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Technically Based Local Limits for the Hood River Wastewater Treatment Plant

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City of Hood River, Oregon

City of Hood River Wastewater Treatment Plant Industrial Pretreatment Program – Development of Local Limits

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Executive Summary

The U.S. Environmental Protection Agency (EPA) regulates compliance with the Clean Water Act (CWA), including Section 307(b) pretreatment standards. As part of this function, EPA issues National Pollutant Discharge Elimination System (NPDES) permits to publicly owned treatment works (POTWs). These permits contain provisions that require compliance with Title 40 of the Code of Federal Regulations Parts 403 through 471 (40 CFR 403–471) to ensure compliance with pretreatment standards by significant sources introducing pollutants subject to such standards to the POTW [cf, CWA 402(b)(8), 33 U.S.C. § 1342(b)(8) *et seq.*]. Requirements to develop Technically Based Local Limits (TBLLs) are specified at 40 CFR 403.5 [c and 403.8(f)(4)]. The EPA has delegated the Oregon Department of Environmental Quality (ODEQ) the authority to approve pretreatment programs at the local level and oversee statewide pretreatment activities, including 40 CFR 403 in its entirety. ODEQ received authority from EPA on March 12, 1981, to regulate pretreatment programs in Oregon. This TBLL evaluation has been prepared to meet Oregon permit requirements for the Hood River Wastewater Treatment Plant (WWTP). These limits have been developed using the Oregon Excel model in accordance with EPA's Technical Support Document, *Local Limits Development Guidance* (EPA 2004), in accordance with Oregon guidance and in accordance with Schedule E: Pretreatment Activities, 5, of NPDES Permit No. OR0020788. In response to these standards, conditions, and requirements, the local limits in Table ES-1 have been developed for the Hood River WWTP.

Table ES-1. Local Limits Summary

Pollutant	Local Limit	Page
Arsenic	0.24 mg/L[a]	5-8
Cadmium	0.12 mg/L[a]	5-8
Chromium (Total)	5.0 mg/L[b]	5-8
Copper	3.97 mg/L[a]	5-8
Cyanide	1.25 mg/L[a]	5-8
Lead	1.17 mg/L[a]	5-8
Mercury	0.042 mg/L[a]	5-8
Molybdenum	0.37 mg/L[a]	5-8
Nickel	2.57 mg/L[a]	5-8
Selenium	0.50 mg/L[a]	5-8
Silver	0.72 mg/L[a]	5-8
Zinc	7.92 mg/L[a]	5-8
Flow	No Limit Adopted	6-1
BOD_5	250 mg/L Surcharge Limit[c]	6-1
TSS	250 mg/L Surcharge Limit[c]	6-1
pH	6.5–9.0 SU	6-2
Ammonia	No Limit Adopted	6-2

Table ES-1. Local Limits Summary

Pollutant	Local Limit	Page
Oils and Grease	100 mg/L Total 25 mg/L Nonpolar	6-2
Temperature	40°C (104°F) at POTW; 60°C (140°F) from SIU	6-2
Flammability	Specified as no material with a closed-cup flashpoint less than140°F and No two consecutive readings at ≥5% LEL and no reading of ≥10% LEL allowed	6-3

[a] Refer to Appendix C, Oregon Department of Environmental Quality Local Limits Workbook Page 5.

[b] The calculated limit is 36.5 mg/L. The Resource Conservation and Recovery Act (RCRA) sets a statutory limit of 5.0 mg/L for total chromium. Under RCRA, chromium concentrations above 5.0 mg/L are classified as hazardous. While chromium in wastewater is not covered by RCRA because of the Domestic Sewer Exclusion, the City of Hood River elects to not allow the discharge of waste at concentrations that would otherwise be classified as "hazardous," and therefore, a limit of 5.0 mg/L is adopted.

[c] These are set as standards for surcharges and not local limits. Hood River bases surcharge on concentrations above normal domestic waste strength, which are set at 250 mg/L for BOD_5 and 250 mg/L for TSS.

Note: All metals are expressed as total recoverable.

°C = degrees Celsius

°F = degrees Fahrenheit

BOD_5 = 5-day biochemical oxygen demand

LEL = lower explosive limit

mg/L = milligram(s) per liter

SIU = significant industrial user

SU = standard units

TSS = total suspended solids

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Acronyms and Abbreviations

°C	degrees Celsius
°F	degrees Fahrenheit
ADRE	average daily removal efficiency
AHL	allowable headworks loading
BOD	biochemical oxygen demand
BOD_5	5-day biochemical oxygen demand
CFR	Code of Federal Regulations
CWA	Clean Water Act
EPA	U.S. Environmental Protection Agency
IPP	Industrial Pretreatment Program
lb/d	pound(s) per day
LEL	lower explosive limit
MAHL	maximum allowable headworks loading
MAIL	maximum allowable industrial loading
mg/L	milligram(s) per liter
mgd	million gallon(s) per day
ML	minimum level
MRE	mean removal efficiency
NA	not applicable
NPDES	National Pollutant Discharge Elimination System
O&G	oils and grease
ODEQ	Oregon Department of Environmental Quality
POC	pollutant of concern
POTW	publicly owned treatment work
RPA	Reasonable Potential Analysis
RFCS	Removal Factors Calculation Spreadsheet
SU	standard unit(s)
SIU	significant industrial user
TBLL	technically based local limit
TSS	total suspended solids
U.S.C.	United States Code
WWTP	wastewater treatment plant

1. Introduction

This local limits development has been prepared by Jacobs Engineering Group Inc., under contract and in cooperation with the City of Hood River, Oregon (hereafter, the "City"), for submittal to the Oregon Department of Environmental Quality (ODEQ). These local limits have been developed in accordance with the U.S. Environmental Protection Agency's (EPA) 2004 Technical Support Document, *Local Limits Development Guidance* (EPA 2004), the *Oregon DEQ Guidance for Industrial Pretreatment Programs* (ODEQ 2019), and National Pollutant Discharge Elimination System (NPDES) Permit No. OR0020788.

Section 402(b) of the Clean Water Act (CWA) provides for EPA to authorize a state to administer its own NPDES permit program. To be authorized, a state program must include adequate authority to issue permits that ensure compliance with the CWA, including Section 307(b) pretreatment standards. The program must ensure that permits issued to publicly owned treatment works (POTWs) include a program to ensure compliance with pretreatment standards by significant sources introducing pollutants subject to such standards to the POTW [cf, CWA 402(b)(8), 33 U.S.C. § 1342(b)(8), et seq.].

EPA authorized the State of Oregon (hereafter, the "State") the authority to administer the NPDES permit program and designated the State as the Approval Authority to implement the Industrial Pretreatment Program (IPP) in the State. The ODEQ is responsible for implementation of the State's IPP. The City, working in cooperation with ODEQ, has developed these Technically Based Local Limits (TBLLs) to meet the requirements of the provision found in Schedule E: Pretreatment Activities, 5, of NPDES Permit No. OR0020788.

