Mass Load Increase for CBOD and TSS at the Rock Creek and Durham AWTFs

Anti-degradation Analysis

November 2010

1.0 Introduction

In the application for renewal of its watershed-based NPDES permit, Clean Water Services (District) requested a mass load increase for $CBOD_5$ and TSS to ensure the continued use of the existing advanced treatment technology at both the Rock Creek and the Durham Advanced Wastewater Treatment Facilities (AWTFs) and to address additional flows due to growth in the basin. The permit renewal application presented the rationale for the mass load increase at the Rock Creek and Durham AWTFs along with a water quality evaluation of the requested action. This report presents the anti-degradation evaluation to support the mass load increase request for $CBOD_5$ and TSS at the Rock Creek and Durham AWTFs.

The anti-degradation evaluation includes a water quality analysis, land use findings, alternatives analysis, and socio-economic considerations. The following sections provide background information regarding the District's request and contain a discussion of each of the elements of the anti-degradation analysis.

2.0 Background

Table 1 illustrates the impact of maintaining the current mass load limits as flows increase due to projected future growth in the District's service area. At present, the permitted mass loads already require monthly average concentrations that are much lower than the "permitted" concentrations in Schedule A of the District's watershed-based NPDES permit. The DEQ method for deriving permitted mass loads expressed in pounds per day is to multiply the plant average design flow by the permitted monthly average concentration. In contrast, wastewater treatment facility design calculations do not rely on monthly *average* but monthly *maximum* dry weather flows to ensure that the facility complies with permit conditions at all times, not just during average flows. As these mass load limits are held constant with increasing flows, the permitted concentrations decrease. If the current mass load limits remain the same in the future, the equivalent maximum monthly effluent concentrations allowed for $CBOD_5$ and TSS will be reduced to below 3 mg/L in 2025 and below 2 mg/L at buildout conditions. The current technology at the Rock Creek and Durham AWTFs will not be able to ensure that this TSS concentration would be met consistently.

TABLE 1
Effect of Mass Load Limits on TSS and $CBOD_5$ Concentrations Currently and in the Future

AWTF	Monthly Average Mass Limit (lb/day)	Flow Condition	Current		2025		Buildout	
			Flow (mgd)	Concentration (mg/L)	Flow (mgd)	Concentration (mg/L)	Flow (mgd)	Concentration (mg/L)
Durham	830	ADWDF	22.6	4.4	25.7	3.8	41.0	2.4
		MMDWDF	30.0	3.3	37.0	2.7	58.6	1.7
Rock Creek	1300	ADWDF	39.0	4.0	54.6	2.9	89.0	1.8
		MMDWDF	52.0	3.0	72.7	2.1	118.0	1.3

ADWDF = average dry weather design flow.
MMDWDF = maximum month dry weather design flow.

To meet these concentration limits, it will be necessary to install membrane treatment technology at these facilities. Substantially greater capital costs and increased energy costs that results in a higher

carbon footprint with no corresponding environmental benefits are associated with implementing membrane treatment technology to meet future mass load driven concentration limits. Therefore, the District requested a mass load increase for $CBOD_5$ and TSS at the Durham and Rock Creek AWTFs.

3.0 Anti-degradation Evaluation

This section contains information to support an anti-degradation evaluation for the mass load increase request for $CBOD_5$ and TSS at the Durham and Rock Creek AWTFs. As noted above, the elements of an anti-degradation evaluation includes a water quality analysis, land use findings, alternatives analysis, and socio-economic considerations. The following sections contain a discussion of each of the elements of the anti-degradation evaluation.

3.1 Water Quality

Several findings have to be made with respect to water quality for the mass load increase for $CBOD_5$ and TSS at the Rock Creek and Durham AWTFs. Specifically, the evaluation needs to make findings regarding water quality limited streams, consistency with Total Maximum Daily Loads (TMDLs), and compliance with water quality standards. With respect to water quality limited streams and consistency with TMDLs, OAR 340-041-0004(9) states the following:

