National Pollutant Discharge Elimination System
Permit Renewal Fact Sheet
Clean Water Services

State of Oregon
Department of Environmental Quality

Final: December 8, 2022

Permittee	Clean Water Services 2550 SW Hillsboro Highway Hillsboro, OR 97123
Existing Permit Information[1]	**File Numbers:** 90735 (Durham WRRF), 90745 (Forest Grove WRRF), 90752 (Hillsboro WRRF), 90770 (Rock Creek WRRF), and 108014 (MS4) **Permit Numbers:** 101141 (Durham WRRF), 101142 (Forest Grove WRRF), 101143 (Hillsboro WRRF), 101144 (Rock Creek WRRF), and 101309 (MS4) **EPA Reference Numbers**: OR0028118 (Durham WRRF), OR0020168 (Forest Grove WRRF), OR0023345 (Hillsboro WRRF), OR0029777 (Rock Creek WRRF) and ORS108014 (MS4) Category: NPDES Domestic C2a; NPDES-DOM-MS4-1 Expiration Date: May 31, 2021
Permittee Contact	Robert P. Baumgartner Director of Regulatory Affairs 503-681-4464 2550 SW Hillsboro Highway Hillsboro, Oregon 97213
Receiving Water Information	Water Body Name: Tualatin River River Miles: 9.2, 37.7, 43.3, 42.9 and 53.8 Assessment Unit ID: 1226500453377 Sub Basin Name: Tualatin Basin Name: Willamette
Proposed Action	Permit Renewals Application Numbers: 950670 (Hillsboro WRRF), 950671 (Forest Grove WRRF), 950672 (Durham WRRF), 950673 (Rock Creek WRRF) and 991575 (MS4) Date Applications Received: December 1, 2020
Permit Writer	Mark W. Hynson 503-229-5295 Date Prepared: December 5, 2022

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1. Introduction

The Oregon Department of Environmental Quality (DEQ) proposes to renew the watershed-based National Pollutant Discharge Elimination System (NPDES) wastewater permit for Clean Water Services (CWS). Clean Water Services is a county service district that provides wastewater treatment, stormwater management, and watershed management to more than 600,000 customers primarily in the urban portion of Washington County. This permit covers four water resources recovery facilities (or wastewater treatment facilities) operated by CWS that discharge to the Tualatin River. The facilities include the Durham Water Resources Recovery Facility (WRRF), the Rock Creek WRRF, the Hillsboro WRRF and the Forest Grove WRRF. This permit allows and regulates the discharge of treated domestic, commercial and industrial wastewater from the four facilities to the Tualatin River. The permit also authorizes discharge of stormwater from the urban areas of the Tualatin River watershed to the Tualatin River and its tributaries – this is commonly referred to as a Municipal Separate Storm Sewer System (MS4) permit. In addition, the permit authorizes CWS to recycle the treated effluent as irrigation water, to land apply Class B biosolids produced by its treatment facilities on farmlands, and to engage in water quality trading to meet permit limits.

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 Limits
Schedule B – Minimum Monitoring and Reporting Requirements
Schedule C – Compliance Schedule
Schedule D – Special Conditions
Schedule E – Pretreatment Activities
Schedule F – General Conditions

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

- Schedule A (Waste Discharge Limits) – This schedule has been updated to reflect current DEQ permit format and to provide clarity on the effluent limits. Requirements related to the permittee's Mercury Minimization Plan and MS4 permit have also been updated. All of these changes to Schedule A of the permit are discussed in Sections 3 and 4 of this Permit Fact Sheet.

- Schedule B (Minimum Monitoring and Reporting Requirements) – General monitoring and reporting requirements are listed in tabular format for additional clarity and include summary statistics to be consistent with web-based electronic Net Discharge Monitoring Reports (NetDMR). The frequency of influent and effluent monitoring for several pollutant parameters has been reduced at all facilities consistent with federal guidance. Monitoring for copper and aluminum to support future water-quality based modeling has been added to the permit. Updates to the MS4 stormwater monitoring program have also been added. For a detailed discussion, refer to Section 5.

- Schedule C (Compliance Schedule) – There is no compliance schedule included in the proposed permit.

- Schedule D (Special Conditions) – New conditions requiring CWS to submit an annual Hauled Waste Annual Report and conduct an updated mixing zone study for each facility has been added to Schedule D. The condition for water quality trading has also been revised for clarity and to remove the requirement for credit retirement. For a more detailed discussion, see Section 7.

- Schedule E (Pretreatment Activities) – Includes all current permit requirements related to pre-treatment program implementation.

- Schedule F (General Conditions) – Includes the latest version of the NPDES General Conditions.

2. Facility Descriptions

Clean Water Services is a county service district with 12 co-implementer cities that serves more than 600,000 customers located primarily within the urban portion of Washington County just west of the City of Portland. CWS owns and operates four water resources recovery facilities (or wastewater treatment facilities) that are designed to treat combined dry weather flows of up to 78.4 million gallons per day (MGD). In addition, CWS implements stormwater management for the urban area of Washington County that includes the Cities of Banks, Beaverton, Cornelius, Durham, Forest Grove, Hillsboro, King City, North Plains, Sherwood, Tigard and Tualatin.

The four water resources recovery facilities operated by CWS include the Durham Water Resources Recovery Facility (WRRF) which discharges into the Tualatin River at River Mile (RM) 9.2, the Rock Creek WRRF discharging at RM 37.7, the Hillsboro WRRF with discharges at RMs 42.9 and 43.3 and the Forest Grove WRRF discharging at RM 53.8. In previous versions of the NPDES permit issued in 2016 and 2005, and CWS's 2020 NPDES permit application, the facilities were referred to as wastewater treatment facilities (or WWTFs) in their common names. CWS recently changed the common name designation to Water Resources Recovery Facility (WRRF). The locations of these facilities within Washington County are shown in Figure 2-1.

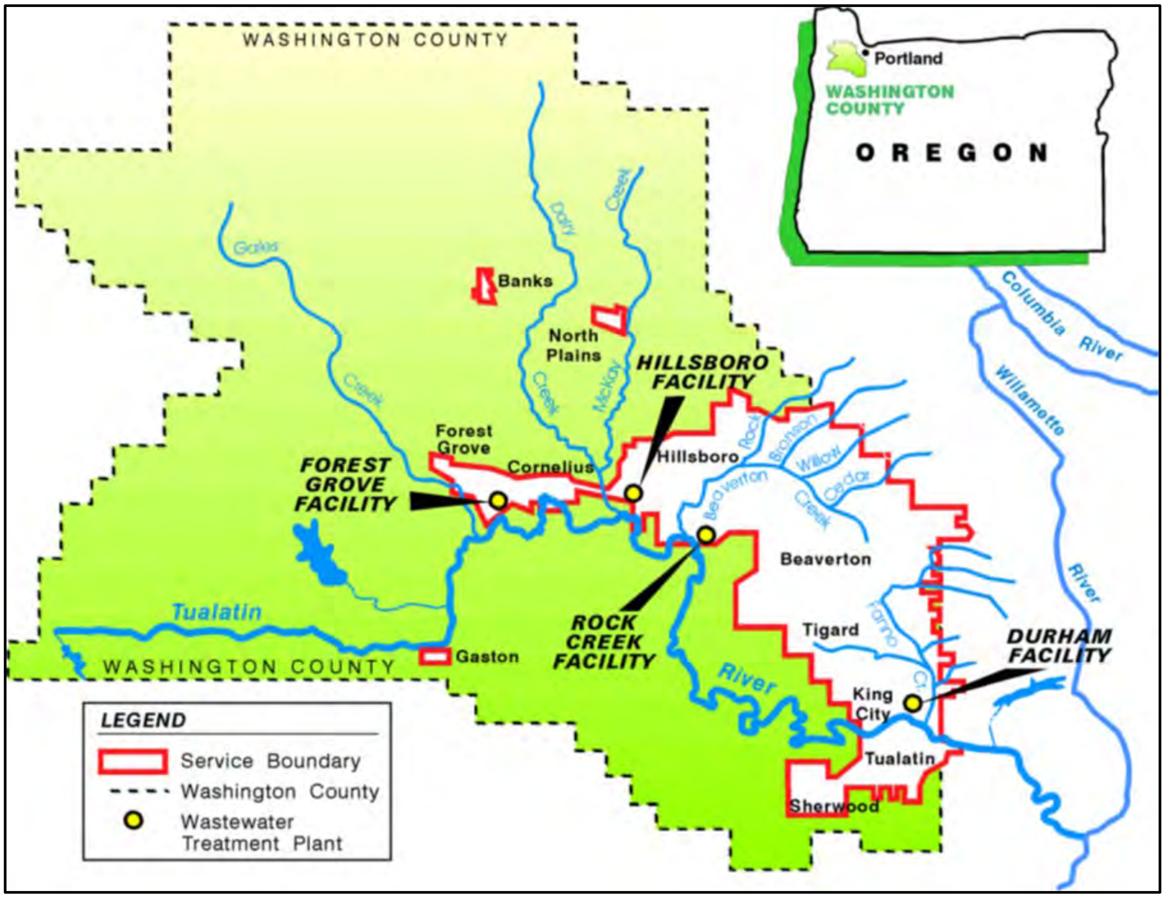

Figure 2-1: Clean Water Service Facility Locations

A description of the principal elements of each facility is presented in the following sections. A contoured aerial photograph and general flow schematic of each plant are presented in Appendix A and B, respectively.

2.1 Wastewater Facilities Descriptions

2.1.1 Durham WRRF

The Durham WRRF, located at 16580 SW 85th Avenue in Tigard, is one of the more advanced treatment systems in the country and provides preliminary screening, primary, secondary, and tertiary wastewater treatment while processing biosolids for beneficial land application (Figure 2-2). The Durham WRRF serves approximately 212,250 customers[1] and is designed to treat an average dry season flow of 25.7 MGD (projected for 2025 conditions) and a daily wet weather peak hydraulic loading of 86.0 MGD. Flow consists of 97 percent domestic and 3 percent industrial.

[1] Clean Water Services Watershed-based NPDES Permit Renewal Application. Section 2: Durham WRRF Permit Renewal Applications. Form 2A and NPDES-R. December 2020.

Preliminary Treatment – Raw sewage enters the Durham WRRF via three interceptor pipes into the influent pump station where flow is pumped and measured through magnetic meters in route to the headworks building. The Durham facility also has a septage receiving station that discharges directly into the raw sewage pump station. The septage consists primarily of pumping from septic tanks, some holding tanks and chemical toilets; there is a separate receiving station for recreational vehicle waste. Annual septage receiving represents less than 0.03% of the plant flow. These wastes are incorporated into the influent flow through on-site receiving stations.

The Durham WRRF also has a receiving station for fats, oils and grease (FOG) delivered from food service establishments for disposal. The receiving station is able to receive and process an estimated 14,000 gallons of FOG per day and generates an estimated 6-million-kilowatt hours (kWh) of energy per year. CWS uses the FOG as a feedstock in the anaerobic digester process.

In the headworks building, the combined influent wastewater flows by gravity through mechanical bar screens with washer compactor units that remove, clean and compact fibrous material and garbage for landfill disposal. The incoming flow passes through grit basins where heavier inorganic material settles and is pumped to grit removal units where it will be prepared for landfill disposal.

Primary treatment – After grit removal is complete, the flow is equally split at the headworks influent structure and fed to four primary clarifiers. In the clarifiers, settleable organics and floatable fats, oils and greases are separated from the wastewater. Primary effluent then enters a primary effluent pump station that directs flow to the available activated sludge system within the facility. Sludge from the primary treatment process is pumped to fermentation and thickening tanks for further processing and removal of solids.

Secondary treatment - The Durham WRRF has five secondary treatment systems, each consisting of an aeration basin and secondary clarifier. The basins and clarifiers facilitate the removal of dissolved organic matter through an activated sludge process that uses bacteria to consume the organic matter. Each aeration basin has been designed to perform biological nutrient removal (BNR) to facilitate the removal of ammonia and phosphorus. Hydrated lime is added to the aeration basins to maintain pH during ammonia removal. In the secondary clarifiers, bacteria flocculate, settle and are collected as activated sludge. A portion of the activated sludge is pumped back to the front of the aeration basins to maintain bacteria levels (referred to as return activated sludge), and a portion is pumped to the solids thickening process (waste activated sludge). The secondary clarifier effluent flows by gravity to tertiary treatment.

Tertiary treatment – The tertiary treatment process is used to remove the total suspended solids and phosphorus that passed through secondary treatment. Phosphorus removal treatment units are operated seasonally (May – October). Although CWS is increasingly moving towards biological removal of phosphorus, the secondary effluent does receive some chemical treatment with alum and polymer to achieve permitted summer discharge limits for phosphorus.

Disinfection - From the tertiary treatment system, the effluent is directed though serpentine contact basins and is disinfected with sodium hypochlorite. The disinfected water is conveyed through multimedia gravity filters that utilize a bed of anthracite coal, silica sand and some garnet sand to provide further solids removal. The filtered effluent is then dechlorinated with sodium bisulfite before discharge from the facility.

Recycled Water – The facility produces Class A recycled water for seasonal irrigation on nearby park lands, athletic fields, and farmlands. Additional chlorine and required monitoring occur during the filtration step described above for final effluent to comply with Class A recycled water production. The treated Class A recycled water is stored in an onsite wet well with a volume of 0.57 million gallons (MG), then distributed to users for irrigation.

Anaerobic Digestion – The facility employs anaerobic digestion to treat the thickened primary sludge, thickened waste activated sludge and FOG. This organic matter is converted into methane, carbon dioxide and water, and to further reduce sludge mass. The sludge is mixed, heated and dosed with ferric chloride to control hydrogen sulfide in the digester gas, which is used in the facility's generators and boilers to provide heat and power throughout the facility. Solids stay in the active anaerobic digesters at about 100°F for about 25 days. The digested biosolids are then dewatered by two decanting centrifuges to 21-25% solids before being loaded onto trucks for land application on nearby farmlands.

Fertilizer Production – The liquids from the dewatering and waste activated sludge thickening processes are directed to an on-site fertilizer production facility where mineral struvite (magnesium ammonium phosphate) is precipitated in a controlled reactor. The removal of the struvite results in the production of a commercial-grade slow-release fertilizer that is sold by CWS.

Source: Google Earth, 2021

Figure 2-2: Aerial View of Durham WRRF

2.1.2 Rock Creek WRRF

The Rock Creek WRRF, located at 3235 SE River Road in Hillsboro, has a service population of approximately 326,488[2]. It is also an advanced treatment system and provides preliminary screening, primary, secondary and tertiary treatment along with biosolids processing for beneficial land application (Figure 2-3). This facility is designed to treat an average dry season flow of 52.7 MGD (projected for 2025 conditions and with no discharge from the Hillsboro and Forest Grove WRRFs) and a daily maximum wet weather flow of 126 MGD. Influent flow is comprised of 83.3 percent domestic and 16.7 percent industrial.

The Rock Creek facility is connected to the Hillsboro and Forest Grove WRRFs by two 24-inch diameter pipelines. Solids are conveyed year-round from the Hillsboro and Forest Grove facilities to the Rock Creek facility for treatment. In the dry summer season (May-October), flow from the Hillsboro and Forest Grove facilities may be conveyed to and treated at the Rock Creek facility. In the winter wet season (November – April), flows exceeding the capacities at Hillsboro and Forest Grove are conveyed to and treated at the Rock Creek WRRF.

[2] Clean Water Services Watershed-based NPDES Permit Renewal Application. Section 3: Rock Creek WRRF Permit Renewal Applications. Form 2A and NPDES-R. December 2020.

Preliminary Treatment – The majority of influent flow to the Rock Creek WRRF enters the facility by gravity in a 72-inch diameter pipe at the influent pumping station located approximately 60 feet below grade. From there, the untreated flow is pumped to the headworks building. Additional raw sewage enters the headworks building directly by force main from three remote pump stations and the Hillsboro and/or Forest Grove WRRFs.

Influent quality at the Rock Creek WRRF is monitored at the headworks building after the raw sewage passes the bar screens. This location allows influent characterization monitoring of all flows received by the headworks from the influent pump station, remote pump station(s), and transfer flows from the Hillsboro and/or Forest Grove WRRFs.

Influent flow is calculated by using the primary clarifier influent flow meters located downstream of bar screens. At this location, the flows to the facility's five primary clarifiers also includes recycled flows from solids processing and filter backwash. The facility's overall influent flow is then calculated based upon the sum of flows measured at the primary clarifiers minus the recycle flows for solids processing and filter backwash.

The Rock Creek WRRF has a septage receiving station that discharges directly into the raw sewage pump station. The septage consists primarily of hauled septic waste from septic tanks, some holding tanks and chemical toilets and recreational vehicle waste. Annual septage receiving represents less than 0.005% of the plant flow.

After the influent pump station, raw sewage flow is directed to the headworks building for preliminary screening. In the headworks building, influent is conveyed by gravity through four mechanical bar screens with a washer compactor process that removes, cleans and compacts fibrous material and garbage for landfill disposal.

Primary Treatment - From the headworks building, the screened flow is then directed by gravity to one or more of five primary clarifiers where settable organic and inorganic particles (grit) are separated from wastewater. Aluminum sulfate is added to the primary clarifiers for phosphorus removal on a seasonal basis (May-September). Primary effluent flows by gravity to two pump stations for distribution to secondary treatment.

Sludge from the primary treatment process is pumped to vortex grit removal units which separate, wash, and dry the heavier inorganic material that is then landfilled. The de-gritted primary sludge is then processed to remove remaining fine fibrous material and is then sent by gravity to fermentation and thickening tanks. The thickened sludge is then pumped to the anaerobic digestion system.

Secondary Treatment - In secondary treatment, the primary effluent flow can be sent to either of two secondary treatment systems consisting of aeration basins and secondary clarifiers designed to perform BNR to facilitate the removal of ammonia and phosphorus (referred to as the west-side or east-side systems). The west-side system consists of two diffused air aeration basins followed by six secondary clarifiers while the east-side system consists of four diffused air aeration basins followed by four secondary clarifiers. The east-side secondary effluent flows through ten mono-media gravity filters and the west-side secondary effluent is directed through an Actiflo™ system in the tertiary treatment system. A portion of the activated sludge is pumped back to the front of the aeration basins as RAS to maintain bacteria levels in the basins while the waste activated sludge is pumped to the solids thickening process. Effluent from the secondary clarifiers is then directed by gravity to tertiary treatment.

Waste activated sludge from the secondary treatment system is thickened on a gravity belt thickener and then pumped to a tank where it is held under anaerobic conditions, which releases phosphorus and magnesium. Tank sludge is thickened again on a gravity belt thickener. The tank filtrate (now high in phosphorus and magnesium) is pumped to the facility's fertilizer production facility and the thickened sludge is pumped to the anaerobic digester.

Tertiary Treatment - The tertiary treatment process is used to remove the total suspended solids and phosphorus that passed through secondary treatment. Phosphorus removal processes are operated seasonally (May – October). Although CWS is increasingly moving towards biological removal of phosphorus, the secondary effluent does receive some chemical treatment with alum and polymer to achieve permitted summer discharge limits for phosphorus.

During the phosphorus removal season, the Actiflo™ system is used to reduce total phosphorus and total suspended solids in the west-side secondary effluent. Actiflo™ is a high-rate clarification process that uses aluminum sulfate, organic polymer and finely graded silica sand to reduce total suspended solids. When excess Actiflo™ capacity is available, secondary effluent from the east-side secondary process can be treated in the Actiflo™ system. The effluent from the Actiflo™ system can be pumped to four mixed-media gravity filters, flow by gravity to two chlorine contact basins, or a combination of both. During the phosphorus removal season, the east-side secondary effluent can be directed to four ClariCone up flow solids contact chemical clarifiers that have a combined flow capacity of 20 MGD. The ClariCone process utilizes aluminum sulfate and organic polymers to facilitate clarification.

The facility also employs direct filtration processes on a year-round basis where the secondary effluent is dosed with aluminum sulfate immediately prior to final filtration. In final filtration, secondary or tertiary effluent is passed through granular media gravity filters that utilize a mono-media bed of anthracite coal.

Disinfection and Effluent Discharge - Filtered effluent flows are disinfected with sodium hypochlorite and directed into three chlorine contact basins: one east-side basin and two west-side basins. During the dry season when ammonia levels are low, liquid ammonium sulfate is added prior to disinfection to limit the production of disinfection by-products. Filtered effluent is de-chlorinated with sodium bisulfite and discharged to the Tualatin River via two outfall lines, one 60-inch (diameter) and one 96-inch (diameter), at RM 37.7. Effluent flow may alternatively be directed to reuse pumps depending on irrigation demand.

Recycled Water – The facility has the ability to produce Class A recycled water. When Class A recycled water is produced, a portion of the chlorinated final plant effluent is diverted to a dedicated basin and pump system where it undergoes additional chlorination and monitoring before being used for seasonal irrigation on nearby farmlands.

Anaerobic Digestion – The facility employs anaerobic digestion in thickened primary sludge and waste-activated sludge to further reduce sludge mass. The sludge is mixed, heated and dosed with ferric chloride to control hydrogen sulfide in the digester gas, which is used in the facility's generators and boilers to provide heat and power throughout the facility. Solids stay in the active anaerobic digesters at about 97°F for about 25 days. The digested biosolids are then dewatered by centrifuge to 22-25% solids before being loaded onto trucks for land application on area farmlands.

Fertilizer Production – The liquids from the dewatering and waste activated sludge thickening processes are directed to an on-site fertilizer production facility where mineral struvite (magnesium ammonium phosphate) within these waste streams is precipitated in a controlled reactor. The removal of the struvite results in the production of a commercial-grade slow-release fertilizer that is sold by CWS.

Source: Google Earth, 2021

Figure 2-3: Aerial View of Rock Creek WRRF

2.1.3 Hillsboro WRRF

The Hillsboro WRRF facility, located at 770 South First Avenue in Hillsboro, provides preliminary screening, primary and secondary wastewater treatment (Figure 2-4). The facility serves a population of approximately 44,660[3] and is designed to treat an average wet season flow of 7.8 MGD (projected for 2025 conditions) and a daily wet weather peak hydraulic flow of 20.0 MGD. Flow is comprised of 98.4 percent domestic and 1.6 percent industrial and commercial. This facility does not accept septage. The Hillsboro facility is connected to the Rock Creek and Forest Grove treatment facilities by two 24-inch diameter pipelines. During peak flows, all influent flow in excess of 20 MGD is pumped to the Rock Creek WRRF for treatment and discharge.

Preliminary Treatment – Raw sewage enters the headworks via gravity flow and influent pumps. The headworks complex provides screening, grit removal, sampling, and flow measurement. The screenings and grit removed from the influent flow are washed and compacted for landfill disposal.

Primary Treatment - After the headworks complex, sewage is directed by gravity to one or two of the primary clarifiers for primary treatment. If required, the influent can also be directed to the high-head pump station for transfer to the Rock Creek or Forest Grove facilities for treatment. At the primary clarifiers, settleable organic and inorganic particles are pumped to the Rock Creek WRRF for treatment. Primary clarifier effluent flows by gravity to secondary treatment.

Secondary Treatment - After primary treatment, the primary effluent flow enters the eight-cell aeration basin and secondary clarifiers that utilize an activated sludge process to remove dissolved organic matter and nutrients that pass through primary treatment. In the secondary clarifiers, bacteria flocculate, settle and are collected as activated sludge. A portion of the activated sludge is returned to the upstream end of the aeration basin as RAS and a portion is pumped to the Rock Creek WRRF as waste activated sludge for solids processing.

Solids and Effluent Transfers - The High Head Pump Station is connected to twin 24-inch pipelines running between and connecting the Forest Grove, Hillsboro and Rock Creek facilities. This connection allows transfer to the Rock Creek WRRF of raw or treated wastewater, along with the primary and secondary solids produced at the Hillsboro facility.

[3] Clean Water Services Watershed-based NPDES Permit Renewal Application. Section 4: Hillsboro WRRF Permit Renewal Applications. Form 2A and NPDES-R. December 2020.

Source: Google Earth, 2021

Figure 2-4: Aerial View of Hillsboro WRRF

Disinfection and Effluent Discharge - Secondary effluent receives disinfection by means of a low pressure/high output ultraviolet system with two channels, each with a capacity of 12 MGD for a total capacity of 24 MGD.

Currently, the Hillsboro WRRF treats wastewater and discharges directly to the Tualatin River during the wet season (generally from November 1 through April 30) through two primary outfalls at RMs 43.3 (H001A) and 42.9 (H001B). During the dry season (generally from May 1 through October 31), wastewater from the Hillsboro WRRF service area is either treated at the Rock Creek WRRF or Forest Grove WRRF. Under most dry season conditions, the facility transfers flows to the Forest Grove WRRF where it is directed through a 95-acre wetland-based Natural Treatment System at Forest Grove for final polishing and discharge into the Tualatin River (described below).

2.1.4 Forest Grove WRRF

The Forest Grove WRRF, located at 1345 SW Fern Hill Road in Forest Grove, provides preliminary screening and secondary treatment (Figure 2-5). The facility serves approximately 38,000[4] people and is designed to treat an average dry season flow of 3.0 MGD and a daily wet weather peak hydraulic flow of 33.0 MGD. The Forest Grove facility is connected to the Hillsboro and Rock Creek treatment facilities by two 24-inch diameter pipelines. When the Hillsboro facility directs treated wastewater to Forest Grove during the dry season, it is anticipated that the combined discharge from the Forest Grove and Hillsboro WRRFs through

[4] Clean Water Services Watershed-based NPDES Permit Renewal Application. Section 5: Forest Grove WRRF Permit Renewal Applications. Form 2A and NPDES-R. December 2020.

the NTS will have an average dry season flow of 6.3 MGD for projected 2025 conditions. Existing influent flow to Forest Grove is comprised of 94.9 percent domestic, and 5.1 percent industrial and commercial. The industrial flow is mainly from food processing facilities and electronic manufacturing facilities. This facility does not accept septage.

Preliminary Treatment – Raw sewage enters the facility by gravity in a 72-inch diameter interceptor pipe at the headworks building where it undergoes mechanical screening to remove, clean and compact fibrous material and garbage for landfill disposal. The raw sewage from the headworks flows by gravity to the influent pump station where it is pumped to the grit building where grit removal basins remove heavier inorganic material (grit) from the waste stream. Grit generated by the de-gritting process is pumped to the headworks building where it is dewatered and retained with the screening for landfill disposal. Effluent from the grit system gravity flows to the aeration basin(s) for treatment, or to the High Head Pump Station (HHPS), where it is pumped to the Rock Creek WRRF for treatment. The HHPS also allows for the distribution of treated effluent to on-site irrigation or off-site irrigation. The HHPS is connected to the twin 24-inch pipelines that connect to the Forest Grove, Hillsboro and Rock Creek facilities. This connection allows the Forest Grove WRRF to transfer to the Rock Creek facility raw or treated wastewater, along with the secondary solids produced.

Secondary treatment – The entire secondary treatment system employs an activated sludge process to remove dissolved organic matter and nutrients. After grit removal, sewage is directed towards two aeration basins to begin secondary treatment. Effluent from the aeration basins flows into the mixed liquor structure where it is split between three secondary clarifiers. Return Activated Sludge (RAS) is drawn off the bottom of the clarifiers to the aeration basin(s) or flows to the RAS wet well. From there it is pumped back to the aeration basins to maintain bacteria populations.

In addition, Waste Activated Sludge (WAS) is pumped to the HHPS to be sent to the Rock Creek WRRF for treatment. About 0.5 to 1.0 MGD of carrier water is used to convey the solids to the Rock Creek WRRF.

Source: Google Earth, 2021

Figure 2-5: Aerial View of Forest Grove WRRF

Disinfection and Effluent Discharge - Secondary effluent receives disinfection using two medium pressure ultraviolet disinfection systems rated for 10 MGD each. This system is effective in deactivating remaining viruses or bacteria.

During the summer dry season (May – October) and under winter low river flow conditions, effluent from the disinfection system is pumped to the NTS for additional treatment prior to discharge to the Tualatin River through the primary outfall (Outfall F001) at RM 53.8. During wet-weather winter months, the effluent from disinfection is pumped to the primary outfall in the river. The wet-weather outfall (Outfall F003) is used when the river elevation rises to a level that floods the NTS and the capacity of the primary outfall line is exceeded.

Recycled Water – Recycled water may be produced at the facility for irrigation during the permit term but is not currently being produced by the facility.

<u>Forest Grove Natural Treatment System</u>

Prior to 2017, both the Forest Grove and Hillsboro WRRFs only discharged directly to the Tualatin River during the wet season. During the dry season, wastewater from both facilities was transferred to the Rock Creek WRRF for treatment and discharge to the river. To allow for year-round discharges from the Forest Grove WRRF, CWS constructed a 95-acre Natural Treatment System at Forest Grove designed to reduce temperature and nutrients in the effluent, provide wetland habitat and recreational benefits, and improve the overall quality of water discharged to the Tualatin River.

Work on the NTS began during the summer of 2012 with the construction of the Lower Treatment Wetland, Re-Aeration Waterfalls and Water Garden. The South Wetlands were constructed in 2014 by converting three large existing sewage lagoons into treatment wetlands and a 20-acre pond that provides open water habitat. The South Wetlands include surface wetlands and associated hydraulic conveyances and controls. The surface treatment wetlands are shallow-water vegetated systems that function as emergent marshes. In each wetland, the bottoms were planted with a wide variety of wetland plant species adapted to emergent and open water conditions. Earthen berms surrounding the wetlands were planted with native trees and shrubs, which provide both species and structural diversity benefits. Over 750,000 native wetland plants were installed in 2014 and are currently being maintained by CWS within the NTS (Figure 2-6). Appendix C presents a layout of the Forest Grove NTS and path of flow for effluent through the wetlands.

In 2016, CWS began construction of the West Wetlands (also known as the Vertical Flow Wetlands), which are designed to remove ammonia. The VFW was completed in 2017 and the NTS began regular operation at the beginning of the 2018 dry season under the conditions of the 2016 NPDES permit, and a Mutual Agreement and Order established with DEQ in March 2017.[5] The MAO set a schedule for improving the operation of the NTS to meet summer limits for temperature and dissolved oxygen. The conditions of the MAO were met by May 2019.

Photo Source: CWS

Figure 2-6: Forest Grove Natural Treatment System

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[5] *Mutual Agreement and Order Between Clean Water Services and Oregon Department of Environmental Quality: MAO Case No. WQ/M-NWR-2017-020.* March 17, 2017.

Under existing dry season discharges allowed by the 2016 permit, the Forest Grove and Hillsboro WRRFs provide preliminary screening and secondary treatment of wastewater before it is directed to the VFW and NTS. Within the VFW, the secondary effluent from the WRRFs is nitrified before being directed into the NTS for further treatment and temperature control. The effluent from the Hillsboro and Forest Grove WRRFs is the principal source of water for the NTS. The NTS discharges through an outlet structure into the Forest Grove WRRF outfall pipe that leads to the Tualatin River and Outfall F001.

During the wet season, a portion of the treated wastewater from the Forest Grove WRRF may be directed to the NTS to maintain flows and aesthetic appearance of the Re-Aeration Waterfalls. However, the majority of the treated wastewater from the Forest Grove WRRF is discharged directly to the Tualatin River through Outfall F001.

During *high flow* wet season flow conditions, the South Wetlands (adjacent to the Tualatin River) are often under water. Under such conditions, the Forest Grove WRRF continues to use Outfall F001 to discharge into the river. The capacity of Outfall F001 is a function of the water level in the river. During high flow conditions, Outfall F001 has recently been expanded to provide a capacity of 30 MGD. Flows in excess of 30 MGD are discharged to the river via a 24-inch diameter pipe that empties into the Pond area of the NTS (Outfall F003). Under such conditions, this is actually the river. Outfall F003 is the designated discharge location during extreme wet season flow conditions when the South Wetland portion of the NTS is flooded.

Depending on the effluent parameter, compliance monitoring for dry season effluent discharges from the Forest Grove WRRF can occur at two locations; 1) at the facility's Effluent Pump Station, which is after disinfection and before discharge into the NTS, and 2) at the Outlet Structure in the South Wetlands prior to discharge into the existing Forest Grove WRRF outfall pipe that leads to Outfall F001 and the Tualatin River. All compliance monitoring during wet season discharges is conducted at the facility's Effluent Pump Station.

Per the 2016 permit, the point of permit compliance on limits for CBOD, TSS, pH and bacteria were established at the Effluent Pump Station while temperature and dissolved oxygen limits are to be met at the NTS Outlet Structure. With the proposed permit, the point of permit compliance for $CBOD_5$, TSS, pH and phosphorus will also be at the Outlet Structure. The reason for this change in the point of compliance for $CBOD_{5,}$ TSS and pH is further explained in Section 3.1.2.

CWS will also be required to monitor the effectiveness and functionality of the NTS by monitoring effluent at the Outlet Structure for metals, nitrates and TKN. While these parameters do not have effluent limits, the monitoring of such parameters is intended to measure the effectiveness of the NTS in removing such parameters.

During the wet season, the NTS will likely be flooded and there will be no monitoring of NTS discharges into Outfall F001. All compliance and characterization monitoring during the wet season will be after disinfection at the facility.

2.1.5 Outfalls

Treated wastewater from all four facilities is discharged to the Tualatin River. A summary discussion of the outfalls associated with each facility covered under this permit is presented below. The locations of the outfalls along the Tualatin River for each facility are presented in Appendix D.

Durham WRRF
The Durham WRRF discharges year-round to the Tualatin River at RM 9.2 through Outfall D001 (Lat: 45.3932N; Long:-122.7644W). This outfall consists of a 66-inch diameter reinforced concrete pressure pipe that terminates with a multiport diffuser that is 96 feet long with 12 stainless steel 20-inch diameter ports spaced evenly along the diffuser. In addition to the multiport diffuser, the Durham facility also has a wet weather outfall pipe (Outfall D003) located 65 feet downstream of Outfall D001 (Lat: 45.3931N; Long:-122.7642W). This outfall consists of a single submerged 7-foot diameter reinforced concrete pipe that extends approximately 40 feet into the Tualatin River. This pipe is only active during peak flow events when the river flow is at a very high stage. The wet weather outfall was not used during the existing permit cycle. The Durham facility also provides Class A recycled water (Outfall D002) during the summer months to several school athletic fields, golf courses and parks in the Tigard area.

Rock Creek WRRF
The Rock Creek WRRF discharges year-round to the Tualatin River at RM 37.7 though Outfall R001 (Lat: 45.4908N; Long: -122.9454W). This outfall includes a 60-inch diameter reinforced concrete pipe with a multiport diffuser approximately 28 feet long. The diffuser section has 12 15-inch diameter ports spread evenly along the diffuser with each port oriented 45 degrees downstream. In addition, the Rock Creek facility has a submerged 8-foot diameter wet weather outfall pipe (Outfall R003) located approximately 50 feet downstream from Outfall R001 (Lat: 45.4908N; Long:-122.9453W). The outfall pipe is buried into the north bank of the river and discharges horizontally into the river. This outfall is designed to handle peak wet weather flows when the hydraulic capacity of the diffuser on Outfall R001 is exceeded. The Rock Creek facility has the capability to produce Class A recycled water for distribution through Outfall R002.

Hillsboro WRRF
The Hillsboro WRRF discharges to the Tualatin River only during high flow conditions as defined in the permit through two outfalls (Outfalls H001A and H001B) at RM 43.3 (Lat: 45.4991N; Long: -122.9859W) and 42.9 (Lat: 45.4989N; Long: -122.9893W), respectively. Effluent from the Hillsboro WRRF is first discharged to a single pipe and conveyed south to a flow control structure. At the structure, the flows are evenly split between the two 30-inch diameter single-port outfalls located approximately one-half mile apart along the north bank of the river. H001A is the western (upstream) outfall and H001B is the eastern (downstream) outfall. The permit also includes a recycled water outfall (Outfall H002) that is available to use during low river flow, however; no recycled water is currently produced by the facility.

Forest Grove WRRF
For the proposed permit renewal, the outfalls at the Forest Grove WRRF are being re-numbered to be consistent with the outfall numbers for the primary dry weather (001) and secondary wet weather (003) outfalls at the Durham and Rock Creek WRRFs. At the Forest Grove WRRF, the

number designation of the primary dry weather outfall is being changed from F001A to F001 while the secondary wet weather outfall number designation changes from F001B to F003. All references to these outfalls within this document will incorporate the new number designations.

The Forest Grove WRRF discharges to the Tualatin River at RM 53.8 via Outfall F001 (formerly F001A) (Lat: 45.5018N; Long: -123.0890W). Originally constructed in 1994, the outfall was replaced in the fall of 2019. The new outfall consists of a single 36-inch diameter pipe that reduces to a 30-inch diameter single port in the river. The new outfall provides better dilution and is fully submerged when discharging. During the low-flow dry season (typically May through October) and under winter low flow conditions, effluent from the plant is directed through the NTS for additional treatment prior to discharge from the NTS outlet structure into the outfall line leading to Outfall F001.

During winter peak river flow conditions when the NTS is flooded, effluent from the plant is conveyed directly to the Tualatin River via the primary outfall line to Outfall F001. However, during extreme river flow conditions when the NTS is flooded, and the capacity of the primary outfall line to Outfall F001 is exceeded, the Forest Grove WRRF discharges into the Pond section of the NTS via a 24-inch diameter single port wet-weather outfall (F003 –formerly F001A) (Lat: 45.5080N; Long: -123.0875W). The location of this pipe in the Pond section of the NTS is shown in Appendix D. The permit also includes Outfall F002 that may be used for recycled water during low flow periods. The permittee is evaluating opportunities to produce recycled water at the Forest Grove WRRF during the permit cycle.

2019-2020 Outfall Inspections

In accordance with Schedule B Condition 13 of the existing 2016 permit, CWS conducted an inspection of the primary and wet weather outfalls for each of the four facilities. The inspections were conducted in August 2019 and May 2020.[6] In general, all of the outfalls were found to be in good structural and serviceable condition with no impairment as to their integrity and function. The inspections did identify some minor repairs that were necessary, such as re-installing a detached anchor on the diffuser section for Outfall D001. The identified repairs have been completed. The proposed permit will require another inspection of all the outfalls during the next permit term.

2.2 Compliance History

The current NPDES Permit expired on May 31, 2021. DEQ received Renewal Application Numbers 950670 (Hillsboro WRRF), 950671 (Forest Grove WRRF), 950672 (Durham WRRF), and 950673 (Rock Creek WRRF) and 991575 (MS4) from CWS on December 1, 2020. Because CWS submitted a complete renewal application to DEQ in a timely manner, the current permit is administratively extended until DEQ takes final action on the renewal application as per OAR 340-045-0040.

[6] Clean Water Services Watershed-based NPDES Permit Renewal Application. Section 7: Outfall Inspection Report – Durham, Rock Creek, Hillsboro and Forest Grove Facilities. November 2020.

The compliance history for all four CWS facilities and MS4 was reviewed in the file record since the last permit renewal (2016). Compliance inspections conducted by DEQ occurred at the Forest Grove and Hillsboro WRRFs on June 15, 2017. A compliance site visit occurred at the Durham WRRF on September 26, 2017, and at the Rock Creek WRRF on August 1, 2017. No compliance issues were noted during these inspections.

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

Warning Letters – Forest Grove WRRF

- An August 5, 2021 Warning Letter (2021-WL-6462) was issued for a May 2021 violation of the effluent temperature limit from the Forest Grove WRRF NTS. The NTS has a permitted effluent temperature limit of 77ºF. The outlet gate at the NTS is designed to close when effluent temperatures reach 76ºF. However, temperature data from the continuous recording device at the NTS outlet structure was not transmitted to the SCADA system that is used to manage the NTS outlet gate. As such, the outlet gate did not shut when effluent temperatures reached 76ºF and effluent temperatures exceeded 77ºF resulting in a release of effluent with recorded temperatures of 82ºF. In response to this event, CWS placed a secondary monitoring device in the outlet structure and instructed operators to monitor the incoming data. No further violations of the temperature limit occurred. No additional enforcement action was necessary as a result of this Warning Letter.
- A January 21, 2021 Warning Letter (WQ-NWR/2021-WL-6045) was issued for a May 2020 violation of the effluent temperature limit from the Forest Grove WRRF NTS. The NTS has a permitted effluent temperature limit of 77ºF. The outlet gate at the NTS is designed to close when effluent temperatures reach 76ºF. Due to a malfunction of the effluent gate at the outlet structure from the NTS, effluent with recorded temperatures of 82ºF was released. The malfunction to the gate was corrected. No additional enforcement action was necessary as a result of this Warning Letter.

Warning Letters – Rock Creek WRRF

- A September 4, 2020 Warning Letter was issued for land applying poorly digested biosolids from the Rock Creek WRRF at the Pimm Farm located in Linn County. CWS corrected the problem by adjusting the digester SCADA system to remove the "algorithm mode" to prevent recurrence of the digester feed problems that resulted in the poorly treated biosolids being land applied. No additional enforcement action was necessary as a result of the Warning Letter.

Warning Letters – Hillsboro WRRF

- A December 28, 2018 Warning Letter (2018-WL-4154) was issued for a violation of the bacteria limit at the Hillsboro WRRF that occurred in May 2018. The exceedance of the bacteria limit was due to a temporary malfunction to the ultraviolet light disinfection system. CWS corrected the problem with the UV disinfection system and no further exceedances of the bacteria limit were recorded. No additional enforcement action was necessary as a result of this Warning Letter.

Warning Letters – Durham WRRF

- A September 28, 2017 Warning Letter (2017-WL-2955) was issued for failure to submit construction plans for DEQ review for improvement projects at the Durham WRRF in accordance with Schedule F of the 2016 permit. Oregon Revised Statutes (ORS 468B.055) require Oregon DEQ to review and approve plans prior to commencement of construction. CWS submitted the request plans to DEQ and received DEQ acceptance. No additional enforcement action was necessary as a result of this Warning Letter.

Pre-Enforcement Notices and Civil Penalties – Durham WRRF Collection System

- A June 18, 2021 Pre-Enforcement Notice (2021-PEN-6375) was issued for a sanitary sewer overflow that occurred June 3 and 4, 2021 at the Meyers Farm sanitary sewer pump station in the City of Tigard. The SSO was the result of a failure to a temporary by-pass pump that resulted in the release of approximately 38,400 gallons of sanitary sewer wastewater. The discharge occurred within and outside the pump station, and into a tributary to the Tualatin River.
- A November 4, 2021 Civil Penalty Assessment and Order (Case No. WQ/SP-NWR-2021-109) in the amount of $13,200 was issued as a result of the Pre-Enforcement Notice (2021-PEN-6375) described above. CWS appealed the Civil Penalty, and an informal meeting was held between CWS and DEQ on February 17, 2022. In response to the informal meeting and additional information provided by CWS, DEQ reduced the penalty amount $10,800. CWS is conducting a Supplemental Environmental Project which was approved by DEQ on September 28, 2022. This project will be implemented from Fall 2022 through Summer 2023 at Summerlake Park in Tigard and incorporates education, ecological enhancement and environmental equity and inclusion components.

Mutual Agreement and Orders

- DEQ signed Mutual Agreement and Order No. WQ/M-NWR-2020-061 with CWS on April 29, 2020 which allows CWS to conduct a study of alternatives to the addition of alum in its treatment process for the control of phosphorus. While alum is useful in controlling phosphorus, the addition of alum increases aluminum in wastewater. In anticipation of EPA's promulgation of an aluminum standard for Oregon, the MAO allows CWS to conduct a study of alternatives to alum addition in its treatment process during the summer phosphorus control period. To facilitate the study, the MAO also established higher interim limits for phosphorus for the duration of the study from those required by the 2016 NPDES permit. The MAO also requires CWS to conduct the study in accordance with the study plans referenced in the MAO. These plans include supplemental river and wastewater monitoring to ensure the protection of water quality. The MAO has been amended twice to extend the termination date to enable collection of data over a broader range of hydrologic and climatic conditions. Unless further amendments are executed, the MAO will terminate on October 31, 2022. CWS has already provided DEQ with study findings obtained in 2020 and 2021 and additional results are pending from studies to be conducted in 2022.

- DEQ signed Mutual Agreement and Order No. WQ/M-NWR-2018-039 with CWS on April 10, 2018 to develop and implement operational strategies at the Forest Grove WRRF to meet dry season limits for total suspended solids and carbonaceous biochemical oxygen demand ($CBOD_5$). The MAO included the submittal of annual Permit Compliance Reports to DEQ detailing effectiveness of operational strategies in meeting TSS and $CBOD_5$ effluent limits in the Permit. The MAO also established interim limits for TSS and $CBOD_5$ at the Forest Grove WRRF during the dry season prior to discharge from the NTS. These interim limits are valid only for the duration of the MAO. The MAO schedule required CWS to achieve full compliance with the effluent limits for $CBOD_5$ and TSS established in the 2016 Permit by October 1, 2022. The MAO was amended on January 20, 2022 to allow additional time to coordinate with permit renewal issues; the MAO now requires compliance with $CBOD_5$ and TSS limits at the Forest Grove WRRF by October 1, 2023. The MAO will be completed by the time the next permit term expires.

- DEQ signed Mutual Agreement and Order No. WQ/M-NWR-2017-020 with CWS on March 17, 2017 to provide a startup schedule for conducting additional testing at the Forest Grove NTS to identify operational strategies and/or modifications to meet permit limits. The MAO required the submittal of an Operation and Monitoring Plan (OMP) to be implemented upon startup of the NTS to better understand temperature and dissolved oxygen dynamics and define operational strategies and/or modifications to the NTS to successfully operate the system and consistently meet permit requirements. Following the monitoring, the MAO required CWS to submit an Operations Management Plan for the NTS which described the natural and/or engineered operational strategies and procedures that would be implemented to obtain full compliance with the permit. The MAO required full implementation of the OMP by May 1, 2019.

  CWS submitted a final OMP dated April 2017 to DEQ and began implementing the operational strategies described in the plan to obtain full permit compliance by the deadline specified in the MAO. As such, DEQ issued a letter closing the MAO on August 6, 2019.

2.3 Groundwater

Wastewater treatment at the CWS facilities generally occurs in water-tight concrete basins with no potential to impact groundwater. Biosolids and recycled wastewater will be applied at agronomic loading rates and in accordance with CWS's DEQ-approved biosolids and recycled water use plans designed to protect groundwater.

The proposed permit includes a wetland-based NTS at the Forest Grove WRRF that routes treated effluent through a series of unlined wetland polishing cells. DEQ does not consider the discharge to the NTS to be an indirect discharge. The effluent discharged to the NTS is fully treated and the NTS is being used for final polishing for solids, $CBOD_5$, temperature and nutrients via surface wetland cells. Additionally, soils testing showed limited potential for water movement into and through the clay soils in the wetland cells of the NTS. No impacts to groundwater are anticipated from the operation of the NTS because of the high-quality effluent being delivered to the NTS and the limited potential for infiltration within the NTS. Groundwater modeling conducted as part of the NTS design also concluded that there was limited potential to affect groundwater.

2.4 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. General NPDES permits for stormwater are not required for wastewater treatment facilities with a design flow of greater than 1 MGD when stormwater associated with industrial activity is collected, treated, and discharged as part of its treated wastewater.

Clean Water Services has previously documented that the Durham, Hillsboro and Forest Grove WRRFs have no stormwater leaving these sites. All stormwater from these facilities is collected, treated and discharged as part of its treated wastewater.

DEQ issued the Rock Creek WRRF a Stormwater Discharge General 1200-Z permit on April 22, 2016. This permit was terminated by DEQ on April 23, 2021, after CWS demonstrated that all stormwater associated with industrial activities was re-routed to the Rock Creek WRRF for treatment and discharge.

Municipal stormwater limitations and controls are addressed further in Section 4.7 of this report.

2.5 Industrial Pretreatment

Clean Water Services implements an industrial pretreatment program that was approved by DEQ in March 1983. The current NPDES permit includes federal and state pretreatment requirements.

Clean Water Services currently permits a total of 43 significant industrial users (SIUs) of which 30 are federally designated categorical industrial users. In addition, CWS has several industrial users under Non-Discharge permit and Best Management Practices agreements. Clean Water Services submits annual pretreatment program reports including updated industrial waste surveys.

DEQ, assisted by PG Environmental, conducted a Pretreatment Compliance Audit of the industrial pretreatment program on April 14-20, 2020, followed by industrial user inspections in September of 2021. 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. CWS is in compliance with its industrial pretreatment program requirements. Schedule E of the proposed permit includes the program requirements.

2.6 Biosolids

The term biosolids refers to domestic wastewater treatment facility solids that have undergone adequate treatment and are suitable for application to the land as a fertilizer or soil amendment. CWS anaerobically digests wastewater related solids at their Durham and Rock Creek WRRFs. Both facilities have two storage silos where digested and dewatered biosolids are temporarily stored before loading upon trucks for land application. Although no biosolids production occurs at the Hillsboro and Forest Grove WRRFs, the unprocessed solids, waste activated sludge solids and some raw sewage flows are transferred to the Rock Creek facility where biosolids are produced.

In 2020, CWS produced approximately 9,997 dry tons of Class B biosolids from primary and secondary wastewater treatment for beneficial land application across 5,752 acres of farmland.[7] During the proposed permit term, CWS has the ability to land apply its biosolids at more than 84 different sites located within western and central Oregon. The majority of the biosolids will likely be applied to arid land sites east of the Cascades. The arid land sites are utilized on a year-round basis provided local road conditions allow for the transportation of biosolids to the application sites. Local farm application sites include farm sites within 65 miles of CWS facilities. Local farm applications are generally conducted during the summer and fall months.

All biosolids are hauled to farm sites by contract haulers that utilize dump trucks and dump pup trailers with a combined payload of 30 wet tons. All dump boxes are required to be water-tight and tarped during biosolids hauling. CWS maintains a contract with the Coffin Butte Landfill for emergency disposal of biosolids in the unlikely event of a process failure at either the Durham or Rock Creek WRRFs.

Monitoring results included as part of the annual reports on biosolids show that metals levels tracked in biosolids for land application are consistently at levels well below the ceiling concentration limits established through the EPA Part 503 regulations. In recent years, metal levels in biosolids have been reduced through CWS’s extensive industrial pretreatment permitting and monitoring system.

The Biosolids Management Plan for all the WRRFs was last updated in March 2021 and is available for public comment along with the proposed permit.

2.7 Recycled Water and Highly Purified Water

Clean Water Services currently operates a recycled water program to produce Class A recycled water for irrigation uses and anticipates continuing to do so in the next permit term. CWS’s current DEQ-approved recycled water use plan (last updated in December 2020) includes the seasonal irrigation of Class A recycled waters and CWS is planning to expand its recycled water program. When the recycled water use plan is fully implemented, it is projected that CWS will be able to recycle as much as 569 million gallons of Class A recycled waters each year across 837 acres of farmland, parks, and athletic fields near its treatment facilities.

Historically, CWS has produced recycled water at all their facilities at one time or another. In recent years, the production of recycled water has been limited to the Durham and Rock Creek WRRFs. For 2021, CWS reported distributing approximately 81.1 million gallons (MG) of Class A recycled water to customers from the Durham plant for use as summarized in the following table[8]:

[7] 2020 Biosolids Annual Report - Clean Water Services. February 19, 2021.
[8] 2021 Recycled Water Use Annual Report. Clean Water Services. January 13, 2022.

Table 2-1: Durham WRRF 2021 Recycled Water Use

Use and Location	Recycled Water Class	Volume (MG)
Summerfield Golf Course	A	22.6
King City Golf Course	A	13.8
Tualatin Country Club Golf Course	A	30.6
City of Durham Park	A	0.4
City of Tigard Cook Park	A	3.1
Tigard High School Lawns	A	4.5
Durham Elementary School Athletic Fields	A	0.2
Thomas Dairy	A	5.9

The Rock Creek and Forest Grove WRRFs will likely supply recycled water for similar purposes during the permit term. These facilities did not produce any recycled water in 2021.

The existing 2016 permit allowed CWS to treat and disinfect small batches of recycled water as highly purified water for demonstration purposes to brew beer for human consumption in accordance with the permittee's Recycled Water Use Plan for Individual Batch Process Production of Highly Purified Water for Beneficial Re-Use (HPW Plan). The HPW Plan was updated in July 2019. The HPW Plan requires CWS to submit an annual report that described the volume of high purity water produced, monitoring, intended uses and venues served, and the volume and method of disposal or reuse of unused high purity water.

In 2019, CWS produced 2,475 gallons of high purity water of which 215 gallons were used to brew beer for five separate venues. The remaining unused quantity was reserved for future reuse or disposal. CWS did not produce or deliver high purity water in 2020 or 2021 due to COVID-19 restrictions on public gatherings. Additional production of high purity water may occur in the next permit term under the conditions of the renewed permit and the current DEQ-approved HPW.

2.8 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 systems for each of the four CWS facilities, which are publicly available at: https://www.deq.state.or.us/wq/opcert/Docs/OpcertReport.pdf. No changes to the existing classifications for the treatment and collection systems are proposed with the renewed permit.

2.9 Thermal Load Management Plan

Water quality trading is an innovative approach to achieve water quality goals more efficiently than traditional methods. The Clean Water Act authorizes EPA, states, and tribes to develop a variety of programs and activities to control pollution, such as water quality trading. In addition, Oregon Revised Statutes (ORS) 468B.555 directs DEQ to develop and implement a pollutant reduction trading program as a means of achieving water quality objectives and standards in Oregon in a manner that complies with state and federal water quality regulations and promotes economic efficiency. DEQ incorporated an option to use water quality trading in the CWS 2005 watershed permit. This provided CWS with an alternate means to demonstrate compliance with water quality-based permit limitations for temperature and oxygen demanding parameters ($CBOD_5$ and ammonia).

Clean Water Services has developed a Thermal Load Management Plan (TLMP) to enable CWS to offset its excess thermal load (i.e., actual thermal load minus allowable thermal load) with a trading program that includes stream flow enhancement and riparian shade restoration. The TLMP was last updated in July 2021 and is available for public comment along with the proposed permit. CWS' thermal load reduction and trading activities are described in the TLMP and are incorporated into the permit by reference. The overall goal of the trading program is to offset all of the excess thermal load using riparian shade restoration and flow enhancement over a 5-year permit term.

Beginning in 2004, CWS began augmenting flow in the Tualatin River during the dry season (July – August) using its stored water in Hagg Lake and Barney Reservoir. This augmented flow has resulted in cooler temperatures and higher dissolved oxygen levels in the Tualatin River. In 2020, CWS released an average of 34.5 cubic feet per second (cfs) and 47.4 cfs of stored water from Hagg Lake in July and August, respectively. These releases generated 920 million kilocalories (kcal) per day of thermal credit for July and 1,205 million kcal per day of thermal credit for August.[9] As explained in the flow enhancement discussion in Section 3.6.1.5, credit values are based on water quality benefits estimated to accrue at WRRF locations.

The riparian shade restoration component of the TLMP was initiated in 2004. Under this program, shade projects are enrolled immediately upon planting of riparian vegetation based upon the projected shade provided by mature riparian restoration. Credits are valued under a 2:1 trading ratio to account for the delay in achievement of full water quality benefits, and all other sources of risk. Thus, for every kilocalorie of excess thermal load to be offset by trading, a riparian restoration project upon full implementation (20 years) must produce two kilocalories in thermal load reduction.

In urban areas of the Tualatin River basin, CWS restores riparian shade in partnership with municipalities, businesses and other stakeholders. CWS and its partners, on a site-specific basis, also restore natural stream function through stream bank stabilization, large wood placement, channel reconfiguration and floodplain reconnection. Riparian restoration produces other significant benefits, including habitat improvement and creation for aquatic and terrestrial biota, retention of stormwater and overall improvement of water quality.

[9] 2020 Annual Report – Water Quality Trading. Clean Water Services. March 2021.

CWS has documented their temperature trading practices to offset the thermal load from the Rock Creek, Durham and Forest Grove facilities in annual reports submitted to DEQ. In 2020, CWS enrolled 10 new riparian restoration projects that are restoring approximately 3.7 stream miles and generating over 8 million kcal per day of thermal credit. Since the trading program began in 2004, CWS has implemented 172 restoration projects along streams within Tualatin River basin that are generating 530 million kcal/day of thermal credit. When combined with the credits from flow enhancement, the thermal credits from the riparian restoration completely offset the excess thermal load from the Durham, Rock Creek and Forest Grove facilities. Annual reports provided to DEQ provide a full accounting of the thermal credits used to offset the thermal load discharged from the treatment plants.

In December 2015, the Environmental Quality Commission adopted rules (OAR 340-039) for DEQ's Water Quality Trading Program. CWS' trading program meets the eligibility requirements found in OAR 340-039. Specifically, CWS' trading program promotes multiple policies found in OAR 340-039-0001(2), including reducing the cost of implementing the TMDL for the Tualatin River Subbasin and helping offset increased thermal loading resulting from growth within the Subbasin. OAR 340-039-0015(2)(a) includes temperature as an eligible parameter for trading. Trading takes place within the Tualatin River Subbasin, which includes eligible water bodies as found in 340-039-0015(3), and which also meets the definition of a 'trading area' as specified in OAR 340-039-0005(5). Finally, CWS uses two Best Management Practices (BMPs) in their trading program; riparian shade restoration and flow enhancement. These two BMPs meet the eligibility requirements of OAR 340-039-0015(4), as they are quantifiable and include quality standards; these BMPs are further explained in Section 3.6.

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 protective of 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 Technology-Based Effluent Limit Development

40 CFR 122.(a)(1) requires publicly-owned treatment works (POTW) 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 Tualatin River basin.

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

Parameter	Federal Secondary Treatment Standards		Tualatin Basin-Specific Design Criteria (OAR 340-041-0345)
	30-Day Average	7-Day Average	Monthly Average
$CBOD_5$ (mg/L)	25	40	10 mg/L during the low stream flow period 20 mg/L during the high stream flow period (Above criteria specified as BOD in OAR. See note a.)
TSS (mg/L)	30	45	
pH (SU)	6.0 – 9.0. (instantaneous)		Not applicable because pH in basin is water quality-based
$CBOD_5$ and TSS % Removal	85%		Not applicable

Note:

a. Federal regulations allow the replacement of BOD limits with $CBOD_5$ limits. For wastewaters with significant nitrogen content, basing permit limitations on $CBOD_5$ instead of BOD_5 eliminates the impact of nitrification on discharge limitations and compliance determinations.

All limits in the proposed permit relative to $CBOD_5$, TSS and pH are as stringent as the above federal secondary standards. Proposed concentration limits for $CBOD_5$ and TSS are equivalent to or more stringent than the Tualatin River basin design criteria. The permit also includes "bubbled" mass limitations for TSS between all four facilities in recognition that the discharge of these pollutants does not have a location-specific effect on the Tualatin River. In addition, each CWS facility is still required to meet the strict concentration limits for TSS and federal secondary load limits specified in the permit. The permit maintains the 85% minimum removal requirement of $CBOD_5$ and TSS. Additional discussion on the determination of $CBOD_5$ and TSS effluent limits is provided below.

3.1.1 Determination of $CBOD_5$ and TSS Effluent Limits

Oregon BOD and TSS Basin Standards

The Tualatin River minimum design criteria listed under OAR 340-041-0345(3)(b), require that wastewater treatment facilities be designed based on the following criteria or equivalent control: BOD_5 and TSS monthly average effluent concentrations of 10 mg/L during periods of low river flow (summer). During periods of high river flow (winter), a minimum average effluent concentration of 20 mg/L for BOD_5 and TSS must be maintained. This is more stringent than the federal secondary treatment standards listed in Table 3-1.

The proposed permit includes $CBOD_5$ and TSS effluent limits for each facility for both low and high stream flow periods. The period of low stream flow is defined in the above cited OAR as "approximately May 1 to October 31" and the period of high stream flows is defined as "approximately November 1 to April 30". The 2016 permit (and earlier versions) provided more refined definitions for these periods which are determined based on actual flow monitoring in the river.[10] The proposed permit will maintain these refined definitions for high and low flow periods on Tualatin which determine when specific effluent limits apply.

The 2016 permit incorporated a 2012 mass load increase approved by the Oregon Environmental Quality Commission. The mass load increase utilized lower concentration limits for $CBOD_5$ and TSS from earlier permit iterations that were the result of various program decisions and policies including maintaining mass loads, basin standards, and identifying achievable effluent quality and policies for converting BOD_5 to $CBOD_5$. The dry season mass load increase for the Durham and Rock Creek WRRFs was based on using 2005 permitted mass load limits and permitted flows for both facilities to back-calculate applicable $CBOD_5$ and TSS concentrations for each facility. For the Durham and Rock Creek WRRFs, the applicable monthly and weekly back-calculated concentrations using this method are 4.4 mg/L and 4.0 mg/L, respectively, which are below the permitted concentration limits. These concentrations provide an extra margin of safety in determining mass load limits and are protective of water quality. Dry season mass load limits were then calculated using these same concentrations and the 2025 design average dry weather flows for the respective facilities.[11] These calculations resulted in lower mass limits than would be determined from existing basin standards. The mass load limits in the existing 2016 permit will be included in the next permit term. A discussion on how the mass loads limits were calculated is presented below.

Calculating Mass Limits

Mass load limitations for $CBOD_5$ and TSS are required per OAR 340-041-0061(9) and are expressed as monthly average, weekly average and daily mass limitations. The following equations were used to calculate the mass-based limits for each of the four CWS facilities:

Monthly Average 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 maximum month dry weather design flow or maximum wet weather design flow.

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

[10] Low and high river flow periods were first established with the 2005 NPDES permit and are consistent with the 2001 Tualatin River TMDL and its 2012 update. The flow-based determinations for high and low flow conditions were developed based upon water quality modeling conducted by the US Geological Survey. The determination of when either a high or low flow period begins is based upon flow conditions monitored at the Farmington Gauge at RM 33.3. For example, the low river flow period begins the earlier of: 1) the first day after April 30 when the seven-consecutive-day median of the daily mean river flow at the Farmington Gauge is less than 250 cubic feet per second (cfs) or: 2) July 1.

[11] Memorandum from Dick Pedersen of DEQ to Environmental Quality Commission regarding Agenda Item, Clean Water Service's Request for Mass Load Increase, EQC Meeting for April 2012. March 6, 2012.

Table 3-2: Design Flows and Concentrations Limits

Facility	Season	Design Flow (MGD)	Monthly $CBOD_5$ Concentration Limit (mg/L)	Monthly TSS Concentration Limit (mg/L)
Durham	Low Flow	25.7	5[a]	5[a]
	High Flow	42	10	10
Rock Creek	Low Flow	52.7[b]	8[c]	8[c]
		46.4[d,e]	8[c]	8[c]
	High Flow	68.4	15	20
Hillsboro	Low Flow	N/A[f]	N/A	N/A
	High Flow	7.8	15	20
Forest Grove	Low Flow	6.3[f]	10	10
	High Flow	7.8	15	20

Notes:

a. Used concentration of 4.4 mg/L to determine mass limits per 2012 EQC Mass Load Increase.

b. Design flow with no discharge from Forest Grove and Hillsboro WRRFs during low river flow period.

c. Used concentration of 4.0 mg/L to determine mass limits per 2012 EQC Mass Load Increase.

d. Design flow with discharge from Forest Grove and Hillsboro WRRFs during low river flow period.

e. Includes 1 MGD solids transfer flows from Forest Grove and Hillsboro WRRFs.

f. Design flow to Forest Grove NTS includes flows from Forest Grove and Hillsboro WRRFs.

For example, the Durham WRRF high river flow mass load limits for $CBOD_5$ for Outfall D001 are based on the average dry weather flow of 42 MGD and a concentration of 10 mg/L. Using this information, the calculations are:

> Monthly Average: 42 MGD x 10 mg/L x 8.34 = 3503 lbs/day rounded off to 3500 lbs/day
>
> Weekly Average: 3500 lbs/day monthly average x 1.5 = 5250 lbs/day (rounded to 5300 lbs/day)
>
> Daily Maximum: 3500 lbs/day monthly x 2 = 7000 lbs/day

All mass load limitations for CWS's other facilities were calculated for low (summer) and high (winter) river flow operating conditions in a similar manner using the treatment plant design flows presented in Table 3-2 above. The calculations are rounded to two significant figures, consistent with DEQ's rounding methodology and the number of significant figures associated with flow measurements for each facility.

TSS Mass Effluent Limits to Meet Secondary Treatment Standards

CWS will also be required to meet the TSS mass loadings at each individual facility under federal secondary treatment standards. Secondary treatment TSS mass limitations were calculated in the same manner as other mass limits using federal monthly and weekly secondary treatment standard concentrations and the treatment design flows presented in Table 3-2 above. A summary listing of the TSS mass limitations for each CWS facility during low and high flow periods under secondary treatment standards are presented in the following tables:

Table 3-3: Low River Flow Secondary TSS Limits for All Facilities

Outfall Number	Parameter	Average Effluent Concentrations (mg/L)		Monthly Average (lbs/day)	Weekly Average (lbs/day)	Daily Maximum (lbs)
		Monthly	Weekly			
D001	TSS	30	45	6,400	9,600	N/A
R001 (See note a.)	TSS	30	45	13,000	20,000	N/A
R001 (See note b.)	TSS	30	45	12,000	18,000	N/A
F001	TSS	30	45	1,600	2400	N/A

Notes:

a. Mass load limits apply only when Rock Creek WRRF discharges and receives effluent flows from Hillsboro or Forest Grove WRRFs.

b. Mass load limits apply only when Rock Creek WRRF discharges with no effluent flows received from Hillsboro and Forest Grove WRRFs.

Table 3-4: High River Flow Secondary TSS Limits for All Facilities

Outfall Number	Parameter	Average Effluent Concentrations (mg/L)		Monthly Average (lbs/day)	Weekly Average (lbs/day)	Daily Maximum (lbs)
		Monthly	Weekly			
D001& D003	TSS	30	45	11,000	17,000	N/A
R001& R003	TSS	30	45	17,000	26,000	N/A
H001A & H001B	TSS	30	45	2000	3000	N/A
F001 & F003	TSS	30	45	2000	3000	N/A

A summary listing of proposed $CBOD_5$ and TSS monthly and weekly concentration limits, and monthly, weekly and daily mass load limitations for low and high river flow conditions are shown in the following tables. All proposed mass limits are the same or less than the existing 2016 permit. Reductions in the weekly mass load limitations are the result of error corrections from the 2016 permit.

Table 3-5: Low Flow $CBOD_5$ and TSS Limits for All Facilities

Outfall Number	Parameter	Average Effluent Concentrations (mg/L) (Unless Otherwise Noted)		Monthly Average (lbs/day)	Weekly Average (lbs/day)	Daily Maximum (lbs/day)
		Monthly	Weekly			
D001	$CBOD_5$ (See note a.)	5	8	950	1400	1900
	TSS (See note b.)	5	8	6400	9,600	N/A
R001 (See note c.)	$CBOD_5$ (See note d.)	8	11	1750	2600	3500
	TSS (See note b.)	8	11	13,000	20,000	N/A
R001 (See note e.)	$CBOD_5$ (See note f.)	8	11	1550	2300	3100
	TSS (See note b.)	8	11	12,000	18,000	N/A
F001	$CBOD_5$ (See notes g and h.)	10	15	500	750	1000
	TSS (See notes b and h.)	10	20	1600	2400	N/A

Notes:

a. $CBOD_5$ limits based on ADWF of 25.7 MGD and effluent concentration of 4.4 mg/L per 2012 Mass Load increase.

b. TSS average monthly and average weekly mass limits based upon federal secondary treatment standards.

c. Mass limits apply only when Rock Creek WRRF discharges and receives effluent flows from Hillsboro and Forest Grove WRRFs.

d. $CBOD_5$ limits based on ADWF of 52.7 MGD and effluent concentrations of 4.0 mg/L per 2012 Mass Load increase.

e. Mass limits apply only when Rock Creek WRRF discharges with no effluent flows received from Hillsboro and Forest Grove WRRFs.

f. $CBOD_5$ limits based on ADWF of 46.4 MGD and effluent concentrations of 4.0 mg/L per 2012 Mass Load increase.

g. $CBOD_5$ limits based on ADWF of 6.3 MGD.

h. Monthly and weekly concentration limits are expressed as median concentrations.