The following appendixes are provided:

- Appendix A – Guidance on the Selection of Pollutants of Concern
- Appendix B – Removal Factors Calculation Spreadsheet
- Appendix C – Oregon Department of Environmental Quality Local Limits Workbook
- Appendix D – Long-hand Calculation of Arsenic Local Limits
- Appendix E – Oregon Water Quality Standards at 55 mg/L Hardness
- Appendix F – Significant Industrial User Test Data for POCs (2021)
- Appendix G – Procedures for Performance-based BOD, TSS, and Flow Limits
- Appendix H – Definitions

2. Local Limits Development Methodology

2.1 Guidance Documents

The following guidance documents were used to develop the TBLLs presented in this document:

- Information Required for Pretreatment Program Local Limits Evaluations (ODEQ 1991)
- Oregon DEQ Guidance for Industrial Pretreatment Programs Local Limits Evaluation (ODEQ 2019)
- Local Limits Development Guidance (EPA 2004)
- Guidance Manual on the Development and Implementation of Local Discharge Limitations under the Pretreatment Program, EPA 833-B-87-202 (EPA 1987)

2.2 Methodology

This document provides the rationale and legal support for local limits developed in relation to technically based environmental criteria using approved methodology. The methodology is intended to ensure full compliance at the treatment facility for all identified criteria. The following steps were taken to develop the Hood River Wastewater Treatment Plant (WWTP) TBLLs:

1. Characterize the Hood River WWTP treatment system in terms of regulatory requirements, plant capacity, treatment trains, unit processes, industrial users, and receiving stream characteristics.
2. Using the site characterization from step 1, select regulatory and operational criteria that apply to the specific treatment systems.
3. Select pollutants that should be considered for local limit development, referred to as pollutants of concern (POCs).[1] Selection is based on review of historic data and also includes a minimum list of EPA-required pollutants. Pollutants selected may be individual elements or compounds, such as metals or halogenated organic compounds that are discussed in Sections 4 through 6. Additionally, local limits may be aimed at controlling groups of substances that collectively exhibit negative characteristics, such as flammability or toxicity. This second category is discussed in Section 6, Other Limits and Concerns.
4. Upon selection of the POCs, collect historic test data or generate new data from sampling and analysis to develop the rationale for the maximum ability of the plant to treat these pollutants and remain compliant with all applicable criteria.
5. Compile test data and model the fate of the pollutants within the system using partitioning coefficients within the plant and physical properties, such as Henry's constants, in the collection system.
6. Conduct standard EPA-accepted calculations for individual elements and compounds discussed in Sections 4 through 6 to determine the maximum pollutant loading that can be allowed at the headworks (allowable headworks loading [AHL]) and still maintain compliance with all applicable criteria.
7. After applying all calculations for all criteria, use the smallest mass that ensures that all NPDES permit criteria are met. This is referred to as the maximum allowable headworks loading (MAHL).

[1] The EPA *Local Limits Development Guidance Manual* (EPA 2004) defines and uses the technical term "Pollutants of Concern" throughout the document. Consequently, to avoid confusion during the regulatory review process of the TBLL, the terms "Pollutants," "Pollutants of Concern," and "POC" are used throughout this document when referring to pollutants considered for local limits development.

8. Subtract a safety and growth factor from the MAHL; the remaining allowable pollutant loading is the maximum allowable industrial loading (MAIL) available to industry.
9. Once the MAIL has been calculated, allocate the mass to the industries based on one of the prescribed methods found in the EPA *Local Limits Development Guidance* (EPA 2004). These allocations then form the basis of the local limits for these pollutants.
10. Develop criteria based on limitations that restrict the magnitude of the negative characteristics exhibited by each type of group for collective groups of pollutants in Section 6, Other Limits and Concerns.

3. System Characterization, Industrial Users, Receiving Stream, and Applicable Criteria

3.1 Treatment System Characterization

The Hood River WWTP is permitted to discharge a maximum daily flow limit of 6.21 million gallons per day (mgd) (wet weather) and is designed to handle a peak instantaneous flow per hour of 9.32 mgd. Currently, the average daily flow is approximately 1.17 mgd. Table 3-1 lists the as-built design capabilities as established in the plant drawings.

Table 3-1. Hood River WWTP As-built Design Capacities

Item	Dry Weather Capacity	Wet Weather Capacity	Peak Hour	Current Annual Average (Year 2021)
Flow (mgd)	1.48	6.21	9.32	1.17
BOD_5 (lb/d)	Maximum 8,100	Average 5,800	Not applicable	5,932
TSS (lb/d)	Maximum 5,800	Average 4,100	Not applicable	4,839

BOD_5 = 5-day biochemical oxygen demand

lb/d = pound(s) per day

TSS = total suspended solids

The treatment process begins with a Parshall flume, followed by bar screens, an automatic screw auger for rag removal, and a grit removal chamber. From the headworks, the flow proceeds to primary clarification. The flow from the primary clarifier then proceeds to activated waste treatment in two sequential aeration basins. After the aeration basins, the flow proceeds through secondary clarifiers, ultraviolet (UV) disinfection, and effluent flow measurement (using a magnetic flowmeter). Final discharge occurs to the Columbia River (River Mile 164.5). The wastewater is discharged to the Columbia River between The Hook and Wells Island to Outfall 002 in 18 feet of water approximately 200 feet from the shore, with a 12-port diffuser to enhance mixing with the receiving water.

The sludge-handling facilities consist of a waste-activated sludge holding tank that is pumped to gravity filters, then to two anaerobic digesters. One digester is offline, has been cleaned, and is scheduled for refurbishment. The anaerobically digested sludge is then pumped to a belt filter press for dewatering. Final disposal is achieved by collecting the dewatered sludge into trucks for land application.

The block diagram included on Figure 3-1 makes identification of the partition coefficient (removal factor) more apparent and shows two partitioning coefficients (sludge removal after primary clarification and overall plant removal) needed to develop local limits for this system.

