Local Limits Evaluation Report

May 2021

Clean Water Services

NPDES Permit No. 101141, 101142, 101143, 101144
File No. 90735, 90745, 90752, 90770

Table of Contents

Appendices

Excel worksheets

Appendix B:	Durham influent, primary effluent and plant effluent monitoring data Forest Grove influent and plant effluent monitoring data-No NTS scenario Forest Grove influent and plant effluent monitoring data- NTS scenario Forest Grove NTS effluent monitoring data Hillsboro influent, primary effluent and plant effluent monitoring data Rock Creek influent, primary effluent and plant effluent monitoring data
Appendix C:	Biosolids monitoring data
Appendix D:	Average pollutant concentration from District SIUs
Appendix E:	Receiving stream background pollutant concentrations
Appendix G:	Screening values for potential hazardous atmospheres
Appendix H:	DEQ local limits workbook- Durham DEQ local limits workbook- Forest Grove DEQ local limits workbook- Forest Grove-With NTS DEQ local limits workbook- Hillsboro DEQ local limits workbook- Rock Creek
Appendix I:	Rock Creek MAIL alternative allocations
Appendix K:	Background loadings as percent of MAHLs

Section 1: Introduction/Background

1.1 POTW Contact Information

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1.2 Treatment Plant Locations and Service Areas

Clean Water Services (District) is a county service district that serves more than 600,000 people in the urban portion of Washington County. The District owns and operates four wastewater treatment facilities (WWTFs) in the Tualatin River watershed — Forest Grove WWTF, Hillsboro WWTF, Rock Creek Advanced Wastewater Treatment Facility (AWTF) and Durham AWTF. All four WWTFs discharge to the Tualatin River.

The District also implements the Municipal Separate Storm Sewer System (MS4) program in the Washington County urban area with its co-implementers (Washington County and the cities of Banks, Beaverton, Cornelius, Durham, Forest Grove, Hillsboro, King City, North Plains, Sherwood, Tigard and Tualatin).

The four WWTFs and the MS4 program are permitted by the Oregon Department of Environmental Quality (DEQ) under the watershed-based National Pollutant Discharge Elimination System (NPDES) permit (NPDES permit). The District's NPDES permit was issued by DEQ on April 22, 2016, with an effective date of June 1, 2016, and an expiration date of May 31, 2021.

1.2.1 Durham Advanced Wastewater Treatment Facility

The Durham facility is located at 16580 SW 85th Avenue, Tigard, OR 97224. This facility provides advanced wastewater treatment for residents, commercial facilities and industrial facilities in the cities of Beaverton, Durham, King City, Sherwood, Tigard, Tualatin, and small portions of southwest Portland and Lake Oswego.

1.2.2 Rock Creek Advanced Wastewater Treatment Facility

The Rock Creek facility is located at 3235 SE River Road, Hillsboro OR 97123. This facility provides advanced wastewater treatment for residents, commercial facilities, and industrial facilities in the cities of Hillsboro and Aloha, and portions of Beaverton and unincorporated Washington County. Rock Creek is connected to the District's treatment facilities in Hillsboro and Forest Grove by two 24-inch diameter pipelines. Solids are conveyed year-round from the Forest Grove and Hillsboro facilities to the Rock

Creek facility for treatment. In the winter wet season (November-April), flows exceeding the facility capacities at Hillsboro and Forest Grove are conveyed to and treated at the Rock Creek facility.

1.2.3 Hillsboro Wastewater Treatment Facility

The Hillsboro facility is located at 770 South First Street, Hillsboro, OR 97123. This facility provides wastewater treatment for residents, commercial facilities, and industrial facilities in the cities of Banks and North Plains; portions of the cities of Hillsboro, Cornelius and Forest Grove; and portions of unincorporated Washington County. The Hillsboro facility is connected to the Rock Creek and Forest Grove treatment facilities by two 24-inch diameter pipeline as described above.

1.2.4 Forest Grove Wastewater Treatment Facility

The Forest Grove facility is located at 1345 SW Fern Hill Road, Forest Grove, OR 97116. This facility provides wastewater treatment for residents, commercial facilities, and industrial facilities in the cities of Forest Grove and Gaston, unincorporated Washington County and portions of Cornelius. The Forest Grove facility is connected to the District's Rock Creek and Hillsboro treatment facilities by two 24-inch diameter pipelines as described above.

1.3 Treatment Plant Descriptions

1.3.1 Durham Advanced Wastewater Treatment Facility

Preliminary Treatment. The influent flow enters the Durham facility via the upper Tualatin River interceptor pipe from the west and the Fanno Creek and lower Tualatin River interceptor pipe from the east. From there, the untreated flow is pumped to the headworks building. Durham receives hauled septic waste from septic tanks, some holding tanks and chemical toilets, and recreational vehicle waste, which is incorporated into the influent flow through onsite receiving stations.

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 the heavier inorganic material settles and is pumped to grit removal units where it will be prepared for landfill disposal.

Primary Treatment. From the headworks building, the wastewater flows by gravity to primary clarifiers where settleable organics and floatable fats, oils and greases are separated from the wastewater. Aluminum sulfate is added to the primary clarifiers for phosphorus removal on a seasonal basis (May-October). Primary effluent flows by gravity to the primary effluent pump station for distribution to secondary treatment.

Secondary Treatment. The secondary treatment system consists of aeration basins and secondary clarifiers that remove the dissolved organic matter and nutrients that pass through primary treatment. This is achieved by the activated sludge process, which uses bacteria to consume the organic matter as food and convert it to carbon dioxide, water and more bacteria. The aeration basins are designed to remove ammonia and phosphorus. Hydrated lime is added to the aeration basins to neutralize the acid produced during ammonia removal. In the secondary clarifiers these 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 enough bacteria to consume the organic matter (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 pass through secondary treatment. Phosphorus removal treatment units are operated seasonally (May-October). Secondary effluent is distributed using gravity to tertiary treatment units, where it is dosed with polymer and aluminum sulfate, then mixed, flocculated and allowed to settle prior to disinfection.

Disinfection. Effluent from the tertiary treatment system flows through serpentine contact basins and is disinfected with sodium hypochlorite to kill any remaining viruses and bacteria.

The disinfected water is conveyed through multimedia gravity filters utilizing a bed of anthracite coal, silica sand and some garnet sand. These filters are used year-round to remove solids from secondary or tertiary effluent. The filter effluent is then dechlorinated with sodium bisulfite.

Effluent Discharge. Following dechlorination, the effluent flow is sampled, monitored and discharged to the Tualatin River through the primary outfall at river mile 9.2. The wet-weather outfall is utilized when flows exceed secondary capacity and the additional storage provided by two onsite surge basins. This excess flow is disinfected, dechlorinated, measured and sampled separately from the primary outfall.

Durham produces reuse water. Additional chlorine and required monitoring occur following filtration to comply with Class A reuse water production. The water is stored in an onsite wetwell, then distributed to users for irrigation.

Solids Removal and Thickening. Sludge from the primary treatment process is pumped to fermentation and thickening tanks. Fermenting bacteria begin to decompose the primary sludge to produce volatile fatty acids, which aid in the biological phosphorus removal process. The overflow from fermentation and thickening is pumped to secondary treatment; the thickened sludge is pumped to anaerobic digestion.

The waste activated sludge from the secondary treatment process is thickened in a gravity thickener and then pumped to a tank where it is held under anaerobic conditions, causing the release of phosphorus and magnesium. The sludge from that tank is thickened again through a centrifuge. The centrate containing high phosphorus and magnesium is pumped to a fertilizer production facility and the thickened sludge is pumped to the anaerobic digester. The waste activated sludge is dosed with an organic polymer prior to thickening to flocculate the solids.

Anaerobic Digestion. Anaerobic digestion is a biological process in which the organic matter in the thickened primary sludge and waste activated sludge is used as the food source for bacteria. In the Durham anaerobic digestion process, fats, oils, grease (FOG) and organic matter are converted to methane, carbon dioxide and water. The sludge is mixed and heated in the digesters to maintain favorable conditions for the bacteria. The sludge is dosed with ferric chloride to control hydrogen sulfide in the digester gas, which is used in generators and boilers in the heat and power system. Excess heat is used to heat the digestion process and buildings throughout the facility. Excess gas is combusted in a flare.

Biosolids Dewatering. Anaerobically digested biosolids are conditioned with organic polymer, dewatered by centrifuge and stored in silos prior to loading into trucks for land application. The residual liquid from the dewatering process is high in phosphorus and ammonia and is stored and pumped to the fertilizer production facility.

Fertilizer Production. The liquids from dewatering and waste activated sludge thickening are high in magnesium, ammonia and phosphorus. These streams are prone to precipitating the mineral struvite (magnesium ammonium phosphate), which causes scale to form in pipes and pumps conveying this liquid. In the fertilizer production facility, struvite is precipitated in a controlled reactor. This limits the potential for nuisance struvite formation elsewhere in the facility, reduces the recycle load of phosphorus and ammonia, and results in a commercial grade slow release fertilizer.

1.3.2 Rock Creek Advanced Wastewater Treatment Facility

Preliminary Treatment. The bulk of the influent flow to the Rock Creek facility enters by gravity in a 72-inch interceptor pipe at the influent pump station approximately 60 feet below grade. From there, the untreated flow is pumped to the headworks building. Rock Creek receives hauled septic waste from septic tanks, some holding tanks and chemical toilets, and recreational vehicle waste, which is incorporated into the influent flow through onsite receiving stations. Additional wastewater enters the headworks building directly by force main from three remote pump stations and the Hillsboro and Forest Grove facilities.

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.

Primary Treatment. From the headworks building, the wastewater flows by gravity to primary clarifiers where settleable organic and inorganic particles (grit) are separated from the 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.

Secondary Treatment. The secondary treatment system consists of aeration basins and secondary clarifiers that utilize the activated sludge process to remove the dissolved organic matter and nutrients that pass through primary treatment. The aeration basins are designed to remove ammonia and phosphorus. Hydrated lime is added to the aeration basins to neutralize the acid produced during ammonia removal. Bacteria flocculate, settle and are collected as activated sludge in the secondary clarifiers. A portion of the activated sludge is pumped back to the front of the aeration basins as return activated sludge to maintain enough bacteria to consume the organic matter. Waste activated sludge is pumped to the solids thickening process. 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 pass through secondary treatment. Phosphorus removal treatment units are operated seasonally (May-September). Secondary effluent is distributed using a combination of gravity and pumped flow to three treatment units. The Actiflo process is a high rate clarification process that uses aluminum sulfate for coagulation, organic polymer for flocculation, and finely graded silica sand, which is embedded in the floc to increase specific gravity and settling velocity. The Claricone process is an upflow solids contact clarification process that also utilizes aluminum sulfate and organic polymer. In direct filtration, the secondary effluent is dosed with aluminum sulfate immediately prior to final filtration.

Granular media gravity filters utilizing a mono-media bed of anthracite coal are used year-round to remove solids from secondary or tertiary effluent.

Disinfection. Effluent from the tertiary treatment system flows through serpentine contact basins and is disinfected with sodium hypochlorite to reduce any remaining viruses and bacteria, followed by dechlorination with sodium bisulfite.

Effluent Discharge. Following disinfection, the effluent flow is metered, monitored and discharged to the Tualatin River through two outfall lines located at river mile 37.7 — a primary outfall and a wet-weather outfall. The wet-weather outfall is used when the river elevation rises to a level that causes the disinfection basin to back up and spill over a weir to the wet-weather outfall line.

Reuse water can be produced at Rock Creek. A portion of chlorinated effluent is diverted to a dedicated basin and pump system where it undergoes additional chlorination and monitoring before being used for irrigation.

Solids Removal and Thickening. Sludge from the primary treatment process is pumped to vortex grit removal units, which separate, wash and dry the heavier inorganic material to prepare it for landfill disposal. The degritted primary sludge flows to a wet well and is then pumped through cylindrical sludge screens to remove and compact the remaining fine fibrous material. From the sludge screens, the primary sludge flows by gravity to fermentation and thickening tanks. Fermenting bacteria begin to decompose the primary sludge to produce volatile fatty acids, which aid in the biological phosphorus removal process. The overflow from fermentation and thickening is pumped to secondary treatment; the thickened sludge is pumped to anaerobic digestion.

The waste activated sludge from the secondary treatment process is thickened on a gravity belt thickener and then pumped to a tank where it is held under anaerobic conditions, causing the release of phosphorus and magnesium. The sludge from that tank is thickened again on a gravity belt thickener. The filtrate containing high phosphorus and magnesium is pumped to a fertilizer production facility and the thickened sludge is pumped to the anaerobic digester. Both of these sludges are dosed with an organic polymer prior to thickening to flocculate the solids.

Anaerobic Digestion. Sludge is mixed and heated in the digesters to maintain favorable conditions for bacteria. The sludge is then dosed with ferric chloride to control hydrogen sulfide in the digester gas, which is used in generators and boilers in the heat and power system. Excess gas is combusted in a flare.

Biosolids Dewatering. Anaerobically digested biosolids are conditioned with organic polymer, dewatered by centrifuge (or backup belt filter press) and stored in silos prior to loading into trucks for land application. The residual liquid from the dewatering process is high in phosphorus and ammonia and is stored and pumped to the fertilizer production facility.

Fertilizer Production. In the fertilizer production facility, struvite is precipitated in a controlled reactor. This process limits the potential for nuisance struvite formation elsewhere in the facility, reduces the recycle load of phosphorus and ammonia, and results in a commercial grade slow release fertilizer.

1.3.3 Hillsboro Wastewater Treatment Facility

Preliminary Treatment. A portion of the influent flow to the Hillsboro facility enters the headworks building by gravity and the rest reaches the headworks via influent pumps. In the headworks building, mechanical bar screens remove fibrous material; garbage and grit removal units remove sand and gravel. The screenings and grit are washed and compacted for landfill disposal.

Primary Treatment. From the headworks building, the wastewater flows by gravity to primary treatment or to the high-head pump station for transfer to the Rock Creek or Forest Grove facilities for further treatment.

Wastewater treated at the Hillsboro facility flows by gravity to primary clarifiers where settleable organic and inorganic particles are separated from the wastewater. Primary effluent flows by gravity to pump stations for distribution to secondary treatment.

Secondary Treatment. The secondary treatment system consists of an aeration basin and secondary clarifiers that utilize the activated sludge process to remove the 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 pumped back to the front of the aeration basin to maintain enough bacteria to consume the organic matter (return activated sludge), and a portion is pumped to the Rock Creek facility for solids processing (waste activated sludge). The secondary clarifier effluent flows by gravity to the ultraviolet disinfection system.

Disinfection. Effluent from the secondary treatment system is metered and flows through a low-pressure ultraviolet disinfection system to reduce remaining bacteria and viruses.

Solids Processing: There is no solids processing at the Hillsboro facility. Primary and secondary solids are conveyed to the Rock Creek facility for treatment.

Effluent Discharge. Following disinfection, the effluent flow is monitored and sent to the high-head pump station. There, the effluent is transferred to either the Rock Creek or Forest Grove facilities during the summer dry season (typically May-October, depending on stream flow) or is discharged to the Tualatin River through the two primary outfalls at river mile 43.3 and 43.9 during the winter wet season (typically November-April, depending on stream flow).

1.3.4 Forest Grove Wastewater Treatment Facility

Preliminary Treatment. The influent flow to the Forest Grove facility enters by gravity in a 72-inch interceptor pipe at the headworks building. In the headworks building, the wastewater flows by gravity through mechanical bar screens with washer compactor units that remove, clean and compact fibrous material and garbage for landfill disposal. Untreated wastewater from the headworks building flows by gravity to the influent pump station approximately 24.5 feet below grade. From there, the untreated flow is pumped to the grit building where it passes through grit removal basins and the heavier inorganic material (grit) settles out. The degritted wastewater then flows by gravity to secondary treatment or to the high-head pump station for transfer to the Rock Creek facility. Grit generated by the degritting process is pumped to the headworks building where it is dewatered and retained with the screenings for landfill disposal.

Secondary Treatment. Aeration basins and secondary clarifiers employ the activated sludge process to remove the dissolved organic matter and nutrients that pass through primary treatment. The aeration basins are designed to remove ammonia and phosphorus. 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 as returned activated sludge to maintain enough bacteria to consume the organic matter, and a portion is pumped from the aeration basins to the high-head pump station for transfer to Rock Creek for further solids processing (waste activated sludge). The secondary clarifier effluent flows by gravity to the ultraviolet disinfection system.

Solids Processing: There is no solids processing at the Forest Grove facility. Solids are conveyed to the Rock Creek facility for treatment.

Disinfection. Effluent from the secondary treatment system flows through a medium pressure ultraviolet disinfection system to reduce remaining bacteria and viruses.

Effluent Discharge. Following disinfection, the effluent flow is monitored and discharged to the Tualatin River through either of two outfall lines located at river mile 53.8 – a primary outfall and a wet-weather outfall. During the summer dry season (May – October) and under winter low flow conditions, effluent from the disinfection system is pumped to the District's natural treatment system (NTS) wetland for additional treatment prior to discharge to the Tualatin River through the primary outfall. During higher winter flow conditions, effluent from the Forest Grove disinfection system is conveyed directly to the Tualatin River via the primary outfall. The wet-weather outfall is used when the river elevation rises to a level that floods the NTS and the capacity of the primary outfall line is exceeded.

Natural Treatment System. During the dry season and during winter low flow conditions, secondary treated effluent from the Forest Grove facility is pumped to the District's 95-acre natural treatment system wetland located adjacent to the Forest Grove plant for further treatment prior to discharge to the Tualatin River. During higher flow conditions typical of winter flows, the Forest Grove facility discharges directly to the Tualatin River. The NTS consists of a vertical flow wetland that provides ammonia reduction and a surface flow wetland provides temperature reduction and water quality enhancement. The NTS also provides wetland habitat and recreational benefits, and improves the overall quality of the discharge to the Tualatin River. Temperature, dissolved oxygen, nutrients and metals are monitored at the NTS outlet structure prior to discharge to the primary outfall.

1.4 Treatment Facility Design and Average Flow

Table 1 displays average annual plant flow, annual average dry weather flow, dry weather design flow in the NPDES permit, annual average wet weather flow, and wet weather design flow in the NPDES permit for each of the four District treatment facilities. The average flows displayed in Table 1 were calculated from plant effluent flow data measured in 2018-2020.

Table 1

Treatment Facility Design and Average Flow

Facility	Average Influent Flow (mgd)	Average Dry Weather Influent Flow (mgd)	Dry Weather Design Flow (mgd)	Average Wet Weather Influent Flow (mgd)	Wet Weather Design Flow (mgd)
Durham	21.7	19.2	25.7	24.3	42.0
Rock Creek	32.8	28.4	46.4	37.3	68.4
Hillsboro	4.0	3.4	-	4.6	7.8
Forest Grove	4.3	3.8	6.3	4.8	7.8

Average influent flows during 2018-2020 were input into the *DEQ Local Limits Workbook* for the Durham, Rock Creek and Hillsboro facilities. Forest Grove has substantially different treatment processes during the dry season and winter low flow conditions; with the Natural Treatment System, the Forest Grove facility provides standard secondary treatment during the high flows more typical in the winter.

The District calculated local limits using two different *DEQ Local Limits Workbooks* to calculate local limits for the Forest Grove facility:

1. Workbook for dry season and winter low flow conditions when discharge occurs through the NTS.
2. Workbook for higher flow conditions typical of winter flows.

The workbook for the dry season and winter low flow conditions contain river flow/dilution factor information and pollutant concentrations that represent conditions where the District expects to discharge the plant effluent to the NTS. The pollutant concentration data entered into this workbook were generated from monitoring to match the anticipated discharge strategy, either through the NTS or standard secondary treatment when the river flow (measured at Golf Course Road) is low. The workbook for the higher flow conditions typical of winter flows contain river flow/dilution factor information and pollutant concentrations that represent conditions where the District expects to discharge the plant effluent directly to the river, without the use of the NTS.

1.5 Sludge Production Rate

Table 2 presents the quantities of sludge flows to the digester and to disposal for the Durham and Rock Creek facilities. These daily rates were calculated from sludge flow data measured in 2018-2020 and converted into the units required by the *DEQ Local Limits Workbook* (mgd). Biosolids produced at the Durham and Rock Creek facilities are land applied in accordance with the provisions of 40 CFR Part 503.

Table 2
Sludge Production Rates at the Durham and Rock Creek Facilities

Sludge Flow Parameter	Durham	Rock Creek
Sludge Flow to Digester (mgd)	0.126	0.197
Sludge Flow to Disposal (mgd)	0.013	0.019

Solids produced at the Hillsboro and Forest Grove facilities are transferred to the Rock Creek facility for treatment. Thus, Table 2 does not include sludge production rates for those facilities.

1.6 Industrial Flow

The District's four treatment facilities received flow from 43 Significant Industrial Users (SIUs) in 2020. Of these SIUs, 11 discharge to the Durham facility; 21 discharge to the Rock Creek facility; five discharge to the Hillsboro facility; and six discharge to the Forest Grove facility.

The District's SIUs report their discharged flows on a monthly basis. For each SIU, the reported monthly average flows for 2016-2020 were averaged. This five-year period was used instead of the three-year period used for District treatment plant data to allow for a better representation of current average industrial flows. Table 3 displays the average industrial flow to each treatment facility expressed as flow in mgd and as a percentage of the average treatment facility flow.