Table 3-6: High River Flow $CBOD_5$ and TSS Limits for All Facilities

Outfall Number (See note a.)	**Parameter** (See note b.)	**Average Effluent Concentrations (mg/L)**		**Monthly Average (lbs/day)**	**Weekly Average (lbs/day)**	**Daily Maximum (lbs)**
		Monthly	**Weekly**			
D001& D003	$CBOD_5$	10	15	3500	5300	7000
	TSS	10	15	11,000	17,000	N/A
R001& R003	$CBOD_5$	15	25	8600	13,000	17,000
	TSS	20	30	17,000	26,000	N/A
H001A & H001B	$CBOD_5$	15	25	1000	1500	2000
	TSS	20	30	2000	3000	N/A
F001 & F003	$CBOD_5$	15	25	1000	1500	2000
	TSS	20	30	2000	3000	N/A

Notes:

a. Limits are combined when both outfalls at each facility are discharging. On any day when discharges occur through both outfalls at each facility, the $CBOD_5$ and TSS mass load will be calculated on a flow-weighted basis for the combined discharge from both outfalls.

b. $CBOD_5$ limits based upon average wet weather design flows in Table 3-2.

3.1.2 Forest Grove NTS CBOD and TSS Limits for Equivalent Control

NTS Treatment Capabilities

During dry season conditions, the Forest Grove and Hillsboro WRRFs discharge treated effluent into the Forest Grove NTS for additional treatment and discharge into the Tualatin River. The minimum design criteria for the Tualatin basin are contained in OAR 340-041-0345(3)(b)(A) and described as follows for the low stream flow period: “During periods of low stream flows (approximately May 1 to October 31): Treatment resulting in monthly average effluent concentrations not to exceed 10 mg/l of BOD and 10 mg/l of SS or equivalent control;”.

DEQ has determined that 10 mg/L BOD is equivalent to 10 mg/L $CBOD_5$. The 2016 permit requires that the treated effluent from the Forest Grove WRRF meet dry season basin design standards prior to discharge into the NTS.

Since becoming operational in 2017, CWS has been documenting the effectiveness of the NTS in removing $CBOD_5$, TSS, metals and nutrients from the treated effluent discharged into the NTS. Monitoring data collected in 2020 and 2021 at the Forest Grove WRRF and the NTS outlet structure indicate that substantial removal of $CBOD_5$ and TSS occurs within the NTS. On average, the data indicates that the NTS can reduce $CBOD_5$ and TSS by 75 and 64 percent, respectively.[12] The monitoring also showed that the NTS was very effective in providing additional removal of nutrients and metals.

[12] Forest Grove Water Resources Recovery Facility and Natural Treatment System – $CBOD_5$ and TSS Limits. Clean Water Services Technical Report. November 2021.

In partnership with CWS, Oregon State University (OSU) also conducted a study using advanced analytical methods to compare the composition of treated secondary effluent from the Forest Grove WRRF with the effluent from the NTS. This study showed that $CBOD_5$ removal to be about 60 percent while TSS removal can be as high as 95 percent.[13] Much of the $CBOD_5$ and TSS in the effluent is removed by the NTS through oxidation of dissolved organic compounds in addition to settling and decay processes. This reduction can be attributed to the long detention time of effluent within the NTS (approximately 5 days), and the natural processes afforded by the NTS. The results of this monitoring reflect other published research and guidance documents by the USEPA and other researchers on the effectiveness of natural wetland systems in reducing $CBOD_5$ and TSS from treated effluent.

Overall, the loadings of $CBOD_5$ and TSS introduced to the NTS are relatively light due to the secondary treatment provided by the Forest Grove and Hillsboro WRRFs. This allows the NTS to provide an additional level of treatment that is equivalent to achieving the Tualatin River basin standards for these parameters. The effluent discharged from the NTS will meet water quality standards for the Tualatin River.

NTS Permit Limits for $CBOD_5$ and TSS

State regulations under OAR 340 -041-0007(15) require municipal wastewater treatment plants be designed according to basin specific minimum design criteria. Subsection (a) states the following regarding minimum design criteria:

(a) In designing treatment facilities, average conditions and a normal range of variability are generally used in establishing design criteria. A facility once completed and placed in operation should operate at or near the design limit most of the time but may operate below the design criteria limit at times due to variables which are unpredictable or uncontrollable. This is particularly true for biological treatment facilities. The actual operating limits are intended to be established by permit pursuant to ORS 468.740 and recognize that the actual performance level may at times be less than the design criteria.

The regulations cited above recognize that biological systems would be expected to have greater variation in operation than physical or chemical treatment facilities. As a natural system, the NTS is expected to have greater variation in the quality of its effluent than a conventional engineered biological system. In addition to the monitoring information submitted by CWS showing the effectiveness of treatment within the NTS, CWS also submitted information regarding the overall capabilities of the NTS so that appropriate effluent limits could be set based on DEQ's design criteria. Clean Water Services calculated effluent limits using EPA's methodology for calculating effluent limits.[14] This methodology applies to technology and water quality based effluent limits as described in the EPA technical document. The analysis indicates the effluent quality from the NTS should be able to achieve the following limits:

[13] Azizi an, M. *Determining the Fatty Acid Composition in Wastewater Treatment Plant using Gas Chromatography, Mass Spectrum (GC-MS), Liquid Mass Spectrum (LC-MS) and Fluorescence Excitation Emission (EEM).* Project Report, Oregon State University. 2021.

[14] *Technical Support Document for Water Quality-based Toxics Control*. Section 5.4 Permit Limit Derivation. United States Environmental Protection Agency. Office of Water. (EN-336). Publication No. EPA/505/2-90-001. PB91-127415. March 1991. .

- $CBOD_5$
  - Median monthly limit = 10 mg/L
  - Median weekly limit = 15 mg/L
- TSS
  - Median monthly limit = 10 mg/L
  - Median weekly limit – 20 mg/L

EPA typically expresses monthly average effluent limits using the mean. This is based on the assumption that environmental data typically follows a log-normal distribution. TSS and $CBOD_5$ data from the NTS is not log-normally distributed and shows higher variability as expected from a natural treatment system. To account for this, the monthly and weekly median values are being applied rather than the average to account for a higher range of variability due to the natural treatment system. This is a change from the 2016 permit which established limits as average monthly and weekly concentration limits. Using the median is more representative of the design capabilities than the average. The design criteria do not include a weekly value, although the federal secondary standards do. For the proposed permit, the median weekly limit of 20 mg/L for TSS is slightly higher than the weekly average of 15 mg/L in the existing permit. This increase in concentration will not impact water quality and reflects the capabilities of the NTS. Actual discharge concentrations are expected to be much less during steady and continuous operations of the NTS. In addition, the median weekly values are well below the secondary treatment standards of 45 mg/L.

In recognition of the equivalent control provided by the NTS for $CBOD_5$ and TSS, the proposed permit sets limits for these parameters at the outlet structure from the NTS. This will be the point of monitoring compliance for $CBOD_5$ and TSS in the next permit term. This is a change from the existing 2016 permit which set limits after disinfection at the Forest Grove WRRF.

The discharge into the NTS is from the Forest Grove WRRF, which is a secondary treatment facility. The Forest Grove secondary treatment facility will ensure that the NTS will receive a light loading of $CBOD_5$ and TSS. Schedule B requires monitoring at this internal location which will be used to characterize WRRF releases to the NTS and assess loading to the NTS.

NTS Operations Plan
Overall, the Forest Grove NTS relies on natural physical and biological processes to treat wastewater that has received prior treatment by traditional secondary mechanical means in an engineered facility. Unlike a mechanical engineered facility, these natural biological and physical processes within the NTS are most efficient at removing pollutants when the NTS is operated in a steady state condition. This requires minimal interruptions in the flow of secondary effluent to the NTS from the Forest Grove WRRF. Monitoring has shown that elevated concentrations of TSS in the NTS effluent is most likely to occur immediately following a re-start of the NTS after it has been shut down for several days or longer.

During the next permit term, NTS operations will require careful monitoring and adjustments to optimize the final treatment of effluent before discharge. As such, Clean Water Services has developed an Operations Plan for the NTS to optimize the functions and capabilities of the wetland-based treatment system. This plan specifies management activities related to Spring start-up, flow control, vegetation and infrastructure maintenance, pest control, compliance monitoring and reporting. The plan also describes end-of-season actions at the NTS. The plan is based upon the permittee's experience in operating the NTS since 2017 and is expected to be modified and updated as additional operational experience is acquired during the next permit term.

A condition in Schedule D of the proposed permit will require CWS to operate the NTS in accordance with the Operations Plan. The plan is to be updated on an annual basis to reflect modifications to the design and function of the NTS, changes in maintenance activities, and implementation of new operational procedures.

The permit also recognizes that the operation of the NTS can be impacted by extreme unpredictable natural and physical events (e.g., declared droughts, smoke from forest fires, flash flooding, etc.) that can affect the ability of the NTS to effectively control pollutants. Such events are expected to be rare, infrequent and of short duration that can affect the ability of the NTS to meet $CBOD_5$ and TSS limits. The proposed permit lists the notification, monitoring and effluent limits the permittee must meet during such events for compliance purposes.

3.1.3 Bubbled TSS Mass Effluent Limit

As part of the 2012 mass load increase for TSS and BOD_5, the 2016 permit established "bubbled" TSS mass limitations in accordance with the Tualatin River TMDL. The bubbled TSS mass limits provide operational flexibility to CWS and helps alleviate pressures related to growth in the river basin since the individual service areas for each treatment facility will not grow at the same rate. The bubbled loads allow CWS to utilize the mass load for their entire service area per the TMDL and transfer the load between facilities within the service area.

The bubbled loads for TSS for both low and high river flow conditions were calculated by summing the individual TSS mass limits for the four facilities into a collective mass limit. The limits include monthly average, weekly average and daily maximums as shown in the following tables:

Table 3-7: Low River Flow Bubbled TSS Mass Limitations

TSS Bubble Load	Durham and Rock Creek WRRFs Discharging			Durham and Rock Creek WRRFs, and Forest Grove NTS Discharging		
	Monthly average (lbs/day)	Weekly average (lbs/day)	Daily maximum (lbs)	Monthly Average (lbs/day)	Weekly Average (lbs/day)	Daily Maximum (lbs)
	2700	4000	5400	3000	4500	6000
Individual TSS Mass Loads Used to Calculate the TSS Bubble Load						
Durham WRRF	950	1400	1900	950	1400	1900
Rock Creek WRRF	1750	2600	3500	1550	2300	3100
Forest Grove WRRF	N/A	N/A	N/A	500	750	1000

Table 3-8: High River Flow Bubbled TSS Mass Limitations

TSS Bubble Load	High River Flow Period for all Facilities		
	Monthly Average (lbs/day)	Weekly Average (lbs/day)	Daily Maximum (lbs)
	17,000[a]	26,000[b]	34,000[c]
Individual TSS Mass Loads Used to Calculate the TSS Bubble Load			
Durham WRRF	3500	5300	7000
Rock Creek WRRF	11,000	17,000	22,000
Hillsboro WRRF	1300	2000	2600
Forest Grove WRRF	1300	2000	2600

Notes:

a. Total TSS is 17,100 lbs/day (3,500 + 11,000 + 1,300 + 1,300 = 17,100). Rounded to 17,000 lbs/day.

b. Total TSS is 26,300 lbs/day (5,300 + 17,000 + 2,000 + 2,000 = 26,300). Rounded to 26,000 lbs/day.

c. Total TSS is 34,200 lbs/day (7,000 +22,000 + 2,600 + 2,600 = 34,200). Rounded to 34,000 lbs/day.

Under both low and high river flow conditions, the TSS bubbled mass limits are more stringent than the corresponding individual mass load limits. They are also less than what would be allowed by secondary treatment standards since they are calculated on more stringent concentrations. Compliance would be determined by summing the individual mass discharges from each of the CWS facilities for the relevant periods and comparing it with the bubbled mass limits.

3.2 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.

3.2.1 Designated Beneficial Uses

NPDES permits issued by DEQ must protect designated beneficial uses of the Tualatin River. These uses are listed in OAR-340-041-0340 (Table 340A) for Willamette River tributaries and include the following:

- Public and private domestic water supply[15]
- 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, and
- Hydro power

Based upon the *Fish Use Designations – Willamette Basin, Oregon Figure 340A* contained in OAR 340-041-0340, the Tualatin River is designated as a salmon and steelhead migration corridor. No salmon or steelhead spawning use is designated for the portions of the river where the WRRFs discharge. The river is not identified as cold core habitat within the reach where the WRRFs discharge.

The applicable numeric water quality criteria are also found in OAR 340-041-0345. These include general criteria and Tualatin Basin-specific criteria intended to be protective of the beneficial uses for the basin, as listed above.

3.2.2 Water Quality-Limited Parameters and Total Maximum Daily Loads

The following table lists the parameters in the 2018/2020 303(d) list for which the Tualatin River is water quality-limited (Category 5 and 4) within the section of the river that receives discharges from the four WRRFs. The table also lists any parameters covered by a TMDL.

[15] With adequate pretreatment and natural quality that meets drinking water standards.

Table 3-9: WQ-Limited and TMDL Parameters

Waterbody Name	Assessment Unit (See note a.)	Parameter	Season
Tualatin River	OR SR 1709001005 02 104018	Biological Criteria	Year Round
Tualatin River	OR SR 1709001005 02 104018 OR SR 1709001002 02 104104	Chlorophyll-a	Year Round
Tualatin River	OR SR 1709001005 02 104018	Dissolved Oxygen	Year Round
Tualatin River	OR SR 1709001004 02 104139 OR SR 1709001002 02 104104	*E-coli*	Year Round
Tualatin River	OR SR 1709001004 02 104139	Fecal coliform	Year Round
Tualatin River	OR SR 1709001005 02 104018	Harmful Algal Blooms	Year Round
Tualatin River	OR SR 1709001005 02 104018	Harmful Algal Blooms	Year Round
Tualatin River	OR SR 1709001005 02 104018 OR SR 1709001002 02 104104 OR SR 1709001004 02 104139	Iron-Total (Aquatic Life)	Year Round
Tualatin River	OR SR 1709001005 02 104018 OR SR 1709001002 02 104139	Methylmercury – Human Health	Year Round
Tualatin River	OR SR 1709001005 02 104018 OR SR 1709001004 02 104139	Temperature	Year Round
TMDL Parameters			
Chlorophyll a, Bacteria, Dissolved Oxygen, Phosphorus, Temperature (2001) – Amended 2012; Willamette Basin Mercury (2019)			
Note: a. Assessment Unit Names: OR SR 1709001002 02 104104 (Tualatin River – Wapato Creek to Dairy Creek)- includes the Forest Grove WWTP discharge area; OR SR 1709001002 02 104139 (Tualatin River – Dairy Creek to McFee Creek) – includes the Hillsboro WRRF and Rock Creek WRRF discharge areas; OR SR 1709001005 02 104018 (Tualatin River – McFee Creek to confluence with Willamette River) – includes the Durham WRRF discharge area			

Each of the parameters listed in the above table is considered a pollutant of concern for the reach of the Tualatin River that the four WRRFs discharge into.

3.2.3 TMDL Wasteload Allocations

DEQ has developed Total Maximum Daily Loads (TMDLs) in the Tualatin and Willamette River Basins for chlorophyll a, dissolved oxygen (through ammonia control), pH, temperature and nuisance algal growth (through total phosphorus control). These TMDLs were initially developed in 2001 and amended in 2012 for total phosphorus and ammonia. A TMDL can be thought of as an estimate of the total amount of pollution a waterbody can assimilate without exceeding water quality standards.

EPA also issued a TMDL and Water Quality Management Plan for mercury on December 30, 2019, with revisions issued on February 4, 2021. This TMDL includes wasteload allocations in the form of mercury reduction plans for major municipal wastewater treatment plants like the four WRRFs operated by CWS. The implementation of a Mercury Monitoring Plan and monitoring for mercury to measure the effectiveness of mercury reduction efforts are required under the proposed permit. Additional details are provided in Section 3.2.11.7.

The following table provides a summary listing of the relevant TMDLs issued for the Willamette River Basin and the Tualatin River that apply to the CWS facilities.

Table 3-10: Applicable TMDLs

TMDL	Parameters	Time Period
Tualatin Subbasin – August 2001 (Amended August 2012)	Temperature	May 1 – October 31
	Bacteria	Year -round
	Phosphorus[a]	May 1 – October 15[b]
	Ammonia (for DO)[c]	May 1 – November 15[d]
	Dissolved Oxygen	Low River Flow
Willamette Basin – February 2021	Mercury	Year Round

Notes:

a. The 2001 TMDL for phosphorus was initially intended to reduce algal blooms in the lower Tualatin River and the WLA applied to Durham and Rock WRRFs. The 2012 amendment approved WLAs for phosphorus for summer discharges from the Hillsboro and Forest Grove WRRFs.

b. The listed time period only applies to Durham WRRF. Applicable time period for the Rock Creek WRRF and Forest Grove WRRF is May 1 - September 30.

c. Ammonia WLAs are designed to protect dissolved oxygen levels in river.

d. Ammonia reduction period may not apply during higher river flow conditions between September 1 and November 15.

Details on how the various WLAs for each listed parameter are used in determining permit effluent limits for each WRRF are further described in the following sections of this report.

3.2.4 Pollutants of Concern

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

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

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

Table 3-11: Domestic Toxic Pollutants of Concern

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

DEQ identified the following pollutants of concern for the four WRRFs as listed in the following table.

Table 3-12: Pollutants of Concern

Pollutant	How was pollutant identified?
pH	Effluent Monitoring
Temperature	TMDL and Effluent Monitoring
E. coli	Effluent Monitoring
Phosphorus	TMDL and 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.

3.2.5 Regulatory Mixing Zone

Permits issued by DEQ sometimes specify mixing zones. Also known as “regulatory mixing zones”, mixing zones are allowed under both state and federal regulation. They are areas in the vicinity of outfalls in which all or some of Oregon’s water quality standards can be suspended. DEQ allows mixing zones when the requirements of Oregon’s Mixing Zone Rule (OAR 340-041-0053) are met.

Two mixing zones can be developed for each discharge: 1) The acute mixing zone, also known as the “zone of initial dilution” (ZID), and 2) the chronic mixing zone, usually referred to as “the regulatory mixing zone (RMZ).” The ZID is a small area where acute criteria can be exceeded as long as it does not cause acute toxicity to organisms drifting through it. The RMZ is an area where acute criteria must be met but chronic criteria can be exceeded. It must be designed to protect the integrity of the entire water body.

The proposed permit assigns a mixing zone for each of the four WRRFs. In addition, the Durham, Rock Creek and Forest Grove facilities are also assigned a separate mixing zone for their respective wet weather outfalls. All of the mixing zone dimensions extend downstream of the outfall. A summary of the ZID and RMZ established for each CWS outfall is presented in Table 3-13.

Table 3-13: Summary of Location and Mixing Zone Dimensions for Outfalls

Facility – Outfall	River Mile	Latitude and Longitude	Mixing Zone Dimensions	
			ZID (ft)	RMZ (ft)
Durham – D001	9.2	45.3932°N -122.7644°W	10	100
Durham – D003	9.2	45.3931°N -122.7642°W	10	65
Rock Creek – R001	37.7	45.4908°N -122.9454°W	10	100
Rock Creek – R003	37.7	45.4908°N -122.9453°W	10	50
Hillsboro – H001A	43.3	45.4991°N -122.9859°W	10	100
Hillsboro – H001B	42.9	45.4989°N -122.9893°W	10	100
Forest Grove – F001	53.8	45.5018°N -123.0890°W	10	100
Forest Grove – F003	53.8	45.5080°N -123.0875°W	10	100

In the permit renewal application for the existing 2016 permit, CWS provided updated mixing zone/ dilution studies for all of these outfalls.[16] Supplemental mixing zone information and dilutions were also provided to DEQ during the existing permit term.[17] Table 3-14 summarizes the water quality standards, applicable 2025 flow rates and dilutions predicted for each outfall as a result of the various CWS mixing zone studies. The effluent flow rates used in the main 2008 mixing zone study reflect the design flows for each facility. The dilutions shown in the table below are considered conservative and were used to conduct water quality analyses and establish permit limits as needed. The process of developing permit limits is described in more detail in the following sections of this report.

[16]Clean Water Services Watershed-based NPDES Permit Renewal Application. Volume 5: Ancillary Reports and Plans. August 7, 2008.
[17]Updated mixing zone information for the Forest Grove WRRF was submitted to DEQ in 2019 as part of an outfall replacement/rehabilitation project for Outfall F001. Updated mixing zone information for Hillsboro Outfalls H001A and H001B provided in CWS memorandum to DEQ dated September 29, 2017.

Table 3-14: Facility Water Quality Standards, Flow Rates and Dilutions

Durham WRRF Outfall D001 – Year-Round Discharge (2025 conditions) **Date of Mixing Zone Study: 2008** (See note b).						
Water Quality Standard	**Stream Flow (cfs)**		**Effluent Flow (mgd)**		**Dilution** (See note a.)	**Location**
	Statistic	**Flow**	**Statistic**	**Flow**		
Aquatic Life, Acute	1Q10	185	ADWDF (See note c).	25.7	2.6	ZID
Aquatic Life, Chronic	7Q10	185	ADWDF	25.7	5.7	MZ
Human Health, Non-Carcinogen	30Q5	190	Annual Average Design	30.3	5.1	MZ
Human Health, Carcinogen	Harmonic Mean	377	Annual Average Design	30.3	9.0	MZ
Durham WRRF Outfall D003 – Wet Weather Discharge (2025 conditions) (See note d.) **Date of Mixing Zone Study: 2008** (See note b.)						
Aquatic Life, Chronic	Peak flow conditions	6000	2-year design peak flow event (See note e.)	28	5.4 (See note f.)	ZID
Aquatic Life, Chronic	Peak flow conditions	6000	2-year design peak flow event (See note e.)	28	7.1 (See note f.)	MZ
Human Health, Non-Carcinogen	Limited use outfall; refer to year-round discharge conditions table					
Human Health, Carcinogen	Limited use outfall; refer to year-round discharge conditions table					

Rock Creek WRRF Primary Outfall R001 – Year-Round Discharge (2025 conditions) **Date of Mixing Zone Study: 2008** (See note b.)						
Aquatic Life, Acute	1Q10	104	Based on future flow condition that is greater than ADWDF of 46.4 MGD	54.6	1.3	ZID
Aquatic Life, Chronic	7Q10	104	Based on future flow condition that is greater than ADWDF of 46.4 MGD	54.6	2.2	MZ
Human Health, Non-Carcinogen	30Q5	106	Annual Average Design	63.2	2.1	MZ
Human Health, Carcinogen	Harmonic Mean	263	Annual Average Design	63.2	3.7	MZ
Rock Creek WRRF Wet Weather Outfall R003 – Wet Season Peak Discharges (See note g.) **Date of Mixing Zone Study: 2016** (See note h.)						
Aquatic Life, Chronic	Peak flow conditions	6000	Two-year design peak flow event (See note i.)	54	3.6 (See note j.)	ZID
Aquatic Life, Chronic	Peak flow conditions	6000	Two-year design peak flow event (See note i.)	54	6.2 (See note j.)	MZ
Human Health, Non-Carcinogen	Limited use outfall; refer to year-round discharge conditions table					
Human Health, Carcinogen	Limited use outfall; refer to year-round discharge conditions table					

Hillsboro WRRF Outfall H001A at RM 43.3 – Wet Season Discharges (2025 conditions) Date of Mixing Zone Study: 2017 (See note k.)						
Aquatic Life, Acute	1Q10	350 (See note l.)	Design average wet weather flow (See note m.)	3.8	3.5	ZID
Aquatic Life, Chronic	7Q10	350 (See note l.)	Design average wet weather flow (See note m.)	3.8	15.7	MZ
Human Health, Non-Carcinogen	30Q5	350 (See note l.)	Annual average design (See note m.)	3.4	15.7	MZ
Human Health, Carcinogen	Harmonic Mean	691	Annual average design (See note m.)	3.4	16.2	MZ
Hillsboro WRRF Outfall H001B at RM 42.9 – Wet Season Discharges (2025 conditions) Date of Mixing Zone Study: 2017 (See note k.)						
Aquatic Life, Acute	1Q10	350 (See note l.)	Design average wet weather flow (See note m.)	3.8	3.5	ZID
Aquatic Life, Chronic	7Q10	350 (See note l.)	Design average wet weather flow (See note m.)	3.8	15.7	MZ
Human Health, Non-Carcinogen	30Q5	350 (See note l.)	Annual average design (See note m.)	3.4	15.7	MZ
Human Health, Carcinogen	Harmonic Mean	691	Annual average design (See note m.)	3.4	16.2	MZ

Forest Grove WRRF and NTS: Outfall F001 – Dry Season Discharges (See note n.) **Date of Mixing Zone Study: 2019** (See note o.)						
Aquatic Life, Acute	1Q10	33	Design average dry weather flow	6.3	1.8	ZID
Aquatic Life, Chronic	7Q10	54	ADWDF	6.3	4.9	MZ
Human Health, Non-Carcinogen	30Q5	69	Annual average design	8.1	6.1	MZ
Human Health, Carcinogen	Harmonic Mean	167	Annual average design	8.1	8.8	MZ
Forest Grove WRRF and NTS: Outfall F001 – Wet Season Discharges (See note p.) **Date of Mixing Zone Study: 2019** (See note o.)						
Aquatic Life, Acute	Wet Season Flow	500 (See note q.)	Design average wet weather flow	7.8	3.1	ZID
Aquatic Life, Chronic	Wet Season Flow	500 (See note q.)	Design average wet weather flow	7.8	19.9	MZ
Human Health, Non-Carcinogen	Refer to dry season conditions table					
Human Health, Carcinogen	Refer to dry season conditions table					
Forest Grove WRRF and NTS: Outfall F003 – Wet Season Peak Flow Conditions (See note r.) **Date of Mixing Zone Study: 2015** (See note s.)						
Aquatic Life, Acute	Peak Flow Conditions	4500	Maximum daily wet weather design flow (See note t.)	7.7	2.1 (See note u.)	ZID
Aquatic Life, Chronic	Peak Flow Conditions	4500	Maximum daily wet weather design flow (See note t.)	7.7	21.4 (See note u.)	MZ
Human Health, Non-Carcinogen	Refer to dry season conditions table					

Human Health, Carcinogen	Refer to dry season conditions table

Notes:

a. Unless otherwise noted in table, dilutions presented above represent dilution factors.
b. While the mixing zone study was conducted in 2008, the effluent flows in the study reflect the design flows specified in the NPDES permit.
c. ADWDF = Average dry weather design flow and PF = Peaking factor
d. Outfall D003 is used during wet season peak flow conditions when the hydraulic capacity of the secondary treatment system at the Durham WRRF is exceeded.
e. The 2-year design peak effluent flow from the Durham WRRF was estimated to be 137 MGD, of which 109 MGD would be discharged through Outfall D001 and 28 MGD would be discharged through D003.
f. The wet weather outfall (D003) is located 35 feet downstream of and within the regulatory mixing zone for D001. The dilutions presented above represent the effective dilution at the wet weather outfall and mixing zone boundary.
g. Outfall R003 is used during wet season peak flow conditions when the hydraulic capacity of R001 is exceeded.
h. Mixing zone study provided to DEQ in a March 7, 2016 memorandum.
i. The 2-year design peak effluent flow from the Rock Creek WRRF was estimated to be 164 MGD. Of which 110 MGD would be conveyed through the primary outfall (R001) and 54 MGD would be conveyed through R003.
j. The wet weather outfall R003 is located 50 feet downstream of and within the regulatory mixing zone for outfall R001. The dilutions presented above represent the effective dilution at R003 and regulatory mixing boundary.
k. Updated mixing zone information and dilutions provided to DEQ in memorandum dated September 29, 2017.
l. The stream flow (350 cfs) represents the flow when the facility can discharge during wet season flow conditions as specified in the permit. CWS has applied this flow regime as the minimum flow regime for discharge from the Hillsboro WRRF.
m. The Hillsboro WRRF design flows are 7.6 MGD (wet weather design flow) and 6.8 MGD (annual average design flow); these flows are equally divided between Outfalls H001A and H001B.
n. At Forest Grove WRRF, dry season flow regime representative of conditions when the Forest Grove NTS is in use. Modeled 2035 effluent conditions.
o. Updated Forest Grove WRRF mixing zone study submitted to DEQ in an August 5, 2019 memorandum as part of Outfall F001 replacement project.
p. Wet season flow regime is when the Forest Grove WRRF discharges directly into river. No discharge through NTS.
q. CWS expects that the Forest Grove WRRF will discharge directly to the Tualatin River at flows ≥ 500 cfs.
r. At Forest Grove WRRF, Outfall F003 is used during peak wet season flow regime when the capacity of Outfall F001 is exceeded. Outfall F003 was not used during the existing 2016 permit term (2016-2020).

s. Mixing zone information provided to DEQ in memorandum dated June 19, 2015.

t. At Forest Grove WRRF, maximum daily wet weather design flow was estimated at 27.7 MGD, of which 20 MGD would be conveyed through Outfall F001 and 7.7 MGD would be conveyed through Outfall F003.

u. Dilutions represent the flow conveyed to the wet weather Outfall F003.

The proposed permit requires Clean Water Services to submit a Level 2 mixing zone study for each facility six months prior to permit expiration. The new study is required to ensure that DEQ has an updated mixing zone analyses for each of the facilities and their respective outfalls at the time of the next permit renewal. The new analysis will also provide updated dilutions at each of the WRRFs for various stream flow and discharge scenarios.

3.2.5.1 Outfalls

Each of the WRRFs have two outfalls. The Durham, Rock Creek and Forest Grove WRRFs have a primary outfall (D001, R001 and F001, respectively) that is used under most discharge conditions. The other is considered a secondary or wet weather outfall (D003, R003 and F003, respectively). The Hillsboro WRRF has a bifurcated discharge with both outfalls (H001A and H001B) in use at all times. None of the CWS outfalls are located in the vicinity of public drinking water intakes, cold water refuges for salmonids, and other NPDES discharges. The portion of the Tualatin River where the outfalls are located is not designated as salmon or steelhead spawning areas. Complete details on the environmental conditions for each CWS outfall were presented in the 2008 mixing zone study that is part of the permit record. The following section presents a summary of the general environmental conditions associated with each outfall under this permit.

<u>Durham WRRF</u>

Durham's primary outfall (Outfall D001) is a multiport diffuser while the wet weather outfall (Outfall D003) is a single submerged 84-inch diameter port. Both outfalls are located immediately upstream of the confluence of Fanno Creek with the Tualatin River. Outfall D003 is only utilized when flows exceed secondary capacity and the additional storage provided by the facility's two on-site surge basins. Since its installation in 2003, this outfall has only been used three times; the outfall was not used during the most recent permit period (2016-2022). The expected future use of this outfall is during periods when flow in the Tualatin River is at, or greater than, 6000 cubic feet per second (cfs) (as measured at the Farmington Gage). Clean Water Services performed a mixing zone analysis of Outfall D003 and estimated "effective" critical dilutions due to the overlapping plume from Outfall D001into the mixing zone of Outfall D003 during high flows. The analysis provided estimated dilutions at both the mixing zone and the ZID boundaries for D003. These effective dilutions, presented in Table 3-14 above, take into account the reduced dilution due to the effect of outfall D001 just upstream of Outfall D003.

Modeling of high flow conditions when Outfall D003 would be discharging indicate an influent flow of 109 MGD, which is the year 2025 maximum daily wet weather flow condition, and a stream flow condition of 6,000 cfs (2-year flood event). This information was used in the reasonable potential analysis that concluded that there is no reasonable potential to exceed water quality criteria even during these extreme flow conditions. It is anticipated that any discharges from Outfall D003 during wet weather conditions would be substantially diluted as a result of high river flow conditions. Coupled with fast plume travel times and the relatively short-term operation of the Outfall D003 during wet weather conditions, aquatic life toxicity concerns are not expected to occur.

The Durham WRRF outfalls are located between a railroad bridge and a pedestrian bridge on an outside bend in the river. Riverbed conditions at the outfalls consist of sands, gravel and rock at the diffuser and sand, mud and rocks at the RMZ.

Rock Creek WRRF

Rock Creek's primary Outfall R001 terminates in the river with a multiport diffuser and the wet weather Outfall R003 terminates as a single 96-inch diameter submerged port. Outfall R003 is primarily utilized when a combination of high river flow and high effluent flows limit the use of Outfall R001. The expected future use of Outfall R003 is during periods when the Tualatin River flow is at, or greater than, 6000 cfs (as measured at the Farmington Gage). CWS has completed a mixing zone analysis of Outfall R003 and has estimated "effective" critical dilutions due to the overlapping plume from Outfall R001 into the mixing zone for Outfall R003 during high flows. The analysis provided estimated dilutions at both the mixing zone and the ZID boundaries. These effective dilutions, presented in Table 3-14 above, take into account the reduced dilution due to the effect of Outfall R001 being just upstream of Outfall R003.

The riverbed at the Rock Creek WRRF outfall locations consists of cobbles with mud and rocks within the RMZ. The riverbank adjacent to the outfalls is mostly wooded.

Hillsboro WRRF

The Hillsboro WRRF has two outfalls approximately 0.4 mile apart on the Tualatin River that are locally referred to as the East Outfall (H001B at RM 42.9) and West Outfall (H001A at RM 43.3). Both outfalls terminate in the river as submerged 30-inch diameter single ports and are only used during wet weather river flow conditions when river flows typically exceed 350 cfs (as measured at the Farmington Gauge). Since both outfalls are of similar design, discharge conditions are expected to have identical dilutions during critical stream conditions. The modeled dilutions above a river flow of 350 cfs for both Outfalls H001A and H001B are estimated at 3.5 at the ZID and 15.7 (7Q10) and 16.2 (30Q5) at the RMZ.

At both Hillsboro WRRF outfalls, the riverbed is comprised of fine silts and muds; however, some woody debris is also present in the vicinity of Outfall H001A. The outfalls are located in an area where the riverbanks are heavily wooded.

Forest Grove WRRF

Outfall F001 at the Forest Grove WRRF was replaced in 2019. It currently consists of a single 36-inch diameter pipe that reduces to a 30-inch diameter single port diffuser at the riverbank edge. Historically, this outfall was only used during the wet season (typically November to April). However, the existing 2016 permit authorized a year-round discharge for this outfall. At Outfall F001, riverbed sediments are comprised of sands and silty sands and the outfall is located on the outside of a bend in the river. Because of the outfall design, the effluent discharge is subject to bank attachment and the effluent plume is not expected to rapidly disperse during critical low stream flow conditions. This bank attachment, however, is along a riprapped shoreline in an area with no known salmonid spawning or coldwater refugia. The mixing zone is therefore expected to have only minimal adverse effects on the indigenous biological community due to the bank attachment.

Under most operating conditions, effluent leaving the NTS will enter the river through Outfall F001. During *extreme* wet season flow conditions, the South Wetlands complex of the NTS (adjacent to the Tualatin River) will be under water. Under such conditions, CWS will continue to use Outfall F001 to discharge effluent to the Tualatin River but may also use Outfall F003 that is located in the northwestern portion of the South Wetlands. Effluent quality will be the same as Outfall F001 and all compliance monitoring during the wet season will be conducted at the Forest Grove WRRF. Under extreme 2025 wet weather conditions, it is estimated that 20 MGD would be discharged through Outfall F001 and 7.7 MGD would be discharged through Outfall F003. Since Outfall F001 was replaced in 2019, Clean Water Services provided DEQ with updated estimated dilutions during these conditions for the outfall which are presented in Table 3-14.[18] For Outfall F003, the estimated dilutions were updated in 2015.[19] The predicted dilution values are higher than the predicted dilution values for Outfall F001 during critical dry season low flow conditions.

3.2.6 pH

The pH criterion for the Tualatin River basin is 6.5 – 8.5 per OAR 340-041-0345. The federal secondary treatment standards allow CWS to discharge effluent with a pH between 6.0 and 9.0 standard unit (SU). The basin standards for pH do not have to be met at the outfall and can instead be met at the edge of the mixing zone.

During the development of the existing 2016 permit, DEQ conducted a reasonable potential analysis for pH for each facility using dilutions factors for both low and high river flow conditions. With the exception of the Durham WRRF under low flow conditions, the 2016 RPA analysis concluded that there would be a reasonable potential to exceed basin pH standards at the edge of the mixing zone using federal secondary treatment standards for pH (6.0 – 9.0 SU). This is largely due to the relatively low dilutions within the mixing zones under both high and low flow conditions. The 2016 RPA analysis resulted in the establishment of the pH limits indicated in Table 3-15. The pH limits are year-round limits that incorporated the more stringent of the low or high flow pH limits determined from the RPA analysis. DEQ set the effluent pH limits to the more stringent of the two ranges to ensure that water quality is protected year-round.

[18]Updated Forest Grove WRRF mixing zone study submitted to DEQ on August 5, 2019 memorandum as part of Outfall F001 replacement project.
[19]CWS Memorandum – Forest Grove Wet Weather Outfall. June 22, 2015.

Table 3-15: Summary of pH Limits for High and Low River Flow Conditions

Facility	Units	Low Flow Conditions	High Flow Conditions	Existing Permit Limits (Year –round)	Proposed Permit Limits (Year –round)
Durham WRRF	SU	6.0 – 9.0	6.1 – 9.0	6.2 - 9.0	6.2 - 9.0
Rock Creek WRRF	SU	6.3 – 9.0	6.3 – 9.0	6.3 – 9.0	6.3 – 9.0
Hillsboro WRRF	SU	N/A	6.2 – 9.0	6.3 – 9.0	6.3 – 9.0[a]
Forest Grove WRRF	SU	6.2 – 9.0	6.0 – 9.0	6.3 – 9.0	6.3 – 9.0[b]

Notes:

a. During low flow conditions, the Hillsboro WRRF has no direct discharges to the Tualatin River and sends primary clarifier effluent to the Forest Grove WRRF. During such times, the pH limits will be met at the outlet structure to the Forest Grove NTS.

b. These limits also apply during peak high flow conditions at the Forest Grove WRRF when the facility discharges to Outfall F003.

Utilizing effluent data collected from January 2017 through December 2020 and ambient water quality data obtained from 2015 to 2020, DEQ conducted new RPAs for each facility using the dilution factors for both low and high river flow conditions as listed in Table 3-14 (a total of 8 RPAs). The RPAs also used the existing permit limits listed in Table 3-15. For the Durham and Rock Creek facilities, the analysis incorporated effective dilutions at the edge of the mixing zones for the wet weather Outfalls D003 and R003 when the upstream Outfalls D001 and R003 are discharging. Both wet weather outfalls D003 and R003 are located downstream and within the mixing zones of the primary Outfalls D001 and R001. DEQ also conducted an analysis of discharges from the Forest Grove NTS during low river flow conditions using effluent data from the outlet structure of the NTS.

Overall, the analysis concluded that the facilities will not exceed water quality criteria for pH when meeting the existing permit limits. The analysis did indicate that, under high flow conditions, the lower end of the existing pH limit range could be slightly relaxed for the Rock Creek and Hillsboro WRRFs and still meet water quality criteria at the edge of the mixing zone. However, the criteria would only be met by a small margin. At Forest Grove, during direct discharge, the replacement of Outfall F001 resulted in better dilutions when compared to the 2016 analysis, which also allows for relaxation of the lower limit of the pH range during high flow conditions. For discharges through the Forest Grove NTS, the RPA confirmed that pH limits below 6.3 will result in a reasonable potential to exceed water quality criteria for pH. For the proposed permit, limits will be maintained at 6.3 to 9.0. The lower end of the pH limit range is considered to be a WQBEL.

To determine the appropriate pH limit range to include for each facility in the proposed permit, the WQBEL limit range derived for each facility during high and low flow conditions needs to be compared to the existing pH limit range for each facility and the more stringent of the two ranges included in the proposed permit. For all four facilities, the existing year-round permit limit ranges are either more stringent, or equal to, the individual low flow and high flow pH limits determined for facility. As such, these existing limits will be carried over to the next permit term and will be year-round limits to be protective of water quality. The endpoints of each range of pH limits are considered to be inclusive of the pH limits. These limits are considered WQBELs and must be met at the point of discharge.

At the Hillsboro WRRF, the facility does not discharge directly to the river during low river flow conditions. During this period, primary clarifier effluent is sent to the Forest Grove WRRF for treatment and subsequent release into the NTS. During such times, the pH limits will be met at the outlet structure from the NTS.

3.2.7 Temperature

Water temperatures affect the life cycles of aquatic species and are a critical factor in maintaining and restoring healthy salmonid populations. The purpose of the temperature criteria in OAR 340-041-0028 is to protect designated, temperature-sensitive beneficial uses (including salmonid life cycle stages) from adverse warming caused by human activities. The following sections present an analysis of the discharges from all four CWS facilities relative to established temperature criteria.

3.2.7.1 Temperature Criteria OAR 340-041-0028

All four WRRFs discharge into the Tualatin River. DEQ developed a TMDL for the Tualatin Basin for temperature in 2001 which included temperature wasteload allocations (WLAs) for facilities discharging during the TMDL critical temperature period. For the Hillsboro facility, the TMDL did not include an explicit WLA because it does not discharge during this critical period, and the biologically-based criterion is met outside of this period. The criterion addressed by the TMDL was 17.8°C, more stringent than the current criterion of 18.0°C, so the TMDL analysis pertaining to this facility is still considered valid. However, the Hillsboro WRRF’s thermal plume impacts still require evaluation, and an analysis is presented in the following “thermal plumes” section.

Applicable temperature criteria for all four discharge locations are summarized in the table below. This table also indicates whether the Tualatin River is water quality-limited for temperature and whether a TMDL wasteload allocation for temperature has been assigned. Using this information, DEQ performed several analyses to determine if existing permit effluent limits need to be modified to comply with the temperature criteria.

Table 3-16: Temperature Criteria Information

Applicable Temperature Criterion	Rearing/Migration 18 C (OAR 340-041-0028(4)(c)
Applicable dates: Year-round	
Salmon/Steelhead Spawning 13°C? *OAR 340-041-0028(4)(a)*	☐Yes ☒No
Applicable dates: Not applicable	
WQ-limited? (See note "a" below.)	☒Yes ☐No
TMDL wasteload allocation assigned?	☒Yes ☐No
Applicable dates: May 1 to October 31	
TMDL based on natural conditions criterion?	☐Yes ☒No
Cold water summer protection criterion applies?	☒Yes ☐No
Cold water spawning protection applies?	☐Yes ☒No
Note: a. The lower Tualatin River is water quality limited for temperature for the section extending from Dairy Creek downstream to the confluence with Willamette River. This includes the Hillsboro, Rock Creek and Durham WRRFs discharge areas.	

<u>Existing (2016) Permit Temperature Limitations</u>

As part of the development of the 2001 temperature TMDL, WLAs for temperature (in the form of Allowable Thermal Loads) were established for the Durham and Rock Creek WRRFs, as well as a WLA for future growth.[20] The treatment facilities' WLAs are based on achieving "no measurable increase" above the system potential stream temperatures at the edge of the mixing zones. Under the temperature standard that was applicable at the time the TMDL was developed, a measurable increase was defined as greater than a 0.3°C increase at the edge of the mixing zone. Additionally, temperature limits of 25°C were included in the permit to be consistent with the WLA footnote in the TMDL that the permit will "ensure incipient lethal temperatures are not exceeded."

In addition to a numeric heat load for each facility, the WLAs also included a provision allowing the recalculation of the WLAs if specific inputs to the WLA equations differed from those used in the TMDL[21]. Based on information obtained during the development of the 2005 and 2016 NPDES permits, the WLAs were recalculated. These recalculated WLAs were considered to be consistent with the assumptions and requirements of the TMDL WLAs. Effluent limits (in the form of allowable thermal loads) were included in the 2016 permit based on the WLAs along with a temperature limit of 25°C to address the incipient lethal temperature requirement noted above. These 2016 limits are presented in the table below.

[20] Tualatin Subbasin Total Maximum Daily Load (TMDL), Section 4.1.7 – Point Sources of Heat – Table 10, Page 48. Oregon Department of Environmental Quality. August 2001.
[21] Tualatin Subbasin Total Maximum Daily Load (TMDL), Section 4.1.7 – Point Sources of Heat – Footnote 9 at the bottom of Page 48. Oregon Department of Environmental Quality. August 2001.

Table 3-17: Existing (2016) Permit Temperature Limitations

Facility	Outfall Number	Parameter	Limitation
Durham AWTF	D001	Effluent Temperature	77° F daily maximum
	D001	Allowable Thermal Load	2.0×10^7 kcal/day
Rock Creek AWTF	R001	Effluent Temperature	77° F daily maximum
	R001	Allowable Thermal Load	2.4×10^7 kcal/day
Forest Grove WRRF	F001	Effluent Temperature	77° F daily maximum
	F001	Allowable Thermal Load	7.0×10^6 kcal/day

<u>TMDL-Based Temperature Limitations</u>

To ensure that the proposed temperature effluent limits are consistent with the TMDL, the TMDL wasteload allocations were reviewed. As with the 2005 and 2016 permit limits, the proposed temperature limits utilize the TMDL provision which allows the recalculation of the WLAs if specific inputs to the WLA equations differed from those used in the TMDL[22]. In accordance with the TMDL, the recalculated WLAs were derived based upon the equations and rationale presented in Section 4.1.4.2 of the TMDL (as were the WLAs in Table 10 of the TMDL). Since the temperature WLAs in the TMDL are in a form that does not directly translate into appropriate effluent limits, the 2005 and 2016 permits included limits that differed numerically from the WLAs values, but were still consistent with the TMDL.[23] The formula that the 2005 and 2016 WLAs (in the form of allowable thermal loads) are based upon is presented below:

$$\text{Allowable Thermal Load} = ((Q_{ZOD} + Q_{PS}) \times (1000/35.3) \times 86400 \times \text{Max } \Delta T_{ZOD} \times 5/9) \text{ kcals/day}$$

Where:

Q_{ZOD} = River flow within the mixing zone, or 25% of the 7Q10 River Flow (cfs)

Q_{PS} = Treatment plant effluent flow (cfs)

Max ΔT_{ZOD} = 0.25 ° F (the maximum allowable temperature increases in the mixing zone under the TMDL)

Using the above equation and inputting the appropriate river and effluent flows presented in Table 3-14 of this report, allowable thermal loads have been developed. These loads, along the other relevant values, are presented in the table below.

[22] Refer to Footnote 9 at the bottom of Page 48. Tualatin Subbasin Total Maximum Daily Load (TMDL), Section 4.1.7 – Point Sources of Heat. Oregon Department of Environmental Quality. August 2001.

[23] The waste load allocations in the TMDL are expressed as the amount of heat loading allowed to be transferred to the river. These values do not take into account the mass of the water in the effluent. The effluent limits are still consistent with the TMDL and result in the same allowable change in river temperature (a maximum of 0.25 °F above the system potential temperature).

Table 3-18: Allowable Thermal Loads

	Durham AWTF (D001)	Rock Creek AWTF (R001)	Forest Grove NTS (F001)
Q_R (7Q10 low flow, cfs)	185	104	54
Q_{ZOD} (25% of Q_R) (cfs)	46	26	13.5
Q_{PS} (cfs)	39.8	71.8	9.7
Q_{PS} (mgd)[a]	25.7	46.4	6.3
Max ΔT (°F)	0.25	0.25	0.25
Max ΔT (°C)	0.14	0.14	0.14
Allowable Thermal Load (10^6 kcal/d)	29.1	33.2	7.9
T (°F) for calculation System Potential Temperature (Tsp) (From TMDL)	64.6	58.5	53.1

Note:
a. Treatment plant effluent flow (Q_{ps}) is based upon average dry weather design flow of the facility.

During the development of the 2016 permit, the Forest Grove NTS had yet to begin discharges to the river. As such, a temperature WLA for NTS use was in made in accordance with the TMDL provision that allowed temperature WLAs for new dischargers (future growth).[24] As specified in the TMDL, the temperature WLA for the Forest Grove NTS was calculated using the same methodology and equations used above for the Durham and Rock Creek facilities. During development of the 2016 permit, the temperature WLA for the NTS (in the form of an "Allowable Thermal Load") was determined to be 7.8 x 10^6 kcal/day. To be conservative, the 2016 permit incorporated an allowable thermal load of 7.0 x 10^6 kcal/day for discharges through the NTS.

For the proposed permit, DEQ updated the calculations of the allowable thermal load for the Forest Grove NTS consistent with the TMDL. The updated calculations resulted in a relatively small increase in allowable thermal load to 7.9 x 10^6 kcal/day.[25] Since this is a relatively small increase, the proposed permit will maintain the allowable thermal load limit of 7.0 x 10^6 kcal/day. Including this effluent limitation in the permit ensures that the discharge from the Forest Grove NTS is consistent with the temperature TMDL.

In general, the calculated allowable thermal loads presented in the Table 3-18 above are slightly higher than those in the existing 2016 permit. The more stringent allowable thermal loads from the 2016 permit presented in Table 3-17 will be maintained in the proposed permit.

[24] Refer to Table 10 of the TMDL.
[25] An updated Mixing Zone Study conducted in 2019 for the replacement of Outfall F001 at the Forest Grove NTS revised the average dry weather design flow (Qps) in Table 3-18 from 6.1 to 6.3 MGD. This resulted in a slightly higher allowable thermal load.

Pre-TMDL-Based Temperature Limitations

In addition to being consistent with the TMDL, the permit limits for the discharges from the Rock Creek, Durham and Forest Grove facilities must also address the revised temperature standard which was put into place after the TMDL was developed. A summary of the analysis related to the new standard is presented below.

Durham and Rock Creek WRRFs

The Durham and Rock Creek WRRFs discharge into a segment of the Tualatin River identified as having a salmon and trout rearing and migration corridor use year-round (OAR 340-041 Figure 340A). This fish use has an associated criterion of 18°C as a 7-day average of the daily maximum temperatures (OAR 340-041-0028(4)(c)). Since a TMDL has not yet been approved to address this biological criterion, the new criterion is implemented through OAR 340-041-0028(12)(b)(A). This rule allows for a human use allowance of no more than 0.3°C above the biological criterion (18°C) after mixing with either 25 percent of the river flow or the temperature mixing zone, whichever is more restrictive.

DEQ conducted an analysis for each facility to determine if the allowable thermal loads contained in the existing 2016 permit (refer to Table 3-17) would lead to exceedances of the human use allowance. The analysis determined that the allowable thermal load limits will meet the human use allowance criteria and the biological criteria. For both facilities, the analysis determined that the allowable thermal load limit to achieve the biological criteria and human use allowance can be higher than allowed by the TMDL and still not have a reasonable potential to exceed criteria. However, the calculated post-TMDL allowable thermal loads show in Table 3-17 (and the existing 2016 permit) are the more stringent WQBELs and will be included in the proposed permit.

Forest Grove Natural Treatment System

The Forest Grove NTS also discharges to a segment of the Tualatin River identified as having a salmon and trout rearing and migration corridor use. As with the Durham and Rock Creek facilities, this fish use has an associated criterion of 18°C as a 7-day average of the daily maximum temperatures year-round (OAR 340-041-0028(4)(c)). The DEQ analysis concluded that the allowable thermal load limits will meet the human use allowance criteria and the biological criteria. Similar to the Durham and Rock Creek facilities, the analysis determined that the allowable thermal load limit can be higher than allowed by the TMDL and still not have a reasonable potential to exceed criteria. However, the calculated post-TMDL allowable thermal loads shown in Table 3-17 (and the existing 2016 permit) are the more stringent WQBELs and will be included in the proposed permit.

Forest Grove Natural Treatment System Cold Water Protection

In addition to not being allowed to warm the river above the biologically based criterion (18˚C) by more than the human use allowance, a separate portion of the temperature rule applies for water bodies that have summer temperatures that are below the criterion. Based upon dry season water quality monitoring conducted by CWS in 2016-2020, the segment of the Tualatin River above the point of discharge for the Forest Grove NTS exhibited a maximum temperature of 16.7°C in September 2016. The colder water and temperature upstream of Forest Grove are influenced by stored water released by CWS. This is colder than the biologically based criterion (which is 18°C). Regulations at OAR 340-041-0028(11)(a) specifies that in these situations the discharge is not allowed to warm the river by more than 0.3°C above the summer ambient temperature.

Utilizing ambient data from 2016-2020 and effluent data from 2017-2020, DEQ's analysis determined that an excess thermal load limit of 46.8 x 10^6 kcals/day would be required to meet summer cold water protection criteria. This excess thermal load limit is relative to the ambient temperature of 16.7°C. This equates to an excess thermal load limit of 15.8 x 10^6 kcals/day relative to the 18°C criterion. This value is higher than the allowable thermal load limit determined by the TMDL. The calculated post-TMDL allowable thermal loads shown in Table 3-17 (and the existing 2016 permit) are the more stringent WQBELs and will be included in the proposed permit to meet cold water protection criteria.

<u>Temperature Limitations and Compliance</u>

The 2016 permit included a revised DEQ-approved Temperature Load Management Plan (TLMP) that incorporated a Thermal Load Credit Trading Plan (TLCTP) that described the mechanisms by which CWS can use water quality credit trading to offset thermal loads. (Note: the thermal loads associated with the 25°C thermal plumes criterion are not eligible for credit trading.) Provided that CWS documented compliance with the conditions of the approved TLMP, CWS would be considered in compliance with the permit and applicable stream criteria for temperature. Overall, CWS has implemented the TLMP with success during the current permit term as documented in their annual reports to DEQ on the TLCTP.

The proposed permit will continue to implement temperature management strategies within the Tualatin River watershed. Schedule A of the permit requires CWS to implement the DEQ-Approved Thermal Load Management Plan to generate thermal credits that meet or exceed the aggregate Thermal Load to Offset (TLO) discharged from the Durham, Rock Creek and Forest Grove treatment facilities. Schedule D, Condition 13 lists the elements of the Thermal Load Management Plan authorized by the permit. The Thermal Load Management Plan was updated in July 2021 and is available for comment along with the proposed permit.

Table A5 (Temperature Limits) in Schedule A of the proposed permit (reproduced below in Table 3-19) indicates the allowable thermal load limits to be used to determine the daily TLO for each treatment facility. The daily TLO is determined by calculating the excess thermal load discharged by each facility and subtracting the allowable thermal load. The permit presents the formula for calculating the daily excess thermal load. Compliance with the thermal load limits shall be demonstrated by meeting or exceeding the TLO through the thermal credits generated in accordance with the DEQ-approved Thermal Load Management Plan. The permittee will also be required to meet the maximum temperature limits which are considered to be WQBELs. Each of the allowable thermal load limitations in the proposed permit are lower than those derived in the above discussion and are therefore conservative.

The permit allows the permittee to use actual effluent flows, effluent temperatures and stream flows to calculate thermal loads (see note "d" in Table 3-19). Clean Water Services will submit a technical memorandum for providing applicable flows and effluent temperatures for demonstrating compliance with the actual flows and temperatures. This memorandum will be submitted to DEQ for approval prior to the use of this option.

As noted above, temperature limits of 25°C (77°F) were included in the permit to be consistent with the WLA footnote in the TMDL that the permit will "ensure incipient lethal temperatures are not exceeded." This is consistent with the thermal shock portion of the thermal plumes requirements (see below). While the current permit's limits addressing this are in the form of temperature limits, limits in the form of excess thermal loads are also consistent with the TMDL and the thermal plumes requirements. The proposed permit includes the option for the permittee to demonstrate compliance by either meeting the temperature limits or meeting the associated excess thermal load limitations. [26] This change in the permit is consistent with both anti-degradation and anti-backsliding requirements (since both the original and proposed limits are based on the TMDL requirements).

Table 3-19: Temperature and Thermal Load Limitations

Outfall Number	Parameter	Units	Applicable Time Period	Average Monthly	Average Weekly	Daily Maximum
D001	Temperature	°C	May 1- October 31	-	-	25 (See notes a. and b.)
	Allowable Thermal Load (See note d.)	million kcal/day	May 1- October 31	-	-	20

[26] Allowable Thermal Load are now more commonly referred to as Excess Thermal Loads (ETLs) in NPDES permits. Allowable Thermal Load is the term used in the TMDL and will be used in the proposed permit to maintain consistency with the terminology used in the TMDL.

Outfall Number	Parameter	Units	Applicable Time Period	Average Monthly	Average Weekly	Daily Maximum
R001	Temperature	ºC	May 1-October 31	-	-	25 (See notes a. and b.)
	Allowable Thermal Load (See note d.)	million kcal/day	May 1-October 31	-	-	24
F001 (See note e.)	Temperature	ºC	May 1-October 31	-	-	25 (See notes a. and c.)
	Allowable Thermal Load (See note d.)	million kcal/day	May 1-October 31	-	-	7.0

Notes:

a. The measurement of maximum effluent temperature must be the maximum 1-hour average temperature.

b. The permittee may demonstrate compliance with this limitation by either complying with this thermal shock temperature limitation (Option A), or by complying with one of the following allowable thermal shock load limits (relative to 25°C, the thermal shock criterion):

Option B: Outfall D001 – 36 million kcal/day

Outfall R001 – 66 million kcal/day

Option C: Thermal Shock Load Limit = 0.3 x (Q_e + Q_r x 0.05) x 2.448 million kcal/day

Where:

Q_r = Stream flow, cfs

Q_e = Treatment plant effluent flow, cfs

c. The permittee may demonstrate compliance with the thermal shock temperature limitations by either complying with a temperature limit (Option A) or by complying with the following allowable thermal load limits (relative to 25°C, the thermal shock criterion):

Option B: Outfall F001 - 85 million kcal/day (Applicable during May)

68 million kcal/day (Applicable during June)

93 million kcal/day (Applicable during July)

76 million kcal/day (Applicable during August)

60 million kcal/day (Applicable during September)

69 million kcal/day (Applicable during October)

d. These thermal load limits for the Durham, Rock Creek and Forest Grove facilities are based on the 2001 Tualatin sub-basin TMDL. The TMDL focused on the July/August time period as the critical time period for deriving wasteload allocations. The permittee must demonstrate compliance with the thermal load limits by using the thermal credits calculated for this time period. The permittee may use actual effluent flows and temperatures, and actual stream flows to calculate the thermal loads for the Durham, Rock Creek and Forest Grove treatment facilities. The DEQ may reopen and modify or reissue the permit to include revised temperature and thermal load limits based on new information or on new or revised laws, regulations, or policies related to temperature, including revised TMDL provisions for the Tualatin River Basin.

Outfall Number	Parameter	Units	Applicable Time Period	Average Monthly	Average Weekly	Daily Maximum
e. The compliance point is at the Natural Treatment System outlet structure prior to discharge to Outfall F001. During this period (May 1 – October 31), when stream flows are high (≥350 cfs at the Farmington gauge) and preclude the use of the Forest Grove Natural Treatment System, the compliance point is at the Forest Grove WRRF.						

3.2.7.2 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 from each of the four WRRFs was evaluated for compliance with thermal plume limitations using effluent temperature data collected from January 2017 through December 2020. Thermal plume criteria related to salmonid spawning, instantaneous lethality and thermal shock were evaluated against dry season effluent temperature data when effluent temperatures are the highest.

The results of evaluation against each of the thermal plume provisions is provided below:

- OAR 340-041-0053(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 degrees Celsius (55.4 Fahrenheit) or more for salmon and steelhead, and 9 degrees Celsius (48 degrees Fahrenheit) or more for bull trout.

  Clean Water Services: Fish use in the segment of the Tualatin River where all four WRRFs discharge is listed in the OARs as year-round salmon and trout rearing and migration use. Salmon spawning is not a listed use and there is no known salmon spawning habitat on the mainstem Tualatin River in the vicinity of the discharges from any of the four WRRFs. [27] Therefore, the discharges do not have the potential to adversely affect this criterion or use.

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

  Clean Water Services: During the July 1 through September 30 dry season discharges of 2017 to 2020, CWS recorded daily maximum effluent temperatures of 24.5ºC at both the Durham and Rock Creek WRRFs and 27.8ºC at the Forest Grove WRRF which includes discharges from the NTS. During the dry season, primary clarifier effluent from the Hillsboro WRRF is directed to the Forest Grove WRRF for treatment prior to discharges

[27] Letter from Mr. Tom Murtagh, ODFW District Fish Biologist – Clackamas, Oregon to Mr. Aaron Barok at Oregon Department of Environmental Quality. April 14, 2014.

through the NTS. All of the recorded temperatures are well below the 32ºC criterion. Relative to the instantaneous lethality criterion, none of the discharges from the WRRFs have the potential to cause acute impairment or instantaneous lethality due to the thermal plume.

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

  Clean Water Services: An analysis of the effluent temperature data from 2017-2020 for all four WRRFs indicates that when each facility's effluent plume reaches 5% of the river's cross-sectional area, the plume's temperature will never be over 25°C unless the ambient river conditions exceed 25°C. For example, using the highest recorded effluent temperature of 24.5°C recorded at the Rock Creek WRRF at an ambient river temperature of 24.9°C, the resulting river temperature at the point where the plume reaches 5% of the river cross-sectional area is 24.2°C. Also, once the ambient river temperature reaches 25°C, the river temperature where the plume reaches 5% of the river cross-sectional area is effectively also at 24.2°C. The results of the analysis conducted for the other three facilities were consistent with the findings for the Rock Creek WRRF which concludes that all of the discharges will meet the criteria for preventing or minimizing thermal shock to migrating fish. Additionally, the proposed permit includes limits consistent with the TMDL to ensure the criteria are met (within the TMDL, temperatures above the criteria are referred to as "incipient lethal temperatures").

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

  Clean Water Services: An analysis related to migration blockage conducted by DEQ and CWS[28] indicates that there was no reasonable potential for exposing migrating native fish to temperatures of 21ºC or more. For example, at the Hillsboro WRRF, effluent temperatures are consistently below 21ºC which results in no reasonable potential. At the other three WRRFs, discharge temperatures are either below 21ºC during peak migration periods for native salmonids or discharge induced mixing ensures that effluent temperatures will not raise river temperatures above 21ºC after mixing with 25 percent of cross-sectional area of the Tualatin River. As such, migration blockage caused by effluent discharges from all four WRRFs is prevented or minimized.

All supporting information related to the temperature analysis including calculations and spreadsheets is maintained in the public record and is available for review upon request. Dilution values used in the analysis were obtained from various mixing zone studies as discussed in Section 3.2.5 of this report.

[28] *Technical Memorandum - Analysis of Mixing Zones and Thermal Plumes at the Rock Creek and Durham WRRFs*. Clean Water Services. March 4, 2022.

3.2.8 Dissolved Oxygen

The impact of CWS' discharges on dissolved oxygen (DO) levels in the Tualatin River has been analyzed in the 2001 TMDL and 2012 Amendment. The existing 2016 permit limits for DO for the discharges at the Durham, Rock Creek and Forest Grove WRRFs were derived from the TMDL modeling.

The modeling results indicate that the discharge from the WRRFs is not likely to cause DO levels in the Tualatin River to drop below the water quality standard of 6.5 mg/L. Water quality modeling conducted as part of the 2012 Amendment concluded that the summer discharges from the Forest Grove and Hillsboro WRRFs would result in a very minor decrease in DO concentrations measured just upstream of the Rock Creek WRRF. Modeling of the condition where no discharge occurs from the Hillsboro and Forest Grove WRRFs was compared with summer discharges occurring from both facilities. The modeling showed a slight decrease of less than 0.10 mg/L of DO between the two scenarios. In addition, the modeling also showed that DO concentrations in the river remained well above the water quality standard of 6.5 mg/L. The slight decrease in DO concentrations is defined as non-degrading in Oregon water quality standards (OAR 340-041-0004(3)) and, as such, is not subject to Oregon's Anti-degradation policy (OAR 340-041-0004).

In addition, CWS' analysis concluded there may even be an overall net increase in DO levels by 0.87 mg/l. This is due to the fact that discharges from both the Durham and Rock Creek WRRFs have high DO levels associated with their discharges and reduced river travel times associated with higher effluent flows in the year 2025 scenario will likely lead to lower consumption of dissolved oxygen by sediment oxygen demand and river background $CBOD_5$.[29] Additional details on the extensive DO modeling conducted for the Tualatin River can be found in the TMDL.

During the existing permit term, the effluent DO limits at the Durham and Rock Creek facilities were monitored after the chlorine contact chamber. At the Forest Grove NTS, effluent DO is measured at the outlet structure from the NTS. Actual effluent DO levels at the points of discharge into the Tualatin River can be expected to be higher than what is actually measured at each facility due to turbulent mixing of the effluent. The turbulent mixing occurs as the effluent passes over the outfall weirs (after the chlorine contact chambers or the NTS outlet structure) and travels to each facility's respective outfall. Sampling conducted by CWS has shown that DO levels in the effluent increases as a result of this turbulent mixing.

All of the facilities are currently producing effluent with relatively high DO levels. A review of the DMRs for the Durham and Rock Creek WRRFs during periods of low river flow in 2017 through 2020 show recorded effluent DO levels consistently within a range of 6.2 - 8.0 mg/l after the chlorine contact chambers and prior to turbulent mixing during discharge. At the Forest Grove NTS, effluent DO levels measured at the outlet structure were consistently in the range of 6.5 – 8.2 mg/l. When the additional input of DO is considered from the turbulent mixing of the effluent, there is no reasonable potential for the discharges to be below water quality standards for the Tualatin River.

[29] Mass Load Increase for CBOD and TSS at the Rock Creek and Durham AWTFs. Antidegradation Analysis. Clean Water Services. November 2010.

As such, the proposed permit establishes the same DO limits for the Durham WRRF, Rock Creek WRRF and Forest Grove WRRF as in the 2016 permit. These limits apply only during low flow periods when DO concentrations are the most critical and susceptible to change. No limits have been established for the Hillsboro WRRF because there is no dry season discharge from this facility to the river.

3.2.9 Phosphorus

Phosphorous is a common constituent of wastewater and is an essential growth-limiting element for plant life. Minimizing the amount of phosphorous in effluent discharges from wastewater treatment facilities is a key factor in preventing eutrophication of surface waters.

The original Tualatin River TMDL for phosphorous was issued in 1988 and updated in 2001. The phosphorous limits in the 2016 permit for the Durham, Rock Creek and Forest Grove facilities were established per the 2001 TMDL. The 2001 TMDL for phosphorous was intended to reduce algae blooms in the lower (downstream) portion of the Tualatin River (often referred to as the Lower River). As described in the TMDL, the Lower River is considered to be that portion of the Tualatin River downstream of Rood Road and the Rock Creek WRRF. The Lower River incorporates the discharges of the Durham and Rock Creek WRRFs. Conversely, the Upper River is the river segment above Rood Road and incorporates the discharges from the Hillsboro and Forest Grove WRRFs.

In 2012, the DEQ-approved an Amendment to the 2001 Tualatin TMDL which provided WLAs for phosphorous for the summer discharges at the Forest Grove and Hillsboro WRRFs. The 2012 Amendment also facilitated phosphorous trading between the Forest Grove and Hillsboro WRRFs with the Rock Creek WRRF. The 2012 Amendment establishes WLAs in the form of a bubble allocation amongst the three facilities to ensure that phosphorous limits in the Lower River are met, while providing operational flexibility for CWS. The bubble allocation essentially places a ceiling on the allowable discharge load from these three facilities. In short, the 2012 Amendment changed the discharge locations where portions of that load may be delivered to the Tualatin River.

Under the existing 2016 permit, phosphorus in the Durham WRRF effluent is limited to a monthly median of 0.11 mg/L while the limit for the Rock Creek WRRF is a monthly median of 0.10 mg/L. These limits are consistent with the 2016 permit and the assumptions and requirements of the 2001 TMDL and the 2012 Amendment. These limits will be maintained in the proposed permit.