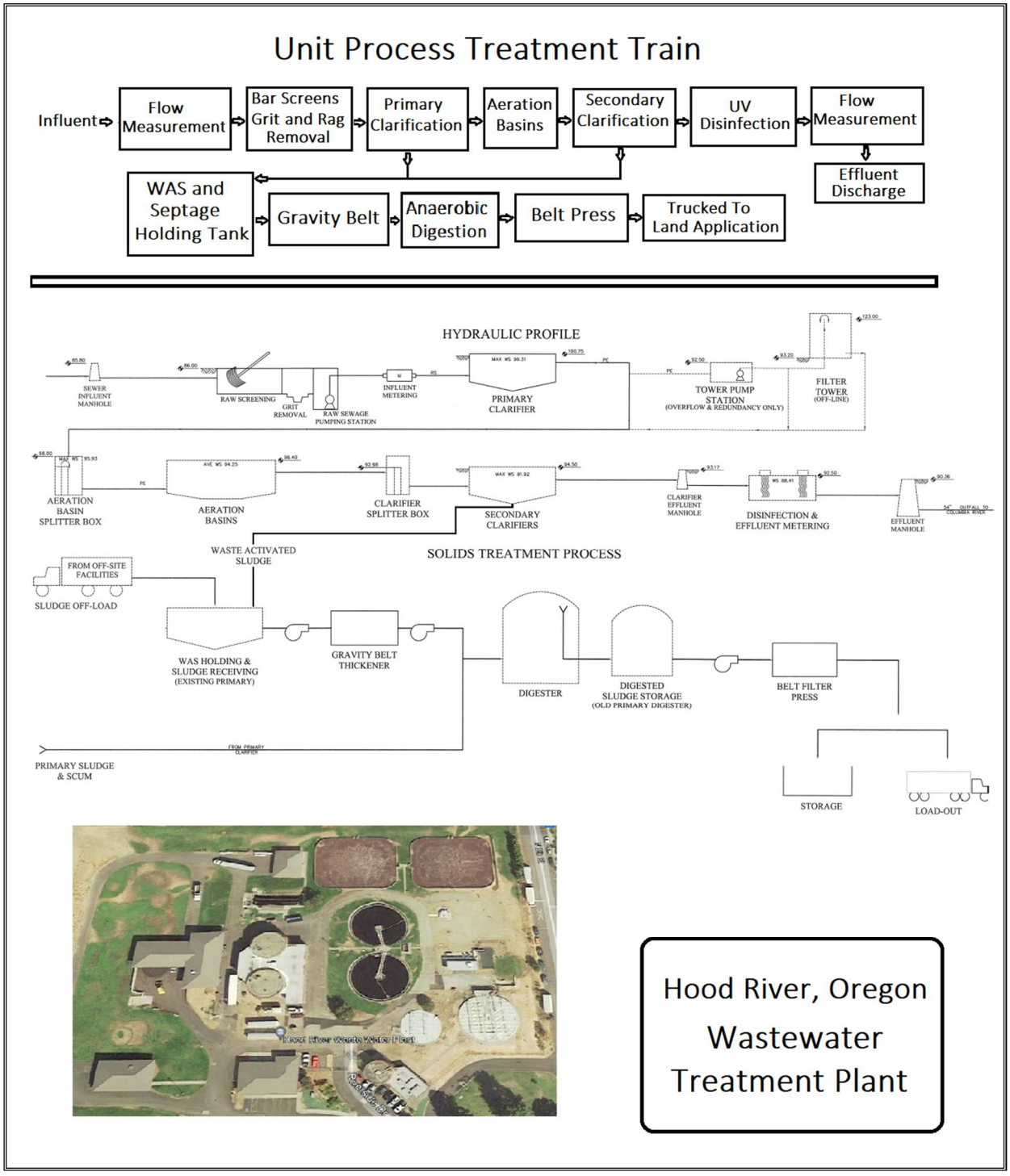

Figure 3-1. Hood River Wastewater Treatment Train, Unit Processes, and Site Aerial

3.2 Industrial Users

The City has issued a permit to four significant industrial users (SIU) that contribute flow to the Hood River WWTP.

- Full Sail Brewing Company, according to the City IPP permit, is an independent beer brewing company. The permit does not have a flow limit but does have a biochemical oxygen demand (BOD) maximum daily limit of 1,500 lb/day and a TSS maximum daily limit of 800 lb/day for this industry. The permit is effective until December 31, 2023.
- pFriem Family Brewers, according to the City IPP permit fact sheet, is a malt beverage manufacturing facility producing 25,000 barrels annually. The permit has a flow limit of 62,000 gallons per day and maximum daily BOD and TSS limits of 1,500 and 400 lb/day, respectively. The current permit is effective for 1 year and will be reevaluated and reissued before February 28, 2022.
- Hood River Juice Company is a fruit juice maker producing approximately 8 million gallons of juice, which is shipped both as bulk and 250,000 gallons of bottled juice annually. Raw fruit is trucked onsite, where it is then sorted, washed, ground, and squeezed to extract juice. The permit does not have a flow limit, but maximum daily BOD and TSS limits are 400 and 250 lb/day, respectively. The permit is effective until September 30, 2026.
- Turtle Island Foods, also known as Tofurky, is a production facility for vegan food products. The permit has a maximum daily BOD limit of 350 lb/day and a TSS maximum daily limit of 600 lb/day. The current permit is effective for 1 year and will be reevaluated and reissued before February 28, 2022.

The total flow discharged from the SIUs is currently 122,000 gallons per day. Hauled waste from septic haulers and recreational vehicle dump stations is currently accepted at the Hood River WWTP. Acceptance of hauled “septic tank” waste is verified by staff daily upon review of pH readings on samples taken from each load of hauled waste. Grab samples of each load are also taken, documented, and held for 30 days. The average daily hauled septic flow is 3,373 gallons per day, approximately 0.29 percent of total flow to the plant. To account for this loading, the safety factor in the local limits in this document has been raised 1 percent, from a total of 10 percent to 11 percent.

3.3 Receiving Stream

Treated wastewater is discharged year-round to the Columbia River through an area of the river between The Hook and Wells Island. The outfall is designated as Outfall 002 in the permit (River Mile 164.5, Latitude 45.717239, and Longitude –121.526800). The outfall is in 18 feet of water, approximately 200 feet from the shore, with a 12-port diffuser to enhance mixing of effluent with the receiving water.

The City will continue to use Outfall 001 for discharge of municipal stormwater and stormwater from the treatment facility. Because treated industrial waste is not discharged at Outfall 001, these local limits are developed exclusively for Outfall 002.

3.4 Applicable Criteria

Using the site characterization, industrial base, and regulatory/operational considerations applicable to this treatment system, the Hood River WWTP is subject to the following criteria:

- Oregon water quality standards
- NPDES permit limits
- Treatment plant inhibition

- Biosolids regulations for disposal
- Worker health and safety (toxicity, flammability, explosivity)
- Plant capacity
- Other applicable criteria based on best professional judgment

These criteria were used to select the POCs and are further discussed in Section 4, POC Selection, Sampling, and Analysis.

4. POC Selection, Sampling, and Analysis

4.1 POC Selection

Toxic pollutants selected for these derivations consist of the EPA national pollutant-mandated list of 11 required metals plus cyanide. Additionally, EPA lists BOD_5, TSS, and ammonia as pollutants that should be discussed. Flow, pH, flammability, temperature, and oil and grease (O&G) are discussed in relation to protecting the treatment works, the collection system, and workers.

Additionally, in the process of selecting POCs, 3 years of historical test data points were reviewed for the Hood River WWTP effluent and sludge samples taken during 2015, 2016, and 2017. This review included testing for priority pollutants and metals. The priority pollutant scans did not identify additional pollutants that required local limits. Table 4-1 provides the full list of pollutants selected for evaluation.

Table 4-1. Pollutants Selected for this Local Limits Evaluation

Arsenic	Molybdenum	Ammonia
Cadmium	Nickel	pH
Chromium, Total	Selenium	O&G
Copper	Silver	Temperature
Cyanide	Zinc	Flammability
Lead	BOD_5	Flow
Mercury	TSS	

4.2 Sampling and Analysis

Sampling was conducted from August 13 to 21, 2021, in accordance with the *Hood River Water Pollution Control Facility Technical Local Limits Evaluation Sampling Plan* (Jacobs 2021) previously approved by ODEQ. Sampling was conducted to develop site-specific partition coefficients (removal factors) for the nonconventional pollutants in Table 4-1. The objective of this sampling was to determine how the pollutants are either moved into the sludge or discharged into the receiving waters. This ratio of removal is known as *removal rate*, *removal coefficient*, or *partitioning coefficient*.