Table 3
Industrial Flow to District Treatment Facilities

Facility	Industrial Flow (mgd)	Percent of Influent
Durham	0.90	4.2%
Rock Creek	7.32	22.3%
Hillsboro	0.06	1.5%
Forest Grove	0.21	4.9%

1.6.1 Contributory Industrial Flow at Rock Creek

The District has previously used the contributory flow allocation method at the Rock Creek facility because it receives relatively dilute discharges from large semiconductor facilities. Along with the contributary flow method, select sources were allocated individual mass loads. The current local limits continue this approach of using contributory flow allocation method and selected mass loads at the Rock Creek facility.

Four SIUs discharging to the Rock Creek facility (referred to in this report as Semiconductor 1, Semiconductor 2, Semiconductor 3 and Semiconductor 4) are manufacturers of semiconducting materials that generally do not employ metals or cyanide in their manufacturing processes. In fact, for these industries, metals are usually considered contaminants in their processes, and the presence of metals at those facilities is avoided to the extent possible. These SIUs were considered to be candidates for designation as noncontributory for the purpose of allocating maximum allowable industrial loadings (MAILs) for most of the metal pollutants of concern and cyanide. The contributory flow allocation method allows the District to allocate the MAIL to SIUs that have potential to discharge metals and cyanide.

Monitoring data from these four SIUs were examined to evaluate the noncontributory status for these SIUs for individual pollutants. In general, the rationale for determining noncontributory status for a particular pollutant includes:

1. Knowledge that the SIU's processes do not utilize the pollutant and therefore do not require pretreatment; the pollutant concentration would not likely increase over time; and adding the pollutant to the SIU's processes would require reporting to the District.
2. Availability of monitoring data that confirm the concentration of the pollutant in the SIU's discharge does not exceed the typical concentration (e.g., the average) of the treatment facility influent (i.e., nonindustrial concentration).

These conditions were met for several metals for these four SIUs. Cyanide is not monitored at these facilities because it is not used in their industrial processes; the assumption was made that none of these facilities contributes cyanide above nonindustrial concentrations. For Semiconductor 3, all three of these conditions were met for all pollutants; this facility is considered noncontributory for all local limits pollutants except mercury. For mercury, the District considers all SIUs to be potential contributors, a decision made based on the fact that mercury is ubiquitous and of concern in the Willamette Basin.

Monitoring data indicate that for three of the metal pollutants there is at least one semiconductor industry that is considered to be a contributor of the pollutant. These pollutants are discussed below.

Arsenic. Semiconductor 4 is a contributor of arsenic, based on examination of the arsenic concentration of its discharge. The concentration of other metals is below nonindustrial sources, and industrial flows from this site are low. Because of the minimal flow contribution, there is no substantial impact to the overall loading by classifying this source as a noncontributing industry.

Copper. Semiconductor 1 and Semiconductor 2 employ specialized processes that utilize small quantities of copper, and both facilities rely on pretreatment to reduce the copper concentration of their discharge. Therefore, these facilities were considered contributory with respect to copper.

Molybdenum. Semiconductor 1 and Semiconductor 2 employ cooling towers that use molybdenum. Both Semiconductor 1 and Semiconductor 2 exceed nonindustrial concentrations and therefore, both of these facilities are considered contributory with respect to molybdenum.

Industrial contributory flows used in the *DEQ Local Limits Workbook.* The copper and molybdenum concentrations from Semiconductor 1 and Semiconductor 2 are well below current local limits; however, due to the large flows from these facilities, they would represent a sizable mass load if they were allocated a local limit using the uniform concentration allocation method. Therefore, the District allocated a mass load for copper and molybdenum to these facilities. The portion of the MAIL that remains after subtracting these loadings was then allocated to all other SIUs that contribute these pollutants to the Rock Creek facility. An Excel workbook was created to perform these calculations. Further details describing the allocation strategy are presented in Section 6.2.2 (Concentration Limits Based on Contributory Flow). Table 4 below displays the industrial contributory flow values that were input into the *DEQ Local Limits Workbook* for Rock Creek.

Table 4
Industrial Contributory Flows for Metals and Cyanide at the Rock Creek Facility

Pollutant	Industrial Flow (mgd)	Contributors
Metals (except copper, molybdenum, and mercury) and cyanide	0.89	All SIUs except Semiconductor 1, Semiconductor 2 and Semiconductor 3
Copper and molybdenum	6.88	All SIUs except Semiconductor 3
Mercury	7.32	All SIUs

1.6.2 Contributory Industrial Flow at Forest Grove

A metal finishing facility (referred to in this report as FG Metal Finisher) is the only SIU that contributes metals to the Forest Grove facility. Its average flow of 0.129 mgd was entered into the *DEQ Local Limits Workbook* to represent industrial contributory flow to the Forest Grove facility for all metals and cyanide.

1.7 Nonindustrial (Domestic/Commercial) Flows

Nonindustrial flow was calculated by subtracting the sum of average measured SIU flow from the average influent flow for each treatment facility. The *DEQ Local Limits Workbook* automatically relegates noncontributory industrial flows to the nonindustrial flow portion of the total plant flows.

1.8 Hauled Wastes

The Durham and Rock Creek facilities receive hauled wastes from local septage haulers who have been permitted to dispose of domestic sanitary wastes through the District's Liquid Waste Hauler permitting process. Flows of these hauled septage wastes averaged 0.017 mgd at Durham and 0.003 mgd at Rock Creek during 2018-2020. These wastes are discharged to the headworks of the treatment plants. The loadings contributed by the hauled wastes are included in the influent sampling performed at the headworks of the treatment plants.

In addition to hauled septage waste, the District accepts FOG wastes that are routed to the anaerobic digesters at the Durham facility. FOG derived from Food Service Establishments is not considered as a substantive source of metals or cyanide.

The District has one permitted industrial user (a nonsignificant industrial user) that hauls its industrial wastewater to the Rock Creek facility. This industry hauls its waste because there is no service to the sanitary sewer. The average volume of this wastewater is less than 1,000 gallons per day and does not contain significant quantities of metals or cyanide.

1.9 Mixing Zone Information

Table 5 presents the dilution factors used in the *DEQ Local Limits Workbook*. These dilution factors correspond to the dry and wet weather design flows specified in the NPDES permit. These values were calculated by CH2MHill (2008), and Kennedy Jenks (2019) in mixing zone studies conducted for the District. The dilution estimates for high flow conditions are based on a range of potential conditions concurrent with when the Forest Grove facility may discharge directly to the Tualatin River without going through the NTS.   It is uncertain what dilution factors DEQ may use for conducting reasonable potential analysis.   For local limits copper was the found to be the most restrictive pollutant of concern and is discussed in 6.2.4   If necessary, the District will update the dilution factors used in this analysis upon issuance of the NPDES Permit.

Table 5

Dilution Factors Used in the *DEQ Local Limits Workbook*

River Design Condition	Durham	Rock Creek	Hillsboro	Forest Grove	Forest Grove[1]
RMZ dilution factor at 7Q10 flow	5.7	2.2	4.4	4.9	19.9
ZID dilution factor at 1Q10 flow	2.6	1.3	2.5	1.8	3.6
RMZ dilution factor at harmonic mean flow	9.0	3.7	16.2	8.8	8.8
RMZ dilution factor at 30Q5 flow	5.1	2.1	8.0	6.1	6.1

[1] Dilution factors used in *DEQ Local Limits Workbook* for wet season scenario when facility is discharging to river without NTS

1.10 Current Local limits

The District's current local limits were developed in 2008. These limits are presented in Table 6.

Table 6

Current Local Limits for Clean Water Services

Pollutant	Unit	Local Limit (mg/L)
Arsenic	mg/L	0.34
Cadmium	mg/L	0.19
Chromium	mg/L	10.2
Copper	mg/L	2.71
Cyanide	mg/L	1.38
Lead	mg/L	1.12
Mercury	mg/L	0.008
Molybdenum	mg/L	1.06
Nickel	mg/L	2.31
Selenium	mg/L	0.97
Silver	mg/L	0.09
Zinc	mg/L	3.28
pH	S.U.	6 - 11
FOG	NA	BMP

Section 2: Data

2.1 POTW Monitoring Data

The District submitted its local limits sampling and analysis plan (SAP) to DEQ in October 2017. The submission of the SAP served to communicate the District's plan and to provide DEQ the opportunity to comment and suggest revisions to the plan. The SAP is included as Appendix A, and describes the sampling locations, pollutants of concern, frequency, schedule, methodology, and analytical methods.

The local limits SAP specified that POTW local limits monitoring would commence for the Hillsboro and Forest Grove facilities during the fourth quarter of 2017 (in November). The SAP also specified that monitoring for the Durham and Rock Creek facilities would begin during the first quarter of 2018, as the District laboratory had already collected the normal NPDES permit-required samples before November 2017. Monitoring for all four treatment facilities was scheduled to continue for one year. Preliminary data analysis conducted in 2019 made it apparent that a nitrification inhibition study would aid the District's efforts to calculate inhibition-based allowable loadings that are protective of the nitrification process. This study was completed in 2020, and the period for collection of plant data for local limits development was extended until the end of 2020.

The District noticed an abrupt increase in the influent concentrations of several metals at Rock Creek during the first four months of 2020 and began an investigation. The District found no evidence of increased industrial contributions of these metals. In response to these observations, the District identified an alternative influent sampling port to compare results from two sampling locations. The District also implemented an increased cleaning schedule to reduce any contaminants that may build up at the sampling location. The concentrations observed at the new influent sampling location were lower than at the original location, and the increased frequency of cleaning also appears to result in lower metals concentrations. This investigation is continuing. The District decided to omit the elevated (and nonrepresentative) data for the first four months of 2020 from local limits calculations.

The following tables present summaries of the POTW local limits monitoring data. The raw data for plant influent, primary clarifier effluent, and plant effluent are presented in Appendix B, and biosolids raw monitoring data for District treatment facilities are presented in Appendix C. Metals concentrations presented in this report represent total recoverable values unless otherwise stated.

2.1.1 Durham Advanced Wastewater Treatment Facility

Table 7 presents average plant influent, primary clarifier effluent, plant effluent, and biosolids concentrations for pollutants of concern at the Durham treatment facility.

Table 7

Average Pollutant Concentrations at Durham Treatment Facility

Durham Facility Average Pollutant Concentrations				
	Wastewater Concentration (µg/L)			Biosolids (mg/kg)
Pollutant	Plant Influent	Primary Effluent	Plant Effluent	
Arsenic	1.54	1.44	0.88	4.3
Cadmium	0.17	0.15	0.04	1.6
Chromium	2.65	1.64	0.30	29.9
Copper	43.0	24.1	3.30	284
Cyanide	2.92	2.50	3.29	NA
Lead	1.49	0.65	0.25	10.9
Mercury	0.068	0.021	0.002	0.5
Molybdenum	2.36	2.29	1.60	7.4
Nickel	4.62	3.94	2.45	19.8
Selenium	0.91	1.02	0.25	5.0
Silver	0.44	0.20	0.03	3.1
Zinc	133	72.9	51.6	636

2.1.2 Rock Creek Advanced Wastewater Treatment Facility

Average pollutant concentrations of plant influent, primary clarifier effluent, plant effluent, and biosolids at the Rock Creek treatment facility are displayed in Table 8.

Table 8

Average Pollutant Concentrations at the Rock Creek Treatment Facility

Rock Creek Facility Average Pollutant Concentrations				
	Wastewater Concentration (µg/L)			Biosolids (mg/kg)
Pollutant	Plant Influent	Primary Effluent	Plant Effluent	
Arsenic	1.93	1.97	1.14	4.9
Cadmium	0.16	0.13	0.04	1.3
Chromium	2.81	2.05	0.50	27.5
Copper	66.1	16.5	2.44	270
Cyanide	6.59	2.50	3.11	NA
Lead	2.07	0.41	0.18	7.4
Mercury	0.062	0.017	0.001	0.6
Molybdenum	12.7	11.6	9.98	11.0
Nickel	5.77	3.46	2.73	23.3
Selenium	1.03	1.35	0.45	5.6
Silver	0.37	0.13	0.03	2.3
Zinc	242	54.6	42.0	546

2.1.3 Hillsboro Wastewater Treatment Facility

Table 9 displays the average pollutant concentrations of plant influent, primary clarifier effluent, and plant effluent at the Hillsboro treatment facility.

Table 9

Average Pollutant Concentrations at the Hillsboro Treatment Facility

Hillsboro Facility Average Pollutant Concentrations			
	Wastewater Concentration (µg/L)		
Pollutant	**Plant Influent**	**Primary Effluent**	**Plant Effluent**
Arsenic	1.45	1.18	0.78
Cadmium	0.12	0.10	0.04
Chromium	2.43	1.70	0.36
Copper	47.4	30.9	4.19
Cyanide	2.50	2.50	2.50
Lead	1.51	0.70	0.17
Mercury	0.059	0.025	0.002
Molybdenum	6.35	7.15	4.40
Nickel	12.70	9.44	7.81
Selenium	0.56	0.50	0.24
Silver	0.21	0.16	0.03
Zinc	108	63.2	30.5

2.1.4 Forest Grove Wastewater Treatment Facility

Average pollutant concentrations of plant influent, plant effluent, and NTS effluent at the Forest Grove treatment facility are displayed in Table 10. Two pollutants were not sampled in the NTS effluent: arsenic and cyanide. For these pollutants, the average plant effluent values were input into the *DEQ Local Limits Workbook*. Thus, for arsenic, cyanide and mercury, the *DEQ Local Limits Workbook* entries do not assume any further removals at the NTS system.

Table 10

Average Pollutant Concentrations at the Forest Grove Treatment Facility – No NTS

Forest Grove Facility Average Pollutant Concentrations		
	Wastewater Concentration (µg/L)	
Pollutant	**Plant Influent**	**Plant Effluent**
Arsenic	1.26	0.98
Cadmium	0.04	0.03
Chromium	1.71	0.43
Copper	34.5	8.52
Cyanide	2.50	2.50
Lead	0.76	0.17
Mercury	0.032	0.002
Molybdenum	0.63	0.38
Nickel	11.4	6.46
Selenium	0.28	0.27
Silver	0.54	0.04
Zinc	50.8	28.1

Table 11
Average Pollutant Concentrations at the Forest Grove Treatment Facility – With NTS

Forest Grove Facility Average Pollutant Concentrations			
	Wastewater Concentration (µg/L)		
Pollutant	**Plant Influent**	**Plant Effluent**	**NTS Effluent**
Arsenic	1.30	0.82	0.82
Cadmium	0.10	0.04	0.04
Chromium	2.36	0.60	0.60
Copper	78.2	10.2	2.23
Cyanide	2.50	2.50	2.50
Lead	1.49	0.58	0.15
Mercury	0.035	0.003	0.001
Molybdenum	2.24	1.41	1.33
Nickel	27.9	16.2	9.42
Selenium	0.57	0.25	0.27
Silver	0.64	0.03	0.02
Zinc	74.4	43.3	5.11

2.2 Industrial Monitoring Data

Appendix D presents average pollutant concentrations for SIU discharges in 2016-2020. These averages were calculated from the results of District sampling of industrial discharges and from self-monitoring data reported to the District.

2.3 Domestic/Commercial Monitoring Data

Collection system sampling to characterize nonindustrial (domestic and commercial) contributions was not included in the local limits SAP. Characterizing domestic/commercial loading by grab samples is often difficult because it is not possible to establish a sample location representative of a mix of residential and commercial loading. In addition, sampling is conducted for a limited period and doesn't fully capture the residential/commercial loading.

The District has previously observed that most plant influent loadings of local limits pollutants are contributed by nonindustrial sources. This assertion is supported by industrial monitoring data that demonstrate that industrial contributions to the overall influent loadings are relatively small. For local limit pollutants of concerns (POCs), average nonindustrial concentrations at each treatment facility were estimated by calculating nonindustrial loadings (by subtracting industrial loadings from influent loadings) and dividing by nonindustrial flow. Table 12 displays the calculated nonindustrial concentration for each local limits POC. For cadmium at the Forest Grove facility, the calculated nonindustrial concentration was negative, a consequence of frequent non-detect results and the use of half the reporting limit in such cases. To avoid inputting a negative concentration, the calculated nonindustrial concentration for cadmium at the Hillsboro facility (0.11 µg/L) was substituted. Both the Hillsboro and Forest Grove facilities are similar in size and proportion of flows from nonindustrial sources.

Table 12
Nonindustrial Concentration

Pollutant	Wastewater Concentration (µg/L)				
	Durham	Rock Creek	Hillsboro	FG - No NTS	FG - With NTS
Arsenic	1.22	0.85	1.37	1.10	1.01
Cadmium	0.17	0.10	0.11	0.11	0.11
Chromium	2.39	1.88	2.40	1.55	2.10
Copper	42.3	75.2	41.7	25.9	64.9
Cyanide	2.96	6.72	2.11	2.40	2.32
Lead	1.52	2.08	1.40	0.08	0.29
Mercury	0.07	0.03	0.06	0.03	0.04
Molybdenum	2.09	9.65	5.78	0.64	2.34
Nickel	4.31	4.97	11.1	7.31	21.4
Selenium	0.84	0.45	0.54	0.23	0.51
Silver	0.45	0.29	0.14	0.31	0.31
Zinc	136	245	110	51.6	110

2.4 Receiving Stream Monitoring Data

The District conducts ambient monitoring of the Tualatin River at several locations. Sampling at four monitoring stations (one upstream location for each treatment facility) was conducted during 2018-2020 to characterize the background pollutant concentrations for use in the *DEQ Local Limits Workbook*. For monitoring stations where greater than four samples per pollutant were taken, the receiving stream background pollutant level entered into the *DEQ Local Limits Workbook* was the 90th percentile of the dataset for each pollutant. For datasets containing four or fewer observations, the maximum value was input into the *DEQ Local Limits Workbook*. For upstream hardness data, the 15th percentile of the dataset was input into the *DEQ Local Limits Workbook*. This approach is consistent with DEQ's guidance for the reasonable potential analysis. The following sections present descriptions of the sampling conducted to characterize background pollutant concentrations, and the values input into the *DEQ Local Limits Workbook*. The receiving stream raw results are presented in Appendix E.

2.4.1 Durham Advanced Wastewater Treatment Facility

The sample site representing pollutant concentrations upstream of the Durham facility is located at the Tualatin River at Jurgens Park (river mile 10.6). Table 13 presents the pollutant parameters, units of measurement, number of samples (N), and the computed values input into the *DEQ Local Limits Workbook.*

Table 13

Receiving Stream Monitoring Data for the Durham Facility

Pollutant Parameter	Unit	N	Statistic	Value
Arsenic, Total Recoverable	µg/L	9	90th percentile	1.092
Cadmium, Total Recoverable	µg/L	23	90th percentile	0.051
Chromium, Total Recoverable	µg/L	23	90th percentile	1.058
Copper, Total Recoverable	µg/L	23	90th percentile	2.086
Hardness	mg/L	20	15th percentile	32.8
Lead, Total Recoverable	µg/L	23	90th percentile	0.303
Mercury by Purge & Trap	ng/L	6	90th percentile	2.76
Nickel, Total Recoverable	µg/L	23	90th percentile	1.646
Selenium, Total Recoverable	µg/L	23	90th percentile	0.254
Silver, Total Recoverable	µg/L	23	90th percentile	0.051
Zinc, Total Recoverable	µg/L	23	90th percentile	9.318

2.4.2 Rock Creek Advanced Wastewater Treatment Facility

The sample site representing pollutant concentrations upstream of the Rock Creek facility is located at the Tualatin River at Rood Bridge Road (river mile 39.1). Table 14 presents the pollutant parameters, units of measurement, number of samples (N), and the computed values input into the *DEQ Local Limits Workbook*.

Table 14

Receiving Stream Monitoring Data for the Rock Creek Facility

Pollutant Parameter	Unit	N	Statistic	Value
Arsenic, Total Recoverable (DRC)	µg/L	10	90th percentile	1.133
Cadmium, Total Recoverable	µg/L	21	90th percentile	0.051
Chromium, Total Recoverable	µg/L	21	90th percentile	1.21
Copper, Total Recoverable	µg/L	21	90th percentile	2.09
Hardness	mg/L	20	15th percentile	28.95
Lead, Total Recoverable	µg/L	21	90th percentile	0.293
Mercury by Purge & Trap	ng/L	5	90th percentile	2.024
Nickel, Total Recoverable	µg/L	21	90th percentile	1.12
Selenium, Total Recoverable	µg/L	21	90th percentile	0.254
Silver, Total Recoverable	µg/L	21	90th percentile	0.051
Zinc, Total Recoverable	µg/L	21	90th percentile	4.11

2.4.3 Hillsboro Wastewater Treatment Facility

The sample site representing pollutant concentrations upstream of the Hillsboro facility is located at the Tualatin River at Highway 219 Bridge (river mile 45.0). Table 15 presents the pollutant parameters, units of measurement, number of samples (N), and the computed values input into the *DEQ Local Limits Workbook*.