The existing effluent limit for phosphorus at the Forest Grove facility is based on the available loading capacity in the Tualatin River below the Rock Creek WRRF in accordance with the TMDL. [30] The TMDL allows a bubble load for the Forest Grove, Hillsboro and Rock Creek WRRFs which must not exceed 66.1 pounds per day as a seasonal median value. The allocation also includes a daily limit of 232 pounds per day and an average monthly limit of 81.6 pounds per day. While the TMDL also includes phosphorus WLAs in the form of daily maximum

[30] All of the phosphorus wasteload allocations for the CWS facilities are listed on Table 2-13 on Page 50 in Section 2.11 (Waste Load Allocations) of the Tualatin Subbasin TMDL. Chapter 2: pH ad Chlorophyll a (Total Phosphorous) TMDL Amendment. Tualatin Subbasin Total Maximum Daily Load and Water Quality Management Plan. August 2012.

effluent concentrations, the TMDL explicitly states that daily limits are not required to be included in the permit. [31] As such, DEQ included an average monthly limit and a seasonal median limit for the Forest Grove WRRF in the 2016 permit. DEQ considers the phosphorus limits included in the permit to be fully consistent with the assumptions and requirements of the TMDL. As such, the existing permit limits will be maintained in the proposed limit.

The actual monthly median TP limit for Forest Grove is determined by subtracting the calculated monthly median total phosphorous mass load from Rock Creek from the 81.6 lbs/day average monthly limit bubble load. This is indicated by the equation in Table A7 of the proposed permit for Outfall F001 as: 81.6 lbs/day – (calculated monthly median total phosphorous mass load from R001 in lbs/day). The calculation of the monthly median total phosphorous mass load from R001 will be in accordance with the formula presented at the bottom of Table 2-13 of the TMDL. In addition, the actual seasonal median TP limit for Forest Grove will be determined in a similar manner to the monthly median limit by subtracting the calculated seasonal median total phosphorous mass load from Rock Creek from the 66.1 lbs/day average seasonal limit bubble load. This is also indicated by an equation at the bottom of Table A7 of the permit for F001.

Consistent with the TMDL, phosphorous is not limited year-round and a phosphorus control period extending from May 1 through October 15 is specified for the Durham WRRF, and May 1 through September 30 for the Rock Creek and Forest Grove facilities.

3.2.10 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 log 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 for *E. coli* that will apply to each of the four WRRFs. These limits apply year-round.

Table 3-20: Proposed *E. coli* Limits

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

3.2.11 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:

[31] The following sentence directly precedes Table 2-13 (on Page 50) in the 2012 TMD: "While equivalent daily targets have been added to this amendment, the renewed watershed NPDES permit will likely be based on the monthly or seasonal targets." Chapter 2: pH ad Chlorophyll a (Total Phosphorous) TMDL Amendment. Tualatin Subbasin Total Maximum Daily Load and Water Quality Management Plan. August 2012.

- Effluent concentrations and variability
- Water quality criteria for aquatic life and human health
- Receiving water concentrations
- Receiving water dilution (if applicable)

DEQ performs these analyses using spreadsheets that incorporate EPA's statistical methodology. If this methodology indicates that there is a potential for a discharge to cause or contribute to exceedances of water quality standards, the methodology is then used to establish permit limits that will not cause or contribute to violations of water quality standards.

As part of the existing 2016 permit, CWS was required to collect data on toxic pollutants for the effluent at all four WRRFs. In addition, CWS also implements an extensive water quality sampling program along the Tualatin River. Utilizing the effluent and ambient river data, reasonable potential analyses were conducted for both aquatic life and human health criteria on all four WRRFs. The analyses were conducted using Tier 1 and Tier II toxics data collected from the effluent discharged from June 2016 through September 2020, which constitute the data that was submitted with the permit renewal application. Ambient river data was collected from July 2018 through September 2020 from sampling stations located upstream of each WRRF. Dilutions predicted under 2025 flow conditions for each facility as presented in Table 3-14 were used in the analysis.

The following sections describe the analyses for various toxic pollutants below.

3.2.11.1 Total Residual Chlorine

CWS uses chlorine at the Durham and Rock Creek WRRFs to disinfect effluent to comply with *E.coli* bacteria limits. The Hillsboro and Forest Grove WRRFs use ultraviolet light for disinfection. Chlorine is a known toxic substance and ambient water quality criteria have been adopted for total residual chlorine under the Oregon Administrative Rules. CWS uses sodium bisulfite to dechlorinate the effluent prior to discharge to reduce potential toxic effects on the receiving stream and meet permit limits.

The existing 2016 permit contains chlorine limits for both the Durham and Rock Creek WRRFs. New chlorine limits for both facilities were calculated based upon updated effluent and ambient river information collected during the existing permit term. For the Durham WRRF, the newly calculated maximum daily limits are less stringent than the existing limits. As such, the existing limits are being retained. For the Rock Creek WRRF, the new calculated limits are the same as the existing limits so the existing limits will be retained for this facility. Proposed limits are listed in the following table.

Table 3-21: Proposed Chlorine Limits

Facility and Outfalls		Chronic (ug/L)	Acute (ug/L)
	Chlorine Criteria	11.0	19.0
		AML	**MDL**
Durham	**Existing Limit**	0.019	0.026
	Calculated Limit	0.019	0.049

(D001, D003)	**Proposed Limit**	**0.019**	**0.026**
Rock Creek (R001, R003)	**Existing Limit**	0.009	0.025
	Calculated Limit	0.009	0.025
	Proposed Limit	**0.009**	**0.025**
Effluent data source: Clean Water Services; effluent data 2016-2020 Receiving water data source: Ambient concentration assumed to be zero.			

The quantitation level for chlorine is 0.05 mg/L. When the total residual chlorine limitation is lower than 0.05 mg/L, DEQ will use 0.05 mg/L as the compliance evaluation level. In other words, daily maximum concentrations at or below 0.05 mg/L will be considered in compliance with the limit. CWS is expected to meet these limits on a consistent basis with the facilities available at the Durham and Rock Creek WRRFs. These limits are considered to be WQBELs.

The permit does not contain a mass load limit for chlorine in accordance with an exception listed under 40 CFR 122.45(f)(ii). Per this exception, pollutant limitations do not have to be expressed in terms of mass when applicable standards and limitations are expressed in terms of other units of measurement. The DEQ standards for chlorine aquatic life water quality criteria are expressed in terms of concentration, not mass (See OAR 340-041-8033, Table 30 – Aquatic Life Water Quality Criteria for Toxic Pollutants). In accordance with the exception in 40 CFR 122.45(f)(ii), limitations based on DEQ's chlorine toxicity standard do not need to be expressed in terms of mass and may be expressed in terms of concentration only. The proposed permit provides appropriate concentration-based limits for chlorine that are protective of water quality and the inclusion of mass-based limits are not required by regulation.

3.2.11.2 Total Ammonia Nitrogen

Ammonia is a substance normally found in wastewater. The wastewater treatment processes, particularly aeration and biological treatment, can convert (oxidize) a large portion to nitrate and nitrite, but the treated effluent still contains some ammonia. After discharge, continued ammonia oxidation removes DO from the receiving stream. Un-oxidized ammonia is also a toxic agent to aquatic life and may have to be limited to prevent in-stream toxicity. Ammonia toxicity varies with pH, alkalinity and temperature of the effluent and receiving water.

The 2016 permit established ammonia limits under various flow conditions for each WRRF. For the permit renewal, updated reasonable potential analyses were conducted for the same river flow conditions for each WRRF. The analyses for the Durham, Rock Creek and Forest Grove WRRFs included a dry season (June through October), a wet season (November through April) and a transition period (May). Since the Hillsboro WRRF only discharges during the wet season, the analysis was limited to only the winter high flow time period (typically November – April). For the other facilities, a May transition period analysis was needed to address the challenges of modeling the discharge from each WRRF as it transitions its nitrification processes from wet to dry season configurations. All of the facilities transition to and establish full nitrification processes for ammonia removal during the summer low river flow period. During the wet season, there are highly variable river and effluent flow rates. As such, a series of RPAs were performed to determine if there is a reasonable potential to exceed water quality criteria and, if there is, to establish limits that are protective of water quality under different river flow conditions.

The updated ammonia analyses utilized effluent and ambient river data collected during the existing permit term. For scenarios (outfalls/seasons) where limits are included in the existing permit, the maximum daily limits were used as the effluent values in the analyses to ensure the existing limits are protective of water quality criteria. For each facility, ambient river data was obtained from a monitoring station located just upstream of each facility's point of discharge. The dilution values used for the ammonia toxicity analyses and effluent limit derivations were obtained from various mixing zone studies as discussed in Section 3.2.5 of this report and are presented in Appendix E. All supporting information related to this analysis is maintained in the public record[32] and is available for review upon request.

For each individual analysis, the existing permit limits (if any) were retained if there was no indication of reasonable potential to exceed the water quality criteria. If there was a reasonable potential, then effluent limits were derived based on the relevant input data. The more stringent of the existing or newly calculated limits are generally included in the permit.

The updated ammonia analysis using observed data resulted in no reasonable potential for Durham, Hillsboro, and Forest Grove using the current permit term data. Data from Rock Creek showed reasonable potential. DEQ however also undertook an RPA using the maximum effluent limit that is in the existing permit. If reasonable potential would exist at maximum permitted levels, then DEQ calculated updated limits and used the lowest of the existing or updated limits for the permit, as presented in the table below. Under some discharge scenarios, the analysis resulted in more restrictive limits for each WRRF (shown in bold text). Only those discharge scenarios requiring discharge limits are shown in the table below. The proposed limits will be included in the permit renewal.

For Forest Grove, a wetland-based NTS was added to the treatment system during the current permit cycle. Effluent monitoring data from the NTS indicates consistent and effective removal of ammonia from the waste stream. A reasonable potential analysis conducted using ammonia data from the NTS demonstrates that there is no reasonable potential for causing or contributing to ammonia toxicity. The NTS is a material and substantial alteration or addition to the Forest Grove WRRF. Therefore, no limits are established for ammonia toxicity for the NTS during the summer while discharging through the NTS. Limits were updated for the direct discharge of effluent from the Forest Grove WRRF to the river during the June through October period and in May when flow in the river is $\leq$ 500 cfs. During such discharges, the compliance point is at the Forest Grove WRRF at internal Outfall F004.

Table 3-22: Summary of Water Quality Based Effluent Limits for Ammonia Toxicity

Facility	Outfall	Time period	Stream Flow*	Existing Limits mg/L		Proposed Limits mg/L	
			cfs	Max. Daily	Monthly Avg.	Max. Daily	Monthly Avg.
Durham	D001	June 1 – October 31	N/A	15.0	6.3	15.0	**5.4**

[32] *Evaluation of Toxicity-based Effluent Limits for Ammonia.* Clean Water Services Memorandum with supporting reasonable potential analysis spreadsheets. July 9, 2021.

Durham	D001	May 1 – May 31	≤500 cfs	18.4	7.7	18.4	7.7
Durham	D001	May 1 – May 31	>500 cfs	39.5	16.6	39.5	16.6
Durham	D001	Nov 1 – April 30	≤ 500 cfs	20.3	8.5	20.3	8.5
Durham	D001	Nov 1 – April 30	>500 to 1000 cfs	34.2	14.3	34.2	14.3
Durham	D001	Nov 1 – April 30	>1000 cfs	55.5	23.3	55.5	23.3
Rock Creek	R001	June 1 – October 31	N/A	7.5	3.1	7.5	3.1
Rock Creek	R001	May 1 – May 31	≤500 cfs	10.6	4.4	10.6	**3.9**
Rock Creek	R001	May 1 – May 31	>500 cfs	29.6	12.4	29.6	**12.1**
Rock Creek	R001	Nov 1 – April 30	≤ 500 cfs	11.5	4.8	11.5	**4.4**
Rock Creek	R001	Nov 1 – April 30	>500 to 1000 cfs	23.2	11.0	23.2	11.0
Rock Creek	R001	Nov 1 – April 30	> 1000 cfs	38.6	16.2	**35.2**	16.2
Forest Grove	F004	June 1 - October 31	N/A	31.6	15.7	31.6	**12.4**
Forest Grove**	F004	May 1 – May 31	≤500 cfs	35.5	17.7	**32.9**	**13.8**
Hillsboro	H001A & H001B	When Discharging (typically Nov 1 – April 30)	≤ 1000 cfs	50.4	25.1	50.4	**17.4**
*Flow as measured at the Farmington Gauge in cubic feet per second (cfs). **The compliance point for the Forest Grove facility is at the Forest Grove WWRF (Outfall F004). Ammonia toxicity limits do not apply when discharging through the NTS.							

3.2.11.3 Ammonia for Dissolved Oxygen

For the Durham, Rock Creek and Forest Grove facilities, the proposed permit also contains additional effluent limitations for ammonia which are designed to protect the levels of dissolved oxygen in the Tualatin River. The limits were included in the existing 2016 permit and are consistent with the assumptions and requirements of the WLAs in the 2001 Tualatin TMDL and 2012 Amendment. These limits are designed to address potential impacts on DO within the river.

Similar to the phosphorous limitation, DEQ-approved a 2012 Amendment to the 2001 Tualatin TMDL which provided WLAs for ammonia for the summer discharges at the Forest Grove WRRF. The 2012 Amendment included a modification to the bubble allocation by allowing the transfer of some of the ammonia load from Durham and Rock Creek to the Forest Grove WRRF (which includes discharges from the Hillsboro WRRF) to accommodate summer discharges at these locations. This is reflected in the existing 2016 permit where the Rock Creek WRRF and Forest Grove WRRF ammonia limits are bubbled into a single limit. The 2012 Amendment did not alter the quantity of ammonia load delivered to the Tualatin River - it simply changed the discharge locations where portions of that load may be delivered to the Tualatin River. Most importantly, the 2012 TMDL amendment maintains the same limits on the quantity of ammonia being discharged to the Lower River where dissolved oxygen problems have historically occurred.[33] The existing 2016 permit limits will be maintained in the proposed permit.

As with the 2016 permit, the proposed DO ammonia limitations are expressed as a weekly median load in pounds per day as calculated from a weekly median Tualatin River flow (as measured at the Farmington gauge), and an ammonia concentration value that varies by month and according to the results of in-river dissolved oxygen monitoring. The proposed ammonia limits are included in the 2001 TMDL and confirmed in the 2012 Amendment[34]. The limits are summarized in Table 3-23.

As allowed by the TMDL, the permitted weekly values are 1.3 times greater than the monthly values given in the TMDL. As shown in Table 3-23 below, the ammonia concentration values used in the calculation of the maximum permitted load are expressed in two “Tiers” and the trigger for moving between the two tiers is the actual measured Tualatin River DO concentration. This is consistent with the TMDL in setting more restrictive effluent limits at times where the DO levels have the potential to fall below the values set by the water quality standards. The trigger for setting the more restrictive ammonia effluent limitations includes margins of safety.

As described in the TMDL, the in-river DO trigger for moving between Tier 1 and Tier 2 is based on the results of a statistical analysis of hourly DO monitoring data. It was found that the mean DO of the previous calendar week was the best predictor of an exceedance of water quality standards, and was therefore chosen as the appropriate predictor variable. The 6.7 mg/L DO concentration was selected through a process of testing a series of values and selecting a value that reduced the overall error rates of the prediction. The applicability of this trigger value was then checked using the historic data. The prediction based on the mean DO concentration of the previous week and the actual outcomes were statistically analyzed. In addition, each instance of a

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[33] Tualatin Subbasin TMDL – Chapter 3: Amendment to 2001 Waste Load Allocations for Ammonia Under 2001 Dissolved Oxygen TMDL for the Tualatin Basin. Oregon Department of Environmental Quality. August 2012.
[34] Tualatin Subbasin TMDL – Appendix 2-A Tualatin River Total Maximum Daily Loads: Total Phosphorus and Dissolved Oxygen Analysis for the Upper River Final Report. Page 3-2. Oregon Department of Environmental Quality. August 2012.

false negative error (failing to predict a water quality violation that actually occurred) was examined to determine if any unusual circumstances had occurred.

Table 3-23: Calculations of Ammonia Limit for Dissolved Oxygen

<table>
<tr><th>Outfall Number</th><th colspan="2">Parameter</th><th colspan="2">Weekly Median Load Limit (lb/day)</th></tr>
<tr><td>D001 & R001 + F001
(See notes a and b.)</td><td colspan="2">Ammonia – N (NH3-N)</td><td colspan="2">Weekly Median Ammonia Load Limit = (Farmington Flow) × (Concentration Variable) × (5.39) lb/day, where:
Farmington Flow is the previous calendar weekly consecutive-day median of the daily mean flow at the Farmington gauge in cfs, and
Concentration Variable is NH_3-N in mg/L during the applicable period as follows:</td></tr>
<tr><th colspan="4">Concentration Variable (NH_3-N, mg/L)
(The applicable tier is based on the in-stream dissolved oxygen concentration described below)</th><th rowspan="2">Applicable Time Period</th></tr>
<tr><th colspan="2">Tier 1</th><th colspan="2">Tier 2</th></tr>
<tr><td colspan="2">1.4</td><td colspan="2">1.4</td><td>May and June</td></tr>
<tr><td colspan="2">1.4</td><td colspan="2">0.8</td><td>July</td></tr>
<tr><td colspan="2">1.4</td><td colspan="2">0.3</td><td>August</td></tr>
<tr><td colspan="2">0.8</td><td colspan="2">0.21</td><td>September through November 15</td></tr>
<tr><td colspan="5">Notes:
a. Outfalls R001 and F001 represents the bubbled ammonia load limit for the Rock Creek and Forest Grove WRRFs.
b. The compliance point for the Forest Grove WRRF is at the NTS outlet structure prior to discharge to Outfall F001. During the period (May 1 – November 15), when stream flows are high ($\geq$ 350 cfs at the Farmington Gauge) and precludes the use of the Forest Grove Natural Treatment System, the compliance point is at the Forest Grove WRRF.</td></tr>
</table>

The Tier 1 concentration variable is in effect for any week during the applicable period unless the following conditions occur, in which case the Tier 2 concentration variable is in effect. As specified in the permit, these conditions include:

- For Durham WRRF: The weekly mean of the daily mean DO concentrations at RM 3.4 (Oswego Dam), with no credit for supersaturation, for the ***previous*** week is less than 6.7 mg/L.

- For Rock Creek WRRF and Forest Grove WRRF: Either the weekly mean of the daily mean DO concentrations, with no credit for supersaturation, at RM 24.5 (Scholls), for the ***previous*** week is less than 6.7 mg/L or the weekly mean of the daily mean DO concentrations, with no credit for supersaturation, at RM 3.4 (Oswego Dam), for the ***previous*** week is less than 6.7 mg/L.

The Tier 1 ammonia concentration values were chosen as the values that were in effect for the previous time period. This provides a maximum limit that steps down through the summer. The Tier 2 ammonia concentration values are based on the design concentration variables from the TMDL, but adjusted to weekly values as explained above.

In addition to the permit limits, CWS has, for the past several years, implemented operational control measures at all four WRRFs to ensure that its discharges have no reasonable potential to cause or contribute to exceedances of the ammonia standards outside of the assigned mixing zones. These operational control measures are also intended to meet permit limits. During the summer, by providing nitrification, the discharging plants remove ammonia in order to achieve oxygen demand limits in the 2001 Tualatin TMDL.

CWS is currently conducting in-stream monitoring of DO in accordance with the United States Geological Survey (USGS) procedures[35] and an agreement with the USGS. The permit is not proposing any changes to these procedures.

3.2.11.4 Priority Pollutant Toxics

CWS is required to monitor their effluent to determine if it contains specific toxic substances at levels sufficient to cause toxicity to aquatic organisms or to impact human health. DEQ conducted a reasonable potential analysis for each facility on the results of this monitoring for the group of toxics listed in the following table. A complete list of the pollutants is located in the reasonable potential spreadsheets located in Appendix F.

Table 3-24: Toxic Pollutants Analyzed

Toxic Group
Metals
Volatile Organic Compounds
Acid Extractable Compounds
Base-Neutral Compounds
Effluent data source: Clean Water Services June 2016-September 2020
Receiving water data source: Clean Water Services July 2018-September 2020

[35] Guidelines and Standard Procedures for Continuous Water-Quality Monitors: Site Selection, Field Operation, Calibration, Record Computation, and Reporting, 2000: U. S. Geological Survey Water Resources Investigations Report -4252, 53 p. http://water.gove/pubs/wri/wri004252/

The RPA analysis was conducted for the discharges from all four WRRFs. The RPAs were conducted for the primary and wet weather outfalls at the Durham, Rock Creek and Forest Grove facilities. Since the Hillsboro WRRF only discharges during high flow river conditions, the RPA analysis was only conducted for this discharge period. The analysis used the flows and dilutions presented in Table 3-14. In general, the RPAs conducted for the primary outfalls under low river flow conditions are considered to be the more critical analysis since this is the period when dilutions and mixing within the Tualatin River can be the lowest. A summary discussion of the results of the RPAs is presented below.

Metals and Cyanide

The RPA analysis was conducted on all four WRRFs for priority pollutant metals for both the aquatic life and human health criteria. As previously stated, the RPA used effluent data collected from June 2016 to September 2020 and Tualatin River data recorded from July 2018 through September 2020.

The RPA is generally a two-step process where the monitoring information is first evaluated for each applicable pollutant to determine if there is the potential for the corresponding criterion to be exceeded at the end-of-pipe (e.g., point of discharge into the river). Amongst the four WRRFs, the RPAs identified cadmium, zinc and free cyanide as potential pollutants of concern at the end-of-pipe discharge for the Durham WRRF. Lead, nickel and zinc were identified as pollutants of concern at end-of-pipe at Hillsboro WRRF, while zinc was identified as a pollutant of concern at end-of-pipe for dry and wet weather discharges from the Forest Grove WRRF. There were no potential concerns for metals and cyanide at the Rock Creek and Forest Grove WRRFs at the point of discharge before mixing with the Tualatin River.

In the second step of the analysis for each identified pollutant of concern, the ambient river conditions are evaluated using available ambient monitoring data, effluent monitoring data and in-stream dilution values. When the ambient concentration and dilution values were entered into the analysis, the completed RPA indicated that there was “no reasonable potential” for metals and cyanide to cause aquatic toxicity at the edges of the regulatory mixing zones and zones of initial dilution for the Durham, Rock Creek, Hillsboro and Forest Grove facilities.

As noted in Section 3.2.2, the Tualatin River is included in the 2018/2020 303(d) list as being water quality limited for iron. Effluent iron levels at all four WRRFs are well below the aquatic life water quality standard of 1 mg/L and therefore do not have reasonable potential (refer to Appendix F: Toxics RPA Spreadsheets)).

Priority Pollutant Organics

CWS conducts monitoring for priority pollutant organics in accordance with the frequency and methodology specified in the current 2016 NPDES permit. CWS conducted required testing for more than 90 pollutants. Most pollutants were not detected; however, some pollutants were detected at low levels in the effluent. These detections were either below water quality criteria or did not have applicable water quality criteria. However, several pollutants were detected in concentrations that required further assessment. These are discussed below:

Chlorodibromomethane and dichloromethane

During the existing permit term, the monitoring at the Durham and Rock Creek WRRFs detected trihalomethanes (THMs) within the effluent in the form of chlorodibromomethane and dichloromethane. The THMs are by-products of the chlorine disinfection systems employed at both facilities. These disinfection by-products are formed when the chlorine that is used to control effluent bacteria reacts with naturally occurring organic and inorganic matter in the discharge. No measurable concentrations of THMs have been recorded at the Hillsboro or Forest Grove WRRFs since both facilities utilize ultraviolet light for disinfection.

The THMs were typically detected in higher concentrations during the dry season when the Durham and Rock Creek facilities are fully nitrifying to reduce effluent ammonia to meet permit limits. During the wet season, the facilities are not fully nitrifying and the residual ammonia in the effluent leads to chloramine formation and reduced concentrations of the THMs. Overall, the presence of a very small amount of ammonia in the effluent helps to reduce concentrations of THMs to levels that are either not detectable or will not violate water quality standards.

CWS evaluated several control strategies to reduce the formation of THMs. The chosen strategy was to optimize chlorine dosing with the addition of ammonia to promote chloramination.[36] After careful planning and testing, CWS implemented a full-scale ammonia dosing system at the Durham WRRF in July 2018, which added a small amount of ammonia to the effluent after chlorination as a means of controlling the formation of THMs. This dosing system incorporated strict controls on the addition of ammonia in order to meet permit effluent limits for ammonia. In addition, the chlorine disinfection process also had strict controls to maintain effective bacteria control. Full-scale testing of the dosing system was conducted at Durham during the 2018 and 2019 dry seasons when the facility was fully nitrifying. The dosing system was not used during other times of the year since ammonia levels in the effluent are adequate to restrict the formation of THMs. Overall, the full-scale testing of the dosing system indicated that the formation of THMs can be controlled while meeting permit effluent limits for ammonia.

Given the success of this control technology in minimizing the formation of THMs at Durham, CWS completed installation of the same dosing system at the Rock Creek WRRF in June 2021. Full-scale testing began in July 2021 when the facility was fully nitrifying. The monitoring conducted for THMs at Rock Creek in July and August 2021 did not detect these compounds in concentrations that could exceed water quality criteria. Updated analysis confirmed that there is no reasonable potential to exceed water quality criteria for THMs. The monitoring also showed that ammonia was also controlled to meet permit limits.

Based upon the results of this initial monitoring and the control technology implemented by CWS, continued control of the formation of THMs is expected with the future operations of both the Durham and Rock Creek facilities. Further, additional monitoring for THMs will continue during the next permit term to measure the effectiveness of the control. As such, no limits for chlorodibromethane or dichclorobromethane are warranted for the proposed permit.

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[36] *Disinfection By-Products at the Rock Creek and Durham WRRFs*. Memorandum from Raj Kapur of Clean Water Services to Tiffany Yelton-Bram of Oregon Department of Environmental Quality. September 27, 2021

Nitrates and Nitrites

At the Rock Creek WRRF, the monitoring detected nitrates and nitrites in concentrations that have a reasonable potential to exceed water quality criteria for nitrates. The potential to exceed water quality criteria is based upon a single elevated sample recorded early in the existing permit term (September 2017) that resulted in a preliminary determination of reasonable potential to exceed criteria. However, this single elevated sample was the result of a reporting error. When this value is corrected or is not considered in the analysis, the remaining monitoring resulted in no reasonable potential to exceed water quality criteria. None of the sampling conducted since September 2017 has resulted in concentrations of nitrates that have the potential to exceed water quality criteria. Given the absence of additional high concentrations of nitrates and nitrites recorded at this facility in the past three years, DEQ will not include a permit limit for nitrates and nitrites. However, DEQ will require further characterization of these pollutants during the new permit cycle under the effluent and ambient monitoring prescribed in Schedule B of the permit.

3.2.11.5 Reasonable Potential Analysis for Copper

Oregon's freshwater copper criterion became effective on January 9, 2017. As described in OAR 340-041-8033 (under Table 30, Endnote N), the freshwater copper criteria are based upon the Biotic Ligand Model (BLM), a metal bioavailability model, which calculates the acute and chronic copper criteria based on the concentrations of the ten parameters in Table 3-25 below. Ideally, paired[37] sets of measured input parameters would be used to determine the applicable instantaneous water quality criteria (IWQC).

Table 3-25: Copper BLM Input Parameters

Parameter	Units	Parameter	Units
Dissolved Organic Carbon	mg/L	Sodium	mg/L
pH	S.U.	Potassium	mg/L
Temperature	ºC	Sulfate	mg/L
Calcium	mg/L	Chloride	mg/L
Magnesium	mg/L	Alkalinity	mg/L

CWS routinely monitors the Tualatin River upstream and downstream from the outfalls from each WRRF as shown in Table 3-26. For the analysis, paired effluent and receiving water data collected by CWS for the copper BLM input parameters was used. For each WRRF, receiving water data was collected from the closest upstream station. For Durham, additional data was collected from the downstream Boones Ferry Road station to assess copper levels in the lowest section of the river after it has received discharges from all four facilities. The analysis utilized river flow dilution values as summarized in Table 3-14 in Section 3.2.5. For the Durham and Rock Creek WRRFs, low river flow dilution values were used for the analysis while the wet season dilution values were used for the Hillsboro WRRF analyses (since the Hillsboro WRRF does not discharge during the summer dry season). Both wet and dry season dilution values were

[37] Paired data refers to concurrent samples that have been taken from two locations (upstream ambient and effluent).

used for the Forest Grove WRRF analyses. Monthly paired effluent and receiving water and effluent data for each facility is summarized in Table 3-27.

Table 3-26: Outfall Locations and Tualatin River Monitoring Sites

Outfall Locations	River Mile	Monitoring Sites	River Mile
Durham (D001)	9.2	Tualatin River at Boones Ferry Rd	8.7
		Tualatin River at Jurgens Park	10.6
Rock Creek (R001)	37.7	Tualatin River at Rood Bridge Rd	39.1
Hillsboro (H001A) Hillsboro (H001B)	43.3 42.9	Tualatin River at Hwy 219	45.0
Forest Grove (F001/F003)	53.8	Tualatin River at Fernhill Rd	56.9

Table 3-27: Copper BLM Paired Data Summary

Facility	Date Range	Number of Paired Sets
Durham WRRF	June 2016 – September 2017	22
Rock Creek WRRF	June 2016 – September 2017	22
Hillsboro WRRF	March 2012 – May 2018	22
Forest Grove WRRF	February 2016 – May 2018	19

During the analysis, paired data sets for each facility were used to calculate the mixed concentration of each model input parameter at the edge of the ZID, regulatory mixing zone and at complete mix using the respective dilution values. The mixed concentration of each input parameter was then entered into the BLM model to calculate the IWQC for each paired data set. Each IWQC was then compared to the corresponding copper concentration calculated at the edge of the ZID, regulatory mixing zone and at complete mix. A toxic unit greater than one, indicates there is a potential for the discharge to exceed the criterion. A toxic unit is equal to the copper concentration divided by the IWQC, so a value greater than one indicates there is a potential for the discharge to exceed the criterion.

Based upon the results of the analysis, none of the paired data sets for any of the WRRFs resulted in a toxicity unit greater than one. This indicates that there is no reasonable potential for any of the facilities to exceed the copper criterion. In addition, DEQ performed an analysis on data collected at six ambient monitoring stations along the Tualatin River in the vicinity of CWS discharges, and none of these data sets demonstrated copper toxicity. This analysis provides additional evidence that the discharges from all four facilities are not contributing to copper toxicity in the river. Based upon the results of this analysis, a limit for copper will not be required in the proposed permit for any of the four facilities. A more detailed discussion of the analysis is contained in an April 2021 DEQ interoffice memo presented in Appendix G.

Future Required Copper BLM Monitoring

Although DEQ’s analysis does not indicate the need for establishing a copper limit with the proposed permit renewal, additional monitoring of copper BLM parameters will be conducted during the next permit term. Schedule B of the proposed permit lists the requirements for monitoring of copper BLM parameters in the effluent of all four WRRFs and within the Tualatin River. The monitoring requirements also detail where the ambient river monitoring will be conducted. Sampling for copper and other BLM parameters will occur on a quarterly basis during the permit cycle; a minimum of 12 paired data sets are required at the Durham, Rock Creek and Hillsboro WRRFs and 24 paired data sets are required at the Forest Grove WRRF. The sampling at the Forest Grove WRRF is to be conducted until the permit is renewed or until the required 24 paired samples are collected. The collected data will be used to assess the potential to exceed the copper criteria for each facility during the next permit renewal.

3.2.11.6 Reasonable Potential Analysis for Aluminum

New water quality standards for aluminum became effective on April 19, 2021. As such, there is not a complete data set available to perform an aluminum reasonable potential analysis for any of the dischargers. To ensure the needed data is available for the next permit renewal, DEQ is requiring sampling for aluminum during the proposed permit term. Sampling for aluminum and supporting parameters will occur once per month until 24 paired samples are collected for each WRRF. If a facility is not discharging, paired samples will not be collected. The five-year term of the proposed permit provides sufficient time to collect 24 paired samples from the Hillsboro WRRF which discharges on a seasonal basis. Samples for copper and aluminum may be taken concurrently. The sampling requirements are described in Schedule B of the permit.

3.2.11.7 Mercury – Human Health Criterion

Oregon’s water quality criterion for mercury is expressed in terms of a fish tissue concentration rather than a water column concentration. A Willamette Basin Mercury TMDL was established by EPA on December 30, 2019. According to the EPA TMDL and the State of Oregon Water Quality Management Plan, CWS is responsible for implementing a DEQ-approved Mercury Minimization Plan (MMP) that covers all four CWS facilities and to conduct mercury monitoring in order to comply with the waste load allocation in the TMDL. CWS developed and implemented an MMP during the existing permit term. CWS has submitted an updated MMP that reflects the accomplishments during the existing permit term and the requirements of the Willamette Basin Mercury TMDL. Accordingly, CWS will be required to:

- Implement the updated MMP to continue to reduce mercury discharges through minimization activities.
- Conduct ongoing monitoring of total mercury in the effluent using a sufficiently sensitive EPA-approved method to enable evaluation of the effectiveness and implementation of the MMP.
- Update the MMP and submit the updated MMP with their renewal application.

The updated MMP was submitted to DEQ as part of the permit renewal application package and is available for comment with the draft permit.

3.3 Antibacksliding

The proposed permit complies with the antibacksliding provisions of CWA section 402(o) and 40 CFR 122.44(l). With the exception of the ammonia limits for the discharges from the Forest Grove Natural Treatment System (NTS), the proposed limits are the same or more stringent than the existing permit so the antibacksliding provision is satisfied. As noted in Section 3.2.11.2, above, a wetland-based NTS was added to the Forest Grove treatment system during the current permit cycle. A reasonable potential analysis conducted using ammonia data from the NTS demonstrates that there is no reasonable potential for causing or contributing to ammonia toxicity. The NTS is a material and substantial alteration or addition to the Forest Grove WRRF. CWA sections 402(o)(2)(A) allows for backsliding in this situation. The permit retains ammonia effluent limits for direct river discharges from the Forest Grove WRRF.

3.4 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 the discharges from all four WRRFs. The proposed permit contains the same or more stringent discharge loadings as the existing permit for all four facilities. Permit renewals with the same discharge loadings as the previous permit are not considered to lower water quality from the existing condition. DEQ is not aware of any information that existing limits are not 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.

3.5 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.

In accordance with the 2016 permit, CWS conducted WET tests on the effluent generated by each of the four facilities. A total of 15 tests were conducted during both high and low river flow conditions from March 2017 to August 2020 to assess the effects of any seasonal variations. At the Forest Grove WRRF, tests were conducted during both high and low flow conditions when the facility discharged directly to the river. Additional tests were also conducted during low flow conditions when discharges from the Forest Grove WRRF were routed through the Forest Grove NTS.

Overall, the WET testing conducted at each of the facilities did not exhibit acute or chronic toxicity as defined by the existing NPDES permit. A complete summary of the test results is maintained in the public record.[38] The proposed permit will require continued WET testing at all four facilities in the next permit term. The frequency of the testing is detailed in Schedule B and the requirement of the WET testing is presented in Schedule D.

3.6 Water Quality Trading

The proposed permit includes continued use of trading to offset temperature impacts. The technology-based requirements must be met at each WRRF. Furthermore, trading must be conducted in a manner that does not cause or contribute to localized water quality problems or impair existing or designated beneficial uses; the TMDL allocation was designed to meet these requirements. Trading is authorized in the permit in Schedule D, Condition 13.a. This condition incorporates into the permit CWS' Thermal Load Management Plan, which serves as CWS' trading plan. Schedule D, Condition 13.c also identifies specific elements included in CWS' trading plan as required by OAR 340-039-0025(5).

Schedule B of the permit includes ambient (i.e., in-stream) monitoring requirements for water quality, biological and physical parameters to document the long-term improvements anticipated through this program. Long-term maintenance and monitoring of the re-vegetated sites will be critical for the continued success of this program. Clean Water Services will be required to continue the documentation of this through the reporting requirements established under Schedule B of the permit. Monitoring and reporting requirements are detailed in Section 5.

3.6.1 Thermal Load Management Plan

The 2004 watershed-based NPDES permit included provisions to develop a Temperature Management Plan (now referred to as the Thermal Load Management Plan) to enable CWS to offset its excess thermal load (i.e., actual thermal load minus allowable thermal load) with a trading program that included stream flow enhancement and riparian shade restoration.

Clean Water Services submitted an updated TLMP in August 2015 as a supporting document for the renewal of its watershed-based 2016 NPDES Permit. Following the adoption of the Water Quality Trading Rules (OAR 340-039), CWS submitted an addendum to the TLMP titled Thermal Load Management Plan Summary (dated February 2016), which included additional elements specified in OAR 340-039. As part of supporting documentation for the permit renewal

[38] *Whole Effluent Toxicity (WET) Test Results (2016-2020)*. Memorandum from Raj Kapur of Clean Water Services to Mark Hynson of Oregon Department of Environmental Quality. June 17, 2022

applications, CWS submitted an updated TLMP in July 2021. CWS' thermal load reduction and trading activities are described in the TLMP and incorporated in the permit by reference. The overall goal of the trading program is to continue to offset 100 percent of the excess thermal load using riparian shade and flow enhancement. The July 2021 TLMP is available for public comment along with the proposed permit.

The TLMP describes CWS' approach to demonstrate compliance with the thermal load limitations in the permit. All water quality credit trading for the pollutants authorized by the permit shall occur within the area established by the August 2001 Tualatin Subbasin TMDL (inclusive of the tributaries). In particular, the area covered by the TMDL corresponds to the fourth field Hydrologic Unit Code (HUC) 17090010 which includes all lands that drain to the Tualatin River.

As noted above, CWS is currently offsetting the excess thermal load from its treatment facilities. CWS proposes to continue to implement a trading program to offset future increases in thermal load associated with population growth before the growth-related increases occur. As in the existing 2016 watershed permit, the proposed activities include riparian shade restoration throughout the Tualatin watershed and flow enhancement from Barney Reservoir and Hagg Lake. A discussion of the principal elements of the TLMP is presented below.

3.6.1.1 Thermal Load to Offset

Based on anticipated 2025 design flows and their associated thermal loads for its WRRFs, its thermal load reduction strategies, and the thermal credits generated from existing shade projects and ongoing flow enhancement, CWS estimates that it will need to generate an additional 334 million kcal/day of thermal credit by 2025 to offset the anticipated thermal loading from its WRRFs.

During the proposed permit term, CWS will continue to generate thermal credits through flow enhancement and riparian shading. Although CWS is currently generating thermal credits that exceed the amount necessary to offset excess thermal loads from its WRRFs, it should be noted that CWS is required to generate thermal credits to offset any future increase in the excess thermal loads from its facilities. Thermal credit targets will be reviewed and updated based on the actual thermal load growth. The equations and data used to generate the estimated thermal load offset can be found in the TLMP.

3.6.1.2 Riparian Shade Restoration

Riparian restoration consistent with TLMP provisions has occurred since 2004. Under the TLMP, shade credit is earned immediately upon restoration of riparian vegetation based upon modeled estimates of future shading. Credits are calculated using a 2:1 trading ratio, used in part to account for the time necessary for shade-generating trees to grow along restored waterways. Thus, for every kilocalorie of excess thermal load to be offset by trading, a riparian restoration project upon full implementation (20 years) must produce two kilocalories in thermal load reduction. Additional discussion on trading ratios is provided below.

In urban areas of the Tualatin River basin, CWS restores riparian shade in partnership with municipalities, businesses, and other stakeholders. On a site-specific basis, CWS and its partners conduct stream enhancement activities such as stream bank stabilization, large wood placement, channel reconfiguration and floodplain reconnection. Riparian restoration activities also produce other significant benefits, including habitat improvement and creation for aquatic and terrestrial biota, stormwater retention and overall improvement of water quality.

CWS' riparian shade program consists of a Capital Program and landowner incentive programs. Riparian shade projects implemented under the Capital Program mostly occur on public lands. Project activities under this program include securing easements or stewardship agreements with property owners, site preparation activities, re-vegetation, monitoring, and maintenance. Additional enhancement activities such as channel reconfiguration, large wood placement, off-channel habitat creation, and in-stream pond removal are performed on a site-specific basis to improve a broader range of ecosystem functions.

CWS also supports landowner incentive programs that enroll agricultural lands in riparian shade programs. Restoration projects in agricultural areas commonly occur on private lands. These projects are implemented with the assistance of the Tualatin Soil and Water Conservation District (TSWCD), and the federal agencies under the USDA: the Natural Resources Conservation Service (NRCS) and the Farm Service Agency (FSA). CWS offers incentive payments to complement existing federal payments on farmland. In addition, CWS has begun offering bonus payments when long-term agreements or conservation easements are established.

The difference between the thermal load blocked by mature riparian vegetation and the thermal load blocked by existing vegetation conditions represents the reduction in thermal load (i.e., environmental benefit) associated with the riparian shade project. Thermal credits resulting from riparian restoration are calculated as the difference between existing effective shade and projected final shade and adjusted by the trading ratio.

On individual shade projects, both existing and final shade are determined using the Shade-a-lator model. The thermal load blocked by existing vegetation is determined using site specific data including stream width, orientation, project dimension, and existing canopy density, height and overhang. The thermal load blocked by restored riparian vegetation is based on projected future conditions, assuming a 20-year vegetation establishment period. DEQ has proposed the following methodology for evaluating the impact of shade:

Heat Load Offset by Shade = Area of Stream Shaded x Increase in Shade Density x Solar Insolation Rate

Where:

- **Area of Stream Shaded** = Average Stream Width x Stream Length
- **Increase in Shade Density** = Effective Shade Density – Initial Shade Density
- **Solar Insolation Rate =** According to a map of solar insolation rates from the Department of Energy, the solar insolation rate during the critical period in the Tualatin Basin is 6 kwh/m^2 day. This translates to 479 kcal/ft^2 day.

This heat load offset calculation is completed for each riparian restoration project that CWS undertakes.

3.6.1.3 Use of Trading Ratios

To calculate thermal credit, a trading ratio is applied to the environmental benefit associated with a riparian shade project. Trading ratios are applied to all trades that occur in Oregon. Trading ratios are applied to account for a variety of uncertainties including predicted time lags between planting vegetation and achieving full shade. For this permit, the trading ratio remains at 2:1 for all riparian projects – this means that CWS receives credit equal to 50% of the environmental benefit associated with the project. Based on this approach, twice as much thermal load will be blocked than is needed to offset the thermal load from the WRRFs. The trading ratio was conceptually derived as the amount of thermal load that would be offset by riparian shade which would be equivalent to the amount of thermal load discharged over a 20-year period. The 20-year period was used to define the time it takes for riparian restoration to mature and generate effective shade. As the riparian canopy continues to fill beyond 20 years, the shade generated may surpass the 20-year estimate.

The trading ratio is partly used to account for the time lag between initial planting and shade establishment. While a 20-year shade establishment period was envisioned in the TLMP, CWS' focus on conducting riparian shade projects on narrow, tributary streams has resulted in a much shorter period for establishing effective shade. As previously stated, CWS has implemented 172 riparian shade projects between 2004 and 2020. One hundred and ten of the 172 projects (64%) have stream widths of ≤20 feet; 154 of the 172 projects (90%) have wetted stream widths of ≤50 feet; and the median stream width for the projects was 15 feet. Field monitoring of shade at the riparian shade projects shows that a high level of riparian shade is provided within 5 years at many sites.[39]

Recognizing the shorter time needed to shade narrower streams, the TLMP allowed a 1:1 trading ratio for narrower, high priority streams. Although CWS continues to select priority streams resulting in most of the projects on narrow streams with cold water uses, CWS has not utilized the 1:1 trading ratio for its riparian shade projects; all projects have been credited using the 2:1 trading ratio. CWS has also utilized light detection and ranging (LiDAR) to measure tree height and shading on select projects. The LiDAR data shows that the tree growth rate is equivalent or greater than the 20-year shade establishment period specified in the TLMP. Additionally, CWS intends to generate the necessary thermal credits to offset growth related increases in thermal load from the WRRFs before the anticipated growth occurs further reducing the shade establishment period. CWS' focus on smaller tributary streams where shade can be developed quickly, along with its strategy to develop thermal credits before they are needed, reduces the time between initial planting and shade establishment to much less than the 20 years factored into the 2:1 trading ratio.

The 20-year shade establishment period provides time for vegetation to grow to a height where it will provide substantial shade. It also provides an upward limit on the amount of accredited shade. Vegetation is expected to continue to grow after 20 years, and it should provide increasing amounts of shade on wider streams. Nevertheless, the credit amount is fixed by the modeled

[39] Thermal Load Management Plan Summary. Clean Water Services. Section 3.2.5 – Trading Ratios. Page 10. July 2021.

calculation of shade based on a 20-year shade establishment period. This substantiates the conservative character of the 2:1 trading ratio applied to thermal credits generated by riparian shade restoration.

CWS also implements explicit protocols (BMP quality standards) to ensure the success of its riparian shade projects and limit the uncertainty associated with these projects. The protocols include developing a variety of land stewardship agreements, designing ecologically-appropriate planting plans, sufficient time for site preparation, conducting high density riparian shade restoration, implementing robust monitoring and maintenance programs, and conducting inter-planting as necessary to ensure project functions are achieved. Each of these elements is discussed in Chapter 6 (Riparian Shade Program Implementation) of the TLMP.

With the 2:1 trading ratio and the conservative assumptions used to calculate thermal credits, offsetting the thermal load via riparian shading means that, in the long-term, the overall reduction in thermal load to the Tualatin River should be significantly greater when compared to technology-based solutions. It should also be noted that the trading ratio does not adequately capture the broader ecological benefits of the riparian shade program. For example, the smaller streams that are the focus of CWS' riparian shade program often tend to support sensitive beneficial uses such as salmonid spawning and rearing. Prioritization criteria for project selection include expanding existing habitat, enhancing aquatic and terrestrial habitat, and connecting projects to other natural/conservation areas and to existing projects to provide watershed-scale improvements. CWS' general approach to riparian shade programs is geared toward improving overall watershed health by inducing landscape level changes to hydrologic, hydraulic, geomorphic, physicochemical and biological conditions in the watershed.[40]

For the reasons noted above, the 2:1 trading ratio used in the permit is reasonable and conservative given CWS' landscape-level approach to site selection, development of ecologically-based site plans and long-term monitoring and maintenance of existing projects. In addition, the 2:1 ratio is widely used by other states and regulatory agencies in water pollution credit trading programs.[41] As such, the 2:1 trading ratio will remain in the permit renewal.

3.6.1.4 Trading Baseline

DEQ defines trading baseline as pollutant load reductions, BMP requirements, or site conditions that must be met under regulatory requirements in place at the time of trading project initiation (OAR 340-039-0005(6)). Trading baseline, or simply "baseline", is short-hand for the water pollutant control requirements that apply to a trade credit generator and credit user. Baseline may include NPDES permit limits, 401 certification requirements, and existing nonpoint source pollution control practices and site-specific conditions or actions necessary to comply with local, state, tribal and federal water quality regulations. Thermal credits can only be generated from riparian shade projects that are above baseline regulatory requirements (OAR 340-039-0030(1)). Baseline regulatory requirements include OAR 629-635 through OAR 629-660 (Forest Practices Act[42],) OAR 603-95 (ODA Local Water Quality Management Rules), and CWS' Design and Construction Standards (Clean Water Services Resolution & Order 07-20).

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[40] Thermal Load Management Plan. Section 5.5.2. Trading Ratio. Page 47. Clean Water Services. August 2015.
[41] Vogel, Jennifer et al. *A Survey of Trading Ratios Used for Generation of Credits in Water Quality Trading Programs* (University of Virginia School of Law, 2012).
[42] CWS has not done any work where the FPA applies as of the date of this permit renewal, however, they may in the future.

Trade credit generators must comply with baseline requirements and also quantify the additional benefits and credits from a trade project. Correspondingly, baseline consists of two elements: compliance with water quality regulations that are already in place at the time of project initiation, and quantification of the water quality benefits beyond that compliance. Trade credits may be generated with the water quality benefits produced by measures that are above and beyond established baseline and appropriate site conditions. For example, attainment of pre-existing water quality requirements or appropriate site condition results in a measured or estimated pollutant loading. A willing landowner restores riparian areas that reduce pollutant loading by an additional 50%. The landowner can sell credits based on the additional 50% pollutant load reduction achieved through these measures.

More information about the regulatory baseline for this permit is attached in Appendix H (April 19, 2017 memo from CWS). A comparison of the requirements for a water quality trading plan in OAR 340-039 with conditions in CWS' watershed-based NPDES permit is attached in Appendix I (February 23, 2017 memo from CWS). This latter document identifies the requirements for a water quality trading plan from OAR 340-039, specifies the permit condition that was incorporated into CWS' watershed-based NPDES permit to address the requirement, and provides a reference to the appropriate section of CWS's Thermal Load Management Plan Summary document that discusses the requirement. More information about trading can be found in DEQ's Water Quality Trading Internal Management Directive, located at: http://www.oregon.gov/deq/Filtered%20Library/WQTradingIMD.pdf.

As previously stated, all trading projects must result in water quality benefits above established baseline before trade credits may be used by CWS to comply with WQBELs. Enrollment and accreditation occur after planting is completed. The 2005 watershed permit anticipated a 20-year lifespan for shade credits. Since the issuance of the existing 2016 permit, DEQ has refined and revised its water quality trading policies. Specifically related to the issue of credit duration, DEQ has determined that as long as the BMP is functioning as planned and delivering the intended water quality benefits, credits generated from the BMP can continue to be used to meet regulatory requirements. This determination is reflected in the recently adopted water quality trading rules. Consistent with current trading policy, shade credits are effective as long as the ecological functions at the project site are sustained and documented. Shade lost to fire, landslides, and other perturbations (including intentional removal) can be replaced from a surplus of shade-producing projects that are not presently enrolled in the shade credit program.

Monitoring and reporting requirements are discussed in Section 3.6.1.7.

3.6.1.5 Flow Enhancement

CWS owns water in two reservoirs, Barney Reservoir and Hagg Lake, and releases additional water to the Tualatin River during the summer and fall periods. The thermal benefits generated during these additional releases are used to offset a portion of the excess thermal loads from the WRRFs. Flow enhancement to the mainstem Tualatin may be introduced at the outflow of Barney Reservoir directly to the upper Tualatin, or from Hagg Lake to Scoggins Creek before it flows into the Tualatin. Through stream restoration, riparian planting, and recycled water use, CWS has also secured instream water rights. These water rights include both natural and stored water rights and are used as instream water rights to help preserve baseflows in the river and tributaries. CWS target flows are 150 cfs at the Farmington gauge (RM 33.3) during July and August, and 180 cfs in September and October. CWS' stored water releases serve multiple functions that include providing sustainable base flow, maintaining minimum dilutions for WRRF discharges, offsetting the thermal load from the WRRFs, and improving overall water quality in the Tualatin River. Thermal benefits from flow enhancement are derived from the additional flow, reduced residence time, and colder instream conditions.

Heat Source is a model used to quantify the benefit of increased flow at the Forest Grove, Rock Creek and Durham facilities under various flow scenarios. The Hillsboro WRRF was not included in the evaluation because it does not discharge to the Tualatin River during the summer. These results were used to develop empirical equations to quantify the thermal benefit from flow enhancement at the Forest Grove, Rock Creek, and Durham WRRFs. Although shown to be conservative estimates for thermal benefits, CWS proposed to DEQ the same equations for the Durham and Rock Creek WRRFs as in the 2005 permit. When the 2005 permit was issued, the Forest Grove WRRF was not discharging under low flow (summer) conditions. Since CWS is now discharging from the Forest Grove facility during the dry season, the TLMP includes a series of empirical equations to calculate thermal benefits from flow enhancement at this site. These equations are presented in Appendix A of the updated 2021 TLMP (Thermal Credit Calculations).[43]

The river flow used to calculate temperature change at the Rock Creek WRRF is the measured flow at the Farmington gauge minus the measured Rock Creek WRRF effluent flow (the gauge is downstream of the facility). For the Durham WRRF, the applicable river flow is the measured flow at the Farmington gauge; this is a conservative estimate of river flow at the Durham WRRF because it does not account for inflows to the river between the gauge and the WRRF. For the Forest Grove WRRF discharge, the river flow used for the calculation is the flow measured at the Golf Course gauge minus the measured WRRF flow (the gauge is located at Golf Course Road downstream of the WRRF).

Thermal load is based on average daily effluent temperature and flow conditions in July and August. It is calculated with respect to the system potential temperatures at the Forest Grove, Rock Creek, and Durham WRRFs as defined in the 2001 Tualatin River Subbasin TMDL. The system potential temperatures at the WRRFs are as follows: 11.7˚C (53.1˚F) at Forest Grove, 14.7˚C (58.5˚F) at Rock Creek and 18.1˚C (64.6˚F) at Durham.

WLAs were calculated for the Rock Creek and Durham WRRFs based on "no measurable increase above system potential temperatures." A measurable increase was defined as an increase greater than 0.14ºC (0.25ºF) at the edge of the mixing zone. Under the current temperature standard, excess thermal load would be calculated using the applicable temperature criteria (18˚C), which is generally much higher than the system potential temperatures, and a human use allowance of 0.3ºC, which is also higher than the "measurable change" threshold used in the 2001 TMDL. Thus, the effluent limits are more stringent and the thermal loads to offset are greater under the 2001 TMDL than would be under the current temperature standard.

[43] Thermal Load Management Plan. Appendix A: Thermal Credit Calculations. Clean Water Services. July 2021.

The months of July and August are the period of interest because it is the time of year when river temperatures are warmest and most likely to exceed the temperature criterion as noted in the 2001 Tualatin River Subbasin TMDL. Even though the flow enhancement credit generation period is based on the months of July and August, CWS continues its stored water releases into September, October, and at times into early November until the onset of fall rains. During the cooler fall period, CWS' stored water releases continue to offset a portion of the thermal load from the WRRFs, provide sustainable base flows in the Tualatin River and improve dissolved oxygen conditions in the Tualatin River watershed.

3.6.1.6 Tributary Flow Enhancement

CWS uses some of their stored water to add flow to tributaries through the Tualatin Valley Irrigation District pipeline. Tributary flow enhancement lowers tributary temperatures slightly and delivers somewhat cooler water to the mainstem Tualatin River. Tributary flow enhancement provides greater benefits for dissolved oxygen levels and flow-related habitat. Tributary flow enhancement is another action that Clean Water Services has taken to improve watershed health in the Tualatin River watershed. Water quality modeling was conducted to evaluate temperature benefits with tributary flow enhancement. The modeling concluded that the temperature benefits above each CWS WRRF are similar to benefits predicted with all the stored water releases continuing down the mainstem Tualatin River (i.e., assuming no tributary flow releases). So CWS will continue to use empirical equations based on stored water releases assuming no tributary flow enhancement.

Thermal credits for shade and flow enhancement as well as thermal loads from the CWS WRRFs are quantified in kilocalories per day. Credits for these activities will be calculated for July and August based on the time frame of interest specified in the TMDL.

3.6.1.7 Thermal Load Management Plan Monitoring and Reporting Requirements

<u>*Monitoring*</u>

CWS conducts both qualitative and quantitative monitoring for all of its riparian shade projects enrolled for thermal credit. Projects are monitored to document growth and to ensure project success. Annual qualitative monitoring is conducted to assess overall project health and project phase (transitional/established/stewardship). Qualitative monitoring consists of a visual assessment of plant growth and mortality, invasive species cover, natural recruitment, herbivory protection strategies, other factors that limit plant growth, and photo point monitoring. Quantitative monitoring is conducted every two years for projects in the Transitional and Establishment phases, and every five years for projects in the Stewardship phase.

Shade is monitored at all project sites by measuring canopy cover. After a riparian shade project's enrollment for thermal credit, CWS conducts shade monitoring five years following initial enrollment and every five years thereafter until year twenty. CWS may evaluate canopy cover by using a densiometer or through remotely sensed datasets, such as LiDAR and aerial photos.

Flow enhancement will be monitored using data from stream flow monitoring stations located throughout the Tualatin River watershed.

CWS must use the results of its qualitative and quantitative monitoring to verify the BMPs are functioning as planned. If monitoring indicates that a project is not performing as anticipated, CWS must take steps (adaptive management) to improve the project's performance. If additional actions do not improve the project's performance, CWS must either remove the credits associated with the project from its portfolio or recalculate the credits based on the project's actual performance.

Monthly Reporting
40 CFR §122.44(i) requires that an NPDES permit contain monitoring and reporting provisions that are sufficient to assure compliance with permit limitations and at a frequency dependent on the nature and effect of the discharge. For any month in which it generates thermal credits, CWS will report in the monthly Discharge Monitoring Report (DMR) for each facility the allowable thermal load, its actual thermal loading, and credits used to offset thermal loads discharged and demonstrate compliance with permit limitations. For riparian restoration activities, CWS will also report project name, project number, stream length planted, thermal load blocked and thermal credits for each new riparian shade project that is completed within the calendar year.

Annual Report
In accordance with the TLMP[44], the proposed permit will require CWS to submit an annual report that summarizes the status of its thermal load credit trading activities for the past year. The report is due to the DEQ by March 31 of each year in the permit term. The annual report must meet the requirements of OAR 340-039-0017(3). The report must present information on the thermal loads being generated by the Rock Creek, Durham and Forest Grove facilities, provide discussion on thermal load reduction activities, and describe thermal load credits resulting from flow enhancement and riparian restoration. Relative to flow enhancement activities, the annual report will also document average daily effluent flows and temperatures from the CWS WRRFs along with average daily flows on the Tualatin River during the critical period of July 1 – August 31. The average daily flow enhancement rate from Hagg Lake and Barney Reservoir will also be included to document flow enhancement credits being generated.

The annual report's discussion of riparian restoration activities will also include project descriptions and thermal credit calculations for projects established during the reporting period. The annual report will also include site assessment reports for all projects for which thermal credit is taken. Site assessment reports will document site conditions, stream characteristics, baseline thermal loads blocked by existing vegetation and the results of riparian vegetation monitoring. Site reports will also identify vegetation maintenance actions taken during the year and describe planned actions for the following year.

The annual report must also describe how credits were used (e.g., applied towards compliance with waste discharge limitations) and provide a progress update relative to the interim goals defined for the trading program (e.g., status of restoration). CWS will assess the effectiveness of its trading program and describe in the annual reports any adaptive management actions it took to adapt trading projects to changing circumstances. CWS must make the annual report available to the public by posting it to its website.

[44] Thermal Load Management Plan. Section 3.2.8 – Tracking and Reporting. Clean Water Services. July 2021.

3.6.1.8 Ancillary Benefits

The thermal trading program in the 2005 and 2016 watershed permits not only provided CWS with a mechanism to meet its thermal load allocations, but it also provides many ancillary benefits to the Tualatin River watershed. The ecosystem benefits of riparian shade restoration include improved stream functions (e.g., floodplain roughness, bank stabilization, peak flow attenuation, nutrient uptake, and habitat creation), increased diversity of aquatic and terrestrial plants and animals, filtering and retention of stormwater, and improved water quality. The increased complexity of structure and diversity of restored riparian forests and scrub-shrub wetlands support many important ecosystem functions for the aquatic environment. CWS' stored water releases also provide multiple ecosystem benefits, including cooling, buffers against temperature changes, and higher dissolved oxygen levels to support aquatic life. The release of stored water, along with the release of the highly treated water from the WRRFs, provides a sustainable base flow to the mainstem Tualatin River during the dry season. Other ancillary benefits from trading are:

- Prioritization of improvements in the watershed by focusing on projects where the expected ecological response would be greatest.
- Encouraging pollutant reductions in locations where they might not otherwise occur and provide incentives for implementing multi-objective projects that otherwise might not be economically feasible.
- Implementation of resilient solutions that can withstand potential climate change impacts and actually sequester carbon.
- Provide incentive for urban/rural partnerships to restore watershed health. Trading can also enable partnerships with cities, counties, state, and non-governmental organizations.

4. Schedule A: Other Limitations

4.1 Biosolids

Schedule A, Condition 10 of the permit controls and limits the use of biosolids produced by the WRRFs. The limits in this section are based on Oregon's "Land Application of Domestic Wastewater Treatment Facility Biosolids, Biosolids Derived Products, and Domestic Septage Rules" (OAR 340-050) and EPA's "Standards for Use or Disposal of Sewage Sludge" (40 CFR, Part 503) that prescribe the requirements for the safe handling and use of domestic wastewater treatment facility solids, biosolids, biosolids derived products, and domestic septage.

As required by OAR 340-050-0031, land application of biosolids occurs pursuant to a DEQ-approved Biosolids Management Plan and Land Application Plan. These plans are required to ensure that the facility's biosolids will be land applied in accordance with all biosolids standards for land application on an on-going basis. The Biosolids Management Plan for all the WRRFs was last updated in March 2021 and is available for public comment along with the proposed permit.

Prior to land application, all biosolids generated at the treatment facilities will need to be treated to reduce pathogenic organisms and vector attractiveness and must meet strict pollutant limits for land application or recycling on an on-going basis as defined in OAR 340-050 and 40 CFR, Part 503 as well as in Schedule A of the permit.

The biosolids treatment operations at the Durham and Rock Creek WRRFs are to be properly operated and closely monitored to ensure that they have adequately reduced both pathogens and vector attractiveness to meet Class B standards pursuant to 40 CFR §503.32 and 40 CFR §503.33 for land application. Any material that fails to meet Class B standards is to be properly managed and disposed of at a facility permitted to accept this material.

Since the Durham and Rock Creek WRRFs will produce Class B biosolids, the facilities will also need to obtain written authorization from DEQ for each land application site prior to its use. Conditions in site authorizations will be enforceable requirements under the permit. Among other requirements, CWS will be required to restrict public access to sites for a minimum of 12 months following land application and not allowing grazing of livestock or the harvesting of crops that are fed to cattle for 30 days following land application of biosolids. Further, the biosolids will need to be land applied at agronomic loading rates to protect groundwater.

4.2 Recycled Water

Schedule A of the permit requires the permittee to apply recycled water according to their current DEQ-approved Recycled Water Use Plan as specified by OAR 340-055-0025. Schedule A, Condition 8 of the permit identifies the standard of treatment and beneficial uses of various classes of recycled waters that could be generated at the WRRFs. The primary concerns with recycled water use include the transmission of waterborne pathogens and adverse effects to the environment due to harmful organic or inorganic parameters. Oregon's "Recycled Water Use Rules" (OAR 340-055) prescribe the requirements for the use of recycled water for beneficial purposes while protecting public health and the environment.

Schedule A also regulates the application of recycled water to prevent the following:

- Damage to crops;
- Adverse impacts to groundwater quality;
- Off-site surface runoff or subsurface drainage through drainage tile;
- Creation of odors, fly and mosquito breeding, or other nuisance conditions;
- Overloading of land with nutrients, organics, salts, or other pollutants; and
- Public access and exposure of the recycled waters.

4.3 Use of Recycled Water to Produce Highly Purified Water

Clean Water Services has the capability of producing small quantities of highly purified water for demonstration purposes that is safe for human consumption. The proposed permit allows the use of recycled water to produce highly purified water (labeled as Outfall HP001) provided it is treated and used in the manner described in CWS's DEQ-approved Recycled Water Use Plan for

Individual Batch Process Production of Highly Purified Water for Beneficial Reuse (HPW Plan). This plan was last updated by CWS and approved by DEQ in July 2019. The HPW Plan requires CWS to submit an annual report that described the volume of high purity water produced, monitoring, intended uses and venues served, and the volume and method of disposal or reuse of unused high purity water.

4.4 Chlorine Usage

Since the Hillsboro and Forest Grove WRRFs do not use chlorine or chlorine compounds for disinfection purposes, the permit prohibits the use of chlorine or chlorine compounds for effluent disinfection purposes at these facilities. The permit also prohibits residual chlorine in the effluent of these facilities as a result of chlorine or chlorine-containing chemicals used for maintenance or other purposes at the facilities. CWS may produce recycled water at these facilities in the future, as such, the permit allows the use of chlorine or chlorine compounds for disinfection of recycled water when producing recycled water at the Hillsboro and Forest Grove WRRFs.

4.5 Groundwater

DEQ determined that the CWS facilities are not required to have limits to protect groundwater.

4.6 Use of Secondary Outfalls

The permit prohibits discharges lasting more than 14 consecutive days from the wet weather outfalls at the Durham (D003) and Forest Grove (F003) WRRFs with approval from DEQ. In addition, the Rock Creek WWRF wet weather outfall (R003) is only permitted to discharge when the capacity of the primary outfall (R001) is exceeded.

4.7 Control and Limitations for Stormwater Discharges from MS4

Appendix J presents discussion on the key elements of the MS4 plan. This section of the permit presents the requirements related to the operation and maintenance of CWS' MS4 system. In general, the permit specifies that CWS must implement a DEQ-approved Stormwater Management Plan (SWMP) that reduces the discharge of pollutants from the MS4 system to the maximum extent practicable. The key elements of the SWMP are specified in the permit. In addition, the permit requires CWS to assess the effectiveness of its DEQ-approved SWMP and to conduct an assessment of the hydromodification impacts.

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. Section 2 of Schedule B describes monitoring and reporting protocols for the permit and includes requirements for:

1. Electronic Submission of Monitoring Results
2. Test Methods, Detection and Quantitation Limits
3. Sufficient Sensitivity of Quantitation Limits
4. Quality Assurance and Quality Control (QA/QC)
5. Reporting Sample Results
6. Calculating and Reporting Mass Loads

The monitoring specified by Schedule B is required to better characterize the effluent quality and the receiving stream (Tualatin River). Due to the complexities of monitoring four separate WRRFs covered under this permit, Schedule B consists of a series of tables that list the parameters to be monitored, the frequency of the monitoring and reporting requirements. The required monitoring, reporting and frequency of monitoring for many of the parameters are based on DEQ's monitoring and reporting matrix guidelines, permit writer judgment, and to ensure that the needed data is available for the next permit renewal.

A summary of the various tables and monitoring requirements in Schedule B are presented below:

Table B1: Reporting Requirements and Due Dates
This table summarizes, for the convenience of the permittee, the reporting requirements and due dates for all reports and studies contained within the permit.

Tables B2 – B8: Influent and Effluent Monitoring
These tables specify the parameters to be monitored on a regular basis in the influent and effluent at all four WRRFs, along with associated monitoring frequencies, sample types and related reporting requirements. In several tables, the individual facilities are grouped together depending on similar treatment and monitoring capabilities (e.g., Table B2 lists the Durham and Rock Creek WRRFs Influent Monitoring Requirements). These tables also specify where in the treatment process the influent and effluent will be monitored and how monitoring will be conducted if certain continuous monitoring systems are not operable.

Compliance monitoring for effluent discharges from the Forest Grove WRRF into the NTS will be conducted after disinfection as detailed in Table B7. Table B8 specifies the dry season (May 1-October 31) monitoring required for discharges from the Forest Grove NTS outlet structure into the outfall pipe that leads to Outfall F001 that discharges into the Tualatin River. During the dry season low flow conditions, the permit compliance point for $CBOD_5$, TSS, total phosphorus, pH, temperature and dissolved oxygen will be at the outlet structure of the NTS; the compliance point for bacteria will be at the Forest Grove WRRF. At all other times, the point of permit compliance for these parameters will be at the Hillsboro and/or Forest Grove WRRFs. Other parameters being measured at the NTS outlet structure (such as metals and nitrates) are intended to measure the effectiveness of the NTS in removing such parameters. During the wet season, the NTS is not in use as the Forest Grove WRRF discharges directly to the Tualatin River through Outfall F001; compliance monitoring for all parameters will be conducted at the Forest Grove WRRF.

Excess Thermal Loads are required to be reported in Tables B4 and B5 (for Durham and Rock Creek WRRFs, respectively) and Table B8 (for the Forest Grove NTS) from May 1 through October 31. The reported values for the months of July and August will be utilized to determine the Thermal Loads to Offset necessary to demonstrate compliance (see Table B9 discussion below). The reported values for the remaining months will be used for characterization purposes.