Concurrent sampling of influent, primary effluent, and effluent from the Hood River WWTP treatment system was conducted for 8 days. This covered seven sample sets. Effluent samples were matched with influent and primary effluent samples taken 1 day earlier to account for retention time in the treatment system. This schedule is shown in Table 4-2.

Receiving stream sampling was performed from a small jetty approximately 0.68 mile upstream of the Outfall 002 discharge point of the treatment plant.

Table 4-2. Sample Schedule

Location	Saturday 8/14/21	Sunday 8/15/21	Monday 8/16/21	Tuesday 8/17/21	Wednesday 8/18/21	Thursday 8/19/21	Friday 8/20/21	Saturday 8/21/21
Influent	1	1	1	1	1	1	1	
Primary Effluent	1	1	1	1	1	1	1	
Final Effluent		1	1	1	1	1	1	1
Biosolids			1			1		
Columbia River				1	1			
Total Sample Sets Per Day	2	3	4	4	4	4	3	1

Grab samples were taken for cyanide at four different time periods during the day to form a single sample for each site each day. Mercury samples were taken, with strict adherence to clean sample procedures, as a single grab daily at each site in accordance with the method requirements. All other samples were taken daily at each site as 24-hour composites. These were collected at approximately 9:00 a.m. each day. Effluent was collected 24 hours after influent for each data set to account for plant retention time. Table 4-3 lists the pollutants included in the testing regimen. Laboratory analytical methods with the appropriate sensitivity and quality assurance and quality control (QA/QC) were requested to provide usable data. The laboratory analytical reports met and exceeded all data reporting requirements. Where the best testing methods available were insufficient to generate removal factors, the EPA's *Local Limits Development Guidance* (EPA 2004), which provides default values (book values), was used as an alternative. These removal rates are shown in the ODEQ Workbook (refer to Appendix C).

Table 4-3. Pollutants Tested for in Each Sample

Pollutant	Sample Location				
	Influent	Primary Clarifier	Effluent	Sludge	Receiving Stream
Arsenic	X	X	X	X	X
Cadmium	X	X	X	X	X
Chromium, Total	X	X	X		X
Copper	X	X	X	X	X
Cyanide	X	X	X		X
Lead	X	X	X	X	X
Mercury	X	X	X	X	X
Molybdenum	X	X	X	X	X
Nickel	X	X	X	X	X

Table 4-3. Pollutants Tested for in Each Sample

Pollutant	Sample Location				
	Influent	Primary Clarifier	Effluent	Sludge	Receiving Stream
Selenium	X	X	X	X	X
Silver	X	X	X	X	X
Zinc	X	X	X	X	X

Cyanide and chromium were not tested for in the sludge samples because of the non-conservative nature of cyanide and the lack of a sludge disposal criterion for both cyanide and chromium.[2]

All testing was performed by Eurofins-Frontier Global Sciences. Table 4-4 lists the laboratory methods used to conduct analysis.

Table 4-4. Methods Used for Testing

Pollutants	Method
Metals	EFGS SOP2836 Closed Vessel Water Oven High Mass Method (Digestion) followed by low level calibration 200.8
Mercury	EFGS SOP2796 EPA 1631 Oxidation followed by EPA 1631E
Cyanide	EPA 335.4
Hardness	SM2340C
Biosolids Metals	Sample Preparation: EFGS SOP5145 CEM Microwave Digestion followed by EPA 1638 Mod.
Biosolids Mercury	EFGS SOP2807 Cold Aqua Regia Digestion for Hg followed by EPA 1631B
Biosolids % Solids	Sample Preparation: EFGS SOP5133 Solids Analysis followed by SM 2540B

[2] Cyanide does not collect in the sludge. Instead, cyanide reduction in the wastewater treatment process occurs because some microbiota can use it as a food source. When cyanide predominates over time, these organisms proliferate and the plant acclimatizes to the presence of cyanide, allowing for treatment of this toxic material. For this reason, 40 CFR 503 does not list a cyanide limit in its disposal criteria.

5. Data Compilation and Analysis

5.1 Data Compilation

Test data generated from the laboratory were reviewed and verified using data qualifiers and laboratory data QA/QC documentation. To determine average influent, primary effluent, and effluent average concentration, all data above the minimum level (ML) were used to develop estimated removal efficiencies. If any data point for either the influent or the effluent was below the ML, one-half the ML was used. The lab reports a reporting limit (RL) for each pollutant. Jacobs contacted the laboratory that performed the analyses and confirmed that the reported RLs followed the exact methodology to produce valid MLs using standards at the levels specified.

Domestic sampling typically is taken from low-flow areas, which are not representative of flow entering the plant. As an alternative, the test data from the influent was used to represent domestic contributions. In this method, referred to in this document as the "domestic approximation," the data used for domestic flow consist of all dischargers, including domestic, commercial, and industrial contributors. Using the influent data is a conservative assumption. The exception is if an industry discharges a significant level of any given POC. In this case, the industry must be sampled for the POC(s) in question on the same day as each plant effluent sample, and the domestic contribution is calculated mathematically to be the influent value in mass minus the industrial value as mass. This quantity is then used as the domestic contribution. For Hood River, based on historical test data, no POC was discharged by industry in quantities to warrant this modification.

The test results from the sampling plan were entered into a "Removal Factors Calculation Spreadsheet" to calculate both the mean removal efficiency (MRE) and average daily removal efficiency (ADRE) for each POC.

The data for cyanide (four grab samples per day per site) were entered into a spreadsheet to calculate average values for the sample day. These data, along with data on other pollutants, were then entered into an Excel spreadsheet labeled "Removal Factors Calculation Spreadsheet" (RFCS) that calculates the average value influent, primary effluent, and effluent values for each POC. The RFCS calculates both the MRE and ADRE. The MRE calculated may be compared to the removal rates calculated by entry of the average values entered into the ODEQ Workbook.[3] A PDF printout of the Workbook is found in Appendix C. The results of the Workbook are compared to hand calculations for arsenic, which have been included as Appendix D.

5.2 Removal Factors

The Hood River WWTP requires the calculation of two removal factors: one for the sludge removal during primary clarification and one for overall plant removal. Removal factors for each pollutant are automatically calculated in both the RFCS and the ODEQ Workbook file. Each day's data points for influent, primary effluent, final effluent, and (for days available) sludge are entered into the RFCS as separate sample set pairs. The spreadsheet then calculates the removal factor on a pollutant-by-pollutant basis across the primary clarifiers and across the full treatment plant. Average removal factors are shown on lines 4 and 5 of the RFCS. Some data entered in the portion of the ODEQ Workbook uses the average

[3] The ADRE calculation requires that an influent sample be paired with a lagged effluent sample to reflect removal efficiency accurately. The average of the results is the removal factor used.

The MRE calculation averages all headworks influent data (Ir) and all secondary treatment effluent data to calculate the removal efficiency from headworks to secondary treatment effluent (effluent in standard secondary treatment).

values entered from lines file on the Sample Data page. In both models, the MRE was selected to determine limits.

The reasonableness of each calculated removal factor must be considered, and some values using the MRE method resulted in negative numbers; therefore, the resulting values were compared to factors generated using ADRE and compared to the EPA (2004) book values shown in Tables 5-1 and 5-2 as a cross check.

