicable Temperature Criterion** | Migration Corridor 20ºC (OAR 340-041-0028(4)(d) |
| Applicable dates: Year-round | |
| **Salmon/Steelhead Spawning 13 °C?** OAR 340-041-0028(4)(a) | ☐Yes ☒No |
| Applicable dates: | |
| **WQ-limited?** | ☒Yes ☐No |
| **TMDL wasteload allocation assigned?** | ☒Yes ☐No |
| Applicable dates: June 1 – September 30 | |
| TMDL based on natural conditions criterion? | ☐Yes ☒No |
| **Cold water summer protection criterion applies?** | ☐Yes ☒No |
| **Cold water spawning protection applies?** | ☐Yes ☒No |
| Comments: | |

The main stem Columbia River has a year-round Salmon and Steelhead Migration criterion of 20 °C. EPA issued a temperature TMDL addressing this criterion for the entire Columbia River on May 18, 2020, and revised on August 13, 2021. With the issuance of the EPA TMDL a wasteload allocation for the facility of 1,370 million kcal/day (monthly average) applies to the discharge and is included in the permit as an effluent limit for the June 1 – September 30 period. This limit is more restrictive than the thermal limit in the current permit as demonstrated in Appendix B. The daily thermal load discharged is calculated by multiplying the daily effluent flow by the average daily effluent temperature and a standard conversion factor. The daily thermal loads are averaged for the month and must be equal to or less than 1,370 million kcal/day.

**Eulachon Analysis**

Pacific eulachon, a species listed as threatened under the Endangered Species Act, are known to migrate and spawn in the Columbia River and its tributaries. While there are no specific temperature criteria within Oregon's water quality rules for the protection of eulachon, DEQ must ensure that thermal mixing zones are as small as feasible and adverse effects to eulachon are minimized.

DEQ has previously performed detailed analyses related to eulachon for two other NPDES facilities on the Columbia River: GP Wauna Paper Mill and the City of Portland's Columbia Blvd. wastewater treatment plant. The results of these studies indicated that the discharges were unlikely to have any detrimental impact on eulachon (see the permit fact sheets for each of these facilities for detailed information). Since this facility has a relatively new outfall[1], and with the receiving stream characteristics and effluent temperatures similar to the Columbia Blvd. facility (but with much lower effluent flow than that facility), DEQ has concluded that the St. Helens

[1] The outfall has a multi-port diffuser and the mixing zone has been sized to be as small as feasible.

discharge will be very unlikely to have any detrimental impact on eulachon due to the thermal nature of its discharge.

**Table 3-12: Temperature Criterion Effluent Limits**

| **Effluent limit needed?** ☒Yes ☐No |
|---|
| **TMDL WLA Limit:** 1370 Mkcal/Day |
| Applicable time period: June 1 – September 30 |
| **Temperature Criterion Limit:** NA |
| 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 ºC or more for salmon and steelhead, and 9 ºC or more for bull trout.

  The City of St. Helens conducted an updated mixing zone study in 2010. This study documented no spawning located in the mixing zone. In addition, Oregon Administrative Rules do not list this section of the Columbia River as having salmonid spawning as a use.

- 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 ºC or more to less than 2 seconds.

  The daily maximum-recorded temperature of the discharge for the 2017 to 2022 period was 30 ºC, below the 32 ºC criterion. Therefore, the discharge does not have the potential to cause acute impairment or instantaneous lethality due to the thermal plume. Since there is no reasonable potential associated with this criterion, no temperature limit is necessary in the permit.

- 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 ºC or more to less than 5% of the cross-section of 100% of the 7Q10 flow of the water body.

An analysis related to thermal shock, included in Appendix A, indicates that when both the effluent and upstream receiving water temperatures are at their maximum measured values, the plume's temperature at 5% of the receiving stream's cross-sectional area will not be above 25 °C. Based on this analysis, thermal shock caused by the discharge is prevented or minimized.

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

  The maximum-recorded receiving water temperature in the vicinity of the discharge location is 23 °C (from the 2015 to 2020 period). An analysis related to migration blockage was performed for the outfall. The analysis for Outfall 001 indicates that when the receiving water temperature is 21.0 °C and the effluent temperature is at the maximum-recorded 7-day value (27.4 °C), the effluent plume when it reaches 25% of the receiving stream's cross-sectional area will be a maximum of 21.0 °C. As such, the effluent discharge does not have the potential to result in migration blockage within the Columbia River.

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

**Table 3-13: Thermal Plume Effluent Limit**

| **Effluent limit needed?** ☐Yes ☒No |
|---|
| **Calculated limit**: NA |
| **Applicable timeframe:** NA |
| Comments: |

#### *3.3.7.3 Cold Water Refugia*

OAR 340-041-0028(4)(d) requires that water bodies subject to the salmonid migration criterion of 20 °C must also have cold water refugia that are sufficiently distributed so as to allow salmon and steelhead migration without significant adverse effects from higher water temperatures elsewhere in the water body. The diffuser of the facility's primary Outfall (001) is approximately 1000 feet offshore of Sauvie Island in the main channel of the Columbia River and 25 feet below the water surface. This location and the surrounding mixing zone area are not expected to contain cold water refugia. As a result, it is unlikely that the facility's effluent would have an impact on any cold water refugia.

### 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 3-14: 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 no chlorine limits. An analysis was conducted to determine if the facility had the reasonable potential to exceed the chlorine criteria. The maximum chlorine concentration of 0.0 ug/L (Reported on the 2004 permit application, monitoring for TRC was not included in the current permit.) was used for the analysis. The analysis indicates the discharge does not have the potential to exceed the chlorine criteria; therefore, no chlorine limits are included in the proposed permit. However, because the facility uses chlorine to meet the bacteria criteria chlorine monitoring will be included in the proposed permit.

#### *3.3.9.2* Total Ammonia Nitrogen

DEQ's ammonia criteria vary with changes in pH and temperature. DEQ performed a reasonable potential analysis that accounts for changes in the effluent and receiving water pH and temperature to determine the appropriate ammonia criteria. The following table provides a summary of the data used for the ammonia analysis and the results of the analysis.

**Table 3-15: Ammonia Analysis Information – Year-Round**

| | Acute | Chronic | |
|---|---|---|---|
| | | 4-day | 30-day |
| Dilution | 22 | 249 | 260 |
| Ammonia Criteria | 2.3 | 1.3 | 0.5 |
| Effluent Data Used | | | |
| Ammonia (mg/L) | 22.8 | 22.8 | |
| pH (SU) | 8.0 | 8.0 | |
| Temperature (ºC) | 30 | 30 | |
| Alkalinity (mg/L CaCO3) | 64 | 64 | |
| Receiving Stream Data Used | | | |
| Ammonia (mg/L) | 0.0 | 0.0 | |
| pH (SU) | 8.2 | 8.2 | |
| Temperature (ºC) | 21.6 | 21.6 | |
| Alkalinity (mg/L CaCO3) | 66.7 | 66.7 | |
| Ammonia Limit Needed? | **No** | | |
| Calculated Limits | AML | MDL | |
| Ammonia (mg/L) | - | - | |
| Effluent data source | | | |
| 2017-2022 ICIS Data | | | |
| Ambient data source | | | |
| AWQMS Database 2015- 2021 | | | |

#### *3.3.9.3* Turbidity

The previous permit contained an interim limit for turbidity with the acknowledgement in note 5 that the Department was in the process of reviewing the turbidity standard and that Outfall 001 was being relocated. The final limit included in the permit never became effective.