> *The new or increased discharged load may not be granted if the receiving stream is classified as being water quality limited under sub-section (a) of the definition of "Water Quality Limited" in OAR 340-041-0002, unless:*
>
> > *(i) The pollutant parameters associated with the proposed discharge are unrelated either directly or indirectly to the parameter(s) causing the receiving stream to violate water quality standards and being designated water quality limited; or*
> > *(ii) Total maximum daily loads (TMDLs), waste load allocations (WLAs) load allocations (LAs), and the reserve capacity have been established for the water quality limited receiving stream; and compliance plans under which enforcement action can be taken have been established; and there will be sufficient reserve capacity to assimilate the increased load under the established TMDL at the time of discharge; or*
> > *(iii) Effective July 1, 1996, in water bodies designated water-quality limited for dissolved oxygen, when establishing WLAs under a TMDL for water bodies meeting the conditions defined in this rule, the Department may at its discretion provide an allowance for WLAs calculated to result in no measurable reduction of dissolved oxygen (DO). For this purpose, "no measurable reduction" is defined as no more than 0.10 mg/L for a single source and no more than 0.20 mg/L for all anthropogenic activities that influence the water quality limited segment. The allowance applies for surface water DO criteria and for Intergravel dissolved oxygen (IGDO) if a determination is made that the conditions are natural. The allowance for WLAs applies only to surface water 30-day and seven-day means; or*
> > *(iv) Under extraordinary circumstances to solve an existing, immediate and critical environmental problem, the Commission or Department may, after the completion of a TMDL but before the water body has achieved compliance with standards, consider a waste load increase for an existing source on a receiving stream designated water quality limited …"*

Total Maximum Daily Loads have been established for ammonia, total phosphorus, bacteria and temperature in the lower Tualatin River. The watershed-based NPDES permit includes wasteload allocations for the Rock Creek and Durham AWTFs for ammonia, total phosphorus, bacteria and

temperature. Even with the mass load increase for $CBOD_5$ and TSS, the discharge from the Rock Creek and Durham AWTFs will continue to meet the TMDL WLAs for ammonia, total phosphorus and bacteria. The District plans to offset the growth related increases in thermal load from the Rock Creek and Durham AWTFs through the continued implementation of the watershed-based thermal trading program.

A water quality analysis for the $CBOD_5$ and TSS mass load increase request was included in the permit renewal application. Dissolved oxygen in the lower river was the key parameter evaluated. Volume 1, Section 6 of the renewal application includes a water quality analysis for dissolved oxygen. The analysis concluded that there would be an overall net ***increase*** in dissolved oxygen levels of 0.87 mg/L associated with the District's request for a mass load increase. The net increase in dissolved oxygen is primarily due to the high dissolved oxygen levels of the effluent using the current treatment technology and the reduced river travel time associated with higher effluent flows in the year 2025 scenario, which led to lower consumption of dissolved oxygen by sediment oxygen demand (SOD) and river background BOD_5.

There is no water quality standard for suspended solids. Furthermore, the discharges from the Rock Creek and Durham AWTFs have lower suspended solids levels than those naturally occurring in the Tualatin River. Thus, suspended solids levels in the Tualatin River would not be increased by the mass load increase. The renewal application presents suspended solids data for the RC and DM AWTFs and the Tualatin River just upstream of the AWTFs to support the above conclusion.

The Tualatin River is listed as being water quality limited for iron and manganese in DEQ's 2004/06 303(d) list. Both the iron and manganese listings were based on exceedance of secondary drinking water criteria for aesthetics, and taste and odor effects. Since the listing, DEQ has changed their methodology for assessing the secondary drinking water criteria for iron and manganese, focusing on the dissolved fraction rather than the total, which may result in a change in the water quality limited status of the Tualatin River. Note also that DEQ has proposed the removal of the secondary drinking water based criteria for iron and manganese in its 2010 review of water quality standards.

The concentrations of iron and manganese in the mainstem Tualatin River are the result of naturally occurring geomorphic characteristics of the basin. The dissolved iron levels in the mainstem Tualatin River and the discharge from the Rock Creek and Durham AWTFs are below the secondary drinking water criteria. The naturally occurring dissolved manganese concentrations exceed the secondary drinking water criteria in the lower Tualatin River. The wastewater discharges are below the naturally occurring concentrations of dissolved manganese in the lower Tualatin River. The wastewater discharge and the District's flow augmentation from Hagg Lake and Barney Reservoir act to reduce concentrations of dissolved manganese in the lower Tualatin River.

The renewal application also included a reasonable potential analysis for the discharges from the Rock Creek and Durham AWTFs. The reasonable potential analyses were conducted for the priority pollutants based on year 2025 flows, which is consistent with the flows for the mass load increase request. The analyses concluded that there was no reasonable potential to exceed water quality standards for the priority pollutants at the Rock Creek and Durham AWTFs.

3.2 Land Use Compatibility Statement

The anti-degradation evaluation requires findings that show that the activity is consistent with local land use plans. Since the District would continue to utilize existing facilities to serve customers within the service area and provide for additional growth in the area, the activity is consistent with local land use

plans.