Table 5-1. Pollutant Percent Removal Factors (%) through Primary Clarification

Pollutant	Median[a]	MRE Generated by RFCS	ADRE Generated by RFCS	Adopted Removal Factor
Arsenic	NP	–7.10	6.79	6.79
Cadmium	15	13.42	17.65	13.42
Chromium, Total	27	30.51	20.65	30.51
Copper	22	–3.03	10.83	10.83
Cyanide	27	Cannot Calculate	Cannot Calculate	27[b]
Lead	57	4.9	21.04	4.96
Mercury	10	77.91	56.34	77.91
Molybdenum	NP	–32.76	Cannot Calculate	10[c]
Nickel	14	–8.85	2.24	14
Selenium	NP	9.60	30.38	9.60
Silver	20	–18.27	12.28	12.28
Zinc	27	–6.71	14.47	14.47

[a] Book value from Local Limits Development Guidance (EPA 2004)

[b] Reference value adopted from Guidance Manual

[c] Based on best professional judgment and data from other Jacobs local limits projects

NP = Book value not published or available

Table 5-2. Pollutant Percent Removal Factors (%) through Activated Sludge Treatment

Pollutant	Second Decile[a]	Median[a]	Eight Decile[a]	Generated by RFCS	Adopted Removal Factor
Arsenic	31	45	53	42.10	42.10
Cadmium	33	67	91	83.98	83.98
Chromium, Total	68	82	91	45.71	45.71
Copper	67	86	95	90.17	90.17
Cyanide	41	69	84	Cannot Calculate	41
Lead	39	61	76	64.76	64.76
Mercury	50	60	79	95.87	95.87

Table 5-2. Pollutant Percent Removal Factors (%) through Activated Sludge Treatment

Pollutant	Second Decile[a]	Median[a]	Eight Decile[a]	Generated by RFCS	Adopted Removal Factor
Molybdenum	NP	NP	NP	50.57	50.57
Nickel	25	42	62	41.44	41.44
Selenium	33	50	67	51.05	51.05
Silver	50	75	88	88.32	88.32
Zinc	64	79	88	38.78	38.78

[a] Book value from Local Limits Development Guidance (EPA 2004)

Based on book values, the site-specific removal factors are reasonable and, in the case of activated waste, are within the 2nd and 8th deciles, except for chromium, mercury, and zinc. The mercury reference values, however, were found to be much lower than actual removals at many other plants where local limit sampling and analysis has been conducted, and consequently, the site-specific removal factor is acceptable. It is not known why the removal factors for chromium and zinc are outside the 2nd and 8th decile.

5.3 Calculation of Allowable Headworks Loadings

Using the adopted removal factors, the standard methodology from EPA's *Local Limits Development Guidance* (EPA 2004), and State guidance, including the ODEQ Workbook, the highest quantity of each pollutant that can be received at the headworks to the treatment plant and still comply with applicable criteria was calculated. Each criterion is explained in the following in relation to water quality and sludge quality requirements.

5.3.1 Water Quality Criteria

To protect receiving stream water quality, State water quality standards were used to set metals limits. The water quality standards are derived from natural log functions that vary with water hardness. The formulas are similar to the translators as described in Appendix J of EPA's 2nd Edition of the *Water Quality Standards Handbook* (EPA 1994). The standards are calculated in Appendix E and use the 55 milligrams per liter (mg/L) test values for hardness on the receiving stream that were obtained from samples taken from the Columbia River. While these standards were calculated, they may differ from the methodology in the ODEQ Workbook, which uses a Reasonable Potential Analysis (RPA) normally used to calculate NPDES limits. Hardness, both in Appendix E and in the ODEQ Workbook, use 55 parts per million, which was taken from test data gathered during the Hood River sampling event on samples taken from the receiving stream.

Using EPA guidance, the AHL for water quality criteria are calculated as follows:

$$L_{wq} = \frac{(8.34)(C_{wq})(Q_{potw})(DF)}{(1-R_{potw})}$$

where:

- L_{wq} = MAHL (lb/d) based on water quality criteria
- C_{wq} = Chronic or acute criteria (mg/L)
- 8.34 = Conversion Factor
- Q_{potw} = POTW average flow (mgd)
- DF = Dilution factor (as specified in the NPDES permit)

R_{potw} = POTW removal efficiency (as a decimal)

5.3.2 NPDES Permit Criteria

NPDES permit limits for metals are typically developed based on water quality criteria and follow the same equation as given under the water quality section, except that the C_{wq} is replaced by the NPDES permit limit. The current NPDES permit for the Hood River WWTP does not include any effluent limits for metals.

5.3.3 Sludge Quality

Treatment plants are required to prohibit nondomestic discharges in amounts that cause violation of applicable sludge disposal or use regulations or restrict the plant from using its chosen sludge disposal option. Currently, the sludge from the Hood River WWTP is digested anaerobically and then sent to a belt filter press for dewatering. The dewatered sludge is then land applied as Class B biosolids.

To maintain this classification, the total metals in the sludge must meet Table 3 of 40 CFR 503.13, which specifies pollutant concentrations as total metals. The following equation is used to calculate AHLs based on Table 3 criteria. Table 3 is replicated on the "Sludge Quality" page in the ODEQ Workbook. The following equations are used to calculate local limits based on sludge disposal.

$$L_{in} = \frac{(8.34)(C_{slcrit})(PS/100)(Q_{sldg})}{R_{potw}}$$

where:

PS = Percent solids in the sludge to disposal
8.34 = Conversion Factor
Q_{sldg} = Sludge flow to disposal (mgd)
C_{slcrit} = Limiting sludge criteria (milligrams per kilogram)
Rpotw = POTW removal efficiency (as a decimal)

The data associated with sludge testing are one of the most reliable sources when considering local limits for conservative pollutants such as metals. Sludge accumulation and treatment concentrates incoming pollutants and averages the pollutants received by the plant over time. Consequently, these data often provide the best estimate of the long-term average pollutant levels in the collection system. At the Hood River WWTP, sludge concentration is a small fraction of the Biosolids Class B (refer to Table 3) limits, which is an indicator that these pollutants are present in low levels throughout the entire waste collection system.

5.3.4 Impact on Wastewater Treatment Plant

Treatment plants must protect against nondomestic discharges that inhibit the treatment processes or operations. Local limits are based on known or estimated inhibitory concentrations of toxic pollutants that may be received in the treatment process. These inhibitory concentration levels are taken from reference data available in the EPA *Local Limits Development Guidance* (EPA 2004). For the Hood River WWTP, calculation of inhibitory AHLs must be conducted for secondary treatment inhibition (activated sludge) and anaerobic sludge digestion. Activated waste inhibition levels are found on the inhibition page of the ODEQ Workbook, in addition to anaerobic sludge digestion reference values. The Workbook uses the following equations to calculate inhibitory AHLs.