The current turbidity standard (OAR 340-041-0036) states that "no more than a ten percent cumulative increase in natural stream turbidities may be allowed, as measured relative to a control point immediately upstream of the turbidity causing activity…". Ambient data from station 35561-ORDEQ (Columbia River Shoreline at Sauvie Island Beach off end of NW Reeder Rd) was the closest upstream station with turbidity data. The average turbidity at this station was 5.13 NTU. Therefore, a 10% increase in turbidity would be 0.51 NTU.

Effluent data collected by the permittee from January 2018 – September 2023 shows the average turbidity as 32.3 NTU. For Outfall 001 a mass balance equation was used to determine the resulting increase in turbidity levels at the edge of the mixing zone. The calculation is as follows:

$$Turbidity_{mz}=(Turbidity_e+Turbidity_s*D_s)/D_{mz}$$

Where:

$Turbidity_{mz}$ is the turbidity at the edge of the mixing zone
$Turbidity_e$ is the average effluent turbidity
$Turbidity_s$ is the average ambient turbidity of the Columbia River
$D_s$ is the portion of the Columbia River available for mixing (defined as $D_{mz}$-1)
$D_{mz}$ is the dilution at the edge of the mixing zone

Using this equation, the resulting turbidity at the edge of the mixing zone is

$$Turbidity_{mz}= (32.3\ NTU +5.13\ NTU*248)/249 = 5.24\ NTU$$

By subtracting the average ambient turbidity from the turbidity at the edge of the mixing zone we get an increase of 0.11 NTU, which is smaller than the 10% increase of 0.51. Based on this analysis it is determined that there is no reasonable potential for the effluent to exceed the water quality standard for turbidity. Therefore, the interim limit will be removed from the permit.

#### *3.3.9.4* Priority Pollutant Toxics

DEQ conducted a reasonable potential analysis for the group of toxics listed in the following table.

**Table 3-16: Toxic Pollutants Analyzed**

| Toxic Group |
|---|
| Metals |
| Volatile Organic Compounds |
| Acid Extractable Compounds |
| Base-Neutral Compounds |
| Pesticides |
| Effluent data source: EDD from DMRS 2017-2022 |
| Receiving water data source: AWQMS Database |

The following parameters were found present in the effluent:

| Pollutant | |
|---|---|
| **Metals** | **Volatile Organic Compounds** |
| Aluminum | Bromoform |
| Antimony, total | Chlorodibromomethane |
| Arsenic, total | Chloroform |

| Pollutant | |
|---|---|
| Beryllium, total | **Base-Neutral Compounds** |
| Chromium, total | Bis (2-ethylhexyl) phthalate |
| Copper, total and dissolved | **Acid-Extractable Compounds** |
| Lead, total | Pentachlorophenol |
| Mercury, total | **Pesticides and PCBs** |
| Nickel, total | Aldrin |
| Zinc, total | Heptachlor |
| Cyanide, total | |
| Iron, total | |

None of these parameters were in concentrations sufficient to cause an impairment at the end of the mixing zone except for Aldrin and Heptachlor. However, with only 1 sample over the method detection limit, there is insufficient data to establish a limit. Additional monitoring will be required in the draft permit to address this.

#### *3.3.9.5* Copper Biotic Ligand Model

Monthly paired effluent and ambient copper BLM input data was collected by the City of St Helens staff and analyzed by various labs starting in March 2019 through February 2021. For the RPAs, the mixed concentration of each input parameter were then entered into the BLM model to calculate the instantaneous water quality criteria (IWQC) for each paired data set. Each IWQC was compared to the corresponding copper concentration of the effluent or the calculated value at complete mix. Table 3-17 below shows the sample date, calculated criterion, calculated copper value, and toxic unit (copper concentration divided by the instantaneous criterion). A toxic unit greater than one indicates there is a potential for the discharge to exceed the criterion. The only date for which there was a TU greater than 1 was on the April 17, 2019 sampling date. This TU was based on total recoverable copper data, not dissolved, and is therefore an overly conservative estimate. Examination of the ratio of dissolved to total recoverable copper for the effluent data indicates that the dissolved fraction is less than half of the total recoverable copper values. Furthermore, the ambient copper values were higher than the effluent copper values for this sampling event, indicating that the potential to exceed the criterion is not due to the facility effluent. There is not reasonable potential to exceed the copper criterion based on this analysis.

**Table 3-17: Copper BLM RPA Results**

| Date | ZID | BLM CMC | Toxic Units | RMZ | BLM CCC | Toxic Units | 100% mix | BLM CCC | Toxic Units |
|---|---|---|---|---|---|---|---|---|---|
| | Cu ug/L | ug/L | | Cu ug/L | ug/L | | Cu ug/L | Cu ug/L | |
| 2019-03-21 | 0.51 | 8.33 | 0.06 | 0.51 | 4.12 | 0.12 | 0.51 | 4.11 | 0.12 |
| 2019-04-17 | 1.97 | 3.15 | 0.625597 | 1.99 | 1.55 | 1.284492 | 1.99 | 1.55 | 1.286982 |
| 2019-05-08 | 0.79 | 3.21 | 0.244826 | 0.80 | 1.35 | 0.592777 | 0.80 | 1.35 | 0.594217 |
| 2019-06-05 | 0.63 | 2.71 | 0.230928 | 0.64 | 1.33 | 0.479267 | 0.64 | 1.32 | 0.481061 |