3.3 Alternatives Evaluation

The Department of Environmental Quality (DEQ) developed an Internal Management Directive (IMD) for conducting an anti-degradation evaluation. DEQ's IMD for an anti-degradation evaluation requires consideration of the following alternatives at a minimum:

- Improved operation and maintenance of existing treatment system
- Recycling or reuse with no discharge
- Discharge to on-site system
- Seasonal or controlled discharges to avoid critical water quality periods
- Discharge to sanitary sewer
- Land application

Some of the alternatives noted above are not feasible or applicable. For example, the District operates some of the most efficient treatment facilities in the country. The District has addressed the tremendous growth that has occurred in the Tualatin River basin over the past 30 years through improved treatment, operation, and maintenance of its wastewater treatment facilities. As part of its facilities planning process, the District evaluated whether the existing treatment facilities can be operated more efficiently. Both the Rock Creek and Durham AWTF Facilities Plans include recommendations for improving efficiencies of existing treatment facilities. The District anticipates implementing the recommendations in the facilities plans. However, these improvements will not, by themselves, enable the District to address the anticipated growth in the service area. Thus, addressing growth issues by improved operation and maintenance is not feasible.

Traditional on-site systems provide a low-tech method for treating and disposing wastewater from single family, multi-family or small community developments. Typical flows range from a few hundred gallons per day to a few thousand. By 2025, the growth in the Rock Creek and Durham service areas is expected to generate an additional 18 MGD of flow above currently permitted flows. The land requirements for an on-site system to address the anticipated growth are significant. Using DEQ's sizing criteria for absorption trenches for a conventional sand filter on-site system, the linear footage per MGD of flow would be 333,300 feet (63 miles) for the type of soils in the District's service area (type C/D). A flow of 18 MGD would require over 1130 miles of absorption trenches. Thus, addressing growth in the basin by discharging to an on-site system is not feasible.

The District provides sanitary sewer services to urban Washington County. Thus, discharging to a sanitary sewer system is not applicable.

The District's Rock Creek AWTF Facilities Plan, the West Basin Facilities Plan, and Durham AWTF Facilities Plan evaluated a number of alternatives to address the anticipated growth in the basin. However, the alternatives evaluated in the facilities plans do not include the "no discharge" alternatives specified in DEQ's anti-degradation IMD. The options in the facilities plans tend to deal with providing advanced treatment at the Rock Creek and Durham AWTFs using current advanced treatment technologies if a mass load increase is granted or abandoning the use of current treatment technologies in favor of membrane treatment technologies if a mass load increase is not granted. Since the objectives of the Facilities Plan evaluations are different from the mass load assessment, some of the alternatives in the District's facilities plans were not developed to the extent noted in the DEQ IMD. For example, the West Basin Facilities Plan evaluated expanding the District's reuse program. However, not discharging the additional flows associated with the anticipated growth in the service area during the dry season was

not the objective for the reuse program. Also, the facilities plans did not evaluate a storage alternative for the additional flows associated with the anticipated growth in the service area because of the importance of the high quality effluent discharges in maintaining Tualatin River flows during the dry season. Thus, the "no discharge" alternatives such as storage and reuse were developed specifically for this evaluation.

The following treatment alternatives, which reflect a combination of alternatives from DEQ's anti-degradation IMD, and the District's facilities plans, were evaluated.

- Preferred alternative: Advanced tertiary treatment using current technology (secondary treatment, nutrient removal, and filtration) at the Rock Creek and Durham AWTFs.
- Alternative 1: Membrane Bioreactors (MBR) at the Rock Creek and Durham AWTFs.
- Alternative 2: Effluent reuse at the Rock Creek and Durham AWTFs for the additional flows associated with the anticipated growth in the service area; continue treatment and discharge of flows up to the permitted flows for the Rock Creek and Durham AWTFs using current advanced treatment technology.
- Alternative 3: Store treated water associated with the anticipated growth at the Rock Creek and Durham AWTFs and discharge during wet season; continue treatment and discharge of flows up to the permitted flows for the Rock Creek and Durham AWTFs using current advanced treatment technology.

3.3.1 Description of Alternatives

This section describes each of the alternatives specified above.

- Preferred alternative: Continued use of advanced tertiary treatment technology at the Rock Creek and Durham AWTFs. Under this alternative, the District would continue the use of existing advanced treatment technology, which consists of secondary treatment, biological nutrient removal, chemical treatment, chlorination, filtration, and dechlorination. A mass load increase *would be* required for this alternative.