Table 15

Receiving Stream Monitoring Data for the Hillsboro Facility

Pollutant Parameter	Unit	N	Statistic	Value
Arsenic, Total Recoverable (DRC)	µg/L	7	90th percentile	1.118
Cadmium, Total Recoverable	µg/L	12	90th percentile	0.049
Chromium, Total Recoverable	µg/L	12	90th percentile	1.226
Copper, Total Recoverable	µg/L	12	90th percentile	1.767
Hardness	mg/L	14	15th percentile	26.49
Lead, Total Recoverable	µg/L	12	90th percentile	0.229
Mercury by Purge & Trap	ng/L	4	Maximum	2.88
Nickel, Total Recoverable	µg/L	12	90th percentile	1.12
Selenium, Total Recoverable	µg/L	12	90th percentile	0.25
Silver, Total Recoverable	µg/L	12	90th percentile	0.047
Zinc, Total Recoverable	µg/L	12	90th percentile	3.339

2.4.4 Forest Grove Wastewater Treatment Facility

The sample site representing pollutant concentrations upstream of the Forest Grove facility is located at the Tualatin River at Fernhill (river mile 56.9). Table 16 presents the pollutant parameters, units of measurement, number of samples (N), and the computed values input into the *DEQ Local Limits Workbook*.

Table 16

Receiving Stream Monitoring Data for the Forest Grove Facility

Pollutant Parameter	Unit	N	Statistic	Value
Arsenic, Total Recoverable (DRC)	µg/L	19	90th percentile	0.346
Cadmium, Total Recoverable	µg/L	54	90th percentile	0.051
Chromium, Total Recoverable	µg/L	54	90th percentile	1.721
Copper, Total Recoverable	µg/L	54	90th percentile	3.314
Hardness	mg/L	53	15th percentile	26.74
Lead, Total Recoverable	µg/L	54	90th percentile	0.371
Mercury by Purge & Trap	ng/L	6	90th percentile	1.85
Nickel, Total Recoverable	µg/L	54	90th percentile	1.215
Selenium, Total Recoverable	µg/L	54	90th percentile	0.254
Silver, Total Recoverable	µg/L	54	90th percentile	0.051
Zinc, Total Recoverable	µg/L	54	90th percentile	5.119

2.5 Local Limits Data Collection

Sampling was conducted by the District's Water Quality Laboratory (WQL), in accordance with the SAP described in Section 2.1. WQL personnel are well-trained and experienced in sample collection and analysis. The WQL operates and maintains state-of-the-art analytical equipment, resulting in method reporting limits (MRLs or quantitation limits) that compare well with those of other analytical laboratories in the wastewater field and consistent with the DEQ specified quantitation limits in the District's NPDES permit. One half the MRL was used in the evaluation for results reported as less than the MRL. In this report, such results are referred to as non-detects.

2.6 Use of Literature or Default Data

Site specific data were used in the evaluation. There were some exceptions, including plant process inhibition values, removal efficiency estimates for some pollutants, and the effluent coefficient of variation for some pollutants. These instances are described further in the following discussion.

2.6.1 Process Inhibition Threshold Values

Process inhibition threshold values from tables published by EPA were used to calculate allowable headworks loadings (AHLs) to prevent inhibition of the activated sludge and anaerobic digestion processes because there were no plant-specific inhibition data available. To prevent inhibition of the nitrification process, the EPA-published minimum inhibition thresholds were used for arsenic, cadmium, chromium, cyanide, lead and nickel. For copper and zinc, the District developed plant-specific nitrification inhibition thresholds and entered them into the *DEQ Local Limits Workbook*. These inhibition thresholds are described in Section 4.4.

2.6.2 Removal Efficiency

Literature values for removal efficiencies were used only in cases where the calculated value could not be considered reliable due to the proportion of plant influent results reported as below detection limits. In cases where this proportion of non-detects was greater than 50% for the plant influent data, available literature values of primary and overall plant removal efficiency were used instead of the calculated value. This was the case for cyanide; accordingly, the median literature removal efficiency values for cyanide from the *EPA Guidance* was input into the *DEQ Local Limits Workbook* for primary and overall plant removals. This was also the case for the Forest Grove No-NTS scenario for cadmium and selenium; the median literature removal efficiency values for the secondary process for these pollutants were entered into the *DEQ Local Limits Workbook*.

2.6.3 Effluent Coefficient of Variation

The *DEQ Local Limits Workbook* requires input of coefficient of variation (CV) of effluent values to calculate AHLs based on prevention of pass through. For pollutant datasets where the proportion of non-detects was greater than 50%, the DEQ-suggested default value of 0.6 was used instead. This default value was input into the *DEQ Local Limits Workbook* for all four treatment facilities for cadmium, cyanide and silver. In addition, the default value was used for selenium at the Durham, Hillsboro and Forest Grove facilities, as well as for chromium at the Durham facility.

Section 3: Pollutants of Concern

3.1 Selection of Pollutants of Concern

The District considered EPA and DEQ guidance in selecting pollutants as potential POCs, which were considered as candidates for local limits development.

3.1.1 EPA List of National POCs

EPA lists 15 pollutants in its guidance that should be included in a POTW's sampling plan for the calculation of data for calculating MAHLs and the possible development of local limits. The following pollutants are listed as national POCs and were included in the local limits SAP: arsenic, cadmium, chromium, copper, cyanide, lead, mercury, molybdenum, nickel, selenium, silver, zinc, 5-day BOD, TSS, and ammonia (for plants that accept nondomestic sources of ammonia).

Five-day CBOD was substituted for the 5-day BOD parameter listed above, to be consistent with the $CBOD_5$ permit limit and monitoring requirements of the NPDES permit.

3.1.2 Phosphorus and Ammonia

In addition to the 15 national POCs, EPA recommends that POTW-specific POCs should be included in the local limits sampling plan. All four District treatment facilities have effluent discharge limits for ammonia nitrogen. Ammonia was already considered a POC under the local limit SAP because it is included on EPA's list of national POCs (the Rock Creek facility accepts nondomestic sources of ammonia). Total phosphorus was considered as a potential POC because of the limitations for this pollutant for the Durham, Rock Creek and Forest Grove WWTFs in the NPDES permit from the 2001 and 2012 Phosphorus TMDLs for the Tualatin River subbasin.

3.1.3 Organic Priority Pollutants

The *EPA Guidance* recommends sampling for Clean Water Act organic priority pollutants for consideration as possible POCs in the development of local limits. The District has NPDES permit requirements for the sampling of many of these pollutants in its plant effluent. Schedule B.6 of the NPDES permit requires characterization of the effluent at the Durham, Rock Creek, Hillsboro and Forest Grove facilities. Monitoring is required for volatile organic compounds, acid-extractable compounds, and base-neutral compounds. The NPDES permit also requires additional effluent monitoring for two disinfection byproducts (chlorodibromomethane (CDBM) and dichlorobromomethane (DCBM)) at the Durham and Rock Creek facilities, and a plasticizer (bis-2-thylhexyl phthalate (BEHP)) at all four WWTFs.

The required monitoring for the organic priority pollutants mentioned above was completed in 2018. The District used the monitoring data to conduct reasonable potential analyses (RPAs) that represent a screening-level evaluation to determine whether any of these pollutants may not meet water quality criteria at the end of pipe, and thus required further evaluation. For most of the organic priority pollutant parameters, the results fell into two categories: they were either (1) not detected based on the quantitation limit (i.e., MRL) specified by DEQ in the NPDES permit; or they were (2) detected but were below the water quality criteria and did not require further evaluation.

There were a few organic priority pollutants where additional data were necessary to determine whether water quality criteria were met. These included CDBM, DCBM and BEHP at the Durham facility; and CDBM, DCBM and 2,4,6-trichlorophenol at the Rock Creek facility. The District conducted additional monitoring for these pollutants to further characterize effluent levels and receiving stream background levels, where necessary. These data were submitted to DEQ in January 2021.

The occasional detection of disinfection byproducts (CDBM and DCBM) results from the formation of these compounds when chlorine used to disinfect effluent reacts with other organics in the wastewater. Since these pollutants are associated with the disinfection process at the Durham and Rock Creek facilities, local limits would not be effective in controlling these pollutants. The District is implementing in-plant controls to minimize the formation of these two disinfection byproducts at the Rock Creek and Durham facilities.

Additional monitoring was also conducted for BEHP at the Durham facility and for 2,4,6-trichlorophenol at the Rock Creek facility. These pollutants were not detected above the quantitation limit specified in the NPDES permit. Thus, these were not identified as pollutants of concern.

Local limits would not be an effective method of controlling organic priority pollutants. The infrequent detection of these compounds at District treatment facilities do not point toward SIUs as sources. The District requires that all Categorical Industrial Users (CIUs) conduct an organic priority pollutant scan at least once. Results of such scans demonstrate that CIUs are unlikely to be the sources of such pollutants. The CIUs that have permit limits for these compounds have developed Toxic Organics Management Plans (TOMPs), which serve to limit the likelihood that these facilities would be sources of organic priority pollutants. SIUs that are not CIUs are evaluated to confirm that toxic organic priority pollutants are not used in their processes.

To protect worker health and safety, the District screens industrial discharges to determine whether specific limits for industrial users are necessary. The screening process emphasizes organic priority pollutants and is further described in Section 4.1.5. For these reasons, organic priority pollutants were removed from further consideration as pollutants of concern for this analysis.

3.1.4 Fats, Oils and Grease

In addition to the pollutants discussed in the *EPA Guidance*, the State of Oregon's local limits guidance includes a recommendation that POTWs include fats, oils and grease in their local limits sampling plans. The local limits SAP did not include FOG. Industrial sources of FOG are controlled by a set of Best Management Practices (BMPs) that requires applicable industrial users to install and maintain grease interceptors/grease traps. The District believes that this method of controlling FOG has been effective and intends to continue utilizing this approach, which is described more fully in Section 7.2.2.

3.2 Implementation of Specific Prohibitions

The Specific Prohibitions of 40 CFR 403.5 (b) have been implemented by the District utilizing the Nondomestic Waste Ordinance 42 (NDWO) and the existing local limits. In 2020 the District revised and updated the District's legal authority for the regulation of nondomestic waste through adoption of the NDWO. The District submitted the legal authority update to DEQ and received DEQ approval for immediate implementation on January 29, 2021. The updated Specific Prohibitions adopted in Section 4 of the NDWO are referenced below.

3.2.1 Fire or explosion hazard

Pollutants that create fire or explosion hazards are regulated by Section 4.b.1 of the NDWO, which prohibits discharges with a closed cup flashpoint of less than 140 degrees Fahrenheit. The District incorporates this requirement into the discharge permits of industrial users as necessary on a permit-specific basis. The District concluded that a local limit is not necessary to implement this specific prohibition.

3.2.2 Corrosive pollutants

Discharges of nondomestic waste with any corrosive property capable of causing structural damage to the POTW are prohibited by Section 4.b.2 of the NDWO, which further specifies the current absolute pH limits of less than 5.0 or equal to or exceeding 12.5. In addition to the absolute pH limits, the District applies a local limit pH range of 6.0 to 11.0.

The District has found that the current local limit pH range of 6.0 to 11.0 works well, and the upper pH limit is beneficial to the nitrification process used to reduce ammonia in the discharge. The District plans to retain the current pH range limit.

3.2.3 Solid or viscous substances

The discharge of solid or viscous substances that may cause obstruction to the flow or other interference with the operation of the wastewater system is regulated by the NDWO Section 4.b.3. This section also defines a maximum size limitation of one-half inch in any dimension for solid materials. This section also prohibits the discharge of viscous substances such as petroleum oil, mineral oil, animal or vegetable fats, oils and greases, and any substance that is solid or viscous at temperatures between 32 and 150 °F. The District concluded that a local limit is not necessary to implement this specific prohibition.

3.2.4 Discharges causing interference

Any substance, including oxygen demanding pollutants, discharged to the POTW at a flow rate or concentration that will or may cause interference or disruption is prohibited and regulated by NDWO Section 4.b.4. Prevention of interference is addressed in the allowable headworks loadings designed to prevent inhibition of treatment processes at the District's treatment facilities. The District concluded that these allowable headworks loadings and the local limits derived from them are sufficient to implement this specific prohibition.

3.2.5 Heat

NDWO Section 4.b.6 prohibits any discharge to the POTW having a temperature that will inhibit biological activity in a POTW treatment plant, and any discharge with a temperature at the point of discharge into the POTW that exceeds 104 °F (40 °C). This section is more stringent than 40 CFR 403.5(b)(5) because it applies the 104 degrees Fahrenheit maximum allowable temperature at the point of discharge, while the Part 403 regulations apply this limit at the treatment plant. The District concluded that a local limit is not necessary to implement this specific prohibition.

3.2.6 Oils

Discharges of petroleum oil, nonbiodegradable cutting oil, or products of mineral oil origin in amounts that will cause interference, pass through, or disruption of the POTW are prohibited by the NDWO at Section 4.b.7. The current BMP-based local limit for FOG also serves to limit the introduction of these substances into District treatment facilities. The District concluded that revising this local limit is not necessary to implement this specific prohibition.

3.2.7 Toxic gases, vapors, and fumes

Any substance that, alone or in combination with other substances, will or may through the creation of toxic, malodorous, or noxious gases, vapors or fumes create a public nuisance, create a hazard to human or animal life, create a hazard to worker health or safety, or prevent safe entry into any portion of the POTW for inspection, maintenance, or repair is specifically prohibited by the NDWO at Section 4.b.5. Moreover, the District has developed and implemented a program to calculate discharge screening values based on EPA-recommended methodology to control discharges with the potential to produce hazardous conditions in the collection system (see Section 4.1.5). The District concluded that the screening approach works well to address safety and health concerns, and that a local limit is not necessary to implement this specific prohibition.

3.2.8 Trucked or hauled wastes

The NDWO at Section 4.b.8 prohibits the discharge of any trucked or hauled wastes except as provided in Section 5.f, which describes the regulation of hauled septic tank waste; hauled industrial waste; and hauled fats, oils and grease. The District developed a Hauled Waste Plan, submitted it to DEQ for review as part of the District's Source Control Implementation Manual, and received approval. The introduction of hauled industrial waste into the POTW is regulated by the following:

A. No person may introduce hauled industrial waste into the POTW at a location other than one designated by the District, nor at times other than those established by the District.
B. No person may introduce hauled industrial waste into the POTW without prior consent of the District.
C. The District may collect samples of a hauled load of industrial waste to ensure compliance with applicable standards.
D. The District may require any person hauling industrial waste to provide a waste analysis of any load prior to discharge.
E. The District may require any person hauling industrial waste to obtain a nondomestic waste discharge permit as a condition of discharge to the POTW.
F. The District may require any person who generates hauled industrial waste to obtain a nondomestic waste discharge permit as a condition of discharge to the POTW.
G. The District may prohibit the disposal of hauled industrial waste.
H. The discharge of hauled industrial waste is subject to all other requirements of District Rules.
I. Persons discharging hauled industrial waste to the POTW must complete a District-supplied waste-tracking form for every load.

The District concluded that these controls are effective, and that additional controls are not necessary to implement trucked or hauled waste requirements.

Section 4: Environmental Criteria

4.1 NPDES Permit Limits

The District's NPDES permit contains effluent limitations for the following pollutants: $CBOD_5$, TSS, phosphorus, ammonia, temperature, *E. Coli*, pH and residual chlorine. Phosphorus was initially considered as a potential POC but was eliminated from further consideration because it is not discharged in concentrations greater than those found in domestic sewage by any District SIU. In addition, phosphorus is treated at such a high level that a local limit would not be necessary to maintain compliance with permit limits. District SIUs are not sources of *E. coli*; chlorine is used for disinfection at the Rock Creek and Durham treatment facilities and is not a POC from SIUs. Thus, *E. coli* and chlorine were also eliminated from consideration for local limits development. The remaining pollutants ($CBOD_5$, TSS, ammonia, temperature, and pH) are discussed in the next sections.

4.1.1 $CBOD_5$ and TSS

Monitoring data for the four District treatment facilities indicate that all of them remove $CBOD_5$ and TSS at rates that allow them to meet their concentration and mass limits, as well as their NPDES permit limits of 85% monthly average removal efficiency for these pollutants. The Durham and Rock Creek facilities average greater than 98% removal of $CBOD_5$ and 99% removal of TSS, based on monitoring data collected during 2018-2020. The Hillsboro facility averaged greater than 98% removal of $CBOD_5$ and TSS during this period. The Forest Grove facility averaged 97% removal for $CBOD_5$ and greater than 95% for TSS during the 2018-2020 period. Thus, there is no indication that any of the treatment facilities is nearing its treatment capacity for these pollutants.

Industrial discharges from SIUs constitute a relatively small proportion of the influent loadings of $CBOD_5$ and TSS. Those SIUs that do discharge these pollutants are required to pay a surcharge based on the strength of COD and TSS loadings introduced to District treatment facilities, which provides a strong monetary incentive to limit the loadings discharged to the treatment facilities.

The District decided to eliminate $CBOD_5$ and TSS from further consideration for local limits development based on the ability of its treatment facilities to treat these pollutants, the relatively small portion contributed by SIUs, and the monetary incentive to limit discharges of these pollutants provided by the industrial surcharge program. The District retains the authority to apply permit-specific limitations for $CBOD_5$ and TSS should they be deemed necessary.

4.1.2 Ammonia

Ammonia was considered a POC because an SIU contributes to the loadings at the Rock Creek facility, and there are stringent discharge requirements for ammonia in the NPDES permit. However, this industrial source of ammonia discharges in concentrations that are lower than domestic levels. During 2018-2020, the average ammonia concentration contributed by this SIU was less than 4 mg/L; during the same period, the average ammonia concentration of the Rock Creek plant influent was 27.8 mg/L.

The Rock Creek facility removes ammonia at an extremely high rate during the dry season (May 1 through November 15). Under certain conditions, the Rock Creek facility must achieve effluent ammonia concentrations of 0.21 mg/L. This facility has consistently demonstrated the capability to remove ammonia to that level. Thus, there is no indication that the Rock Creek facility is approaching its treatment capacity for ammonia.

The Rock Creek facility also has year-round, flow-based ammonia limits designed to prevent ammonia toxicity. The facility has also been able to comply with these limits on a consistent basis.

The Durham, Hillsboro, and Forest Grove facilities have the potential to receive ammonia loadings from industrial sources. However, these facilities have consistently met ammonia limits and there is no indication that they are approaching their capacity for treatment of ammonia.

For the reasons discussed above, the District decided that local limits for ammonia are not needed and would not be beneficial. The District retains the authority to apply permit-specific limits for ammonia should they be deemed necessary.

4.1.3 Temperature

The District has both a thermal load limit and a temperature limit in its NPDES permit. The District evaluated thermal loads from SIUs and concluded that temperature limits are not necessary. The District has required its largest SIU to develop and implement a temperature management plan based on the temperature limit in the District's NPDES permit.

4.1.4 pH

The District's local limits for pH were discussed in Section 3.2.2 (Corrosive Pollutants). In addition to prevention of corrosion, the District's local limits for pH are intended to protect the treatment processes (activated sludge process and nitrification). The District plans to retain this local limit.

4.2 Water Quality Standards

The *DEQ Local Limits Workbook* utilizes the DEQ Reasonable Potential Analysis (RPA) spreadsheet to calculate end-of-pipe maximum allowable concentrations based on achieving Oregon water quality criteria. The RPA spreadsheet utilizes facility flow rate (described in Section 1.4), mixing zone information (described in Section 1.9), receiving stream pollutant background concentration data (described in Section 2.4), coefficient of variation (CV) values (described in Section 2.6.3) for plant effluent pollutant data, and hardness data for the facility effluent and receiving stream. Hardness values for the facility effluent and receiving stream were the values of the 15^{th} percentile of the data collected from 2018-2020 for these locations.

The DEQ RPA spreadsheet embedded within the *DEQ Local Limits Workbook* does not use the current Oregon water quality criteria for copper. These criteria were updated in 2017 and are calculated with site-specific data using the Biotic Ligand Model (BLM). This model requires input of 11 different water quality parameters that affect the bioavailability and toxicity of copper in freshwaters. Parameters include temperature, pH, dissolved organic carbon, hardness, calcium, magnesium, sodium, potassium, sulfate, chloride, alkalinity and sulfide. The District's NPDES permit required the collection of concurrent data for these parameters to calculate water quality criteria based on the BLM. Concurrent data were collected from WWTF effluent and from the river upstream and downstream of each WWTF every month over a two-year period. These data were submitted to DEQ in 2018.

The WWTF effluent and ambient data were used to calculate water quality criteria at the Zone of Initial Dilution (ZID) and Regulatory Mixing Zone (RMZ) for each sampling event. A mass balance equation was used to calculate the concentration of input parameters at the ZID and RMZ for each sampling date. The copper BLM was used to determine the criterion maximum concentration (CMC) and criterion continuous concentration (CCC). Based on available dilution and background receiving stream conditions, the waste load allocations (WLAs) were calculated at the ZID and RMZ for each date for which data was available. The 10^{th} percentile value of the WLAs was used to derive effluent target values for each WWTF. The acute and chronic long-term averages were calculated using the CCC and CMC, respectively using the procedure in EPA's Technical Support Document for Water Quality-Based Toxics Control (EPA TSD, 1991). The more stringent of the acute and chronic long-term averages was used to calculate the maximum daily limit and average monthly limit. The maximum daily limit for each WWTF was then input into the "NPDES Permit Limit" field on the "Pass Through" tab of the *DEQ Local Limits Workbook*.