| Date | ZID | BLM CMC | Toxic Units | RMZ | BLM CCC | Toxic Units | 100% mix | BLM CCC | Toxic Units |
|---|---|---|---|---|---|---|---|---|---|
| | Cu ug/L | ug/L | | Cu ug/L | ug/L | | Cu ug/L | Cu ug/L | |
| 2019-07-11 | 0.67 | 5.06 | 0.131485 | 0.68 | 2.15 | 0.316793 | 0.68 | 2.15 | 0.318355 |
| 2019-08-21 | 0.59 | 2.78 | 0.213058 | 0.60 | 1.15 | 0.515812 | 0.60 | 1.15 | 0.517395 |
| 2019-09-04 | 0.64 | 4.46 | 0.14353 | 0.64 | 1.89 | 0.338962 | 0.64 | 1.88 | 0.339661 |
| 2019-10-10 | 0.63 | 2.80 | 0.224392 | 0.64 | 1.38 | 0.465537 | 0.64 | 1.37 | 0.46745 |
| 2019-11-07 | 0.50 | 3.33 | 0.150596 | 0.51 | 1.64 | 0.312145 | 0.51 | 1.64 | 0.313122 |
| 2019-12-05 | 0.47 | 2.38 | 0.198071 | 0.48 | 0.99 | 0.484719 | 0.48 | 0.98 | 0.486465 |
| 2020-01-09 | 0.61 | 8.06 | 0.075088 | 0.60 | 3.97 | 0.150004 | 0.60 | 3.97 | 0.149933 |
| 2020-02-06 | 0.40 | 4.24 | 0.095416 | 0.40 | 2.10 | 0.193232 | 0.40 | 2.09 | 0.193418 |
| 2020-03-05 | 0.50 | 7.37 | 0.068016 | 0.49 | 3.64 | 0.135175 | 0.49 | 3.64 | 0.135008 |
| 2020-04-23 | 0.52 | 2.47 | 0.212406 | 0.50 | 1.22 | 0.406877 | 0.49 | 1.22 | 0.405677 |
| 2020-05-20 | 0.64 | 3.73 | 0.170237 | 0.64 | 1.57 | 0.40774 | 0.64 | 1.57 | 0.408606 |
| 2020-06-11 | 0.60 | 1.57 | 0.380534 | 0.60 | 0.63 | 0.952596 | 0.60 | 0.63 | 0.956298 |
| 2020-07-09 | 0.67 | 4.27 | 0.155801 | 0.66 | 2.23 | 0.296584 | 0.66 | 2.13 | 0.310132 |
| 2020-08-13 | 0.55 | 6.34 | 0.086302 | 0.55 | 3.48 | 0.159149 | 0.55 | 3.27 | 0.169406 |
| 2020-09-17 | 0.60 | 4.61 | 0.130352 | 0.60 | 2.04 | 0.295685 | 0.60 | 1.90 | 0.316997 |
| 2020-10-08 | 0.58 | 3.63 | 0.159833 | 0.59 | 1.51 | 0.393968 | 0.59 | 1.50 | 0.395627 |
| 2020-11-09 | 0.49 | 3.64 | 0.133747 | 0.49 | 1.52 | 0.325707 | 0.49 | 1.42 | 0.349136 |
| 2020-12-07 | 0.49 | 2.94 | 0.168089 | 0.48 | 1.12 | 0.42894 | 0.48 | 1.12 | 0.428342 |
| 2021-01-07 | 0.78 | 2.56 | 0.306117 | 0.78 | 1.08 | 0.721947 | 0.78 | 1.08 | 0.721548 |
| 2021-02-04 | 0.58 | 2.63 | 0.221172 | 0.58 | 1.09 | 0.535656 | 0.58 | 1.02 | 0.573401 |

#### *3.3.9.6* Aluminum

The results of the analysis are shown in Table 3-18. The maximum estimated concentration at the edge of the ZID is below the acute criterion and the mixing zone concentration is above the chronic criterion. Complete mix concentrations of aluminum are above the complete mix criterion. However, the maximum measured concentration of effluent total recoverable aluminum was 280 ug/L, which was below the chronic and complete mix criteria. The 90$^{th}$ percentile of the ambient total aluminum was 391 ug/L, which is above the chronic and complete mix criteria. Based upon this analysis, the exceedance of the criteria is not due to the effluent discharge. However, because this was a non-paired analysis, paired monitoring will be required in the next permit cycle.

**Table 3-18: Aluminum RPA Results**

| Location | Applicable Aluminum Criterion (Total Recoverable, µg/L) | Estimated Maximum Aluminum Concentration (Total Recoverable, µg/L) | Additional Monitoring Needed? |
|---|---|---|---|
| At edge of Zone of Initial Dilution (ZID) | 886 | 392 | No |
| At edge of Regulatory Mixing Zone (RMZ) | 303 | 391 | Yes – non paired analysis |
| After complete mix | 300 | 391 | Yes – non paired analysis |

#### *3.3.9.7* Mercury – Human Health Criterion

Oregon's human health water quality criterion for mercury is expressed in terms of a fish tissue concentration rather than a water column concentration. Because of this, DEQ's approach to performing the reasonable potential analysis for mercury is different from that for other parameters. This approach is described in DEQ's "Implementation of Methylmercury in NPDES Permits" internal management directive.

According to the IMD, "Any facility contributing significant and consistent concentrations of total mercury to the receiving water body is considered to have the reasonable potential to exceed the water quality criterion unless a site-specific survey determines otherwise." Because the water quality criterion for mercury is a fish tissue-based concentration rather than a water column concentration, permit limits for mercury cannot be expressed in terms of a concentration. Therefore, when mercury is present in treated effluent on a consistent basis, the permit needs to contain mercury monitoring, plus a narrative effluent limit that consists of a Mercury Minimization Plan (MMP).

A review of effluent monitoring data indicates that total mercury is present in the discharge and therefore there is a reasonable potential to cause or contribute to the exceedance of the water quality standard. Accordingly, the proposed permit requires the facility to monitor for mercury and develop and implement a mercury minimization plan. This requirement is contained in Schedule A of the permit. Once the plan it submitted to DEQ for review, it must go on public notice for public review and is incorporated into the permit by reference.

# 3.4 Antibacksliding

The proposed permit complies with the antibacksliding provisions of CWA sections 402(o) and 303(d)(4) and 40 CFR 22.44(l). The proposed limits for $BOD_5$, TSS, pH, bacteria and temperature are the same or more stringent than the existing permit so the antibacksliding provision is satisfied for these parameters.

Because the current permit regulated the effluent from a direct discharging pulp and paper mill, it contained several technology-based effluent limits (TBELs) specific to that industry type. These TBELs include the AOX limits for Outfall 001 and all of the limits at internal Outfalls 005 and 006. As noted in Section 3.2 above, these TBELs are no longer applicable due the significant changes at the facility. Outfalls 005 and 006 no longer exist since they were part of the kraft mill bleach plant which has been completely removed and is therefore no longer capable of discharging effluent. The anti-backsliding regulations allow for exceptions when there is new information related to a facility and the applicability of existing limits. It is apparent that the new information regarding the removal of the pulping and bleaching operations supports the removal of the associated TBELs.

As noted in Section 3.3.9.3 above, the proposed permit does not include the turbidity limits that are included in the current permit. The rationale for this is that the effluent no longer has a reasonable potential to exceed the turbidity standard due to new information related to the facility. First, as noted above, the pulping and bleaching operations at the mill have ceased and paper making operations have been significantly reduced. Second, a new outfall with a multiport diffuser was constructed within a different area of the receiving water. This new outfall, along with the significantly reduced effluent flows due to the curtailment of mill operations, has resulted in much higher dilutions at the edge of the mixing zone. The anti-backsliding regulations allow for exceptions when there is new information related to a facility and the applicability of existing limits. It is apparent that the new information, along with a finding that there is no reasonable potential to exceed the applicable standard, supports the removal of the current permit's turbidity limits.

Lastly, as noted in Section 3.3.3 above, the proposed permit does not contain the 2,3,7,8-TCDD limits that are included in the current permit. These limits were based on a TMDL wasteload allocation that applied specifically to the paper mill that was previously at the site. As noted above, the mill and – importantly – the bleaching and pulping portions of the mill, is no longer in operation and not part of this permit. The removal of this limit is therefore consistent with the applicable TMDL. Although antibackslіding provisions generally do not allow relaxation of effluent limits in renewal permits, section 303(d)(4)(A) of the Clean Water Act allows relaxation when the receiving water is not in attainment for the limiting or related pollutant, the effluent limit is consistent with any TMDL wasteload allocation, and it can be shown that relaxation is consistent with antidegradation requirements. As noted above, the receiving water is water quality limited, and the removal of the limit is consistent with the TMDL.

## 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. With the exception of the 2,3,7,8-TCDD mass load limits, the proposed permit contains the same or more stringent discharge loadings as the existing permit. Permit renewals with the same discharge loadings as the previous permit are not considered to lower water quality from the existing condition. For 2,3,7,8-TCDD, the removal of the limits is not expected to result in a lowering of water quality since the source of the pollutant (the bleaching and pulping operations of the mill) has been removed. Since no degradation of the receiving stream is likely to occur due to this action, no further anti-degradation review is required.