Secondary Treatment Inhibition:

$$L_{inhib2} = \frac{(8.34)(C_{crit})(Q_{potw})}{(1 - R_{prim})}$$

where:

L_{inhib2}	=	MAHL (lb/d) based on inhibition of secondary process
8.34	=	Conversion Factor
C_{crit}	=	Inhibition level (mg/L)
R_{prim}	=	Primary removal efficiency (decimal); because primary removal is not available, the denominator in the equation is 1
Q_{potw}	=	POTW average flow

Anaerobic Digestion Inhibition:

$$L_{inhibdgstr} = \frac{(8.34)*(C_{crit})(Q_{dig})}{R_{potw}}$$

where:

$L_{inhibdgstr}$	=	MAHL (lb/d) based on inhibition of anaerobic digestion
8.34	=	Conversion Factor
C_{crit}	=	Inhibition level (mg/L) for anaerobic digestion
Q_{dig}	=	Sludge flow to disposal (mgd)
R_{potw}	=	POTW removal efficiency (as a decimal)

5.4 Limit Selection

The ODEQ Workbook automates the calculation of the AHL for each criteria and then uses the MAHL to generate the local limit. The Workbook chooses the lowest of the acute and chronic criteria. Consequently, because the spreadsheet is locked, it is not possible to distinguish which criteria was chosen. Additionally, the Workbook does not seem to calculate the human health criteria but may include this in the RPA calculation.

Table 5-3 presents the AHLs calculated in pounds for each limiting criterion and then selects the lowest of these AHLs as the MAHL. Table 5-3 also presents the basis of the lowest AHL.

Table 5-3. Calculated AHLs and Selection of MAHL

Pollutant	Pass Through (lb/d)	Allowable Headworks Loadings					Basis of MAHL
		Human Health (lb/d)[a]	Inhibition Activated Waste (lb/d)	Sludge Based on Table 3 40 CFR 503 (lb/d)	Anaerobic Digestion Inhibition (lb/d)	MAHL (lb/d)	
Arsenic	58.69	--	1.05	0.29	0.56	0.29	Sludge Quality
Cadmium	1.14	--	56.35	0.14	3.50	0.14	Sludge Quality
Chromium	60.93	--	702.05	NA	41.74	41.74	Inhibition
Copper	8.23	--	10.94	4.87	6.51	4.87	Sludge Quality
Cyanide	5.24	--	33.42	NA	1.43	1.43	Inhibition
Lead	3.66	--	30.80	1.36	77.06	1.36	Sludge Quality
Mercury	0.27	--	22.09	0.05	NA	0.05	Sludge Quality
Molybdenum	NA	--	NA	0.43	NA	0.43	Sludge Quality
Nickel	45.56	--	34.04	2.97	3.54	2.97	Sludge Quality
Selenium	2.57	--	NA	0.57	NA	0.57	Sludge Quality
Silver	0.82	--	NA	NA	2.16	0.82	Pass Through
Zinc	10.44	--	57.04	21.14	151.40	10.44	Pass Through

[a] The Oregon Local Limits spreadsheet shows a column for human health but does not display this value.

NA = not applicable

Using the MAHL calculated in Table 5-3, the MAIL is calculated. This involves removing from the MAHL the uncontrolled loading from domestic and commercial users. Table 5-3 also subtracts an 11 percent growth and safety factor. This factor is normally 10 percent, but an additional 1 percent was added to account for accepting septage. This factor provides for future industrial growth and a margin of safety to protect all environmental criteria.

Table 5-4 uses the following formula to calculate the MAIL for each pollutant.

MAIL (lb/d) = MAHL (lb/d) – Domestic Loading (lb/d) – Safety/Growth Factor (lb/d)

Table 5-4. Calculation of Maximum Allowable Industrial Loading

Pollutant	MAHL (lb/d)	Domestic Loading (lb/d)	Safety and Growth Factor = 11% of MAHL (lb/d)	MAIL (lb/d)
Arsenic	0.29	0.0054	0.031	0.25
Cadmium	0.14	0.0020	0.015	0.12
Chromium	41.74	0.019	4.60	37.13
Copper	4.87	0.30	0.54	4.04
Cyanide	1.43	0.0002	0.16	1.27
Lead	1.36	0.016	0.15	1.19
Mercury	0.052	0.0036	0.0057	0.043
Molybdenum	0.43	0.0077	0.048	0.38
Nickel	2.97	0.024	0.33	2.62
Selenium	0.57	0.0037	0.063	0.51
Silver	0.82	0.0017	0.091	0.73
Zinc	10.44	1.23	1.148	8.06

5.5 Uniform Allocation to Permitted Industrial Users

Local limits presented herein are based on uniform allocation of available pollutant loading applied to the permitted industrial user. In this method, the mass of a regulated pollutant is distributed equally to industrial flow and each industry receives the same concentration-based limits. Uniform limits are derived from the following formula that converts lb/d to mg/L of industrial flow:

Local Limit (mg/L) = MAIL (lb/d)/(total industrial flow (mgd) * 8.34)

The limits derived using this formula are shown for each pollutant in Table 5-5, which are transferred as adopted limits in Table 5-6.

Table 5-5. Calculation of Uniform Concentration-based Limit (mg/L)

Pollutant	MAIL (lb/d)	Industrial Flow (mgd)	Conversion Factor	Final Local Limit (mg/L)
Arsenic	0.25	0.122	8.34	0.24
Cadmium	0.12	0.122	8.34	0.12
Chromium (Total)	37.13	0.122	8.34	36.5
Copper	4.04	0.122	8.34	3.97
Cyanide	1.27	0.122	8.34	1.25
Lead	1.19	0.122	8.34	1.17
Mercury	0.043	0.122	8.34	0.042
Molybdenum	0.38	0.122	8.34	0.37
Nickel	2.62	0.122	8.34	2.57
Selenium	0.51	0.122	8.34	0.50
Silver	0.73	0.122	8.34	0.72
Zinc	8.06	0.122	8.34	7.92

Table 5-6 presents the selected limits found on the limits page of the ODEQ Workbook.

Table 5-6. Adopted Local Limits Compared to Previous Local Limits

Pollutant	Prior Limits Adopted October 1995	Adopted Local Limit
Arsenic	0.40 mg/L	0.24 mg/L
Cadmium	0.22 mg/L	0.12 mg/L
Chromium (Total)	2.77 mg/L	5.0 mg/L [a]
Copper	3.38 mg/L	3.97 mg/L
Cyanide	1.20 mg/L	1.25 mg/L
Lead	0.69 mg/L	1.17 mg/L
Mercury	0.008 mg/L	0.042 mg/L
Molybdenum	0.4 mg/L	0.37 mg/L
Nickel	3.98 mg/L	2.57 mg/L
Selenium	–	0.50 mg/L
Silver	0.18 mg/L	0.72 mg/L
Zinc	2.61 mg/L	7.92 mg/L
Flow	–	No Limit Adopted

Table 5-6. Adopted Local Limits Compared to Previous Local Limits

Pollutant	Prior Limits Adopted October 1995	Adopted Local Limit
BOD_5	250 mg/L [b]	No Limit Adopted
TSS	250 mg/L [b]	No Limit Adopted
pH	6.0–9.0 SU	6.5–9.0 SU
Ammonia	–	No Limit Adopted
O&G	100 mg/L, nonpolar 25 mg/L polar	100 mg/L, nonpolar; 25 mg/L polar
Temperature	–	40°C (104°F) at the POTW; 76.5°F (24.7°C) at user discharge point;[c] 60°C (140°F) from SIU
Flammability	–	Specified as no material with a closed-cup flashpoint <140°F and No two consecutive readings at ≥5% LEL, and no reading of ≥10% LEL allowed[d]

[a] The calculated limit is 36.5 mg/L. The Resource Conservation and Recovery Act (RCRA) sets a statutory limit of 5.0 mg/L for total chromium. Under RCRA, chromium concentrations above 5.0 mg/L are classified as hazardous. While chromium in wastewater is not covered by RCRA because of the Domestic Sewer Exclusion, the City of Hood River elects to not allow the discharge of waste at concentrations that would otherwise be classified as "hazardous," and therefore, a limit of 5.0 mg/L is adopted.