4.3 Biosolids Use and Disposal

The District's biosolids program consists of direct land application of dewatered, Class B biosolids. Biosolids are land applied on farm sites within 65 miles of District facilities during summer and fall months. High ground moisture content and field conditions make winter and spring applications impractical. In arid Eastern Oregon, biosolids are land applied year-round as long as road conditions allow transportation of the biosolids to the application sites.

The 40 CFR Part 503 biosolids regulations and the Oregon Administrative Rules (OAR Chapter 340, Division 50) govern the use or disposal of sewage sludge. All land application of biosolids must meet the ceiling concentrations displayed in column 2 of Table 17 below. In addition, the application of biosolids to agricultural land requires compliance with either the cumulative loading rates in column 3 or the monthly average pollutant concentrations (clean sludge) in column 4 of Table 17.

The District is using the clean sludge values as the basis of developing sludge quality-based AHLs. The District's biosolids currently meet these clean sludge concentration levels, and maintaining low pollutant levels is consistent with the objectives of the National Pretreatment Program.

Table 17

Land Application Criteria for Agricultural Application of Biosolids.

Pollutant	Ceiling Concentrations (mg/kg)	Cumulative Loading Rates (kg/hectare)	Clean Sludge (mg/kg)
Arsenic	75	41	41
Cadmium	85	39	39
Chromium	NA	NA	NA
Copper	4300	1500	1500
Cyanide	NA	NA	NA
Lead	840	300	300
Mercury	57	17	17
Molybdenum	75	NA	NA
Nickel	420	420	420
Selenium	100	100	100
Silver	NA	NA	NA
Zinc	7500	2800	2800

4.4 Treatment Plant Process Inhibition

All four District treatment facilities operate activated sludge systems. To develop AHLs based on prevention of inhibition of the activated sludge systems, the minimum inhibition threshold value of the range of values for each pollutant published in the *EPA Guidance* was input into the *DEQ Local Limits Workbook*.

The Durham and Rock Creek facilities employ anaerobic digestion processes to stabilize sludge so that it can be land applied. The District entered EPA-published anaerobic digestion inhibition threshold concentrations into the *DEQ Local Limits Workbook* to allow it to calculate AHLs that prevent inhibition.

The Durham, Rock Creek and Forest Grove WWTFs employ biological treatment processes to remove ammonia (nitrification). The Hillsboro facility does not employ nitrification for ammonia removal. To develop AHLs based on prevention of inhibition of nitrification at these facilities, the minimum inhibition threshold value of the range of values for each pollutant published in the *EPA Guidance* was input into the *DEQ Local Limits Workbook*, except for the inhibition thresholds for copper and zinc. The nitrification inhibition thresholds for these pollutants used in the *DEQ Local Limits Workbook* were developed by conducting an inhibition study that used the return activated sludge from the Durham, Rock Creek and Forest Grove facilities. This study is described in Appendix F.

The nitrification inhibition study concluded that threshold concentrations of 0.20 and 0.37 mg/L for copper and zinc, respectively, would protect all three treatment facilities that employ nitrification. The District had additional concerns about the nitrification process at the Forest Grove treatment plant. The Forest Grove facility does not have a primary clarifier, which is known to remove a substantial portion of the influent loadings for metals at the other three treatment facilities. To address the lack of primary clarification at the Forest Grove facility, the District elected to use more conservative nitrification inhibition thresholds for that treatment plant (0.15 and 0.20 mg/L for copper and zinc, respectively). All of the nitrification inhibition thresholds used are within the range of inhibition levels specified in the *EPA Guidance*.

Table 18 displays the inhibition threshold values input into the *DEQ Local Limits Workbook*.

Table 18
Inhibition Threshold Values Used in Local Limits Evaluation

Pollutant	Activated Sludge (mg/L)	Nitrification (mg/L)	Anaerobic Digestion (mg/L)
Arsenic	0.1	1.5	1.6
Cadmium	1	5.2	20
Chromium	1	0.25	130
Copper	1	0.20[1], 0.15[2]	40
Cyanide	0.1	0.34	4
Lead	0.1	0.5	340
Mercury	0.1	-	-
Molybdenum	-	-	-
Nickel	1	0.25	10
Selenium	-	-	-
Silver	0.25	-	13
Zinc	0.3	0.37[1], 0.20[2]	400

[1] Inhibition threshold used for the Durham and Rock Creek facilities
[2] Inhibition threshold used for the Forest Grove facility

4.5 Worker Health and Safety

The nondomestic waste ordinance includes language that prohibits the discharge of potential sources of fire, explosion or toxicity hazards into the collection system. The District implements these prohibitions by screening all industrial users to identify any possible sources of these hazards.

The District has developed a set of screening values to apply on a permit-specific basis to any industrial user (not just SIUs) with the potential to generate hazardous gases or vapors in the collection system. Development of these screening values follows the methodology presented in the *EPA Guidance*. Exposure limits are designed to protect against formation of explosive and/or toxic atmospheres to which workers may be exposed as the basis of the screening values. The District's screening values utilize exposure limits from the American Conference of Governmental Industrial Hygienists (ACGIH), the Occupational Safety and Health Administration (OSHA), and the National Institute for Occupational Safety and Health (NIOSH) to develop these screening values. A table of these screening values is presented in Appendix G. These screening values are applied as permit limits to those IUs with the potential to discharge these pollutants of concern.

4.6 Other Specific Prohibitions

As with the specific prohibitions designed to protect worker health and safety, the District's NDWO effectively provides protection by prohibiting the other specific discharges described in Section 3.2. No revisions of local limits are planned to implement these prohibitions.

Section 5: Headworks Loading Calculations

5.1 Removal Efficiencies

Removal efficiency calculations were performed using the *DEQ Local Limits Workbook* on the "General" sheet. Average pollutant concentrations in the plant influent, primary effluent, and plant effluent were entered into the *DEQ Local Limits Workbook*, which uses the mean removal efficiency method of computing removal efficiencies. Literature values for primary and secondary removals were used for cyanide as described in Section 2.6.2; the cyanide laboratory results for plant influent were mostly below detection limits. Literature values for secondary removals were also used for cadmium and selenium for the No-NTS Forest Grove *DEQ Local Limits Workbook* for similar reasons.

Table 19 displays the primary removal efficiency values used in the MAHL analyses, and Table 20 presents the secondary and tertiary removal efficiencies. The Forest Grove NTS is considered a tertiary process when effluent from the activated sludge process is treated in that system. When the NTS is employed at Forest Grove, the concentration of pollutants in the NTS effluent was used to calculate overall POTW removal efficiencies. Note that all primary removal efficiency values are zero for Forest Grove because this facility does not employ primary clarification. Zero values were also entered to represent instances where the presence of non-detects, and the resulting substitution of values that are half the reporting limit, led to a calculated primary removal efficiency that was less than zero. This was the case for selenium at Durham, arsenic and selenium at Rock Creek, and molybdenum at Hillsboro.

Table 19

Treatment Facility Primary Removal Efficiency

Pollutant	Primary Removal Efficiency (Percent)			
	Durham	**Rock Creek**	**Hillsboro**	**Forest Grove**
Arsenic	6.4	0.0	18.7	0.0
Cadmium	16.6	19.4	12.3	0.0
Chromium	38.1	27.0	30.0	0.0
Copper	44.1	75.0	35.0	0.0
Cyanide	27.0	27.0	27.0	0.0
Lead	56.5	80.3	53.3	0.0
Mercury	69.1	71.9	58.2	0.0
Molybdenum	2.9	8.6	0.0	0.0
Nickel	14.7	40.1	25.6	0.0
Selenium	0.0	0.0	11.9	0.0
Silver	55.3	65.2	25.3	0.0
Zinc	45.1	77.4	41.6	0.0

Table 20
Treatment Facility Secondary and Tertiary Plant Removal Efficiency

Pollutant	Secondary and Tertiary Plant Removal Efficiency (Percent)					
	Durham	Rock Creek	Hillsboro	FG Secondary (No NTS)	FG Secondary (NTS)	FG Tertiary (NTS)
Arsenic	42.8	40.9	45.8	22.5	36.8	36.8
Cadmium	75.0	72.8	68.9	67.0	57.8	59.7
Chromium	88.7	82.2	85.2	75.1	74.7	74.7
Copper	92.3	96.3	91.2	75.3	86.9	97.2
Cyanide	69.0	69.0	69.0	69.0	69.0	69.0
Lead	83.1	91.5	88.5	77.0	61.2	89.8
Mercury	97.4	97.6	96.2	94.1	92.6	96.6
Molybdenum	32.4	21.7	30.7	40.5	37.0	40.5
Nickel	47.1	52.7	38.5	43.3	42.0	66.3
Selenium	72.0	56.1	58.0	50.0	56.2	53.1
Silver	92.4	91.0	85.7	92.6	94.9	92.0
Zinc	61.1	82.6	71.8	44.7	41.0	93.4

5.2 Allowable Headworks Loadings Calculations

The *DEQ Local Limits Workbook* is an Excel workbook that performs the MAHL analyses and local limits calculations using plant data described in Section 2. Printouts of the *DEQ Local Limits Workbook* for all District treatment facilities are provided in Appendix H.

The District modified one of the hidden worksheets (3. Aquatic Toxicity Limits) in the *DEQ Local Limits Workbook*. In Section 6 (Probability basis for WLA multipliers) of the worksheet, the default value for the "%'ile for Calculating Max Daily (MDL)" field was 95%. When this worksheet was incorporated into the *DEQ Local Limits Workbook* during its development, this value had been changed from 99% to 95% consistent with previous recommendations for using the EPA Region 10 WQ spreadsheet for local limits development. The District's modification was to restore the original value of that field back to 99%. This change is consistent with DEQ's approach in its *Reasonable Potential Analysis Workbook*.

5.3 Industrial Flow

The District applies its local limits to SIUs. Thus, industrial flow is defined as the total flow discharged by SIUs to a given District treatment facility. The industrial flow values used in the local limits analyses were described in further detail in Section 1.6.

5.4 Mass Balance – Predicted versus Actual

Predicted loadings are calculated using flows and concentrations from domestic/commercial (nonindustrial) sources and from industries. The District's local limits SAP did not include sampling to characterize nonindustrial contributions. Nonindustrial loadings were calculated by subtracting industrial loadings from influent loadings for each local limits POC. The calculated nonindustrial loadings were then converted to concentrations using the total nonindustrial flow for each treatment facility. For this reason, the predicted versus actual mass balance was not performed. This mass balance is primarily a check on the reasonableness of the data and assumptions, and does not influence the headworks loading calculations and local limits.

5.5 Mass Balance – Pollutant Fate

The following tables compare the difference between influent loadings and effluent loadings with biosolids loadings for metals and cyanide at the District treatment facilities. Because the Forest Grove and Hillsboro facilities transfer solids and part or all of the liquid waste streams to the Rock Creek facility, these three treatment facilities were considered as one system for the pollutant fate mass balance. In both tables, the column entitled "Pollutant Fate Mass Balance" displays the quotient represented by (average influent loading – average effluent loading)/(average biosolids loading). A value of 1.0 would therefore represent a perfect mass balance. Cyanide was not measured in biosolids samples; therefore, there were no mass balance calculations for cyanide.

5.5.1 Durham Advanced Wastewater Treatment Facility

Table 21 displays the pollutant fate mass balance at the Durham facility.

Table 21
Mass Balance of Pollutant Fate at Durham

Pollutant	Pollutant Loadings (Lbs/day)			Pollutant Fate Mass Balance
	Plant Influent	Plant Effluent	Biosolids	
Arsenic	0.278	0.159	0.101	1.18
Cadmium	0.031	0.008	0.037	0.63
Chromium	0.479	0.054	0.699	0.61
Copper	7.790	0.598	6.642	1.08
Lead	0.270	0.046	0.255	0.88
Mercury	0.012	0.0003	0.012	0.97
Molybdenum	0.427	0.289	0.172	0.81
Nickel	0.836	0.443	0.464	0.85
Selenium	0.164	0.046	0.118	1.00
Silver	0.079	0.006	0.073	1.01
Zinc	24.024	9.336	14.878	0.99

Most of the pollutant fate mass balance indicators demonstrate a reasonable mass balance, at least for those pollutants that can be reliably detected in the wastewater samples. The mass balances for cadmium and chromium were somewhat poorer than those for the other pollutants. These pollutants are frequently not detected in the effluent, which may have contributed to this result.

5.5.2 West Basin Treatment Facilities

Table 22 presents the pollutant fate mass balance at the Rock Creek, Forest Grove and Hillsboro facilities (the West Basin facilities). The table does not include plant influent and effluent loading calculations for the Hillsboro and Forest Grove facilities. Solids from those facilities are transferred to the Rock Creek facility; thus, loadings from those transfers are represented in the Rock Creek influent.

Since there is no solids processing at the Hillsboro and Forest Grove facilities, a mass balance of pollutant is not performed for these facilities.

Table 22
Mass Balance of Pollutant Fate at the West Basin Facilities

Pollutant	Pollutant Loadings (Lbs/day)			Pollutant Fate Mass Balance
	Plant Influent	Plant Effluent	Biosolids	
Arsenic	0.529	0.312	0.179	1.21
Cadmium	0.044	0.012	0.048	0.66
Chromium	0.769	0.137	1.008	0.63
Copper	18.1	0.667	9.884	1.76
Cyanide	1.803	0.850		
Lead	0.568	0.048	0.270	1.92
Mercury	0.017	0.0004	0.021	0.79
Molybdenum	3.485	2.730	0.402	1.88
Nickel	1.578	0.747	0.854	0.97
Selenium	0.283	0.124	0.204	0.78
Silver	0.100	0.009	0.085	1.08
Zinc	66.2	11.5	20.0	2.73

The calculated mass balances are fairly reasonable for many pollutants. The mass balance for copper, lead, molybdenum and zinc were high, with the mass balance for zinc exceeding 2.0. The high ratio of influent to effluent and biosolids loadings is likely due to influent monitoring results for these pollutants that may be influenced by attributes of the sample location that are still not fully understood. This issue was discussed in Section 2.1 and is currently being investigated.

Section 6: Allocation of Maximum Allowable Headworks Loadings

6.1 Safety Factor and Expansion/Growth Allowance

A net safety factor for uncertainty (10%) and additional expansion/growth allowance (5%) totaling 15% was chosen to address data uncertainties and potential for growth. This safety and growth factor was used in every *DEQ Local Limits Workbook* for every pollutant except for copper for the No-NTS scenario at Forest Grove as discussed in Section 6.2.4.

6.2 Allocation Methodology

The District owns and operates four treatment facility serving several municipal jurisdictions. To provide a level of equitability between the municipal jurisdictions and for ease of implementation, the District's general preference is to establish one set of local limits for SIUs across the service area. This is the approach that was generally taken for the local limits currently in effect, and the District proposes to employ this method for most of the local limits developed for this report. The first step in accomplishing this approach is to decide how MAILs are to be allocated to SIUs within each treatment facility. The methodology applicable to each treatment facility is described in the next sections.

6.2.1 Uniform Concentration Limits

For the Durham and Hillsboro facilities, the MAILs will be allocated to SIUs using the total industrial flow for each facility. This method results in concentration limits that are the same for each SIU that discharges to a given treatment facility.

6.2.2 Limits Based on Contributory Flow

For the Rock Creek facility, the MAILs will be allocated only to those SIUs that contribute the pollutant of concern. Section 1.6.1 discusses the method chosen to designate SIUs as either contributory or noncontributory for the purpose of making this allocation. Use of this method results in a set of local limits that would only apply to the SIUs that contribute the pollutant. For the Forest Grove facility, the MAILs will be allocated to the only SIU contributing pollutants; this allocation was discussed in Section 1.6.2.

The general approach for the industrial contributory flow allocation method is to divide the MAIL for each pollutant among the applicable industries to generate a concentration limit that is the same for each contributory industrial user. This is the approach that the District took for the Rock Creek facility for all local limit POCs except copper and molybdenum, as described in Section 1.6.1. The approach taken for copper and molybdenum was to allocate a mass load to Semiconductor 1 and Semiconductor 2 and then allocate the remaining portion of the copper and molybdenum MAILs to the other industrial contributors.

The District developed an Excel workbook (named *Rock Creek MAIL alternative allocations* and hereinafter referred to as the *District Workbook* and presented in Appendix I) that serves two purposes. The first purpose, performed on the "Rock Creek" sheet of the *District Workbook*, is to assign mass loadings to specific industrial users and to then allocate the remaining portion of the MAILs to the other Rock Creek industrial contributors. The "Rock Creek" sheet then calculates concentration limits for contributory industrial users who have not received a mass loading allocation. In addition to the mass allocations to specific SIUs, the "Rock Creek" sheet can set aside loadings that the District desires to hold in reserve as an extra level of conservativeness for pollutants of particular concern. The second purpose, performed on the “All plants” sheet of the *District Workbook*, is to select the local limit for each pollutant that will be proposed in the present report. A detailed description of the *District Workbook* is included as Appendix J.

6.2.3 Establishing a Single Set of Limits for Most District SIUs

The District’s intention was, where reasonable, to apply the lowest of the four calculated plant-specific local limits for each pollutant to every SIU in the District’s service area, with the exception of the SIUs that are considered noncontributory for one or more pollutants. That approach would have resulted in very stringent local limits for copper and molybdenum. The District was concerned about the achievability of uniform concentration limits for those pollutants. This approach would result in limits that many SIUs could not achieve, without having the benefit of significantly influencing influent concentrations. Instead, it decided to apply mass limitations to two semiconductor facilities and a metal finisher facility, and concentration limits for the remaining contributory SIUs. As noted, these facilities typically had high flow and relatively low concentrations, resulting in unused industrial headworks loadings using either the contributary flow or uniform method.

The previous section contained a discussion of the “Rock Creek” sheet of the *District Workbook*, which was used to allocate MAILs and calculate concentration limits for the Rock Creek facility. The “All plants” sheet of that workbook was then used to select the calculated limits that would be applied to SIUs. This sheet is reproduced below as Table 23.

Table 23
Plant-Specific Calculated Local Limits and Minimum Values

	Plant-Specific Calculated Local Limits (mg/L)						
Pollutant	**Durham**	**Rock Creek**	**Hillsboro**	**FG NTS**	**FG No NTS**	**Minimum Limit**	**Minimum of non-FG plants**
Arsenic	0.23	0.26	1.72	0.71	0.93	**0.23**	
Cadmium	0.13	0.22	0.69	0.21	0.65	**0.13**	
Chromium	8.20	10.72	78.53	6.17	44.82	**6.17**	
Copper	3.28	2.74	4.18	1.90	1.15	1.15	**2.74**
Cyanide	1.87	1.17	4.06	1.20	4.37	**1.17**	
Lead	0.70	1.31	2.07	1.12	1.81	**0.70**	
Mercury	0.044	0.006	0.083	0.053	0.193	**0.006**	
Molybdenum	0.56	0.60	N/A	N/A	N/A	**0.56**	
Nickel	2.26	3.19	13.61	5.63	39.65	**2.26**	
Selenium	0.35	0.74	3.80	1.21	4.11	**0.35**	
Silver	0.10	0.06	0.13	0.10	0.60	**0.06**	
Zinc	5.94	5.46	21.31	1.87	10.79	**1.87**	

Table 23 contains columns for the calculated limits for each of the Durham, Rock Creek, Hillsboro and Forest Grove facilities. For the Durham, Hillsboro and Forest Grove plants, the limits input into these columns were calculated by the respective *DEQ Local Limits Workbooks* for these facilities. The limits for the Rock Creek plant were calculated by the “Rock Creek” sheet of the *District Workbook* as discussed in

Section 6.2.2.1. There are two columns for the calculated limits for the Forest Grove facility: one for the NTS scenario, and another for the No-NTS scenario. The limits displayed in the "Minimum Limit" column are the minimum values for all four treatment facilities. Implementing a single set of local limits applicable to all contributory industrial users would be unreasonable since the Forest Grove local limit was specific to a single facility and may change with the issuance of a new permit. .

The 1.15 mg/L copper limit is based on the Forest Grove facility. . The District decided to apply the MAIL available at the Forest Grove facility as a mass limit for copper to FG Metal Finisher, the only contributory SIU that discharges to the Forest Grove facility. The local limit to be applied to SIUs discharging to the other three treatment facilities will be the minimum value of the copper limit calculated for those plants. The column "Minimum of non-FG plants" in Table 24 displays that calculated limit (2.74 mg/L). This limit is almost identical to the current local limit for copper (2.71 mg/L). For ease of implementation, the District will propose that the local limit for copper applicable to SIUs discharging to the Durham, Rock Creek, and Hillsboro facilities remain unchanged from its current value.