- Alternative 1: Membrane Bioreactors (MBR) at the Rock Creek and Durham AWTFs. The growth in the basin necessitates the construction of additional treatment capacity at the Rock Creek and Durham AWTFs. Without a mass load increase, the growth in the basin will require the District to further increase the level of advanced wastewater treatment and abandon the use of the current advanced treatment technology in favor of membrane bioreactors (MBR) at the Rock Creek and Durham AWTFs. Under this alternative, all future expansion of treatment capacity will be through the addition of membrane bioreactors at both the Rock Creek and Durham AWTFs. A mass load increase would *not* be required for this alternative.

- Alternative 2: Effluent reuse at the Rock Creek and Durham AWTFs. Under this alternative, the District would develop a reuse program for the additional flow at the Rock Creek and Durham AWTFs as a result of growth in the basin. The District would continue treatment and discharge of flows up to the current permitted flows for the Rock Creek and Durham AWTFs using existing advanced treatment technology. The level of treatment necessary to produce reuse water at the Rock Creek and Durham AWTFs would be similar to the level of treatment in the preferred alternative. Thus, the costs presented for this alternative reflect the treatment costs for the preferred alternative plus the costs of an effluent reuse program for the additional flows associated with growth in the service area. A mass load increase would *not* be required for this alternative.

- Alternative 3: Store treated water associated with anticipated growth in the Rock Creek and Durham AWTF service area and discharge during wet season. Under this alternative, the District would store the additional flow generated at the Rock Creek and Durham AWTFs as a result of growth in the service area. The District would continue treatment and discharge of flows up to the current permitted flows for the Rock Creek and Durham AWTFs using existing advanced treatment technology. The level of treatment necessary to produce stored water at the Rock Creek and Durham AWTFs would be similar to the level of treatment in the preferred alternative. Thus, the costs presented for this alternative reflect the treatment costs for the preferred alternative plus the costs of providing storage during the dry season for the additional flows associated with growth in the service area. A mass load increase would *not* be required for this alternative.

3.3.2 Economic Evaluation

Capital costs, and operation and maintenance (O&M) costs were developed and used to calculate the total present worth costs for each alternative. O&M costs were projected over 20 years and capitalized at 5% per annum. The following table summarizes the capital, O&M, and present worth costs associated with each of the alternatives at the Rock Creek and Durham AWTFs:

TABLE 2
Capital and O&M Costs of Alternatives

Alternative	Alternative Description	Present Worth Capital Costs (RC + DM)	Present Worth O&M Costs (RC + DM)	Present Worth Total Costs (RC + DM)
Preferred	Existing advanced treatment technology @ RC and DM	$87.3 million	$21.4 million	$108.7 million
1	MBR @ RC and DM	$115.1 million	$37.5 million	$152.6 million
2	Reuse @ RC and DM	$277.7 million	$39.0 million	$316.7 million
3	Storage @ RC and DM	$259.3 million	$37.8 million	$297.1 million

Developing a reuse program or storing water for the 18 MGD of additional flow associated with growth in the Rock Creek and Durham service areas is very expensive. As a result, the costs associated with these non-discharge options (alternatives 2 and 3) are significantly higher than the costs associated with the use of existing advanced treatment or membrane technologies. The continued use of existing advanced treatment technology at the Rock Creek and Durham AWTFs was the most cost effective alternative which also meets water quality objectives for the Tualatin River.

3.3.3 Non-Economic Evaluation

A non-economic evaluation rating system was developed to evaluate alternative 1 and the preferred alternative. Non-economic criteria included permitability, reliability, operational flexibility,

environmental benefit, in-stream water quality impacts, and public acceptance. All criteria were entered into the rating system with equal weight. The results of the non-economic criteria rating are presented in the table below:

TABLE 3
Non-economic Criteria Rating

Criteria	Alternative 1	Preferred Alternative
1. Permittability	4	2
2. Reliability	3	4
3. Operational Flexibility	3	4
4. Environmental Benefit	2	4
5. In-stream Water Quality Impact	3	3
6. Public Acceptance	3	3
Non-economic Criteria Rating	**3.0**	**3.3**

Key	
Considerably Below Average	1
Moderately Below Average	2
Average Performance	3
Moderately Above Average	4
Considerably Above Average	5

Alternative 1 was rated superior to the preferred alternative in the permitting category because it could be permitted within the standard permit renewal procedures and without EQC action. Alternative 1 was rated equivalent to the preferred alternative for the water quality impact category because water quality objectives would be met with either alternative. The preferred alternative was considered to be superior to Alternative 1 in the reliability, operational flexibility and environmental benefit categories. Overall, the non-economic criteria rating shows that the continued use of the existing advanced treatment technologies at the Rock Creek and Durham AWTFs is superior compared to the use of membrane technologies.