DEQ is not aware of any information that existing limits are not protective of 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

Whole effluent toxicity (WET) tests are used to determine the treated wastewater's aggregate toxic effect on aquatic organisms. Wastewater samples are collected, and aquatic organisms are subjected to a range of concentrations in controlled laboratory experiments. EPA recommends that WET tests be used in NPDES permits together with requirements based on chemical-specific water quality criteria.

WET tests are used to determine the percentage of effluent that produces an adverse effect on a group of test organisms. The measured effect may be fertilization, growth, reproduction, or survival. EPA's methodology includes both an acute test and a chronic test. An acute WET test is considered to show toxicity if adverse effects occur at effluent concentrations less than what is found at the edge of the zone of immediate dilution (ZID). A chronic WET test is considered to show toxicity if adverse effects occur at effluent concentration less than what is known to occur at the edge of the mixing zone.

## 3.7 Groundwater

The treatment facility does not have any basins, ponds or lagoons that have the potential to leach into the groundwater. No groundwater monitoring or limits are required.

# 4. Schedule A: Other Limitations

## 4.1 Mixing Zone

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

# 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 contains a new effluent limit for pH. The facility is unable to meet this limit upon permit issuance as the current facility does not have a pH adjustment system. The proposed permit contains a compliance schedule that allows time for the facility to make facility modifications in order to meet the new limits. This compliance schedule lays out a series of milestones which upon completion, will enable the permittee to meet the permit's water quality-based effluent limit for pH (see 40 CFR 122.47 and OAR 340-041-0061(12)).

The limits addressed in the schedule are more restrictive WQBELs than the TBELs in the current permit. As there is no pH adjustment system currently installed, it has been determined that the permittee will not be able to meet these limits at the permit's effective date. However, interim limits begin at the permit's effective date that are TBELs and are more restrictive than the limits in the current permit. DEQ has determined that the proposed compliance schedule requires the permittee to meet the final limits as soon as possible.

# 7. Schedule D: Special Conditions

The proposed permit contains the following special conditions:

## 7.1 Inflow and Infiltration

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

## 7.2 Mixing Zone Study

A requirement to submit an updated mixing zone study.

## 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 Wastewater Solids Annual Report

This condition requires the permittee to submit a Wastewater Solids Annual Report each year documenting removal of wastewater solids from the facility during the previous calendar year.

## 7.7 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.

## 7.8 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.

## 7.9 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.

## 7.10 Whole Effluent Toxicity Testing

The permittee is required to perform WET testing to ensure the aggregate of toxics is not negatively impacting aquatic life. This condition describes the test procedures and requirement for the WET testing. A dilution series has been specified on the basis of the mixing zone analysis.

## 7.11 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.

## 7.12 Outfall Inspection

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

## 7.13 Lagoon Leak Test

A condition that requires the permittee to conduct a lagoon leak test in accordance with DEQ guidance (Appendix C). 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 (Appendix D).

# 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: Thermal Plumes RPA

| Facility Name: St. Helens STP | | | Date: 4/12/23 |
|---|---|---|---|
| **OAR 340-041-0053(2)(d)(C): Thermal Shock** | | | |
| **25 deg C at 5% of the stream cross section** | | | |
| Enter data into white cells below: | | | Data Metric/Source |
| 7Q10 = | 85,346 | cfs | 2007 St. Helens MZ Study |
| Ambient Temperature= | 23 | ºC | DEQ AWQMS Database |
| Effluent Flow = | 11.4 | mgd | 2007 St. Helens MZ Study |
| Max Daily Effluent Temperature = | 30 | ºC | 2017-2022 DMRs |
| 5% of 7Q10 = | 4267.3 | cfs | |
| 5% dilution = | 243 | dilution = (Qr*0.05)/Qe + 1 | |
| **Temperature at 5% cross section =** | **23.0** | **ºC** | **No Reasonable Potential** |

| **OAR 340-041-0053(2)(d)(D): Migration Blockage** | | | |
|---|---|---|---|
| **21 deg C at 25% of the stream cross section** | | | |
| Enter data into white cells below: | | | Data Metric/Source |
| 7Q10 = | 85,346 | cfs | 2007 St. Helens MZ Study |
| Ambient Temperature = | 21 | ºC | DEQ AWQMS Database |
| Effluent Flow = | 11.4 | mgd | 2007 St. Helens MZ Study |
| Max 7dAM Effluent Temperature = | 27.4 | ºC | 2017 - 2022 DMRs |
| 25% of 7Q10 = | 21336.5 | cfs | |
| 25% dilution = | 1211 | dilution = (Qr*0.25)/Qe + 1 | |
| **Temperature at 25% cross section =** | **21.0** | **ºC** | |
| **ΔT at 25% Stream Flow=** | **0.0** | **ºC** | **No Reasonable Potential** |

# Appendix B: Comparison Between Current and Proposed Thermal Load Limits

The following is a conversion of the old limit, which is in units of MW and is relative to the criterion of 20°C, to the same units and relative temperature of the new limits (million kcal/day and 0°C, respectively). The conversion allows for a comparison between the old and new thermal load limits.

The existing limit is expressed in units of MW. To use this conversion tool, this limit first needs to be converted to units of million Kcals/day. The conversion factor is 1 MW = 20.64 million Kcals/day. So the existing limit of 71.2 MW is equalt to 1470 million Kcals/day. Both of these limits are relative to the criterion of 20°C. This is converted below to a limit relative to 0°C, the same as the limit in the proposed permit.

| Original Excess Thermal Load Limit Relative to 20°C | | | | | | |
|---|---|---|---|---|---|---|
| Original $T_a$ (°C)= | 20 | Original TLL= | 1470 | Million Kcals/day | Effluent Flow (MGD)= | 9.4 |
| Original Excess Thermal Load Limit Relative to 0°C, same as new limit | | | | | | |
| New Ta (°C)= | 0 | New TLL= | 2182 | Million Kcals/day | | |

$TTL_{new} = TTL_{original}$ + TL needed to bring effluent up to $T_{a, new}$

TL needed to bring effluent up to $T_{a, new} = [(T_{a, original} - T_{a, new}) * 3.78541 * Q_e]$

$$\mathbf{TTL_{new} = TTL_{original} + [(T_{a, original} - T_{a, new}) * 3.78541 * Q_e]}$$

Therefore, at the design flow of 9.4 mgd, the existing limit of 71.2 MW relative the criterion of 20°C) is equal to a limit of 2182 million Kcals/day (relative to 0°C, which is how the TMDL WLA is expressed). This current limit value is far greater than the limit of 1370 million Kcals/d that is in the proposed permit. This is true for all plausible lower effluent flows as well. While the new limit has a different averaging period that precludes a direct comparison with the existing limit, the new limit is almost certainly still more restrictive than the current limit considering the value of the old limit is almost 60% greater than the existing limit.

# Appendix C: Guidelines for Estimating Leakage from Existing Sewage Lagoons

## State of Oregon

## Department of Environmental Quality Guidelines

**Guidelines for Estimating Leakage from Existing Sewage Lagoons**



**PURPOSE AND SCOPE**

These guidelines provide for relatively inexpensive test equipment and procedures to be used for prioritizing problem lagoons used for treating domestic sewage. Such tests are not definitive. They should be considered preliminary and approximate.