In comparison to the existing 2016 permit, the permit renewal will include a reduction in the frequency of monitoring for several pollutant parameters in the influent and effluent at each of the four WRRFs as indicated in the following table:

Table 5-1: Influent and Effluent Monitoring Frequency Reductions

Facility	Parameters	Existing Monitoring Frequency	Proposed Monitoring Frequency
Durham	TSS	3/week	1/week
Rock Creek	$CBOD_5$ & TSS	3/week	1/week
Hillsboro (See note a.)	$CBOD_5$ & TSS	3/week	1/week
Forest Grove (See note a.)	$CBOD_5$ & TSS	3/week	1/week

Note:

a. Monitoring frequency reductions for Hillsboro and Forest Grove apply only from November 1 – April 30 during wet weather discharges.

In accordance with DEQ's Monitoring Matrix, each WRRF is typically required to monitor influent and effluent for $CBOD_5$ and TSS at least three times per week. A permittee may request a reduction in the frequency of monitoring provided the facility meets the qualifications stipulated in EPA's Interim Guidance for Performance-Based Reductions of NPDES Permit Monitoring Frequencies (April 19, 1996). Monitoring may not be reduced for any analytes for which the permittee's receiving water is listed as impaired in DEQ's most recent water quality integrated report.

During permit development, CWS requested a reduction in the frequency of influent and effluent monitoring for several parameters at each WRRF. This request included supporting information per EPA's guidance. DEQ conducted an analysis regarding the potential to reduce the frequency of monitoring at each WRRF based upon EPA's guidance. This analysis considered each facility's current monitoring requirements, compliance history relative to applicable permit limits, monitoring capabilities and water quality limitations of the receiving water where the facility discharges. In general, each WRRF produces high quality effluent that is consistently within permit limits. In addition, each facility employs continuous monitoring for the subject pollutants. The analysis concluded that each WRRF is eligible for reductions in the monitoring frequency for $CBOD_5$ and TSS as indicated in the table above. The proposed reduction in monitoring frequency is highly unlikely to result in a lowering of water quality. It is the responsibility of the permittee to maintain these performance levels to continue to receive monitoring reductions. Monitoring reduction eligibility will be re-assessed at the next permit renewal. While the proposed permit will authorize monitoring at one sample per week for $CBOD_5$ and/or TSS in the influent and effluent at the WRRFs, the permittee may collect and report more samples if desired. All supporting information related to this analysis is maintained in the public record and is available for review upon request.

Table B9: Aggregate Thermal Load to Offset and Aggregate Thermal Credits Generated
This table requires reporting of the aggregate thermal load that CWS must offset and the aggregate thermal credits that CWS generates through its water quality trading program. The aggregate thermal load that must be offset is the sum of the combined Thermal Loads to Offset from the Durham and Rock Creek WRRFs and the Forest Grove NTS. The aggregate thermal load credit is CWS' combined credits from its riparian shade restoration and flow enhancement activities.

Table B10: Wet Weather Outfall Monitoring - D003, R003 and F003
This table requires CWS to monitor the frequency and duration of discharges from the wet weather outfalls at the Durham, Rock Creek and Forest Grove WRRFs. The table also lists the pollutant parameters to be monitored during each discharge period.

Table B11: Pretreatment Monitoring
This table lists the pollutants, sampling frequency, sample type and report requirements for CWS to demonstrate compliance with pretreatment standards.

Tables B12 – B14: Copper and Aluminum Biotic Ligand Model Sampling Requirements
Tables B12 through B14 list the river and effluent monitoring requirements to support the copper Biotic Ligand Model (BLM) and aluminum analyses. Table B12 lists the locations of monitoring sites on the Tualatin River where receiving water data is to be collected. This table and Table B13 essentially require the permittee to monitor the Tualatin River upstream and downstream of the discharges from Outfalls D001, R001, H001A, H001B and F001, and effluent from these outfalls, for parameters associated with the copper BLM. Although DEQ conducted an RPA for copper, additional monitoring for copper is warranted during the next permit term. The permittee is required to monitor copper and supporting BLM parameters on a quarterly basis beginning at the first full quarter after the permit effective date until a minimum of 12 paired data sets (river and effluent) are collected at the Rock Creek, Durham and Hillsboro WRRFs; quarterly sampling is also required at the Forest Grove WRRF (F001) until 24 samples are collected.

New water quality criteria for aluminum became effective on April 19, 2021 and will be in effect during the next permit term. As such, the next permit renewal will require a reasonable potential analysis of the permittee's discharge against the aluminum criteria. DEQ is requiring sampling for aluminum during the proposed permit term in order to have the necessary data available for the analysis and to reduce delays in renewing the permit. Sampling for aluminum and supporting parameters will occur once per month starting at the first full month after the permit effective date until 24 paired samples are collected for each WRRF.

Tables B15 through B18: Monitoring for Toxics and Other Parameters

Because each WRRF discharges more than 1 MGD or a portion of the source water originates from industrial facilities, the permit contains additional monitoring requirements for toxic pollutants. These parameters are listed in Tables B15 through B18. For all the parameters listed, CWS must sample quarterly for each of the first three years after the permit effective date and the sampling must represent both high and low river flow conditions. DEQ will then evaluate these results to determine if additional sampling will be needed.

If DEQ's analysis indicates that the permittee's effluent may cause or contribute to exceedances of water quality standards at the point of discharge with no dilution present, DEQ will notify the permittee as noted in Schedule B, Condition 9. The DEQ notification may require follow-up monitoring. The purpose of this follow-up monitoring will be to determine if the discharge has a reasonable potential to cause or contribute to exceedances of water quality for the toxics in question in the Tualatin River.

Table B19: WET Test Monitoring

This table specifies the frequency, type and location of sampling needed to perform WET testing. The permittee will be required to conduct a minimum of four WET tests during the next permit term using the effluent to be discharged to Outfalls D001, R001, H001A, H001B and F001. During dry season when the Forest Grove NTS is operational, samples for the WET tests are to be collected at the NTS outlet structure prior to discharge to the Tualatin River. When Hillsboro does not discharge and flow is directed to Forest Grove or Rock Creek during the low flow period, WET testing at the Forest Grove NTS or at the Rock Creek WRRF, respectively, can be used to meet the minimum WET testing requirements for the non-discharging period for the Hillsboro WRRF.

Table B20: Recycled Water Monitoring Requirements

OAR 340-055-0012 requires CWS to monitor and demonstrate compliance with the treatment criteria for a specific class of recycled water. Table B20 lists the monitoring requirements consistent with OAR 340-055-0012 for recycled water. This permit gives CWS the option to use the Colilert method for testing of total coliform in recycled water provided this method and procedure is described in the recycled water use plan. Other specific monitoring and sampling procedures are also described in the recycled water use plan.

Tables B21 and B22: Biosolids Monitoring and Minimum Monitoring Frequency

These tables list the monitoring requirements that pertain to biosolids, consistent with OAR 340-050-0035 and 40 CFR §503.16 through 503.18. Table B21 lists the monitoring requirements related to biosolids and Table B22 establishes the minimum frequency for the biosolids sampling. Specific details on how and where biosolids monitoring will be conducted are provided in CWS' DEQ-approved Biosolids Management Plan that is available for public comment with the proposed permit.

The biosolids will be routinely sampled and tested for plant nutrients (nitrogen, phosphorus, and potassium) and regulated pollutants (arsenic, cadmium, copper, lead, mercury, molybdenum, nickel, selenium, and zinc) to demonstrate on-going compliance with loading and pollutant concentration limits for biosolids. The monitoring is also required to design the agronomic loading rate for land application of the biosolids. Biosolids must be land applied at agronomic rates to ensure that the land application will not degrade groundwater through nitrate contamination.

In addition to biosolids monitoring, CWS is required to maintain records on the land application of biosolids. Records must be sufficient to demonstrate that biosolids were applied within agronomic loading rates and following required site management practices. The permit requires CWS to record the date, quantity, and location of biosolids applied to the land on a site map or electronic GIS system.

Table B23: Hillsboro and Forest Grove WRRFs Transfer Flows

This table requires CWS to monitor and report on the transfer of flows among the Hillsboro, Forest Grove, and/or Rock Creek WRRFs. The monitoring will be conducted year-round and on a daily basis when flows are being transferred.

Tables B24 and B25: Watershed Monitoring

Clean Water Services currently conducts a comprehensive watershed-based monitoring program within the Tualatin River Basin that includes in-stream water quality monitoring; physical conditions monitoring; stream flow, and biological monitoring consisting of macro-invertebrate surveys. The monitoring is used to characterize the watershed and evaluate the effectiveness of the permittee's actions in the watershed and is not for purposes of evaluating compliance. This beneficial monitoring will continue with the next permit term.

Table B24 lists the parameters and frequency of in-stream monitoring to be conducted at various locations within the Tualatin River watershed. The results of this monitoring will be used to support future permitting and analysis of water quality in the Tualatin River watershed. The monitoring will be conducted at 15 locations throughout the Tualatin River watershed including the upper and lower portions of the Tualatin River and its tributaries. The locations of the monitoring sites will be determined by CWS and will be selected where CWS believes the best data can be obtained to monitor the overall health and condition of the watershed, while providing good representative data coverage for all portions of the basin.

Table B25 presents the in-stream biological and physical monitoring requirements to be conducted within the watershed during the next permit term. This monitoring effort will occur once during the permit term and must be conducted at 15 locations within the watershed where CWS believes the best representative data can be obtained. The biological monitoring will consist of macro invertebrate sampling while the physical characteristic monitoring will include an assessment of channel dimensions, stream bank condition and percent canopy cover. Upon approval from DEQ, CWS may substitute eDNA sampling for macroinvertebrate sampling.

Table B26: MS4 Stormwater Monitoring
Monitoring requirements specific to stormwater under the MS4 portion of this permit are listed under this table. Additional details to the MS4 monitoring plan and sampling and analysis are detailed in the permit.

The final section of Schedule B provides details on the required annual report submissions for the MS4 portion of the permit.

6. Schedule C: Compliance Schedules and Conditions

There is no Schedule C associated with this permit.

7. Schedule D: Special Conditions

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

7.1 Inflow and Infiltration

As previously described, it is important for the permittee to assess and take steps to reduce the rate of infiltration and inflow of stormwater and groundwater into the sewer system. Consistent with this, Schedule D of the permit requires the permittee to submit an annual report that details the activities completed and planned through local capacity improvement projects to identify and reduce I/I in the sanitary collection system.

7.2 Emergency Response and Public Notification Plan

This condition requires CWS to develop and submit an emergency and spill response plan or ensure the existing plan is current per General Condition B.8 in Schedule F. An updated copy of the plan must be kept on file at the facility for DEQ review.

7.3 Mixing Zone Study

This condition requires CWS to update the mixing zone study for each of the four WRRFs and present the results with the next permit renewal application. The mixing zone study for each facility must meet the requirements of a Level 2 mixing zone study in accordance with DEQ's Mixing Zone Internal Management Directive (IMD). In addition, the mixing zone study must also update the thermal plume analysis for each WRRF. Each mixing zone study report must summarize the procedures for conducting the analysis at each facility and clearly identify the outfalls, effluent flows, stream flows and dilution values for each discharge scenario anticipated from the respective facility.

7.4 Recycle Water Use Plan

A condition requiring the permittee to maintain a recycled water use plan that meets 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 permittee 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. Such activities can include small-scale supplemental irrigation of turf grasses, shrub or ornamental trees on the grounds of the permittee's facilities. All of the requirements listed in this condition must be satisfied for an exempt use to be valid.

7.6 Biosolids Management Plan

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

The permittee's Biosolids Management Plan was last updated in 2021 and is available for public comment with the proposed permit. The plan includes all sites authorized by DEQ for land application of biosolids.

7.7 Wastewater Solids Transfers

A condition that allows the permittee to transfer treated or untreated wastewater solids to other in-state or out-of-state facilities that are permitted to accept the wastewater solids. The permittee is required to monitor, report, and dispose of solids as required by the permit of the receiving facility. Wastewater solids that are transferred out-of-state must meet all requirements for the use of disposal or wastewater solids as required by both Oregon and the receiving state.

7.8 Hauled Waste Annual Report

This condition requires CWS to submit a Hauled Waste Annual Report the describes the hauled waste received at their facilities. The report must include the date, time, type and amount of hauled waste received each time one of the permittee's facilities receives hauled waste.

7.9 Whole Effluent Toxicity Testing

The permittee is required to perform WET testing at each of the four WRRFs 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 for each of the four CWS facilities under low and high river flow conditions on the basis of the mixing zone analysis.

7.10 Operator Certification

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

7.11 Outfall Inspection

A condition that requires the permittee to inspect the outfalls at each CWS facility and submit a report regarding their condition.

7.12 Forest Grove Natural Treatment System Operations Plan

A condition requiring the permittee to maintain an Operations Plan for the Forest Grove Natural Treatment System. At a minimum, the plan must describe the general design and capabilities of the NTS in providing wastewater treatment and specify the adaptive management strategies for optimizing the quality of effluent discharged from the NTS. The plan must also describe effluent monitoring locations and procedures, current maintenance and management activities employed to the NTS and planned improvements or revisions to the NTS. The plan must be updated on an annual basis.

7.13 Water Quality Trading in the Tualatin Basin

This condition authorizes CWS to use water quality credit trading to comply with the waste discharge limitations of Schedule A provided its credit trading activities comply with the requirements of this section and its Thermal Load Management Plan. The overall components and provisions of the credit trading program are described in this condition.

7.14 Municipal Separate Storm Sewer System (MS4) Provisions

This condition lists the provisions of the Municipal Separate Storm Sewer System (MS4).

7.15 MS4 Renewal Application Package

A condition that requires CWS to submit a permit renewal application package to support any proposed modifications to the stormwater management plan for the next permit renewal. The renewal application package must be submitted at least 180 days prior to permit expiration. This condition describes the information that must be included in the MS4 application package.

8. Schedule E: Pretreatment

As described in Section 2.5, CWS implements an industrial pretreatment program that was initially approved by DEQ in March 1983 and was subjected to a DEQ compliance audit in April 2020. Schedule E of the permit contains various conditions related to the industrial pretreatment program. Schedule E of the permit has been updated to include required changes under the Streamlining Rule of 2005. For example, Schedule E, Condition 3 requires CWS to update its inventory of industrial users (IUs) at a frequency of no less than once per year. The permit also requires that survey update procedures ensure that IUs potentially subject to pretreatment are identified and issued a control mechanism, if required, within 6 months after receipt of information indicating that the IU is subject to pretreatment.

Schedule E, Condition 13 requires that CWS submit a complete report on or before March 31 that describes the pretreatment activities conducted during the previous calendar year. In addition, Schedule E, Condition 14 requires CWS to submit substantial and non-substantial pretreatment program modification requests to DEQ for approval.

9. 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.

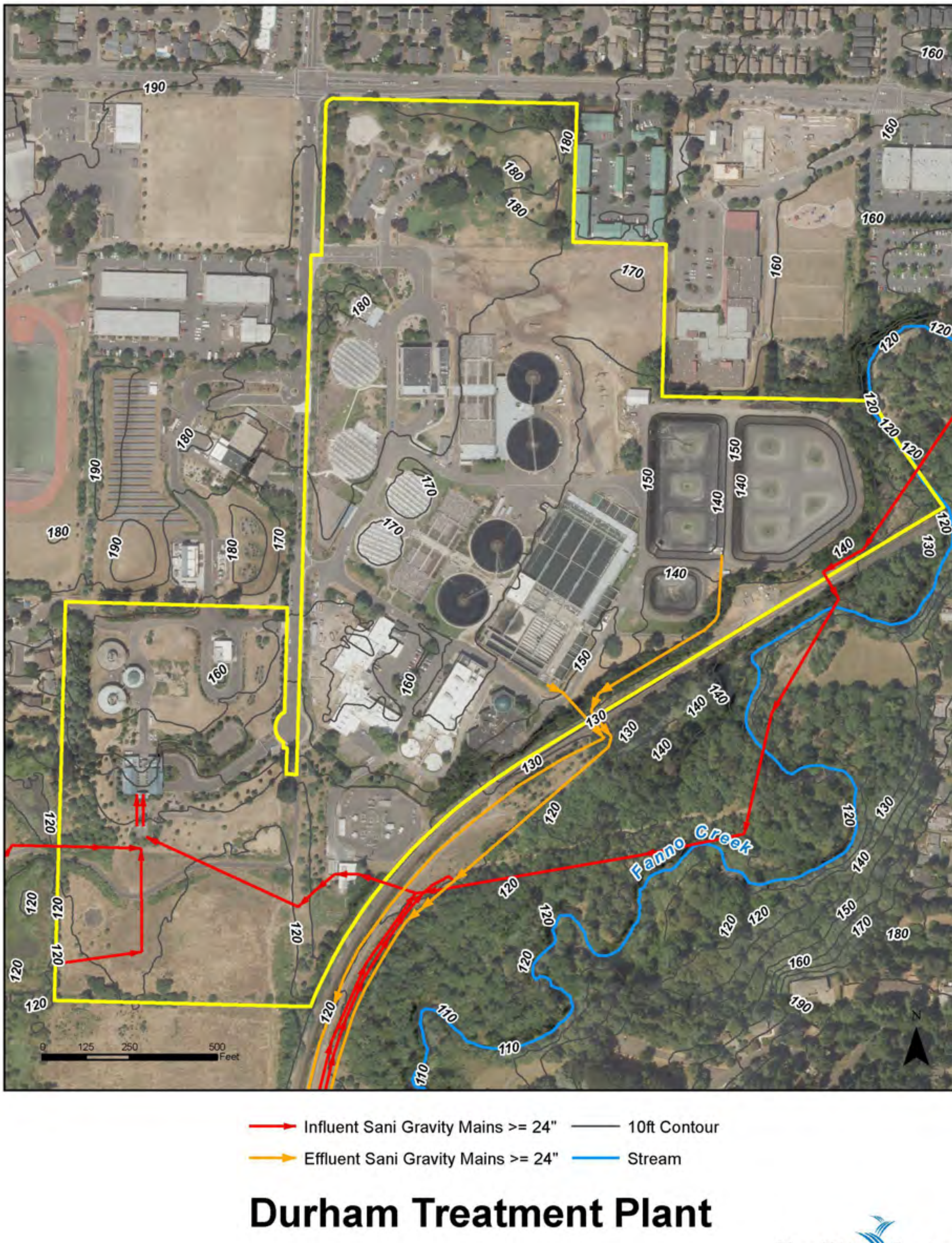
- Section A. Standard Conditions
- Section B. Operation and Maintenance of Pollution Controls
- Section C. Monitoring and Records
- Section D. Reporting Requirements
- Section E. Definitions

10. Next Steps

The proposed NPDES permit will be made available for public comment for a minimum of 40 days as required by OAR 340-045-0027. Public notice and links to the proposed permit will be posted on DEQ's website and sent to subscribers of DEQ's pertinent public notice e-mail lists. A virtual public hearing is scheduled for September 22 at 6:00 PM.

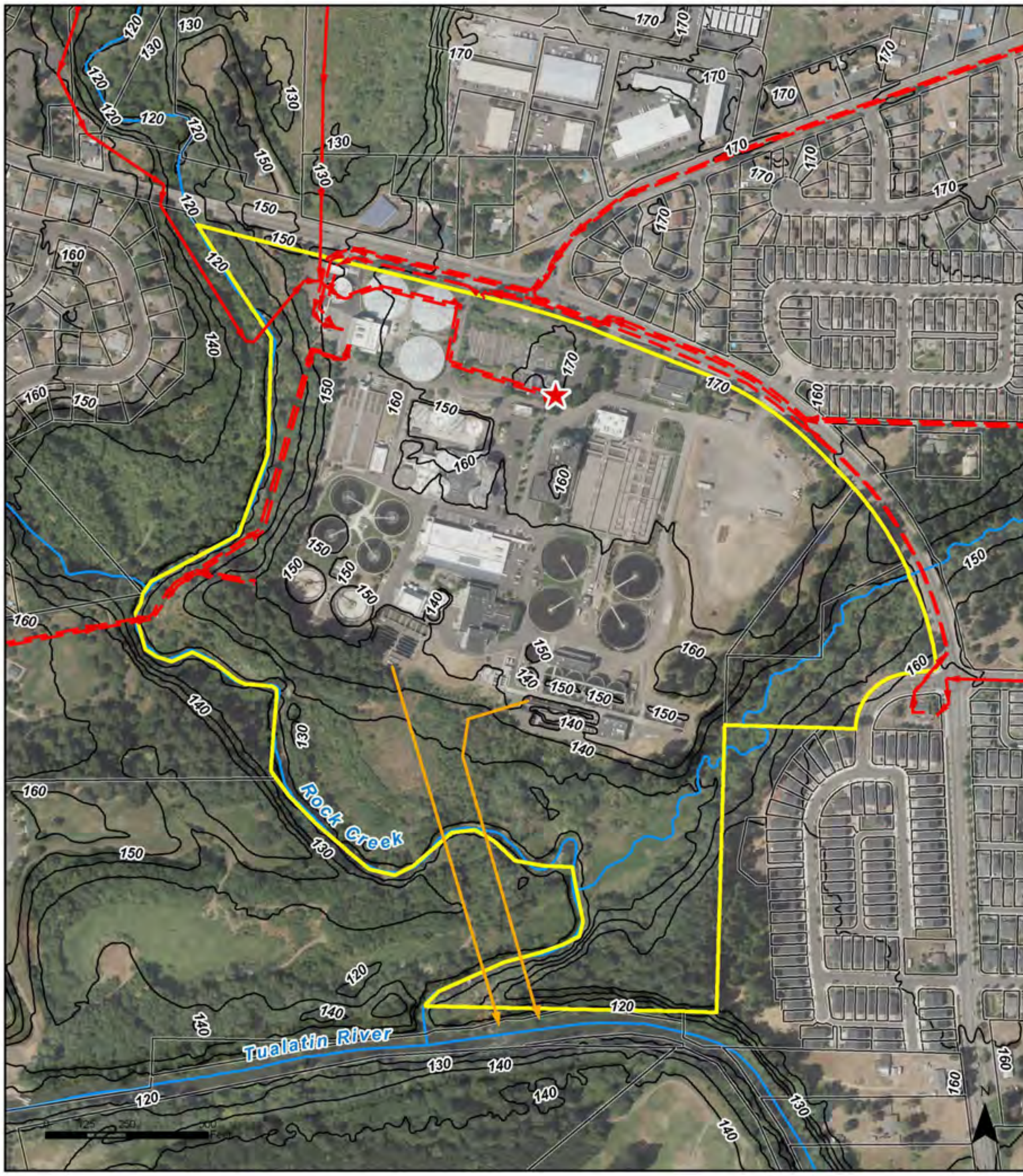
DEQ will respond to comments received during the comment period. All those providing comment will receive a copy of DEQ's response. Interested parties may also request a copy of DEQ's response. Once comments are received and evaluated, DEQ will decide whether to issue the permit as proposed, to make changes to the permit, or to deny the permit. DEQ will notify the permittee of DEQ's decision. If substantive changes are made to the permit, then an additional public notice period may occur. DEQ may also revise this fact sheet or update the fact sheet through memoranda.

Appendix A: Facility Site Maps



Durham Treatment Plant

Clean Water Services



Rock Creek Treatment Plant

Clean Water Services

Hillsboro Treatment Plant

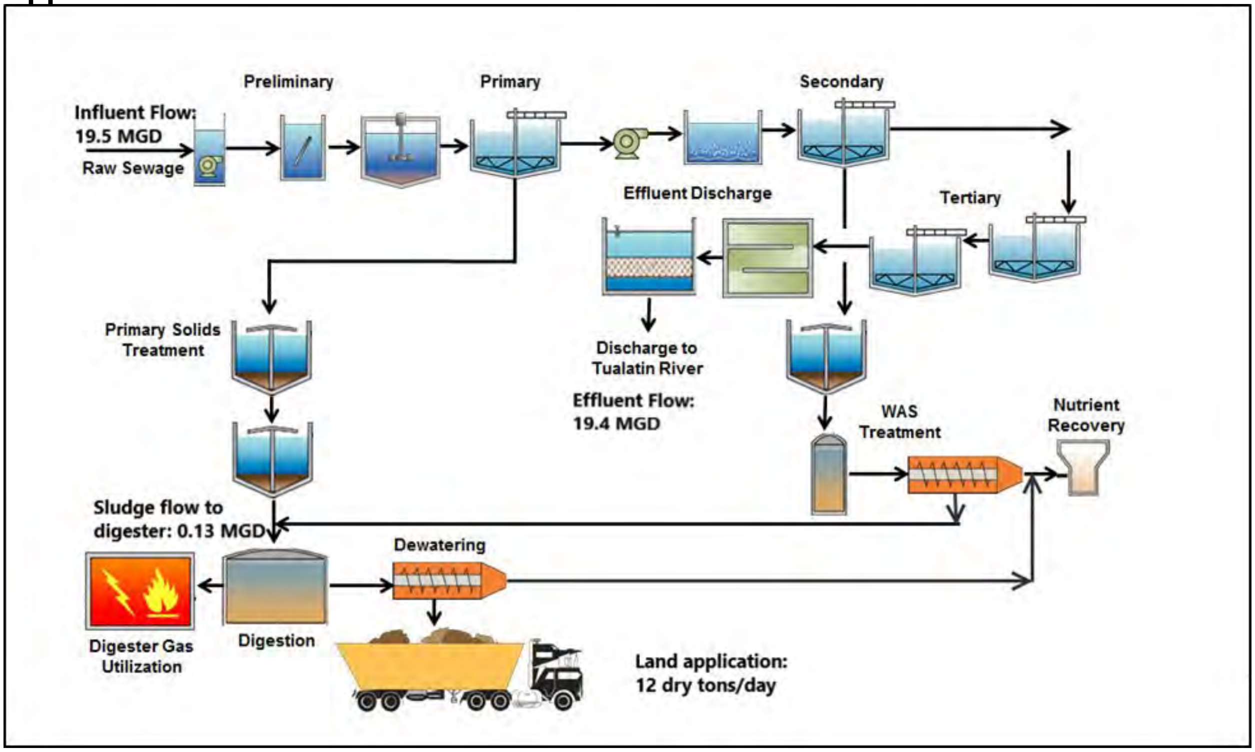
CleanWater Services

Forest Grove Treatment Plant

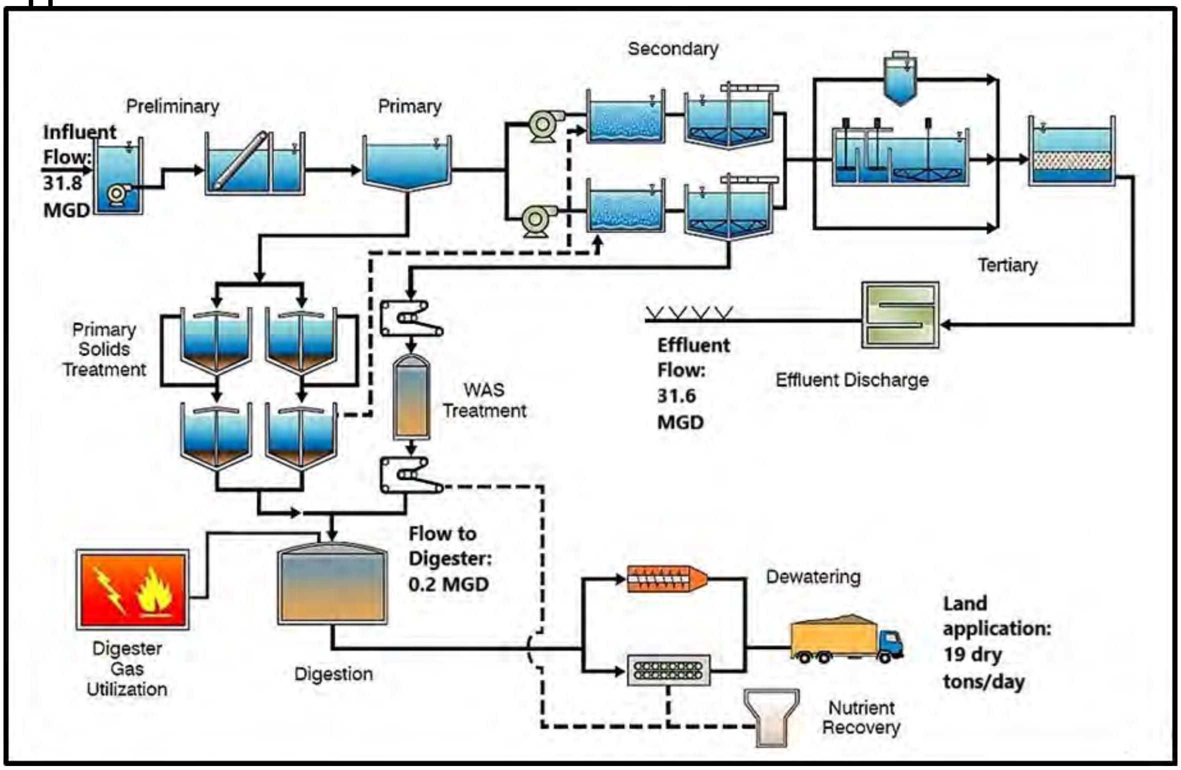
Clean Water Services

Appendix B: Schematic Flow Diagrams

Appendix B-1 – Durham WRRF Process Flow Schematic

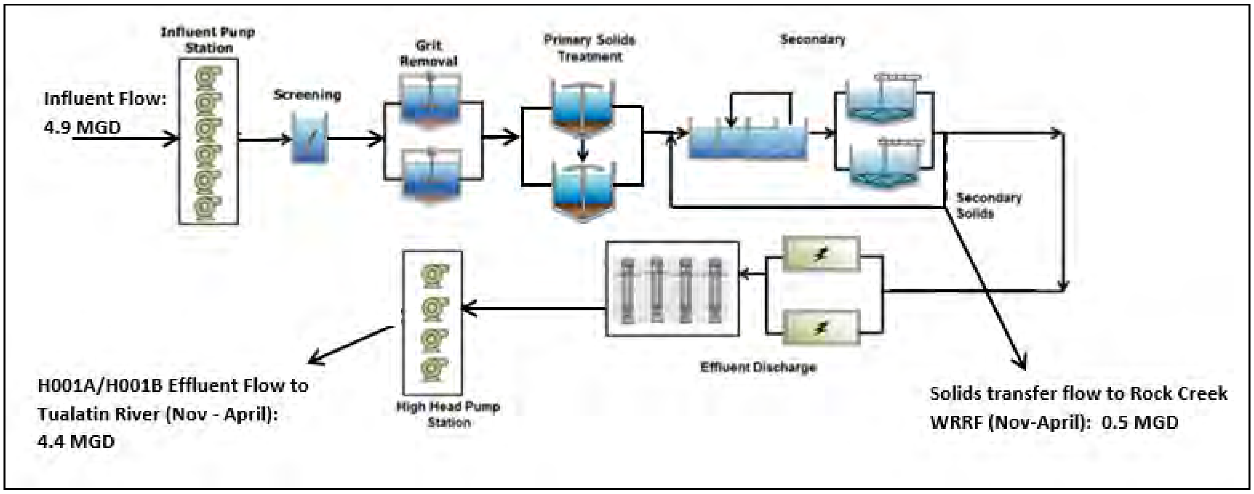


Appendix B-2 – Rock Creek Process Flow Schematic



Appendix B-3: Hillsboro WRRF Process Flow Diagram

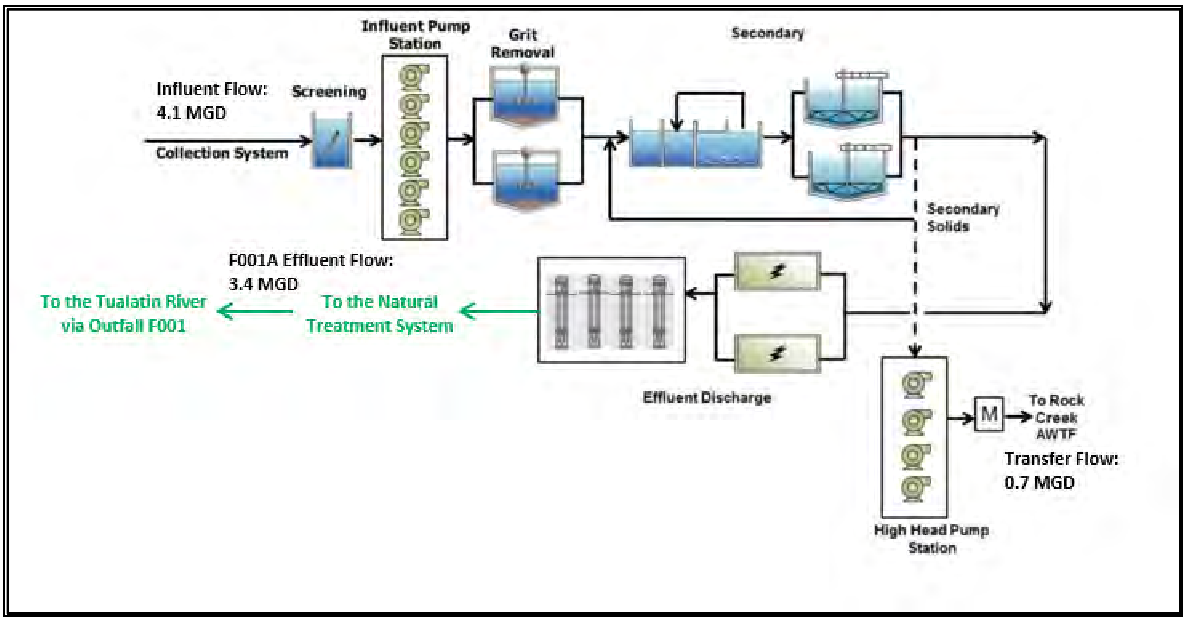
Effluent from the Hillsboro WWRF is transferred to either the Rock Creek or Forest Grove WRRFs during the summer dry season (May through October); during the wet season (typically November through April), effluent is discharged to the Tualatin River through the two primary outfalls (H001A & H001B). The process flow diagram below shows actual wet season average flows at the Hillsboro facility for 2019. Solids are conveyed to the Rock Creek WRRF for processing.



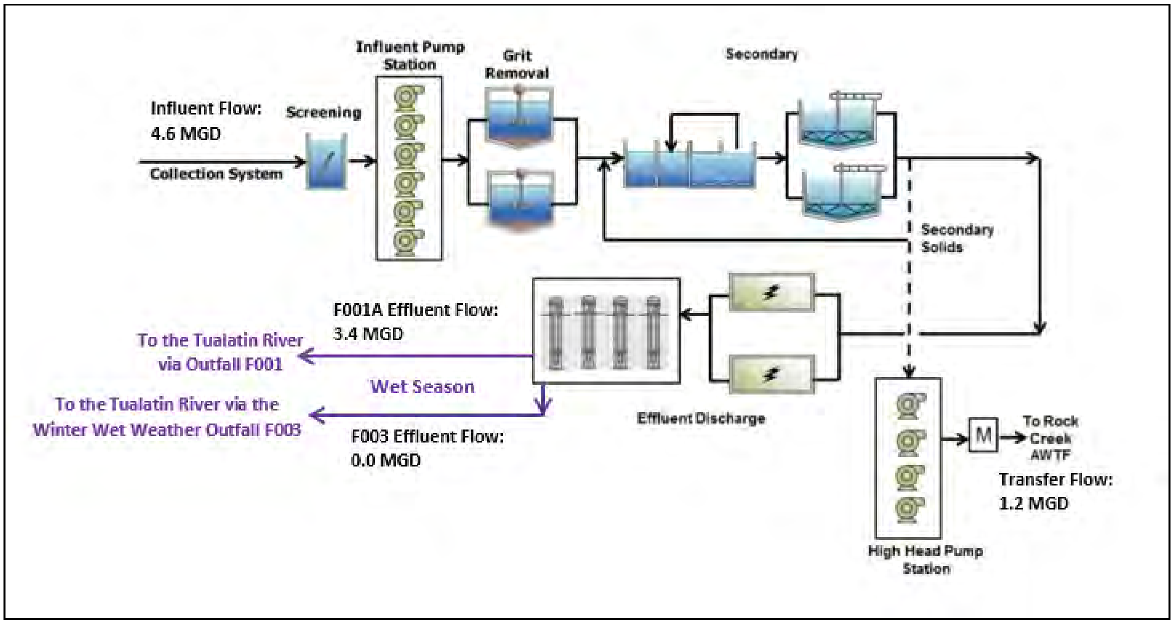
Appendix B-4: Forest Grove WRRF & Natural Treatment System Process Flow Diagram

The process flow diagram below shows average flows at the Forest Grove facility during dry and wet seasons for 2019. During the dry season (typically May through October), effluent flow from the Forest Grove facility is directed through the Natural Treatment System (NTS) for additional treatment prior to discharge to the Tualatin River via Outfall F001. During the wet season, discharge from the Forest Grove facility is conveyed directly to the Tualatin River through Outfall F001. The wet weather outfall, Outfall F003, is used when the NTS is flooded and the capacity of the primary outfall, Outfall F001, is exceeded; Outfall F003 has not been used during the permit term. Currently, the NTS is being brought up to full operation; estimated flows for when the NTS is fully operational are presented in the schematic.

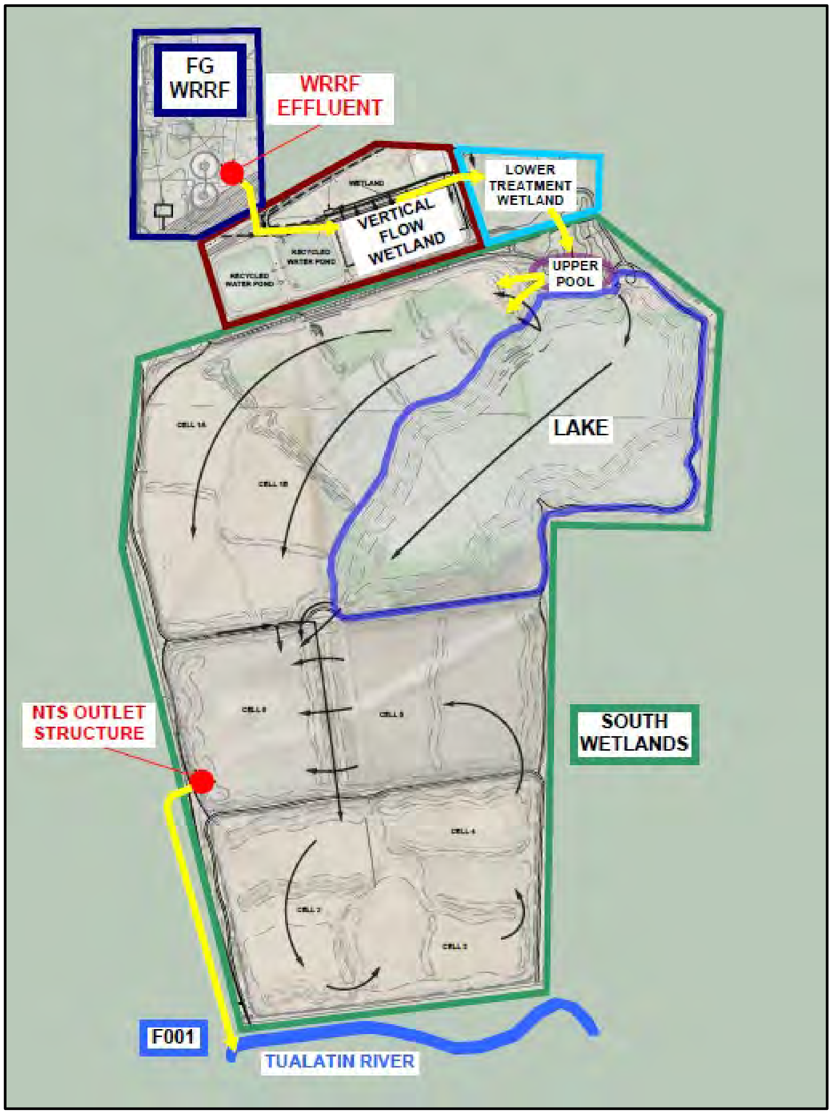
Dry Season Process Flow Diagram



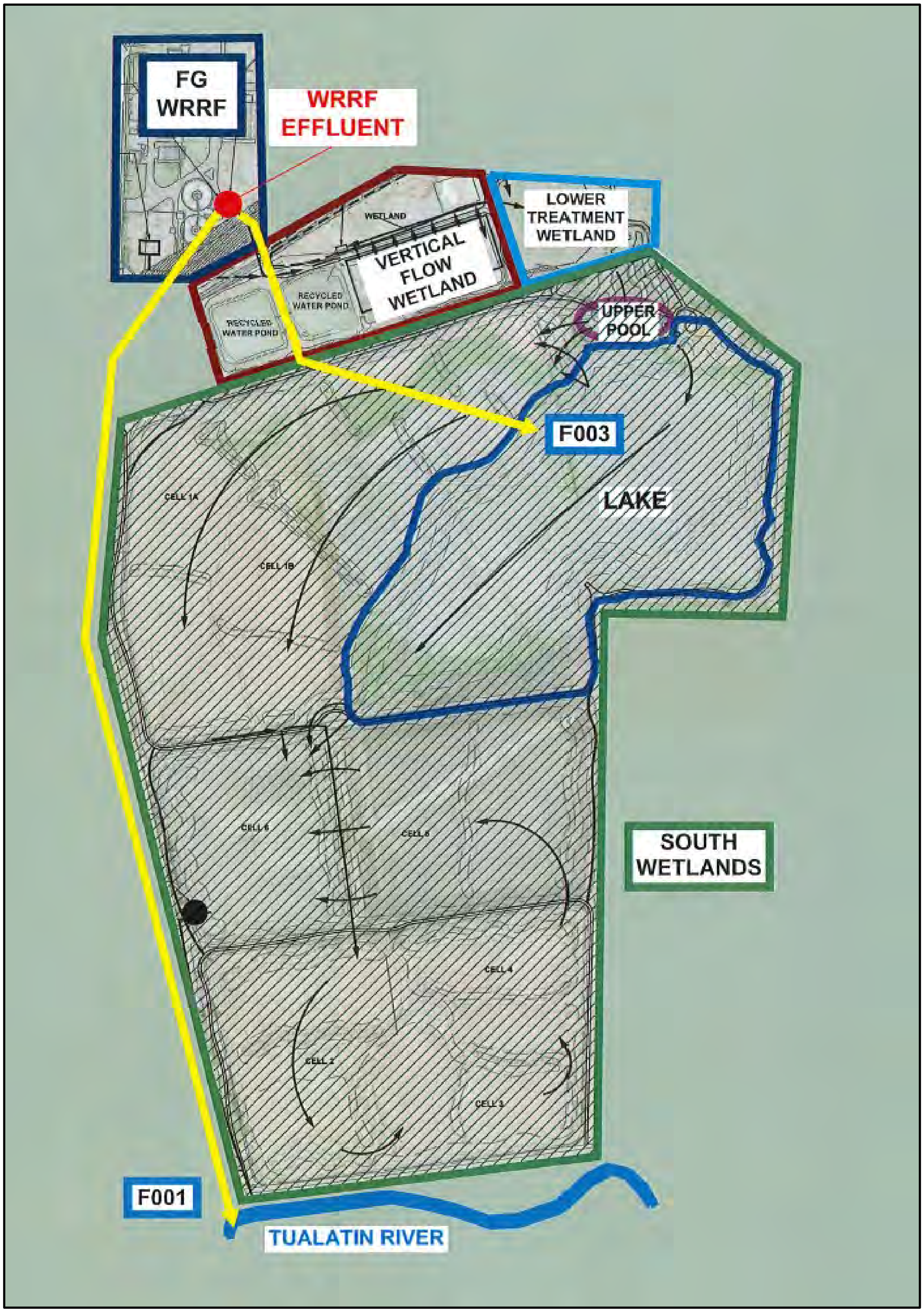
Wet Season Process Flow Diagram



Appendix C: Natural Treatment System Flow Diagrams

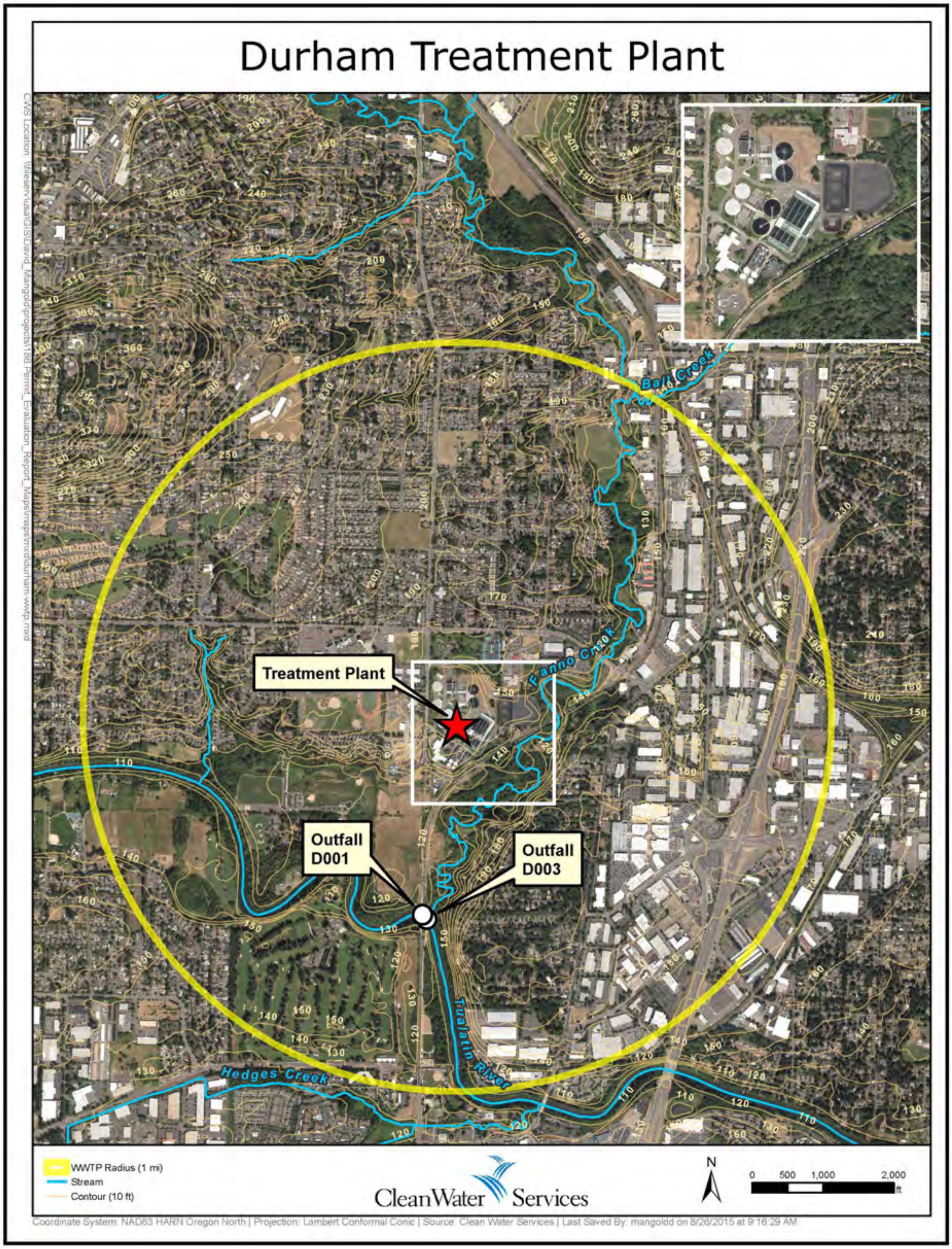


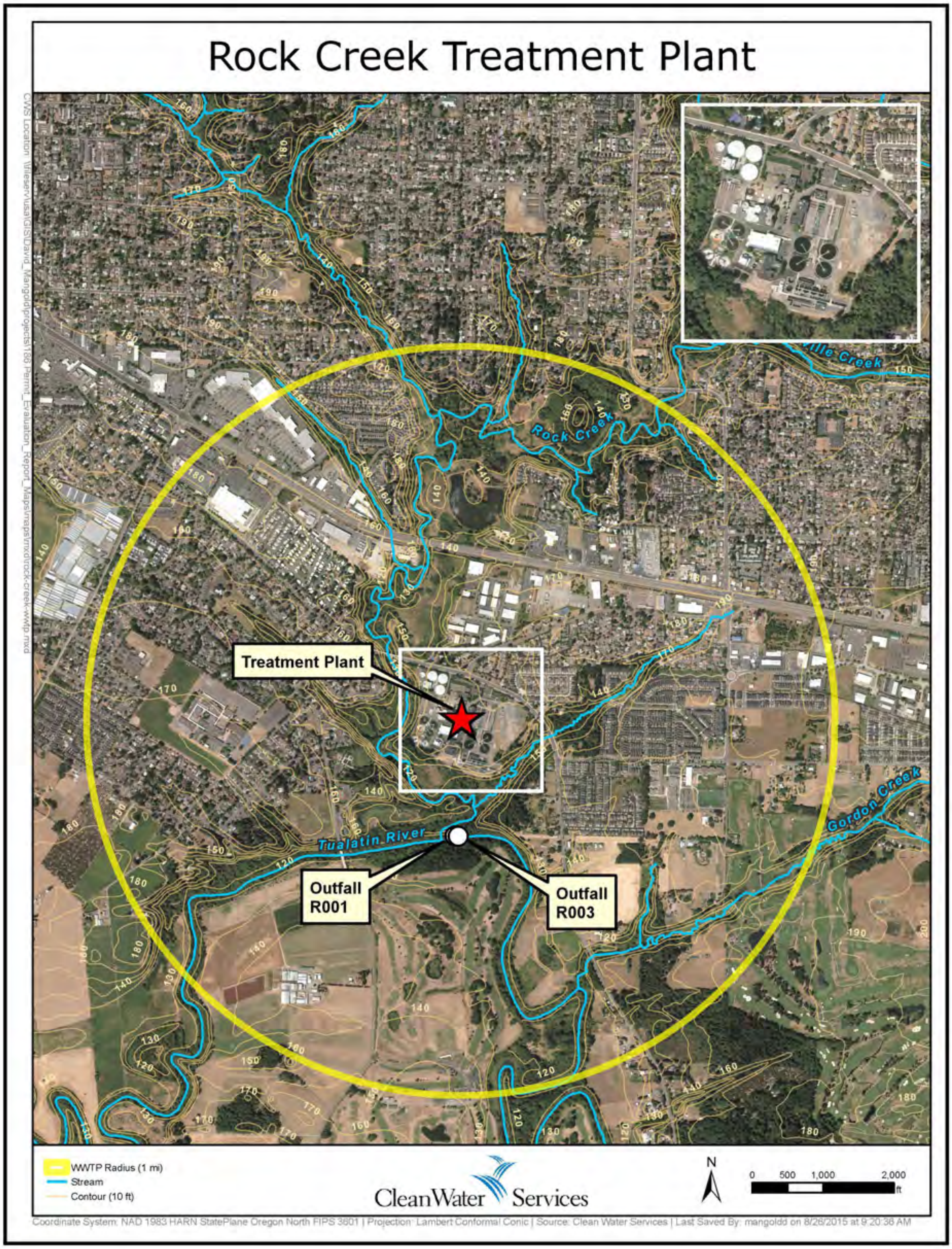
Appendix C-1 – Forest Grove Natural Treatment System Dry Weather Flow Schematic

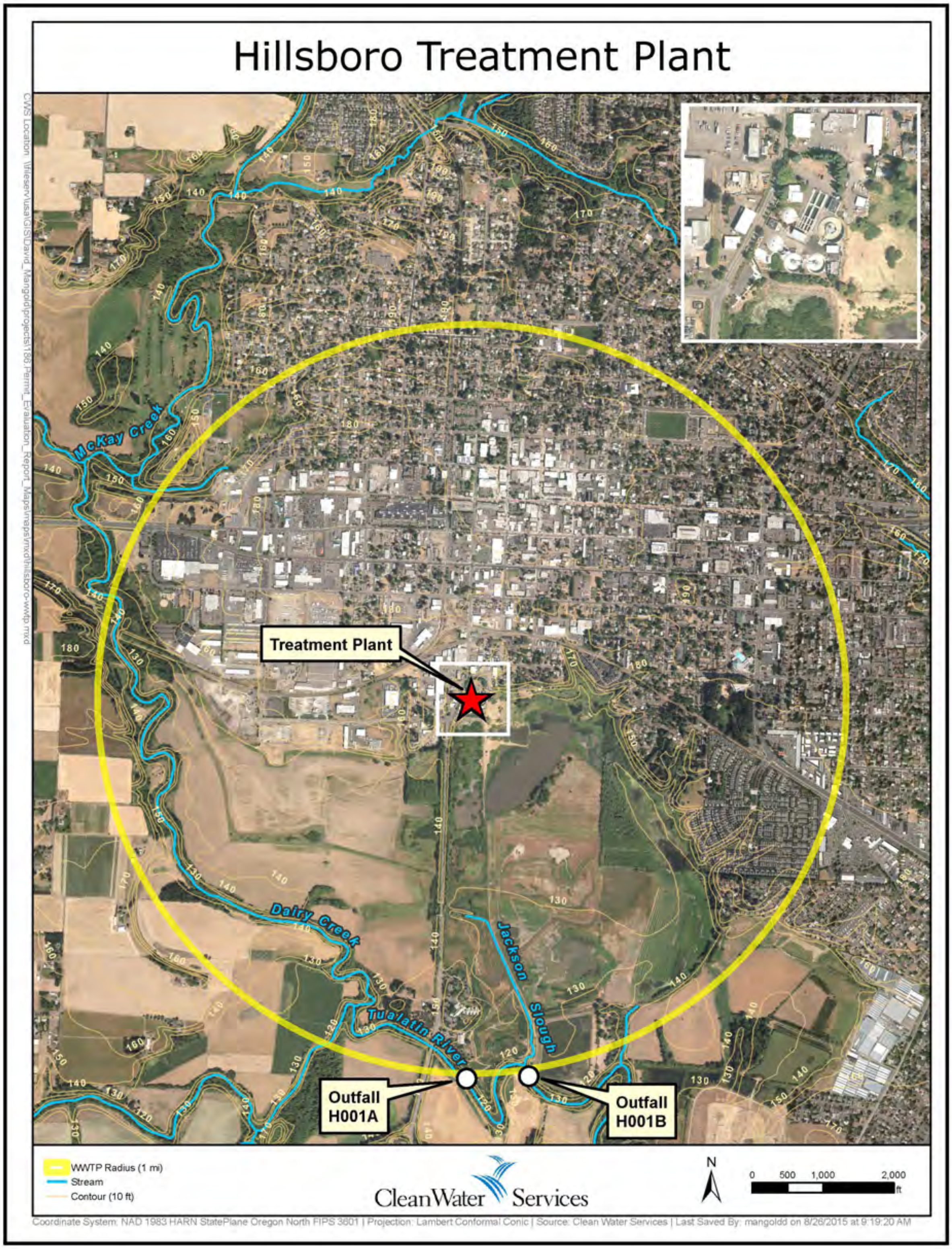


Appendix C-2 – Forest Grove Natural Treatment System
Wet Weather Flow Schematic

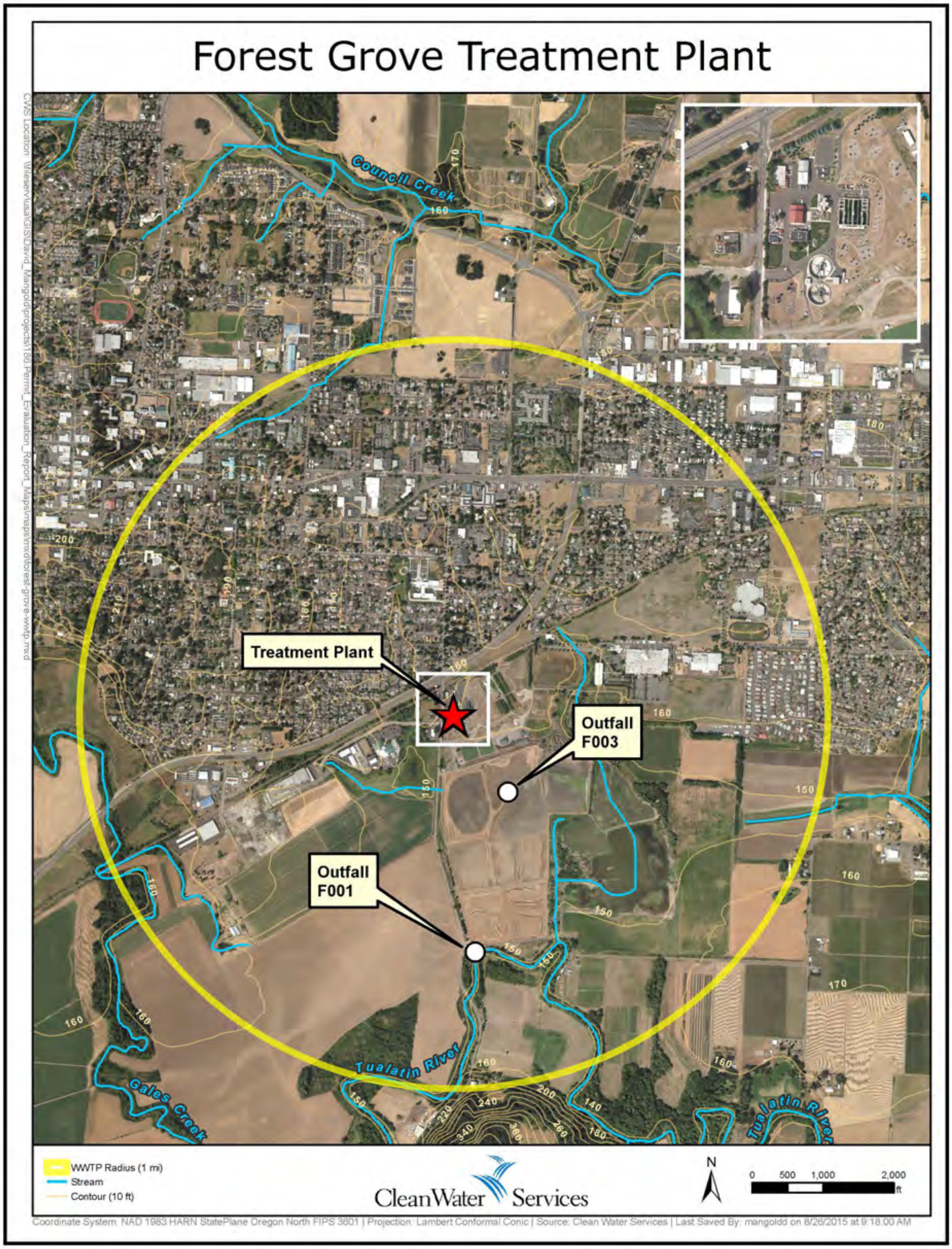
Appendix D: Outfall Locations




Rock Creek Treatment Plant
Rock Creek
Treatment Plant
Tualatin River
Outfall R001
Outfall R003
Gordon Creek
WWTP Radius (1 mi)
Stream
Contour (10 ft)
Clean Water Services
N
0 500 1,000 2,000
ft
Coordinate System: NAD 1983 HARN StatePlane Oregon North FIPS 3601 | Projection: Lambert Conformal Conic | Source: Clean Water Services | Last Saved By: mangoldd on 8/26/2015 at 9:20:36 AM



Hillsboro Treatment Plant
McKay Creek
Dairy Creek
Tualatin River
Jackson Slough
Treatment Plant
Outfall H001A
Outfall H001B
WWTP Radius (1 mi)
Stream
Contour (10 ft)
CleanWater Services
N
0 500 1,000 2,000 ft
Coordinate System: NAD 1983 HARN StatePlane Oregon North FIPS 3601 | Projection: Lambert Conformal Conic | Source: Clean Water Services | Last Saved By: mangoldd on 8/26/2015 at 9:19:20 AM


Forest Grove Treatment Plant
Council Creek
Treatment Plant
Outfall
F003
Outfall
F001
Tualatin River
Gales Creek
Tualatin River
WWTP Radius (1 mi)
Stream
Contour (10 ft)
Clean Water Services
N
0 500 1,000 2,000
ft
Coordinate System: NAD 1983 HARN StatePlane Oregon North FIPS 3601 | Projection: Lambert Conformal Conic | Source: Clean Water Services | Last Saved By: mangoldd on 8/26/2015 at 9:18:00 AM

Appendix E: Ammonia RPA Dilutions

Appendix E. Mixing Zone Dilutions Used In CWS Ammonia Toxicity RPAs and Limit Derivations				
Flows	**Dilutions at**			**Data Source/Methodology for Dilution Value Estimations**
	ZID	**MZB**	**30Q5**	
Durham				
June - October				
All	2.6	5.7	5.1	Critical annual low flow dilutions from 2008 MZ Study
Nov - April				
<500	2.6	5.7	5.1	Critical annual low flow dilutions from 2008 MZ Study
500-1000	3.2	8.4	8.4	ZID: interpolated from modeled values/MZ dilutions from regression equations based
>1000	4.5	13.5	13.5	on dilutions modeled for 2008 Mixing Zone Study
May				
<500	2.6	5.7	5.1	Critical annual low flow dilutions from 2008 MZ Study
>500	4.2	11.1	11.1	ZID: interpolated from modeled values/MZ dilutions from regression equations using critical May effluent flows
Rock Cr				
June - October				
All	1.3	2.2	2.1	Critical annual low flow dilutions from 2008 MZ Study
Nov - April				
<500	1.3	2.2	2.1	Critical annual low flow dilutions from 2008 MZ Study
500-1000	2.2	4.3	4.3	ZID: interpolated from modeled values/MZ dilutions from regression equations based
>1000	3.2	6.1	6.1	on dilutions modeled for 2008 Mixing Zone Study
May				
<500	1.3	2.2	2.1	Critical annual low flow dilutions from 2008 MZ Study
>500	2.9	5.4	5.4	ZID: interpolated from modeled values/MZ dilutions from regression equations using critical May effluent flows
Forest Grove				
June - October				
All	1.8	4.9	6.1	Critical annual low flow dilutions from 2013 NTS Permitting Report
Nov - April				
<500	1.8	4.9	6.1	2019 MZ Study
>500	2.3	10.2	10.2	Interpolated
May				
<500	1.8	4.9	6.1	2019 MZ study
>500	2.3	10.2	10.2	ZID: interpolated from wet season low flow (115 cfs u/s of plant) and wet season median flow (791 cfs u/s of plant) dilutions from 2008 MZ Study/MZ dilutions at annual harmonic mean flow (263 cfs at Farmington gage) from 2013 NTS Permitting Report
Hillsboro West (H001A - Upstream)				
Nov - April				
<1000	2.7	15.7	15.7	Memo to DEQ September 29, 2017
>1000	2.7	16.2	16.2	ZID: interpolated/MZ dilutions based on wet season harmonic mean flow (825 cfs at Farmington gage) from 2008 MZ Study
May - Oct: No Discharge				
Hillsboro East (H001B - Downstream)				
Nov - April				
<1000	2.8	15.7	15.7	Memo to DEQ September 29, 2017
>1000	2.8	16.2	16.2	Farmington gage) from 2008 MZ Study. Takes into account impacts of west (upstream) plume.
May - Oct: No Discharge				

Appendix F: Toxics RPA Spreadsheets

Appendix F-1 Durham WRRF Toxics RPA Outfall D001

Aquatic Toxicity & Human Health

5. Aquatic Toxicity RP

RPA Run Information	
Facility Name:	Durham STP
DEQ File Number:	90735
EPA Identification #:	OR0028118
Permit Number:	101141
Prepared By:	Aliana Britson
Preparation Date:	6/21/2022
Facility Flow Rate (MGD):	25.7
Outfall Number:	1
Determination Date:	6/21/22

RPA Run Notes: Dilutions from 2008 MZ study. Effluent data from 2016-2020

Color Key:	"*" = Enter data
Intermediate Calc.s	"--" = Will calculate
Calculation Results	

Facility Information				
1. Are there dilution #'s from mixing zone study? (Yes/No)				yes
2. Is the receiving waterbody fresh water? (Yes/No)				yes
3. If Question 1 = "No", then fill in the following table				
Eff. Flow Rate	MGD	N/A	Calculated dilution Factors	
Stream Flow: 7Q10	CFS	N/A	Dilution @ ZID	N/A
Stream Flow: 1Q10	CFS	N/A	Dilution @ MZ	N/A
% dilution at ZID	%	10%		
% dilution at MZ	%	25%		
4. If answered "Yes" to Question #1, then fill in dilution values	Dilution @ ZID (1Q10 from study)			2.6
	Dilution @ MZ (7Q10 from study)			5.7
5. Enter Water Hardness. Use average hardness during critical (usually low-flow period). Effluent default is 25 mg/L.	Effluent		$mg/L\ CaCO_3$	123.5
	Up-stream		$mg/L\ CaCO_3$	10
	ZID boundary		$mg/L\ CaCO_3$	54
	MZ boundary		$mg/L\ CaCO_3$	30
6. Please enter statistical Confidence and Probablity values (note: defaults already entered)	Confidence Level		%	99%
	Probability Basis		%	95%

		Identify Pollutants of Concern					Determine In-Stream Conc.			Det. Reasonable Potential			
Pollutant Parameter	Evaluation Required?	# of Sample	Highest Effluent Conc.	Coefficent of Variation	Est. Max Eff. Conc.	RP at end of pipe?	Ambient Conc.	Max Total Conc. @ ZID	Max Total Conc. @ RMZ	WQ Crit: 1 Hour (CMC)	WQ Crit: 4 Day (CCC)	Is there Reasonable Potential to Exceed? (Yes/No)	
	(Yes/No)		(µg/l)	Default=0.6	(µg/l)	(Yes/No)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	Acute	Chronic
Table 1 Effluent Parameters for all POTWs w/a Flow > 0.1 MGD													
Nitrates-Nitrite	Yes	Evaluation will occur with DO analysis											
Table 2 Effluent Parameters for Selected POTWs													
Hardness (Total as CaCO3)	Yes	Must be collected for metals criteria calculation. Submit data to the fields at the top of the spreadsheet											
Table 2: Metals (total recoverable), cyanide and total phenols										Use total recoverable data as surrogate.		no	
Arsenic (total recoverable)	Yes	25	0.951	0.29476971	--	No Aquatic Water Quality Criteria							
Arsenic (total inorganic)	Yes	--	--	--	--	No Aquatic Water Quality Criteria							

Arsenic (dissolved inorganic)	Yes	--	--	--	--	Data	*	--	--	340.00	150.00	--	--
Cadmium (total recoverable)	Yes	86	0.557	4.714531334	0.577526	No	*	--	--	1.94	--	--	--
Cadmium (dissolved)	Yes	52	0.568	3.977280819	0.610725	Yes	0	0.234894	0.107144769	1.03	0.11	NO	NO
Chromium (total recoverable)	Yes	25	0.588	1.497352289	--	No Aquatic Water Quality Criteria							
Chromium III (dissolved)	Yes	--	--	--	--	Data	*	--	--	1082.81	32.07	--	--
Chromium VI (dissolved)	Yes	--	--	--	--	Data	*	--	--	16.00	11.00	--	--
Copper (total recoverable)	Yes	49	5.92	0.27029482	--	No Aquatic Water Quality Criteria							
Copper (dissolved)	Yes	24	3.84	0.211964481	4.455072	No	*	--	--	See BLM	See BLM	--	--
Iron (total recoverable)	Yes	22	148	0.531361607	216.5028	No	*	--	--	--	1000.00	--	--
Lead (total recoverable)	Yes	25	0.189	0.244841007	--	No Aquatic Water Quality Criteria							
Lead (dissolved)	Yes	25	0.416	0.570886267	0.598135	No	*	--	--	36.96	0.68	--	--
Mercury (total)	Yes	37	0.0026	0.315056233	0.002991	No	*	--	--	2.40	0.01	--	--
Nickel (total recoverable)	Yes	25	9.68	0.584225664	--	No Aquatic Water Quality Criteria							
Nickel (dissolved)	Yes	25	9.96	0.610468603	14.63433	No	*	--	--	277.06	18.79	--	--
Selenium (total recoverable)	Yes	25	0.846	1.665127549	--	No Aquatic Water Quality Criteria							
Selenium (dissolved)	Yes	26	0.919	2.285882354	2.243155	No	*	--	--	13.00	4.60	--	--
Silver (total recoverable)	Yes	25	0	0	--	No Aquatic Water Quality Criteria							
Silver (dissolved)	Yes	25	0	0	0	No	*	--	--	1.30	0.10	--	--
Zinc (total recoverable)	Yes	25	38.7	0.188430785	--	No Aquatic Water Quality Criteria							
Zinc (dissolved)	Yes	25	40.3	0.216293845	46.64396	Yes	12.45	25.60152	18.44894036	70.70	43.09	NO	NO
Cyanide (total)	Yes	25	35.5	1.835243278	--	No Aquatic Water Quality Criteria							
Cyanide (free)	Yes	3	1.87	0.6	7.20523	Yes	0	2.771242	1.264075436	22.00	5.20	NO	NO
Total phenolic compounds	Yes	No Aquatic Water Quality Criteria											
Table 2: Volatile organic compounds													
Table 2: Acid-extractable compounds													
Pentachlorophenol	Yes	7	0	0	0	No	*	--	--	pH Data	pH Data	--	--
Table 2: Base-neutral compounds													
Table 3: Pesticides and PCBs													
Aldrin	Yes	--	--	--	--	Data	*	--	--	3.00	na	--	--
BHC-gamma (Lindane)	Yes	--	--	--	--	Data	*	--	--	0.95	0.08	--	--
Chlordane	Yes	--	--	--	--	Data	*	--	--	2.40	0.00	--	--
Chloropyrifos	Yes	--	--	--	--	Data	*	--	--	0.08	0.04	--	--

Demeton	Yes	--	--	--	--	Data	*	--	--	na	0.10	--	--
DDT 4,4'	Yes	--	--	--	--	Data	*	--	--	1.10	0.00	--	--
Dieldrin	Yes	--	--	--	--	Data	*	--	--	0.24	0.06	--	--
Endosulfan alpha	Yes	--	--	--	--	Data	*	--	--	0.22	0.06	--	--
Endosulfan beta	Yes	--	--	--	--	Data	*	--	--	0.22	0.06	--	--
Endosulfan	Yes	--	--	--	--	Data	*	--	--	0.22	0.06	--	--
Endrin	Yes	--	--	--	--	Data	*	--	--	0.09	0.04	--	--
Guthion	Yes	--	--	--	--	Data	*	--	--	na	0.01	--	--
Heptachlor	Yes	--	--	--	--	Data	*	--	--	0.52	0.00	--	--
Heptachlor Epoxide	Yes	--	--	--	--	Data	*	--	--	0.52	0.00	--	--
Malathion	Yes	--	--	--	--	Data	*	--	--	na	0.10	--	--
Methoxychlor	Yes	--	--	--	--	Data	*	--	--	na	0.03	--	--
Mirex	Yes	--	--	--	--	Data	*	--	--	na	0.00	--	--
Parathion	Yes	--	--	--	--	Data	*	--	--	0.07	0.01	--	--
Toxaphene	Yes	--	--	--	--	Data	*	--	--	0.73	0.00	--	--
Total PCBs (Sum of PCB	Yes	--	--	--	--	Data	*	--	--	2.00	0.01	--	--
Table3: Other parameters with state water quality criteria													
Hydrogen Sulfide (dissolved as S)	TBD	--	--	--	--	--	*	--	--	na	2.00	--	--
Phosphorus, Elemental	TBD	--	--	--	--	--	*	--	--	na	na	--	--
tributyltin (TBT)	TBD	--	--	--	--	--	*	--	--	0.46	0.06	--	--

RPA Run Information	
Facility Name:	Durham STP
DEQ File Number:	90735
EPA Identification #:	OR0028118
Permit Number:	101141
Prepared By:	Aliana Britson
Preparation Date:	6/21/2022
Facility Flow Rate (MGD):	25.7
Outfall Number:	1
Determination Date:	6/21/22

Color Key:	"*" = Enter data
Intermediate Calc.s	"--" = Will calculate
Calculation Results	

Facility Information					
1. Do I have dilution values from a mixing zone study? (Yes/No)					Yes
2. If answered "No" to Question 1, then fill in the following table					
Eff. Flow Rate	MGD	N/A	Calculated dilution Factors		
Stream Flow: Harmonic M	CFS	N/A	Dilution @ Harmonic Mean		N/A
Stream Flow: 30Q5	CFS	N/A	Dilution @ 30Q5		N/A
% dilution at MZ	%	25%			
3. If answered "Yes" to Question #1, then fill in dilution values			Dilution @ RMZ: harmonic mean flow		9
			Dilution @ RMZ: 30Q5 flow		5.1
4. Please enter statistical Confidence and Probablity values (note: defaults already entered)			Confidence Level	%	95%
			Probability Basis	%	95%
5. Is the water "fresh" or "salt"?			Fresh		

RPA Run Notes: Dilutons from 2008 mixing zone study. Effluent data from 2016 - 2020.