Both the economic and non-economic criteria illustrate the superiority of the continued use of the existing advanced treatment technologies at the Rock Creek and Durham AWTFs.

3.4 Socio-economic Evaluation

With population growth, the Durham and Rock Creek AWTFs will not be able to consistently achieve the current mass load limits using the existing tertiary treatment and filtration technology. It will become necessary for Clean Water Services to incorporate higher levels of treatment such as membrane bio-reactors with microfiltration to continue to meet existing mass load limits especially for TSS, which is the primary parameter of concern from the design perspective. The existing tertiary treatment and filtration technology is effective at removing 97.9% of the influent TSS levels. The use of membrane bio-reactors would result in a slight increase in removal efficiency to 98.4%. This incremental increase in TSS treatment efficiency comes at a significant cost – $43.9 million. The District believes that the significant expenditures are not necessary to achieve water quality standards or prevent further degradation and

can be avoided while continuing to provide water quality benefits.

In addition to the water quality analysis, land use findings, and alternatives analysis, the anti-degradation evaluation also includes socio-economic considerations. Specifically, the anti-degradation analysis requires a finding that the action is necessary and benefits of the lowered water quality outweigh the environmental costs of the reduced water quality. As noted in the previous section, the District evaluated several alternatives prior to identifying its preferred alternative. To accommodate the additional flows related to growth in the service area, the District is proposing to implement the most economically prudent and environmentally sustainable alternative. While the difference in costs between the preferred alternative and alternative 1 is significant, the rate impacts associated with the higher costs would fall within the range of economic tolerability that have been suggested by the U.S. EPA. However, since the additional costs are significant and the related benefits are not, a conventional socio-economic evaluation would not be the appropriate mechanism for addressing this element of the anti-degradation analysis. Instead the District focused on the overall ecological benefit associated with the preferred alternative.

Using the narrowly defined criteria in DEQ's anti-degradation IMD, the mass load increase for $CBOD_5$ and TSS at the Rock Creek and Durham AWTFs could be misconstrued as resulting in a lowering of water quality. However, as noted above, the water quality analysis concluded that there would be an overall net ***increase*** in dissolved oxygen levels of 0.87 mg/L. The effluent $CBOD_5$ concentrations at both the Rock Creek and Durham AWTFs are typically below detectable levels (i.e. < 2 mg/L). The suspended solids concentrations in the Tualatin River would not be affected with the mass load increase because the discharges from the Rock Creek and Durham AWTFs have lower suspended solids concentrations than those which naturally occur in the Tualatin River. Thus, the mass load increase would not result in lowering of water quality.

DEQ defined broader environmental considerations beyond water quality issues in the anti-degradation IMD. The environmental "costs" noted in DEQ's anti-degradation IMD includes the following:

- loss of assimilative capacity;
- impact on fishing,
- impacts on recreation and tourism;
- impact public health; and
- impact on societal value for environmental quality.

The Districts' implementation of the preferred option will not affect the assimilative capacity of the Tualatin River nor is it expected to impact fishing, recreation, tourism, public health, or societal value for environmental quality.

In conducting the socio-economic evaluation, the District focused on the overall ecological benefits associated with the preferred alternative. These include:

- Significantly lower energy usage (carbon footprint) of the current advanced treatment technology compared to membrane technology; and
- Continued enhancement of dry season flows in the Tualatin River with highly treated effluent (when compared to the "no additional discharge" scenarios).

In addition to the benefits noted above, the District plans to implement a TSS reduction program to improve overall water quality in the Tualatin watershed if a mass load increase is granted for the Rock

Creek and Durham AWTFs. The following is a discussion of the ecological benefits of the preferred alternative and the District's TSS reduction program.

Energy usage/carbon footprint: Membrane technology will increase the carbon footprint of the Durham and Rock Creek AWTFs by substantially increasing electricity usage. In its climate change adaptation goals for the National Water Program, EPA stated that one of its primary objectives is to improve the sustainability of water and wastewater utilities and reduce greenhouse gases. According to EPA, reducing energy usage at water and wastewater treatment plants is the primary mechanism to achieve this goal (Presentation by James Goodrich, USEPA at "Climate Change Impacts on Water and Research Needs Workshop" in Denver, Colorado, August 31- September 2, 2010). At the Durham AWTF, the use of membrane technology would result in 2.4 times (3950 additional MW-hours annually) the electricity used to operate than the existing advanced treatment technology for year 2025 flows. At the Rock Creek AWTF, the use of membrane technology would result in 1.9 times (3250 additional MW-hours annually) the electricity used to operate than the existing advanced treatment technology for year 2025 flows. The increased energy usage results in a larger carbon footprint as measured in terms of CO_2 emissions. The increased energy usage results in an increase in the annual CO_2 emissions of 5.3 million lbs at the Durham AWTF and 4.4 million lbs at the Rock Creek AWTF. The increased energy usage and larger carbon footprint does not result in any corresponding environmental benefit as noted in the water quality analysis and non-economic evaluation sections.