[b] These are set as standards for surcharges and not local limits. Hood River bases surcharge on concentrations above normal domestic waste strength, which are set at 250 mg/L for BOD_5 and 250 mg/L for TSS.

[c] cf. 40 CFR 403.5(b)(5)

[d] As per guidance in EPA Model Pretreatment Ordinance (EPA 2007)

Note: All metals are expressed as total recoverable.

°C = degree(s) Celsius

°F = degree(s) Fahrenheit

LEL = lower explosive limit

SU = standard unit(s)

6. Other Limits and Concerns

In keeping with EPA recommendations, the need for local limits for flow, BOD_5, TSS, pH, O&G, and ammonia were also evaluated. Worker health and safety limits for temperature, flammability, and toxicity were also considered. Table 6-1 summarizes local limits for this second group of parameters. A discussion of all evaluated pollutants/groups of compounds follows in this section.

Table 6-1. Local Limits for Other Pollutants

Pollutant	Minimum Limit	Maximum Limit
Flow	NA	NA
BOD	NA	No limit adopted, 250 mg/L set as surcharge limit
TSS	NA	No limit adopted, 250 mg/L set as surcharge limit
Ammonia	NA	No limit adopted
pH	6.5 SU	9.0 SU
O&G Nonpolar O&G	NA	100 mg/L 25 mg/L
Temperature	NA	40°C (104°F) at the POTW; 60°C (140°F) from SIU[a]
Flammability	NA	Specified as no material with a closed-cup flashpoint <140°F and No two consecutive readings at ≥5% LEL, and no reading of ≥10% LEL allowed[b]

[a] cf. 40 CFR 403.5(b)(5)

[b] As per guidance in EPA Model Sewer Use Ordinance

6.1 Flow

The Hood River WWTP is designed to treat a peak daily flow of 1.48 mgd dry weather flow/6.21 mgd wet weather flow. The plant currently receives a monthly average daily flow of approximately 1.17 mgd. Consequently, the Hood River WWTP currently has additional capacity available for industrial use; therefore, flow limits are not currently needed.

6.2 BOD_5 and TSS

The dry weather capacity to treat BOD_5 is 8,100 lb/d. The plant's current annual daily average influent BOD_5 is 5,932 lb/day. Similarly, the plant dry weather TSS capacity is 5,800 lb/d. The facility receives an annual average of 4,839 lb/d. Consequentially, on an average basis, sufficient capacity is available for industry. The issue of BOD and TSS limits is not amenable to uniform concentration limits. Adopting local limits for BOD_5 and TSS using the uniform allocation method implies that discharges may not be accepted above such a limit, though capacity is available. Because spikes in BOD and TSS have been noted in the plant monitoring record, including spikes that interfered with plant operations and compliance, the Hood River IPP has established BOD and TSS mass-based limits on three of its current four SIUs. Upon completion of the surcharge study the City intends to establish mass-based industry-specific limits for all SIUs based on industrial performance and historical ability to control BOD and TSS limits. The method to

establish these limits are shown in Appendix G. The City will compare the limits developed with this method to current limits and to plant capacity available and then use the most appropriate limits (which will be enforced) and surcharges to assure that plant capacity is not exceeded. As part of this strategy, discharges greater than domestic-strength waste will be surcharged. The City has, in its Sewer Use Ordinance, provisions for surcharges on discharges greater than 250 mg/L for BOD and/or greater than 250 mg/L for TSS. This is an industry-wide practice that has been accepted as a common level for domestic waste.

Based on experience nationwide, Jacobs considers surcharging to be a better control than local limits for BOD and TSS and is currently conducting a technically based surcharge study to determine an appropriate rate that industries should pay for BOD and TSS. This surcharge rate will recover both pretreatment costs as provided under law, actual cost of treatment, and act as a deterrent to discharging more BOD and TSS than an industry needs to discharge. The surcharge rate will also encourage pollution minimization of these parameters.

6.3 Ammonia

Ammonia is listed by EPA as a POC that should be evaluated. The Hood River WWTP treatment process is not currently designed and operated to remove ammonia. Ammonia is present in all wastewater from domestic sources and local limits are not an effective control method, except for industries that discharge well above domestic contributions. The discharge of ammonia to the treatment plant does not follow local limits methodology because the sources are domestic wastes.

6.4 pH

The local limits for pH previously established in the Hood River Sewer Use Ordinance was 6.0 to 9.0 SUs. The wastewater treatment plant influent over time, however, has progressively experienced a decreasing pH and has needed to add alkalinity to facilitate treatment and meet discharge permit requirements. Consequently, raising the lower pH limit will result in better treatment and reduce the need for additions of alkalinity. The pH limits are therefore set with a lower limit of 6.5 SU and an upper limit of 9.0 SU.

6.5 Oils and Grease

The previous limit for O&G was 100 mg/L total O&G and 25 mg/L for nonpolar O&G. The lower limit for nonpolar grease is based on the fact that nonpolar grease is known to cause higher interference in both aerobic and anaerobic digestion. This is found in Section 5.3.3 of the EPA 2004 manual on Development of Local Limits. These limits have been effective and will be retained.

6.6 Temperature

Limits are set to protect the health and safety of the public and workers. Limits are also set to protect the collection system from high temperature damage and the treatment plant from interference with biological processes.

A 104°F (40°C) limit at the headworks of the sewage treatment plant is a specific requirement of the federal pretreatment regulations [cf. 40 CFR 403.5(b)(5)].

A 140°F (60°C) limit at the point of discharge into the Hood River WWTP sanitary sewer system has also been adopted as a limit to protect collection system workers and pretreatment staff. This is adopted due to the potential for inflicting burns as published by the U.S. Consumer Product Safety Commission Publication 5098 009611 032012 at www.cpsc.gov. This document indicates that workers exposed to 60°C for 6 seconds will experience third-degrees burns.

6.7 Flammability

Local limits for flammability are adopted prohibiting any discharge with a closed-cup flashpoint less than 140°F (60°C). An additional LEL local limit is added in this document that prohibits two successive readings of an LEL meter in the headspace of the collection system below an industry's discharge into the sanitary sewer that exceed 5 percent, and no single LEL meter reading may be 10 percent or higher.

The closed-cup flashpoint limit is based on federal pretreatment regulations [CF, 40 CFR 403.5 (b)(1)]. The LEL limits are established based on worker/community health and safety and are much easier to monitor in the system and, consequently, to enforce than the closed-cup flashpoint limit.

7. Adoption and Implementation of Local Limits

Upon approval by ODEQ, the City will publicly post these limits and provide a 30-day public comment period. The City will respond to comments received, as appropriate. Upon completion of this comment period the City will adopt these limits into the City Sewer Use Ordinance by resolution.