			Identify Pollutants of Concern					In-Stream Conc.		Det. Reasonable Potential			
Pollutant Parameter	Evaluation Required?	Carcinogen Status	# of Sample	Effluent Conc.	Coefficent of Variation	Est. Max Eff. Conc.	RP at end of pipe?	Ambient Conc.	Max Total Conc. @ RMZ	WQ Crit: Water + Fish	WQ Crit: Fish	Is there Reasonable Potential to Exceed? (Yes/No)	
	(Yes/No)	(Yes/No)		(µg/l)	Default=0.6	(µg/l)	(Yes/No)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	Water + Fish	Fish
Table 1 Effluent Parameters for all POTWs w/a Flow > 0.1 MGD													
Nitrates-Nitrite	Yes	n	794	16700	0.287499214	12501.43	Yes	3183	5010.144	10000	na	NO	--
Table 2 Effluent Parameters for Selected POTWs													
Table 2: Metals (total recoverable), cyanide and total phenols										Use total recoverable data as surrogate.		No	
Antimony (total recoverable)	Yes	n	87	4.02	1.034824392	3.441293	No	*	--	5	64	--	--
Arsenic (total recoverable)	Yes	y	25	0.74086	0.29476971	No Human Health Water Quality Criteria							
Arsenic (total inorganic)	Yes	Y	--	--	--	--	Data	*	--	2	2.1	--	--
Copper (total recoverable)	Yes	N	49	5.92	0.27029482	6.0539	No	*	--	1300	na	--	--
Mercury (total)	Yes	N	RP is "Yes" if at least 4 mercury samples and 25% or more of samples are above the recommended QL. See methylmercury IMD										
Methyl Mercury	Yes	N	13	0.00015	0.443099818	0.000213	Yes	*	--	na	0.00014	--	--
Nickel (total recoverable)	Yes	N	25	9.68	0.584225664	12.24492	No	*	--	140	170	--	--
Selenium (total recoverable)	Yes	N	25	0.846	1.665127549	1.394551	No	*	--	120	420	--	--
Thallium (total recoverable)	Yes	N	25	0	0	0	No	*	--	0	0.047	--	--
Zinc (total recoverable)	Yes	N	25	38.7	0.188430785	41.966	No	*	--	2100	2600	--	--
Cyanide (total)	Yes	N	25	35.5	1.835243278	60.1116	No	*	--	130	130	--	--
Table 2: Volatile organic compounds													
Acrolein	Yes	N	8	0	0	0	No	*	--	1	0.93	--	--
Acrylonitrile	Yes	Y	8	0	0	0	No	*	--	0	0.025	--	--
Benzene	Yes	Y	8	0	0	0	No	*	--	0	1.4	--	--
Bromoform	Yes	y	8	0	0	0	No	*	--	3	14	--	--
Carbon Tetrachloride	Yes	Y	8	0	0	0	No	*	--	0	0.16	--	--
Chlorobenzene	Yes	N	8	0	0	0	No	*	--	74	160	--	--
Chlorodibromomethane	Yes	y	27	0.08255	2.132837046	0.137792	No	*	--	0	1.3	--	--
Chloroform	Yes	n	8	28	0.6	53.14479	No	*	--	260	1100	--	--
1,2-Dichlorobenzene (o)	Yes	n	8	0	0	0	No	*	--	110	130	--	--
1,3-Dichlorobenzene (m)	Yes	n	8	0	0	0	No	*	--	80	96	--	--
1,4-Dichlorobenzene (p)	Yes	n	8	0	0	0	No	*	--	16	19	--	--
Dichlorobromomethane	Yes	y	27	0.17832	1.596479986	0.277017	No	*	--	0	1.7	--	--
1,2-dichloroethane	Yes	y	8	0	0	0	No	*	--	0	3.7	--	--
1,2-trans-dichloroethylene	Yes	n	8	0	0	0	No	*	--	120	1000	--	--
1,1-dichloroethylene	Yes	n	8	0	0	0	No	*	--	230	710	--	--
1,2-dichloropropane	Yes	y	8	0	0	0	No	*	--	0	1.5	--	--
1,3-dichloropropene	Yes	y	--	--	--	--	Data	*	--	0	2.1	--	--
Ethylbenzene	Yes	n	8	0	0	0	No	*	--	160	210	--	--
Methyl Bromide	Yes	n	8	0	0	0	No	*	--	37	150	--	--
Methylene Chloride	Yes	y	8	0	0	0	No	*	--	4	59	--	--
1,1,2,2-tetrachloroethane	Yes	y	8	0	0	0	No	*	--	0	0.40	--	--
Tetrachloroethylene	Yes	y	8	0	0	0	No	*	--	0	0.33	--	--
Toluene	Yes	n	8	1.4	0.6	2.657239	No	*	--	720	1500	--	--
1,1,2-trichloroethane	Yes	y	8	0	0	0	No	*	--	0	1.6	--	--
Trichloroethylene	Yes	y	8	0	0	0	No	*	--	1	3	--	--
Vinyl Chloride	Yes	y	8	0	0	0	No	*	--	0	0.24	--	--
Table 2: Acid-extractable compounds													
2-chlorophenol	Yes	n	7	0	0	0	No	*	--	14	15	--	--
2,4-dichlorophenol	Yes	n	7	0	0	0	No	*	--	23	29	--	--
2,4-dimethylphenol	Yes	n	7	0	0	0	No	*	--	76	85	--	--
4,6-dinitro-o-cresol	Yes	n	7	0	0	0	No	*	--	9	28	--	--
2,4-dinitrophenol	Yes	n	7	0	0	0	No	*	--	62	530	--	--
Pentachlorophenol	Yes	y	7	0	0	0	No	*	--	0	0.30	--	--
Phenol	Yes	n	7	0	0	0	No	*	--	9400	86000	--	--
2,4,5-trichlorophenol	Yes	n	7	0	0	0	No	*	--	330	360	--	--
2,4,6-trichlorophenol	Yes	y	7	0	0	0	No	*	--	0	0.24	--	--
Table 2: Base-neutral compounds													
Acenaphthene	Yes	n	7	0	0	0	No	*	--	95	99	--	--
Anthracene	Yes	n	7	0	0	0	No	*	--	2900	4000	--	--

Benzidine	Yes	y	7	0	0	0	No	*	--	0	0.00002	--	--
Benzo(a)anthracene	Yes	y	7	0	0	0	No	*	--	0	0.0018	--	--
Benzo(a)pyrene	Yes	y	7	0	0	0	No	*	--	0	0.0018	--	--
Benzo(b)fluoranthene	Yes	y	7	0	0	0	No	*	--	0	0.0018	--	--
Benzo(k)fluoranthene	Yes	y	7	0	0	0	No	*	--	0	0.0018	--	--
Bis(2-chloroethyl)ether	Yes	y	7	0	0	0	No	*	--	0	0.053	--	--
Bis (2-chloro-1-methylethyl) ether	Yes	n	--	--	--	--	Data	*	--	1200	6500	--	--
Chloromethyl Ether, bis	Yes	y	--	--	--	--	Data	*	--	0	0.000029	--	--
Bis (2-ethylhexyl)phthalate	Yes	y	16	0	0	0	No	*	--	0	0.22	--	--
Butylbenzyl phthalate	Yes	n	7	0.3	0.6	0.601519	No	*	--	190	190	--	--
2-chloronaphthalene	Yes	n	7	0	0	0	No	*	--	150	160	--	--
Chrysene	Yes	y	7	0	0	0	No	*	--	0	0.0018	--	--
Di-n-butyl phthalate	Yes	n	7	1	0.6	2.005064	No	*	--	400	450	--	--
Dibenzo(a,h)anthracene	Yes	y	7	0	0	0	No	*	--	0	0.0018	--	--
3,3-Dichlorobenzidine	Yes	y	7	0	0	0	No	*	--	0	0.0028	--	--
Diethyl phthalate	Yes	n	8	0	0	0	No	*	--	3800	4400	--	--
Dimethyl phthalate	Yes	n	8	0	0	0	No	*	--	84000	110000	--	--
2,4-dinitrotoluene	Yes	y	7	0	0	0	No	*	--	0	0.34	--	--
1,2-diphenylhydrazine	Yes	y	--	--	--	--	Data	*	--	0	0.02	--	--
Fluoranthene	Yes	n	7	0	0	0	No	*	--	14	14	--	--
Fluorene	Yes	n	7	0	0	0	No	*	--	390	530	--	--
Hexachlorobenzene	Yes	n	7	0	0	0	No	*	--	0	0.000029	--	--
Hexachlorobutadiene	Yes	y	7	0	0	0	No	*	--	0	1.8	--	--
Hexachlorocyclopentadiene	Yes	n	6	0	0	0	No	*	--	30	110	--	--
Hexachloroethane	Yes	y	7	0	0	0	No	*	--	0	0.33	--	--
Indeno(1,2,3-cd)pyrene	Yes	y	7	0	0	0	No	*	--	0	0.0018	--	--
Isophorone	Yes	n	7	0	0	0	No	*	--	27	96	--	--
Nitrobenzene	Yes	n	7	0	0	0	No	*	--	14	69	--	--
N-nitrosodimethylamine	Yes	y	6	0	0	0	No	*	--	0	0.3	--	--
N-nitrosodi-n-propylamine	Yes	y	7	0	0	0	No	*	--	0	0.051	--	--
N-nitrosodiphenylamine	Yes	y	7	0	0	0	No	*	--	1	0.60	--	--
Pentachlorobenzene	Yes	n	7	0	0	0	No	*	--	0	0.15	--	--
Pyrene	Yes	n	7	0	0	0	No	*	--	290	400	--	--
1,2,4-trichlorobenzene	Yes	n	7	0	0	0	No	*	--	6	7	--	--
Tetrachlorobenzene,1,2,4,5	Yes	n	7	0	0	0	No	*	--	0	0.11	--	--
Table 3: Pesticides and PCBs													
Aldrin	Yes	y	--	--	--	--	Data	*	--	0	0.0000050	--	--
BHC-Technical	No	y	--	--	--	--	--	*	--	0	0.0015	--	--
BHC-alpha	Yes	y	--	--	--	--	Data	*	--	0	0.00049	--	--
BHC-beta	Yes	y	--	--	--	--	Data	*	--	0	0.0017	--	--
BHC-gamma (Lindane)	Yes	n	--	--	--	--	Data	*	--	0	0.18	--	--
Chlordane	Yes	y	--	--	--	--	Data	*	--	0	0.000081	--	--
DDD 4,4'	Yes	y	--	--	--	--	Data	*	--	0	0.000031	--	--
DDE 4,4'	Yes	y	--	--	--	--	Data	*	--	0	0.000022	--	--
DDT 4,4'	Yes	y	--	--	--	--	Data	*	--	0	0.000022	--	--
Dieldrin	Yes	y	--	--	--	--	Data	*	--	0	0.0000054	--	--
Endosulfan alpha	Yes	n	--	--	--	--	Data	*	--	9	8.9	--	--
Endosulfan beta	Yes	n	--	--	--	--	Data	*	--	9	8.9	--	--
Endosulfan Sulfate	Yes	n	--	--	--	--	Data	*	--	9	8.9	--	--
Endrin	Yes	n	--	--	--	--	Data	*	--	0	0.024	--	--
Endrin Aldehyde	Yes	n	--	--	--	--	Data	*	--	0	0.030	--	--
Heptachlor	Yes	y	--	--	--	--	Data	*	--	0	0.0000079	--	--
Heptachlor Epoxide	Yes	y	--	--	--	--	Data	*	--	0	0.0000039	--	--
Methoxychlor	Yes	n	--	--	--	--	Data	*	--	100	na	--	--
Toxaphene	Yes	y	--	--	--	--	Data	*	--	0	0.000028	--	--
Total PCBs (Sum of PCB Aroclors)	Yes	y	--	--	--	--	Data	*	--	0	0.0000064	--	--
Table3: Other parameters with state water quality criteria													
Barium (total recoverable)	TBD	n	--	--	--	--	--	*	--	1000	na	--	--
Manganese (total recoverable)	TBD	n	--	--	--	--	--	*	--	Withdrawn	100	--	--
2,4,5-TP [2-(2,4,5-Trichloro-phenoxy) propanoic acid]d	TBD	n	--	--	--	--	--	*	--	10	na	--	--
2,4-D (2,4-Dichlorophenoxy) acetic acid)	TBD	n	--	--	--	--	--	*	--	100	na	--	--
Dioxin 2,3,7,8-TCDD	TBD	y	--	--	--	--	--	*	--	0	5.1E-10	--	--
Nitrosamines	TBD	y	--	--	--	--	--	*	--	0	0.046	--	--
N-Nitrosodibutylamine	TBD	y	--	--	--	--	--	*	--	0	0.022	--	--
N-Nitrosodiethylamine	TBD	y	--	--	--	--	--	*	--	0	0.046	--	--
N-Nitrosopyrrolidine	TBD	y	--	--	--	--	--	*	--	0	3.4	--	--

Appendix F-2 – Rock Creek WRRF Toxics RPA – Outfall R001

Aquatic Toxicity & Human Health

5. Aquatic Toxicity RP

RPA Run Information	
Facility Name:	Rock Creek
DEQ File Number:	90770
EPA Identification #:	OR0029777
Permit Number:	101144
Prepared By:	Aliana Britson
Preparation Date:	6/21/2022
Facility Flow Rate (MGD):	52.7
Outfall Number:	1
Determination Date:	6/21/22

RPA Run Notes:Dilutions from 2008 Mixing Zone Study and 2016 update. Effluent data from 2016 -2020.

Color Key:	"#" = Enter data
Intermediate Calc.s	"--" = Will calculate
Calculation Results	

Facility Information					
1. Are there dilution #'s from mixing zone study? (Yes/No)					yes
2. Is the receiving waterbody fresh water? (Yes/No)					yes
3. If Question 1 = "No", then fill in the following table					
Eff. Flow Rate		MGD	N/A	Calculated dilution Factors	
Stream Flow: 7Q10		CFS	N/A	Dilution @ ZID	N/A
Stream Flow: 1Q10		CFS	N/A	Dilution @ MZ	N/A
% dilution at ZID		%	10%		
% dilution at MZ		%	25%		
4. If answered "Yes" to Question #1, then fill in dilution values	Dilution @ ZID (1Q10 from study)				1.3
	Dilution @ MZ (7Q10 from study)				2.2
5. Enter Water Hardness. Use average hardness during critical (usually low-flow period). Effluent default is 25 mg/L.	Effluent			mg/L $CaCO_3$	149
	Up-stream			mg/L $CaCO_3$	32
	ZID boundary			mg/L $CaCO_3$	122
	MZ boundary			mg/L $CaCO_3$	85
6. Please enter statistical Confidence and Probablity values (note: defaults already entered)	Confidence Level			%	99%
	Probability Basis			%	95%

		Identify Pollutants of Concern					Determine In-Stream Conc.			Det. Reasonable Potential			
Pollutant Parameter	Evaluation Required?	# of Sample	Highest Effluent Conc.	Coefficent of Variation	Est. Max Eff. Conc.	RP at end of pipe?	Ambient Conc.	Max Total Conc. @ ZID	Max Total Conc. @ RMZ	WQ Crit: 1 Hour (CMC)	WQ Crit: 4 Day (CCC)	Is there Reasonable Potential to Exceed? (Yes/No)	
	(Yes/No)		(µg/l)	Default=0.6	(µg/l)	(Yes/No)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	Acute	Chronic
Table 1 Effluent Parameters for all POTWs w/a Flow > 0.1 MGD													
Nitrates-Nitrite	Yes	Evaluation will occur with DO analysis											
Table 2 Effluent Parameters for Selected POTWs													
Hardness (Total as CaCO3)	Yes	Must be collected for metals criteria calculation. Submit data to the fields at the top of the spreadsheet											
Table 2: Metals (total recoverable), cyanide and total phenols										Use total recoverable data as surrogate.		no	
Arsenic (total recoverable)	Yes	31	2.18	0.349995979	--	No Aquatic Water Quality Criteria							
Arsenic (total inorganic)	Yes	--	--	--	--	No Aquatic Water Quality Criteria							

Arsenic (dissolved inorganic)	Yes	--	--	--	--	Data	*	--	--	340.00	150.00	--	--
Cadmium (total recoverable)	Yes	30	0.0805	1.445558328	0.148233	No	*	--	--	4.91	--	--	--
Cadmium (dissolved)	Yes	30	0.0803	1.854743398	0.162	No	*	--	--	2.31	0.24	--	--
Chromium (total recoverable)	Yes	34	0.987	0.899065008	--	No Aquatic Water Quality Criteria							
Chromium III (dissolved)	Yes	--	--	--	--	Data	*	--	--	2121.96	75.57	--	--
Chromium VI (dissolved)	Yes	--	--	--	--	Data	*	--	--	16.00	11.00	--	--
Copper (total recoverable)	Yes	54	5.22	0.213925145	--	No Aquatic Water Quality Criteria							
Copper (dissolved)	Yes	24	4.91	0.275348821	5.946829	No	*	--	--	See BLM	See BLM	--	--
Iron (total recoverable)	Yes	21	98.8	0.456137192	139.4208	No	*	--	--	--	1000.00	--	--
Lead (total recoverable)	Yes	30	0.294	0.490901154	--	No Aquatic Water Quality Criteria							
Lead (dissolved)	Yes	30	0.258	0.54502718	0.34589	No	*	--	--	105.16	2.59	--	--
Mercury (total)	Yes	41	0.00365	0.700520926	0.004694	No	*	--	--	2.40	0.01	--	--
Nickel (total recoverable)	Yes	30	6.62	0.421897867	--	No Aquatic Water Quality Criteria							
Nickel (dissolved)	Yes	30	6.71	0.44748234	8.577828	No	*	--	--	555.13	45.54	--	--
Selenium (total recoverable)	Yes	30	1.64	0.56273758	--	No Aquatic Water Quality Criteria							
Selenium (dissolved)	Yes	30	1.77	0.602728945	2.437509	No	*	--	--	13.00	4.60	--	--
Silver (total recoverable)	Yes	30	0.0489	5.477225575	--	No Aquatic Water Quality Criteria							
Silver (dissolved)	Yes	30	0	0	0	No	*	--	--	5.33	0.10	--	--
Zinc (total recoverable)	Yes	30	44.8	0.231353599	--	No Aquatic Water Quality Criteria							
Zinc (dissolved)	Yes	30	44.6	0.246187878	51.27345	No	*	--	--	141.80	104.59	--	--
Cyanide (total)	Yes	26	11.3	1.67305409	--	No Aquatic Water Quality Criteria							
Cyanide (free)	Yes	3	1.16	0.6	4.469554	No	*	--	--	22.00	5.20	--	--
Total phenolic compounds	Yes	No Aquatic Water Quality Criteria											
Table 2: Volatile organic compounds													
Table 2: Acid-extractable compounds													
Pentachlorophenol	Yes	7	0	0	0	No	*	--	--	pH Data	pH Data	--	--
Table 2: Base-neutral compounds													
Table 3: Pesticides and PCBs													
Aldrin	Yes	--	--	--	--	Data	*	--	--	3.00	na	--	--
BHC-gamma (Lindane)	Yes	--	--	--	--	Data	*	--	--	0.95	0.08	--	--
Chlordane	Yes	--	--	--	--	Data	*	--	--	2.40	0.00	--	--
Chloropyrifos	Yes	--	--	--	--	Data	*	--	--	0.08	0.04	--	--
Demeton	Yes	--	--	--	--	Data	*	--	--	na	0.10	--	--
DDT 4,4'	Yes	--	--	--	--	Data	*	--	--	1.10	0.00	--	--
Dieldrin	Yes	--	--	--	--	Data	*	--	--	0.24	0.06	--	--
Endosulfan alpha	Yes	--	--	--	--	Data	*	--	--	0.22	0.06	--	--
Endosulfan beta	Yes	--	--	--	--	Data	*	--	--	0.22	0.06	--	--
Endosulfan	Yes	--	--	--	--	Data	*	--	--	0.22	0.06	--	--
Endrin	Yes	--	--	--	--	Data	*	--	--	0.09	0.04	--	--
Guthion	Yes	--	--	--	--	Data	*	--	--	na	0.01	--	--
Heptachlor	Yes	--	--	--	--	Data	*	--	--	0.52	0.00	--	--
Heptachlor Epoxide	Yes	--	--	--	--	Data	*	--	--	0.52	0.00	--	--
Malathion	Yes	--	--	--	--	Data	*	--	--	na	0.10	--	--
Methoxychlor	Yes	--	--	--	--	Data	*	--	--	na	0.03	--	--
Mirex	Yes	--	--	--	--	Data	*	--	--	na	0.00	--	--
Parathion	Yes	--	--	--	--	Data	*	--	--	0.07	0.01	--	--
Toxaphene	Yes	--	--	--	--	Data	*	--	--	0.73	0.00	--	--
Total PCBs (Sum of PCB	Yes	--	--	--	--	Data	*	--	--	2.00	0.01	--	--
Table3: Other parameters with state water quality criteria													
Hydrogen Sulfide (dissolved as S)	TBD	--	--	--	--	--	*	--	--	na	2.00	--	--
Phosphorus, Elemental	TBD	--	--	--	--	--	*	--	--	na	na	--	--
tributyltin (TBT)	TBD	--	--	--	--	--	*	--	--	0.46	0.06	--	--

RPA Run Information	
Facility Name:	Rock Creek
DEQ File Number:	90770
EPA Identification #:	OR0029777
Permit Number:	101144
Prepared By:	Aliana Britson
Preparation Date:	6/21/2022
Facility Flow Rate (MGD):	52.7
Outfall Number:	1
Determination Date:	6/21/22

Color Key:	"*" = Enter data
Intermediate Calc.s	"--" = Will calculate
Calculation Results	

Facility Information					
1. Do I have dilution values from a mixing zone study? (Yes/No)					Yes
2. If answered "No" to Question 1, then fill in the following table					
Eff. Flow Rate	MGD	N/A	Calculated dilution Factors		
Stream Flow: Harmonic M	CFS	N/A	Dilution @ Harmonic Mean		N/A
Stream Flow: 30Q5	CFS	N/A	Dilution @ 30Q5		N/A
% dilution at MZ	%	25%			
3. If answered "Yes" to Question #1, then fill in dilution values		Dilution @ RMZ: harmonic mean flow			3.7
		Dilution @ RMZ: 30Q5 flow			2.1
4. Please enter statistical Confidence and Probablity values (note: defaults already entered)		Confidence Level		%	95%
		Probability Basis		%	95%
5. Is the water "fresh" or "salt"?			Fresh		

RPA Run Notes: Dilutions from 2008 Mixing Zone Study and 2016 update. Effluent data from 2016 - 2020.

			Identify Pollutants of Concern					In-Stream Conc.		Det. Reasonable Potential			
Pollutant Parameter	Evaluation Required?	Carcinogen Status	# of Sample	Effluent Conc.	Coefficent of Variation	Est. Max Eff. Conc.	RP at end of pipe?	Ambient Conc.	Max Total Conc. @ RMZ	WQ Crit: Water + Fish	WQ Crit: Fish	Is there Reasonable Potential to Exceed? (Yes/No)	
	(Yes/No)	(Yes/No)		(µg/l)	Default=0.6	(µg/l)	(Yes/No)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	Water + Fish	Fish
Table 1 Effluent Parameters for all POTWs w/a Flow > 0.1 MGD													
Nitrates-Nitrite	Yes	n	805	39500	0.334211921	28231.63	Yes	250	13574.59	10000	na	YES	--
Table 2 Effluent Parameters for Selected POTWs													
Table 2: Metals (total recoverable), cyanide and total phenols										Use total recoverable data as surrogate.		No	
Antimony (total recoverable)	Yes	n	30	0.36	0.234310175	0.388942	No	*	--	5	64	--	--
Arsenic (total recoverable)	Yes	y	31	1.17769	0.349995979	No Human Health Water Quality Criteria							
Arsenic (total inorganic)	Yes	Y	--	--	--	--	Data	*	--	2	2.1	--	--
Copper (total recoverable)	Yes	N	54	5.22	0.213925145	5.261343	No	*	--	1300	na	--	--
Mercury (total)	Yes	N	RP is "Yes" if at least 4 mercury samples and 25% or more of samples are above the recommended QL. See methylmercury IMD										
Methyl Mercury	Yes	N	13	0.00003	1.950056689	8.42E-05	No	*	--	na	0.00014	--	--
Nickel (total recoverable)	Yes	N	30	6.62	0.421897867	7.579683	No	*	--	140	170	--	--
Selenium (total recoverable)	Yes	N	30	1.64	0.56273758	1.954493	No	*	--	120	420	--	--
Thallium (total recoverable)	Yes	N	30	0	0	0	No	*	--	0	0.047	--	--
Zinc (total recoverable)	Yes	N	30	44.8	0.231353599	48.35568	No	*	--	2100	2600	--	--
Cyanide (total)	Yes	N	26	11.3	1.67305409	18.19031	No	*	--	130	130	--	--
Table 2: Volatile organic compounds													
Acrolein	Yes	N	8	0	0	0	No	*	--	1	0.93	--	--
Acrylonitrile	Yes	Y	8	0	0	0	No	*	--	0	0.025	--	--
Benzene	Yes	Y	8	0	0	0	No	*	--	0	1.4	--	--
Bromoform	Yes	y	8	0.11568	0.6	0.219555	No	*	--	3	14	--	--
Carbon Tetrachloride	Yes	Y	8	0	0	0	No	*	--	0	0.16	--	--
Chlorobenzene	Yes	N	8	0	0	0	No	*	--	74	160	--	--
Chlorodibromomethane	Yes	y	27	0.71298	1.002030986	0.988107	Yes	0	0.267056	0.3	1.3	NO	NO
Chloroform	Yes	n	8	15	0.6	28.47042	No	*	--	260	1100	--	--
1,2-Dichlorobenzene (o)	Yes	n	8	0	0	0	No	*	--	110	130	--	--
1,3-Dichlorobenzene (m)	Yes	n	8	0	0	0	No	*	--	80	96	--	--
1,4-Dichlorobenzene (p)	Yes	n	8	0	0	0	No	*	--	16	19	--	--
Dichlorobromomethane	Yes	y	27	0.80264	0.864480115	1.075244	Yes	0	0.290606	0.4	1.7	NO	NO
1,2-dichloroethane	Yes	y	8	0	0	0	No	*	--	0	3.7	--	--
1,2-trans-dichloroethylene	Yes	n	8	0	0	0	No	*	--	120	1000	--	--
1,1-dichloroethylene	Yes	n	8	0	0	0	No	*	--	230	710	--	--
1,2-dichloropropane	Yes	y	8	0	0	0	No	*	--	0	1.5	--	--
1,3-dichloropropene	Yes	y	8	0	0	0	No	*	--	0	2.1	--	--
Ethylbenzene	Yes	n	8	0	0	0	No	*	--	160	210	--	--
Methyl Bromide	Yes	n	8	0	0	0	No	*	--	37	150	--	--
Methylene Chloride	Yes	y	8	0.04757	0.6	0.090299	No	*	--	4	59	--	--
1,1,2,2-tetrachloroethane	Yes	y	8	0	0	0	No	*	--	0	0.40	--	--
Tetrachloroethylene	Yes	y	8	0	0	0	No	*	--	0	0.33	--	--
Toluene	Yes	n	8	0	0	0	No	*	--	720	1500	--	--
1,1,2-trichloroethane	Yes	y	8	0	0	0	No	*	--	0	1.6	--	--
Trichloroethylene	Yes	y	8	0	0	0	No	*	--	1	3	--	--
Vinyl Chloride	Yes	y	8	0	0	0	No	*	--	0	0.24	--	--
Table 2: Acid-extractable compounds													
2-chlorophenol	Yes	n	7	0	0	0	No	*	--	14	15	--	--
2,4-dichlorophenol	Yes	n	7	0	0	0	No	*	--	23	29	--	--
2,4-dimethylphenol	Yes	n	7	0	0	0	No	*	--	76	85	--	--
4,6-dinitro-o-cresol	Yes	n	7	0	0	0	No	*	--	9	28	--	--
2,4-dinitrophenol	Yes	n	7	0	0	0	No	*	--	62	530	--	--
Pentachlorophenol	Yes	y	7	0	0	0	No	*	--	0	0.30	--	--
Phenol	Yes	n	7	0	0	0	No	*	--	9400	86000	--	--
2,4,5-trichlorophenol	Yes	n	7	0	0	0	No	*	--	330	360	--	--
2,4,6-trichlorophenol	Yes	y	16	0.03473	4	0.111638	No	*	--	0	0.24	--	--
Table 2: Base-neutral compounds													
Acenaphthene	Yes	n	7	0	0	0	No	*	--	95	99	--	--
Anthracene	Yes	n	7	0	0	0	No	*	--	2900	4000	--	--

Benzidine	Yes	y	7	0	0	0	No	*	--	0	0.00002	--	–
Benzo(a)anthracene	Yes	y	7	0	0	0	No	*	--	0	0.0018	--	–
Benzo(a)pyrene	Yes	y	7	0	0	0	No	*	--	0	0.0018	--	–
Benzo(b)fluoranthene	Yes	y	7	0	0	0	No	*	--	0	0.0018	--	–
Benzo(k)fluoranthene	Yes	y	7	0	0	0	No	*	--	0	0.0018	--	–
Bis(2-chloroethyl)ether	Yes	y	7	0	0	0	No	*	--	0	0.053	--	–
Bis (2-chloro-1-methylethyl) ether	Yes	n	--	--	–	–	Data	*	--	1200	6500	--	–
Chloromethyl Ether, bis	Yes	y	--	--	–	–	Data	*	--	0	0.000029	--	–
Bis (2-ethylhexyl)phthalate	Yes	y	8	0	0	0	No	*	--	0	0.22	--	–
Butylbenzyl phthalate	Yes	n	8	0	0	0	No	*	--	190	190	--	–
2-chloronaphthalene	Yes	n	7	0	0	0	No	*	--	150	160	--	–
Chrysene	Yes	y	7	0	0	0	No	*	--	0	0.0018	--	–
Di-n-butyl phthalate	Yes	n	7	0.45	0.6	0.902279	No	*	--	400	450	--	–
Dibenzo(a,h)anthracene	Yes	y	7	0	0	0	No	*	--	0	0.0018	--	–
3,3-Dichlorobenzidine	Yes	y	7	0	0	0	No	*	--	0	0.0028	--	–
Diethyl phthalate	Yes	n	8	0	0	0	No	*	--	3800	4400	--	–
Dimethyl phthalate	Yes	n	8	0	0	0	No	*	--	84000	110000	--	–
2,4-dinitrotoluene	Yes	y	7	0	0	0	No	*	--	0	0.34	--	–
1,2-diphenylhydrazine	Yes	y	--	--	–	–	Data	*	--	0	0.02	--	–
Fluoranthene	Yes	n	7	0	0	0	No	*	--	14	14	--	–
Fluorene	Yes	n	7	0	0	0	No	*	--	390	530	--	–
Hexachlorobenzene	Yes	n	7	0	0	0	No	*	--	0	0.000029	--	–
Hexachlorobutadiene	Yes	y	7	0	0	0	No	*	--	0	1.8	--	–
Hexachlorocyclopentadiene	Yes	n	6	0	0	0	No	*	--	30	110	--	–
Hexachloroethane	Yes	y	7	0	0	0	No	*	--	0	0.33	--	–
Indeno(1,2,3-cd)pyrene	Yes	y	7	0	0	0	No	*	--	0	0.0018	--	–
Isophorone	Yes	n	7	0	0	0	No	*	--	27	96	--	–
Nitrobenzene	Yes	n	7	0	0	0	No	*	--	14	69	--	–
N-nitrosodimethylamine	Yes	y	6	0	0	0	No	*	--	0	0.3	--	–
N-nitrosodi-n-propylamine	Yes	y	7	0	0	0	No	*	--	0	0.051	--	–
N-nitrosodiphenylamine	Yes	y	7	0	0	0	No	*	--	1	0.60	--	–
Pentachlorobenzene	Yes	n	7	0	0	0	No	*	--	0	0.15	--	–
Pyrene	Yes	n	7	0	0	0	No	*	--	290	400	--	–
1,2,4-trichlorobenzene	Yes	n	7	0	0	0	No	*	--	6	7	--	–
Tetrachlorobenzene,1,2,4,5	Yes	n	7	0	0	0	No	*	--	0	0.11	--	–
Table 3: Pesticides and PCBs													
Aldrin	Yes	y	--	--	–	–	Data	*	--	0	0.0000050	--	–
BHC-Technical	No	y	--	--	–	–	–	*	--	0	0.0015	--	–
BHC-alpha	Yes	y	–	--	–	–	Data	*	--	0	0.00049	--	–
BHC-beta	Yes	y	–	--	–	–	Data	*	--	0	0.0017	--	–
BHC-gamma (Lindane)	Yes	n	–	--	–	–	Data	*	--	0	0.18	--	–
Chlordane	Yes	y	–	--	–	–	Data	*	--	0	0.000081	--	–
DDD 4,4'	Yes	y	–	--	–	–	Data	*	--	0	0.000031	--	–
DDE 4,4'	Yes	y	–	--	–	–	Data	*	--	0	0.000022	--	–
DDT 4,4'	Yes	y	–	--	–	–	Data	*	--	0	0.000022	--	–
Dieldrin	Yes	y	–	--	–	–	Data	*	--	0	0.0000054	--	–
Endosulfan alpha	Yes	n	--	--	–	–	Data	*	--	9	8.9	--	–
Endosulfan beta	Yes	n	--	--	–	–	Data	*	--	9	8.9	--	–
Endosulfan Sulfate	Yes	n	--	--	–	–	Data	*	--	9	8.9	--	–
Endrin	Yes	n	--	--	–	–	Data	*	--	0	0.024	--	–
Endrin Aldehyde	Yes	n	--	--	–	–	Data	*	--	0	0.030	--	–
Heptachlor	Yes	y	--	--	–	–	Data	*	--	0	0.0000079	--	–
Heptachlor Epoxide	Yes	y	--	--	–	–	Data	*	--	0	0.0000039	--	–
Methoxychlor	Yes	n	--	--	–	–	Data	*	--	100	na	--	–
Toxaphene	Yes	y	--	--	–	–	Data	*	--	0	0.000028	--	–
Total PCBs (Sum of PCB Aroclors)	Yes	y	--	--	–	–	Data	*	--	0	0.0000064	--	–
Table3: Other parameters with state water quality criteria													
Barium (total recoverable)	TBD	n	--	--	–	–	–	*	--	1000	na	--	–
Manganese (total recoverable)	TBD	n	--	--	–	–	–	*	--	Withdrawn	100	--	–
2,4,5-TP [2-(2,4,5-Trichloro-phenoxy) propanoic acid]d	TBD	n	--	--	–	–	–	*	--	10	na	--	–
2,4-D (2,4-Dichlorophenoxy) acetic acid)	TBD	n	--	--	–	–	–	*	--	100	na	--	–
Dioxin 2,3,7,8-TCDD	TBD	y	--	--	–	–	–	*	--	0	5.1E-10	--	–
Nitrosamines	TBD	y	--	--	–	–	–	*	--	0	0.046	--	–
N-Nitrosodibutylamine	TBD	y	--	--	–	–	–	*	--	0	0.022	--	–
N-Nitrosodiethylamine	TBD	y	--	--	–	–	–	*	--	0	0.046	--	–
N-Nitrosopyrrolidine	TBD	y	--	--	–	–	–	*	--	0	3.4	--	–

Appendix F-3 – Hillsboro Toxics RPA Outfall H001A

Aquatic Toxicity & Human Health

5. Aquatic Toxicity RP

RPA Run Information	
Facility Name:	Hillsboro
DEQ File Number:	90752
EPA Identification #:	OR0023345
Permit Number:	101143
Prepared By:	Aliana Britson
Preparation Date:	6/17/2022
Facility Flow Rate (MGD):	0
Outfall Number:	H001A (West)
Determination Date:	6/17/22

RPA Run Notes: Dilutions from 2017 Mixing Zone Update to 2008 Study. Effluent data from 2016-2020. Mixing zone does not overlap with Outfall H001B. No ambient cyanide data - value assumed to be 0.

Color Key:	"*" = Enter data
Intermediate Calc.s	"--" = Will calculate
Calculation Results	

Facility Information					
1. Are there dilution #'s from mixing zone study? (Yes/No)					yes
2. Is the receiving waterbody fresh water? (Yes/No)					yes
3. If Question 1 = "No", then fill in the following table					
Eff. Flow Rate	MGD	N/A	Calculated dilution Factors		
Stream Flow: 7Q10	CFS	N/A	Dilution @ ZID		N/A
Stream Flow: 1Q10	CFS	N/A	Dilution @ MZ		N/A
% dilution at ZID	%	10%			
% dilution at MZ	%	25%			
4. If answered "Yes" to Question #1, then fill in dilution values			Dilution @ ZID (1Q10 from study)		3.5
			Dilution @ MZ (7Q10 from study)		15.7
5. Enter Water Hardness. Use average hardness during critical (usually low-flow period). Effluent default is 25 mg/L.			Effluent	mg/L $CaCO_3$	76.8167
			Up-stream	mg/L $CaCO_3$	26.1
			ZID boundary	mg/L $CaCO_3$	41
			MZ boundary	mg/L $CaCO_3$	29
6. Please enter statistical Confidence and Probablity values (note: defaults already entered)			Confidence Level	%	99%
			Probability Basis	%	95%

		Identify Pollutants of Concern					Determine In-Stream Conc.			Det. Reasonable Potential			
Pollutant Parameter	Evaluation Required?	# of Sample	Highest Effluent Conc.	Coefficent of Variation	Est. Max Eff. Conc.	RP at end of pipe?	Ambient Conc.	Max Total Conc. @ ZID	Max Total Conc. @ RMZ	WQ Crit: 1 Hour (CMC)	WQ Crit: 4 Day (CCC)	Is there Reasonable Potential to Exceed? (Yes/No)	
	(Yes/No)		(µg/l)	Default=0.6	(µg/l)	(Yes/No)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	Acute	Chronic
Table 1 Effluent Parameters for all POTWs w/a Flow > 0.1 MGD													
Nitrates-Nitrite	Yes	Evaluation will occur with DO analysis											
Table 2 Effluent Parameters for Selected POTWs													
Hardness (Total as CaCO3)	Yes	Must be collected for metals criteria calculation. Submit data to the fields at the top of the spreadsheet											
Table 2: Metals (total recoverable), cyanide and total phenols										Use total recoverable data as surrogate.		no	
Arsenic (total recoverable)	Yes	16	0.881	0.289429072	--	No Aquatic Water Quality Criteria							

Arsenic (total inorganic)	Yes	--	--	--	--	No Aquatic Water Quality Criteria							
Arsenic (dissolved inorganic)	Yes	--	--	--	--	Data	*	--	--	340.00	150.00	--	--
Cadmium (total recoverable)	Yes	16	0.0972	2.798439957	0.40725	No	*	--	--	1.42	--	--	--
Cadmium (dissolved)	Yes	16	0	0	0	No	*	--	--	0.79	0.11	--	--
Chromium (total recoverable)	Yes	18	0.679	1.313971197	--	No Aquatic Water Quality Criteria							
Chromium III (dissolved)	Yes	--	--	--	--	Data	*	--	--	861.60	31.56	--	--
Chromium VI (dissolved)	Yes	--	--	--	--	Data	*	--	--	16.00	11.00	--	--
Copper (total recoverable)	Yes	32	9.21	0.396582776	--	No Aquatic Water Quality Criteria							
Copper (dissolved)	Yes	16	6.86	0.492085029	10.78035	No	*	--	--	See BLM	See BLM	--	--
Iron (total recoverable)	Yes	13	148	0.304681172	206.3521	No	*	--	--	--	1000.00	--	--
Lead (total recoverable)	Yes	16	0.614	0.696911011	--	No Aquatic Water Quality Criteria							
Lead (dissolved)	Yes	16	0.556	0.713393507	1.036265	Yes	0.02	0.310362	0.084730276	25.91	0.67	NO	NO
Mercury (total)	Yes	17	0.00338	0.244023603	0.004227	No	*	--	--	2.40	0.01	--	--
Nickel (total recoverable)	Yes	34	19.3	0.637613058	--	No Aquatic Water Quality Criteria							
Nickel (dissolved)	Yes	34	18.4	0.622731367	24.53425	Yes	0.614	7.448357	2.137582758	218.81	18.48	NO	NO
Selenium (total recoverable)	Yes	16	0	0	--	No Aquatic Water Quality Criteria							
Selenium (dissolved)	Yes	17	0.11	4	0.526161	No	*	--	--	13.00	4.60	--	--
Silver (total recoverable)	Yes	16	0.0399	2.749271258	--	No Aquatic Water Quality Criteria							
Silver (dissolved)	Yes	16	0	0	0	No	*	--	--	0.80	0.10	--	--
Zinc (total recoverable)	Yes	18	52.8	0.428300763	--	No Aquatic Water Quality Criteria							
Zinc (dissolved)	Yes	16	30.4	0.36000288	42.66186	Yes	2.25	13.79625	4.824003935	55.81	42.38	NO	NO
Cyanide (total)	Yes	16	14.6	2.153554707	--	No Aquatic Water Quality Criteria							
Cyanide (free)	Yes	--	--	--	--	Data	0	--	--	22.00	5.20	--	--
Total phenolic compounds	Yes	No Aquatic Water Quality Criteria											
Table 2: Volatile organic compounds													
Table 2: Acid-extractable compounds													
Pentachlorophenol	Yes	3	0	0	0	No	*	--	--	pH Data	pH Data	--	--
Table 2: Base-neutral compounds													
Table 3: Pesticides and PCBs													
Aldrin	Yes	--	--	--	--	Data	*	--	--	3.00	na	--	--
BHC-gamma (Lindane)	Yes	--	--	--	--	Data	*	--	--	0.95	0.08	--	--
Chlordane	Yes	--	--	--	--	Data	*	--	--	2.40	0.00	--	--
Chloropyrifos	Yes	--	--	--	--	Data	*	--	--	0.08	0.04	--	--
Demeton	Yes	--	--	--	--	Data	*	--	--	na	0.10	--	--
DDT 4,4'	Yes	--	--	--	--	Data	*	--	--	1.10	0.00	--	--
Dieldrin	Yes	--	--	--	--	Data	*	--	--	0.24	0.06	--	--
Endosulfan alpha	Yes	--	--	--	--	Data	*	--	--	0.22	0.06	--	--
Endosulfan beta	Yes	--	--	--	--	Data	*	--	--	0.22	0.06	--	--
Endosulfan	Yes	--	--	--	--	Data	*	--	--	0.22	0.06	--	--
Endrin	Yes	--	--	--	--	Data	*	--	--	0.09	0.04	--	--
Guthion	Yes	--	--	--	--	Data	*	--	--	na	0.01	--	--
Heptachlor	Yes	--	--	--	--	Data	*	--	--	0.52	0.00	--	--
Heptachlor Epoxide	Yes	--	--	--	--	Data	*	--	--	0.52	0.00	--	--
Malathion	Yes	--	--	--	--	Data	*	--	--	na	0.10	--	--
Methoxychlor	Yes	--	--	--	--	Data	*	--	--	na	0.03	--	--
Mirex	Yes	--	--	--	--	Data	*	--	--	na	0.00	--	--
Parathion	Yes	--	--	--	--	Data	*	--	--	0.07	0.01	--	--
Toxaphene	Yes	--	--	--	--	Data	*	--	--	0.73	0.00	--	--
Total PCBs (Sum of PCB	Yes	--	--	--	--	Data	*	--	--	2.00	0.01	--	--
Table3: Other parameters with state water quality criteria													
Hydrogen Sulfide (dissolved as S)	TBD	--	--	--	--	--	*	--	--	na	2.00	--	--
Phosphorus, Elemental	TBD	--	--	--	--	--	*	--	--	na	na	--	--
tributyltin (TBT)	TBD	--	--	--	--	--	*	--	--	0.46	0.06	--	--

7. Human Health RP

RPA Run Information	
Facility Name:	Hillsboro
DEQ File Number:	90752
EPA Identification #:	OR0023345
Permit Number:	101143
Prepared By:	Aliana Britson
Preparation Date:	6/17/2022
Facility Flow Rate (MGD):	0
Outfall Number:	H001A (West)
Determination Date:	6/17/22

Color Key:	"*" = Enter data
Intermediate Calc.s	"--" = Will calculate
Calculation Results	

Facility Information						
1. Do I have dilution values from a mixing zone study? (Yes/No)						Yes
2. If answered "No" to Question 1, then fill in the following table						
Eff. Flow Rate		MGD	N/A	Calculated dilution Factors		
Stream Flow: Harmonic M		CFS	N/A	Dilution @ Harmonic Mean		N/A
Stream Flow: 30Q5		CFS	N/A	Dilution @ 30Q5		N/A
% dilution at MZ		%	25%			
3. If answered "Yes" to Question #1, then fill in dilution values			Dilution @ RMZ: harmonic mean flow			16.2
			Dilution @ RMZ: 30Q5 flow			15.7
4. Please enter statistical Confidence and Probablity values (note: defaults already entered)			Confidence Level		%	95%
			Probability Basis		%	95%
5. Is the water "fresh" or "salt"?				Fresh		

RPA Run Notes: Dilutions from 2017 Mixing Zone Update to 2008 Study. Effluent data from 2016-2020. Mixing zone does not overlap with Outfall H001B. No ambient cyanide data - value assumed to be 0.

			Identify Pollutants of Concern					In-Stream Conc.		Det. Reasonable Potential			
Pollutant Parameter	Evaluation Required?	Carcinogen Status	# of Sample	Effluent Conc.	Coefficent of Variation	Est. Max Eff. Conc.	RP at end of pipe?	Ambient Conc.	Max Total Conc. @ RMZ	WQ Crit: Water + Fish	WQ Crit: Fish	Is there Reasonable Potential to Exceed? (Yes/No)	
	(Yes/No)	(Yes/No)		(µg/l)	Default=0.6	(µg/l)	(Yes/No)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	Water + Fish	Fish
Table 1 Effluent Parameters for all POTWs w/a Flow > 0.1 MGD													
Nitrates-Nitrite	Yes	n	249	32800	0.515703862	24348.22	Yes	238	1773.683	10000	na	NO	--
Table 2 Effluent Parameters for Selected POTWs													
Table 2: Metals (total recoverable), cyanide and total phenols										Use total recoverable data as surrogate.		Yes	
Antimony (total recoverable)	Yes	n	16	0.242	0.449054456	0.325783	No	*	--	5	64	--	--
Arsenic (total recoverable)	Yes	y	16	0.75721	0.289429072	No Human Health Water Quality Criteria							
Arsenic (total inorganic)	Yes	Y	16	0.75721	0.289429072	0.921844	No	*	--	2	2.1	--	--
Copper (total recoverable)	Yes	N	32	9.21	0.396582776	10.3297	No	*	--	1300	na	--	--
Mercury (total)	Yes	N	RP is "Yes" if at least 4 mercury samples and 25% or more of samples are above the recommended QL. See methylmercury IMD										
Methyl Mercury	Yes	N	f sample	0	0	--	Yes	*	--	na	0.00014	--	--
Nickel (total recoverable)	Yes	N	34	19.3	0.637613058	22.57553	No	*	--	140	170	--	--
Selenium (total recoverable)	Yes	N	16	0	0	0	No	*	--	120	420	--	--
Thallium (total recoverable)	Yes	N	16	0	0	0	No	*	--	0	0.047	--	--
Zinc (total recoverable)	Yes	N	18	52.8	0.428300763	68.16988	No	*	--	2100	2600	--	--
Cyanide (total)	Yes	N	16	14.6	2.153554707	36.35159	No	*	--	130	130	--	--
Table 2: Volatile organic compounds													
Acrolein	Yes	N	4	0	0	0	No	*	--	1	0.93	--	--
Acrylonitrile	Yes	Y	4	0	0	0	No	*	--	0	0.025	--	--
Benzene	Yes	Y	4	0	0	0	No	*	--	0	1.4	--	--
Bromoform	Yes	y	4	0	0	0	No	*	--	3	14	--	--
Carbon Tetrachloride	Yes	Y	4	0	0	0	No	*	--	0	0.16	--	--
Chlorobenzene	Yes	N	4	0	0	0	No	*	--	74	160	--	--
Chlorodibromomethane	Yes	y	4	0	0	0	No	*	--	0	1.3	--	--
Chloroform	Yes	n	4	1.5	0.6	3.877906	No	*	--	260	1100	--	--
1,2-Dichlorobenzene (o)	Yes	n	4	0	0	0	No	*	--	110	130	--	--
1,3-Dichlorobenzene (m)	Yes	n	4	0	0	0	No	*	--	80	96	--	--
1,4-Dichlorobenzene (p)	Yes	n	4	0	0	0	No	*	--	16	19	--	--
Dichlorobromomethane	Yes	y	4	0	0	0	No	*	--	0	1.7	--	--
1,2-dichloroethane	Yes	y	4	0	0	0	No	*	--	0	3.7	--	--
1,2-trans-dichloroethylene	Yes	n	4	0	0	0	No	*	--	120	1000	--	--
1,1-dichloroethylene	Yes	n	4	0	0	0	No	*	--	230	710	--	--
1,2-dichloropropane	Yes	y	4	0	0	0	No	*	--	0	1.5	--	--
1,3-dichloropropene	Yes	y	4	0	0	0	No	*	--	0	2.1	--	--
Ethylbenzene	Yes	n	4	0	0	0	No	*	--	160	210	--	--
Methyl Bromide	Yes	n	4	0	0	0	No	*	--	37	150	--	--
Methylene Chloride	Yes	y	4	0	0	0	No	*	--	4	59	--	--
1,1,2,2-tetrachloroethane	Yes	y	4	0	0	0	No	*	--	0	0.40	--	--
Tetrachloroethylene	Yes	y	4	0	0	0	No	*	--	0	0.33	--	--
Toluene	Yes	n	4	0.72	0.6	1.861395	No	*	--	720	1500	--	--
1,1,2-trichloroethane	Yes	y	4	0	0	0	No	*	--	0	1.6	--	--
Trichloroethylene	Yes	y	4	0	0	0	No	*	--	1	3	--	--
Vinyl Chloride	Yes	y	4	0	0	0	No	*	--	0	0.24	--	--
Table 2: Acid-extractable compounds													
2-chlorophenol	Yes	n	3	0	0	0	No	*	--	14	15	--	--
2,4-dichlorophenol	Yes	n	3	0	0	0	No	*	--	23	29	--	--
2,4-dimethylphenol	Yes	n	3	0	0	0	No	*	--	76	85	--	--
4,6-dinitro-o-cresol	Yes	n	3	0	0	0	No	*	--	9	28	--	--
2,4-dinitrophenol	Yes	n	3	0	0	0	No	*	--	62	530	--	--
Pentachlorophenol	Yes	y	3	0	0	0	No	*	--	0	0.30	--	--
Phenol	Yes	n	3	0	0	0	No	*	--	9400	86000	--	--
2,4,5-trichlorophenol	Yes	n	3	0	0	0	No	*	--	330	360	--	--
2,4,6-trichlorophenol	Yes	y	3	0	0	0	No	*	--	0	0.24	--	--
Table 2: Base-neutral compounds													
Acenaphthene	Yes	n	3	0	0	0	No	*	--	95	99	--	--
Anthracene	Yes	n	3	0	0	0	No	*	--	2900	4000	--	--

Benzidine	Yes	y	2	0	0	0	No	*	--	0	0.00002	--	--
Benzo(a)anthracene	Yes	y	3	0	0	0	No	*	--	0	0.0018	--	--
Benzo(a)pyrene	Yes	y	3	0	0	0	No	*	--	0	0.0018	--	--
Benzo(b)fluoranthene	Yes	y	3	0	0	0	No	*	--	0	0.0018	--	--
Benzo(k)fluoranthene	Yes	y	3	0	0	0	No	*	--	0	0.0018	--	--
Bis(2-chloroethyl)ether	Yes	y	3	0	0	0	No	*	--	0	0.053	--	--
Bis (2-chloro-1-methylethyl) ether	Yes	n	--	--	--	--	Data	*	--	1200	6500	--	--
Chloromethyl Ether, bis	Yes	y	--	--	--	--	Data	*	--	0	0.000029	--	--
Bis (2-ethylhexyl)phthalate	Yes	y	4	0	0	0	No	*	--	0	0.22	--	--
Butylbenzyl phthalate	Yes	n	4	0	0	0	No	*	--	190	190	--	--
2-chloronaphthalene	Yes	n	3	0	0	0	No	*	--	150	160	--	--
Chrysene	Yes	y	3	0	0	0	No	*	--	0	0.0018	--	--
Di-n-butyl phthalate	Yes	n	4	0.62	0.6	1.602868	No	*	--	400	450	--	--
Dibenzo(a,h)anthracene	Yes	y	3	0	0	0	No	*	--	0	0.0018	--	--
3,3-Dichlorobenzidine	Yes	y	3	0	0	0	No	*	--	0	0.0028	--	--
Diethyl phthalate	Yes	n	4	0	0	0	No	*	--	3800	4400	--	--
Dimethyl phthalate	Yes	n	4	0	0	0	No	*	--	84000	110000	--	--
2,4-dinitrotoluene	Yes	y	3	0	0	0	No	*	--	0	0.34	--	--
1,2-diphenylhydrazine	Yes	y	--	--	--	--	Data	*	--	0	0.02	--	--
Fluoranthene	Yes	n	3	0	0	0	No	*	--	14	14	--	--
Fluorene	Yes	n	3	0	0	0	No	*	--	390	530	--	--
Hexachlorobenzene	Yes	n	3	0	0	0	No	*	--	0	0.000029	--	--
Hexachlorobutadiene	Yes	y	3	0	0	0	No	*	--	0	1.8	--	--
Hexachlorocyclopentadiene	Yes	n	2	0	0	0	No	*	--	30	110	--	--
Hexachloroethane	Yes	y	3	0	0	0	No	*	--	0	0.33	--	--
Indeno(1,2,3-cd)pyrene	Yes	y	3	0	0	0	No	*	--	0	0.0018	--	--
Isophorone	Yes	n	3	0	0	0	No	*	--	27	96	--	--
Nitrobenzene	Yes	n	3	0	0	0	No	*	--	14	69	--	--
N-nitrosodimethylamine	Yes	y	2	0	0	0	No	*	--	0	0.3	--	--
N-nitrosodi-n-propylamine	Yes	y	3	0	0	0	No	*	--	0	0.051	--	--
N-nitrosodiphenylamine	Yes	y	3	0	0	0	No	*	--	1	0.60	--	--
Pentachlorobenzene	Yes	n	3	0	0	0	No	*	--	0	0.15	--	--
Pyrene	Yes	n	3	0	0	0	No	*	--	290	400	--	--
1,2,4-trichlorobenzene	Yes	n	3	0	0	0	No	*	--	6	7	--	--
Tetrachlorobenzene,1,2,4,5	Yes	n	3	0	0	0	No	*	--	0	0.11	--	--
Table 3: Pesticides and PCBs													
Aldrin	Yes	y	--	--	--	--	Data	*	--	0	0.0000050	--	--
BHC-Technical	No	y	--	--	--	--	--	*	--	0	0.0015	--	--

BHC-alpha	Yes	y	--	--	--	--	Data	*	--	0	0.00049	--	--
BHC-beta	Yes	y	--	--	--	--	Data	*	--	0	0.0017	--	--
BHC-gamma (Lindane)	Yes	n	--	--	--	--	Data	*	--	0	0.18	--	--
Chlordane	Yes	y	--	--	--	--	Data	*	--	0	0.000081	--	--
DDD 4,4'	Yes	y	--	--	--	--	Data	*	--	0	0.000031	--	--
DDE 4,4'	Yes	y	--	--	--	--	Data	*	--	0	0.000022	--	--
DDT 4,4'	Yes	y	--	--	--	--	Data	*	--	0	0.000022	--	--
Dieldrin	Yes	y	--	--	--	--	Data	*	--	0	0.0000054	--	--
Endosulfan alpha	Yes	n	--	--	--	--	Data	*	--	9	8.9	--	--
Endosulfan beta	Yes	n	--	--	--	--	Data	*	--	9	8.9	--	--
Endosulfan Sulfate	Yes	n	--	--	--	--	Data	*	--	9	8.9	--	--
Endrin	Yes	n	--	--	--	--	Data	*	--	0	0.024	--	--
Endrin Aldehyde	Yes	n	--	--	--	--	Data	*	--	0	0.030	--	--
Heptachlor	Yes	y	--	--	--	--	Data	*	--	0	0.0000079	--	--
Heptachlor Epoxide	Yes	y	--	--	--	--	Data	*	--	0	0.0000039	--	--
Methoxychlor	Yes	n	--	--	--	--	Data	*	--	100	na	--	--
Toxaphene	Yes	y	--	--	--	--	Data	*	--	0	0.000028	--	--
Total PCBs (Sum of PCB Aroclors)	Yes	y	--	--	--	--	Data	*	--	0	0.0000064	--	--
Table3: Other parameters with state water quality criteria													
Barium (total recoverable)	TBD	n	--	--	--	--	--	*	--	1000	na	--	--
Manganese (total recoverable)	TBD	n	--	--	--	--	--	*	--	Withdrawn	100	--	--
2,4,5-TP [2-(2,4,5-Trichloro-phenoxy) propanoic acid]d	TBD	n	--	--	--	--	--	*	--	10	na	--	--
2,4-D (2,4-Dichlorophenoxy) acetic acid)	TBD	n	--	--	--	--	--	*	--	100	na	--	--
Dioxin 2,3,7,8-TCDD	TBD	y	--	--	--	--	--	*	--	0	5.1E-10	--	--
Nitrosamines	TBD	y	--	--	--	--	--	*	--	0	0.046	--	--
N-Nitrosodibutylamine	TBD	y	--	--	--	--	--	*	--	0	0.022	--	--
N-Nitrosodiethylamine	TBD	y	--	--	--	--	--	*	--	0	0.046	--	--
N-Nitrosopyrrolidine	TBD	y	--	--	--	--	--	*	--	0	3.4	--	--

Appendix F-4 – Hillsboro Toxics RPA Outfall H001B

Aquatic Toxicity & Human Health

5. Aquatic Toxicity RP

RPA Run Information	
Facility Name:	Hillsboro
DEQ File Number:	90752
EPA Identification #:	OR0023345
Permit Number:	101143
Prepared By:	Aliana Britson
Preparation Date:	6/17/2022
Facility Flow Rate (MGD):	0
Outfall Number:	H001B
Determination Date:	6/17/22

RPA Run Notes: Dilutions from 2017 Update to 2008 mixing zone study. Effluent data from 2016-2020. Mixing zone does not overlap with Outfall H001A. No ambient cyanide data - assumed value of 0.