TABLE 4
Energy Usage and Carbon Footprint (2025 flows)

Treatment Facility	Energy Usage (MW-hours per year)		Carbon Footprint (CO_2 emissions in million lbs per year)	
	With existing technology	With membrane technology	With existing technology	With membrane technology
Durham AWTF	2900	6850	3.9 million lbs	9.2 million lbs
Rock Creek AWTF	3850	7100	5.2 million lbs	9.6 million lbs

Enhancement of dry season flows: Flow from the highly treated wastewater from the Rock Creek and Durham AWTFs is an important source of the water in the Tualatin River. The discharge from the Rock Creek and Durham AWTFs along with the District's stored water releases from Hagg Lake and Barney Reservoir are critical in maintaining the beneficial uses in the mainstem Tualatin River. During critical low flow conditions, the discharges from the Rock Creek and Durham AWTFs make up over 40% of the flow in the Tualatin River at current conditions. With the addition of the stored water releases, the District's activities contribute more than 60% of the total flow in the Tualatin River during the critical low flow conditions.

With the anticipated increase in flows as a result of growth in the service area, the discharges from the Rock Creek and Durham AWTFs are expected to contribute an additional 14% of the flow in the Tualatin River at 2025 flows (for a total of 54% of the river's base flow). With the stored water releases, the District's activities would contribute about 70% of the total flow in the Tualatin River during the critical low flow conditions.

TSS reduction program: The District implements a number of programs that reduce TSS levels, and thereby improving water quality and ecological functions of the Tualatin River watershed. These actions

include watershed enhancement projects and flow augmentation.

The District conducts a variety of enhancement projects in the Tualatin River watershed. Watershed enhancement projects are undertaken within the Urban Growth Boundary (UGB) to preserve stream health and/or enhance stream conditions by generating on-going benefits to water quality, water quantity and aquatic habitat. Enhancement activities include channel reconfiguration, large wood placement, gravel-boulder placement, off-channel habitat, in-stream pond removal, invasive species management, and re-vegetation. These projects are effective at reducing stream bank erosion and thereby, reducing TSS levels in Tualatin River watershed. From 2004-09, the District conducted 42 projects, which resulted in 16.7 miles of stream enhancement within the UGB. Currently, enhancement activities outside the UGB primarily consist of re-vegetation. From 2004-09, the District conducted 29 projects, which resulted in 17 miles of riparian plantings outside the UGB. In the future, the District is planning to conduct stream enhancement activities focusing on flow restoration and improving habitat outside the UGB as well.

The District augments flow in the Tualatin River with stored water from Hagg Lake and Barney Reservoir. The District contracts 12,618 acre-feet annually from Hagg Lake and 1,667 acre-feet annually from Barney Reservoir for use in maintaining water quality in the Tualatin River. The District's stored water releases equate to about 60 cfs per day for 120 days during low flow conditions (July – October). The District's stored water releases provide a variety of water quality and ecological benefits including reduced stream temperatures and higher dissolved oxygen levels. In addition to these benefits, the District's stored water releases have very low TSS levels and result in lower TSS levels in the Tualatin River.

The District will continue to implement programs to improve overall ecological benefit and focus specific projects to reduce TSS levels in the watershed. The District plans to develop tools for quantifying TSS load reductions from its watershed enhancement projects and flow augmentation activities during the permit cycle.