6.2.4 Specifying a Copper Local Limit for Forest Grove

DEQ is actively working on the renewal of the NPDES permit for the District's facilities. Copper is a pollutant of concern at the Forest Grove WWTF and NTS. As part of the permit renewal process, DEQ will conduct a reasonable potential evaluation. DEQ may find that the discharge from the Forest Grove WWTF/NTS has reasonable potential to exceed water quality criteria for copper and include effluent limits. The District's analysis indicates that based on operation alternatives, there is a wide range of potential outcomes and potential limits from the DEQ reasonable potential evaluation. The pass-through limits that the District calculated for the local limits analysis is within the range of potential limits based on an expanded operational control strategy. If effluent limits are established for copper, it is expected that a compliance schedule will be included in the NPDES permit to implement necessary controls including the construction of additional treatment facilities to meet the effluent limits for copper. Constructing additional treatment facilities will materially change the treatment efficiency at the Forest Grove WWTF and NTS, and thereby the allowable headworks loading and local limits.

The District is following *EPA Guidance* published on its Local Limits Website by establishing a mass-based local limit for FG Metal Finisher based on current flows and concentrations (Region III Guidance for Setting Local Limits for a Pollutant Where the Domestic Loading Exceeds the Maximum Allowable Headworks Loading (epa.gov)). A copper MAIL of 1.24 lbs/day was calculated using the *DEQ Local Limits Workbook* for the Forest Grove No-NTS scenario, using a safety and growth factor of 5%. This MAIL will be allocated to FG Metal Finisher as a local limit, as it is the only contributory SIU discharging to the Forest Grove facility. The District is also continuing to work with FG Metal Finisher to implement strategies including treatment upgrades to further reduce copper levels and feasibility studies to determine the potential transfer to the larger Rock Creek plan, consistent with the *EPA Guidance* regarding the incorporation of toxic reduction measures. The proposed copper local limit for FG Metal Finisher is consistent with the copper industrial loading for the Forest Grove facility, will continue to meet the technology-based limits that apply to FG Metal Finisher, will continue to be protective of biological treatment processes, and is within the range of potential effluent limits calculated to achieve pass-through requirements. This approach enables the District to implement necessary controls to meet potential effluent limits for copper within the timeframe provided in the NPDES permit renewal. Following the implementation of necessary controls to meet copper limits, the District will update the local limits analysis at the Forest Grove facility.

6.3 Nonindustrial (Domestic/Commercial) Loadings Assumptions

As discussed in Section 1.7, nonindustrial flows have been defined as the flows from domestic/commercial sources and non-metal-bearing industrial sources, and are often discussed as background. Background loadings are calculated by the *DEQ Local Limits Workbook*, and are displayed in the "Actual Uncontrollable" column of the "Limits" tab of the *DEQ Local Limits Workbook*. Calculation of these loadings uses the values entered into the "Nonindustrial" column of the "General" tab of the *DEQ Local Limits Workbook*.

6.4 Significant Background Loadings

Appendix K presents nonindustrial (background) loadings, the calculated MAHLs, and the percentage of each MAHL represented by the nonindustrial loadings for each pollutant at all four treatment facilities. Analysis of background loadings as a percentage of MAHLs indicates that this percentage is below 50% for all pollutants except copper at the Forest Grove (No-NTS) facility, and zinc at the Rock Creek and Forest Grove (NTS) facilities. Copper and zinc are commonly detected in domestic and commercial wastewaters. The local limits proposed for these pollutants are expected to adequately prevent pass through and interference, and to assure compliance with biosolids land application criteria.

6.5 Implementation of Limits

Local limits are developed to apply to SIUs discharging to District treatment facilities. Limits developed by the District can also be applied to nonsignificant industrial users. Local limits are incorporated into the NDWO by reference.

6.5.1 Significant Industrial Users

The District's Industrial Pretreatment Program Implementation Manual states that, following DEQ's review and approval of the local limits evaluation report, the District will incorporate the proposed Local Limits into permits for SIUs. Upon final approval by DEQ of the revisions to local limits, the District will modify SIU discharge permits to reflect the applicable new discharge limitations.

6.5.2 Nonsignificant Industrial Users

The NDWO states that "any person discharging nondomestic waste from a nondomestic source to the POTW must provide treatment as necessary to comply with District Rules and must achieve compliance with all applicable Categorical Pretreatment Standards, Local Limits, and the prohibitions set out in Section 4 within the time limitations specified by EPA, the State, or the District, whichever is more stringent." Thus, the District is authorized to apply local limits to nonsignificant industrial users.

Section 7: Other Considerations

7.1 Achievability of Limits

The proposed revised local limits are presented in Table 24.

Table 24

Proposed Local Limits

Pollutant	Local Limit (mg/L, except pH)		Local Limit (lbs/day)
	Durham, Rock Creek, and Hillsboro Facilities	**Forest Grove Facility**	**Applied to Specific SIUs**
Arsenic	0.23	0.23	
Cadmium	0.13	0.13	
Chromium	6.17	6.17	
Copper	2.71	1.15[1]	8.00[2]
Cyanide	1.17	1.17	
Lead	0.7	0.7	
Mercury	0.006	0.006	
Molybdenum	0.56	0.56	4.26[3]
Nickel	2.26	2.26	
Selenium	0.35	0.35	
Silver	0.06	0.06	
Zinc	1.87	1.87	
pH (S.U.)	6 - 11	6 - 11	
FOG	BMP	BMP	

1 To be proposed as a mass limit of 1.24 lb/day for the only contributory SIU

2 Allocation to be distributed to two semiconductor facilities that discharge to the Rock Creek facility

3 Allocation to be distributed to two semiconductor facilities that discharge to the Rock Creek facility and a metal finisher that discharges to the Hillsboro facility

Monitoring data from District SIUs for 2016-2020 were examined to assess the achievability of these proposed local limits. The compliance rate for the revised limits is expected to be very high.

The proposed mass-based local limit for copper for the Forest Grove facility is substantially lower than the current concentration-based local limit. Analysis of copper discharge data from FG Metal Finisher indicates this SIU will be able to comply with the mass-based copper limit greater than 98% of the time. As noted in Section 6.2.4, FG Metal Finisher is also implementing treatment upgrades to further reduce copper levels which will ensure a higher compliance rate.

7.2 Limits for Conventional Pollutants

The District does not propose to implement local limits for $CBOD_5$ or TSS. The rationale for eliminating these pollutants from further consideration for local limits development was presented in Section 4.1.1.

Section 3.1.4 discussed the reasons that FOG was not included in the local limits SAP. The District plans to control FOG from SIU and non-SIU sources by continuing to implement its FOG management plan.

The current local limit for FOG is the set of BMPs that must be undertaken by industrial/commercial sources of FOG. The requirement to implement these BMPs has been incorporated into the District's NDWO at Section 5.c:

> Fats, Oil and Grease Control
>
> 1. Notwithstanding compliance with the Oregon State Uniform Plumbing Code or installation of a District-approved grease interceptor, no person may discharge any fats, oils, or grease (FOG) in quantities sufficient to cause or contribute to restriction or obstruction of flow in the POTW.
> 2. The owner or operator of any facility where a grease interceptor is installed must maintain the grease interceptor in efficient operating condition by removing accumulated FOG before the system capacity is exceeded. The District may impose maintenance frequency requirements when necessary to ensure proper maintenance. The use of chemicals to dissolve FOG in, or downstream of, a grease interceptor is prohibited. No person may discharge accumulated FOG to the POTW or any private piping discharging to the POTW.
> 3. The District may require the owner or operator of a grease interceptor to open it for inspection. The District may require the owner or operator to maintain records of grease interceptor maintenance and to provide such records to the District upon request.

7.3 Limits for Non-conservative Pollutants

As previously mentioned, the District decided not to implement local limits for organic priority pollutants and ammonia. Discussion of these decisions is found in Sections 3.1.3 and 4.1.2, respectively. Discussion of the proposed local limit for FOG is found in Section 7.2.2.

References

CH2M Hill, 2008. *Mixing Zone/Dilution Studies Update.* Prepared for Clean Water Services. March 2008.

Environmental Protection Agency, 2004. *Local Limits Development Guidance.* EPA 833-R-04-002A. July 2004.

Kennedy Jenks, 2019. *Forest Grove WWTF Mixing Zone Study Update*. Prepared for Clean Water Services. August 2019.

Appendix A: Local Limits Sampling and Analysis Plan

Local Limits Sampling and Analysis Plan

According to EPA guidance, a POTW that has concluded that its local limits should be reevaluated should determine whether it has sufficient existing data to recalculate Maximum Allowable Headworks Loadings (MAHLs) for a local limits evaluation. If existing data are not sufficient, the POTW should develop a sampling and analysis plan to acquire the data necessary for the reevaluation.

Clean Water Services (District) has determined that existing data, along with the data that are currently being generated in accordance with permit monitoring requirements, will provide most, but not all, of the data necessary to recalculate local limits. The influent and effluent data being collected under the District's monitoring plan will not be sufficient to determine the efficiency of removing pollutants at the Forest Grove Natural Treatment System. The District considered proposing a new local limit evaluation be limited to the changes resulting from the addition of the Natural Treatment System (NTS), but instead concluded that other considerations, such as the likelihood of effluent limits for mercury, would be applicable to all its treatment facilities. In addition to the NTS changes, the District plans to collect primary clarifier effluent data to allow it to estimate primary removal efficiency.

The following Sampling and Analysis Plan (SAP) was developed to reevaluate the District's local discharge limitations under the Industrial Pretreatment Program.

Sampling Locations

This section describes the sampling locations that will be monitored at the four treatment plants and the Tualatin River, as well as sampling locations that are not included in this SAP. Where appropriate, the sampling locations will be the same as those currently being monitored under the requirements established in the District's NPDES discharge permit.

Tualatin River. Monitoring of the Tualatin River, upstream of each treatment plant, will be included in this SAP and sampled once per quarter, the frequency that these locations are currently sampled. Data generated from this component of the Watershed Monitoring Plan will be used to represent background conditions in the Tualatin River.

Nonindustrial Contributions to the Collection System. Collection system sampling to characterize nonindustrial (domestic and commercial) contributions will not be included in this SAP. The District has determined that nearly all the plant influent loadings of local limits pollutants are contributed by nonindustrial sources. Industrial monitoring data demonstrate that industrial contributions to the overall influent loadings are very small. For most of the Pollutants of Concern (POCs), the assumption will be made that influent loadings are equal to nonindustrial loadings. Ammonia, which is known to be contributed in substantial quantities by industries discharging to the Rock Creek facility, is an exception. For ammonia, the assumed nonindustrial loading at Rock Creek will be the difference between the influent loading and the industrial loading.

Septage Haulers. Monitoring of septage haulers will not be included in this SAP. The District only accepts hauled wastes from permitted septage haulers, and these permits prohibit the discharge of wastes other than from domestic sanitary sources. In addition, the District monitors and conducts sampling of hauled wastes to detect the potential introduction of industrial wastes into its system.

Industrial Users. Additional sampling of industrial users will not be included in this SAP. The District's Pretreatment Program requires industrial users to self-monitor discharges. In addition, the District conducts its own monitoring of industrial users, which will continue as the District collects the data described in this SAP. Thus, there is an existing robust dataset of industrial monitoring information that will be used to characterize industrial contributions to the collection system and treatment facilities.

Plant Influent. For all four District treatment facilities, the influent sampling locations and sampling frequency are specified in the NPDES discharge permit. These locations will be monitored in accordance with the permit-required frequency under this SAP.

Primary Clarifier Effluent. Sampling of the primary clarifier effluent at the three treatment facilities that employ primary clarification (Durham, Rock Creek and Hillsboro) will generate information necessary to calculate removal efficiencies of the primary clarifiers. These removal efficiencies are necessary to calculate Allowable Headworks Loadings based on the prevention of inhibition of the activated sludge processes at the treatment facilities. The District does not monitor these locations on a routine basis, so this monitoring will begin when this SAP is implemented in late 2017.

Final Effluent. Sampling of the final effluent for all four treatment facilities will take place at the outfalls designated by the NPDES discharge permit watershed monitoring plan. Final effluent monitoring data will be used, along with data from influent sampling, to calculate removal efficiencies across the treatment facilities. These locations will be monitored in accordance with the permit-required frequency under this SAP.

Natural Treatment System. At the Forest Grove facility, samples will also be taken from the surface discharge from the NTS prior to entry into Outfall F001A (nominally from May to October). The NTS is expected to remove additional pollutants following secondary treatment at the Forest Grove facility.

Biosolids. Sampling of the biosolids produced by the Durham and Rock Creek facilities will be conducted at the same locations as is currently done in accordance with the NPDES discharge permit watershed monitoring plan. The results of the biosolids analyses are not directly used in the calculations of local limits; these results are used to conduct a mass balance of pollutant fate, where influent loadings are expected to be approximately equal to the sum of effluent and biosolids loadings.

Transfer from Forest Grove/Hillsboro to the Rock Creek Facility. Sampling of the two 24-inch diameter pipelines that transfer solids from the Forest Grove and Hillsboro facilities to the Rock Creek facility will not be included in this SAP. Such sampling occurred for previous local limit evaluations to help characterize the influent loadings to Rock Creek that were not measured at the Rock Creek influent monitoring location. This is no longer necessary because the Rock Creek influent sampling location now incorporates all transfer flows.

Pollutants of Concern

In its *Local Limits Development Guidance*, EPA lists 15 pollutants that should be included in a POTW's sampling plan to calculate MAHLs and the possible development of local limits. These pollutants are listed below and will be included in the SAP:

<u>15 National POCs</u>

1. Arsenic
2. Cadmium
3. Chromium
4. Copper
5. Cyanide
6. Lead
7. Mercury
8. Molybdenum
9. Nickel
10. Selenium
11. Silver
12. Zinc
13. 5-Day BOD
14. TSS
15. Ammonia (for plants that accept nondomestic sources)

The metals in the above list will be analyzed as total recoverable for the plant influent and primary clarifier effluent. The plant effluent will be analyzed for total recoverable metals and dissolved metals. The plant effluent will also be analyzed for hardness to help assess compliance with water quality criteria that are hardness-dependent.

Five-day CBOD will be substituted for the 5-day BOD parameter listed above to be consistent with the CBOD permit limit and monitoring requirements of its NPDES permit.

In addition to the 15 national POCs, EPA recommends that POTW-specific POCs should be included in the local limits sampling plan. The Durham and Rock Creek facilities both have effluent discharge limits for ammonia nitrogen and total phosphorus. Ammonia is already considered a POC under this SAP because it's on EPA's list of national POCs. Total phosphorus will be added to the list of POCs.

The *EPA Guidance* also recommends sampling for Clean Water Act organic priority pollutants for consideration as possible POCs in the development of local limits. The District already has permit requirements for sampling these pollutants in its plant effluents. In addition, monitoring for these pollutants has been conducted for the influent, biosolids, and Tualatin River upstream of the treatment plant discharges in previous years. For this reason, no additional sampling of these pollutants will be included in this SAP.

In addition to the pollutants discussed in the *EPA Guidance*, the State of Oregon's local limits guidance includes a recommendation that POTWs include pH and fats, oils and grease (FOG) in local limits sampling plans. The SAP will include pH, but not FOG. FOG is controlled by a management plan that requires applicable industrial users to install and maintain grease interceptors/grease traps.

Sample Frequency and Schedule. For the Hillsboro and Forest Grove facilities, sampling of the plant influent, primary clarifier effluent (for the Hillsboro facility), and plant effluent will be conducted for three consecutive days, at least semiannually, for a one-year period that begins in November 2017. For the Durham and Rock Creek facilities, sampling of the plant influent, primary clarifier effluent, and plant effluent will be collected for three consecutive days during every quarter for one year, beginning in the first quarter of 2018. These three-day sampling events for plant influent and effluent are required under the pretreatment monitoring requirements of the NPDES permit.

Sampling of biosolids currently is conducted once per month (twice the minimum frequency of the permit requirement). This frequency will be maintained for the duration of the local limits sampling period.

Sampling Methodology and Analytical Methods. All samples of the plant influent, primary clarifier effluent and plant effluent will be 24-hour flow-proportional composite samples (this does not apply to cyanide sampling that requires grab samples). The biosolids and NTS discharge samples will be grab samples. Sampling procedures will be the same as is currently done for compliance with the NPDES permit monitoring requirements. All sampling and analyses will be conducted in accordance with the methods specified in 40 CFR Part 136. The table below presents test descriptions, units, Method Reporting Limits (MRLs), method references, and method descriptions.

Additional monitoring data. The District has already collected similar data from most of the monitoring sites specified in this SAP, as much of this monitoring is required by its NPDES permit. The District plans to use recent monitoring results from the required quarterly monitoring performed in 2017 to augment the data collected in accordance with this SAP in its local limits analysis. This will double the amount of data indicated in Table 2, with the exception of the primary clarifier effluent and the NTS.

Expected date of local limits evaluation submission. The sampling described by this SAP is expected to be completed in the last quarter of 2018. The results of all analyses associated with this SAP are expected to be available for local limits calculation during the first quarter of 2019. The District expects that its local limits evaluation report will be submitted to DEQ by June 30, 2019.

Table 1
Analytical tests, units, MRLs and methods for local limits data

Test Description	Unit	MRL	Method Reference	Method Description
pH, Field	S.U.	0.1	SM 4500-H+ B	Electrometric, ISE
Total Suspended Solids	mg/L	0.5	SM 2540 D	Gravimetric
Ammonia-N, Soluble	mg/L	0.01	SM 4500-NH3 G	Colorimetric, automated phenate
Carbonaceous Biochemical Oxygen Demand, 5-day	mg/L	0.2	SM 5210 B	Probe
Total Phosphorous	mg/L	0.025	EPA 365.4	Colorimetric, automated (ascorbate)
Total Cyanide	mg/L	0.005	ASTM D 4374-06	Colorimetric, automated UV
Arsenic, Soluble and Total Recoverable* *Will consider use of inorganic method as necessary	µg/L	0.2	EPA 200.8	ICP/MS
Cadmium, Soluble and Total Recoverable	µg/L	0.1	EPA 200.8	ICP/MS
Chromium, Soluble and Total Recoverable	µg/L	0.4	EPA 200.8	ICP/MS
Copper, Soluble and Total Recoverable	µg/L	0.4	EPA 200.8	ICP/MS
Hardness, Total	mg/L	0.5	EPA 200.7	ICP
Lead, Soluble and Total Recoverable	µg/L	0.1	EPA 200.8	ICP/MS
Mercury by Purge and Trap	ng/L	0.5	EPA 1631E	Manual cold vapor/Purge & Trap
Molybdenum, Soluble and Total Recoverable	µg/L	0.1	EPA 200.8	ICP/MS
Nickel, Soluble and Total Recoverable	µg/L	0.4	EPA 200.8	ICP/MS
Selenium, Soluble and Total Recoverable	µg/L	0.05	EPA 200.8	ICP/MS
Silver, Soluble and Total Recoverable	µg/L	0.1	EPA 200.8	ICP/MS
Zinc, Soluble and Total Recoverable	µg/L	2.5	EPA 200.8	ICP/MS

Table 2
Summary of proposed local limits SAP

Location	Parameters	Frequency	Type of Sample	Number of Samples
Tualatin River, upstream of WWTF discharges	• Total recoverable metals • Dissolved metals • pH • Hardness	Quarterly	Grab	4
Plant Influent	• Total recoverable metals • Cyanide	3 consecutive days/quarter (pretreatment monitoring required by the permit)	24-hour flow proportional composite sample except cyanide (grab), and pH (continuous recorder)	12
	• *$CBOD_5$* • *TSS* • *Ammonia* • *Total phosphorus* • *pH*	*Routine monitoring as required by permit*		
Primary Clarifier Effluent	• Total recoverable metals • Cyanide • Ammonia • pH	3 consecutive days/quarter	24-hour flow proportional composite sample except cyanide (grab), and pH (continuous recorder)	12
Plant Effluent	• Total recoverable metals • Dissolved metals • Cyanide	3 consecutive days/quarter (pretreatment monitoring required by the permit)	24-hour flow proportional composite sample except cyanide (grab), and pH (continuous recorder)	12
	• *$CBOD_5$* • *TSS* • *Ammonia* • *Total phosphorus* • *pH* • *Hardness*	*Routine monitoring as required by permit*		
Natural Treatment System discharge	• Total recoverable metals • Dissolved metals • Cyanide • Ammonia • Total phosphorus • pH • Hardness	Monthly during dry season (May-October)	Grab	6
Biosolids	Total recoverable metals	1 day/month	Grab	12

Appendix F: Summary of Zinc and Copper Testing for Local Limits Analysis

Appendix F
Nitrification Inhibition Testing for Metals/Local Limits Input

1.0 BACKGROUND

The U.S. Environmental Protection Agency (EPA) provides nitrification inhibition thresholds for a variety of substances including chemicals and metals. These data along with other criteria may be used in the absence of site-specific information to derive local limits for POTWs. Many of the nitrification inhibition threshold values are based on a limited number of studies, some of which are several decades old. Additionally, the range of nitrification inhibition threshold values can vary by an order of magnitude or more. Consequently, many POTWs default to using the most conservative values when setting local limits for significant industrial users.