Tests based on these guidelines can only indicate whether the seal on an existing lagoon probably remains intact, or approximately how much it may be leaking. Preliminary tests of this type are not suitable for sewage lagoons where there is a strong likelihood of contamination, or an immediate urgency to protect a priority aquifer.

**EXCLUSIONS**

Such preliminary testing is not suitable for various types of lagoons which may contain stronger wastes than sewage. For example, leak tests for sludge, septage, strong industrial wastes, and landfill leachate lagoons may warrant a higher level of accuracy. To attain greater accuracy entails considerable time and expense, requires more equipment to develop wind and temperature records, and involves calculations outside the scope of these guidelines.

Such accuracy is seldom warranted for sewage lagoons. In critical groundwater pollution situations, where lagoon seepage is a known concern, immediate installation of monitoring wells and a formal program of groundwater monitoring are normally warranted. In such situations, no program of leak testing is probably accurate enough to substitute for direct groundwater monitoring. Leak testing would only delay the definitive determinations that must be made.

## GENERAL APPROACH

The general objective of a leak test is to estimate the average rate of seepage through the bottom of the lagoon. Normally each lagoon cell is isolated and tested separately, which better pinpoints the location of any major leaks. The rate of seepage is expressed in inches per day or centimeters per second.

Leak testing should be restricted to July and August, when rainfall is minimal and the ground is dry enough to exclude significant runoff. Tests conducted at other times will have more variables and may underreport seepage due to runoff effects.

To obtain reasonable precision, each cell of a lagoon should be isolated and tested over a period of 10 - 15 days. Cell depth and pan evaporation measurements should be taken daily. If the lagoon cell cannot be isolated, then daily influent/effluent flows must also be measured. Daily measurements are preferred over weekly to improve precision and to minimize random measurement errors.

Lagoon liquid depth should suit the purpose of the test. To determine average seepage rates, lagoons should be at average operating depth.

In priority areas, any rate of seepage greater than zero may warrant direct sampling and monitoring of the groundwater. Seepage of 1/8" per day or less is normal. However, this low rate can cause groundwater contamination where lagoon contents are strong and background levels are high quality. Seepage exceeding 1/4" per day indicates a seal failure, or absence of adequate initial seal.

## EQUIPMENT REQUIREMENTS

Each cell of a lagoon needs to be equipped with a staff gauge for level measurements. Stilling wells to dampen wave action are recommended, and will allow a staff gauge to be read to 1/8" - 1/16". Precipitation can be measured to about 1/100" with a good rain gauge. Evaporation can be measured to roughly 1/1000" with a hook gauge.

The following specifications for rainfall and evaporation equipment are based on Weathertronics equipment manufactured by Qualimetrics, Inc. of Sacramento, and available in Oregon through International Reforestation Supply, Eugene (345-0597). Equivalent equipment is acceptable.

1. Rain Gauge. Qualimetrics Model 6330. This is a plastic gauge with 11" capacity and 0.01" graduations, designed for post mounting.

2. Evaporation Pan. Qualimetrics Model 6821. This is a standard US Weather Bureau steel pan, 47.5" diameter by 10" deep.

3. Hook Gauge. Qualimetrics Model 6831. This is a brass gauge with 0.02" graduations.

To obtain accurate measurements, the equipment needs to be set up level and plumb in an unsheltered area near the lagoon. Equipment may have to be fenced to exclude animals.

The above list is a minimum. Various equipment needed to attain higher levels of accuracy is not listed. For example:

- Recording anemometer

- Max/min thermometers for air, for the evaporation pan, and for the lagoon surface

- Upwind and downwind evaporation pans
- Barometric pressure

If such equipment is available, its use will add precision and accuracy to the results. However, its use is not mandatory for preliminary leak tests used to screen and prioritize existing sewage treatment lagoons.

**MEASUREMENTS AND CALCULATIONS**

Measurements should be made on a schedule, at the same time each day, so that each set of data represents the duration of exactly one day. All measurements should be tabulated to aid calculation and reporting. We recommend using the attached form or a similar format.

Computations should be converted to compatible units of depth. Influent volume (gallons per day) is converted to inches per day through measurement of the actual water surface area. Rainfall will normally be near zero in July and August, but should be verified daily.

Evaporation will vary with wind and temperature. It should be measured daily, and the pan should be kept well filled.

Lagoon evaporation rates are invariably less than pan evaporation rates. Pan correction factors generally vary from 0.7 to 0.9. The larger the lagoon, the more its evaporation rate lags behind pan evaporation, so the smaller the numerical value of the pan correction factor.

In hot and windy summer weather, evaporation can be substantial. An erroneous pan correction factor can inject significant error. The result of computing seepage rates without any correction for pan evaporation is to overcalculate the evaporation rate. The effect of this error would be to underreport the seepage rate.

**REPORT FORMAT**

Leakage reports should be short and to the point. The main conclusion is to estimate the seepage rate from each lagoon cell, and from the lagoon as a whole. The methodology and equipment need to be described briefly but thoroughly. A copy of all field measurements and calculations should be tabulated and attached as supporting documentation.

Reports should be certified and signed by a registered engineer or professional hydrologist.

**ANNUAL WATER BALANCE**

The annual water balance prepared for each lagoon requires determinations of both seepage and evaporation. Leak tests performed according to these guidelines at average liquid depth can establish an average rate of seepage for the water balance. The rate of seepage will tend to vary with liquid level, and will remain constant if the level stays constant.

For the purpose of making water balance calculations, a monthly average evaporation rate should be obtained from local climatological records. Such records may then be applied with a suitable pan correction factor between 0.7 and 0.9, as previously described.

Rate of evaporation and pan correction factors both tend to vary throughout the year. To make accurate adjustments requires additional measurements be taken of all the pertinent factors. These include wind, water

temperature, air temperature, and atmospheric pressure. Pan evaporation corrections should conform to established calculation methods, as presented in standard hydrology texts.

**NEW LAGOONS**

New sewage and sludge lagoons are designed to be effectively watertight and nearly leak-free. Lagoons which may jeopardize groundwater because of their contents, uses, or location are routinely installed with groundwater monitoring wells. In such applications, leak testing is not a practical or reliable alternative to direct monitoring of the groundwater.

All of the measurements in leak tests are approximations, especially liquid level, and the pan correction factor is usually a rough estimate. Consequently, seepage computed from a leak test cannot be used to prove or substantiate the existence of any actual leak. Leak testing as a basis for acceptance of lagoon construction is not feasible, too often has led to fruitless litigation, and should be discouraged.

As a practical matter, the engineer must design each lagoon for watertightness. Then the engineer must conduct thorough, intensive, and continuous construction inspection to verify that watertight construction is being attained. Inspection may include compaction, infiltrometer, smoke, and spark tests, and constant observation of workmanship and materials.

If leakage and contamination occurred from a properly inspected and certified lagoon, it would indicate a damaged liner or a failure of design. Assuming good design and inspection, the engineer's written certification of proper construction carries a presumption of watertightness. No leak testing program should be approved as a substitute for diligent construction inspection.

**INQUIRIES**

Inquiries about these guidelines should be directed to DEQ regional water-quality plan review engineers.