4.0 Proposed NPDES Permit Limits and Conditions

The District's watershed-based NPDES permit identifies both effluent concentrations and mass loads for TSS and $CBOD_5$. The current limits are the result of several permit iterations implementing various program policies and expectations including maintaining mass loads, identifying achievable effluent quality, basin standards, and policies for converting BOD_5 to $CBOD_5$. As a result of these various program policies, the concentration limits in the permit cannot be calculated from the mass load limits. The District 's dry season mass load increase request is based on using the currently permitted mass load limits and the permitted flows for the Durham and Rock Creek AWTFs to back-calculate applicable $CBOD_5$ and TSS concentrations for each facility. For the Rock Creek AWTF, the applicable back-calculated concentration using this method is 4.0 mg/L – below the permitted concentration limits. For the Durham AWTF, the applicable back-calculated concentration is 4.4 mg/L – well below the permitted concentration limits. Dry season mass load limits were then calculated using 4.0 mg/L for the Rock Creek AWTF and 4.4 mg/L for the Durham AWTF and the 2025 design average dry weather flows for the respective facilities. The concentration ***limits*** are the same as those in the current permit for the Rock Creek and Durham AWTFs. Table 5 presents the proposed $CBOD_5$ and TSS effluent limits for the Rock Creek and Durham AWTFs.

TABLE 5
Dry Season $CBOD_5$ and TSS Effluent Limits for Rock Creek and Durham AWTFs (no dry season discharge from Hillsboro and Forest Grove WWTFs)

Treatment Facility	Outfall Number	Parameter	Concentration Limits		Mass Load Limits		
			Monthly	Weekly	Monthly	Weekly	Daily***
Durham*	D001	$CBOD_5$	5	8	950	1400	1900
		TSS	5	8	950	1400	1900
Rock Creek**	R001	$CBOD_5$	8	11	1800	2700	3600
		TSS	8	11	1800	2700	3600

* Based on a design average dry weather flow of 25.7 MGD and an effluent $CBOD_5$/TSS concentration of 4.4 mg/L at the Durham AWTF

**Based on a design average dry weather flow of 54.6 MGD and an effluent $CBOD_5$/TSS concentration of 4.0 mg/L at the Rock Creek AWTF

*** On any day when the total flow to a treatment facility exceeds twice the design average dry weather flow, the daily maximum mass limit is suspended

Two 24-inch pipelines connect the Forest Grove, Hillsboro, and Rock Creek facilities (West Basin facilities). These pipelines allow the transfer of treated or untreated wastewater and biosolids between the West Basin facilities, which greatly enhances the District's operational and maintenance flexibility. Currently, flows generated in the Forest Grove and Hillsboro service areas are sent to the Rock Creek AWTF for treatment and discharge during the dry season. The design average dry weather flow for the Rock Creek AWTF in Table 1 and used to calculate the mass load limits in Table 5 includes the transfer flows from the Hillsboro and Forest Grove WWTFs. In its permit renewal application, the District requested dry season discharges from the Hillsboro and Forest Grove WWTFs. Dry season discharges from the Hillsboro and Forest Grove WWTFs would reduce the design average dry weather flow for the Rock Creek AWTF. The following table presents the 2025 flows at the Rock Creek AWTF with dry season discharges from the Hillsboro and Forest Grove WWTFs.

TABLE 6
Dry Season Effluent Flows at Rock Creek AWTF with dry season discharges from Hillsboro and Forest Grove WWTFs (mgd)

Facility	Dry Season Discharge Flows (2025 conditions)
Rock Creek	46.4
Forest Grove	3.7
Hillsboro	4.5

The $CBOD_5$ and TSS effluent limits for the Durham and Rock Creek AWTFs with dry season discharge from the Hillsboro and Forest Grove WWTFs are presented below.

TABLE 7
Dry Season $CBOD_5$ and TSS Effluent Limits for Rock Creek and Durham AWTFs (with dry season discharge from Hillsboro and Forest Grove WWTFs)

Treatment Facility	Outfall Number	Parameter	Concentration Limits		Mass Load Limits		
			Monthly	Weekly	Monthly	Weekly	Daily***
Durham*	D001	$CBOD_5$	5	8	950	1400	1900
		TSS	5	8	950	1400	1900
Rock Creek**	R001	$CBOD_5$	8	11	1550	2300	3100
		TSS	8	11	1550	2300	3100

* Based on a design average dry weather flow of 25.7 MGD and an effluent $CBOD_5$/TSS concentration of 4.4 mg/L at the Durham AWTF

**Based on a design average dry weather flow of 46.4 MGD and an effluent $CBOD_5$/TSS concentration of 4.0 mg/L at the Rock Creek AWTF

*** On any day when the total flow to a treatment facility exceeds twice the design average dry weather flow, the daily maximum mass limit is suspended

Wet season mass load limits were calculated using the concentrations presented in Table 8 and 2025 design average wet weather flows for the Rock Creek and Durham AWTFs. The concentration limits for $CBOD_5$ and TSS at the Durham and Rock Creek AWTFs are the same as those in the current watershed-based NPDES permit. For the Durham AWTF, the wet season mass load limits are the same as those in the current permit because there has been no change in the design average wet weather flow. At the Rock Creek AWTF, the calculations did result in higher mass loads. The resulting wet season mass loads for the Durham and Rock Creek AWTFs are presented in the table below.