Clean Water Services (District) revising local limits. For most pollutants, District is using the minimum inhibition threshold value published in the EPA *Local Limits Development Guidance* (EPA, 2004) to calculate allowable headworks loadings based on prevention of nitrification inhibition. The inhibition threshold range in the EPA *Guidance* for copper ranges from 0.05-0.48 mg/L and for zinc from 0.08-0.50 mg/L. District data from 2018-2019 show that facilities were not impacted when copper and zinc concentrations were higher than the minimum threshold values in the EPA guidance. Therefore the determination of facility-specific nitrification inhibition thresholds would be appropriate for the District Facilities

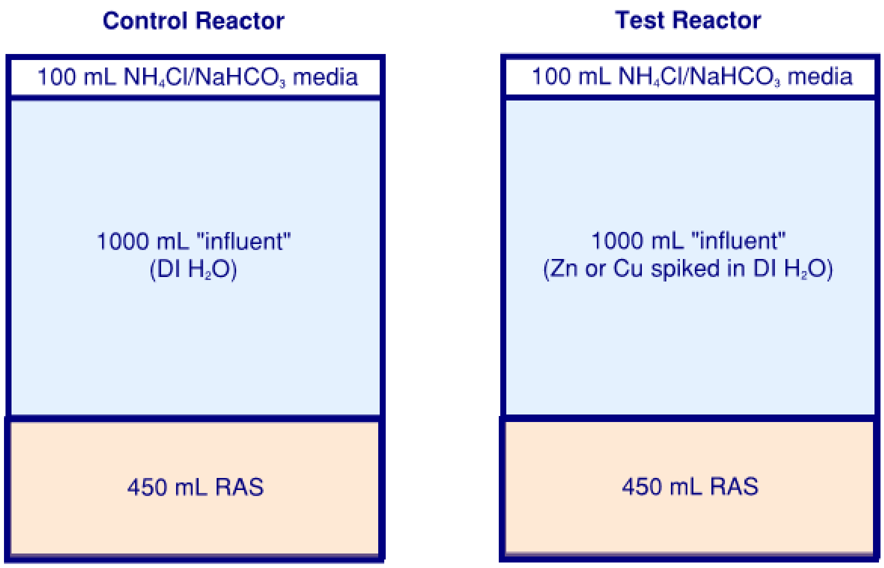
A study was conducted to test a range of metals concentrations using return activated sludge (RAS) from each of the three facilities to establish nitrification inhibition levels that are protective of the biological processes at the WWTFs.

2.0 METHODS

Testing was carried out from March to June 2020 using a modified version of ISO 9509:2006[1]. This method assesses the short-term inhibitory effect of test substances on nitrifying bacteria in activated sludge over the course of several hours. The test substance is added to activated sludge, which is spiked with an ammonia substrate and constantly aerated while nitrate is measured to determine the rate of nitrification. During each set of tests, six reactors were operated concurrently with varying levels of zinc or copper spikes. Each set of tests included one control (deionized water with no added metals) against which the nitrification rates of the spiked samples were compared (Figure 1).

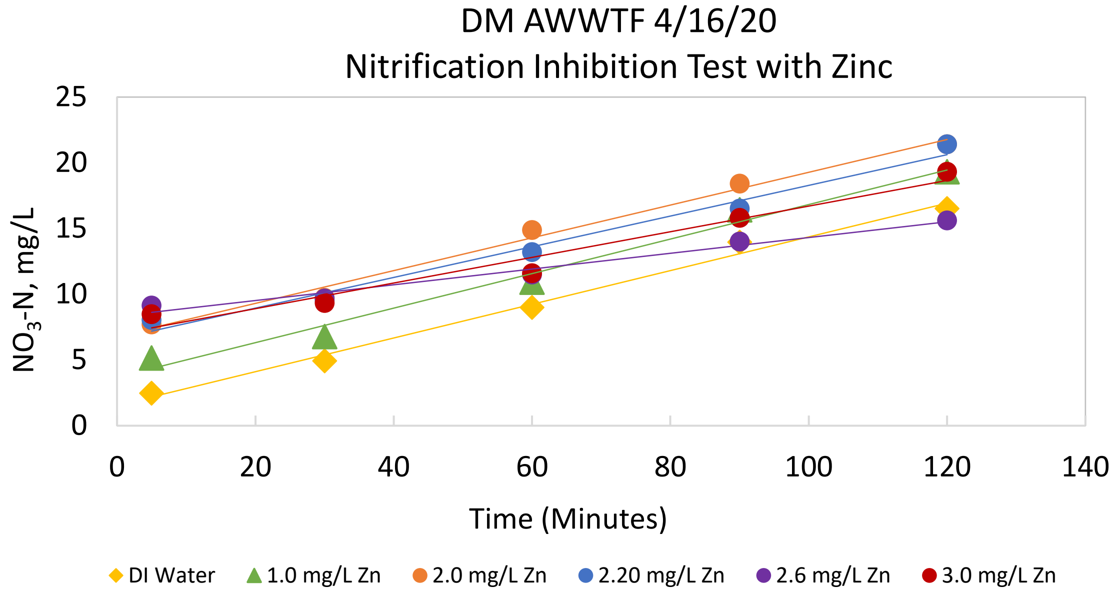
[1] ISO 9509(2006): https://www.iso.org/obp/ui/#iso:std:iso:9509:en

Figure 1
Experimental setup for control and test reactors



Reactors were aerated constantly for 120 minutes while maintaining constant temperature and pH. Nitrate was sampled at t = 5, 30, 60, 90 and 120 minutes. Ammonia was sampled at the beginning and end of each test, and nitrite was sampled at the end of each test. Nitrogen species were measured using Hach Test-N-Tube (TNT) and TNT Plus kits (#832, 835, 840, and #26053-45). Nitrate levels were graphed vs. time (Figure 2) and nitrate production rates (nitrification rates) were derived from the slopes. Rates were normalized to 20 °C using a temperature correction factor and compared to the nitrification rate of the DI control.

Figure 2
Example of raw nitrate production data from control and dosed reactors



Testing started with RAS from Durham and then proceeded to Forest Grove and Rock Creek RAS. Low concentrations of zinc and copper were tested initially, with doses increased until complete or near-complete inhibition of nitrification was observed. Samples were taken from several of the reactors each week for ICP-MS metals analysis to determine the total concentration of metals, including the spike and background metals from the RAS biomass. Nitrification rates were plotted against the measured or calculated concentration of zinc or copper in the reactor.

Samples of influent and RAS at each of the three WWTFs were analyzed for zinc and copper. These measurements were used to calculate an average RAS:influent concentration factor for each metal at each facility and to calculate potential sustained influent concentrations that would correspond with the test concentrations.

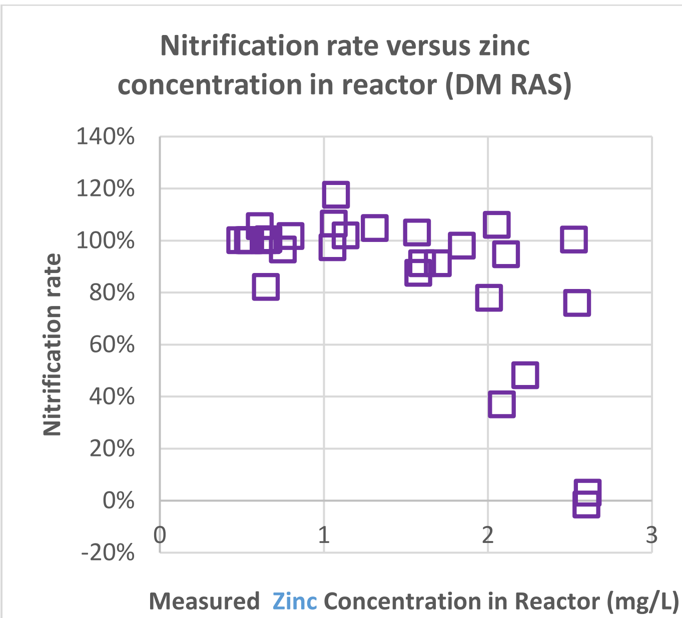
3.0 RESULTS

Durham AWTF

Results from the Durham AWTF (Figures 3 and 4) showed a trend of decreasing nitrification with higher influent zinc and copper concentrations. Most of the tests were run in the 0-4 mg/L concentration range.

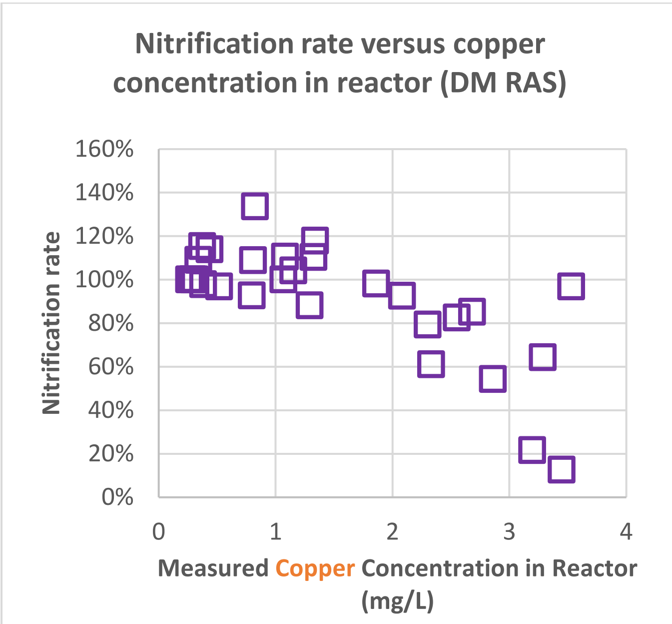
Figure 3

Durham AWTF zinc test results



(Note: The single negative point is from a test where the final nitrate concentration was lower than the initial concentration.)

Figure 4
Durham AWTF copper test results



Nitrification rates remain at or around 100% of control rates until about 2 mg/L zinc or copper in the reactor, after which they tend to decrease. There is some variation and higher concentrations are not universally inhibitory, but nitrification is stable at concentrations less than 2 mg/L.

Forest Grove WWTF

Forest Grove WWTF results (Figures 5 and 6) showed a similar trend to the results from the Durham WWTF. A significant decrease in nitrate production/nitrification rate was noted beginning at concentrations of around 2 mg/L zinc and slightly above 2 mg/L copper.

Figure 5

Forest Grove WWTF zinc test results

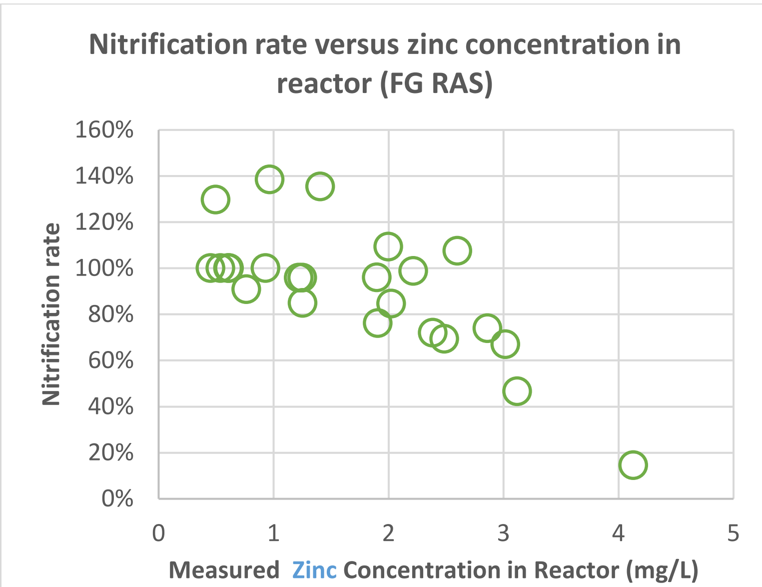
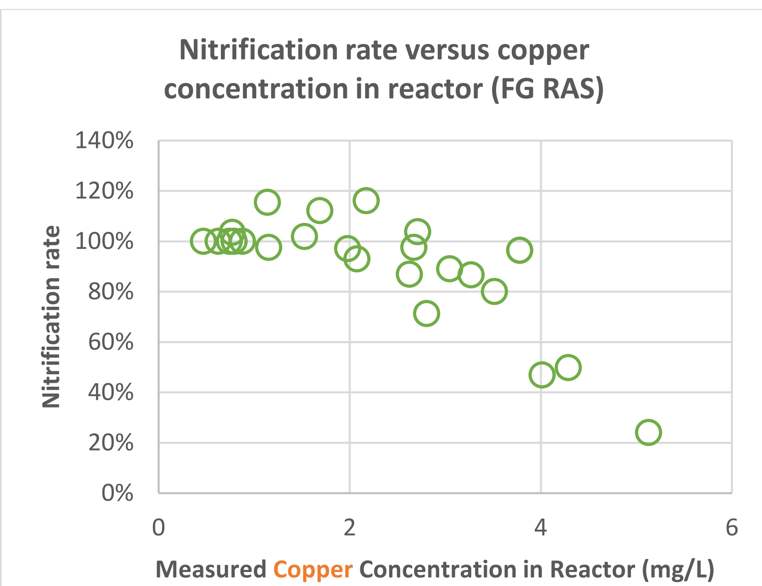


Figure 6

Forest Grove WWTF copper test results



Rock Creek AWTF

Figures 7 and 8 present the test results from the Rock Creek AWTF. RAS from the Rock Creek AWTF was tested at up to 3.4 mg/L zinc and 2.5 mg/L copper using the same 1,000 mg/L metals standards used for the Durham and Forest Grove testing. Nitrification rates from these tests were all greater than 90% of control nitrification rates (shown by the cluster of data points at the left end of the graph).

Figure 7

Rock Creek AWTF zinc test results

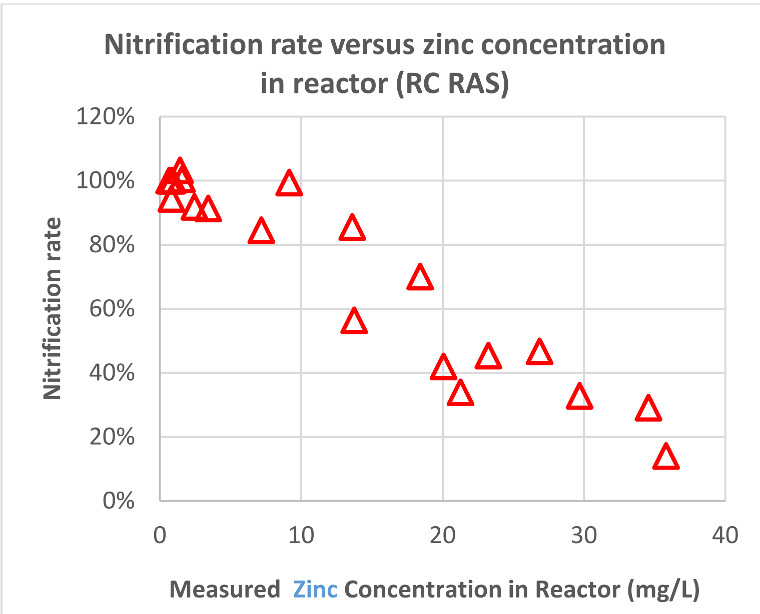
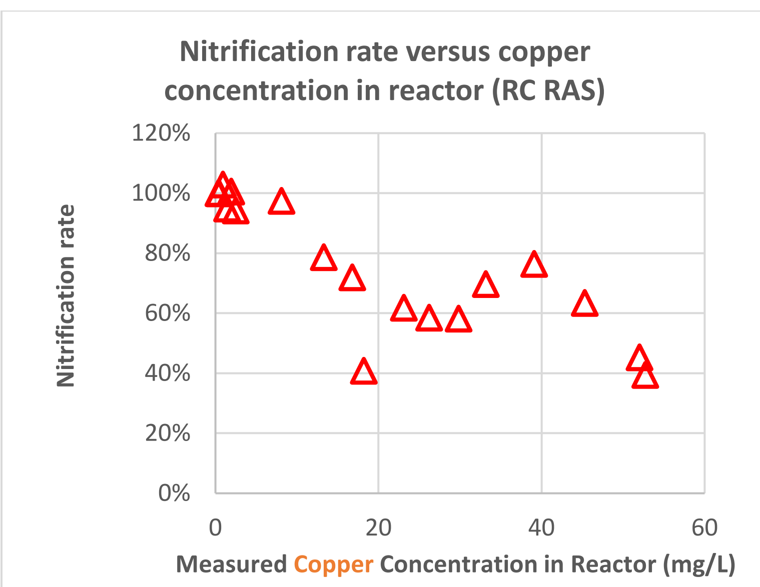


Figure 8

Rock Creek AWTF copper test results



Summary of all three facilities Figures 9 and 10 present zinc and copper test results from all three facilities. As mentioned above, significant differences in nitrate production and nitrification rates are seen beginning at concentrations around 2 mg/L for both zinc and copper.

Figure 9

Zinc test results (all facilities)

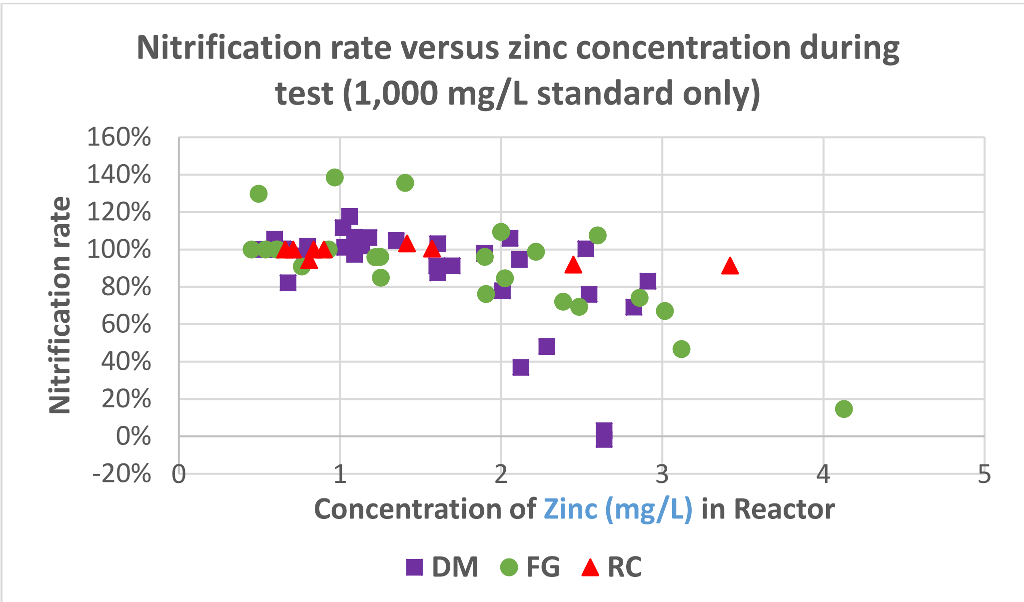
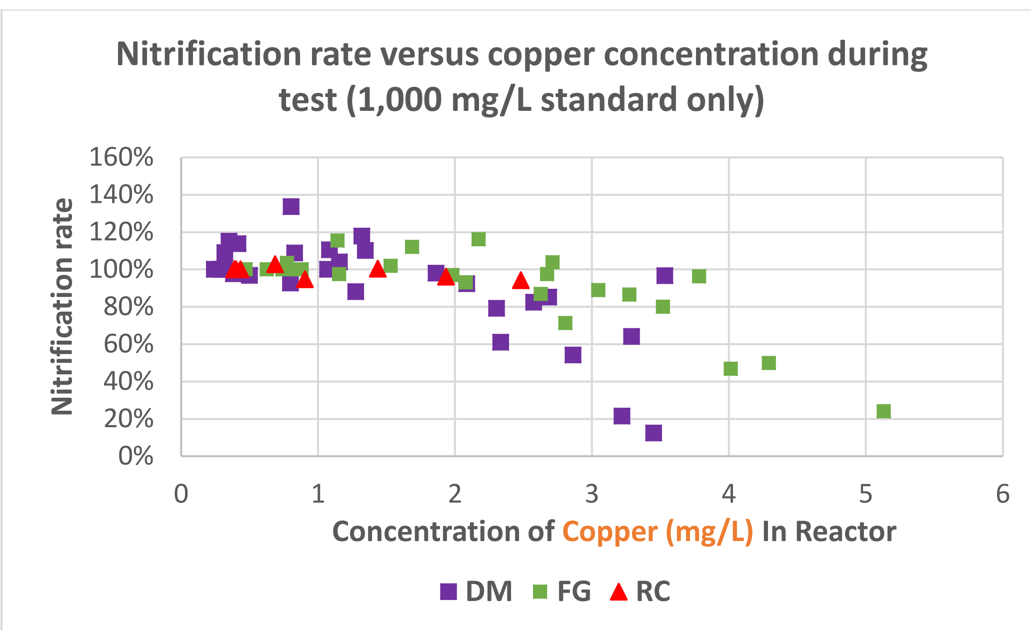


Figure 10

Copper test results (all facilities)



4.0 IMPLICATIONS FOR INFLUENT LOADINGS/TRANSLATION OF EXPERIMENTAL DATA TO POTENTIAL INFLUENT CONCENTRATIONS

Because this testing was not conducted as part of a long-term acclimated biomass experiment, the results need to be interpreted in terms of analogous conditions from longer-term exposure. For that reason, samples were taken to approximate the accumulation of zinc and copper in the biomass to calculate the overall mass of metals that would be analogous to the testing conditions at a given influent concentration. During the testing, the biomass used had been subjected to low historical metals loading. Spiked concentrations were sometimes considerably higher than historical influent concentrations. If higher influent loadings were seen on a consistent basis, this would translate to higher metals concentrations in RAS.