Color Key:	"#" = Enter data
Intermediate Calc.s	"--" = Will calculate
Calculation Results	

Facility Information					
1. Are there dilution #'s from mixing zone study? (Yes/No)					yes
2. Is the receiving waterbody fresh water? (Yes/No)					yes
3. If Question 1 = "No", then fill in the following table					
Eff. Flow Rate	MGD	N/A	Calculated dilution Factors		
Stream Flow: 7Q10	CFS	N/A	Dilution @ ZID		N/A
Stream Flow: 1Q10	CFS	N/A	Dilution @ MZ		N/A
% dilution at ZID	%	10%			
% dilution at MZ	%	25%			
4. If answered "Yes" to Question #1, then fill in dilution values			Dilution @ ZID (1Q10 from study)		3.5
			Dilution @ MZ (7Q10 from study)		15.7
5. Enter Water Hardness. Use average hardness during critical (usually low-flow period). Effluent default is 25 mg/L.			Effluent	mg/L $CaCO_3$	76.8167
			Up-stream	mg/L $CaCO_3$	26.1
			ZID boundary	mg/L $CaCO_3$	41
			MZ boundary	mg/L $CaCO_3$	29
6. Please enter statistical Confidence and Probablity values (note: defaults already entered)			Confidence Level	%	99%
			Probability Basis	%	95%

		Identify Pollutants of Concern					Determine In-Stream Conc.			Det. Reasonable Potential			
Pollutant Parameter	Evaluation Required?	# of Sample	Highest Effluent Conc.	Coefficent of Variation	Est. Max Eff. Conc.	RP at end of pipe?	Ambient Conc.	Max Total Conc. @ ZID	Max Total Conc. @ RMZ	WQ Crit: 1 Hour (CMC)	WQ Crit: 4 Day (CCC)	Is there Reasonable Potential to Exceed? (Yes/No)	
	(Yes/No)		(µg/l)	Default=0.6	(µg/l)	(Yes/No)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	Acute	Chronic
Table 1 Effluent Parameters for all POTWs w/a Flow > 0.1 MGD													
Nitrates-Nitrite	Yes	Evaluation will occur with DO analysis											
Table 2 Effluent Parameters for Selected POTWs													
Hardness (Total as CaCO3)	Yes	Must be collected for metals criteria calculation. Submit data to the fields at the top of the spreadsheet											
Table 2: Metals (total recoverable), cyanide and total phenols										Use total recoverable data as surrogate		no	
Arsenic (total recoverable)	Yes	16	0.881	0.289429072	--	No Aquatic Water Quality Criteria							
Arsenic (total inorganic)	Yes	--	--	--	--	No Aquatic Water Quality Criteria							

Arsenic (dissolved inorganic)	Yes	--	--	--	--	Data	*	--	--	340.00	150.00	--	--
Cadmium (total recoverable)	Yes	16	0.0972	2.798439957	0.40725	No	*	--	--	1.42	--	--	--
Cadmium (dissolved)	Yes	16	0	0	0	No	*	--	--	0.79	0.11	--	--
Chromium (total recoverable)	Yes	18	0.679	1.313971197	--	No Aquatic Water Quality Criteria							
Chromium III (dissolved)	Yes	--	--	--	--	Data	*	--	--	861.60	31.56	--	--
Chromium VI (dissolved)	Yes	--	--	--	--	Data	*	--	--	16.00	11.00	--	--
Copper (total recoverable)	Yes	32	9.21	0.396582776	--	No Aquatic Water Quality Criteria							
Copper (dissolved)	Yes	16	6.86	0.492085029	10.78035	No	*	--	--	See BLM	See BLM	--	--
Iron (total recoverable)	Yes	13	148	0.304681172	206.3521	No	*	--	--	--	1000.00	--	--
Lead (total recoverable)	Yes	16	0.614	0.696911011	--	No Aquatic Water Quality Criteria							
Lead (dissolved)	Yes	16	0.556	0.713393507	1.036265	Yes	0.02	0.310362	0.084730276	25.91	0.67	NO	NO
Mercury (total)	Yes	17	0.00338	0.244023603	0.004227	No	*	--	--	2.40	0.01	--	--
Nickel (total recoverable)	Yes	34	19.3	0.637613058	--	No Aquatic Water Quality Criteria							
Nickel (dissolved)	Yes	34	18.4	0.622731367	24.53425	Yes	0.614	7.448357	2.137582758	218.81	18.48	NO	NO
Selenium (total recoverable)	Yes	16	0	0	--	No Aquatic Water Quality Criteria							
Selenium (dissolved)	Yes	17	0.11	4	0.526161	No	*	--	--	13.00	4.60	--	--
Silver (total recoverable)	Yes	16	0.0399	2.749271258	--	No Aquatic Water Quality Criteria							
Silver (dissolved)	Yes	16	0	0	0	No	*	--	--	0.80	0.10	--	--
Zinc (total recoverable)	Yes	18	52.8	0.428300763	--	No Aquatic Water Quality Criteria							
Zinc (dissolved)	Yes	16	30.4	0.36000288	42.66186	Yes	2.25	13.79625	4.824003935	55.81	42.38	NO	NO
Cyanide (total)	Yes	16	14.6	2.153554707	--	No Aquatic Water Quality Criteria							
Cyanide (free)	Yes	--	--	--	--	Data	0	--	--	22.00	5.20	--	--
Total phenolic compounds	Yes	No Aquatic Water Quality Criteria											
Table 2: Volatile organic compounds													
Table 2: Acid-extractable compounds													
Pentachlorophenol	Yes	3	0	0	0	No	*	--	--	pH Data	pH Data	--	--
Table 2: Base-neutral compounds													
Table 3: Pesticides and PCBs													
Aldrin	Yes	--	--	--	--	Data	*	--	--	3.00	na	--	--
BHC-gamma (Lindane)	Yes	--	--	--	--	Data	*	--	--	0.95	0.08	--	--
Chlordane	Yes	--	--	--	--	Data	*	--	--	2.40	0.00	--	--
Chloropyrifos	Yes	--	--	--	--	Data	*	--	--	0.08	0.04	--	--
Demeton	Yes	--	--	--	--	Data	*	--	--	na	0.10	--	--
DDT 4,4'	Yes	--	--	--	--	Data	*	--	--	1.10	0.00	--	--
Dieldrin	Yes	--	--	--	--	Data	*	--	--	0.24	0.06	--	--
Endosulfan alpha	Yes	--	--	--	--	Data	*	--	--	0.22	0.06	--	--
Endosulfan beta	Yes	--	--	--	--	Data	*	--	--	0.22	0.06	--	--
Endosulfan	Yes	--	--	--	--	Data	*	--	--	0.22	0.06	--	--
Endrin	Yes	--	--	--	--	Data	*	--	--	0.09	0.04	--	--
Guthion	Yes	--	--	--	--	Data	*	--	--	na	0.01	--	--
Heptachlor	Yes	--	--	--	--	Data	*	--	--	0.52	0.00	--	--
Heptachlor Epoxide	Yes	--	--	--	--	Data	*	--	--	0.52	0.00	--	--
Malathion	Yes	--	--	--	--	Data	*	--	--	na	0.10	--	--
Methoxychlor	Yes	--	--	--	--	Data	*	--	--	na	0.03	--	--
Mirex	Yes	--	--	--	--	Data	*	--	--	na	0.00	--	--
Parathion	Yes	--	--	--	--	Data	*	--	--	0.07	0.01	--	--
Toxaphene	Yes	--	--	--	--	Data	*	--	--	0.73	0.00	--	--
Total PCBs (Sum of PCB	Yes	--	--	--	--	Data	*	--	--	2.00	0.01	--	--
Table3: Other parameters with state water quality criteria													
Hydrogen Sulfide (dissolved as S)	TBD	--	--	--	--	--	*	--	--	na	2.00	--	--
Phosphorus, Elemental	TBD	--	--	--	--	--	*	--	--	na	na	--	--
tributyltin (TBT)	TBD	--	--	--	--	--	*	--	--	0.46	0.06	--	--

7. Human Health RP

RPA Run Information	
Facility Name:	Hillsboro
DEQ File Number:	90752
EPA Identification #:	OR0023345
Permit Number:	101143
Prepared By:	Aliana Britson
Preparation Date:	6/17/2022
Facility Flow Rate (MGD):	0
Outfall Number:	H001B
Determination Date:	6/17/22

Color Key:	"*" = Enter data
Intermediate Calc.s	"--" = Will calculate
Calculation Results	

Facility Information						
1. Do I have dilution values from a mixing zone study? (Yes/No)						Yes
2. If answered "No" to Question 1, then fill in the following table						
Eff. Flow Rate		MGD	N/A	Calculated dilution Factors		
Stream Flow: Harmonic M		CFS	N/A	Dilution @ Harmonic Mean		N/A
Stream Flow: 30Q5		CFS	N/A	Dilution @ 30Q5		N/A
% dilution at MZ		%	25%			
3. If answered "Yes" to Question #1, then fill in dilution values				Dilution @ RMZ: harmonic mean flow		16.2
				Dilution @ RMZ: 30Q5 flow		15.7
4. Please enter statistical Confidence and Probablity values (note: defaults already entered)				Confidence Level	%	95%
				Probability Basis	%	95%
5. Is the water "fresh" or "salt"?				Fresh		

RPA Run Notes: Dilutions from 2017 Update to 2008 mixing zone study. Effluent data from 2016-2020. Mixing zone does not overlap with Outfall H001A.

Pollutant Parameter	Evaluation Required? (Yes/No)	Carcinogen Status (Yes/No)	Identify Pollutants of Concern: # of Sample	Effluent Conc. (µg/l)	Coefficent of Variation Default=0.6	Est. Max Eff. Conc. (µg/l)	RP at end of pipe? (Yes/No)	In-Stream Conc.: Ambient Conc. (µg/l)	Max Total Conc. @ RMZ (µg/l)	Det. Reasonable Potential: WQ Crit: Water + Fish (µg/l)	WQ Crit: Fish (µg/l)	Is there Reasonable Potential to Exceed? (Yes/No) Water + Fish	Fish
Table 1 Effluent Parameters for all POTWs w/a Flow > 0.1 MGD													
Nitrates-Nitrite	Yes	n	249	32800	0.515703862	24348.22	Yes	238	1773.683	10000	na	NO	--
Table 2 Effluent Parameters for Selected POTWs													
Table 2: Metals (total recoverable), cyanide and total phenols										Use total recoverable data as surrogate.		Yes	
Antimony (total recoverable)	Yes	n	16	0.242	0.449054456	0.325783	No	*	--	5	64	--	--
Arsenic (total recoverable)	Yes	y	16	0.75721	0.289429072	No Human Health Water Quality Criteria							
Arsenic (total inorganic)	Yes	Y	16	0.75721	0.289429072	0.921844	No	*	--	2	2.1	--	--
Copper (total recoverable)	Yes	N	32	9.21	0.396582776	10.3297	No	*	--	1300	na	--	--
Mercury (total)	Yes	N	RP is "Yes" if at least 4 mercury samples and 25% or more of samples are above the recommended QL. See methylmercury IMD										
Methyl Mercury	Yes	N	f samples	0	0	--	Yes	*	--	na	0.00014	--	--
Nickel (total recoverable)	Yes	N	34	19.3	0.637613058	22.57553	No	*	--	140	170	--	--
Selenium (total recoverable)	Yes	N	16	0	0	0	No	*	--	120	420	--	--
Thallium (total recoverable)	Yes	N	16	0	0	0	No	*	--	0	0.047	--	--
Zinc (total recoverable)	Yes	N	18	52.8	0.428300763	68.16988	No	*	--	2100	2600	--	--
Cyanide (total)	Yes	N	16	14.6	2.153554707	36.35159	No	*	--	130	130	--	--
Table 2: Volatile organic compounds													
Acrolein	Yes	N	4	0	0	0	No	*	--	1	0.93	--	--
Acrylonitrile	Yes	Y	4	0	0	0	No	*	--	0	0.025	--	--
Benzene	Yes	Y	4	0	0	0	No	*	--	0	1.4	--	--
Bromoform	Yes	y	4	0	0	0	No	*	--	3	14	--	--
Carbon Tetrachloride	Yes	Y	4	0	0	0	No	*	--	0	0.16	--	--
Chlorobenzene	Yes	N	4	0	0	0	No	*	--	74	160	--	--
Chlorodibromomethane	Yes	y	4	0	0	0	No	*	--	0	1.3	--	--
Chloroform	Yes	n	4	1.5	0.6	3.877906	No	*	--	260	1100	--	--
1,2-Dichlorobenzene (o)	Yes	n	4	0	0	0	No	*	--	110	130	--	--
1,3-Dichlorobenzene (m)	Yes	n	4	0	0	0	No	*	--	80	96	--	--
1,4-Dichlorobenzene (p)	Yes	n	4	0	0	0	No	*	--	16	19	--	--
Dichlorobromomethane	Yes	y	4	0	0	0	No	*	--	0	1.7	--	--
1,2-dichloroethane	Yes	y	4	0	0	0	No	*	--	0	3.7	--	--
1,2-trans-dichloroethylene	Yes	n	4	0	0	0	No	*	--	120	1000	--	--
1,1-dichloroethylene	Yes	n	4	0	0	0	No	*	--	230	710	--	--
1,2-dichloropropane	Yes	y	4	0	0	0	No	*	--	0	1.5	--	--
1,3-dichloropropene	Yes	y	4	0	0	0	No	*	--	0	2.1	--	--
Ethylbenzene	Yes	n	4	0	0	0	No	*	--	160	210	--	--
Methyl Bromide	Yes	n	4	0	0	0	No	*	--	37	150	--	--
Methylene Chloride	Yes	y	4	0	0	0	No	*	--	4	59	--	--
1,1,2,2-tetrachloroethane	Yes	y	4	0	0	0	No	*	--	0	0.40	--	--
Tetrachloroethylene	Yes	y	4	0	0	0	No	*	--	0	0.33	--	--
Toluene	Yes	n	4	0.72	0.6	1.861395	No	*	--	720	1500	--	--
1,1,2-trichloroethane	Yes	y	4	0	0	0	No	*	--	0	1.6	--	--
Trichloroethylene	Yes	y	4	0	0	0	No	*	--	1	3	--	--
Vinyl Chloride	Yes	y	4	0	0	0	No	*	--	0	0.24	--	--
Table 2: Acid-extractable compounds													
2-chlorophenol	Yes	n	3	0	0	0	No	*	--	14	15	--	--
2,4-dichlorophenol	Yes	n	3	0	0	0	No	*	--	23	29	--	--
2,4-dimethylphenol	Yes	n	3	0	0	0	No	*	--	76	85	--	--
4,6-dinitro-o-cresol	Yes	n	3	0	0	0	No	*	--	9	28	--	--
2,4-dinitrophenol	Yes	n	3	0	0	0	No	*	--	62	530	--	--
Pentachlorophenol	Yes	y	3	0	0	0	No	*	--	0	0.30	--	--
Phenol	Yes	n	3	0	0	0	No	*	--	9400	86000	--	--
2,4,5-trichlorophenol	Yes	n	3	0	0	0	No	*	--	330	360	--	--
2,4,6-trichlorophenol	Yes	y	3	0	0	0	No	*	--	0	0.24	--	--
Table 2: Base-neutral compounds													
Acenaphthene	Yes	n	3	0	0	0	No	*	--	95	99	--	--
Anthracene	Yes	n	3	0	0	0	No	*	--	2900	4000	--	--

Benzidine	Yes	y	2	0	0	0	No	*	--	0	0.00002	--	--
Benzo(a)anthracene	Yes	y	3	0	0	0	No	*	--	0	0.0018	--	--
Benzo(a)pyrene	Yes	y	3	0	0	0	No	*	--	0	0.0018	--	--
Benzo(b)fluoranthene	Yes	y	3	0	0	0	No	*	--	0	0.0018	--	--
Benzo(k)fluoranthene	Yes	y	3	0	0	0	No	*	--	0	0.0018	--	--
Bis(2-chloroethyl)ether	Yes	y	3	0	0	0	No	*	--	0	0.053	--	--
Bis (2-chloro-1-methylethyl) ether	Yes	n	--	--	--	--	Data	*	--	1200	6500	--	--
Chloromethyl Ether, bis	Yes	y	--	--	--	--	Data	*	--	0	0.000029	--	--
Bis (2-ethylhexyl)phthalate	Yes	y	4	0	0	0	No	*	--	0	0.22	--	--
Butylbenzyl phthalate	Yes	n	4	0	0	0	No	*	--	190	190	--	--
2-chloronaphthalene	Yes	n	3	0	0	0	No	*	--	150	160	--	--
Chrysene	Yes	y	3	0	0	0	No	*	--	0	0.0018	--	--
Di-n-butyl phthalate	Yes	n	4	0.62	0.6	1.602868	No	*	--	400	450	--	--
Dibenzo(a,h)anthracene	Yes	y	3	0	0	0	No	*	--	0	0.0018	--	--
3,3-Dichlorobenzidine	Yes	y	3	0	0	0	No	*	--	0	0.0028	--	--
Diethyl phthalate	Yes	n	4	0	0	0	No	*	--	3800	4400	--	--
Dimethyl phthalate	Yes	n	4	0	0	0	No	*	--	84000	110000	--	--
2,4-dinitrotoluene	Yes	y	3	0	0	0	No	*	--	0	0.34	--	--
1,2-diphenylhydrazine	Yes	y	--	--	--	--	Data	*	--	0	0.02	--	--
Fluoranthene	Yes	n	3	0	0	0	No	*	--	14	14	--	--
Fluorene	Yes	n	3	0	0	0	No	*	--	390	530	--	--
Hexachlorobenzene	Yes	n	3	0	0	0	No	*	--	0	0.000029	--	--
Hexachlorobutadiene	Yes	y	3	0	0	0	No	*	--	0	1.8	--	--
Hexachlorocyclopentadiene	Yes	n	2	0	0	0	No	*	--	30	110	--	--
Hexachloroethane	Yes	y	3	0	0	0	No	*	--	0	0.33	--	--
Indeno(1,2,3-cd)pyrene	Yes	y	3	0	0	0	No	*	--	0	0.0018	--	--
Isophorone	Yes	n	3	0	0	0	No	*	--	27	96	--	--
Nitrobenzene	Yes	n	3	0	0	0	No	*	--	14	69	--	--
N-nitrosodimethylamine	Yes	y	2	0	0	0	No	*	--	0	0.3	--	--
N-nitrosodi-n-propylamine	Yes	y	3	0	0	0	No	*	--	0	0.051	--	--
N-nitrosodiphenylamine	Yes	y	3	0	0	0	No	*	--	1	0.60	--	--
Pentachlorobenzene	Yes	n	3	0	0	0	No	*	--	0	0.15	--	--
Pyrene	Yes	n	3	0	0	0	No	*	--	290	400	--	--
1,2,4-trichlorobenzene	Yes	n	3	0	0	0	No	*	--	6	7	--	--
Tetrachlorobenzene,1,2,4,5	Yes	n	3	0	0	0	No	*	--	0	0.11	--	--
Table 3: Pesticides and PCBs													
Aldrin	Yes	y	--	--	--	--	Data	*	--	0	0.0000050	--	--
BHC-Technical	No	y	--	--	--	--	--	*	--	0	0.0015	--	--
BHC-alpha	Yes	y	--	--	--	--	Data	*	--	0	0.00049	--	--
BHC-beta	Yes	y	--	--	--	--	Data	*	--	0	0.0017	--	--
BHC-gamma (Lindane)	Yes	n	--	--	--	--	Data	*	--	0	0.18	--	--
Chlordane	Yes	y	--	--	--	--	Data	*	--	0	0.000081	--	--
DDD 4,4'	Yes	y	--	--	--	--	Data	*	--	0	0.000031	--	--
DDE 4,4'	Yes	y	--	--	--	--	Data	*	--	0	0.000022	--	--
DDT 4,4'	Yes	y	--	--	--	--	Data	*	--	0	0.000022	--	--
Dieldrin	Yes	y	--	--	--	--	Data	*	--	0	0.0000054	--	--
Endosulfan alpha	Yes	n	--	--	--	--	Data	*	--	9	8.9	--	--
Endosulfan beta	Yes	n	--	--	--	--	Data	*	--	9	8.9	--	--
Endosulfan Sulfate	Yes	n	--	--	--	--	Data	*	--	9	8.9	--	--
Endrin	Yes	n	--	--	--	--	Data	*	--	0	0.024	--	--
Endrin Aldehyde	Yes	n	--	--	--	--	Data	*	--	0	0.030	--	--
Heptachlor	Yes	y	--	--	--	--	Data	*	--	0	0.0000079	--	--
Heptachlor Epoxide	Yes	y	--	--	--	--	Data	*	--	0	0.0000039	--	--
Methoxychlor	Yes	n	--	--	--	--	Data	*	--	100	na	--	--
Toxaphene	Yes	y	--	--	--	--	Data	*	--	0	0.000028	--	--
Total PCBs (Sum of PCB Aroclors)	Yes	y	--	--	--	--	Data	*	--	0	0.0000064	--	--
Table3: Other parameters with state water quality criteria													
Barium (total recoverable)	TBD	n	--	--	--	--	--	*	--	1000	na	--	--
Manganese (total recoverable)	TBD	n	--	--	--	--	--	*	--	Withdrawn	100	--	--
2,4,5-TP [2-(2,4,5-Trichloro-phenoxy) propanoic acid]d	TBD	n	--	--	--	--	--	*	--	10	na	--	--
2,4-D (2,4-Dichlorophenoxy) acetic acid)	TBD	n	--	--	--	--	--	*	--	100	na	--	--
Dioxin 2,3,7,8-TCDD	TBD	y	--	--	--	--	--	*	--	0	5.1E-10	--	--
Nitrosamines	TBD	y	--	--	--	--	--	*	--	0	0.046	--	--
N-Nitrosodibutylamine	TBD	y	--	--	--	--	--	*	--	0	0.022	--	--
N-Nitrosodiethylamine	TBD	y	--	--	--	--	--	*	--	0	0.046	--	--
N-Nitrosopyrrolidine	TBD	y	--	--	--	--	--	*	--	0	3.4	--	--

Appendix F-5 – Forest Grove Toxics RPA Outfall F001

Aquatic Toxicity & Human Health

5. Aquatic Toxicity RP

RPA Run Information	
Facility Name:	Forest Grove STP
DEQ File Number:	90745
EPA Identification #:	OR0020168
Permit Number:	101142
Prepared By:	Aliana Britson
Preparation Date:	6/21/2022
Facility Flow Rate (MGD):	6.3
Outfall Number:	F001A (Dry)
Determination Date:	enter det. Date

RPA Run Notes:Dilutions from 2019 update to 2008 mixing zone study. Outfall replaced in 2019. Ambient hardness from CWS 2020 stormwater annual report

Color Key:	"#" = Enter data
Intermediate Calc.s	"--" = Will calculate
Calculation Results	

Facility Information					
1. Are there dilution #'s from mixing zone study? (Yes/No)					yes
2. Is the receiving waterbody fresh water? (Yes/No)					yes
3. If Question 1 = "No", then fill in the following table					
Eff. Flow Rate	MGD	N/A	Calculated dilution Factors		
Stream Flow: 7Q10	CFS	N/A	Dilution @ ZID		N/A
Stream Flow: 1Q10	CFS	N/A	Dilution @ MZ		N/A
% dilution at ZID	%	10%			
% dilution at MZ	%	25%			
4. If answered "Yes" to Question #1, then fill in dilution values		Dilution @ ZID (1Q10 from study)			1.8
		Dilution @ MZ (7Q10 from study)			4.9
5. Enter Water Hardness. Use average hardness during critical (usually low-flow period). Effluent default is 25 mg/L.		Effluent		mg/L $CaCO_3$	69.7333
		Up-stream		mg/L $CaCO_3$	27
		ZID boundary		mg/L $CaCO_3$	51
		MZ boundary		mg/L $CaCO_3$	36
6. Please enter statistical Confidence and Probablity values (note: defaults already entered)		Confidence Level		%	99%
		Probability Basis		%	95%

		Identify Pollutants of Concern					Determine In-Stream Conc.			Det. Reasonable Potential			
Pollutant Parameter	Evaluation Required?	# of Sample	Highest Effluent Conc.	Coefficent of Variation	Est. Max Eff. Conc.	RP at end of pipe?	Ambient Conc.	Max Total Conc. @ ZID	Max Total Conc. @ RMZ	WQ Crit: 1 Hour (CMC)	WQ Crit: 4 Day (CCC)	Is there Reasonable Potential to Exceed? (Yes/No)	
	(Yes/No)		(µg/l)	Default=0.6	(µg/l)	(Yes/No)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	Acute	Chronic
Table 1 Effluent Parameters for all POTWs w/a Flow > 0.1 MGD													
Nitrates-Nitrite	Yes	Evaluation will occur with DO analysis											
Table 2 Effluent Parameters for Selected POTWs													
Hardness (Total as CaCO3)	Yes	Must be collected for metals criteria calculation. Submit data to the fields at the top of the spreadsheet											
Table 2: Metals (total recoverable), cyanide and total phenols									Use total recoverable data as surrogate			no	
Arsenic (total recoverable)	Yes	16	1.13	0.307592029	--	No Aquatic Water Quality Criteria							
Arsenic (total inorganic)	Yes	--	--	--	--	No Aquatic Water Quality Criteria							

Arsenic (dissolved inorganic)	Yes	--	--	--	--	Data	*	--	--	340.00	150.00	--	--
Cadmium (total recoverable)	Yes	16	0.0676	2.152887299	0.242254	No	*	--	--	1.82	--	--	--
Cadmium (dissolved)	Yes	16	0	0	0	No	*	--	--	0.98	0.13	--	--
Chromium (total recoverable)	Yes	17	0.991	0.824207257	--	No Aquatic Water Quality Criteria							
Chromium III (dissolved)	Yes	--	--	--	--	Data	*	--	--	1034.41	37.09	--	--
Chromium VI (dissolved)	Yes	--	--	--	--	Data	*	--	--	16.00	11.00	--	--
Copper (total recoverable)	Yes	33	16.3	0.392279334	--	No Aquatic Water Quality Criteria							
Copper (dissolved)	Yes	17	10.2	0.37476639	14.28882	No	*	--	--	See BLM	See BLM	--	--
Iron (total recoverable)	Yes	11	189	0.568585052	363.9399	No	*	--	--	--	1000.00	--	--
Lead (total recoverable)	Yes	16	0.477	0.642908006	--	No Aquatic Water Quality Criteria							
Lead (dissolved)	Yes	16	0.359	0.363571413	0.740925	No	*	--	--	34.42	0.86	--	--
Mercury (total)	Yes	16	0.00371	0.285369855	0.004868	No	*	--	--	2.40	0.01	--	--
Nickel (total recoverable)	Yes	16	11.7	0.436717154	--	No Aquatic Water Quality Criteria							
Nickel (dissolved)	Yes	16	11.3	0.446856509	17.0983	No	*	--	--	264.28	21.83	--	--
Selenium (total recoverable)	Yes	16	0.538	4	--	No Aquatic Water Quality Criteria							
Selenium (dissolved)	Yes	17	0.124	4.123105626	0.602518	No	*	--	--	13.00	4.60	--	--
Silver (total recoverable)	Yes	16	0.0546	1.196329666	--	No Aquatic Water Quality Criteria							
Silver (dissolved)	Yes	16	0	0	0	No	*	--	--	1.18	0.10	--	--
Zinc (total recoverable)	Yes	29	78.6	0.491005587	--	No Aquatic Water Quality Criteria							
Zinc (dissolved)	Yes	29	76.7	0.522545268	102.7318	Yes	2.06	57.98877	22.60526359	67.43	50.09	NO	NO
Cyanide (total)	Yes	16	0	0	--	No Aquatic Water Quality Criteria							
Cyanide (free)	Yes	1	0.527	0.6	4.766099	No	*	--	--	22.00	5.20	--	--
Total phenolic compounds	Yes	No Aquatic Water Quality Criteria											
Table 2: Volatile organic compounds													
Table 2: Acid-extractable compounds													
Pentachlorophenol	Yes	3	0	0	0	No	*	--	--	pH Data	pH Data	--	--
Table 2: Base-neutral compounds													
Table 3: Pesticides and PCBs													
Aldrin	Yes	--	--	--	--	Data	*	--	--	3.00	na	--	--
BHC-gamma (Lindane)	Yes	--	--	--	--	Data	*	--	--	0.95	0.08	--	--
Chlordane	Yes	--	--	--	--	Data	*	--	--	2.40	0.00	--	--
Chloropyrifos	Yes	--	--	--	--	Data	*	--	--	0.08	0.04	--	--

Demeton	Yes	--	--	--	--	Data	*	--	--	na	0.10	--	--
DDT 4,4'	Yes	--	--	--	--	Data	*	--	--	1.10	0.00	--	--
Dieldrin	Yes	--	--	--	--	Data	*	--	--	0.24	0.06	--	--
Endosulfan alpha	Yes	--	--	--	--	Data	*	--	--	0.22	0.06	--	--
Endosulfan beta	Yes	--	--	--	--	Data	*	--	--	0.22	0.06	--	--
Endosulfan	Yes	--	--	--	--	Data	*	--	--	0.22	0.06	--	--
Endrin	Yes	--	--	--	--	Data	*	--	--	0.09	0.04	--	--
Guthion	Yes	--	--	--	--	Data	*	--	--	na	0.01	--	--
Heptachlor	Yes	--	--	--	--	Data	*	--	--	0.52	0.00	--	--
Heptachlor Epoxide	Yes	--	--	--	--	Data	*	--	--	0.52	0.00	--	--
Malathion	Yes	--	--	--	--	Data	*	--	--	na	0.10	--	--
Methoxychlor	Yes	--	--	--	--	Data	*	--	--	na	0.03	--	--
Mirex	Yes	--	--	--	--	Data	*	--	--	na	0.00	--	--
Parathion	Yes	--	--	--	--	Data	*	--	--	0.07	0.01	--	--
Toxaphene	Yes	--	--	--	--	Data	*	--	--	0.73	0.00	--	--
Total PCBs (Sum of PCB	Yes	--	--	--	--	Data	*	--	--	2.00	0.01	--	--
Table3: Other parameters with state water quality criteria													
Hydrogen Sulfide (dissolved as S)	TBD	--	--	--	--	--	*	--	--	na	2.00	--	--
Phosphorus, Elemental	TBD	--	--	--	--	--	*	--	--	na	na	--	--
tributyltin (TBT)	TBD	--	--	--	--	--	*	--	--	0.46	0.06	--	--

7. Human Health RP

RPA Run Information	
Facility Name:	Forest Grove STP
DEQ File Number:	90745
EPA Identification #:	OR0020168
Permit Number:	101142
Prepared By:	Aliana Britson
Preparation Date:	6/21/2022
Facility Flow Rate (MGD):	6.3
Outfall Number:	F001A (Dry)
Determination Date:	6/21/22

Color Key:	"*" = Enter data
Intermediate Calc.s	"--" = Will calculate
Calculation Results	

Facility Information					
1. Do I have dilution values from a mixing zone study? (Yes/No)					Yes
2. If answered "No" to Question 1, then fill in the following table					
Eff. Flow Rate	MGD	N/A	Calculated dilution Factors		
Stream Flow: Harmonic M	CFS	N/A	Dilution @ Harmonic Mean		N/A
Stream Flow: 30Q5	CFS	N/A	Dilution @ 30Q5		N/A
% dilution at MZ	%	25%			
3. If answered "Yes" to Question #1, then fill in dilution values			Dilution @ RMZ: harmonic mean flow		8.8
			Dilution @ RMZ: 30Q5 flow		6.1
4. Please enter statistical Confidence and Probablity values (note: defaults already entered)			Confidence Level	%	95%
			Probability Basis	%	95%
5. Is the water "fresh" or "salt"?			Fresh		

RPA Run Notes:Dilutions from 2019 update to 2008 mixing zone study. Outfall replaced in 2019. Ambient hardness from CWS 2020 stormwater annual report (Fernhill site). Effluent hardness is from year-round data.

			Identify Pollutants of Concern					In-Stream Conc.		Det. Reasonable Potential			
Pollutant Parameter	Evaluation Required?	Carcinogen Status	# of Sample	Effluent Conc.	Coefficent of Variation	Est. Max Eff. Conc.	RP at end of pipe?	Ambient Conc.	Max Total Conc. @ RMZ	WQ Crit: Water + Fish	WQ Crit: Fish	Is there Reasonable Potential to Exceed? (Yes/No)	
	(Yes/No)	(Yes/No)		(µg/l)	Default=0.6	(µg/l)	(Yes/No)	(µg/l)	(µg/l)	(µg/l)	(µg/l)	Water + Fish	Fish
Table 1 Effluent Parameters for all POTWs w/a Flow > 0.1 MGD													
Nitrates-Nitrite	Yes	n	496	16900	0.585822613	10558.23	Yes	376	2045.218	10000	na	NO	--
Table 2 Effluent Parameters for Selected POTWs													
Table 2: Metals (total recoverable), cyanide and total phenols											Use total recoverable data as surrogate.	No	
Antimony (total recoverable)	Yes	n	16	0.147	0.710390606	0.229019	No	*	--	5	64	--	--
Arsenic (total recoverable)	Yes	y	16	0.88024	0.307592029	No Human Health Water Quality Criteria							
Arsenic (total inorganic)	Yes	Y	--	--	--	--	Data	*	--	2	2.1	--	--
Copper (total recoverable)	Yes	N	33	16.3	0.392279334	18.14896	No	*	--	1300	na	--	--
Mercury (total)	Yes	N	RP is "Yes" if at least 4 mercury samples and 25% or more of samples are above the recommended QL. See methylmercury IMD										
Methyl Mercury	Yes	N	13	0.00012	0.683584779	0.0002	Yes	*	--	na	0.00014	--	--
Nickel (total recoverable)	Yes	N	16	11.7	0.436717154	15.6332	No	*	--	140	170	--	--
Selenium (total recoverable)	Yes	N	16	0.538	4	1.729202	No	*	--	120	420	--	--
Thallium (total recoverable)	Yes	N	16	0	0	0	No	*	--	0	0.047	--	--
Zinc (total recoverable)	Yes	N	29	78.6	0.491005587	92.59797	No	*	--	2100	2600	--	--
Cyanide (total)	Yes	N	16	0	0	0	No	*	--	130	130	--	--
Table 2: Volatile organic compounds													
Acrolein	Yes	N	4	0	0	0	No	*	--	1	0.93	--	--
Acrylonitrile	Yes	Y	4	0	0	0	No	*	--	0	0.025	--	--
Benzene	Yes	Y	4	0	0	0	No	*	--	0	1.4	--	--
Bromoform	Yes	y	4	0	0	0	No	*	--	3	14	--	--
Carbon Tetrachloride	Yes	Y	4	0	0	0	No	*	--	0	0.16	--	--
Chlorobenzene	Yes	N	4	0	0	0	No	*	--	74	160	--	--
Chlorodibromomethane	Yes	y	4	0	0	0	No	*	--	0	1.3	--	--
Chloroform	Yes	n	4	3.6	0.6	9.306975	No	*	--	260	1100	--	--
1,2-Dichlorobenzene (o)	Yes	n	4	0	0	0	No	*	--	110	130	--	--
1,3-Dichlorobenzene (m)	Yes	n	4	0	0	0	No	*	--	80	96	--	--
1,4-Dichlorobenzene (p)	Yes	n	4	0	0	0	No	*	--	16	19	--	--
Dichlorobromomethane	Yes	y	4	0	0	0	No	*	--	0	1.7	--	--
1,2-dichloroethane	Yes	y	4	0	0	0	No	*	--	0	3.7	--	--
1,2-trans-dichloroethylene	Yes	n	4	0	0	0	No	*	--	120	1000	--	--
1,1-dichloroethylene	Yes	n	4	0	0	0	No	*	--	230	710	--	--
1,2-dichloropropane	Yes	y	4	0	0	0	No	*	--	0	1.5	--	--
1,3-dichloropropene	Yes	y	4	0	0	0	No	*	--	0	2.1	--	--
Ethylbenzene	Yes	n	4	0	0	0	No	*	--	160	210	--	--
Methyl Bromide	Yes	n	4	0	0	0	No	*	--	37	150	--	--
Methylene Chloride	Yes	y	4	0	0	0	No	*	--	4	59	--	--
1,1,2,2-tetrachloroethane	Yes	y	4	0	0	0	No	*	--	0	0.40	--	--
Tetrachloroethylene	Yes	y	4	0	0	0	No	*	--	0	0.33	--	--
Toluene	Yes	n	4	0.76	0.6	1.964806	No	*	--	720	1500	--	--
1,1,2-trichloroethane	Yes	y	4	0	0	0	No	*	--	0	1.6	--	--
Trichloroethylene	Yes	y	4	0	0	0	No	*	--	1	3	--	--
Vinyl Chloride	Yes	y	4	0	0	0	No	*	--	0	0.24	--	--
Table 2: Acid-extractable compounds													
2-chlorophenol	Yes	n	3	0	0	0	No	*	--	14	15	--	--
2,4-dichlorophenol	Yes	n	3	0	0	0	No	*	--	23	29	--	--
2,4-dimethylphenol	Yes	n	3	0	0	0	No	*	--	76	85	--	--
4,6-dinitro-o-cresol	Yes	n	3	0	0	0	No	*	--	9	28	--	--
2,4-dinitrophenol	Yes	n	3	0	0	0	No	*	--	62	530	--	--
Pentachlorophenol	Yes	y	3	0	0	0	No	*	--	0	0.30	--	--
Phenol	Yes	n	3	0	0	0	No	*	--	9400	86000	--	--
2,4,5-trichlorophenol	Yes	n	3	0	0	0	No	*	--	330	360	--	--
2,4,6-trichlorophenol	Yes	y	3	0	0	0	No	*	--	0	0.24	--	--
Table 2: Base-neutral compounds													
Acenaphthene	Yes	n	3	0	0	0	No	*	--	95	99	--	--
Anthracene	Yes	n	3	0	0	0	No	*	--	2900	4000	--	--

Benzidine	Yes	y	2	0	0	0	No	*	--	0	0.00002	--	--
Benzo(a)anthracene	Yes	y	3	0	0	0	No	*	--	0	0.0018	--	--
Benzo(a)pyrene	Yes	y	3	0	0	0	No	*	--	0	0.0018	--	--
Benzo(b)fluoranthene	Yes	y	3	0	0	0	No	*	--	0	0.0018	--	--
Benzo(k)fluoranthene	Yes	y	3	0	0	0	No	*	--	0	0.0018	--	--
Bis(2-chloroethyl)ether	Yes	y	3	0	0	0	No	*	--	0	0.053	--	--
Bis (2-chloro-1-methylethyl) ether	Yes	n	--	--	--	--	Data	*	--	1200	6500	--	--
Chloromethyl Ether, bis	Yes	y	--	--	--	--	Data	*	--	0	0.000029	--	--
Bis (2-ethylhexyl)phthalate	Yes	y	4	0	0	0	No	*	--	0	0.22	--	--
Butylbenzyl phthalate	Yes	n	4	0	0	0	No	*	--	190	190	--	--
2-chloronaphthalene	Yes	n	3	0	0	0	No	*	--	150	160	--	--
Chrysene	Yes	y	3	0	0	0	No	*	--	0	0.0018	--	--
Di-n-butyl phthalate	Yes	n	4	0.86	0.6	2.223333	No	*	--	400	450	--	--
Dibenzo(a,h)anthracene	Yes	y	3	0	0	0	No	*	--	0	0.0018	--	--
3,3-Dichlorobenzidine	Yes	y	3	0	0	0	No	*	--	0	0.0028	--	--
Diethyl phthalate	Yes	n	4	0	0	0	No	*	--	3800	4400	--	--
Dimethyl phthalate	Yes	n	4	0	0	0	No	*	--	84000	110000	--	--
2,4-dinitrotoluene	Yes	y	3	0	0	0	No	*	--	0	0.34	--	--
1,2-diphenylhydrazine	Yes	y	--	--	--	--	Data	*	--	0	0.02	--	--
Fluoranthene	Yes	n	3	0	0	0	No	*	--	14	14	--	--
Fluorene	Yes	n	3	0	0	0	No	*	--	390	530	--	--
Hexachlorobenzene	Yes	n	3	0	0	0	No	*	--	0	0.000029	--	--
Hexachlorobutadiene	Yes	y	3	0	0	0	No	*	--	0	1.8	--	--
Hexachlorocyclopentadiene	Yes	n	3	0	0	0	No	*	--	30	110	--	--
Hexachloroethane	Yes	y	3	0	0	0	No	*	--	0	0.33	--	--
Indeno(1,2,3-cd)pyrene	Yes	y	3	0	0	0	No	*	--	0	0.0018	--	--
Isophorone	Yes	n	3	0	0	0	No	*	--	27	96	--	--
Nitrobenzene	Yes	n	3	0	0	0	No	*	--	14	69	--	--
N-nitrosodimethylamine	Yes	y	2	0	0	0	No	*	--	0	0.3	--	--
N-nitrosodi-n-propylamine	Yes	y	3	0	0	0	No	*	--	0	0.051	--	--
N-nitrosodiphenylamine	Yes	y	3	0	0	0	No	*	--	1	0.60	--	--
Pentachlorobenzene	Yes	n	3	0	0	0	No	*	--	0	0.15	--	--
Pyrene	Yes	n	3	0	0	0	No	*	--	290	400	--	--
1,2,4-trichlorobenzene	Yes	n	3	0	0	0	No	*	--	6	7	--	--
Tetrachlorobenzene,1,2,4,5	Yes	n	3	0	0	0	No	*	--	0	0.11	--	--
Table 3: Pesticides and PCBs													
Aldrin	Yes	y	--	--	--	--	Data	*	--	0	0.0000050	--	--
BHC-Technical	No	y	--	--	--	--	--	*	--	0	0.0015	--	--
BHC-alpha	Yes	y	--	--	--	--	Data	*	--	0	0.00049	--	--
BHC-beta	Yes	y	--	--	--	--	Data	*	--	0	0.0017	--	--
BHC-gamma (Lindane)	Yes	n	--	--	--	--	Data	*	--	0	0.18	--	--
Chlordane	Yes	y	--	--	--	--	Data	*	--	0	0.000081	--	--
DDD 4,4'	Yes	y	--	--	--	--	Data	*	--	0	0.000031	--	--
DDE 4,4'	Yes	y	--	--	--	--	Data	*	--	0	0.000022	--	--
DDT 4,4'	Yes	y	--	--	--	--	Data	*	--	0	0.000022	--	--
Dieldrin	Yes	y	--	--	--	--	Data	*	--	0	0.0000054	--	--
Endosulfan alpha	Yes	n	--	--	--	--	Data	*	--	9	8.9	--	--
Endosulfan beta	Yes	n	--	--	--	--	Data	*	--	9	8.9	--	--
Endosulfan Sulfate	Yes	n	--	--	--	--	Data	*	--	9	8.9	--	--
Endrin	Yes	n	--	--	--	--	Data	*	--	0	0.024	--	--
Endrin Aldehyde	Yes	n	--	--	--	--	Data	*	--	0	0.030	--	--
Heptachlor	Yes	y	--	--	--	--	Data	*	--	0	0.0000079	--	--
Heptachlor Epoxide	Yes	y	--	--	--	--	Data	*	--	0	0.0000039	--	--
Methoxychlor	Yes	n	--	--	--	--	Data	*	--	100	na	--	--
Toxaphene	Yes	y	--	--	--	--	Data	*	--	0	0.000028	--	--
Total PCBs (Sum of PCB Aroclors)	Yes	y	--	--	--	--	Data	*	--	0	0.0000064	--	--
Table3: Other parameters with state water quality criteria													
Barium (total recoverable)	TBD	n	--	--	--	--	--	*	--	1000	na	--	--
Manganese (total recoverable)	TBD	n	--	--	--	--	--	*	--	Withdrawn	100	--	--
2,4,5-TP [2-(2,4,5-Trichloro-phenoxy) propanoic acid]d	TBD	n	--	--	--	--	--	*	--	10	na	--	--
2,4-D (2,4-Dichlorophenoxy) acetic acid)	TBD	n	--	--	--	--	--	*	--	100	na	--	--
Dioxin 2,3,7,8-TCDD	TBD	y	--	--	--	--	--	*	--	0	5.1E-10	--	--
Nitrosamines	TBD	y	--	--	--	--	--	*	--	0	0.046	--	--
N-Nitrosodibutylamine	TBD	y	--	--	--	--	--	*	--	0	0.022	--	--
N-Nitrosodiethylamine	TBD	y	--	--	--	--	--	*	--	0	0.046	--	--
N-Nitrosopyrrolidine	TBD	y	--	--	--	--	--	*	--	0	3.4	--	--

Appendix G: Copper BLM Analysis Summary

Memo

Appendix G

Copper BLM Analysis – March 2022

Clean Water Services - Durham #101141, Forest Grove #101142, Hillsboro #101143, Rock Creek #101144

DEQ
State of Oregon
Department of Environmental Quality

Water Quality Permitting and Program Development
700 NE Multnomah St.
Suite 600
Portland, OR 97232
Phone: 503-229-5696
800-452-4011
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Contact: Jeff Navarro

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DEQ is a leader in restoring, maintaining and enhancing the quality of Oregon's air, land and water.

Background

Oregon's freshwater copper criterion became effective on January 9, 2017. As described in OAR 340-041-8033 (under Table 30, Endnote N), the freshwater copper criteria are based upon the Biotic Ligand Model (BLM), a metal bioavailability model, which calculates the acute and chronic copper criteria based on the concentrations of certain parameters in the water (see Table 1). Ideally, paired sets of measured input parameters would be used to determine the applicable criteria.

Table 1: Copper BLM Input Parameters

Parameter	Units
Dissolved Organic Carbon	mg/L
pH	S.U.
Temperature	°C
Calcium	mg/L
Magnesium	mg/L
Sodium	mg/L
Potassium	mg/L
Sulfate	mg/L
Chloride	mg/L
Alkalinity	mg/L

When calculating the copper criterion using the BLM methodology it's important to understand that the criterion is calculated based on ten input parameters. It's also important to understand how the input parameters influence the calculated criterion. DEQ conducted a statewide sensitivity analysis of the model and determined the model is most sensitive to dissolved organic carbon (DOC) and pH. The copper criterion becomes more stringent with lower DOC and pH values. For typical concentrations observed in Oregon's waters, the other parameters have minimal impact on the criteria but are needed to calculate it. The statement below is taken from DEQ's copper BLM technical support document.

> *For less-sensitive parameters, any errors introduced by the estimation of missing values for geochemical ions and alkalinity using either regional medians of existing data, or correlation to specific conductance data (see section VI.A.1) are unlikely to have a significant influence on the estimation of the distribution for instantaneous water quality criteria*[1].

Clean Water Services has four wastewater treatment plants that discharge to the Tualatin River. The location of the outfalls are included in Table 2. Clean Water Services routinely monitors the Tualatin River upstream and downstream from each outfall. The monitoring stations are also listed in Table 2. Effluent and receiving water data collected and analyzed by Clean Water Services was used for the analysis. Dilution values used for the analysis are included in each of the summary tables for each outfall.

Table 2: Outfall Locations and Tualatin R. Monitoring Sites

Outfall Locations	River Mile	Monitoring Sites	River Mile
Forest Grove (001A/B)	53.8	Tualatin River at Fernhill Rd	56.9
Hillsboro (001A) Hillsboro (001B)	43.3 42.9	Tualatin River at Hwy 219	45.0
Rock Creek	37.7	Tualatin River at Rood Bridge Rd	39.1
Durham	9.2	Tualatin River at Scholls	27.1
		Tualatin River at Jurgens Park	10.6
		Tualatin River at Boones Ferry Rd	8.7

[1] Technical Support Document: An Evaluation to Derive Statewide Copper Criteria Using the Biotic Ligand Model

Explanation of the results

Rock Creek

Monthly paired effluent and ambient copper BLM input data was available starting in June, 2016 through September, 2017. A total of 22 paired samples was used for the analysis. Additional non-paired effluent and ambient copper data beginning in 2015 was also used for the more conservative analysis discussed below. The Tualatin River data was collected at the Rood Bridge Rd station, less than ½ mile upstream from the outfall. Paired values were used to calculate the mixed concentration of each model input parameter at the edge of the ZID, mixing zone and at complete mix using the respective dilution value. The mixed concentration of each input parameter was then entered into the BLM model to calculate the instantaneous water quality criterion (IWQC) for each paired data set. Each IWQC was compared to the corresponding copper concentration calculated at the edge of the ZID, mixing zone and at complete mix. Table 3 shows the sample date, calculated criterion, calculated copper value, the 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 final column indicates whether there is reasonable potential, denoted by RP, to exceed the criterion. None of the copper concentrations exceeded their corresponding IWQCs. The maximum toxic unit was 0.3, well below the toxicity unit of 1.0.

Table 3: Rock Creek Paired Data Analysis

Rock Creek - Paired Analysis												
	ZID				Mixing Zone				100% Mix			
	CMC	Cu			CCC	Cu			CCC	Cu		
Date	ug/L	ug/L	Toxic Unit	RP?	ug/L	ug/L	Toxic Unit	RP?	ug/L	ug/L	Toxic Unit	RP?
6/13/2016	14.9	2.5	0.2	No RP	6.8	1.9	0.3	No RP	6.8	1.9	0.3	No RP
7/11/2016	14.7	2.0	0.1	No RP	6.7	1.5	0.2	No RP	6.6	1.5	0.2	No RP
8/15/2016	16.7	2.8	0.2	No RP	7.5	2.0	0.3	No RP	7.2	2.0	0.3	No RP
9/12/2016	13.5	3.4	0.3	No RP	6.1	2.4	0.4	No RP	5.9	2.3	0.4	No RP
10/3/2016	19.1	3.2	0.2	No RP	7.8	2.3	0.3	No RP	7.8	2.3	0.3	No RP
11/14/2016	19.1	4.0	0.2	No RP	7.7	2.9	0.4	No RP	7.7	2.8	0.4	No RP
12/13/2016	9.1	2.4	0.3	No RP	4.2	1.8	0.4	No RP	4.0	1.8	0.4	No RP
1/25/2017	9.3	1.8	0.2	No RP	3.8	1.4	0.4	No RP	3.8	1.4	0.4	No RP
2/6/2017	8.0	1.6	0.2	No RP	4.3	1.3	0.3	No RP	4.3	1.3	0.3	No RP
3/6/2017	16.5	2.0	0.1	No RP	6.5	1.5	0.2	No RP	6.5	1.5	0.2	No RP
4/17/2017	14.5	1.6	0.1	No RP	5.8	1.2	0.2	No RP	5.8	1.2	0.2	No RP
5/8/2017	12.7	2.3	0.2	No RP	5.2	1.7	0.3	No RP	5.2	1.7	0.3	No RP
6/5/2017	12.1	2.3	0.2	No RP	5.8	1.7	0.3	No RP	5.8	1.7	0.3	No RP
7/10/2017	13.3	2.8	0.2	No RP	6.0	2.0	0.3	No RP	6.0	2.0	0.3	No RP
8/7/2017	17.6	2.8	0.2	No RP	6.6	2.0	0.3	No RP	6.6	2.0	0.3	No RP
9/11/2017	17.8	3.0	0.2	No RP	6.8	2.1	0.3	No RP	6.6	2.1	0.3	No RP
10/16/2017	13.1	2.8	0.2	No RP	6.5	2.1	0.3	No RP	6.5	2.0	0.3	No RP
11/15/2017	12.3	3.2	0.3	No RP	6.1	2.4	0.4	No RP	6.1	2.3	0.4	No RP
12/6/2017	10.5	2.7	0.3	No RP	5.0	2.0	0.4	No RP	4.9	2.0	0.4	No RP
1/8/2018	10.1	2.5	0.2	No RP	4.5	1.9	0.4	No RP	4.5	1.8	0.4	No RP
2/6/2018	12.0	2.8	0.2	No RP	5.5	2.0	0.4	No RP	5.3	2.0	0.4	No RP
3/6/2018	12.0	2.4	0.2	No RP	5.2	1.7	0.3	No RP	5.2	1.7	0.3	No RP
ZID Dilution = 1.3, RMZ Dilution = 2.2, 100% Mix Dilution = 2.2												

Durham

Monthly paired effluent and ambient copper BLM input data was available starting in June, 2016 through September 2017. A total of 22 paired samples was used for the analysis. Additional non-paired effluent and ambient copper data beginning in 2015 was also used for the more conservative analysis discussed below. The Tualatin River data was collected at the Jurgens Park station, less than 1 ½ miles upstream from the outfall. Paired values were used to calculate the mixed concentration of each model input parameter at the edge of the ZID, mixing zone and at complete mix using the respective dilution value. The mixed concentration of each input parameter was then entered into the BLM model to calculate the instantaneous water quality criterion (IWQC) for each paired data set. Each IWQC was compared to the corresponding copper concentration calculated at the edge of the ZID, mixing zone and at complete mix. Table 4 shows the sample date, calculated criterion, calculated copper value, the 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 final column indicates whether there is reasonable potential, denoted by RP, to exceed the criterion. None of the copper concentrations exceeded their corresponding IWQCs. The maximum toxic unit was 0.4, well below the toxicity unit of 1.0.

Table 4: Durham Paired Data Analysis

Durham - Paired Analysis

	ZID				Mixing Zone				100% Mix			
	CMC	Cu			CCC	Cu			CCC	Cu		
Date	ug/L	ug/L	Toxic Unit	RP?	ug/L	ug/L	Toxic Unit	RP?	ug/L	ug/L	Toxic Unit	RP?
6/14/2016	13.8	2.2	0.2	No RP	6.8	2.0	0.3	No RP	6.8	2.0	0.3	No RP
7/12/2016	12.7	1.7	0.1	No RP	6.1	1.7	0.3	No RP	6.1	1.7	0.3	No RP
8/16/2016	13.6	2.1	0.2	No RP	7.3	1.9	0.3	No RP	7.3	1.9	0.3	No RP
9/13/2016	14.9	2.2	0.1	No RP	7.1	2.0	0.3	No RP	7.1	2.0	0.3	No RP
10/4/2016	16.8	2.2	0.1	No RP	7.2	2.1	0.3	No RP	7.2	2.1	0.3	No RP
11/15/2016	13.4	2.1	0.2	No RP	6.2	1.7	0.3	No RP	6.2	1.7	0.3	No RP
12/14/2016	8.6	1.7	0.2	No RP	3.8	1.4	0.4	No RP	3.8	1.4	0.4	No RP
1/26/2017	8.5	1.5	0.2	No RP	3.4	1.1	0.3	No RP	3.4	1.1	0.3	No RP
2/7/2017	5.3	1.5	0.3	No RP	3.2	1.3	0.4	No RP	3.2	1.3	0.4	No RP
3/7/2017	9.2	1.4	0.2	No RP	3.8	1.0	0.3	No RP	3.8	1.0	0.3	No RP
4/18/2017	12.1	1.8	0.1	No RP	4.5	1.3	0.3	No RP	4.5	1.3	0.3	No RP
5/9/2017	11.5	1.2	0.1	No RP	5.8	1.0	0.2	No RP	5.8	1.0	0.2	No RP
6/6/2017	9.2	2.0	0.2	No RP	4.3	1.5	0.4	No RP	4.3	1.5	0.4	No RP
7/11/2017	14.8	2.1	0.1	No RP	6.4	1.8	0.3	No RP	6.4	1.8	0.3	No RP
8/8/2017	11.3	1.9	0.2	No RP	5.3	1.8	0.3	No RP	5.3	1.8	0.3	No RP
9/12/2017	8.7	1.8	0.2	No RP	4.2	1.7	0.4	No RP	4.2	1.7	0.4	No RP
10/17/2017	19.7	2.0	0.1	No RP	9.8	1.8	0.2	No RP	9.8	1.8	0.2	No RP
11/14/2017	14.5	1.8	0.1	No RP	8.6	1.6	0.2	No RP	8.6	1.6	0.2	No RP
12/5/2017	10.1	1.6	0.2	No RP	5.3	1.3	0.2	No RP	5.3	1.3	0.2	No RP
1/9/2018	11.2	1.8	0.2	No RP	5.5	1.4	0.3	No RP	5.5	1.4	0.3	No RP
2/5/2018	8.7	1.7	0.2	No RP	3.2	1.3	0.4	No RP	3.2	1.3	0.4	No RP
3/5/2018	14.9	1.9	0.1	No RP	6.1	1.3	0.2	No RP	6.1	1.3	0.2	No RP

ZID Dilution = 2.6, RMZ Dilution = 5.7, 100% Mix Dilution = 5.7

Hillsboro

Hillsboro has two outfalls with each achieving the same dilution. Outfall 001A is upstream from outfall 001B. I conducted an analysis for each outfall. Twenty-one paired samples were available from various discharge months starting in 2013 through 2017. The Tualatin River data was collected at the Highway 219 station, less than one quarter of a mile upstream from the outfall. This data was used for the outfall 001A analysis. Paired values were used to calculate the mixed concentration of each model input parameter at the edge of the ZID, mixing zone and at complete mix using the respective dilution value. The mixed concentration of each input parameter was then entered into the BLM model to calculate the instantaneous water quality criterion (IWQC) for each paired data set. Each IWQC was compared to the corresponding copper concentration calculated at the edge of the ZID, mixing zone and at complete mix. Table 5 shows the sample date, calculated criterion, calculated copper value, the 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 final column indicates whether there is reasonable potential, denoted by RP, to exceed the criterion. None of the copper concentrations exceeded their corresponding IWQCs. Some values were close to the toxic unit of 1.0 and this warrants additional monitoring during the next permit cycle.

Table 5: Hillsboro Paired Data Analysis

Hillsboro 001A - Paired Analysis												
	ZID				Mixing Zone				100% Mix			
	CMC	Cu			CCC	Cu			CCC	Cu		
Date	ug/L	ug/L	Toxic Unit	RP?	ug/L	ug/L	Toxic Unit	RP?	ug/L	ug/L	Toxic Unit	RP?
3/6/2012	3.1	2.1	0.7	No RP	1.7	1.0	0.6	No RP	1.8	0.8	0.4	No RP
4/10/2012	3.5	1.7	0.5	No RP	1.6	1.0	0.6	No RP	1.4	0.9	0.7	No RP
11/27/2012	2.7	2.3	0.9	No RP	1.5	1.4	0.9	No RP	1.7	1.2	0.7	No RP
3/6/2013	6.7	2.1	0.3	No RP	2.7	1.1	0.4	No RP	2.4	0.9	0.4	No RP
12/3/2013	6.5	NA	NA	NA	3.2	NA	NA	NA	2.7	NA	NA	NA
2/25/2014	4.3	1.4	0.3	No RP	1.5	0.8	0.5	No RP	1.3	0.7	0.5	No RP
5/5/2015	5.7	1.6	0.3	No RP	3.1	0.9	0.3	No RP	3.0	0.7	0.2	No RP
2/9/2016	5.0	1.0	0.2	No RP	1.5	0.7	0.5	No RP	1.3	0.7	0.5	No RP
11/14/2016	7.3	2.0	0.3	No RP	3.4	1.2	0.4	No RP	3.0	1.0	0.3	No RP
12/13/2016	3.2	1.6	0.5	No RP	1.9	1.3	0.7	No RP	2.2	1.3	0.6	No RP
1/25/2017	2.9	1.2	0.4	No RP	1.7	0.9	0.5	No RP	1.9	0.9	0.5	No RP
2/6/2017	4.2	1.7	0.4	No RP	2.7	1.1	0.4	No RP	2.6	1.0	0.4	No RP
3/6/2017	3.8	1.1	0.3	No RP	2.1	0.8	0.4	No RP	1.9	0.7	0.4	No RP
4/17/2017	4.2	1.4	0.3	No RP	2.3	0.9	0.4	No RP	2.1	0.8	0.4	No RP
5/8/2017	4.0	1.7	0.4	No RP	2.4	0.9	0.4	No RP	2.5	0.8	0.3	No RP
6/5/2017	6.6	2.5	0.4	No RP	3.1	1.1	0.4	No RP	3.2	0.9	0.3	No RP
11/15/2017	8.8	1.4	0.2	No RP	4.2	1.2	0.3	No RP	3.9	1.1	0.3	No RP
12/6/2017	6.5	1.8	0.3	No RP	3.1	1.5	0.5	No RP	2.7	1.4	0.5	No RP
1/8/2018	6.0	1.5	0.3	No RP	3.6	1.2	0.3	No RP	3.6	1.1	0.3	No RP
2/6/2018	5.0	2.2	0.4	No RP	2.6	1.2	0.5	No RP	2.2	1.0	0.4	No RP
3/6/2018	5.3	1.3	0.2	No RP	2.2	0.8	0.4	No RP	2.2	0.7	0.3	No RP
4/9/2018	4.3	1.2	0.3	No RP	2.2	1.0	0.4	No RP	2.0	0.9	0.5	No RP
5/1/2018	5.9	2.4	0.4	No RP	2.3	1.1	0.5	No RP	2.0	0.9	0.5	No RP
ZID Dilution = 3.5, RMZ Dilution = 15.7, 100% Mix Dilution = 61												

The same methodology was used for outfall 001B with one exception. The 100 percent mixed concentrations from the 001A analysis were used as the background data. The results of the analysis are shown in Table 6. The results are very similar with no reasonable potential to exceed the criterion.

Table 6: Hillsboro Outfall 001B Paired Analysis

Hillsboro 001B - Paired Analysis												
	ZID				Mixing Zone				100% Mix			
Date	CMC ug/L	Cu ug/L	Toxic Unit	RP?	CCC ug/L	Cu ug/L	Toxic Unit	RP?	CCC ug/L	Cu ug/L	Toxic Unit	RP?
3/6/2012	3.3	2.3	0.7	No RP	1.6	1.2	0.8	No RP	1.6	0.9	0.5	No RP
4/10/2012	3.7	1.8	0.5	No RP	1.7	1.1	0.7	No RP	1.5	0.9	0.6	No RP
11/27/2012	2.8	2.4	0.9	No RP	1.6	1.5	0.9	No RP	1.8	1.3	0.7	No RP
3/6/2013	6.2	2.2	0.4	No RP	2.9	1.3	0.5	No RP	2.5	1.0	0.4	No RP
12/3/2013	7.0	NA	NA	NA	3.0	NA	NA	NA	3.0	NA	NA	NA
2/25/2014	4.6	1.5	0.3	No RP	1.7	0.9	0.5	No RP	1.4	0.8	0.6	No RP
5/5/2015	5.2	1.8	0.3	No RP	3.0	1.0	0.3	No RP	3.3	0.8	0.2	No RP
2/9/2016	5.2	1.1	0.2	No RP	1.7	0.8	0.5	No RP	1.4	0.7	0.5	No RP
11/14/2016	8.7	2.2	0.3	No RP	3.7	1.3	0.3	No RP	3.2	1.1	0.3	No RP
12/13/2016	3.4	1.7	0.5	No RP	2.0	1.4	0.7	No RP	2.2	1.3	0.6	No RP
1/25/2017	3.1	1.2	0.4	No RP	1.8	1.0	0.5	No RP	1.7	0.9	0.5	No RP
2/6/2017	4.2	1.8	0.4	No RP	2.7	1.2	0.4	No RP	2.7	1.0	0.4	No RP
3/6/2017	4.0	1.1	0.3	No RP	2.0	0.8	0.4	No RP	2.1	0.8	0.4	No RP
4/17/2017	3.8	1.5	0.4	No RP	2.1	1.0	0.5	No RP	2.3	0.8	0.4	No RP
5/8/2017	4.3	1.8	0.4	No RP	2.5	1.0	0.4	No RP	2.3	0.9	0.4	No RP
6/5/2017	7.1	2.7	0.4	No RP	3.4	1.3	0.4	No RP	2.9	1.0	0.3	No RP
11/15/2017	9.1	1.4	0.2	No RP	4.4	1.2	0.3	No RP	4.1	1.1	0.3	No RP
12/6/2017	7.0	1.8	0.3	No RP	3.3	1.5	0.5	No RP	2.9	1.4	0.5	No RP
1/8/2018	4.8	1.5	0.3	No RP	2.9	1.2	0.4	No RP	3.3	1.1	0.3	No RP
2/6/2018	6.9	2.3	0.3	No RP	2.7	1.4	0.5	No RP	2.4	1.1	0.5	No RP
3/6/2018	7.6	1.4	0.2	No RP	2.8	0.9	0.3	No RP	2.4	0.8	0.3	No RP
4/9/2018	4.5	1.3	0.3	No RP	2.2	1.0	0.4	No RP	2.1	1.0	0.5	No RP
5/1/2018	6.3	2.6	0.4	No RP	2.5	1.3	0.5	No RP	2.1	1.0	0.5	No RP
ZID Dilution = 3.5, RMZ Dilution = 15.7, 100% Mix Dilution = 61												

Forest Grove

Historically, Forest Grove only discharged during the high flow period as defined in the permit as November 1 or November 15 depending on river flows. The existing permit now allows a summer-time discharge through the natural treatment system. Clean Water Services collected monthly paired data starting in February 2016. Effluent samples were not collected during summer periods when Forest Grove was not discharging. The Tualatin River data was collected at the Fernhill Rd station, less than one quarter of a mile upstream from the outfall. Nineteen paired values were used to calculate the concentration of each input parameter at the edge of the ZID, mixing zone and at complete mix using the respective summer and winter dilution values in Table 7. The mixed concentration of each input parameter was then entered into the BLM model to calculate the instantaneous water quality criterion (IWQC) for each paired data set. Each IWQC was compared to the corresponding copper concentration calculated at the edge of the ZID, mixing zone and at complete mix. Table 7 contains the results of the analysis which shows the calculated criterion, the calculated copper concentration and the associated toxic unit at the edge of the ZID, mixing zone and at 100 percent mixing. A toxic unit greater than one indicates the criterion is exceeded. The final column indicates whether there is reasonable potential, denoted by RP, to exceed the criterion. None of the copper concentrations exceeded their corresponding IWQCs. The maximum toxic unit was 0.9 and there is no reasonable potential for the discharge to violate the copper criterion.

Table 7: Forest Grove Outfall 001 Paired Data Analysis

Forest Grove - Paired Analysis												
	ZID				Mixing Zone				100% Mix			
	CMC	Cu			CCC	Cu			CCC	Cu		
Date	ug/L	ug/L	Toxic Unit	RP?	ug/L	ug/L	Toxic Unit	RP?	ug/L	ug/L	Toxic Unit	RP?
2/9/2016	4.2	3.9	0.9	No RP	1.8	1.5	0.8	No RP	1.9	1.1	0.6	No RP
3/1/2016	4.3	1.7	0.4	No RP	1.8	1.1	0.6	No RP	1.6	0.9	0.6	No RP
6/13/2016	19.1	3.5	0.2	No RP	6.5	1.7	0.3	No RP	5.2	1.4	0.3	No RP
12/13/2016	4.3	2.6	0.6	No RP	1.8	1.3	0.7	No RP	1.7	1.1	0.6	No RP
1/25/2017	5.7	4.9	0.9	No RP	2.0	1.8	0.9	No RP	1.7	1.4	0.8	No RP
2/6/2017	3.2	1.8	0.6	No RP	2.1	1.1	0.5	No RP	2.1	1.0	0.5	No RP
3/6/2017	4.4	3.1	0.7	No RP	2.1	1.4	0.7	No RP	2.2	1.2	0.5	No RP
4/17/2017	5.1	2.7	0.5	No RP	2.1	1.3	0.6	No RP	2.3	1.1	0.5	No RP
5/8/2017	9.6	2.8	0.3	No RP	3.7	1.5	0.4	No RP	3.3	1.3	0.4	No RP
6/5/2017	11.2	2.9	0.3	No RP	3.7	1.5	0.4	No RP	3.5	1.3	0.4	No RP
7/10/2017	12.9	1.3	0.1	No RP	4.3	0.9	0.2	No RP	3.6	0.9	0.3	No RP
9/20/2017	19.9	2.3	0.1	No RP	5.5	1.4	0.3	No RP	4.8	1.2	0.3	No RP
11/15/2017	7.4	4.0	0.5	No RP	3.4	1.8	0.5	No RP	3.5	1.4	0.4	No RP
12/6/2017	6.4	2.8	0.4	No RP	2.4	1.3	0.5	No RP	2.6	1.1	0.4	No RP
1/8/2018	4.6	2.9	0.6	No RP	1.8	1.4	0.8	No RP	1.6	1.1	0.7	No RP
2/6/2018	6.5	5.2	0.8	No RP	2.2	1.9	0.9	No RP	2.1	1.4	0.7	No RP
3/6/2018	6.1	3.6	0.6	No RP	2.4	1.4	0.6	No RP	2.5	1.1	0.4	No RP
5/1/2018	10.4	5.6	0.5	No RP	3.2	2.5	0.8	No RP	2.6	2.0	0.8	No RP
5/9/2018	10.4	1.8	0.2	No RP	3.0	1.1	0.4	No RP	2.7	1.0	0.4	No RP
Winter: ZID Dilution = 2.1, RMZ Dilution = 7.7, 100% Mix Dilution = 13.2												
Summer: ZID Dilution = 1.8, RMZ Dilution = 5.4, 100% Mix Dilution = 6.7												

Tualatin River Analysis

Clean Water Services collects BLM input parameters at six locations along the Tualatin River as summarized in Table 2. One station is upstream of all of the outfalls, one station is downstream of all of the outfalls and the remaining four are spread out throughout the river primarily targeting areas just upstream of a treatment plant outfall. Table 8 provides a summary of this data for each station. The table displays the calculated chronic criterion (also referred to as the criteria continuous concentration or CCC), the measured copper concentration (Cu) and the calculated toxic unit (TU). The criteria and copper concentrations are in units of ug/L. This data shows that the highest toxic unit at all of the station is 0.6, demonstrating there are no copper violations at any point along the Tualatin River. Even though all of these sampling points are after complete mixing occurs, there are times during the low stream flow months where the effluent from these treatment plants make up a significant portion of the river flow. So this analysis provides additional evidence that these discharges are not demonstrating copper toxicity after full mix with the river.