DSM:LAGOON2.TST

Orig. V.93

Rev1. VIII.94

**LAGOON LEAK TEST**

**CITY OF _____**

**CELL NO._____ WATER SURFACE AREA_____**

**CELL WATER DEPTH @ TEST START_____ @ TEST END_____**

| Date | INFLUENT (in/day) | +PRECIP (in/day) | -EVAP (in/day) | - EFFLUENT (in/day) | =NET SEEPAGE |
|---|---|---|---|---|---|
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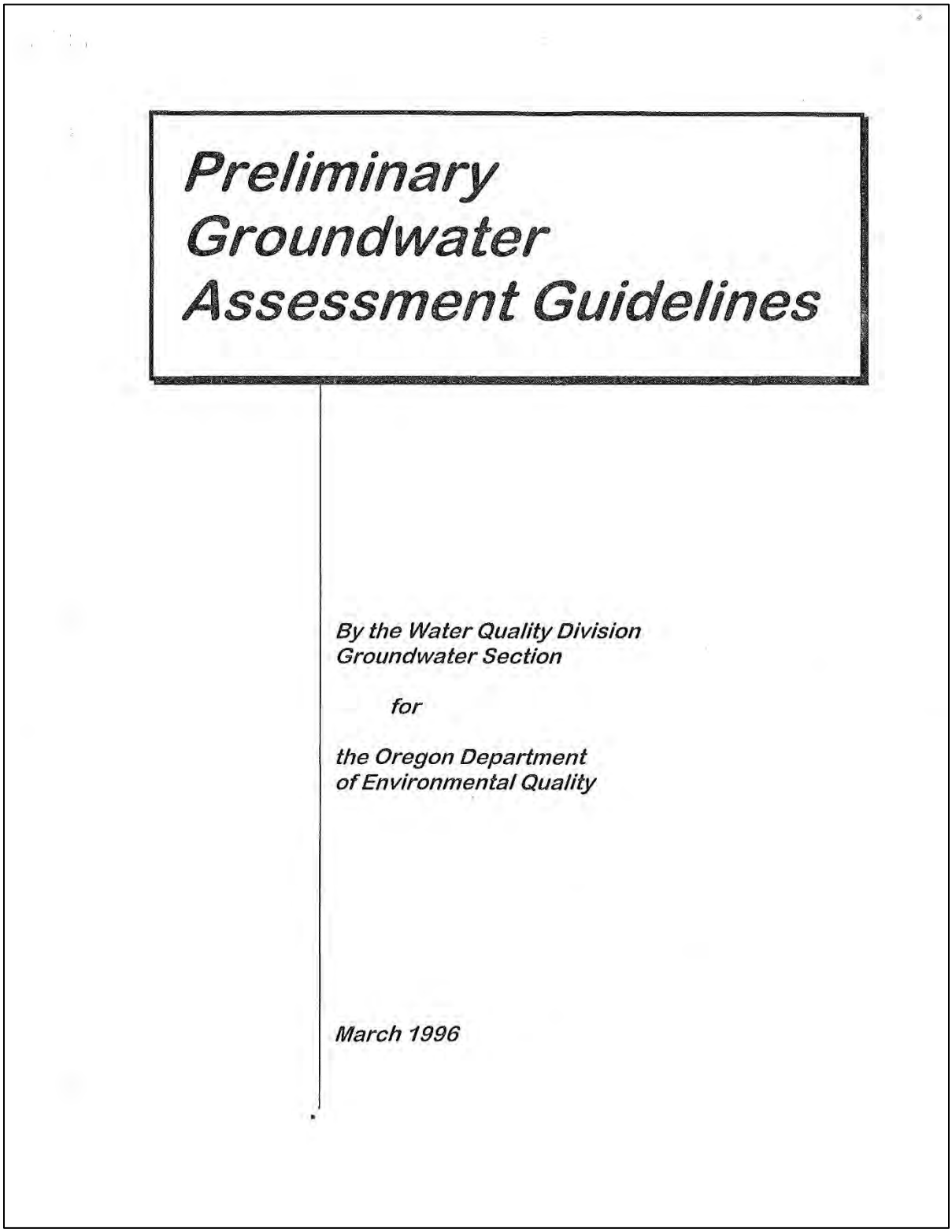
**NOTES:**

# Appendix D: Preliminary Groundwater Assessment Guidelines



Preliminary
Groundwater
Assessment Guidelines

By the Water Quality Division
Groundwater Section

for

the Oregon Department
of Environmental Quality

March 1996

## *Table of Contents*

# Preliminary Groundwater Assessment Guidelines

## Introduction

Successful protection of Oregon's groundwater depends upon an adequate evaluation of potential contamination by permitted facilities. This evaluation is based on review of appropriate technical information and reports [OAR 340-40-030(2)] submitted by the facility. Although some point source activities are clearly recognized as having a high potential to impact groundwater, the potential impacts from other activities may not be as clear. In these cases, the DEQ has chosen to allow a phased approach in which the facility first provides available/easily obtainable information. This information is called a Preliminary Groundwater Assessment Report and is the subject of these guidelines. Based on this information, the Department will determine if a Hydrogeologic Characterization will be required. A Hydrogeologic Characterization requires the collection of site-specific information and involves a more detailed evaluation of site conditions and potential impacts. Requirements for Hydrogeologic Characterizations are discussed in the guidance document titled - Hydrogeologic Characterization Part B: Guidelines.

The purpose of these guidelines is to offer a standardized approach for the submittal of a Preliminary Groundwater Assessment (PGA) in order to minimize costs and to ensure that needed information is received. It is the Department's intent that the information required in a PGA can be easily and relatively quickly obtained from published sources, public records, previous investigations, etc. It is not intended that the PGA require extensive site-specific data collection, calculations, or modeling. In some instances, however, minimal data collection may be required (e.g. a wastewater analysis or the collection of water level data in existing wells).

DEQ recommends that reports follow the format outlined in these guidelines. The reporting format should be modified, expanded, or shortened, as appropriate, to ensure that the reports are more readable and understandable. Having reports written in a consistent format will allow DEQ groundwater specialists and hydrogeologists to more easily and quickly evaluate the information presented. Consultants can also use the format to assess whether their report includes the information needed by DEQ.

This guidance has been developed by and for DEQ's Water Quality Groundwater Point Source Program. Other DEQ programs may have different requirements.

All reports involving the collection and interpretation of geologic and hydrogeologic information should be prepared and signed by an Oregon Registered Professional Geologist, Registered Professional Engineer, or Certified Engineering Geologist qualified by training and/or experience to work on hydrogeologic investigations. That geologist or engineer is expected to have directed the study and to have visited the site.

## *Definitions:*

"Contaminant" - dredged spoil, solid waste, incinerator residue, sewage, garbage, sewerage sludge, munitions, chemical wastes, biological materials, radioactive materials, heat, wrecked or discarded equipment, rock, sand, cellar dirt, and industrial, municipal, and agricultural waste discharged to water, and includes any pollutant or other characteristic element which may result in pollution of the waters of the State (OAR 340-40-010).

"Point Source" - any confined or discrete source of pollution where contaminants can either enter into - or be conveyed by the movement of water to - public waters (OAR 340-40-010).