Multiple influent and RAS samples from each WWTF were analyzed to determine average copper and zinc concentrations. The average ratio between influent and RAS concentrations was used to calculate what sustained influent metals concentrations might correspond to the concentrations tested in the reactors, and therefore what sustained influent metals concentrations might correspond with the start of unstable nitrification.

This approach assumed that metals removal or adsorption would remain linear over the range of metals concentrations, and that RAS:influent metal concentration ratios would remain relatively stable over the range of typical WWTF SRTs.

These RAS and influent metals concentrations were used to calculate conversion factors between test reactor concentrations and the potential sustained influent metals levels that would result in the test conditions.

Table 1
Summary of influent and RAS concentration data and calculated conversion factors

	Zinc			Copper		
	Durham	**Forest Grove**	**Rock Creek**	**Durham**	**Forest Grove**	**Rock Creek**
Average Influent Metal Concentration (mg/L)	0.16	0.11	0.27	0.05	0.09	0.07
Average RAS Metal Concentration (mg/L)	2.04	2.16	2.46	1.38	2.41	1.39
Ratio of RAS/Influent Concentrations	12.4	19.0	9.4	20.9	32.7	21.3
Conversion between Influent and Testing Conditions*	4.2	6.2	3.4	6.7	10.1	6.8

* The conversion factor is calculated as follows:

$$\text{Conversion factor} = \frac{(\text{(RAS:influent concentration ratio} * 450\text{ mL}) + 1000\text{ mL})}{1550\text{ mL}}$$

Where 450 mL is the volume of RAS used in the bioassay test, 1000 mL is the volume of influent, and 1550 mL is the total volume in the reactor.

To verify the reasonableness of these conversion factors, existing data on metals removal in primary and secondary treatment processes, along with SRT/HRT and RAS ratio information, were used to estimate the accumulation ratio of metals in RAS. The test concentration factors calculated in this manner (Table 2) were in the same range as the conversion factors in Table 1.

Table 2

Metals removal, SRT, HRT, and RAS ratio assumptions and resulting test reactor concentration factors

	Zinc			Copper		
	Durham	Forest Grove	Rock Creek	Durham	Forest Grove	Rock Creek
WWTF influent concentration (unit basis; influent = 1)	1	1	1	1	1	1
Average primary removal efficiency	44%	0%	77%	39%	0%	71%
(A) Primary effluent concentration	0.56	1.00	0.23	0.61	1.00	0.29
Average secondary removal efficiency	35%	49%	28%	84%	87%	83%
(B) Assumed secondary eff. conc.	0.36	0.51	0.17	0.09	0.13	0.05
(C) Typical summer SRT (days)	5	5	5	5	5	5
(D) Typical summer HRT (hours)	8	8	8	8	8	8
(E) RAS ratio in aeration basins	50%	90%	50%	50%	90%	50%
(F) Conc. factor [C * (24/D) * (1+E)/E]	45	32	45	45	32	45
(G) Concentration in RAS [F * (A-B)]	8.91	15.36	2.86	23.15	27.41	10.82
(H) Inhibition test RAS volume	450 mL	450 mL	450 mL	450 mL	450 mL	450 mL
(I) Inhibition test influent volume	1,000 mL	1,000 mL	1,000 mL	1,000 mL	1,000 mL	1,000 mL
(J) Calculated test conc. in reactor [(G*H + I) / 1550]	3.23	5.10	1.48	7.37	8.60	3.79

The conversion factors from the inhibition testing samples were used as they were based on direct measurements and were generally more conservative. Adopting these conversion factors results in the following graphs of calculated sustained influent concentrations and corresponding nitrification rates.

Figure 11
Durham AWTF: Nitrification rate and potential influent zinc concentrations

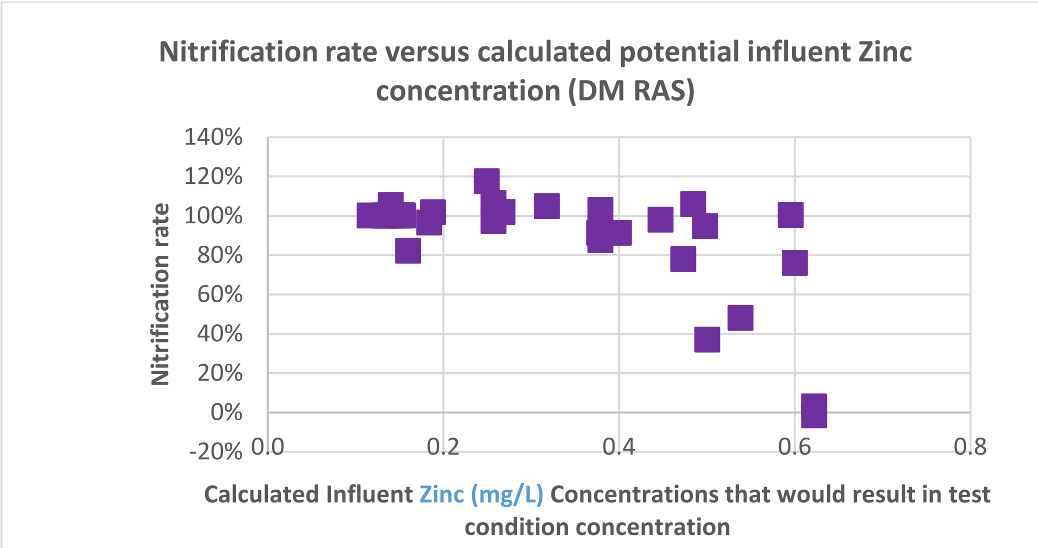
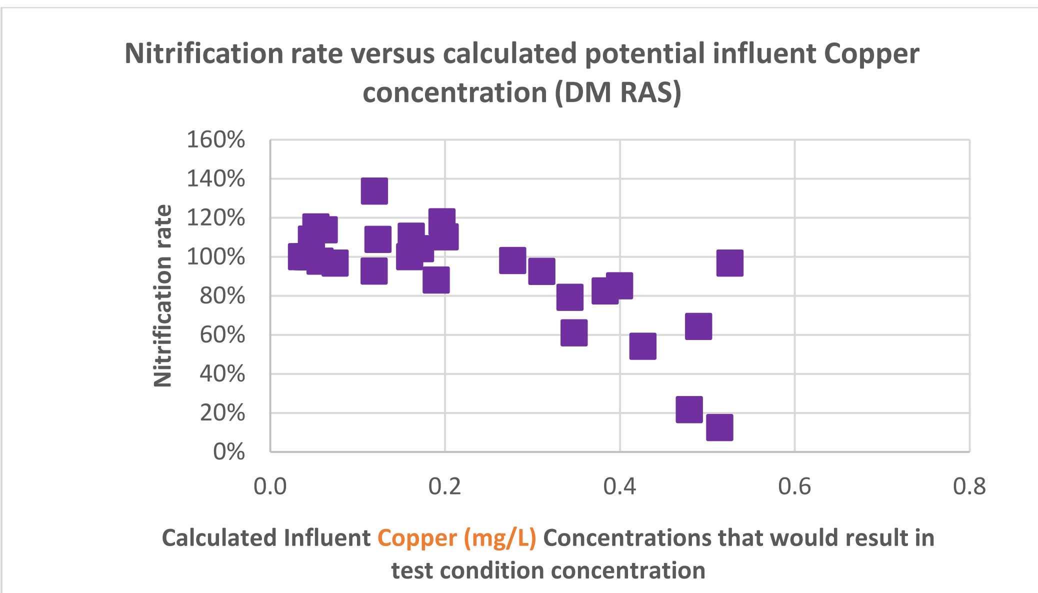


Figure 12
Durham AWTF: Nitrification rate and potential influent copper concentrations



(Note: The Durham WWTF graphs only include concentrations from tests using 1,000 mg/L standards.)

Figure 13

Forest Grove WWTF: Nitrification rate and potential influent zinc concentrations

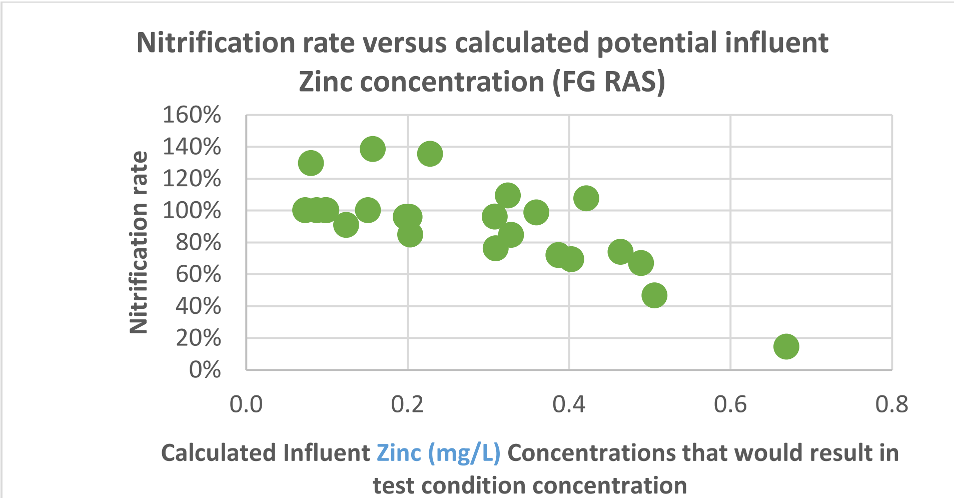


Figure 14

Forest Grove WWTF: Nitrification rate and potential influent copper concentrations

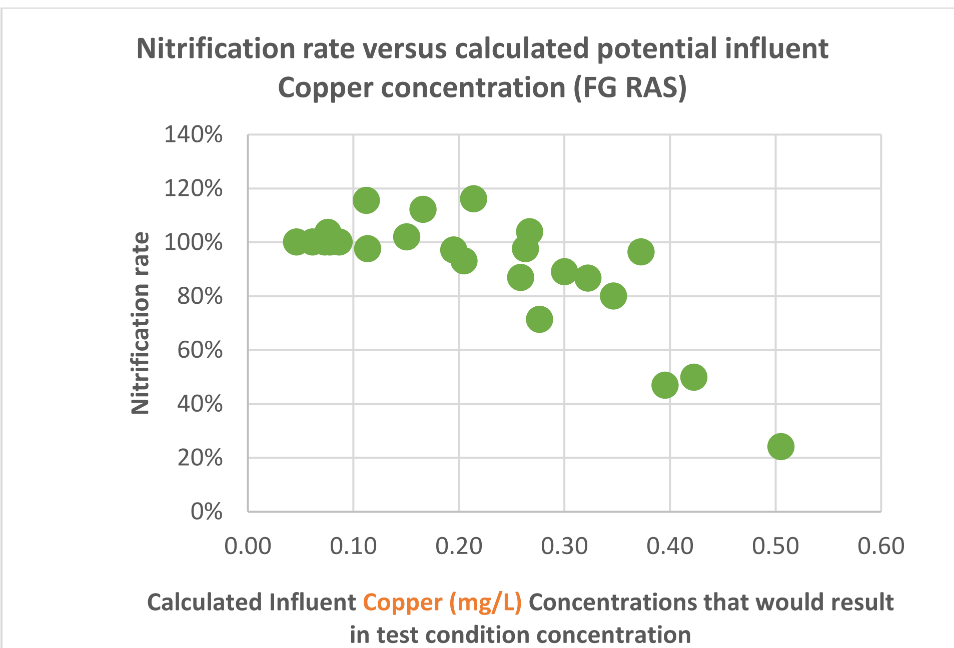


Figure 15

Rock Creek AWTF: Nitrification rate and potential influent zinc concentrations

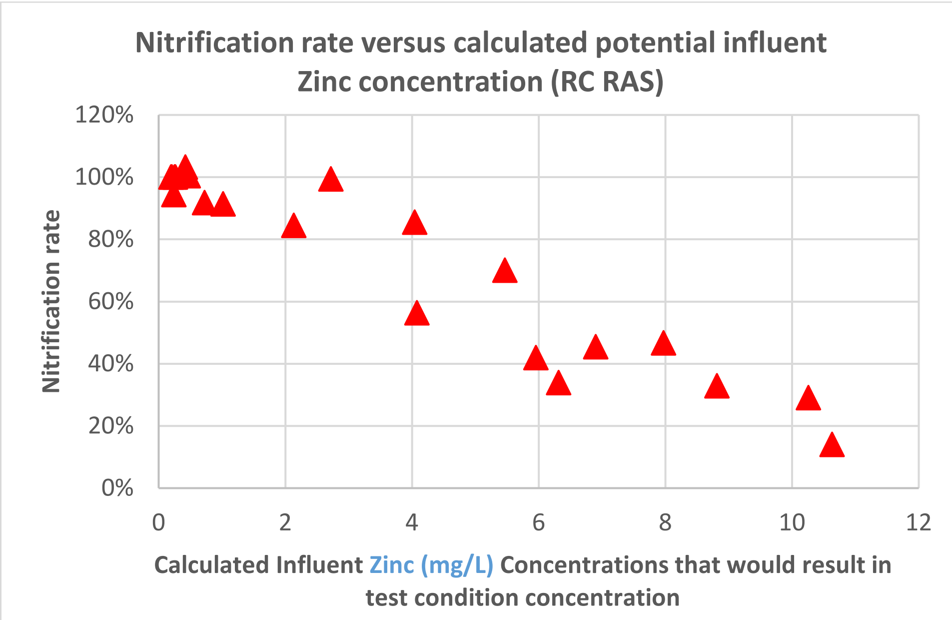
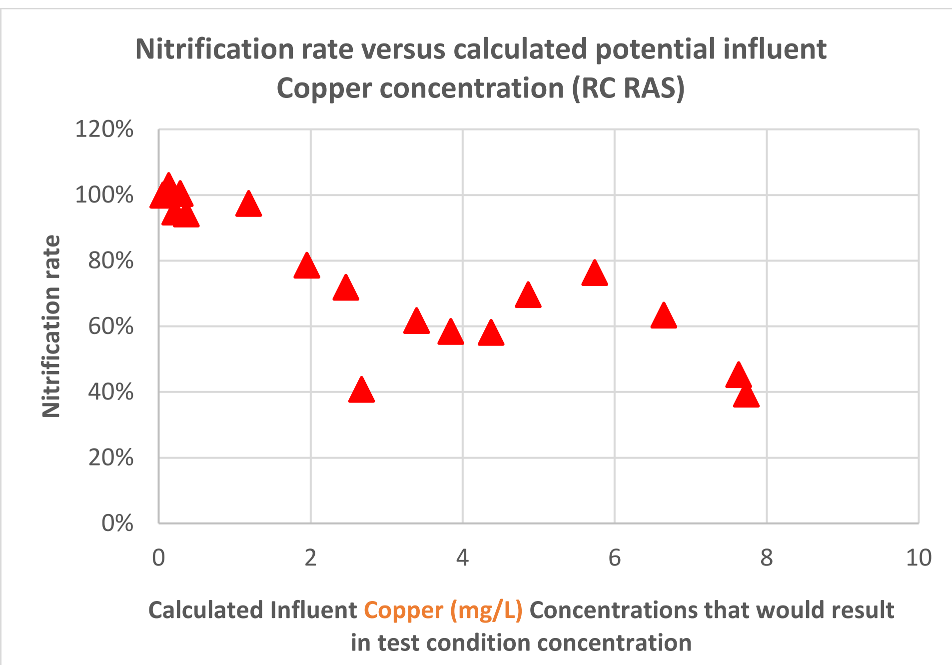


Figure 16

Rock Creek AWTF: Nitrification rate and potential influent copper concentrations



5.0 APPLICATION OF TEST RESULTS

The test results were fitted to a simple logistic Sigmoidal equation described below. This equation fits data to an "S"-shaped curve and is widely used for toxicity dose response and other biological reactions and is well suited for the empirical model to illustrated nitrification inhibition due to metals.

$$log_{10}\frac{Test}{Control} = \frac{exp^{Log_{10}(Metal\ Concentration) - Log_{10}(Inflection\ Point)}}{(1 + exp^{Slope \times Log_{10}(Metal\ Concentration) - Log_{10}(Inflection\ Point)}) \times SaturationPoint}$$

Fitting the equation is dependent on describing four specific characteristics. This differs from a linear equation, which requires two (intercept and slope). These four characteristics are:

- Saturation point: The point above which a response to the metals is predicted to occur.
- Slope: The rate of the response.
- Inflection point: In an "S" curve, the point where the rate of response from the metal changes from increasing as the metal increases to a decreasing response to increased metals.
- Minimum threshold: In this effort, presumed to be zero as nitrification can be fully inhibited.

Developing the optimum fit to reduce error requires sequential iterations. These iterations can be facilitated by the Solver program in Excel designed to generate results that minimize the mean sum squared of the error $\frac{\left(\sum(y-y^{\Delta})^2\right)}{n}$. Graphical analysis was used to minimize any bias in the residuals and to guide fitting the equation.

The results are discussed by metal (copper and zinc) by plant below.

The results for copper were similar (not significantly different) for the three plants (Figure 17). The results were therefore pooled to fit the S-shaped curve. When fitting the results one value (near 100% at an influent concentration near 0.5 mg/L) was ignored. Clearly, ignoring this data point will bias the results of fitting the curve. However, because the goal is to establish a risk-based understanding of when inhibition may occur, this appears appropriate. Inclusion of the point may lead to a less responsive curve.

Figure 17
Copper test results (all facilities)

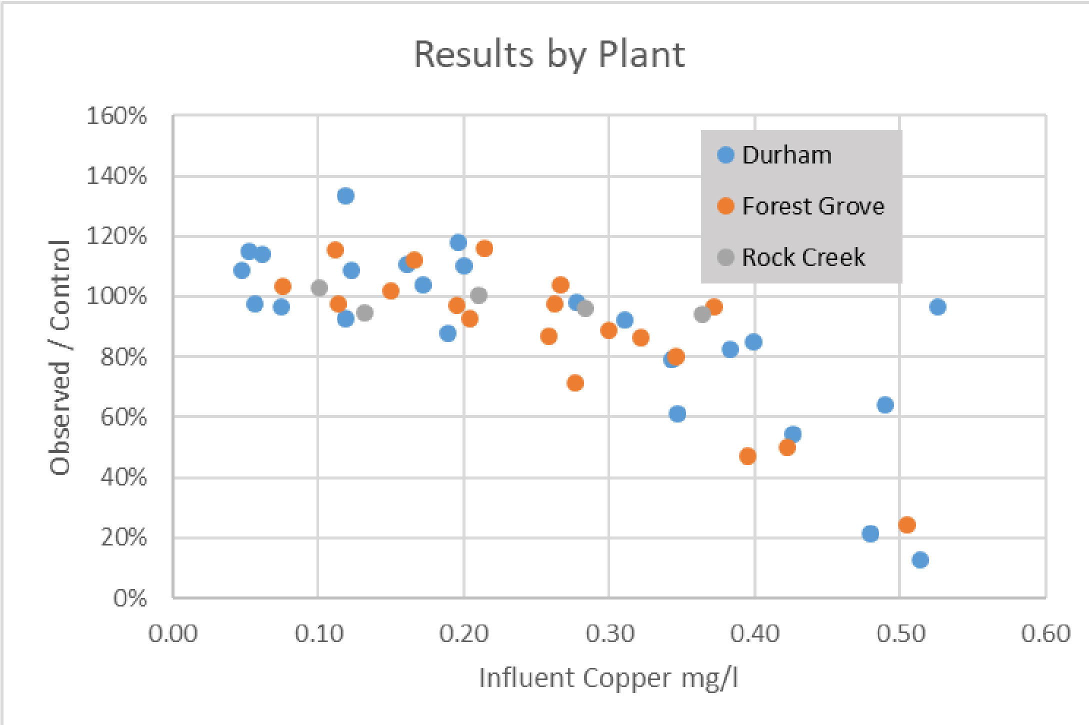
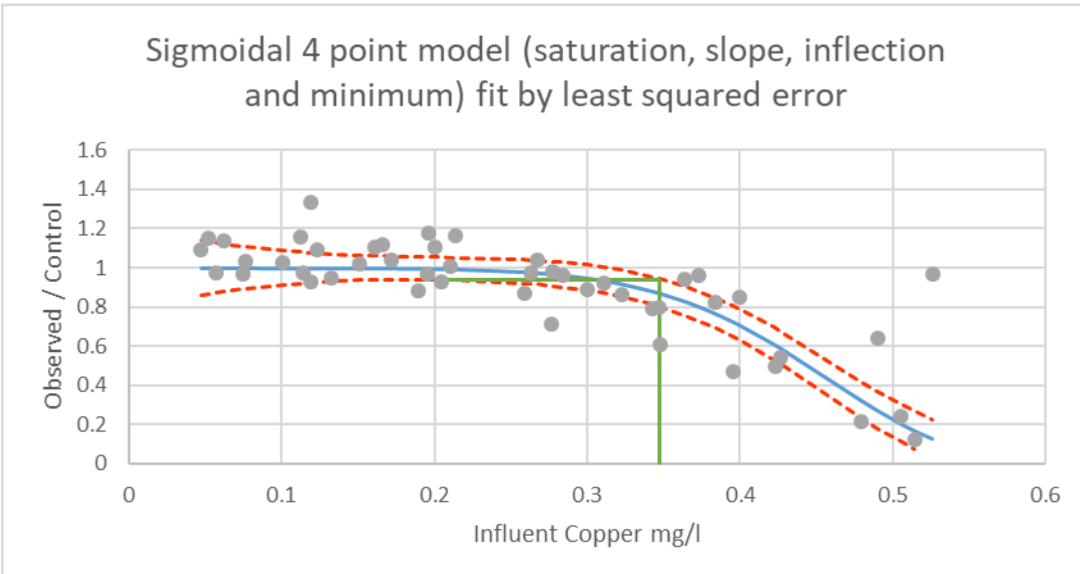


Figure 18 illustrates the results of the "S"-shaped model fit through the nitrification inhibition results from the three plants. Also illustrated are the 95% confidence curves around the predicted mean line.