Table 8: Tualatin River BLM Analysis Results

Tualatin River Analysis																		
	Fernhill			HWY 219			Rood			Scholls			Jurgens			Boones		
Date	CCC	Cu	TU	CCC	Cu	TU	CCC	Cu	TU	CCC	Cu	TU	CCC	Cu	TU	CCC	Cu	TU
6/13/2016	2.7	0.7	0.3	2.755	0.7	0.3	3.6	1.0	0.3	5.8	1.3	0.2	5.1	1.9	0.4	5.8	1.8	0.3
7/11/2016	2.9	0.7	0.2	3.9	0.7	0.2	3.6	0.7	0.2	7.3	1.4	0.2	4.6	1.6	0.3	5.1	1.6	0.3
8/15/2016	2.3	0.8	0.3	3.037	0.9	0.3	2.6	0.9	0.3	6.3	1.8	0.3	5.5	1.7	0.3	5.2	1.6	0.3
9/12/2016	2.6	0.8	0.3	3.106	0.9	0.3	3.1	0.9	0.3	6.2	2.1	0.3	5.9	1.9	0.3	6.2	1.9	0.3
10/3/2016	3.2	0.8	0.3	5.088	0.9	0.2	4.0	1.1	0.3	7.6	1.8	0.2	5.9	2.0	0.3	5.9	2.0	0.3
11/14/2016	2.4	1.1	0.4	2.941	1.0	0.3	3.0	1.2	0.4	4.2	1.4	0.3	4.4	1.4	0.3	4.4	1.6	0.4
12/13/2016	1.7	0.8	0.5	2.076	1.3	0.6	2.0	1.0	0.5	2.9	1.2	0.4	2.4	1.1	0.5	2.4	1.4	0.6
1/25/2017	1.6	0.7	0.4	1.852	0.9	0.5	2.1	0.8	0.4	2.3	0.9	0.4	2.5	0.8	0.3	2.3	0.9	0.4
2/6/2017	2.3	0.9	0.4	2.698	0.9	0.3	3.3	1.0	0.3	4.4	1.2	0.3	3.3	1.2	0.4	3.4	1.3	0.4
3/6/2017	2.3	0.8	0.4	2.062	0.7	0.3	2.1	0.8	0.4	2.6	0.8	0.3	2.2	0.8	0.4	2.2	0.9	0.4
4/17/2017	2.1	0.8	0.4	2.212	0.8	0.3	2.1	0.6	0.3	2.3	0.8	0.3	2.5	0.9	0.3	2.2	1.0	0.4
5/8/2017	2.4	0.7	0.3	2.348	0.7	0.3	2.0	0.8	0.4	2.6	0.9	0.3	4.5	0.9	0.2	4.0	1.0	0.2
6/5/2017	2.2	0.7	0.3	2.877	0.8	0.3	3.1	0.8	0.3	4.3	1.2	0.3	3.3	1.1	0.3	4.0	1.2	0.3
7/10/2017	2.3	0.7	0.3	2.844	0.7	0.3	3.0	0.7	0.2	4.7	1.5	0.3	4.2	1.6	0.4	4.9	1.7	0.3
8/30/2017	1.9	0.6	0.3	2.587	0.7	0.3	2.4	0.8	0.3	5.4	1.7	0.3	3.7	1.7	0.5	4.1	1.8	0.4
9/20/2017	2.7	0.9	0.3	4.381	1.0	0.2	3.2	0.8	0.2	6.4	1.8	0.3	2.9	1.6	0.6	4.2	1.7	0.4
10/16/2017	2.2	0.7	0.3	3.047	0.7	0.2	3.5	1.1	0.3	7.6	1.5	0.2	6.9	1.6	0.2	7.6	1.7	0.2
11/15/2017	3.3	1.0	0.3	3.985	1.1	0.3	4.0	1.1	0.3	4.8	1.5	0.3	8.0	1.4	0.2	7.1	1.5	0.2
12/6/2017	2.1	0.8	0.4	2.658	1.4	0.5	2.5	1.0	0.4	3.3	1.1	0.3	4.4	1.1	0.3	5.6	1.1	0.2
1/8/2018	1.3	0.8	0.6	3.915	1.1	0.3	1.7	0.9	0.5	1.9	1.0	0.5	3.5	1.0	0.3	3.8	1.1	0.3
2/6/2018	1.7	0.6	0.4	2.272	1.0	0.4	1.9	0.8	0.4	2.3	0.9	0.4	1.8	0.9	0.5	2.1	0.9	0.4
3/6/2018	2.1	0.6	0.3	2.06	0.7	0.3	2.0	0.6	0.3	2.5	0.7	0.3	2.6	0.7	0.3	2.8	0.8	0.3

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Appendix H: Regulatory Summary for Defining Trading Baseline

CleanWater Services

MEMORANDUM

Date: **April 19, 2017**

To: **Kurt Unger, Oregon DEQ**

From: **Jamie Hughes, Clean Water Services**
Raj Kapur, Clean Water Services

Copies: **Mark Hynson, Oregon DEQ**
Courtney Brown, Oregon DEQ

Subject: **Regulatory Requirements for Defining Trading Baseline**

Background

As part of its watershed-based NPDES permit (permit), Clean Water Services (District) implements a water quality trading program for temperature where credits generated from flow enhancement and riparian planting activities are used to offset the thermal load from the District's wastewater treatment facilities (WWTFs). In December 2015, DEQ adopted rules for Water Quality Trading (Oregon Administrative Rule (OAR) 340-039) which included requirements for trading baseline. Subsequently, DEQ updated the water quality trading permit condition in the District's permit to reflect key elements from the rules.

Schedule D.10.c.ii of the District's permit includes the following condition regarding trading baseline:

ii. Trading Baseline – The permittee shall verify that project sites comply with the regulatory requirements described in OAR 340-039-0030(1). Regulatory requirements that must be met to comply with the trading baseline include OAR 629-635 through OAR 629-660 (Forest Practices Act), OAR 603-95 (ODA local water quality management rules), and the permittee's Design and Construction Standards (Clean Water Services Resolution & Order 07-20). Only project sites that are in compliance with baseline regulatory requirements will be considered for the riparian shade program.

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This memorandum identifies the specific regulatory requirements that apply to riparian areas in the Tualatin watershed. This information is used by the District to determine baseline conditions for riparian planting projects enrolled in the water quality credit trading program.

Projects in Agricultural Areas

For riparian planting projects that are conducted in agricultural areas, local water quality management rules developed by the Oregon Department of Agriculture (ODA) (OAR 603-95 also known as Senate Bill (SB) 1010) were identified as the regulatory requirements that apply.[1] OAR 603-95-0140(2)(b) includes non-disturbance criteria for streamside riparian areas as shown in the excerpt from the OARs for the Tualatin River Subbasin below:

Tualatin River Subbasin

603-095-0100

Purpose

(1) These rules have been developed to help implement a water quality management area plan for the Tualatin River Watershed Agricultural Water Quality Management Area pursuant to authorities vested in the Oregon Department of Agriculture (department) through ORS 568.900-568.933 and 561.190-561.191. The plan is known as the Tualatin River Watershed Agricultural Water Quality Management Area Plan.

(2) The purpose of these rules is to provide requirements for landowners and operators (as defined in ORS 568.903) in the Tualatin River Watershed Agricultural Water Quality Management Area to prevent and control water pollution from agricultural activities and soil erosion and to meet water quality standards.

Stat. Auth.: ORS 561.190 - 561.561.191 & 568.912
Stats. Implemented: ORS 568.900 - 568.933
Hist.: AD 3-1996, f. & cert. ef. 4-9-96; DOA 4-2015, f. & cert. ef. 1-29-15

603-095-0120

Geographic and Programmatic Scope

(1) The Tualatin River Watershed Agricultural Water Quality Management Area includes the drainage area of the Tualatin River upstream from the confluence with the Willamette River near West Linn. The physical boundaries of the Tualatin River Watershed are mapped in Appendix A of these rules.

(2) Operational boundaries for the land base under the purview of these rules include all lands within the Tualatin River Watershed Agricultural Water Quality Management Area in agricultural use, agricultural and rural lands lying idle or on which management has been deferred, and forested lands with agricultural activities, except for public lands managed by federal agencies, Tribal Trust lands, and activities subject to the Oregon Forest Practices Act (ORS Chapter 527).

(3) Current productive agricultural use or profitability is not required for the provisions of these rules to apply.

(4) For lands in agricultural use within other Designated Management Agencies' or state agency jurisdictions, the department and the appropriate Local Management Agency will work with these Designated Management Agencies to assure that provisions of these rules apply and that any services or fees are not duplicated.

[ED. NOTE: Appendices referenced are available from the agency.]

Stat. Auth.: ORS 561.190 - 561.191 & 568.912
Stats. Implemented: ORS 568.900 - 568.933
Hist.: AD 3-1996, f. & cert. ef. 4-9-96; DOA 4-2015, f. & cert. ef. 1-29-15

[1] http://arcweb.sos.state.or.us/pages/rules/oars_600/oar_603/603_095.html

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Requirements

All landowners or operators conducting activities on lands described in OAR 603-095-0120(2) and (3) must comply with the following rules: A landowner or operator is responsible for only those conditions caused by activities conducted on land managed by the landowner or operator. These rules do not apply to conditions resulting from unusual weather events or other exceptional circumstances that could not have been reasonably anticipated.

(1) Erosion:

(a) There must be no visible evidence of erosion resulting from agricultural activities in a location where the eroded sediment could enter waters of the state.

(b) Visible evidence of erosion consists of one or more of the following features:

(A) Sheet wash, noted by visible pedestalling, surface undulations, and/or flute marks on bare or sparsely-vegetated ground; or

(B) Active gullies, as described in OAR 603-095-0010(1); or

(C) Multiple rills, which have the form of gullies but are smaller in cross section than one square foot; or

(D) Soil deposition that could enter surface water; or

(E) Streambanks breaking down, eroding, tension-cracking, shearing, or slumping beyond the level that would be anticipated from natural disturbances given natural hydrologic characteristics; or

(F) Underground drainage tile outlets that contribute to soil or bank erosion.

(c) Private roads used for agricultural activities, including road surfaces, fill, ditch lines, and associated structures, must not contribute sediment to waters of the state. All private roads used for agricultural activities not subject to the Oregon Forest Practices Act are subject to this regulation.

(2) Streamside Vegetation:

(a) Landowners or operators must allow vegetation, consistent with site capability, to become established along perennial and intermittent streams to protect water quality by providing shade, filtering out pollutants from surface runoff, and protecting streambank integrity during high stream flows, such as would be expected to follow a 25-year, 24-hour storm.

(b) If any agricultural activity disturbs enough streamside vegetation to impair the conditions and functions described in 603-095-0140(2)(a), the landowner or operator must replant or restore the disturbed area with vegetation that will provide the functions required in 603-095-0140(2)(a).

(c) Agricultural activities are allowed if they do not impair the conditions and functions described in 603-095-0140(2)(a).

(3) Irrigation Water: Irrigation discharge, both surface and subsurface, that enters waters of the state must not exceed water quality standards or cause pollution of the receiving water.

(4) Nutrient Management: Landowners and operators must store and use feed, fertilizer, manure, and other sources of crop nutrients in a manner that prevents transport of pollutants to waters of the state.

(5) Waste: Persons subject to these rules must not violate any provision of ORS 468B.025 or 468B.050.

Stat. Auth.: ORS 561.190 - 561.191 & 568.912
Stats. Implemented: ORS 568.900 - 568.933
Hist.: AD 3-1996, f. & cert. ef. 4-9-96; DOA 3-2004, f. & cert. ef. 1-23-04; DOA 4-2015, f. & cert. ef. 1-29-15

The ODA is responsible for developing water quality management plans for agricultural areas that ensure agricultural activities help achieve water quality standards. The Tualatin River Watershed Agricultural Water Quality Management Plan was updated in 2016 and is codified in OAR 603-095-0100.

The Tualatin Soil and Water Conservation District (TSWCD), with the support of local partners, implements the Agricultural Water Quality Management Plan as a local management agency for the ODA. The TSWCD provides technical, financial and educational assistance to landowners, as resources allow, for design and installation of management strategies that prevent and control agricultural water pollution. The District contracts with the TSWCD to provide incentives for enrolling landowners in an enhanced version of the U.S. Department of Agriculture's Conservation Reserve Enhancement Program and Vegetated Buffer Areas for Conservation program. With regards to streamside vegetation requirements, the Tualatin River Watershed Agricultural Water Quality Management Plan states that the following conditions are indicators of non-compliance:

- Active streambank erosion in conjunction with tillage, grazing, or destruction of vegetation by the landowner or occupier.
- Removal or destruction of vegetation that impedes the goals of shading water, stabilizing banks, and filtering pollutants in runoff during high rainfall.

As part of the program implementation, the TSWCD screens each applicant to determine if the property is under an enforcement action based on the conditions specified in the Tualatin River Watershed Agricultural Water Quality Management Plan. If there are no unresolved enforcement actions, the property is deemed to be in compliance with the Tualatin River Watershed Agricultural Water Quality Management Plan; only projects that are in compliance with the Tualatin River Watershed Agricultural Water Quality Management Plan are enrolled in the program. For these projects, the District uses existing vegetation to define baseline conditions for determining thermal credit based on the non-disturbance criteria for streamside vegetation.

Projects in Urban Areas

Clean Water Services Design and Construction Standards

For riparian planting projects conducted in urban areas, the District's Design and Construction (D&C) standards (Clean Water Services Resolution & Order 07-20) apply to all active construction sites and to all construction project sites undertaken since the mid-1990's.[2]

Chapter 3.0 of the District's D&C standards (Sensitive Areas and Vegetated Corridors) requires the enhancement and maintenance of the vegetated stream corridor and states specific requirements for this work. An excerpt from section 3.06 of the D&C standards lists the requirements for enhancement of the vegetated corridor during development activities.

[2] http://cleanwaterservices.org/media/1462/design-and-construction-standards-2007.pdf

3.06.2	Required Vegetated Corridor Enhancement

The applicant shall enhance the Vegetated Corridor in accordance with the following requirements:

a. For Vegetated Corridors up to 50 feet wide the applicant shall enhance the entire corridor to meet or exceed good corridor condition as defined in Section 3.14.2, Table 3-3.

b. For Vegetated Corridors greater than 50 feet in width, the applicant shall enhance the first 50 feet closest to the Sensitive Area to meet or exceed good corridor condition as defined in Section 3.14.2, Table 3-3.

c. Enhancement shall be accomplished in accordance with Section 3.14.2, Table 3-3.

The District does not enroll projects for thermal credit in urban areas where riparian enhancement and maintenance is required by the D&C standards.

City Regulations and Statewide Planning Goal 5

For areas where the D&C standards do not apply, the District determines whether City or other agency regulations regarding riparian maintenance or enhancement in natural resource areas apply to the riparian planting projects. The cities' regulations for natural resource areas are based on the implementation of Oregon's Statewide Planning Goal 5.

Oregon's statewide program for land-use planning includes the development of 19 statewide planning goals. Goal 5 of the statewide planning goals aims to protect natural resources and conserve scenic and historic areas and open spaces.[3] To address Goal 5, eight cities (Beaverton, Cornelius, Durham, Forest Grove, Hillsboro, Sherwood, Tigard and Tualatin) and Washington County agreed to work with Metro, Tualatin Hills Parks and Recreation District and the District to meet federal, state and regional requirements for protecting riparian corridors and wildlife habitat in the Tualatin Basin.[4,5]

[3] http://www.oregon.gov/lcd/docs/goals/compilation_of_statewide_planning_goals.pdf

[4] Although not listed, King City and the City of North Plains also adopted and implement Statewide Planning Goal 5

[5] http://www.co.washington.or.us/LUT/Divisions/LongRangePlanning/Publications/upload/TBSC-Final-Report_01207.pdf

Subsequently, Metro developed a regional Nature in Neighborhoods program, also referred to as Title 13 of Metro's Urban Growth Management Functional Plan[6], which included provisions for providing tools designed to reduce the environmental impacts of new development and provisions for facilitating and encouraging the use of habitat-friendly development practices. One of the actions taken by the cities to implement Title 13 was to amend city development codes to include the implementation of habitat-friendly development practices.

However, because Title 13 only *encourages* the implementation of habitat-friendly development practices and does not *require* the implementation of these actions, the cities' regulations are not always clear in terms of what is required for riparian areas. Each city's regulations pertaining to riparian maintenance and/or enhancement in natural areas are presented below.

City of Banks

As previously stated, Title 13 only encourages the implementation of habitat-friendly development practices and does not require the implementation of these actions. As a result, the City of Banks did not update its development codes to include requirements for natural resource areas. The City does not have other regulations that apply to natural resource areas.

As a result, the District utilizes existing conditions to define baseline for determining thermal credits for projects located in the City of Banks where the D&C standards do not apply.

City of Beaverton

Section 60.12 of the City of Beaverton's development codes allows for and encourages the implementation of habitat-friendly development practices including the preservation, enhancement and creation of natural areas.[7] The excerpt from Section 60.12.05 below states that these practices are voluntary. As a result, the District utilizes existing conditions to define baseline for determining thermal credits for projects in the City of Beaverton where the D&C standards do not apply.

[6] http://www.oregonmetro.gov/urban-growth-management-functional-plan

[7] http://www.beavertonoregon.gov/DocumentCenter/View/4970

60.12.	**HABITAT FRIENDLY DEVELOPMENT PRACTICES**
60.12.05.	**Purpose.** Allow and encourage Habitat Friendly Development Practices (HFDPs) that integrate preservation, enhancement and creation of Habitat Benefit Areas (HBAs) and use of Low Impact Development (LID) techniques in order to support natural systems that provide wildlife with food, shelter, and clean water. All of the provisions of Section 60.12. are voluntary and are not required of new development or redevelopment. The provisions are applicable only when a property owner elects to utilize the provisions contained in this section.

City of Cornelius

Chapter 18.95 of the City of Cornelius's municipal codes aims to protect significant natural resources and comply with the provisions of Goal 5 and Title 13.[8] The City's development codes do not include a specific requirement to protect or enhance riparian areas but instead state that resource enhancement and restoration activities are "permitted" as shown in section 18.95.020(A) below. Because the City does not require active restoration of riparian areas, the District utilizes existing conditions to define baseline for determining thermal credits for projects located in the City of Cornelius where the D&C standards do not apply.

18.95.010 Purpose.

(A) The purpose of the natural resources overlay is to protect the significant natural resources identified in the city's natural resources inventory and map. The natural resources overlay shall protect resources and functional values that have been identified by the city and state as providing benefits to the public. The natural resources overlay complies with the direction of the comprehensive plan and State Planning Goal 5.

(B) Natural resources overlay (NRO) is applicable to the resource sites and abutting properties identified in the natural resources inventory and map, the Goal 5 ESEE analysis and to future lands annexed into the city that are identified as or contain Goal 5 resources.

8 http://www.ci.cornelius.or.us/index.asp?SEC=990A1A84-C087-47CF-A705-DACB3B93D251&Type=B_BASIC

18.95.020 Permitted uses.

The following uses are permitted outright in the natural resources overlay:

(A) Resource enhancement and restoration activities.

(B) Land divisions per Chapter 17.05 CMC.

(C) Removal of nonnative or invasive vegetative species.

(D) Dedication of rights-of-way.

(E) Temporary emergency procedures necessary for the protection of property.

(F) Actions taken by the city to correct or abate a nuisance.

(G) Approved storm water discharge.

(H) Existing lawn within the riparian area may be maintained, but not expanded into the resource area.

(I) Existing utility lines.

(J) Existing legal nonconforming structures. Replacement of nonconforming structures shall comply with Chapter 18.135 CMC. [Ord. 837 §§ 1, 2, 2003; Code 2000 § 11.20.102.]

City of Durham

Section 2.15 of the City of Durham's development codes states the City's regulations pertaining to natural resource areas.[9] The City's regulations for stream-side vegetated corridors state that these areas should be *preserved whenever feasible*. Because the City does not require active restoration of riparian areas, the District utilizes existing conditions to define baseline for determining thermal credits for projects located in the City of Durham where the D&C standards to not apply.

2.15 Natural Resources Overlay (NRO) District. The NRO district allocates land that may be included in a planned residential development within a single dwelling residential district and that should be preserved whenever feasible for protection and preservation of fish, wildlife and riparian habitat, natural water storage areas such as flood ways and flood plains and stream side vegetated corridors along waterways.

2.15.1 Uses permitted in the NRO district are those permitted in the Natural Resources district but only as part of a Planned Residential Development.

[9] http://www.durham-oregon.us/LinkClick.aspx?link=DevelopmentCode.pdf&tabid=1160&mid=1848&language=en-US

City of Forest Grove

The purpose of the Natural Resource Areas section (Section 10.5) of Article 5 of the City of Forest Grove's development code is to comply with Metro's Title 13 plan.[10] Section 10.5.005(F) allows for and encourages habitat-friendly development. Because the City does not require active restoration of riparian areas, the District utilizes existing conditions to define baseline for determining thermal credits for projects in the City of Forest Grove where the D&C standards do not apply.

> **NATURAL RESOURCE AREAS**
>
> **10.5.005 INTENT**
>
> The purpose of this ordinance is to comply with Section 4 of Title 13 of Metro's Urban Growth Management Functional Plan.

> F. To allow and encourage habitat-friendly development, while minimizing the impact on fish and wildlife habitat functions.

City of Gaston

Because Title 13 only encourages the implementation of habitat-friendly development practices and does not require the implementation of these actions, the City of Gaston did not update its development codes to include requirements for natural resource areas. The City does not have other regulations that apply to natural resource areas. As a result, the District utilizes existing conditions to define baseline for determining thermal credits for projects located in the City of Gaston where the D&C standards do not apply.

City of Hillsboro

Section 12.27.225 of the City of Hillsboro's community development codes *allows for* natural resource enhancement but does not require it.[11] Because the City does not require active restoration of riparian areas, the District utilizes existing conditions to define baseline for determining thermal credits for projects in the City of Hillsboro where the D&C standards do not apply.

[10] http://www.forestgrove-or.gov/sites/default/files/fileattachments/planning/page/7771/article_5.pdf
[11] http://qcode.us/codes/hillsboro/

12.27.225 Natural Resource Enhancement.

A. Enhancement Approvals. Projects such as bank stabilization, riparian vegetation enhancement, in-channel habitat improvements, and similar projects which improve or maintain the quality of a SNR Site or its Impact Area shall be approved if the applicant demonstrates that both of the following standards are met:

1. The quality of 1 or more ecological functions or values of the SNR will be improved; and
2. Plantings include only species from the Metro Native Plants List.

B. Required Mitigation Not Included. For purposes of this Section, "resource enhancement projects" do not include required mitigation pursuant to Section 12.27.250.

King City

As shown in the excerpt from section 16.140.060(I) below, King City *may* require enhancement of riparian areas through planting or other improvements and the protection of natural ponds and vegetation is only performed *when practicable*.[12] Because the City does not require active restoration of riparian areas, the District utilizes existing conditions to define baseline for determining thermal credits at projects in King City where the D&C standards do not apply.

16.140.060 Development standards for floodplain and drainage hazard area applications.

The applicant for a proposed floodplain or drainage hazard area development shall demonstrate compliance with the following applicable standards of this chapter.

I. That the environmental impact of the disturbance or alteration of riparian wildlife and vegetation has been minimized to the extent practicable as required by clean water services. Enhancement of riparian habitats through planting or other such improvements may be required to mitigate adverse effects. Significant features such as natural ponds, large trees, and endangered vegetation within the flood or drainage hazard area shall be protected when practicable.

[12] http://www.ci.king-city.or.us/municipal_code/Muni_Code.pdf

City of North Plains

The regulations in section 16.75 of the City of North Plains' development codes aim to protect natural resources, wetlands and riparian corridors; encourage the restoration of wetlands and riparian corridors; and carry out the provisions of Statewide Planning Goal 5.[13] The excerpt from section 16.75.020 below states that the City strongly *encourages* the enhancement or restoration of natural areas. Because the City does not require active restoration of riparian areas, the District utilizes existing conditions to define baseline for determining thermal credits for projects in the City of North Plains where the D&C standards do not apply.

> **16.75.020 NATURAL RESOURCE ENHANCEMENT AND RESTORATION**
>
> The City strongly encourages the enhancement or restoration of natural resources, such as riparian corridors along the unnamed tributary of McKay Creek and McKay Creek, in-channel habitat improvements, non-native plant control, and similar projects which propose to improve the quality of a Significant Natural Resource. However, no enhancement activity requiring the excavation or filling of material in a wetland shall be allowed unless all applicable State and Federal wetland permits have been granted.

City of Sherwood

Chapter 16.144 of the City of Sherwood's code of ordinances regarding wetland, habitat and natural areas, aims to protect environmentally sensitive areas.[14] The excerpt from 16.144.030 below states that the City allows flexibility of the specific development standards in exchange for a specified amount of protection of environmentally sensitive areas that are not also governed by floodplain, wetland and Clean Water Services vegetated corridor regulations. Because the City does not require active restoration of riparian areas, the District utilizes existing conditions to define baseline for determining thermal credits at projects in the City of Sherwood where the D&C standards do not apply.

> 16.144.030 - Exceptions to Standards
>
> In order to protect environmentally sensitive areas that are not also governed by floodplain, wetland and Clean Water Services vegetated corridor regulations, the City allows flexibility of the specific standards in exchange for the specified amount of protection inventoried environmentally sensitive areas as defined in this code.

[13] http://cityofnp.org/files/2513/8143/9274/Chapter_16.75_SNR.pdf

[14] https://www.municode.com/library/or/sherwood/codes/code_of_ordinances?nodeId=TIT16ZOCODECO_DIVVIIIENRE_CH16.144WEHANAAR

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City of Tigard

Chapter 18.775 of the City of Tigard's community development codes regarding sensitive areas includes the implementation of the District's D&C standards, Metro's Title 13 plan and Statewide Planning Goal 5.[15] The excerpt from section 18.775.020 below states that stream and wetland restoration and enhancement, non-native vegetation removal, and planting of native plant species are exempt from the provisions regarding development. Because the City does not require active restoration of riparian areas, the District utilizes existing conditions to define baseline for determining thermal credits at projects in the City of Tigard where the D&C standards do not apply.

18.775.020 Applicability of Uses—Permitted, Prohibited, and Nonconforming

C. Exemptions. When performed under the direction of the city, and in compliance with the provisions of the City of Tigard Standards and Specifications for Riparian Area Management, on file in the engineering division, the following shall be exempt from the provisions of this section:

1. Responses to public emergencies, including emergency repairs to public facilities;
2. Stream and wetlands restoration and enhancement programs, except in special flood hazard areas when meeting the definition of development in paragraph 18.775.040.R.1;
3. Non-native vegetation removal;
4. Planting of native plant species; and
5. Routine maintenance or replacement of existing public facilities projects, except in special flood hazard areas when meeting the definition of development in paragraph 18.775.040.R.1.

City of Tualatin

The purpose of Chapter 72 of the City of Tualatin's development codes regarding natural resource areas is to identify and protect natural resource areas through preservation and conservation.[16] An excerpt from section 72.060(2)(g) states that the City *permits* wildlife protection and enhancement, including the removal of non-native vegetation and replacement with native plant species. Because the City does not require active restoration of riparian areas, the District utilizes existing conditions to define baseline for determining thermal credits at projects in the City of Tualatin where the D&C standards do not apply.

[15] http://www.tigard-or.gov/DevelopmentCode/18775_1.pdf

[16] https://www.tualatinoregon.gov/developmentcode/tdc-chapter-72-natural-resource-protection-overlay-district-nrpo

Section 72.060 Development Restrictions in Greenways and Natural Areas.

(1) Except as provided in Subsection (2), no building, structure, grading, excavation, placement of fill, vegetation removal, impervious surface, use, activity or other development shall occur within Riverbank, Creek and Other Greenways, and Wetland and Open Space Natural Areas.

(2) The following uses, activities and types of development are permitted within Riverbank, Creek and Other Greenways, and Wetland and Open Space Natural Areas provided they are designed to minimize intrusion into riparian areas:

(g) Wildlife protection and enhancement, including the removal of non-native vegetation and replacement with native plant species.

Washington County

The purpose of section 422-1 of Washington County's community development codes regarding significant natural resource areas is to permit limited and safe development in natural resource areas while *providing for* protection and enhancement of these sites.[17] Because the County does not require active restoration of riparian areas, the District utilizes existing conditions to define baseline for determining thermal credits for projects in Washington County where other city regulations and the District's D&C standards do not apply.

422-1 Intent and Purpose

The intent and purpose of these standards is to permit limited and safe development in areas with significant natural resources, while providing for the identification, protection, enhancement and perpetuation of natural sites, features, objects and organisms within the county, here identified as important for their uniqueness, psychological or scientific value, fish and wildlife habitat, educational opportunities or ecological role.

Development within riparian areas, Water Areas and Wetlands, or Water Areas and Wetlands and Fish and Wildlife Habitat shall comply with applicable state and federal regulatory guidelines.

In summary, none of the cities' regulations regarding protection, maintenance and enhancement of riparian areas require active restoration of riparian areas. Thus, for riparian planting projects that are not located in an area where the D&C standards apply, the District utilizes existing conditions to define baseline for determining thermal credits.

Other Agency Regulations

The District also partners with other agencies to implement riparian planting projects, including conducting riparian planting projects on properties owned by Metro and U.S. Fish and Wildlife. These properties are outside the urban area and are not located in an area where agricultural activities are occurring. As a result, neither the ODA's local water quality management rules nor the District's D&C standards apply to these project sites. Therefore, the District utilizes existing conditions to define baseline for determining thermal credits at these projects.

[17] https://www.municode.com/library/or/washington_county/codes/community_development_code?nodeId=COMMUNITY_DEVELOPMENT_CODE_ARTIVDEST_422SINARE

Projects in Forested Areas

The District does not currently conduct riparian planting projects in forested areas and does not have plans to do so in the near term. Should the District conduct riparian planting projects in forested areas in the future, the District will evaluate the regulatory requirements and vegetation conditions that will be used to determine baseline at these projects.

Appendix I: Trading Ratio Documentation

CleanWater Services

Trading Ratio Discussion

February 23, 2017

Clean Water Services submitted a Thermal Load Management Plan (TLMP) in August 2015 as a supporting document for the renewal of its watershed-based NPDES Permit. Following the adoption of the Water Quality Trading Rules (OAR 340-039), Clean Water Services submitted an addendum to the TLMP titled Thermal Load Management Plan Summary, which included additional elements specified in OAR 340-039. The Thermal Load Management Plan Summary document was submitted to DEQ in March 2016. Below are excerpts regarding the trading ratio from both documents.

From the Thermal Load Management Plan Summary Document (March 2016)

Section 5) Trading Ratios, Page 5:

The difference between the thermal load blocked after project implementation (with a 20-year shade establishment period) and the thermal load blocked with existing vegetation represents the reduction in thermal load (i.e., environmental benefit) associated with the riparian shade project. To calculate thermal credit, a trading ratio is applied to the environmental benefit associated with the riparian shade project. The District applies a 2:1 trading ratio for calculating thermal credit (i.e., the thermal credit is equal to 50% of the environmental benefit associated with the project) for all projects. This means that twice as much thermal load will be blocked than is needed to offset the thermal load from the WWTFs. The trading ratio was conceptually derived as the amount of thermal load that would be offset by riparian shade which would be equivalent to the amount of thermal load discharged over a 20-year period. The 20-year period was used to define the time it takes for riparian plantings to generate effective shade. As the riparian shade matures beyond 20-years even greater shade may be generated.

The trading ratio is primarily used to account for the time lag between initial planting and shade establishment. While a 20-year shade establishment period was envisioned in the TMP, the District's focus on conducting riparian shade projects on narrow, tributary streams has resulted in a much shorter period for establishing effective shade. From 2004–2014, the District has implemented 98 riparian shade projects. Sixty-nine of the 98 projects (70%) have stream widths of ≤20 feet; ninety-two of the 98 projects (94%) have wetted stream widths of ≤50 feet; and the median stream width for the projects was < 12 feet. Field monitoring of shade at the riparian shade projects shows that a high level of riparian shade is provided within 5 years at many sites. Recognizing the shorter time needed to shade narrower streams, the TMP allowed a 1:1 trading ratio for narrower, high priority streams. Although the District continues to select priority streams, the District did not utilize the 1:1 trading ratio for its riparian shade projects; all projects were credited using the 2:1 trading ratio. The District has also utilized light detection and ranging (LiDAR) to measure tree height and shading on select projects. The LiDAR data shows that the tree growth rate is equivalent or greater than the 20 year shade establishment period specified in the TMP. Additionally, the District intends to generate the necessary thermal credits to offset growth related increases in thermal load from the WWTFs before the anticipated growth occurs further reducing the shade establishment period. Thus, the District's focus on narrow tributary streams where effective shade can be developed quickly, along with its strategy to develop thermal credits before they are needed, enables the District to reduce the time between initial planting and shade establishment to much less than the 20 years.

The District also undertakes significant steps to improve the success of its riparian shade program; these include developing a variety of land stewardship agreements, designing ecologically-appropriate planting plans, extending site preparation, conducting high density riparian shade plantings, implementing robust monitoring and maintenance programs, and conducting inter-planting as necessary to ensure project functions are achieved.

For the reasons noted above, the 2:1 trading ratio used by the District to determine thermal credits is conservative. As more information becomes available in the future and DEQ develops additional guidance, the District may modify the trading ratio to provide incentives for narrow streams and for stream enhancement activities.

From the Thermal Load Management Plan (August 2015)

Executive Summary, Page 5:

To calculate thermal credit, a trading ratio is applied to the environmental benefit associated with the riparian shade project. The District applies a 2:1 trading ratio for calculating thermal credit (i.e., the thermal credit is equal to 50% of the environmental benefit associated with the project). The trading ratio is primarily used to account for the time lag between initial planting and shade establishment. While a 20-year shade establishment period was envisioned in the 2005 TMP, the District's focus on conducting riparian shade projects on smaller, tributary streams has resulted in much shorter period for establishing shade. Additionally, the District intends to generate the necessary thermal credits to offset growth related increases in thermal load from the WWTFs before the anticipated growth occurs. Thus, the District's focus on smaller tributary streams where shade can be developed quickly, along with its strategy to develop thermal credits before they are needed, enables the District to reduce the time between initial planting and shade establishment to much less than the 20 years used to establish the 2:1 trading ratio.

With the 2:1 trading ratio, offsetting the thermal load via riparian shading means that the overall reduction in thermal load to the Tualatin River will be significantly greater than through the implementation of technology-based solutions. Additionally, the trading ratio does not account for the broader ecosystem benefits of the riparian shade program, such as improved stream functions (e.g., bank stabilization, peak flow attenuation, and habitat creation), increased diversity of aquatic and terrestrial plant and animal species, and improved water quality.

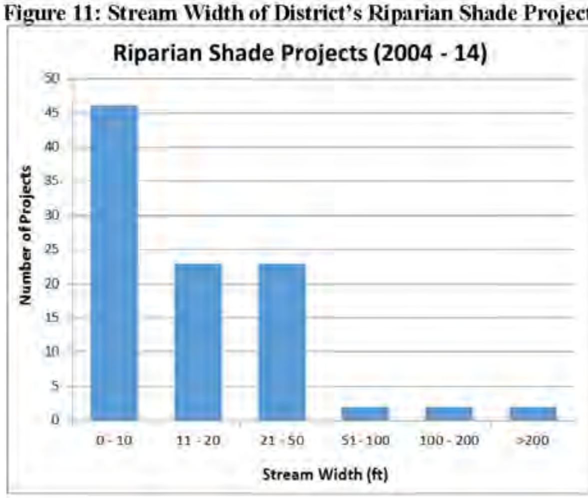
Section 5.5.2 Trading Ratio, Page 47:

In accordance with the recommendations in DEQ's Water Quality Trading IMD, the District will utilize a 2:1 trading ratio primarily to account for the time between initial planting and shade establishment (DEQ, 2012).

The 2:1 trading ratio was established based on a 20-year shade establishment period. The shade establishment period for smaller streams is much less than the 20 years. For example, Bishaw et al. (2000) measured the growth rate of newly planted riparian trees in select streams in western Oregon and showed that vegetation provided substantial riparian shade (80%+) in 5-6 years on a stream 8-12 feet wide. Smith (2013), evaluating the State of Washington's CREP program, showed that greater than 70% riparian shade was produced by 5 – 10 year old projects on streams with widths less than or equal to 25 feet.

The District has focused its riparian shade program on smaller streams as shown in Figure 11:

Figure 11: Stream Width of District's Riparian Shade Projects



From 2004–2014, the District has implemented 98 riparian shade projects. Sixty-nine of the 98 projects (70%) have stream widths of ≤20 feet; ninety-two of the 98 projects (94%) have wetted stream widths of ≤50 feet. Field monitoring of shade at the riparian shade projects (Chapter 6, Figure 12) shows that high level of riparian shade is provided within 5 years at many sites.

Recognizing the shorter time needed to shade smaller streams, the 2005 TMP allowed a 1:1 trading ratio for streams less than 7 feet wide. The District did not utilize the 1:1 trading ratio for its riparian shade projects. All projects were credited using the 2:1 trading ratio.

The 20-year shade establishment period provides time for vegetation to grow to a height where it will provide substantial shade. It also provides an upward limit on the amount of shade credit that can be generated. Vegetation is expected to continue to grow after 20 years, and it should provide increasing amounts of shade on wider streams. Nevertheless, the credit amount is fixed by the modeled calculation of shade based on a 20-year shade establishment period. This provides an additional layer of conservativeness beyond those provided by the 2:1 trading ratio for the thermal credits generated by the riparian shade program.

The DEQ Water Quality Trading IMD also notes that the trading ratio is used to account for uncertainty associated with riparian shade planting projects (DEQ, 2012). There is no objective measure (metric) associated with uncertainty in the 2:1 ratio. The uncertainty described by the IMD includes components of variability in project effectiveness, predictability of forecasted conditions, precision of understanding surrogate measures for nonpoint source loads, and the dynamic nature of riparian ecosystems. The District implements explicit protocols to ensure the success of its riparian shade projects and effectively limit uncertainty. These include developing a variety of land stewardship agreements, designing ecologically-appropriate planting plans, extending site preparation, conducting high density riparian shade plantings, implementing robust monitoring and maintenance programs, and conducting inter-planting as necessary to ensure project functions are achieved.

Additionally, it should be noted that the District intends to generate the necessary thermal credits to offset growth related increases in thermal load from the WWTFs before the anticipated growth occurs in its service area. As discussed in Chapter 8.3, the District is already employing this strategy to develop thermal credits to offset future increases associated with growth in the basin. The District's focus on smaller tributary streams where shade can be developed quickly along with its strategy to develop thermal credits before they are needed enables the District to reduce the time between initial planting and shade establishment to much less than the 20 years used to establish the 2:1 trading ratio.

With the 2:1 trading ratio and the conservative assumptions used to calculate thermal credits, offsetting the thermal load via riparian shading means that in the long run the overall reduction in thermal load to the Tualatin River should be significantly greater than through the implementation of technology-based solutions.

It should also be noted that the trading ratio does not account for the broader ecological benefits of the riparian shade program. As previously noted, the riparian shade activities are often only a component of the District's multiple-objective ecological enhancement projects. The District's general approach to riparian shade programs is geared toward improving overall watershed health by inducing landscape level changes to hydrologic, hydraulic, geomorphic, physicochemical and biological conditions in the watershed.

Appendix J: MS4 Documentation

Appendix J

CLEAN WATER SERVICES
NPDES MUNICIPAL SEPARATE STORM SEWER SYSTEM PERMIT
EVALUATION REPORT AND FACT SHEET

TABLE OF CONTENTS

LEGAL AND POLICY ANALYSIS

Anti-backsliding Review

This NPDES permit, like its previous iterations, requires the permittee to control pollutants discharged through their MS4 to the MEP, to protect water quality, and to satisfy the appropriate water quality requirements of the Clean Water Act. This permit requires the permittee to implement a comprehensive Stormwater Management Program (SWMP) Document as the primary mechanism to achieve the MEP standard to reduce pollutants in their respective MS4 discharges.[1]

This permit contains clear, specific, and measurable provisions to prescribe the continued implementation of specific tasks, BMPs, BMP design requirements, performance requirements, adaptive management requirements, schedules for implementation, as well as maintenance, and frequency of actions as required minimum control measures that must be met. Although such provisions are expressed differently than the comparable provisions in DEQ's previously issued individual permits, DEQ has determined that the provisions in this permit are, in all cases, at least as stringent as those established in the previous individual permits, given the nature and scope of new and/or enhanced conditions included in the permit for each program element

Anti-degradation Review

Under Oregon's Antidegradation Policy for Surface Waters in Oregon Administrative Rule (OAR) 340-041-0004, DEQ is required to demonstrate that, when issuing a permit, the discharge will not result in a lowering of water quality from the ambient condition and that it protects existing and designated uses. Therefore, in waters where existing uses are more sensitive than the uses specifically designated for the waterbody, the permit limits and requirements will protect the more sensitive existing beneficial uses, as well as other designated uses.

The controls required in this MS4 Phase I permit are expected to result in discharges to the permittee's MS4s that reduce pollutants to the maximum extent practicable to protect water quality, and to satisfy the appropriate water quality requirements of the Clean Water Act. The Clean Water Act provides that the level of pollutant reduction for MS4s is limited to the "maximum extent practicable" because federal law recognizes the unique nature of municipal stormwater runoff.[2]

The law recognizes that stormwater discharges are highly variable in nature and difficult to control due to topography, land use and weather differences (e.g., intensity and duration of storms). The goal of the permit is a net reduction in pollutant loadings over the five-year permit

[1] See 40 CFR § 122.44(k).
[2] See Clean Water Act § 402(p), 33.U.S.C. §1342(p), the U.S. EPA's regulations permitting municipal stormwater discharges at 40 CFR § 122.28, and 64 FR 68722 [Dec. 8, 1999]

term. Over the five-year permit term, the permittee will implement and/or enhance an identified range of stormwater management control programs to minimize stormwater pollution discharges in stormwater runoff to and from the MS4, including from existing and new residential, commercial, and industrial developments and permittee owned and/or operated facilities.

Section 301(b)(1)(C) of the Clean Water Act and regulations at 40 CFR § 122.44 require the NPDES permitting authority to develop limitations in permits necessary to meet water quality standards, subject to the MEP standard described above. A state's water quality standards are composed of use classifications, numeric and/or narrative water quality criteria, and an anti-degradation policy. The use classification system designates the beneficial uses for each waterbody, such as drinking water supply, contact recreation, and aquatic life. The numeric and narrative water quality criteria are the amount of any pollutant deemed necessary by the state to support the beneficial use classification of each waterbody. The anti-degradation policy represents a three-tiered approach to maintain and protect various levels of water quality and uses.

DEQ has determined that existing water quality would not be degraded by the issuance of this permit. The stormwater discharges authorized by this permit have been ongoing since the federal regulations requiring an NPDES permit were adopted. This permit is expected to reduce the current level of pollution discharged from the permittee's stormwater-related conveyance system and facilities. DEQ expects the pollution reduction measures implemented by the permittee in accordance with this permit to offset any expansion of stormwater conveyances systems and outfalls because of the permit requirement to implement a broad range of pollution reduction measures, including measures to address impacts from new development and significant redevelopment. In short, this permit is expected to reduce the current level of pollution discharged from the permittee's stormwater-related facilities at a level greater than projections for growth impacts. Therefore, the issuance of this permit will protect and improve existing water quality and is consistent with DEQ's antidegradation policy.

Water Quality Limited Waters and Total Maximum Daily Loads

Section 303(d) of the CWA requires states to identify their impaired waterbodies. Impaired waterbodies are water quality limited and do not meet water quality standards. In Oregon, the responsibility to delegate water quality limited waterbodies rests with DEQ. The list of these waterbodies is referred to as the 303(d) list.

DEQ is also responsible for developing pollutant reduction plans for water quality limited waterbodies. Total Maximum Daily Loads (TMDLs) are pollutant load reduction plans that define wasteload allocations (WLAs)for point sources and load allocations (LAs) for non-point sources of pollutants. TMDLs also specify how much of a particular pollutant can be discharged to a specific stream or segment and still meet water quality standards. Oregon's 2018/2020 Integrated Report and 303(d) list contain the water quality limited waterbodies with and without a TMDL.[3] The 2018/2020 Integrated Report was approved by the U.S. Environmental Protection Agency on Nov. 12, 2020 and is now current and in effect.

For MS4 discharges to waterbodies subject to a TMDL and/or listed on DEQ's 303(d) list, the permittee must comply with the more stringent requirements in the Special Conditions in Schedule D in accordance with 40 CFR § 122.34(c)(1) and 122.44(d)(1)(vii)(A)-(B).

State Statutory Permit Requirements

All water quality permits must meet the requirements of state law. Oregon statutes in general give the Environmental Quality Commission and DEQ broad authority to impose permit requirements needed to prevent, abate, or control water pollution. See ORS 468B.010, 468B.015, 468B.020, and 468B110. However, direct statutory requirements applicable to discharge permits are more limited. ORS 468B.020 (2)(b) directs DEQ to require the use of all available and reasonable methods necessary to protect water quality and beneficial uses. At a minimum, NPDES permits for regulated MS4s must require the permittee to develop, implement, and enforce a SWMP designed to reduce the discharge of pollutants from the MS4 to the MEP, to protect water quality, and to satisfy the appropriate water quality requirements under the Clean Water Act. The SWMP must include, at a minimum, the stormwater control measures set forth in the federal regulations at 40 CFR § 122.26(d)(2)(iv), and program elements must be documented, described, or referenced in the SWMP Document as described in Schedule A.14.b of the permit.

[3] Oregon DEQ's 2018/2020 Integrated Report is available online at: https://www.oregon.gov/deq/wq/Pages/2018-Integrated-Report.aspx

The following sections of this report describe the relevant sections of the proposed permit that regulate the permittee's MS4 stormwater discharges:

COVER PAGE

Receiving Stream Information

The first several pages of permit renewal include information about the permittee, the receiving stream(s) to which the permittee's MS4 discharges stormwater, description of the sources covered by the permit, major receiving stream information, and permit approval authority. In addition, a reference is made to the Total Maximum Daily Load (TMDL) that establishes wasteload allocations (WLAs) for urban stormwater in the Tualatin subbasin. This reference does not create any permit requirements or represent numeric effluent limits. Rather, it is simply designed to acknowledge the existence of the EPA-approved TMDLs and associated stormwater WLAs. The methods by which the permittee is required to address TMDLs are described in Schedules A and Schedule D of the permit. With the exception of the allowable non-stormwater discharges identified in Schedule A.14.a.iv, the permit prohibits all non-stormwater discharges unless otherwise approved by DEQ.

SCHEDULE A.14
Controls and Limitations for Stormwater Discharges from MS4s

Schedule A.14 describes the required controls and limitations for stormwater discharges from the permitted source. Additional requirements related to some of the controls and limitations discussed in this section of Schedule A can be found in other schedules of the permit. In combination with the BMPs described in the SWMP Document, the required controls and limitations in this permit reflect DEQ's determination of what represents the MEP standard. The detailed requirements for SWMP development, implementation and modification are found in Schedules A, B and D.

Condition A.14.a
Authorized Discharges

This MS4 Phase I Individual Permit ("permit") conditionally authorizes municipal stormwater discharges, and certain types of non-stormwater discharges, provided the permittee complies with the terms and conditions of the permit.

Condition A.14.a.i
Requirement to Reduce the Discharge of Pollutants

The permit for MS4 discharges must include terms and conditions to reduce the discharge of pollutants from the MS4 to the MEP, to protect water quality, and to satisfy the appropriate water quality requirements of the Clean Water Act. The permittee must control pollutants in their MS4 discharges to the MEP by addressing the following stormwater control measures outlined in the permit: public education and outreach, public participation and involvement, illicit discharge detection and elimination, construction site runoff control, post construction runoff control, pollution prevention and good housekeeping for municipal operations, and industrial and commercial controls. In addition, this permit also addresses the permittee's infrastructure retrofit planning, hydromodification assessment, and data compilation and mapping as they relate to stormwater discharges. Implementation of the DEQ-approved SWMP Document, which will outline the details of how the permittee will meet the requirements of the permit, will establish compliance with the MEP standard.

Condition A.14.a.ii
Water Quality Standards

This permit does not require compliance with water quality standards. Compliance with all permit requirements constitutes compliance with applicable water quality standards as established in OAR 340-041. The permit includes a framework for documenting, communicating, developing and submitting a plan with corrective actions for circumstances when DEQ or the permittee determine that a pollutant in the MS4 discharge is causing or contributing to an exceedance of an applicable water quality standard not already addressed by the illicit discharge and elimination (IDDE) program or covered by activities described in TMDL Implementation Plan(s). The actions implemented by the permittee will be based on the specifics of each situation that causes the exceedance. This framework is appropriate to ensure any MS4 discharges that are causing or contributing to an exceedance of an applicable water quality standard are documented, investigated, and managed appropriately.

Condition A.14.a.iii
Limitations of Coverage

The permit does not authorize the permittee to discharge stormwater associated with industrial or construction activity (as defined in 40 CFR § 122.26(b)(14) and (15)). Such discharges are only authorized upon DEQ's issuance of the appropriate general NPDES permit, or a separate individual NPDES permit (as necessary). DEQ encourages infiltration of stormwater, but this permit does not authorize the discharge of stormwater to an Underground Injection Control (UIC) system. Any owner or operator of any type of Class V underground injection control system must obtain permit coverage through Rule Authorization, a General Permit, or through a Water Pollution Control Facilities (individual) permit, and must comply with 40 CFR § 144-146, and other measures required in Oregon's UIC rules (see OAR 340-044).

Condition A.14.a.iv
Allowable Non-Stormwater Discharges

Certain types of discharges unrelated to precipitation events (i.e., non-stormwater discharges), listed in permit Schedule A.14.a.iv, are conditionally allowed to enter and discharge from the MS4s. Such allowable non-stormwater discharges cannot be significant sources of pollution to the waters of the state. Documentation regarding management of certain discharges listed in Schedule A.14.a.iv(B), as with the document "Management Practices for the Disposal of Chlorinated Water," is available at https://www.oregon.gov/deq/FilterDocs/chlorwaterdisp.pdf. The permittee must prohibit all other non-stormwater discharges into the MS4(s).

The permittee is responsible for the quality of the discharge from their MS4, and therefore have an interest in locating and discontinuing, or ensuring the local, state, or federal permitting of any uncontrolled non-stormwater discharges into their MS4, and are required to implement illicit discharge detection and elimination programs (Schedule A.14.c.iii).

Schedule A.14.b Permittee's Responsibilities

Schedule A.14.b.i
Coordination Among Other Public Entities and Joint Agreements
The permittee is responsible for compliance with the terms and conditions outlined in the MS4 Phase I Individual Permit related to their MS4 and associated discharges. Implementation of the permit can be shared with other entities, be they co-implementers, entities subject to other MS4 permits, or other entities that may be responsible for contributions to or controls on the MS4. For instance, the permittee may develop agreements with entities or jurisdictions adjacent to their MS4 system to implement certain minimum measures within the permittee's or that entity's jurisdiction. Similarly, the permittee may coordinate and/or pool resources with regional partners on stormwater education and outreach messaging to meet relevant requirements of Schedule A.14.c.i.

The permittee, if relinquishing implementation responsibility to another entity, must ensure that the minimum measures (or portions thereof) are at least as stringent as required by the permit. Additionally, the permittee must develop and maintain a written record of agreements with other entities, as a record of accountability. The permittee remains ultimately responsible for compliance with the permit obligations in the event the other entity fails to implement the control measure (or any component thereof).

Condition A.14.b.ii
Maintain Adequate Legal Authority
The permit requires the permittee to maintain adequate legal authority to implement and enforce the required SWMP control measures as allowed and authorized pursuant to applicable state law.[4] Without adequate legal authority or other mechanisms to control what enters or discharges from the MS4s, the permittee cannot perform vital stormwater management functions, such as performing inspections, requiring installation and proper operation of pollutant control measures within its jurisdiction, and/or enforcing such requirements. The permittee must utilize all relevant regulatory mechanisms available to them in accordance with applicable state and federal laws to

[4] 40 CFR § 122.34(b)(3)(ii)(B), (b)(4)(ii)(A), and (b)(5)(ii)(B)); MS4 Permit Improvement Guide, April 2010. EPA 833-R10-001.

control pollutants into and from the MS4s, to the MEP. DEQ expects the permittee to exercise their legal authority in six specific ways:

1. Effectively prohibit and eliminate pollutants to the MS4 from illicit discharges and connections.
2. Effectively respond to and control spills, dumping or disposal of unauthorized non-stormwater materials into the MS4.
3. Maintain the ability to control pollutants discharged into the MS4 from land disturbance and new and redevelopment activities occurring within their jurisdiction.
4. Control the contribution of pollutants from one MS4 into another, through interagency agreements as necessary or appropriate.
5. Require compliance with applicable rules within their jurisdiction using public education, technical assistance, or enforcement, as applicable.
6. Carry out inspections, surveillance, and monitoring procedures necessary to determine compliance with the permit and IGAs or cooperative agreements.

The permittee must summarize and reference their legal authorities necessary to meet the conditions of the permit in their SWMP Document as required in Schedule A.14.b.ii. The SWMP Document must also describe how the permittee will impose their requirements, and/or use cooperative agreements with other jurisdictions or entities, to implement the required stormwater control measures based on their unique legal powers under state law.

This permit condition includes provisions for the permittee to review and refine if needed intergovernmental agreements with the multiple jurisdictions within the service area.
CWS is a public body created pursuant to State law and is the "operator" of the MS4 for the entire service area, including within and around the municipal boundaries of the communities it serves. The definition of MS4 can be found at 40 CFR 122.26(b)(8) and includes public bodies that own or operate an MS4.

Clean Water Services has been established as a county service district (i.e., public body) for Washington County under Oregon Revised Statues (ORS) Chapter 451 which is where the MS4 program responsibility is vested. Under ORS 451.550, which defines the powers of county service districts, CWS is authorized to manage, control, operate, and maintain service facilities; make and accept contracts necessary to exercise the powers of the county service district; and adopt storm and surface water management plans, programs, and regulations.

The Code of Federal Regulations (CFR) provides NPDES stormwater permit applicants various options when applying for a MS4 permit. One includes a system-wide permit, including one permit that covers all discharges within a system that discharge to the same watershed (40 CFR 122.26(a)(3)(ii)). In this instance, the permittee has requested DEQ issue a system-wide or watershed-based permit and have claimed they are the sole permit applicant for discharges from the municipal separate storm sewers for which the operator is responsible. See 40 CFR 122.26(a)(3)(iii)(b).

Clean Water Services has established contractually binding intergovernmental agreements (IGA) with surrounding municipalities that provide CWS adequate legal authority to administer MS4 requirements within the service area which includes ensuring implementation of any land use requirements that are part of the draft permit. This meets the requirements found in 40 CFR 122.26 (c)(2)(i) that provides the operator legal authority to carry out MS4 duties. The permittee is required to review and refine, if needed these agreements by November 1, 2024, and refer to them appropriately in the SWMP Document (see Schedule A.14.b.iii). CWS is solely responsible for implementation of the terms and conditions in the permit. The co-implementer municipalities are held directly accountable through the IGAs.

At this time, several of these agreements are due for updates in order to facilitate the appropriate management of the MS4, in some cases because long-standing agreements are expired or about to expire. If, upon review of the SWMP Document or any other submission, it is found by the DEQ that the conditions of the permit are not being met due to a lack of appropriate coordination and/or cooperation, then the permit may be reopened or renewed to include other municipalities as co-permittees.

CWS has requested that the local governments within its service area continue to be referenced in the permit as "co-implementers." This is not a term that is defined or customarily used in the MS4 permitting context, and its use within the permit would be confusing given that CWS is the sole permittee and legally responsible for complying with the permit conditions, including permit conditions related to pollution prevention in municipal operations. DEQ acknowledges the collaborative efforts between CWS and jurisdictions within its service area to perform work within their respective geographic and functional areas of responsibility. There is nothing in the permit that prevents CWS from naming the jurisdictions within the MS4 service area as co-implementers in its own communications.

Condition A.14.b.iii
SWMP Document

NPDES permits for MS4 discharges require the operator to implement and enforce a SWMP designed to reduce the discharge of pollutants from the MS4 to the MEP, to protect water quality, and to satisfy the appropriate water quality requirements of the Clean Water Act. The permittee is required to develop and update as necessary, a written Stormwater Management Program (SWMP) Document.[5] The SWMP Document is a separate and distinct submission from the Stormwater Management Plan submitted under the previous permit; the SWMP Document serves similar purposes but also has a different scope and greater flexibility than the previous permit's Stormwater Management Plan. The SWMP Document summarizes the physical characteristics of the MS4, and describes how the permittee conducts the required SWMP control

[5] 40 CFR § 122.34(b) and NPDES Municipal Separate Storm Sewer System General Permit Remand, Final Rule (81 FR 89320, Dec. 9, 2016). The final rule at § 122.34(b) requires each permit to require the permittee to develop a "written storm water management program document or documents that, at a minimum, describes in detail how the permittee intends to comply with the permit's requirements for each minimum control measure.".

measures within its jurisdiction, including descriptions or summaries of BMPs implemented. Throughout this permit, a variety of supporting documents are described as required for inclusion in the SWMP Document; this inclusion may be as subsections of the document, as appendices, or as citations or links that will be updated as supporting program documents are updated.

DEQ is allowing supporting documents and strategies to be referenced in the SWMP rather than directly included due to the varying level of detail that may be too voluminous to incorporate. However, supporting documents and strategies, to the extent practicable, must be accessible to the public and clearly referenced in the SWMP Document. The intent of this requirement is to provide DEQ and the public with access to documentation of detailed strategies and guidance documents describing how the permittee will meet permit conditions. DEQ recognizes that Standard Operating Procedures (SOPs) may change more frequently than Ordinance, or Code, or documents like a Stormwater Manual. Where SOPs are important to the SWMP Document, they should at a minimum be summarized and be available upon request. The SWMP Document should also describe the permittee's unique implementation elements such as cooperative or shared responsibilities with other entities. The SWMP Document is intended to address three audiences:

General Public – The SWMP Document serves to inform and involve the public in the local stormwater management program.
Elected officials and permittee staff - The SWMP Document can be used by the permittee as an internal planning or briefing document.
DEQ - The SWMP Document provides DEQ with a discrete document to review and approve how the permittee will comply with permit requirements and implement its stormwater management program.

The requirement for the permittee to develop a SWMP Document is an enforceable condition of the permit. The contents of the SWMP Document are not directly enforceable as effluent limitations of the permit. In general, because the details within a SWMP Document (e.g., measurable goals set by the permittee, program strategies, BMPs, etc.) are not enforceable permit terms unless specified by the permit, the permittee may create and revise the SWMP Document and its supporting documentation as necessary to support adaptive management and provide up-to-date descriptions of how they will meet any permit requirements during the permit term. Updates to the SWMP Document may therefore occur without DEQ review and approval of each change as a permit modification.[6] However, because the SWMP Document is required to be an adaptive management tool that works with each successive iteration toward improvement of MS4 management and water quality, and must provide rationales for changes according to Schedule A.14.b.vi., the SWMP Document is subject to DEQ review and approval on initial submission. DEQ reviewed MS4 permits from other states as well as guidance from EPA in establishing this framework, and though certain guidance from EPA is directed towards Phase II (small) MS4 communities, the framework is valid for application to Phase I communities.

[6] NPDES Municipal Separate Storm Sewer System General Permit Remand, Final Rule (81 FR 89320, Dec. 9, 2016)

The first iteration of the permittee's SWMP Document must be developed with opportunity for public input, and submitted to DEQ and posted on their publicly available website no later than November 1, 2023. The SWMP Document must thenceforward be updated as needed with changes submitted for review by DEQ with the Annual Report. DEQ will make every effort to review and respond to the permittee's SWMP Document submission as soon as possible, and the permittee and co-implementers may begin implementation upon approval.

Conditions A.14.b.iv,v
SWMP Information, Metrics, and Resources

The permittee is required to track indicator metrics and information to document and report on SWMP implementation progress. The permittee demonstrates compliance with Schedule A.14.b.iv by fully implementing the requirements of this permit. Not every tracking measure must be reported annually in its entirety, but records must be maintained for audits, inspections and/or evaluation by DEQ. The specific tracking measures that are required to be reported annually have been described in the relevant sections. The permit does not specify staffing or funding levels, thus providing flexibility and incentive for the permittee to adopt the most efficient methods to comply with the permit requirements within the MEP framework.

Condition A.14.b.vi
Review and Modification of the SWMP Document

The SWMP Document itself is a requirement of the permit, and like other permit requirements, is subject to DEQ approval. However, as described above, because the SWMP Document is not incorporated by reference into the permit, modifications to the contents of the SWMP Document are not modifications to the permit. For this reason, changes may be made to the SWMP Document at any time, though modifications to delete, adjust, or replace elements of the approved SWMP Document must be supported with a rationale to be submitted with the next Annual Report after the change. The rationale must support the value of the change in terms of effectiveness at pollutant removal from or to the MS4, or overall effectiveness of the program illustrating or demonstrating how the change will not adversely impact water quality. In this way, DEQ maintains oversight to ensure that changes to the SWMP Document are justifiable and supported by evidence or data, while allowing the permittee greater flexibility to shift resources, adjust prioritization, and improve their programs as needed, for continued improvement of program effectiveness. DEQ recognizes that updates to the SWMP Document may be made or requested by multiple municipal departments in a given year, and recommends tracking documentation for updates in the form of a "change log" or "version notes" sheet that can be maintained between the cover page and table of contents, in order to simplify reporting. Increased flexibility with SWMP Document updates does not in any way exempt the permittee from the requirement to meet permit conditions.

Schedule A.14.c
Stormwater Management Program Control Measures

Schedule A.14.c of the permit contains clear, specific, and measurable requirements. For each minimum control measure, specific tasks, BMPs, design requirements, performance requirements, adaptive management requirements, schedules for implementation and maintenance, and/or frequency of actions are outlined. The specific actions and ongoing activities that comprise the minimum control measure are referred to as SWMP program components. The permit balances implementation flexibility while establishing clear, specific, and measurable permit requirements in accordance with the MS4 MEP standard.

The permittee must demonstrate that they have met the respective compliance dates through the submittal of the Annual Reports (see Schedule B.15), and through submittal of the permit renewal application. The permittee must continue to conduct their current SWMP controls. Upon the permit effective date, the permittee is expected to begin to integrate/develop the conditions of the permit.

Condition A.14.c.i
Public Education and Outreach
The permittee is required to address the public education and outreach requirements. The permittee has conducted public education and outreach programs, as part of their compliance efforts with all prior MS4 permits. DEQ encourages cooperative outreach efforts between communities to continue this effort, and intends for the terms and conditions of the permit to inspire additional cross-area or collaborative outreach and education efforts to reach stakeholders within their coverage areas.

Once the permit is effective, the permittee must update or continue their existing public education and outreach program strategy, and incorporate new program components as necessary. The goal of the education and outreach strategy is to reduce or change behaviors and practices among the public that cause or contribute to adverse stormwater impacts on receiving waters. The strategy should promote specific actions to increase community and stakeholder understanding of how to reduce pollutant discharges in stormwater runoff and prevent illicit discharge from entering the MS4 or impacting receiving waters, and incorporate strategies to remove barriers to taking these actions.

The permit includes specific requirements to engage key stakeholder groups with topic-specific content. The permit further requires the permittee to consider equity and environmental justice as a component of their education and outreach strategy, which is an important advancement from previous permit iterations. The public education strategy should inform individuals, households, and businesses about the steps each can take to reduce stormwater pollution, including, but not limited to: avoiding the use of products or chemicals known to cause water quality concerns for humans and wildlife in Oregon; the proper handling, use and disposal of fertilizers, pesticides, motor oil, and other household hazardous wastes; and protecting and restoring riparian vegetation.

The educational materials and activities the permittee is required to provide must address the priority audiences listed, and a selection of the prioritized topics, specific behaviors, and removal of barriers to change, to maximize success.[7] The permit allows some flexibility within each stakeholder group for the permittee to adjust their approach based on local demographics and needs. The permit also specifies a list of priority topics to be addressed by the education and outreach materials but allows flexibility for the permittee to deviate from the list based on issues of significance in their respective community. Examples of strategies include distributing door hangers, brochures or fact sheets, promoting website information, using social media, sponsoring speaking engagements before community groups, providing public service announcements, implementing educational programs for K12 students, and conducting community-based projects such as storm drain stenciling, and watershed and stream/beach cleanups. Where appropriate for the permittee's community demographics and the presence of community-based organizations that serve diverse audiences and/or work on environmental justice,[8] outreach must include messaging in languages and communication methodologies used in the community to ensure diversity, equity, and inclusion in the permittee's programs.[9] DEQ understands that not all priority groups can be engaged at the same depth and does not have an expectation that all will receive the same amount of outreach. The permittee is expected to prioritize based on an understanding of their own communities, and to shift priorities, conduct pilot testing, and engage in adaptive management as the permit cycle proceeds to make the most effective use of their budget capacity and engagement.

The permittee must track and evaluate the success of public education activities during the permit term with, for example, measures of total reach, proportion of a priority audience reached, and engagement, surveys assessing impact on behaviors of the public, or other qualitative and quantitative assessment methods. The intent is to generate behavioral changes in the community with a positive impact on water quality, and the permittee is encouraged to select tracking measures that aid in evaluation of progress toward that goal. The permittee is required to maintain records of educational and outreach activities. The intent of this measurable goal is to document and evaluate the success of the program, by both the permittee and by DEQ, to continually adaptively manage and enhance future education and outreach in subsequent permits.

Condition A.14.c.ii
Public Involvement and Participation
This section of the permit addresses the public involvement and participation requirements consistent with 40 CFR § 122.26. Federal regulations require MS4 permittees to comply with State, Tribal and local public notice requirements when implementing a public involvement/participation program. The objective of a public involvement and participation program is to provide opportunities for residents from all economic and ethnic backgrounds to participate in the maintenance, further development, or adaptive management of the permittee's

[7] Many valuable resources exist to help create strategies for public education & outreach, such as Doug McKenzie-Mohr's Fostering Sustainable Behavior - An Introduction to Community-Based Social Marketing (Third Edition), available at https://cbsm.com/book
[8] Recommended readings on Environmental Justice are available at https://www.epa.gov/environmentaljustice
[9] DEQ Recommends EPA's EJSCREEN Tool for reports and maps combining environmental and demographic indicators that would be of use to permittees in evaluating how to organize prioritization of public education & outreach efforts.

stormwater management programs. This might involve, for example, establishment of a citizen advisory committee, a volunteer monitoring program, and/or other community engagement activity specifically designed for the permittee to receive feedback from local stakeholders that informs stormwater program development or hands-on volunteer assistance that supports existing programs. Public involvement and participation can also be implemented via measures such as surveys of public opinion and attitudes, working with local civic organizations to install medallions or to stencil catch basins to remind the public that pollutants entering the storm sewer system reach local water, or other stewardship opportunities.

Public involvement in planning of stormwater management programs was required for the initial application for NPDES MS4 permit coverage, but there is not an explicit public involvement requirement in the federal regulations regarding the ongoing adaptive management decisions of the stormwater management program.[10] For this reason, public involvement, participation, and/or comment is not required for adaptive management updates to the SWMP Document, but rather only for its initial submission. However, the permittee is encouraged to use updates to the SWMP Document as an opportunity for public involvement, by advisory committee, public comment, or other means as appropriate to the permittee's processes and precedent. The permittee must update or continue their existing public involvement and participation program and impose the specified new program components.

The permittee is required to maintain and promote at least one publicly accessible website to provide all relevant SWMP information to the public. Relevant SWMP information includes the permittee's SWMP Document, links to ordinances, policies, or guidance documents related to the stormwater management programs required by this permit, relevant public education material, MS4 and other Annual Reports, and easily identifiable (and up to date) contact information such that members of the public may easily call or email to report spills or illicit discharges, and/or ask questions, etc. The website must also include the posting of draft documents noted in the permit as requiring public review.

Though the permittee does not own or manage any waterways, the permittee is also required to create or participate in the establishment of stewardship opportunities over the permit term to foster participation by the public. The permittee must also maintain records of their public involvement participation activities, and report on participation metrics in every Annual Report through the permit term.

Condition A.14.c.iii
Illicit Discharge Detection and Elimination
This section of the permit addresses the Illicit Discharge Detection and Elimination (IDDE) requirements consistent with 40 CFR § 122.26 (d)(2)(iv) and spill response within the MS4 coverage area. At a minimum, the permit requires the permittee to maintain the ability to prohibit, detect, and eliminate illicit discharges from the MS4, and respond to spills of prohibited materials within the MS4 coverage area. Stormwater discharges are different from illicit

[10] 40 CFR § 122.26 (d)(2)(iv)

discharges. Stormwater runoff conveys pollutants that stormwater picks up from upland sources, then flows to the MS4. Illicit discharges are not from precipitation events. Illicit discharges are the addition of pollutants to the MS4 or surface waters from intentional or unintentional human dumping or disposal activities, and may involve sources such as a restaurant dumping mop water outside, a contractor dumping paint rinsate into a parking lot catch basin, or a person dumping wastes into a stormdrain. The permittee must continue to prohibit non-stormwater discharges into the MS4 (except those conditionally allowed by Schedule A.14.a.iv) to the extent allowable under state law (meaning that these programs and procedures are only required to the extent they are permitted under federal and state laws). The permittee must implement follow-up procedures as appropriate and actions to ensure compliance.