"Pollution" - such alteration of the physical, chemical or biological properties of any water of the state, including change in temperature, taste, color, turbidity, silt or odor of the waters, or such discharge of any liquid, gaseous, solid, radioactive or other substance into any water of the state, which will or tends to, either by itself or in connection with any other substance, create a public nuisance or which will or tends to render such water harmful, detrimental or injurious to public health, safety or welfare, or to domestic, commercial, industrial, agricultural, recreational or other legitimate beneficial uses or to livestock, wildlife, fish or other aquatic life or the habitat thereof (OAR 340-40-010).

"Uppermost Aquifer" - the geologic formation, group of formations, or part of a formation that contains the uppermost potentiometric surface capable of yielding water to wells or springs, and may include fill material that is saturated (OAR 340-40-010).

"Wastes" - sewage, industrial wastes, and all other liquid, gaseous, solid, radioactive, or other substances which will or may cause pollution or tend to cause pollution of any water of the state (OAR 340-40-010).

# Chapter 1
# Facility Characterization

A comprehensive description of the facility is needed to fully understand the potential impacts to groundwater quality. Past and present uses of the facility, including storage and handling practices, are important to identify potential soil or groundwater contamination from previous activities. This information will help to avoid exacerbation of existing conditions by new wastewater discharges.

## 1.1 Facility Description and Location

Describe the facility, including the type of facility and how long the facility has been in operation.

Provide a written description of the location of the disposal/storage facility with respect to identifiable landmarks, and site access routes from the nearest US or State Highway. The description of the location of the waste disposal/storage site(s) should include: County; Section, Township, Range (to 1/4 1/4 1/4 Section); and latitude and longitude.

Provide maps as needed to describe the facility's location and property boundaries.

## 1.2 Land Use

General land use practices can have a direct influence on the underlying groundwater quality. Provide a discussion of and a map indicating land use within 1/2 mile of the boundaries of the site.

## 1.3 Wastes and Materials Treatment, Disposal and Storage

List the types and quantities of wastes and materials to be disposed of or stored at the facility. Provide a process flow diagram for the facility (if available) to identify the waste stream generation points and handling procedures. Also, provide a discussion of past waste disposal or storage practices.

Discuss the location, type, and dimensions of each waste or material storage area including lagoons, solids storage, etc. All historical and proposed waste or material storage areas should be identified on a site map. Provide a discussion of waste solids handling and management.

Indicate the historical and proposed types of waste discharges from the facility. This should include land application, drain fields, wetlands, seepage from storage impoundments, leaching from storage areas, etc.

Discuss the location and dimensions of each waste or wastewater disposal area at the site including ponds, lagoons, drain fields, irrigation sites, etc. All present and past waste disposal areas should be identified on a site map.

## *1.4 Wastewater Discharge Rates and Frequencies*

Discuss current or proposed wastewater discharge rates and frequencies to ponds, lagoons, drain fields, irrigation areas, etc. Discuss past wastewater disposal rates and frequencies.

Discuss seepage rates through lined or unlined ponds, lagoons, wetlands, etc.

# Chapter 2
# Waste Characterization

The character and strength of a facility's waste stream is used in evaluating the potential threat to groundwater quality.

## 2.1 Chemicals and Materials

Many substances used by facilities may intentionally or inadvertently enter its waste stream.

List and identify the chemical composition of the chemicals and materials, including those previously used and those proposed for use in the facility's processes, maintenance, cleaning, etc. Identify the quantities and uses of the chemicals and materials. Provide Material Safety Data Sheets, where available.

## 2.2 Characterization of Wastes and Wastewater

The quality of a facility's wastewater can directly affect groundwater quality.

Provide an analysis and a discussion of the chemical characteristics of the existing and proposed wastewater stream(s).

Discuss sampling parameters, methods, locations, and frequencies used in the characterization of the wastewater.

If wastewater is not available for analysis provide an evaluation of potential wastewater characteristics based on bench or pilot tests, analyses from comparable facilities, calculations, etc. Indicate how the predicted wastewater characteristics were determined.

## 2.3 Characterization of Solids

The facility's solid waste stream(s) may also have an effect on the underlying groundwater quality.

Discuss the quantities and characteristics of waste solids or materials historically stockpiled or stored and those proposed to be stockpiled or stored at the site. Discuss the leaching potential of the materials. If a material produces a leachate, estimate the volume and characteristics of the leachate.

Discuss sampling parameters, methods, locations, and frequencies used in the characterization of the solids.

# Chapter 3
# Site Characterization

Groundwater quality and movement are directly related to a variety of site factors including topography, climate, hydrology, geology, and hydrogeology. Potential impacts to groundwater quality need to be considered with the local setting.

## 3.1 Topography

Shallow groundwater movement may closely mirror surface water flow and the slope of the land surface.

Provide a general discussion of the topography of the site and the area adjacent to the site. Provide a site map indicating the topography of the site and an area within at least 1/4 mile of the site, if available.

## 3.2 Climate

Rainfall recharges shallow aquifers and affects the quality of the shallow groundwater.

Provide a general discussion of the climate of the area.

## 3.3 Groundwater and Surface Water Use in the Vicinity

By understanding where and how water is used we can gain a clearer picture of local groundwater movement and identify vulnerable receptors of contaminated groundwater.

Provide an inventory of water wells and surface water diversion points on site and within a 1/2 mile radius of the site boundary. The inventory should identify, to the extent practicable, all active and inactive water wells, irrigation wells, and surface water diversion points. At a minimum, the driller's log files and other records of the Oregon Water Resources Department (OWRD) should be reviewed to identify wells and water diversion points within the area of investigation. Additionally, a door-to-door field survey should be made to identify wells in the area for which logs may not be on file with the OWRD or for which location information is not adequate. The following if possible: name and address of current well owner, driller's name and affiliation, date drilled, well location, aquifer,

land surface elevation, depth of well, material and construction, use of well, static and pumping water levels and dates of measurement, and available water quality data. Provide tables indicating the wells and surface water diversion points, their proximity, type of use, withdrawal rates, etc. Wells and surface water usage points should be shown on an area map indicating the facility's property boundaries. Well logs should be provided, where available, and referenced to the location map and the table.

Indicate if the site is located within a well head protection area; the recharge zone of a principal or primary water supply aquifer; or within the zone of influence of a public water supply well or well field at maximum pumping rate(s).

## 3.4 Soil Characterization

Soil is a very important link between the surface and subsurface; and between activities above ground and the quality and quantity of groundwater below ground.

Based on existing information and previous investigations provide a general discussion of soils within the site boundaries including soil type, soil texture, vertical and horizontal distribution of soils. All sources of information used in the discussion of soils should be cited in the reference section.

## 3.5 Geologic Characterization

Groundwater's occurrence, movement and natural quality are directly related to the geologic environment. Geology can also affect the groundwater's vulnerability to contamination.

### *3.5.1 Regional Geology*

Describe regional geology based on existing publications and reports, public records, and from previous investigations. Geologic studies may have been conducted by DEQ, the United States Geologic Society, the Oregon Water Resources Department, or through a university or independent research. The discussion of regional geology should include the age, areal and subsurface distribution, thickness, physical description and genesis of major lithologic units; and the age, occurrence, orientation and physical description of major structural features.

*3.5.2 Local Geology*

Characterize the local site-specific geology based on publications reports, public records, existing site-specific information, etc. Sources for site-specific information may include previous geologic borings, test pits, well logs, etc. The discussion should include, but should not necessarily be limited to, identification of the horizontal and vertical extent of subsurface materials, the types of materials, structural features, and the geological influences that may control groundwater flow (such as high permeability zones, fractures, fault zones, buried stream deposits, etc.).