Figure 18
Sigmoidal model for copper (all facilities)



The derived saturation point was 0.225 mg/L influent copper. As fitted, the model predicts that there will be some response with copper greater than 0.225 mg/L. A statistically significant response occurs near 0.3 mg/L, and a statistically significant result as expressed by the data in this test by about 0.35 mg/L copper.

Figures 19 and 20 are provided as an example of the iterations used to best fit the "S"-shaped curve model. The saturation point is used in this illustration because it is important for describing the threshold for a response.

Figure 19
Example of iterative approach to fit "S" curve

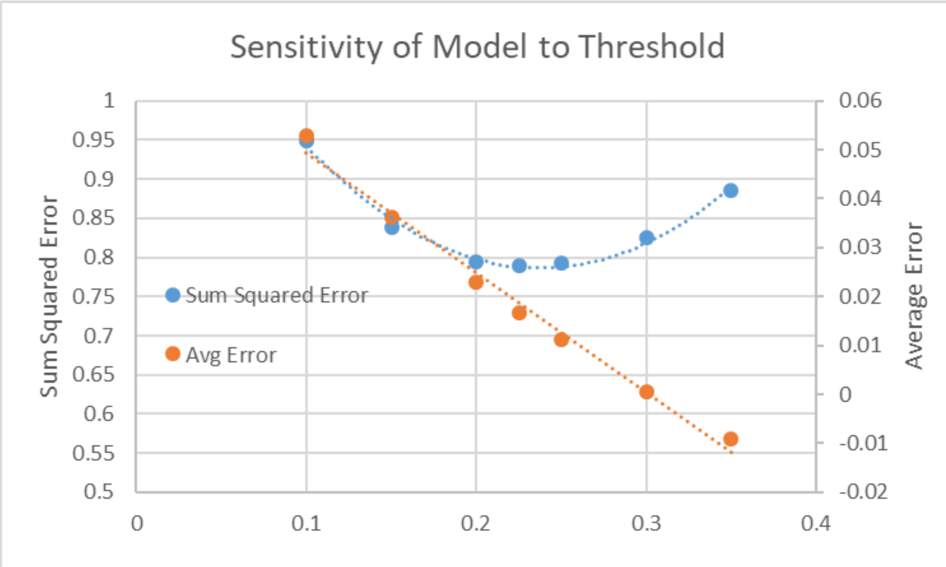
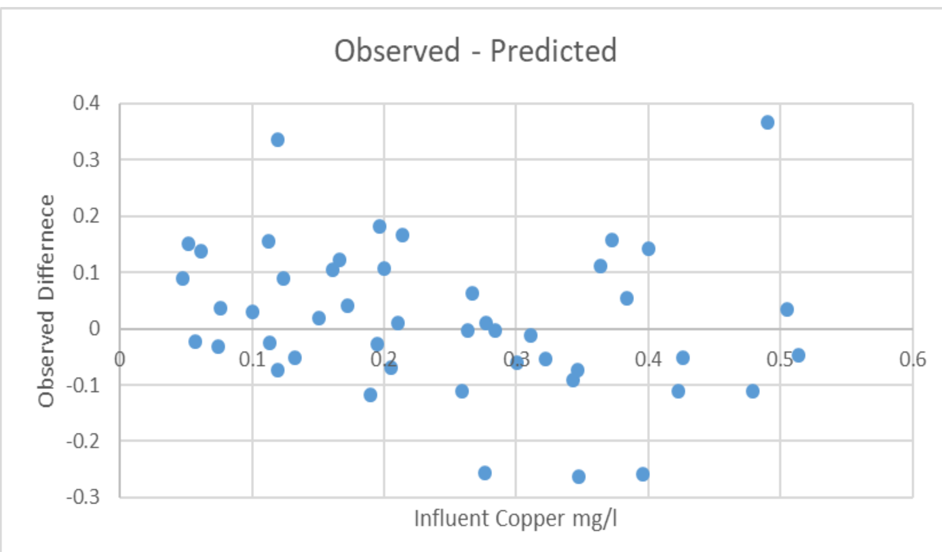


Figure 20
Example of iterative approach to fit "S" curve

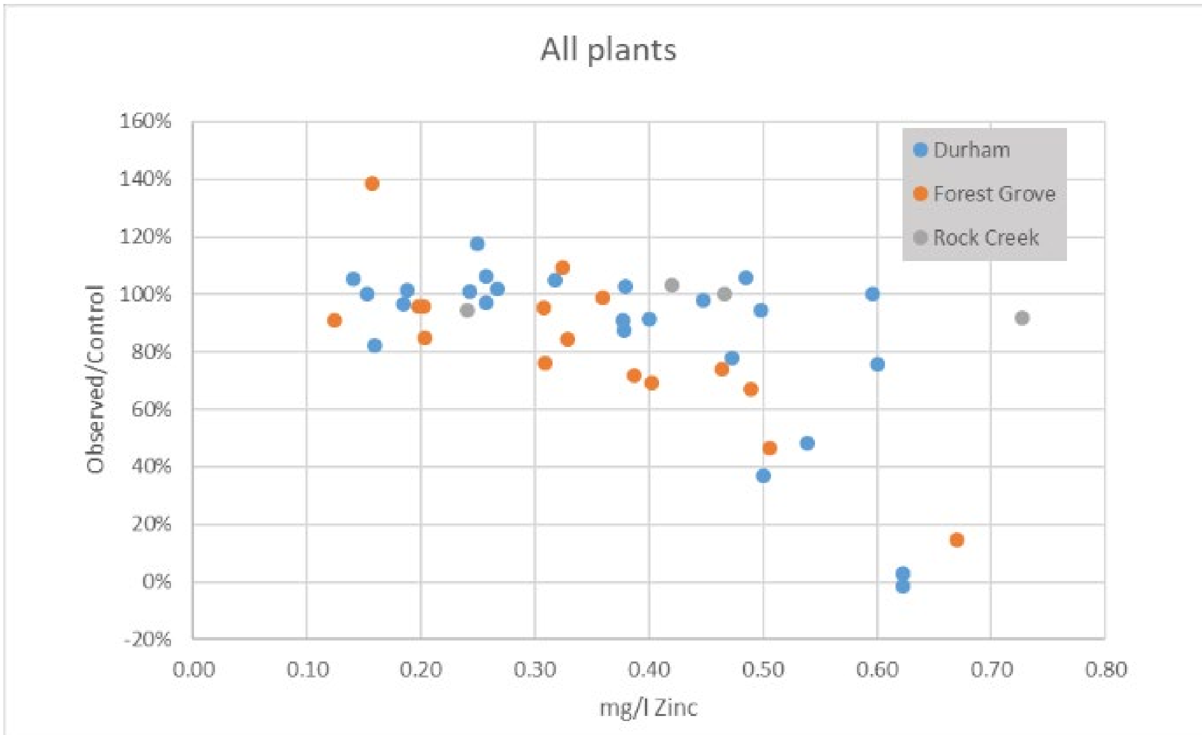


The threshold response result minimizes error in the range of 0.2 to 0.25 mg/L copper. The average error is slightly positive, meaning that the observed is greater than predicted, but that is anticipated because the model is constrained at 1 and several results showed greater nitrification than the control below the saturation point. Also, a high value in the range of 0.5 mg/L were neglected in fitting the "S" curve.

The results for zinc differed by plant. The results for the Forest Grove WWTF indicated a response at lower zinc influent concentrations than at the Durham and Rock Creek AWTFs. Pooling the data may therefore overestimate the zinc threshold for the Forest Grove WWTF, and potentially underestimate the threshold for the tertiary plants. The "S" curve was therefore fit separately for the Forest Grove WWTF and for the Rock Creek and Durham AWTFs.

Figure 21

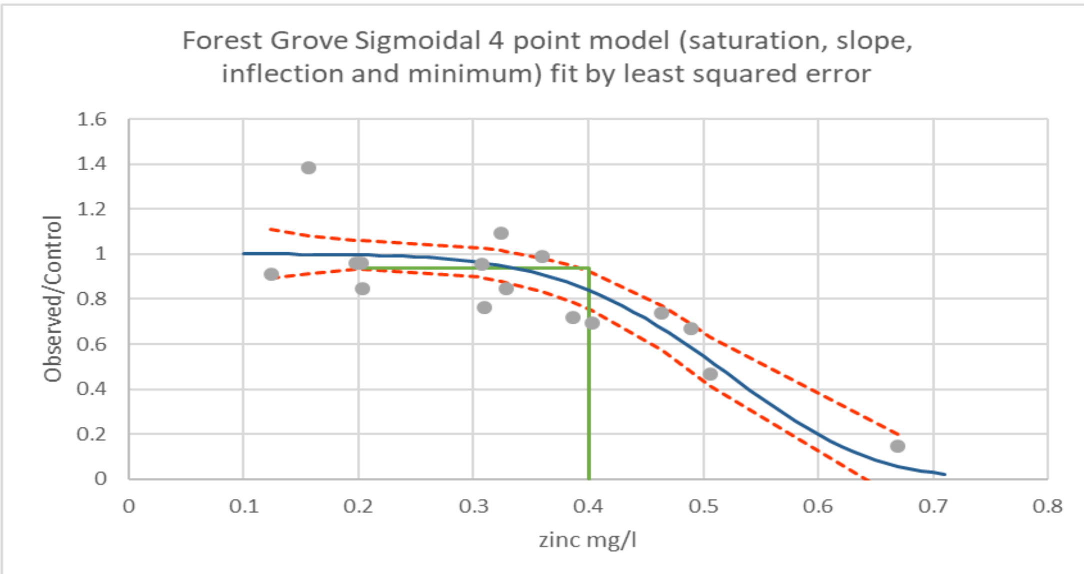
Zinc test results (all facilities)



The “S” curve fit for the Forest Grove WWTF has a saturation point for zinc of 0.25 mg/L. A statistically significant difference in the mean result as represented by the data available was near 0.4 mg/L zinc.

Figure 22

Sigmoidal model for zinc (Forest Grove WWTF)

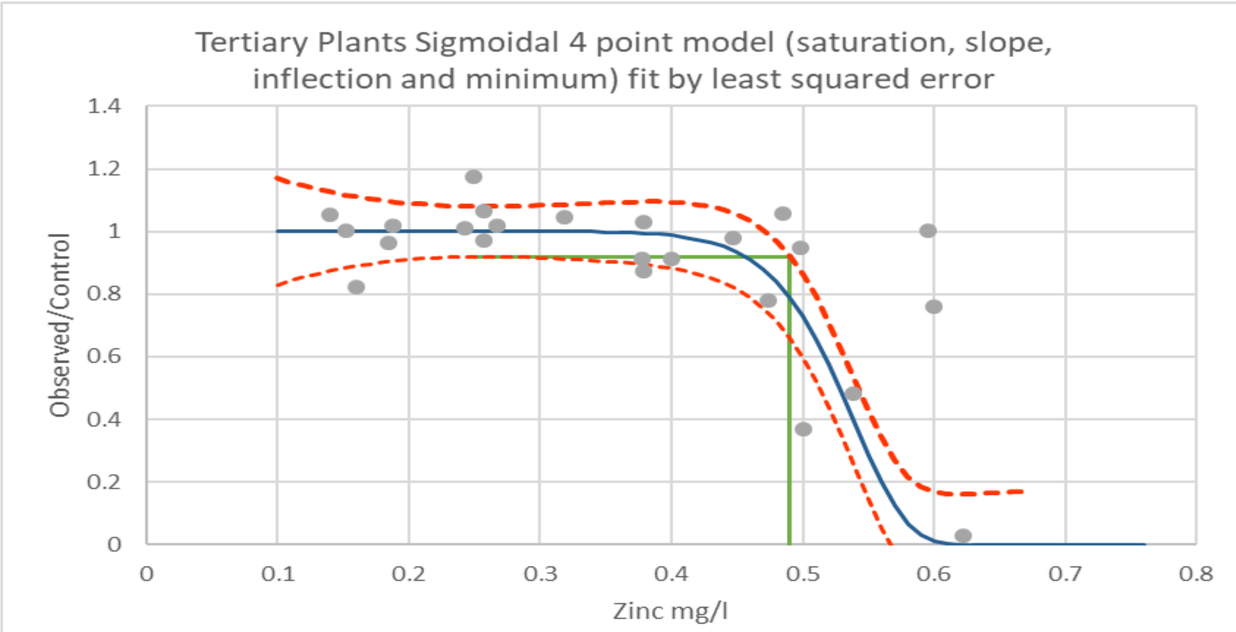


One disadvantage of separating the data is that there is less data to fit the curve. Also, because the test for significance is dependent on the data, the lines representing a significant difference are wider than may have occurred with a similar set of results with more data.

To fit the “S”-shaped curve for the Rock Creek and Durham AWTFs, two data points at about 0.6 mg/L with near 80% and 100% of the control nitrification results were neglected. The reasoning is the same as discussed above. The “S” curve then may be thought of as fitting how nitrification may respond to zinc based on the observed data. The treatment facilities may also be at times or under certain conditions less sensitive.

Figure 23

Sigmoidal model for zinc (Rock Creek and Durham AWTFs)



The saturation point was near 0.37 mg/L zinc. A statistically significant response occurs near 0.48 mg/L zinc. The sharp rate of decline near 0.5 mg/L provides an illustration that significant results may also be very relevant below 80% of the control.

Based on the test results, the following nitrification inhibition thresholds for copper and zinc were used in the local limits analysis:

Table 3

Nitrification inhibition thresholds for copper and zinc

Nitrification Inhibition Thresholds		
Parameter/Facility	Saturation (mg/L)	95% CI (mg/L)
Copper (all facilities)	0.225	0.35
Zinc (Forest Grove WWTF)	0.25	0.4
Zinc (Rock Creek and Durham AWTFs)	0.37	0.48

Appendix J: Description of the District Workbook

Appendix J
Description of the District Workbook

The following describes the *District Workbook* (Appendix I: *Rock Creek MAIL alternative allocations*) and how the *Rock Creek* and the *All plant* sheets perform their functions.

For each pollutant, the *Rock Creek* sheet allows the user to allocate a portion of the maximum allowable industrial loading (MAIL) as (1) a mass load to specific industrial users, (2) a reserve, and (3) as a uniform allocation to the Rock Creek industrial contributors that have not received a mass load allocation. The *All plants* sheet of the *District Workbook* lists the limits calculated for each District treatment facility and selects, for each pollutant, the local limit to be proposed in the *Local Limits Evaluation Report*.

The *Rock Creek* sheet

In row 1 of the *Rock Creek* sheet of the *District Workbook*, the POTW Flow and the Industrial Flow are entered. These are the same values that were entered into the *General* sheet of the *DEQ Local Limits Workbook*.

In column B, the maximum allowable headworks loading (MAHL) values are entered, in pounds per day, that were calculated by the *DEQ Local Limits Workbook* for Rock Creek on the *Limits* sheet. In column C, the combined Safety and Growth Factor is entered as a percent, just as was done for the *DEQ Local Limits Workbook* on the *General* sheet. The District selected 15 percent for these two factors. The *District Workbook* then multiplies the MAHL by the Safety and Growth Factor to obtain the safety and growth loading (in column D) that will be subtracted from the MAHL as part of the calculation of the MAIL.

Nonindustrial Concentration of pollutants are entered into column E just as they were on the *General* sheet of the *DEQ Local Limits Workbook*. These concentrations are multiplied by Nonindustrial Flow (column F) to calculate Nonindustrial Loadings (column G). The Nonindustrial Flow is the POTW Flow minus the Industrial Contributory Flow (described in the following paragraph) for each pollutant. The MAILs are calculated by subtracting the Safety and Growth Factor (lbs/day) and Nonindustrial Loading from the MAHL. The values of the MAILs displayed in column H are identical to the MAIL values calculated on the *Limit*s sheet of the *DEQ Local Limits Workbook* for Rock Creek. To calculate concentration local limits, the sheet uses the portion of the MAIL that is not held in reserve (column I) or allocated to specific SIUs (column J).

The Industrial Contributory Flow for each pollutant is partitioned to: (1) those SIUs that are receiving a mass load allocation (entered in column K); and, (2) those SIUs included in the uniform allocation (entered in column L). The values of column K are not used in any calculation, but they do show which SIUs are receiving a mass load allocation. Clicking on one of the non-zero cells in column K allows the user to see the flows that are used to calculate the value in column K. For copper and molybdenum, two SIUs (designated Semiconductor 1 and Semiconductor 2) are receiving a mass load allocation. The values in column L indicate which industries will be regulated by the concentration local limit for each pollutant. The mercury local limit will apply to all Rock Creek SIUs. The concentration local limit for every other pollutant will apply to all Rock Creek SIUs except Semiconductor 1, Semiconductor 2, and Semiconductor 3.

Concentration local limit. The Local Limit Using Industrial Contributory Flow (column M) calculates a concentration limit using the portion of the MAIL not allocated to specific SIUs or held in reserve divided by the SIU flow in column L. The flows used in these calculations are those in column L.

The *District Workbook* and Contributory Flow Decisions. Table 1 below summarizes the allocation decisions discussed above.

Table 1

Summary of allocation decisions for the Rock Creek facility

Pollutants	Amount of MAIL Held in Reserve (lbs/day)	Amount of MAIL Allocated to Specific SIUs (lbs/day)	Flow From SIUs Receiving a Mass Allocation (mgd)	Flow From SIUs Not Receiving a Mass Allocation (mgd)	SIUs to be Regulated by Concentration Local Limit
Arsenic, Cadmium, Chromium, Cyanide, Lead, Nickel, Selenium, Silver, and Zinc	0.00	0.00	0.00	0.89	All SIUs except Semiconductor 1, Semiconductor 2, and Semiconductor 3
Mercury	0.00	0.00	0.00	7.32	All SIUs
Copper	4.00	8.00	5.99	0.89	All SIUs except Semiconductor 1, Semiconductor 2, and Semiconductor 3
Molybdenum	0.00	4.26	5.99	0.89	All SIUs except Semiconductor 1, Semiconductor 2, and Semiconductor 3
*15% of the MAHL was reserved for all pollutants, an additional 4 lbs/day was reserved for copper out of the MAIL					

Summary of calculations on the Rock Creek sheet. All Rock Creek SIUs will be regulated by the mercury local limit. The concentration local limits for arsenic, cadmium, chromium, cyanide, lead, nickel, selenium, silver, and lead will be applied to all Rock Creek SIUs except three noncontributory semiconductor facilities for these pollutants. For copper and molybdenum, two semiconductor facilities have a mass allocation for copper and molybdenum. A third semiconductor facility is noncontributory for all pollutants except mercury and will only have a local limit for that pollutant. All other sources to Rock Creek received a uniform allocation. A small mass loading for molybdenum is allocated to a metal finisher that discharges to the Hillsboro facility. This allocation for molybdenum is part of the 4.26 lbs/day allocated to specific SIUs from the Rock Creek MAIL because solids from the Hillsboro facility are transferred to Rock Creek. The Rock Creek MAIL for molybdenum is based on sludge disposal standards.

The *All plants* sheet

The *All plants* sheet presents the plant-specific calculated local limits and, for each pollutant, selects the limit to be proposed in the local limits evaluation report. For the Durham, Hillsboro, and Forest Grove facilities, these values were calculated in the one of the two Local Limit (mg/L) columns of the *Limits* sheet in the *DEQ Local Limits Workbook*. For the Durham and Hillsboro facilities, the values in the Using Total Industrial Flow column of the *Limits* sheet of the *DEQ Workbook* were input into the *All plants* sheet of the *District Workbook*. For the Forest Grove facility (both the *With NTS* and *No-NTS* scenarios), the values in the Using Industrial Contributory Flow column of the *Limits* sheet in the *DEQ Workbook* were input into the *All plants* sheet of the *District Workbook*. For the Rock Creek facility, the values in the Local Limit Using Industrial Contributory Flow column of the *Rock Creek* sheet in the *District Workbook* are linked directly to the Rock Creek column of the *All plants* sheet in the same workbook.

To select the calculated local limits to be applied to all District SIUs (except for those regulated by a mass limit as described above or those which are noncontributory for most POCs), the *All plants* sheet generally selects the minimum value of the limits calculated for all plants. The one exception is the local limit for copper. For copper, the minimum value of the calculated limits for the Durham, Rock Creek, and Hillsboro facilities will be applied to SIUs that discharge to one of those facilities. For SIUs discharging to the Forest Grove facility, the copper local limit was based on the current levels pending permit reissuance following EPA guidance for when reasonable potential is uncertain. The copper levels for Forest Grove are described in greater detail in the body of the Local Limits report.