TABLE 8
CBOD and TSS Effluent Limits (wet season)

Treatment Facility	Outfall Number	Parameter	Concentration Limits		Mass Load Limits		
			Monthly	Weekly	Monthly	Weekly	Daily***
Durham*	D001 & D003	$CBOD_5$	10	15	3500	5300	7000
		TSS	10	15	3500	5300	7000
Rock Creek**	R001 & R003	$CBOD_5$	20	30	11400	17100	22800
		TSS	20	30	11400	17100	22800

* Based on a year 2025 design average wet weather flow of 42 MGD at the Durham AWTF

**Based on a year 2025 design average wet weather flow of 68.4 MGD at the Rock Creek AWTF

*** On any day when the total flow to a treatment facility exceeds twice the design average wet weather flow, the daily maximum mass limit is suspended

5.0 Bubbled TSS Mass Load for the Four WWTFs

The mass load limits for TSS will be the principal drivers for future design decisions at the District's treatment facilities. The District is requesting that the TSS mass load limits in the new permit be

established as a mass load bubble. The bubbled TSS mass limits would provide the District operational flexibility; it will also help alleviate pressures related to growth in the basin because the service areas for each treatment facility will not grow at the same rate. A bubbled load will enable the District to utilize the mass load for the entire service area, consistent with watershed permitting policies. Water quality would not be impacted because the wastewater treatment facilities will continue to produce high quality effluent to meet the concentrations limits in the watershed-based NPDES permit.

A bubbled load for TSS would be established for the wastewater treatment plant discharges by summing the individual mass limits for the four plants into a collective mass limit. Bubbled TSS mass load would be established for the dry and wet season and defined for the same three temporal periods currently in place: monthly average; weekly average; and daily maximum. Compliance would be determined by summing the individual mass discharges from each of the facilities for the relevant periods and subtracting that total from the collective mass limits.

The bubbled mass loads were calculated using the following individual mass limits:

- Proposed TSS mass loads presented in Tables 7 and 8 for the Rock Creek and Durham AWTFs;
- Proposed dry season TSS mass loads for the Hillsboro and Forest Grove WWTFs presented in Table 12 of the report titled "Dry Season Discharges from the Hillsboro and Forest Grove WWTFs – NPDES Permitting Report"; and
- Wet season TSS mass loads for the Hillsboro and Forest Grove WWTFs based on the currently permitted mass loads.

Table 9 presents TSS bubble load for the dry and wet season and the individual TSS mass loads that were used to calculate the bubble load.

TABLE 9
TSS Mass Load Bubble for the Four WWTFs

Dry Season					**Wet Season**			
	Monthly* Average lb/day	Weekly* Average lb/day	Daily* Maximum lbs			Monthly Average lb/day	Weekly Average lb/day	Daily* Maximum lbs
TSS Bubble Load	**3175**	**4710**	**6350**		**TSS Bubble Load**	**17500**	**26400**	**35100**
Individual Mass Loads Used to Calculate the TSS Bubble Load								
Durham	*950*	*1400*	*1900*		*Durham*	*3500*	*5300*	*7000*
Rock Creek	*1550*	*2300*	*3100*		*Rock Creek*	*11400*	*17100*	*22800*
Forest Grove	*300*	*450*	*600*		*Forest Grove*	*1300*	*2000*	*2700*
Hillsboro	*375*	*560*	*750*		*Hillsboro*	*1300*	*2000*	*2600*

* On any day when the total flow to an individual treatment facility exceeds twice the design average flow, the daily maximum mass loads for will not be utilized in the bubble load calculation.

As with the existing dissolved oxygen point-point trading program, the TSS point-point bubble could be authorized exclusively within the permit itself. Provisions would be added to Schedules A and B to

establish the TSS mass load bubbles. TSS would be added to the list of tradable pollutants (currently at Schedule D.7.b.) with permission for point-point credit trading. The Reporting and Evaluation provisions (currently in Schedule D.7.i) would include TSS bubble load trading activities. A provision would also be included in Schedule D for the development of a TSS reduction program based on the District's watershed activities.

5.0 Appendices

Appendix A: Oregon Administrative Rules – Anti-degradation Policy

Appendix B: Anti-degradation Implementation Flow Chart

Appendix C: Anti-degradation Review Sheet