If existing information includes previously collected site-specific geologic data, then the following should be included in the report, where available:

- a description of previous surface geologic investigations;
- a description of previous subsurface investigations including
  - number, location, and depth of borings and test pits;
  - the drilling and soil/rock sampling methods used to collect soil and rock samples;
  - the procedures and methods used to characterize the soil and rock material samples obtained from the boring and tests pits (e.g. grain-size analysis, etc.)
- a discussion of supplementary techniques such as geophysics, cone penetrometer investigation, aerial imagery, etc. used in previous investigations at the site.

The following supporting information should be included in the report, if available:

Copies of existing boring/geologic logs. Logs should include existing results from laboratory analysis, field identifications, descriptive text, and graphical display.

Results and appropriate tables and graphs resulting from previous field or laboratory testing of geologic materials.

A map showing the locations of existing borings, trenches and other sampling locations.

A map indicating the surficial geology of the site.

Cross-sections and/or fence diagrams constructed from existing information that depict the geology of the site. The cross-sections or fence diagrams should be referenced to a site map.

All sources of information used in characterizing the regional and local geology should be cited in the reference section.

## 3.6 Hydrogeologic Characterization

Groundwater movement is dynamic and complex. It is affected by geologic structure and the type of material through which the water flows. How contaminants reach groundwater and move in it is equally complex. Hydrogeologic data and information are basic to understanding the potential for groundwater quality impacts.

### *3.6.1 Regional Hydrogeology*

The regional hydrogeology should be described based on existing information. These information sources might include publications, reports, public records, previous investigations, etc. The description should include the depth, thickness, physical characteristics, and lateral persistence of major and minor aquifers and aquitards; rates and directions of groundwater flow; areas of recharge and discharge (including water wells); hydrologic boundaries; seasonal variations in groundwater levels and flow; and chemical quality of the groundwater.

### *3.6.2 Local Hydrogeology*

Provide a discussion of site-specific hydrogeology based on existing information. If sufficient information is available, the discussion should include depth to groundwater; depth, thickness, lateral and vertical extent of aquifers and confining layers; presence of perched aquifers; groundwater levels and gradients; groundwater flow directions and fluctuations; groundwater flow rates; inter-connection between aquifers and between groundwater and surface water; groundwater quality; and human-induced influences.

If existing information includes the previous collection of site-specific hydrogeologic data, then the following should be included in the report, where available:

- number, location, and depth of previous borings and existing monitoring wells or piezometers;
- information on existing well and piezometer construction and development;
- the methods and equipment previously used to define the saturated zones, gradients, groundwater flow directions, etc.;
- the field and laboratory methods and tests used to define aquifer properties (e.g., laboratory permeability testing, slug tests, aquifer tests, etc.);
- a description of indirect methods used, such as geophysics; and

- Formulas used for calculations (e.g., calculations of groundwater flow velocities) should be cited.

The following information should be provided in the report where possible:

Logs from existing supply wells, monitoring wells, piezometers, and geologic borings should be provided. Logs should include results of laboratory analysis, field identifications, descriptive text, and graphic display, if available. In addition, logs for any water supply wells within 1/2 mile of the site should also be provided.

A map showing the locations of wells, borings, etc.

Existing data from previous in-situ hydraulic tests and a discussion of the methods used, if known.

A table listing the elevations, depths and screened/open intervals for the existing wells and piezometers.

Water level measurements in appropriate surface water bodies and existing wells and piezometers. This may require the collection of data. The measurements should be referenced to common datum, if possible. The dates of the measurements should be indicated.

If sufficient water level data can be collected on or near the site then contour map(s) of the potentiometric surface(s) of the aquifer(s) present at the site should be presented. Surface water level data should be incorporated into the contour map, when appropriate. The contour map(s) should indicate the measuring points, water level values, and measurement date(s). Contour lines within the actual area represented by the data should be represented with a solid line. Any interpretation outside the field data should be represented with a dotted or dashed line. Flow directions also should be indicated on the contour maps. The water level measurements dates should be indicated on the map.

If sufficient information is available, provide cross-sections that depict the hydrogeologic environment at the site. Reference the cross-section(s) orientations on a location map.

All sources of information used in characterizing the regional and local hydrogeology should be cited in the reference section.

### *3.6.3 Groundwater Quality*

Based on existing information provide a discussion of the existing water quality at or near the site. Discuss sampling methods and analytical methods, if known, and provide laboratory reporting sheets, if available.

Describe any existing groundwater monitoring programs at the facility. Indicate if the facility is located in a Groundwater Management Area and identify the parameter(s) of concern.

## *3.7 Surface Hydrologic Characterization*

Groundwater and surface water are interconnected in the hydrologic cycle. Consideration of groundwater's impacts on surface water bodies (and vice versa) provides a holistic evaluation of a facility's potential impacts on general water quality.

Describe any surface water bodies including seeps, springs, wetlands, ponds, lakes, rivers, streams, or other surface water features on-site or within a 1/2 mile radius of the facility. The locations of surface water bodies should be shown on the site map or the location map, whichever is appropriate. Indicate surface water elevations, if known.

Describe the site's surface water drainage conditions and susceptibility to flooding.

Provide a discussion of existing surface water quality data at or near the site. Discuss sampling and analytical methods if available. Provide laboratory water quality data sheets, if available.

Identify streams/water bodies classified as "water quality limited". Identify parameters of concern.

## *Chapter 4*
## *Evaluation of Potential Water Quality Impacts*

The need to monitor groundwater, establish regulatory limits and/or conduct other activities aimed at protecting groundwater quality is linked to a facility's potential impacts on water quality.

Based on the information discussed above, provide any appropriate conclusions on the potential for water quality impacts from the facility.

# Supporting Information

## References

Provide references for publication(s) and other information sources used in the preparation of this report.

## Figures, Tables, and Maps

Provide figures, tables and maps as needed to support and clarify the information presented in the text of the report.

Provide a series of maps to describe the facility location, site conditions, sampling locations, land use, etc. All maps should have a north arrow, bar scale, a drawing date and an explanation of all map symbols.

- *Location Maps.*

Submit a map or a series of maps showing the disposal/storage facility and the area within at least a three mile radius of the site boundary. Provide two USGS 7.5 min. (1:24,000) topographic maps. If 7.5 min. maps are not available, then provide two enlargements of 15 min. (1:62,500) USGS topographic maps. One of the maps should indicate land ownership and use adjacent to the site. The other map should indicate the following information: site boundaries, an area at least three miles around site boundary, locations of all wells within 1/2 mile of wastewater disposal site, surface water bodies, etc.

- *Site Maps*

Provide a series of site maps of an appropriate scale (scale of 1 inch = 200 feet recommended) to show the following information:

1. buildings, other structures, and property lines
2. topography of the site and an area within at least 1/4 mile of the site, if available
3. locations of wells, borings, or sampling points
4. location of the 100-year flood plain
5. surface water bodies (seeps, springs, streams, ponds and wetlands), drainage ditches, etc.

6. all active and closed wastewater disposal / storage / application sites and
7. all material storage areas

Provide other maps as necessary to describe soils, geology, hydrogeology, land use, etc.

## *Appendices*

Provide appendices as needed to include such items as well logs, laboratory reports, MSDS sheets, calculations, etc.

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