The permittee has implemented IDDE and spill response programs since the initial issuance of the individual MS4 permit. The permit prohibits the discharge of non-precipitation flows ("illicit" or "non-stormwater" flows) to the MS4 with very specific exceptions conditionally allowed by Schedule A.14.a.iv. The permittee must continue to conduct timely, thorough, and systematic illicit discharge investigations and removal of illicit connections. The permittee is required to update and maintain written IDDE protocols that include specific procedures for implementation of the IDDE program. Examples of these requirements are a detailed MS4 map and digital inventory, a written prioritization for dry-weather screening activities of areas with a potential of illicit discharges, enforcement protocols, and record keeping.

An IDDE program, including the enforcement and tracking of such a program, is necessary to avoid illicit discharges or improper disposal of waste materials to surface waters. The permittee is expected to coordinate with DEQ when illicit discharges occur that may involve DEQ's jurisdictional authority, or as required by the Oregon Emergency Response System reportable quantities standards. The permittee is also required to report to other entities, if a spill enters another permittee's or agency's system (e.g., neighboring city, county, etc.). DEQ also encourage the permittee to establish or maintain communication channels with local stakeholders such as watershed councils, conservation districts, etc., regarding concerns with water quality from spills, dumping or accidents that may be cause for concern from the public, as appropriate. The permittee is required to develop or continue to maintain a current MS4 map, including any new components of stormwater infrastructure that must be included in the MS4 map and digital inventory. The purpose of the MS4 map and digital inventory, outfall inventory, conveyance system and stormwater control locations, and locations of chronic discharges is to record and verify MS4 outfall locations and include other relevant descriptive characteristics of the system. DEQ expects that the permittee know the locations and characteristics of all outfalls that it owns/operates through mapping their infrastructure and associated assets. DEQ also recognizes that such databases of infrastructure and assets are living chronicles of systems that change and grow as more information comes to light, old assets are removed, new areas are developed, and as new technologies are implemented.

The MS4 mapping and digital inventory must be current and made available to DEQ upon request and must also be updated and provided as part of each permit renewal package. The associated inventory must be in a digitized format, with a tabulation of the attributes identified in

Schedule A.14.c.iii(A).1-4. To the extent data are available, the mapping and outfall inventory should also include acreages of land uses in the catchment area leading to each outfall, as well as other relevant attributes such as impermeable surface area, percentage of tree cover, etc. While the permittee must maintain a current MS4 map and a digital inventory, the permit does not specify their required format. DEQ encourages permittees to utilize a digital MS4 mapping system, such as an electronic geographic information system format, which enables sharing of data and can more easily utilize public tools and sources of information such as Oregon Metro's Data Resource Center or the Oregon Explorer Natural Resources Digital Library.[11] The permittee is encouraged to couple this mapping requirement and its products with other control measures, such as their Dry Weather Screening Programs and associated investigations requirements in the Schedule A.14.c.iii(E), and to use it for decision making and adaptive management. For example, attributes or characteristics associated with the outfall inventory could greatly influence the selection of priority locations for annual field screening. The intent is to require co-/permittees to conduct a GIS exercise (or similar data-oriented system) to tap existing data sets where available, and indicate where further data may be needed, and allow for better adaptive management system-wide. Other relevant factors that are also useful to maintain mapping of for association with outfalls and for IDDE investigation purposes, according to the Center for Watershed Protection, include:

- Presence of certain industries by SIC code
- Historic complaints
- Sanitary and storm sewers in close or in common manholes
- "Gaps" in sanitary mapping
- Licensed businesses, SIC codes, industrial permittees
- Areas with businesses with night hours (e.g., bars and restaurants)

Further uses of mapping the above types of information in association with outfalls may include assessing where to prioritize capital improvement projects (e.g., rain gardens, pervious pavement, etc.), where community tree plantings can be focused for maximum effect, and where industrial or utility facilities may be contributing pollutants. The complex interactions among land-covers have several direct implications for the ongoing management of urban watersheds, and co-/permittees are required to gather this information in order to better understand their infrastructure and landscape and the effect of each on stormwater.[12]

The permittee must continue to effectively prohibit non-stormwater discharges to their MS4s through enforcement of an ordinance or other legal mechanism to the extent allowable under state law (meaning these programs and procedures are only required to the extent they are permitted under federal and state laws). Section A.14.c.iii(C) identifies the minimum requirements for enforcement procedures that DEQ expects the permittee to be able to practice

[11] See: https://www.oregonmetro.gov/tools-partners/data-resource-center and https://oregonexplorer.info/topics/watersheds?qt-subtopic_quicktab=4&ptopic=98

[12] Beck, S. M., McHale, M. R., & Hess, G. R. (2016). Beyond Impervious: Urban Land-Cover Pattern Variation and Implications for Watershed Management. Environmental Management, 58(1), 15–30. https://doi.org/10.1007/s00267-016-0700-8

within their jurisdictions, if necessary, consistent with requirements of the previous permit. The ordinance/legal mechanism does not need to cite each individual prohibition, provided that the permittee's legal mechanism would or could address illicit non-stormwater discharges into the MS4, whether from commercial or individual sources. This provision provides a minimum expectation for the local ordinance/legal mechanism to fully prohibit the breadth of possible non-stormwater discharges that could negatively impact receiving water quality.

Permit condition A.14.c.iii(C) requires the permittee to maintain a written enforcement response policy or plan to support their IDDE Program efforts to detect and eliminate illicit discharges into the MS4 and is consistent with requirements of the previous permit. The enforcement program must include mechanisms to effectively compel compliance from chronic violators that repeatedly violate the illicit discharge requirements. The enforcement program must also consider factors related to the severity of the illicit discharge to inform the selection of associated penalties and/or corrective actions required by the responsible party.

Permit Condition A.14.c.iii(D) establishes DEQ's expectations for the permittee's minimum Illicit Discharge Complaint Report and Response program and is consistent with requirements of the previous permit. The permittee must maintain, and advertise, a publicly accessible and available means for the public to report illicit discharges, such as a phone number, webpage, and/or other communication channel. On average, complaints must be answered within two working days and records regarding actions taken must be maintained. This condition also establishes timelines for the permittee when responding to complaints and illicit discharges identified through field investigations.

Sources of illicit discharges may be fixed or mobile, intermittent or continuous, yet the frequency or severity of such discharges can have lasting effects on water quality. The nature, extent, actions, and conclusions of each investigation should be recorded with the original complaint to provide a full picture of each incident. This record provides detailed information about the types and locations of discharges, their possible sources, and other information pertinent to targeting future investigations, inspections, outreach, and education activities. Additionally, accurate and complete documentation of incidents provides evidence to support potential citation or civil penalty cases when needed.

The permittee must have systems and protocols in place so that they may track and appropriately respond to reports of illicit discharges from the public and permittee staff. The permittee must ensure that illicit discharges are referred to appropriate response staff and/or emergency response authorities. Staff assigned to handle calls should be trained in stormwater issues and emergency response to gather and transfer accurate information to responders. Conducting an investigation as soon as possible after the initial complaint report is crucial to the success of this program. DEQ recognizes that not all reported illicit discharges may be found and tracked to the source upon detection, and so the permit also includes a new requirement to track "chronic illicit discharges," as defined in Schedule D. This information is intended to assist in risk mapping, investigations of new reports, prioritization of dry weather screening locations, and other adaptive management.

The permittee is required to continue to conduct dry weather screening to identify illicit non-stormwater flows, and DEQ recommends they review the Center for Watershed Protection's IDDE Manual.[13] The Manual includes instructions for maximizing the effectiveness of IDDE programs, including dry-weather screening, and lays out a process for auditing existing IDDE resources and programs. Such an audit may benefit the co-permittees immensely given the time spent in administrative extension and the new programmatic flexibility granted by the SWMP Document structure.

Permit condition A.14.c.iii(E) establishes a minimum system evaluation and dry weather screening requirement to comply with this section of the permit, and is consistent with requirements of the previous permit. However, the science continues to evolve, and new research has emerged in the time since the last permit renewal.[14] This is why the permit requires an update to the criteria for dry weather screening location selection, and sharing of information with those who perform the routine inspection, maintenance, and cleaning schedule required in Schedule A.14.c.vi.B (Inspection, Maintenance, and Cleaning, in Pollution Prevention for Municipal Operations), assuming different departments or staff are utilized. The SWMP Document should describe how dry weather screening location selection is based in mapped data. This information will help the permittee make informed program enhancement decisions related to potential risks posed by factors such as land use, density, impervious area, and age of infrastructure.

This section of the permit requires the permittee to continue to use dry-weather field screening pollutant parameter 'action levels' that, if exceeded, will trigger the permittee to conduct further investigation to identify sources of illicit discharges. DEQ recommends that the permittee review illicit discharge detection and elimination program guidance developed by the Center for Watershed Protection and referenced by the United States Environmental Protection Agency (http://www.epa.gov/npdes/pubs/idde_chapter-12.pdf).

The permittee is required to maintain and update written procedures for conducting investigations, source tracking, field screening and characterizing illicit discharges such as described in the Center for Watershed Protection manual. DEQ has also established the minimum documentation, screening and laboratory analysis procedure for identifying the illicit discharge, when it is not known. Suspected sources of discharge include, but are not limited to, sanitary cross-connections or leaks, spills, seepage from storage containers, non-stormwater discharges or other residential, commercial, industrial or transportation-related activities.

[13] Available at https://www3.epa.gov/npdes/pubs/idde_manualwithappendices.pdf

[14] See, for example, Development of Effective Procedures for Illicit-Discharge Risk Mapping by P.R. Bender, et al. (2016), available at https://ascelibrary.org/doi/abs/10.1061/(ASCE)WR.1943-5452.0000747 ; A low cost method to detect polluted surface water outfalls and misconnected drainage by D.M. Chandler and D.N. Lerner (2015), available at https://onlinelibrary.wiley.com/doi/abs/10.1111/wej.12112 ; and Analysis and determination of optimum risk factors to prioritize illegal discharge potential in urban catchments, by Y. Owusu-Asante (2019), available at https://doi.org/10.1016/j.pce.2019.04.007

This section of the permit also includes the requirement that the dry weather screening inspection activities take place annually, specifically at identified priority locations documented by the permittee. The annual field screening must include a portion or all of the permittee's identified priority locations. Priority locations must, where possible, be located at an accessible location downstream of any source of suspected illegal or illicit activity or other location as identified by the permittee. DEQ recommends the permittee review the related resources referenced herein at footnote 14. Priority locations must be based on an equitable consideration of hydrological conditions, total drainage area of the location, population density of the location, traffic density, age of the structures or buildings in the area, history of the area, land use types, personnel safety, accessibility, and historical complaints or other appropriate factors as identified by the permittee. DEQ encourages the use of risk analyses based on these factors, as described in recent scientific literature cited above in footnote 14.

DEQ maintains that ongoing field screening activities play an important role in a comprehensive illicit discharge detection and elimination program. Each employee involved in the program must have training in screening for their respective duties in the IDDE program. The training approach and frequencies must be described or referenced in the SWMP Document.

The IDDE program's activities must be tracked and documented. Each MS4 Annual Report should include a summary of all activities involving or relating to illicit discharge.

Schedule A.14.c.iv
Construction Site Runoff Control
The permittee must continue to implement a program that prevents and/or controls the discharge of pollutants in stormwater runoff from construction sites. Construction sites that disturb one acre or more of land are covered by DEQ's 1200-C construction stormwater general NPDES permit, and the permittee has an agreement with DEQ to implement the construction stormwater permit (1200-C) in its service area. However, the construction site runoff control requirements in this permit are needed to reflect that the permittee controls construction site discharges into their MS4 system for all construction projects that cause ground disturbance, regardless of size (if dirt/turbid water is moving off site via discovery or complaint), otherwise a minimum threshold for inspection is defined as sites that result in land disturbance of equal to or greater than 500 square feet.

The requirements in Conditions A.14.c.iv(A) through (G) describe DEQ's minimum expectations for the permittee's construction stormwater program. The requirements are similar to those in the previous permit, but are more specific about certain actions that the permittee is required to perform. The new elements added to this section will increase effectiveness as well as flexibility in program implementation and tracking of outcomes, which will improve transparency and accountability as well as adaptive management capacity. The main elements include having an ordinance to require controls and impose sanctions, requiring implementation and maintenance of BMPs, preventing or controlling site construction wastes from impacting water quality, site plan review procedures, site inspection procedures, and enforcement procedures.

DEQ expects the permittee will describe within its site plan review, site inspection, and enforcement procedures the actions and activities the permittee will implement to ensure the discharge of pollutants in stormwater runoff from construction sites is prevented and controlled accordingly. The permit language allows for simplified ESCPs or a description of required outcomes with prescribed BMPs for small, low-risk construction sites, provided that the permittee's criteria and specifications for such activities, as for ESCPs, are documented or referenced in the SWMP Document, and that construction operators are required to keep a copy of their erosion & sediment control obligations on site or electronically accessible onsite for reference and updating as needed during operations, maintenance of controls, and inspections. These procedures should include the approach the permittee will follow to ensure proper installation of erosion control BMPs and the oversight of the installation of stormwater facilities to ensure proper function. All procedures must be referenced in or described in the SWMP Document.

Employees or contractors of the permittee, as well as any co-implementer staff involved in the Construction Site Runoff program must be trained in the appropriate program elements related to their work (i.e., ESCP review, site inspections, and compliance and enforcement of the permittee's requirements). Training should be conducted for every employee within 60 days of assignment to the program, but before each individual is assigned to conduct activities associated with this section individually (i.e., without guidance/oversite from colleagues) and once per permit term, or every five years, at a minimum.

The program's activities must be tracked and documented. Each Annual Report should include a summary of all activities involving the Construction Site Runoff Control program.

Schedule A.14.c.v
Post-Construction Site Runoff Control For New Development and Redevelopment
This permit condition requires the permittee to continue to control and enforce a post-construction site runoff program applicable to new and redevelopment of sites within their jurisdiction.

Urbanization's impact on water quality with its creation of impervious surfaces is well established.[15] EPA's research shows a linkage between low total or effective impervious surface area and changes in stream biotic assemblages. This permit includes requirements that the permittee look for opportunities to include both nonstructural and structural stormwater controls in existing development when redevelopment occurs.

The permittee developed and finalized a set of Design & Construction Standards to address post-construction site runoff under a previous iteration of the permit, published in 2019. DEQ recognizes that time and resources will be necessary to update, refine, and issue post-

[15] U.S. EPA. The Causal Analysis/Diagnosis Decision Information System Volume 2: Sources, Stressors and Responses.

construction site requirements within a permittee's jurisdictional boundaries in response to this permit condition. As a result, this condition requires the permittee to continue implementing current requirements until these new requirements can be reflected and incorporated into their post-construction program in accordance with this permit schedule. DEQ recognizes that many factors are outside permittee control and DEQ purview, including land use laws and other state and federal regulations, as well as other local considerations such as policy goals and land use or zoning regulations particular to the permittee or their region. These factors are unaffected by stormwater considerations and will affect site design, therefore these permit conditions are not intended to be applied where it would be inappropriate to do so.

Where the previous permit included a condition that required the permittee to optimize onsite retention based on site conditions, this permit condition expands on the previous requirements by identifying specific minimum performance standards, or minimum requirements for the development of the permittee's own standards, in Schedule A.14.c.v(C). DEQ's basis for the permit's new performance standards includes the following:

• Review of the post-construction stormwater requirements of Phase I and Phase II permits in other states
• Oregon's approach for managing post-construction stormwater in the TMDL and Coastal Nonpoint
Pollution Control Programs
• The approaches required of Oregon's Phase II general permit registrants
• EPA's guidance provided in the 1999 NPDES MS4 Phase II rules
• EPA's guidance for improving MS4 Permits and its compendium of NPDES permit examples
• Recent scientific literature

The information below presents the rationale for the post-construction site runoff management requirements in this permit condition and highlights the information used in formulating this condition.

The Post-Construction Site Runoff Control program permit language was drafted with the goal of providing clear, specific, and measurable permit conditions. The permit includes enforceable narrative and numeric conditions, such as the site performance standard and treatment requirement.

Where the previous permit emphasized the removal of obstacles to Low Impact Development/Green Infrastructure (LID/GI) (or equivalent) condition A.14.c.v(B) explicitly requires the permittee to prioritize it through requirements or provision of incentives. The use of the LID/GI (or equivalent) approach to stormwater management, prioritizing non-structural stormwater controls to minimize the creation of impervious surfaces and minimize stormwater volume is an important element in addressing other program conditions, such as optimizing onsite retention (i.e., infiltration, evapotranspiration, and water capture and reuse), targeting natural surface or predevelopment hydrologic functions, and minimizing hydrological and water quality impacts from stormwater runoff from impervious surfaces and compacted pervious cover such as gravel parking lots. This condition requires the permittee to evaluate ways to increase the use of green infrastructure when structural stormwater controls are needed to remove pollutants from stormwater or to further reduce stormwater volume prior to discharging. The intent is to make LID/GI the preferred and commonly used approach to site development, and to require extended filtration where LID/GI or other onsite retention is not feasible. There are many methods of incentivizing and prioritizing LID/GI (or equivalent) approaches in local code and practice.[16,17]

The permittee's Design & Construction Standards specifically must be updated by November 1, 2026, in order to keep the permittee's standards abreast of rapidly changing industry science and technology. As noted elsewhere, the emerging contaminant 6PPD quinone is expected to become a priority for removal in the future because of its direct link with the mortality in Coho salmon caused by urban runoff. Fate & transport studies and research on the most effective BMP structures and placement are ongoing in multiple states and will need to inform future development as well as retrofits.

This permit condition requires the permittee to implement a regulatory trigger for post-construction site runoff when a development or redevelopment creates or replaces 1,000 square feet or more of impervious surfaces. The intent of this impervious area threshold is to prevent the further degradation of water quality in waterbodies receiving the permittee's stormwater discharge. DEQ has established this threshold for post-construction stormwater controls to reduce stormwater volume and to treat stormwater discharges to ensure the permittee's stormwater management efforts will contribute significantly to collective efforts to attain water quality standards as a community experiences further urbanization. Thresholds are based on a variety of MEP factors relevant to the permittee's jurisdictions.

As highlighted in EPA's National Menu of BMPs for post-construction stormwater requirements, the application of non-structural stormwater controls as a first step in meeting this requirement has broad applicability nationwide as a practice that can successfully achieve the post-construction minimum control measure. As an initial approach, the "Runoff Reduction Method" is appropriate for all municipalities subject to this condition and can be used to create an economic incentive by providing a mechanism to credit the volume reduction associated with better site design and creating a reduction in the overall size and footprint necessary for structural treatment and detention practices.[18] For information on the broad applicability of the runoff reduction method, DEQ encourages the permittee to review sources cited in the National Menu of Stormwater BMPs, including EPA's Using Smart Growth Techniques as Stormwater Best Management Practices and the National Association of Home Builders Research Center's The Practice of Low Impact Development prepared for the U.S. Department of Housing and

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[16] AHBL. 2012. Integrating LID into Local Codes: A Guidebook for Local Governments, prepared by AHBL for the Puget Sound Partnership, July 2012.
[17] Wulkan, Bruce. 2007. Promoting Low Impact Development in Puget Sound through Regulatory Assistance and Other Measures. Low Impact Development, 1–10. https://doi.org/10.1061/41007(331)1
[18] Battiata, Joseph, Kelly Collins, David Hirschman, and Greg Hoffmann. 2010. The Runoff Reduction Method. Journal of Contemporary Water Research & Education, Issue 146

Urban Development.[19,20] EPA developed this menu of BMPs "to reduce the risk that MS4 permittees will develop inadequate BMPs" as they develop their stormwater programs.

Permit condition A.14.c.v.C outlines two options for developing site performance standards. The first option, building on the approach established in the previous Phase I and II permits, requires that the permittee establish a numeric site performance standard with an on-site stormwater retention requirement, referred to in Schedule A.14.c.v(C).1 of the permit as the Numeric Stormwater Retention Requirement (NSRR). This condition strives to be more clear, specific, and measurable in its requirement for the retention of stormwater on-site and the treatment of stormwater discharged off-site when, due to site constraints, full compliance with this retention requirement is not practicable. The intent is to establish an appropriate retention requirement methodology, so that the permittee may add a compatible and practicable retention requirement to their existing post-construction program if one is not already in place, tailor their program to better accommodate local conditions and watershed priorities, and reduce discharges of pollutants and control stormwater runoff from new development and redevelopment project sites. The permittee may include evapotranspiration and reuse of stormwater in accounting for retention volumes, but are not required to exhaust those options prior to allowing treatment or offsite options. The permittee may collaborate with other entities to implement this condition in an effort to leverage their collective resources and establish uniform requirements in a region for the regional development community. Further guidance for leveraging limited resources to develop post-construction site runoff requirements in compliance with this condition may also be found in the Western Oregon Low Impact Development Guidance Manual, in the EPA publication of the Center for Watershed Protection's Managing Stormwater in Your Community; a Guide for Building An Effective Post-Construction Program, and in sources cited on the previous page.[21,22]

When site constraints prevent the on-site retention of the stormwater volume specified in the NSRR, the permittee must require treatment of the runoff volume up to a specified water quality design storm prior to its discharge offsite using one or more structural stormwater controls. Discharge offsite must target natural surface or predevelopment hydrologic function as much as practical using one of several methods. Given the requirement to retain a portion of the stormwater from a rain event on-site, the size of the treatment structural stormwater control(s) will be reduced, generating cost savings in material and the space needed for this control. On its webpage for the Cost-Benefit of Green Infrastructure, EPA has compiled several studies analyzing the costs as well as presenting cost-benefit analyses of green infrastructure and a

[19] EPA. 2005. Using Smart Growth Techniques as Stormwater Best Management Practices (EPA 231-B-05-002)
[20] National Association of Home Builders Research Center. 2003. The Practice of Low Impact Development. Prepared for the U.S. Department of Housing and Urban Development Office of Policy Development and Research, Washington, D.C.
[21] https://www.oregon.gov/deq/wq/tmdls/Pages/TMDLs-LID.aspx
[22] EPA. 2008. Managing Stormwater in Your Community; a Guide for Building An Effective Post-Construction Program (EPA 833-R-08-001)

design approach using better site design early in the process of planning for stormwater management.[23]

Compliance with the stormwater treatment requirement is necessary when designing a structural stormwater control to treat the stormwater runoff volume specified in the permittee' design standards prior to its discharge off-site. Specifically, this condition requires that the permittee establish treatment standards for structural stormwater controls in order to ensure effective removal of total suspended solids (TSS) prior to discharge, and the permittee may include an upper and lower bound on the effluent TSS concentration that reflects the practical limitation of an engineered control (e.g., 80% removal of TSS for typical influent concentrations ranging from 20 mg/L to greater than 200 mg/L). The runoff discharged off-site must target predevelopment hydrologic function in terms of rate, duration, and volume in order to minimize the potential for hydromodification impacts off-site. The permittee may adopt treatment standards for other targeted pollutants such as a TMDL or 303(d) listed pollutant but, at minimum, TSS is the required design pollutant for structural stormwater controls because it serves as a surrogate for other pollutants. Pollutants such as mercury, and nutrients will likely be captured when using the TSS treatment standard.[24] More importantly, when evaluating options for a structural stormwater control, this condition requires the permittee to prioritize the use of green infrastructure, because research (cited here and elsewhere) emphasizes the value to urban stream ecology of treatment, even with simple and inexpensive soil columns, especially in terms of the survivability of salmon and invertebrate populations in urban streams.[25,26]

This permit condition's numeric site performance standard involving a retention and treatment requirement is consistent with national trends in post-construction stormwater management. In 2005, the State of Minnesota conducted a review of trends in stormwater management in the previous decade.[27] The Minnesota review noted shifts in statewide post-construction stormwater managements reflected in the stormwater requirements in Wisconsin, Pennsylvania, New York, Vermont, Maryland, and Washington. These shifts included increased emphasis for on-site runoff reduction using better site design practices and increased emphasis for runoff retention volume requirements for pollutant reduction. Moreover, the Association of Clean Water Administrators' postconstruction workgroup indicated that 50 percent of the states in 2016 used a numeric retention standard, 28 percent use a narrative retention standard, and 22 percent used

[23] U.S. EPA Green Infrastructure Cost-Benefit Resources Webpage https://www.epa.gov/green-infrastructure/greeninfrastructure-cost-benefit-resources
[24] National Research Council. 2009. Urban Stormwater Management in the United States. The National Academies Press, Washington, D.C
[25] McIntyre, J. K., Edmunds, R. C., Redig, M. G., Mudrock, E. M., Davis, J. W., Incardona, J. P., Stark, J. D., and Scholz, N. L. (2016). Confirmation of Stormwater Bioretention Treatment Effectiveness Using Molecular Indicators of Cardiovascular Toxicity in Developing Fish. Environmental Science & Technology, 50(3), 1561–1569. https://doi.org/10.1021/acs.est.5b04786
[26] Spromberg, J. A., Baldwin, D. H., Damm, S. E., McIntyre, J. K., Huff, M., Sloan, C. A., Scholz, N. L. (2016). Coho salmon spawner mortality in western US urban watersheds: Bioinfiltration prevents lethal storm water impacts. Journal of Applied Ecology, 53(2), 398–407. https://doi.org/10.1111/1365-2664.12534
[27] Minnesota Stormwater Manual. 2005. Issue Paper D: *Unified Stormwater Sizing Criteria for Minnesota* V.6 Final

numeric treatment standards to address specific pollutants.[28] This is a 32 percent increase from the number of states using a numeric retention standard in 2014.[29] The site performance standard in this condition brings Oregon's permit in line with standards across the country and EPA's guidance.

The other option under Schedule A.14.c.v(C), Option 2, is for the permittee to establish their own narrative site performance standards. This is because the establishment of numerical site performance standards may represent technical challenges conflicting with existing design and construction standards and practices. If this option is selected, the permittee must demonstrate how equivalent benefits are achieved, how LID/GI practices and BMPs are still prioritized, how treatment is achieved to remove TSS before stormwater is discharged, and how pre-development site hydrology is achieved. GI approaches to treating stormwater under this option must infiltrate where soils allow, and may discharge after extended filtration (as defined in Schedule D.14.d) where infiltration is infeasible. This option requires the permittee's site design measures and planning procedures to require projects to consider site layout options that optimize for retention of stormwater, to the extent allowable by state and federal law (meaning these programs and procedures are only required to the extent they are permitted under federal and state laws). Such site optimization options may include:

• Defining development and protected areas, identifying areas that are most suitable for development and
areas to be left undisturbed.
• Concentrating development on portions of the site with less permeable soils and preserving areas that can
promote infiltration.
• Limiting overall impervious coverage of the site with paving and roofs.
• Setting back development from creeks, wetlands, and riparian habitats.
• Preservation of significant trees.
• Conforming the site layout along natural landforms.
• Avoiding excessive grading and disturbance of vegetation and soils.
• Replicating the site's natural drainage patterns.
• Detaining and retaining runoff throughout the site.

Option 2 also requires the permittee to establish a minimum set of defined onsite stormwater controls or site design measures to reduce project runoff. Such controls or measures may include:

• Soil Quality Improvement and Maintenance
• Tree Planting and Preservation
• Rooftop and Impervious Area Disconnection

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[28] Association of Clean Water Administrators. March 21, 2016. *The Weekly Wrap*. Volume VII., Issue 10
[29] Sawyers, Andrew D. and Best-Wong, Benita. 2014. Memorandum: Revisions to the November 22, 2002 Memorandum *Establishing TMDL Wasteload Allocations (WLA) for Stormwater Sources and NPDES Permit Requirements Based on Those WLAs*. U.S. EPA

• Porous Pavement
• Green Roofs
• Vegetated Swales
• Rain Barrels and Cisterns

The permittee's Integrated Stormwater Planning approach and the sub-basin plans developed under the previous permit's Hydromodification Assessment requirements focuses on a combination of upland controls and stream corridor enhancement activities to improve watershed health. These sub-basin plans may be expanded on beyond the hydromodification focus as they are developed, to include localized guidance or requirements such as the optimization options, site design measures and stormwater controls listed above.

Condition A.14.c.v(D) sets requirements for the establishment of Water Quality Benefit Offset Programs in order to allow stormwater mitigation off-site when site-specific conditions make full compliance with either Site Performance Standard option infeasible. This condition is not mandatory if the permittee chooses not to offer such benefit offset programs. The intent of this condition is to provide the permittee with multiple pathways to mitigate the water quality impacts associated with the increase in stormwater from urban development, should the permittee choose to provide those options for developers. DEQ has concluded that providing more options will give the permittee and the development community greater flexibility to achieve permit compliance. The development of such program options not only maximizes opportunities to mitigate water quality impacts but increase the flexibility in reducing pollutant loading.

The option of off-site mitigation or other such programs at another location offers the permittee as well as the development community an alternative compliance approach when site constraints make compliance with the retention or treatment requirements infeasible. Stormwater mitigation may provide a more economical path toward compliance that is equally protective of water quality. To ensure appropriate sites or projects are ultimately selected, the option of off-site mitigation at another location would benefit from an inventory of appropriate alternative projects or sites as well as standards to account for how these projects or sites will meet the stormwater retention or treatment requirements in the site performance standard. This inventory would serve as a preliminary assessment of opportunities for alternative compliance and should not preclude the pursuit of more effective opportunities that may arise unexpectedly.

This inventory of alternative sites may be provided by the development community or be generated by the permittee. The permittee can integrate or leverage compliance with this requirement using other inventories or assessments, such as a buildable lands inventory, a statewide planning Goal 5 inventory, or a statewide planning Goal 11 public facilities inventory for the permittee's stormwater systems. Moreover, to minimize additional administrative costs, the Operations & Maintenance (O&M) tracking mechanism could be used by the permittee to record performance of mitigation projects and water quality impacts of development at another location.

This condition offers two other off-site mitigation options that, if utilized by the permittee, require the establishment of a stormwater mitigation bank program or a stormwater payment-in-lieu program. The development of a stormwater mitigation bank necessitates an analysis of the market for off-site mitigation to evaluate the supply as well as demand for off-site mitigation credits to determine if there is viable market to support this program. It also involves the establishment of a trade currency based on the unmet stormwater retention or treatment requirement at the development site. However, as noted below, the administrative burden in implementing a stormwater mitigation-banking program is likely to be offset by its future cost savings.

Additionally, the permittee may again choose to collaborate with other MS4 entities to implement this condition as a group in an effort to leverage their collective resources and establish more uniform requirements in a region for the development community. The cost savings from stormwater mitigation banking is typically achieved when a permittee or developer meets the retention requirement for a constrained property at another location where the stormwater can more cost effectively be retained on-site. Stormwater mitigation banking generates savings using market forces to identify low cost mitigation opportunities and, therefore, attracting limited resources to the most cost-effective mitigation opportunities within a subwatershed. Off-site mitigation credit can be derived on a site already owned by the permittee or by a developer by using existing resources as long as the mitigation site's existing capacity to retain stormwater is enhanced in the mitigation process.

This condition also includes, as an alternative for compliance an off-site mitigation option involving a stormwater payment-in-lieu program. As with a stormwater mitigation bank program, this option will entail some administrative burden in establishing the currency or unit used to compare the unmet stormwater volume retention or treatment requirement with the future opportunity to meet this requirement at an off-site location. An in-lieu program involves establishing a rate based on this currency such as a dollar amount per volume of runoff retained, impervious area, site usage, or other factors. Additionally, if the permittee develops a payment-in-lieu program, the permittee will need to develop a rubric or set of trading ratios and the scale of trading, in order to define the value of the payment to be required in lieu of compliance with retention or treatment requirements for a given impervious area. The rubric or trading ratios would establish the runoff reduction volume that a non-structural or a structural stormwater control such as an infiltration basin must be designed to infiltrate off-site, or the dollar amount due for such offsite mitigation for a given project. The scale of trading defines the geographic boundary linking the development or redevelopment site to eligible alternative locations for compliance with the retention requirement.

The payment-in-lieu option provides the site owner or operator with flexibility while leveraging the permittee's limited resources to strategically locate stormwater controls for greater environmental impact. The permittee may aggregate fees and apply them to a stormwater structural or non-structural control at a later point in time. This compliance flexibility and additional funding provided by a payment-in-lieu program will likely, over time, offset the administrative costs of establishing a pay-in-lieu program.

The groundwater replenishment project option allows the permittee to meet the unmet portion of the retention requirements in the site performance standard with groundwater replenishment. This opens up yet another opportunity to identify a lower cost compliance approach. The mitigation option can be combined with the permittee's stormwater mitigation bank program. In this example, commercial systems designed to efficiently infiltrate and store underground large volumes of stormwater within a small footprint lend themselves to creating opportunities to supply stormwater volume credits within the permittee's jurisdiction. The opportunity to generate these credits by maximizing the stormwater retained on a site, in turn, creates an incentive for the permittee or developer to pursue groundwater replenishment projects. This requirement will also help support the permittee's efforts to implement a "one water" approach to municipal water management with its goal of integrating the management of stormwater, drinking water, and wastewater for not only cost efficiencies but better water resource management. For more information, DEQ recommends Water Environment Foundation's 2015 report, *Pathways to One Water – A Guide for Institutional Innovation.*

This permit condition also requires the permittee to review and approve site plans to verify proper implementation of post-construction site runoff plans for all new development and redevelopment projects, at a minimum, at sites that develop or replace impervious area exceeding the established impervious area threshold. Specific standards are a critical component of this program, but even the best local requirements must be supported by a review component to ensure that the locally established performance standards are met. To comply with this requirement, the permittee must have the authority to deny projects when it determines that the controls at a specific site are not designed to meet the established standards. DEQ expects that the permittee will establish submittal requirements for post-construction site runoff plans, and requirements for documentation of site-specific circumstances requiring deviation from adherence to the NSRR or alternative site retention standard, including a description of circumstances in which a written justification by an Oregon Registered Professional Engineer or Oregon Certified Engineering Geologist would be required for approval. Economic considerations alone are insufficient reason for allowing deviation from adherence to the retention and treatment standards. Providing clear submittal requirements for plans will also meet the education requirements for developers.

The permittee must ensure the long-term operation and maintenance of structural stormwater controls.[30] The permit requires the permittee to use a database type inventory to track and manage the operational condition of structural stormwater controls within its coverage area. This can take the form of a computerized maintenance management system or asset management system that allows for the electronic logging of operation and maintenance tasks. Ongoing maintenance is necessary to ensure that the BMPs will perform as designed over time, especially with LID/GI, as these often include landscaping work and maintenance of plant communities, which is not always well considered in engineering design and long-term cost estimations.

[30] See resources at https://www.epa.gov/green-infrastructure/green-infrastructure-operations-and-maintenance , and https://www.epa.gov/npdes/stormwater-maintenance

Ongoing maintenance of existing stormwater management controls is a primary challenge for many local stormwater management programs across the country. This is why, for example, the permit includes a requirement to ensure that operation & maintenance procedures for controls that include soil must be designed to maintain permeability of those soils, though it does not require testing to verify. As with any infrastructure, deferred maintenance can increase costs and negatively affect receiving waters. Unmaintained BMPs will ultimately fail to perform their design functions, and can become a nuisance and/or pose safety problems. The permittee must track those permanent controls which are known to them, or for which they accept ownership, beginning no later than the permit effective date.

Each permittee employee or contractor involved in the program must be trained in their respective area of practice, e.g., site plan reviews, inspections, and O&M practices. More specialized training may be required for the permittee's employees and contractors that conduct reviews of plans or evaluate compliance with long-term operation and maintenance requirements. The permittee's training approach and frequencies must be described or referenced in the SWMP Document. DEQ recommends that training should be conducted for each type of participant at least once per permit term. The program's progress must be tracked and documented. Each MS4 Annual Report should include a summary of activities involving Post-Construction Site Runoff Controls.

Condition A.14.c.vi
Pollution Prevention and Good Housekeeping for Municipal Operations
Operation and maintenance of municipal facilities is an integral part of any SWMP, and, when coupled with good housekeeping and pollution prevention principles, reduces the risk of water quality problems from MS4 discharges. These provisions require the implementation of an operation and maintenance program that includes a staff training component, and articulates as its goal the prevention or reduction of pollutant runoff from municipal operations.

The permit requires the permittee to reduce the discharge of pollutants from permittee owned or operated streets, roads and highways and in the management of operating or closed municipal landfills or other treatment, storage or disposal facilities for municipal waste. In addition, controls for application of pesticides, herbicides and fertilizers in public rights-of-way and at permittee-owned facilities are required. DEQ encourages the adoption of Integrated Pest Management (IPM)[31] approaches through policy or ordinance as well as SOPs for permittee staff and contractors.

[31] IPM is an ecosystem-based strategy that focuses on long-term prevention of pests or their damage through a combination of techniques such as biological control, habitat manipulation, modification of cultural practices, and use of resistant plant varieties. Pesticides are used only after monitoring indicates they are needed according to established guidelines, and treatments are made with the goal of removing only the target organism. Pest control materials are selected and applied in a manner that minimizes risks to human health, beneficial and non-target organisms, and the environment. IPM techniques could include biological controls (e.g., ladybugs and other natural enemies or predators); physical or mechanical controls (e.g., hand labor or mowing, caulking entry points to

These permit conditions clarify and expand the conditions under the pollution prevention for municipal operations program element relative to the previous permit, and include specific requirements intended to prevent or reduce pollutants from properties owned or operated by the permittee. The types of properties or facilities DEQ envisions to be included under this program include parks and open spaces, fleet and building maintenance facilities, transportation systems and fire-fighting training facilities for which the permittee has authority, as well as other facilities and activities as described in Schedule A.14.c.vi(D). The actions, activities and approaches related to this permit condition are important because the permittee has direct control of these types of operations, and the actions, activities and approaches may play a role as a broader example of the type of efforts that can be implemented.

Permit condition A.14.c.vi(B) requires the permittee to establish a program for the systematic inspection, maintenance, and cleaning of the permittee's MS4, designed to maximize debris and pollutant removal, and verify proper operation of all its municipal structural treatment controls designed to reduce pollutants (including floatables) in stormwater discharges to or from its MS4s and related drainage structures. An Asset Management strategy that supports permittee-determined cleaning frequencies, based on our levels-of-service and other relevant factors, must be included or referenced in the SWMP. DEQ encourages the use of integrated asset management and field data collection software, such as GIS applications for use in phones that import field updates back to the permittee's database, for tracking and adaptive management purposes. Keeping accurate records of maintenance, cleaning, and inspection activities is a vital part of such a program, and many options exist to facilitate record keeping such as ESRI Collector, Survey123, and Explorer. Such recordkeeping allows for flexibility in adaptive management, such that the permittee may change the inspection process every year to complement or reflect the findings of the previous year's inspections. The permittee may establish an inspection prioritization system for catch basins and other structural MS4 elements, and establish alternate inspection frequency every year, provided the permittee describes all relevant factors it uses to target and prioritize its inspections to specific areas of its MS4 in the SWMP Document or another document cited/referenced therein. DEQ recognizes that it may not be feasible to inspect all catch basins in a system within the permit term, which is why the permit allows for the permittee to prioritize appropriate levels of service, which may be based on a multitude of factors (e.g., "hot spots," land use, equity metrics, age of infrastructure, etc.), so long as the permittee describes or includes by reference its rationale in the SWMP Document.

Schedule A.14.c.vi(E) requires controls for winter maintenance activities. As climate conditions continue to change, so must the approaches taken to ensure the safety and security of people and the environment. The permittee will continue to implement a winter maintenance program to provide safe roadways for commuters. DEQ is establishing reporting requirements for winter maintenance material use and storage, as a way to begin to understand if, how and where they

buildings); cultural controls (e.g., mulching, alternative plant type selection, and enhanced cleaning and containment of food sources in buildings); and reduced risk chemical controls (e.g., soaps or oils). For more information on IPM in Oregon, visit https://agsci.oregonstate.edu/oipmc/resources.

may impact water resources in Oregon. The permittee must ensure that materials used for winter maintenance activities in municipal operations are stored and used appropriately, and develop a Winter Maintenance Strategy specifically for maintenance of roads and streets if one does not already exist.

DEQ recognizes that the use of de-icers and anti-icing materials is not restricted to municipalities, and that as with pesticides, private use of de-icing and anti-icing materials may outweigh the amounts used by the MS4 permittee. The goal of the winter maintenance condition in the permit is to document how the permittee uses and stores materials for winter management. As more information is available, DEQ will be able to analyze trends and impacts as it relates to road maintenance programs. DEQ will use that information to make future policy decisions about this activity and/or assess related impacts to surface waters.

This permit condition is not intended to conflict with other NPDES permit conditions or regulatory mechanisms. The permittee must implement the condition while still in accordance with the O&M Strategy for stormwater controls, described in Schedule A.14.c.v(F) (Long Term Operations & Maintenance, in Post Construction) and other elements of this Pollution Prevention for Municipal Operations section.

This permit condition requires employees of the permittee and anyone performing work on behalf of the permittee to receive appropriate training, such that operation and maintenance activities are conducted properly and with attention to potential water quality impacts.

This permit condition requires the permittee to maintain records of their Pollution Prevention and Good Housekeeping for Municipal Operations programs and summarize activities in the MS4 Annual Report.

Condition A.14.c.vii
Industrial and Commercial Facilities
Federal stormwater regulations envision states and municipal permittees cooperating in addressing pollutants in stormwater discharges to municipal storm sewers from industrial facilities.

Currently, Clean Water Services and the cities of Eugene and Portland, through an Inter-Governmental Agreement (IGA) with DEQ, act as DEQ's agents for 1200-Z NPDES industrial stormwater permits within their jurisdictions. The IGA outlines both DEQ's and the agent's responsibilities in carrying out permit administration and compliance, including a fee-sharing agreement. An Agents' major responsibilities typically include processing new industrial NPDES permit applications and making permit registration recommendations; reviewing stormwater discharge monitoring reports; reviewing action plans; inspecting sites; and being the first responder for complaints and permit compliance.

Industrial activities that are subject to permitting requirements are determined by SIC codes listed in the federal regulations and by the location of the discharge. This requirement assists DEQ in identifying businesses that need NPDES permit coverage and will assist the permittee in evaluating industrial stormwater discharges within their jurisdictions. Copying DEQ on the correspondence with the business meets this requirement. A list of all businesses that were contacted during the prior year should be included in each annual report.

This condition also requires that priorities and procedures for inspection and implementation be established, and be described, referenced, or cited in the SWMP Document for industrial and commercial facilities where site specific information has identified a discharge that contributes a significant pollutant load to the MS4. The terms "significant pollutant load," "pollutants of concern," and significant pollutants" are intended to reflect the concerns identified in the permittee's community. Although this condition does not specifically require the permittee to evaluate all commercial and industrial sources within their jurisdiction, DEQ anticipates the current IDDE program, monitoring, pollution prevention activities, and the evaluations required by this section will identify the appropriate commercial and industrial sources of pollutant load to the MS4 so that the permittee may focus their efforts where they'll be most effective. Coordination of stormwater evaluation with other programs, such as a commercial/industrial pre-treatment program's Industrial User Survey or business licensing questionnaire, is encouraged, but not required. The permittee is also encouraged to examine other DEQ resources for useful program elements they may choose to incorporate, including DEQ's 1200-Z stormwater permit's Stormwater Pollution Control Plan template and Check List, and the Industrial Stormwater BMP Manual.[32]

Included in this condition is an update to the Industrial/Commercial Facilities Strategy developed in the previous permit term, including development of an inventory of businesses with the potential to discharge a significant pollutant load to the MS4, inspection and enforcement requirements, and provision of education on stormwater management to inspected facilities as appropriate (e.g., as follow up to or part of an inspection, or as part of the public education and outreach program). DEQ anticipates this requirement will further strengthen and complement related stormwater management efforts, such as IDDE, education and outreach, operations and maintenance of structural controls, and/or the identification of priority retrofit approaches or areas.

This condition also requires training of staff, tracking of activities conducted to fulfill the requirements of this section, and a summary of the data collected to be included in the annual reporting.

Condition A.14.c.viii
Infrastructure Retrofit and Hydromodification Assessment Update

[32] Available at https://www.oregon.gov/deq/FilterPermitsDocs/1200zguide.pdf and https://www.oregon.gov/deq/FilterDocs/IndBMP021413.pdf , respectively.

The historic focus of stormwater management in urban areas in Oregon was generally related to drainage problems and flooding. As a result, water quality impacts caused by urbanization and the related stormwater quality management issues have increasingly been documented. Stormwater retrofits help improve water quality by providing stormwater treatment in locations where practices previously did not exist or were ineffective. DEQ acknowledges that it may take decades or longer to address the water quality impacts from existing infrastructure, and the application of strategies based on new research can speed progress.

Recent research, for example, has suggested that despite much lower impervious surface area, roads with a higher volume of traffic are more closely correlated than other land uses with higher pollutant loads and with Coho salmon mortality regardless of antecedent dry period duration, indicating that motor vehicles may be more of a pollutant source than impervious areas, and that Coho in more urbanized areas are more vulnerable to nonpoint source pollution irrespective of the timing, intensity, or frequency of storms.[33] Other work found that although untreated highway runoff was often lethal to salmon and invertebrates, this lethality was eliminated when the runoff was filtered through soil media in bioretention columns.[34] Even more recently, N-(1,3-Dimethylbutyl)-N′-phenyl-p-phenylenediamine Quinone (or, more simply, "6PPD quinone") has been pinpointed as the cause of urban runoff mortality syndrome in Coho, and studies are ongoing to determine optimal strategies to mitigate the issue. Studies and findings like these may inform shifts in strategies and priorities for retrofits in the near future, so it is important to re-evaluate retrofit and hydromodification strategies periodically, and to share with DEQ and the municipal stormwater community how priorities have already shifted to improve effectiveness.

In the most recent permit cycle, the permittee developed a retrofit strategy and a hydromodification assessment that evaluated their system and established priorities for progress toward improvements in water quality. This permit condition requires a status update on these efforts and an evaluation of any changes in priorities since initial development and implementation. DEQ expects that the permittee's efforts initiated in the previous permit term to assess, understand, and address hydromodification impacts and retrofit planning will require an ongoing, systematic evaluation, modification, and implementation over multiple NPDES permit cycles; the update is simply intended to reflect the current status. The information that is identified in the update report will be used in the development of requirements in subsequent permits.

Condition A.14.c.ix
Summary of SWMP Document Requirements and Deadlines

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[33] Feist, B. E., Buhle, E. R., Baldwin, D. H., Spromberg, J. A., Damm, S. E., Davis, J. W., & Scholz, N. L. (2017). Roads to ruin: Conservation threats to a sentinel species across an urban gradient. Ecological Applications, 27(8), 2382–2396. https://doi.org/10.1002/eap.1615

[34] McIntyre, J. K., Davis, J. W., Hinman, C., Macneale, K. H., Anulacion, B. F., Scholz, N. L., & Stark, J. D. (2015). Soil bioretention protects juvenile salmon and their prey from the toxic impacts of urban stormwater runoff. Chemosphere, 132, 213–219. https://doi.org/10.1016/j.chemosphere.2014.12.052

DEQ has included a schedule summarizing the due dates for completion of new program element activities or tasks required in Schedule A or the submittal date for information or reports related to these activities or tasks. The deadlines reflect DEQ's consideration and analysis of the resources (personnel, financial, time) needed to complete each action or activity, the current status and future capacity of the local MS4 stormwater management programs, and DEQ's municipal stormwater program.

SCHEDULES B.15 and B.16
MS4 Stormwater Monitoring and Reporting Requirements

Condition B.15
MS4 Stormwater Monitoring Program
This permit condition describes the monitoring objectives, as well as the requirements for the Monitoring Plan, for the Sampling & Analysis procedures, and for collaboration among permittees or where a third party is conducting monitoring for the permittee.

The results of the monitoring program are used to evaluate the effectiveness of the stormwater management program in reducing the discharge of pollutants to the maximum extent practicable. Although knowledge of stormwater management is continually increasing, significant knowledge gaps remain. In an ongoing effort to reduce the knowledge gaps as they relate to MS4 program management in Oregon, the requirements in Schedule B.15 provide flexibility for implementing a monitoring program to improve adaptive program management while identifying an appropriate monitoring approach for gathering specific information about stormwater program effectiveness.

DEQ also considered the extensive resources necessary to conduct a monitoring program to produce quality data, and the importance of appropriately balancing the expenditure of limited program resources between implementation and verification of program effectiveness. DEQ expects a suitable level of environmental monitoring (i.e., field monitoring) be conducted, along with the identification and evaluation of supplemental data/information, in order to continue to build datasets and knowledge for the adaptive management of the stormwater programs.

This permit condition continues to require that the monitoring programs incorporate the listed monitoring objectives similar to the monitoring objectives listed in the existing permits. The monitoring objectives establish the foundation for a broad monitoring program intended to address complex issues related to stormwater management, including source evaluation, best management practice effectiveness, pollutant discharge characterization, and the related status and trends in water quality.

This permit condition also continues to require an appropriate level of environmental monitoring be conducted during the permit term to ensure ongoing collection of monitoring data to support effective stormwater management decision-making and the identification of water quality improvements. This monitoring will be used to inform future monitoring needs and requirements. DEQ acknowledges that urban stormwater runoff in Oregon has, in many ways, been adequately characterized, and that more emphasis is needed around BMP effectiveness. DEQ intends to foster an intentional, collaborative, and ongoing dialogue with MS4 entities over the course of the permit term with the intent to increase monitoring effectiveness and decrease costs.

The environmental monitoring requirements identified in Table B26 are based on the requirements of the previous permit term, with modifications accounting for changes since the previous permit's issuance in the body of knowledge about urban stormwater in Oregon, and reflect a commitment that the environmental monitoring activities will contribute to addressing select monitoring objectives. For example the pesticide parameters included in the monitoring requirements table reflect information gathered from multiple Oregon data sets and analysis of multiple sources, including the 2015 USGS Willamette Basin monitoring study, Oregon Pesticide Stewardship Partnership (PSP) program data, and MS4 and UIC permit-related pesticide monitoring data.[35] Decisions for pesticide inclusion were based on detected pesticide concentrations relative to EPA aquatic life benchmarks or Oregon water quality criteria, and pesticide detection frequency in urban watersheds. The use of a decision matrix developed by the Oregon inter-agency Water Quality Pesticide Team determined the top pesticides for inclusion by detection frequency and by concentration relative to a benchmark. The permittee remains free to establish a study of pesticides of their own design for inclusion in the Monitoring Plan, focused on a selection of the listed pesticides. At a minimum, the permittee must consider the pesticides on this list in preparation of the monitoring plan to address the pesticide monitoring requirement in Table B26, and in the final selection of the pesticides that the permittee will incorporate into its environmental monitoring activities. The permittee is not limited to selecting pesticides from the list, but the permittee must provide the rationale for why the pesticides identified on this list were either incorporated or excluded from its environmental monitoring activities.

The monitoring requirements in Schedule B.15 and elsewhere in Schedule B also ensure that data collection for applicable 303(d) and TMDL pollutant parameters is continued, monitoring approaches and collection methods that will allow for appropriate statistical analysis are utilized, and data related to pesticides in urban stormwater is collected. Table B26 does not include instream biological monitoring (e.g., macroinvertebrate survey), but the permittee is expected to use such data as required in Tables B24 and B25, as well as other sources, to provide a more comprehensive assessment of water quality in the annual monitoring report.

[35] See resources at https://www.oregon.gov/ODA/programs/Pesticides/Water/Pages/AboutWaterPesticides.aspx and https://pubs.usgs.gov/fs/2015/3020/pdf/fs2015-3020.pdf

The implementation of a comprehensive monitoring plan is required by this permit condition. The monitoring plan must be designed to guide the permittee in addressing the monitoring program objectives and serve as a key component in the adaptive management of the stormwater program. Addressing the monitoring objectives will typically require a different monitoring strategy or project design, and resource availability often limits the number of sample events, sample locations and pollutant parameters that can be reasonably and cost effectively collected and analyzed during a permit term. DEQ has determined that the monitoring plan submitted with the renewal application is sufficient to meet these requirements.

This permit condition outlines the specific information that must be included in the monitoring plan for each environmental monitoring project or task, including those necessitated by the requirements identified in Table B26. This permit condition generally requires documentation of the planning, implementation, and assessment procedures, including specific quality assurance and quality control activities, which are necessary to obtain the type and quality of environmental data and information needed for its intended use. This documentation is of particular importance since the environmental monitoring projects or tasks will often be conducted to address the permit requirements identified in Tables in Schedule B. Likewise, this permit condition further strengthens the relationship between monitoring and stormwater program decision-making by requiring the permittee to identify the relationship between permit-term monitoring activities (e.g., environmental monitoring) and a long-term monitoring strategy. Identifying this relationship will further ensure that monitoring data is collected and prioritized to provide information to support iterative management of the stormwater programs.

This permit condition specifically requires the identification of how each of the six monitoring objectives is addressed, and this must include incorporation of relevant goals or intended application of findings related to other permittee work, including the monitoring required in Tables B24 and B25. For example, the permittee must document in the monitoring plan the sources of information and stormwater program best management practices or environmental monitoring projects or tasks that will be used to address the monitoring objectives.

Modifications to the permittee's monitoring plan will still require the permittee to request and receive DEQ approval unless the specific conditions highlighted in this section are met. This permitting approach will result in more detailed monitoring plans, which will provide additional transparency into the collection, analysis, assessment, and use of monitoring data. The sampling and analytical requirements presented in this permit condition establish the provisions for collection and analysis of environmental monitoring data to ensure appropriate data are available to support adaptive stormwater management. With DEQ approval, deviations from prescribed sampling and analysis procedures may also be permitted, as needed.

The stormwater sampling requirements specify what conditions qualify as an acceptable storm event. Due to the cost associated with mobilizing for stormwater monitoring, and considering the type of rainfall events in western Oregon, DEQ is providing the permittee with flexibility to target a variety of rainfall events. The rainfall events that are targeted should include those which may yield high pollutant loads/concentrations by representing a range in types of expected events based on factors such as rainfall intensity and duration, and antecedent dry period. DEQ will require the permittee to use the data submission template for all monitoring results for the permit term.

This condition allows the permittee to employ a time-composite or grab sampling method if the flow proportional composite method is shown to be infeasible or scientifically unwarranted. In allowing this flexibility, DEQ acknowledges that a specific monitoring project or pollutant parameter may warrant the use of the time-composite or grab sampling method, but ultimately requires the permittee to document its rationale in the monitoring plan that must be reviewed and approved by DEQ. The most recent publication of 40 CFR 136 is referenced in this section of the permit. Although it contains multiple EPA approved and standard methods for the examination of water and wastewater, some methods may not be specified. In those cases, the permittee may use alternative methods with consultation and approval by DEQ.

This permit condition also specifies the requirements that must be met for the permittee to use coordinated monitoring as a means to address their environmental monitoring requirements. The environmental monitoring requirements are identified in Table B26. In light of the fact that environmental monitoring data must be collected and analyzed in accordance with a monitoring plan that reflects the requirements in Schedule B.15.a.iii, DEQ requires that an agreement is established prior to the coordinated environmental monitoring being conducted. DEQ does not, however, expect the agreement to be formal, such as a signed contract or intergovernmental agreement, as long as each party participating in the coordinated monitoring activity understands its roles and responsibilities, and the agreement is documented.

DEQ recognizes that scientific literature, EPA guidance, and trends in urban stormwater monitoring across the country continue to make the case that coordinated monitoring on larger, watershed scales is the most effective way to answer questions about the impacts of urban stormwater on receiving waters and anticipates that the requirements of Schedule B may need to change in future permit terms. DEQ anticipates convening discussions to consider regional monitoring program(s), and encourages MS4 co-/permittees to engage in larger coordinated efforts to conduct studies and share data with entities not subject to the permit, whether those entities have MS4 permits of their own or not. Such a regional program(s) would likely reduce costs and produce more actionable data to inform future permits.

Condition B.16
MS4 Reporting Requirements
The permittee is required to submit an evaluation of their progress toward implementing the control measures of the SWMP Document and their conditions described in Schedule A, as well as any applicable Special Conditions described in Schedule D. This will be included in the Annual Report submitted to DEQ by November 1 each year, beginning in 2023, for the time period July 1 of the previous year through June 30 of the same year. One printed copy and an electronic copy must be submitted to DEQ at the locations listed in the permit until DEQ requires

the permittee to submit all of the elements electronically. This section lists the requirements for the contents of the annual report. The annual reporting requirements are similar to the previous permit requirements and are largely derived from the federal stormwater regulations[36]. This permit condition has been modified to add clarity and reflect updated permit language, such as reporting progress towards meeting measurable goals. The permit condition requires the annual report be made available electronically as part of the formal submittal to DEQ and on the permittee's website to further enhance the transparency of the stormwater programs. The annual reporting requirement also includes a summary of adaptive management implementation, both in terms of changes made to the SWMP Document or stormwater management programs within the reporting year, and reflecting on what the findings from the reporting year have shown about adaptive management modifications made in prior (recent) years.

[36] 40 CFR § 122.42(c)

SCHEDULES D.14 and D.15
Special Conditions for MS4 and MS4 Renewal Application Package

Condition D.14.a
Legal Authority
The language in this condition requires the permittee to maintain adequate legal authority to implement and enforce the provisions of the permit. DEQ considers the general permit language adequate to reflect the complexity of this fourth-generation permit and captures the objective of this condition.

Condition D.14.b
303(d) Listed Pollutants
This permit condition requires the permittee to evaluate 303(d) listed pollutants for those waterbodies for which TMDLs have not yet been approved by USEPA and to which the MS4 discharges. The requirements of this condition are similar to the existing permit requirements, and include an evaluation to determine the likelihood that discharges from the MS4 cause or contribute to the water quality degradation, an assessment of the effectiveness of the permittee's BMPs in addressing and reducing the applicable 303(d) listed pollutants, and an identification of SWMP revisions that may be necessary to address and reduce the 303(d) pollutants to the MEP.

If the permittee or DEQ identifies that stormwater discharges from the MS4 continue to cause or contribute to water quality degradation based on the updated evaluation required by this condition, the permittee must review existing BMPs or identify new BMPs effective in reducing the discharge of the identified pollutants to the maximum extent practicable, and make appropriate changes to their stormwater management program and/or SWMP. This condition ensures that MS4s will consider and undertake actions to address pollutants of concern in the short term for those waterbodies that are water quality limited, as required by an adaptive management approach.

DEQ expects that many of the modifications the permittee make to their stormwater management programs and SWMP Documents to address the 303(d) pollutants may be similar to modifications made in response to the TMDL conditions of this permit. Where applicable, DEQ anticipates the permittee may be "credited" for the reductions of 303(d) pollutants for new or modified BMPs implemented between the approval date of new TMDLs and the incorporation of new TMDL pollutant reduction permit requirements if the permittee identifies a 303(d) pollutant loading baseline and completes a pollutant load reduction estimate representing the new or modified BMPs that have been implemented. In this instance, the TMDL benchmarks established in the following permit cycle will reflect the reductions made in previous years.

Condition D.14.c
Total Maximum Daily Loads

A Total Maximum Daily Load is used to calculate the amount of pollutant that a waterbody can receive and still meet the applicable water quality standard. This is referred to as the "loading" or "assimilative capacity" of the waterbody. The TMDL pollutant load includes point sources, non-point sources, background sources, and a margin of safety.

Wasteload allocations (WLAs) are portions of the TMDL pollutant load that are allocated to point sources including municipal stormwater discharges. Federal regulations require qualified municipalities, such as cities, counties, and special districts, to obtain NPDES permit coverage for their stormwater discharges. The NPDES MS4 permits serve as the mechanism to address TMDL WLAs for municipal stormwater.

DEQ has determined that implementation of the permit conditions, BMPs identified in the SWMP Document, and the adaptive management process will meet TMDL WLAs for municipal stormwater. The permittee will likely need to begin a comprehensive program evaluation to address specific pollutants or pollutant sources identified in applicable TMDLs and develop appropriate revisions to the stormwater management programs several years in advance of permit expiration.

As with the previous iteration of the permit, DEQ has determined that permit conditions with both numeric and narrative criteria continue to be the appropriate approach for addressing TMDL WLAs in the MS4 permits at this time.

This permit condition also applies to receiving waters to which a jurisdiction discharges where TMDLs have been approved by USEPA at the time of permit issuance, or within three years of the date of issuance of this permit. If a new or modified TMDL is approved after the beginning of the fourth year of this permit cycle, the subsequent permit will include specific requirements to address the TMDL WLAs. In addition, it is important to note that TMDLs currently are issued as Department orders. Should DEQ determine that other implementation requirements or time frames are appropriate and incorporated into the TMDL, this permit may be subsequently reopened during the permit cycle.

Applicable TMDLs for the permittee include those developed for the Tualatin River Subbasin, approved by the EPA August 2001 and amended in 2012, and the Willamette Basin TMDLs, approved by the EPA September 2006, as well as the Willamette River Mercury TMDL (2019), which is addressed individually in this permit condition. The pollutants identified with a wasteload allocation for the permittee are total mercury, bacteria, pH, chlorophyll a (total phosphorous), and dissolved oxygen.

This permit condition also repeats the requirements from the last permit term for reporting on TMDL Pollutant Load Reduction Evaluation and TMDL Benchmarks. In the previous permit term, the permittee developed reasonable estimates of the number, type, pollutant load reduction, and associated cost information related to the BMPs identified by the permittee as part of the wasteload allocation attainment assessment (WLAAA). DEQ anticipates that this WLAAA from the previous permit term will continue to inform the permittee's program in terms of choices of retrofit projects and percent of additional effective impervious area to be removed or receiving treatment by structural stormwater controls, pollutant reduction models, and GIS analysis. For this reason, DEQ did not determine that a repeat of the WLAAA exercise was necessary for this permit term. However, given known and likely changes in socio-economic, technological, and environmental factors, such an analysis may be required again in a future permit term.

The TMDL pollutant load reduction evaluation must be conducted at least once during the permit term, and submitted with the permit renewal application package. The evaluation must be based on an empirical pollutant load reduction model, water quality status and trends analysis, and other applicable and acceptable quantitative and qualitative assessment approaches. The evaluation should reasonably estimate and reflect the land use, stormwater runoff, pollutant loading, and effectiveness of stormwater control measures implemented at the time when the evaluation is conducted.

The TMDL pollutant load reduction evaluation must incorporate an estimate of the load reduction achieved through the implementation of structural stormwater control measures (e.g., vegetative filter swale, rain garden), and an estimation or consideration of non-structural BMPs (e.g., education and outreach). The pollutant reduction model used by the permittee to estimate pollutant load reductions must reflect generally accepted scientific modeling practices and approaches (e.g., Simple Method, Stormwater Management Model 'SWMM'). The methodology and rationale for the model must be described in the evaluation report, including any data or model limitations, data input assumptions, the estimated effectiveness of structural BMPs, and the estimation or consideration of non-structural BMPs. The permittee may incorporate pollutant reduction credit for any structural BMPs in this evaluation if operation and maintenance of the structural BMP is covered by their structural stormwater control operation and maintenance programs as required in Schedule A.14.c.v(F) (Long Term Operation & Maintenance, Post-Construction) and A.14.c.vi (Pollution Prevention & Good Housekeeping for Municipal Operations).

The TMDL pollutant load reduction evaluation must also incorporate the results of a water quality trends analysis and summarize the relationship of this analysis and municipal stormwater discharges. The water quality trends analysis must be completed for each waterbody for which sufficient data have been collected. The waterbodies must reflect a reasonable representation of all of the waterbodies the permittee discharges to with applicable TMDLs, and include a consideration of the resources that are required to collect adequate monitoring data to complete a water quality statistical trends analysis.

Finally, as part of the TMDL pollutant load reduction evaluation, the permittee is required to provide a narrative summarizing progress towards applicable WLAs and TMDL benchmark(s). If the permittee estimates that TMDL WLAs are currently achieved with existing BMP implementation, a statement supporting this conclusion must be provided as well.

DEQ will evaluate the TMDL pollutant load reduction evaluation, and the conclusions therein whether the TMDL WLAs have been achieved based on the submitted information and implementation of existing BMPs. If the TMDL WLAs are met for certain parameters, the permittee does not need to set pollutant load reduction benchmarks for those parameters for the next permit cycle, though the TMDL remains active and BMPs that contributed to such success should be maintained. DEQ anticipates it will notify the permittee within 90 days of receiving the TMDL pollutant load reduction evaluation whether DEQ concurs with the permittee's conclusion that the existing BMP implementation achieves the applicable TMDL WLAs.

If the TMDL pollutant load reduction evaluation demonstrates that TMDL WLAs are not met for certain parameters, the permittee must develop pollutant load reduction benchmarks for those parameters as part of the permit renewal submittal. The benchmarks should reflect structural and, where effectiveness information is available, non-structural controls implemented as part of the permittee's current stormwater management program, as well as any additional reductions expected to result from BMPs proposed for the five-year permit term.

The TMDL benchmarks are not numeric effluent limits, and DEQ expects the TMDL benchmarks to be permit cycle (i.e., 5-year) targets used to assess progress towards meeting the WLA. DEQ anticipates the MS4 permittee will continue to iteratively manage their MS4 stormwater program to reduce pollutants, and identify the TMDL benchmarks accordingly

Condition D.14.d
Definitions
The definitions provided in this permit condition provide additional clarification related to MS4-related terms, and generally reflect definitions in the Clean Water Act, Oregon Administrative Rules or based upon EPA and DEQ program language that describe municipal stormwater concepts.

Condition D.15
MS4 Renewal Application Package
The permittee must submit a permit renewal application package no later than 180 days prior to the expiration date of this permit in order to continue permit coverage for MS4 stormwater discharges in the event the permit has not been renewed prior to expiration. This permit condition describes the information that must be provided in the renewal application. Renewal applications must contain any proposed modifications to the stormwater program, including proposed alterations to the SWMP Document. In the interest of transparency, the renewal application is an opportunity to solicit public input from the permittee's community, separate from the periodic updates to the SWMP Document between renewals that do not require public review. DEQ will evaluate the programs based upon the information submitted with the permit renewal application and all other relevant information, such as annual reports, Total Maximum Daily Load (TMDL) pollutant load reduction evaluation, applicable scientific studies, and federal requirements and guidance.

As in the previous permit, this condition includes a requirement for the permittee to provide DEQ with the information and analysis necessary to support DEQ's independent determination that the permittee's stormwater management program reduce pollutants in stormwater discharges to the MEP, including an evaluation of the management practices, control techniques and other provisions using three MEP general evaluation factors (i.e., effectiveness, local applicability, and program resources). Since each MS4 stormwater management program is unique in how they achieve the MEP standard, often employing different BMPs or emphasizing different program areas, this requirement calls for the use of a defined set of standardized and objective criteria for each of the three MEP evaluation factors. Using a permittee-defined set of objective criteria will ensure a consistent application and equitable assessment of the stormwater programs, and a reasonable certainty that the stormwater program is achieving the MEP standard. DEQ encourages the permittee to coordinate the identification and development of the objective criteria with other MS4 permittees, and involve DEQ early in the permit term to guarantee the appropriateness and usefulness of the objective criteria for DEQ's independent evaluation.

The MS4 permit renewal package must also include a proposed monitoring program objectives matrix with proposed changes to the monitoring plan. The monitoring objectives matrix and proposed changes to the monitoring plan should complement the long-term monitoring strategy identified in the existing monitoring plan, as required in the monitoring plan permit conditions, and should consider the type of additional environmental monitoring data that is needed in the implementation of the adaptive management process. DEQ anticipates rigorous engagement with the permittee and stakeholders during the permit term about monitoring approaches, pollutants of concern, a watershed-scale monitoring collaboration, or other factors that the permittee should consider when updating their monitoring objectives matrix and proposed changes to the monitoring plan. DEQ anticipates the proposal will be used in future development of the specific monitoring requirements.

SCHEDULE F
General Conditions

The general conditions that are applicable to all NPDES permits are included in this section. They address operation and maintenance, monitoring and record-keeping, and reporting requirements. The Department recognizes that some of these conditions do not readily apply to municipal stormwater discharges. However, the stormwater permits are NPDES permits, and these conditions are required for all such permits. Where a conflict exists, the general conditions included in this section are superseded by the conditions in Schedules A, B and D.