The new local limits will then apply to all nondomestic users. It is the intent of this document that only users that have been issued industrial wastewater discharge permits, such as SIUs and other users with a potential to discharge pollutants for which local limits have been developed, will be required to routinely monitor for compliance with local limits.

8. References

Jacobs Engineering Group Inc. 2021. Hood River Wastewater Treatment Plant Technically-Based Local Limits Sampling and Evaluation Plan Prepared for City of Hood River. July 2021.

Oregon Department of Environmental Quality (ODEQ). 1991. *Information Required for Pretreatment Program Local Limits Evaluations.* Water Quality Division. September 23.

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U.S. Environmental Protection Agency (EPA). 1987. *Guidance Manual on the Development and Implementation of Local Discharge Limitations under the Pretreatment Program*. EPA 833-B-87-202. Office of Water Enforcement and Permits. December.

U.S. Environmental Protection Agency (EPA). 1994. *Water Quality Standards Handbook: Second Edition*. EPA-823-B-12-002. Office of Water. August.

U.S. Environmental Protection Agency (EPA). 2004. *Local Limits Development Guidance*. EPA 833-R-04-002A. Office of Wastewater Management. July.

U.S. Environmental Protection Agency (EPA). 2007. *EPA Model Pretreatment Ordinance*. EPA 833-B-06-002. Office of Wastewater Management/Permits Division. January. https://www3.epa.gov/npdes/pubs/pretreatment_model_suo.pdf

Appendix A
Guidance on the Selection of Pollutants of Concern

Guidance on the Selection of Pollutants of Concern

Guidance Manual on the Development and Implementation of Local Discharge Limitations Under the Pretreatment Program, EPA 833-B-87-202, December 1987

Also, EPA guidance directs that a toxic pollutant may be classified as a POC if it meets the following screening criteria:

- *The maximum concentration of the pollutant in a grab sample from the POTWs influent is more than half the inhibition threshold for the biological process; or the maximum concentration of the pollutant in a 24-hour composite sample from the POTWs influent is more than one-fourth of the inhibition threshold for the biological process.*
- *The maximum concentration of the pollutant in the POTWs influent is more than 1/500* of the applicable sludge criteria.*
- *The maximum concentration of the pollutant in the POTWs influent is more than the maximum allowable effluent concentration.*
- *The maximum concentration of the pollutant in the POTW's effluent is more than one-half the allowable effluent concentration.*
- *The maximum concentration of the pollutant in the POTW's sludge is more than one-half of the allowable sludge concentration.*

The maximum measured concentration of the pollutant was greater than the American Conference of Government Industrial Hygienists' screening level for fume toxicity.

Appendix B
Removal Factors Calculation Spreadsheet

Appendix B - Removal Factors Calculation Spreadsheet (RFC

Influent/Primary Effluent/Effluent Monitoring and Removal Factors

0

Line Number

Sample Data

Enter ADRE or MRE all lines in 5-8 will reflect the chosen method based on entry: MRE

Use Domestic Approximation Y or N: Y

			Arsenic (T)	Cadmium	Chrome (T)	Copper	Cyanide	Lead	Mercury	Molybdenum	Nickel	Selenium	Silver	Zinc
1	SUMMARY DATA													
2	Ave. Influent Conc.		0.620 ug/L	0.231 ug/L	2.157 ug/L	33.943 ug/L	#DIV/0!	1.853 ug/L	0.412 ug/L	0.876 ug/L	2.734 ug/L	0.427 ug/L	0.197 ug/L	140.429 ug/L
3	Ave. Effluent Conc.		0.359 ug/L	0.037 ug/L	1.171 ug/L	3.336 ug/L	#DIV/0!	0.653 ug/L	0.017 ug/L	0.433 ug/L	1.601 ug/L	0.209 ug/L	0.023 ug/L	85.971 ug/L
4	Ave. Primary Effluent Conc.		0.664 ug/L	0.200 ug/L	1.499 ug/L	34.971 ug/L	#DIV/0!	1.761 ug/L	0.091 ug/L	1.163 ug/L	2.976 ug/L	0.386 ug/L	0.233 ug/L	149.857 ug/L
6	Ave. Primary Removal (MRE)		-7.14%	13.18%	30.53%	-3.03%	#DIV/0!	4.93%	77.86%	-32.79%	-8.83%	9.70%	-18.31%	-6.71%
8	Ave. Overall Removal (MRE)		42.17%	84.10%	45.70%	90.17%	#DIV/0!	64.75%	95.97%	50.57%	41.43%	51.17%	88.52%	38.78%
9	Effluent Variation (COV)		0.05	0.24	1.78	0.19	#DIV/0!	0.08	18.09	0.12	0.06	20.00	0.62	0.09
10	Average Sludge Conc.		2.45 mg/kg	5.25 mg/kg	18.45 mg/kg	#DIV/0!	#DIV/0!	16.55 mg/kg	#DIV/0!	6.47 mg/kg	15.75 mg/kg	6.66 mg/kg	3.26 mg/kg	854.5 mg/kg
11	Ambient Receiving Water Conc.		0.000 ug/L	0.000 ug/L	0.000 ug/L	0.000 ug/L	0.000 ug/L	0.000 ug/L	0.000 ug/L	0.000 ug/L	0.000 ug/L	0.000 ug/L	0.000 ug/L	0.000 ug/L
12	AVE Industrial Conc.		0.0 ug/L	0.0 ug/L	0.0 ug/L	0.0 ug/L	0.0 ug/L	0.0 ug/L	0.0 ug/L	0.0 ug/L	0.0 ug/L	0.0 ug/L	0.0 ug/L	0.0 ug/L
13	SUMMARY (ABOVE)													
14	SAMPLE 1													
15	Date:	LOCATION	Arsenic (T)	Cadmium	Chrome (T)	Copper	Cyanide	Lead	Mercury	Molybdenum	Nickel	Selenium	Silver	Zinc
16	8/13/2021	Influent	0.66 ug/l	0.165 ug/l	1.7 ug/l	29.8 ug/l	ND	1.79 ug/l	0.0894 ug/l	0.6 ug/l	2.63 ug/l	0.3 ug/l	0.173 ug/l	133. ug/l
17	8/14/2021	Effluent	0.36 ug/l	0.036 ug/l	0.63 ug/l	4.33 ug/l	ND	0.59 ug/l	0.0014 ug/l	0.4 ug/l	1.66 ug/l	0.34 ug/l	0.01 ug/l	78.8 ug/l
18	8/13/2021	Prim._Clar.	0.67 ug/l	0.228 ug/l	1.63 ug/l	39.6 ug/l	ND	1.97 ug/l	0.0806 ug/l	0.94 ug/l	3.05 ug/l	0.37 ug/l	0.244 ug/l	179. ug/l
19		Sludge												
20		Sludge Wet												
21	Aqueous	ML/RL												
22	Sludge	ML/RL												
23	Primary Removal Rate:		Can't Do	Can't Do	4.12%	Can't Do	**Can't Do**	Can't Do	9.84%	Can't Do	Can't Do	Can't Do	Can't Do	Can't Do
24	Overall Removal Rate		45.45%	78.18%	62.94%	85.47%	Can't Do	67.04%	98.41%	33.33%	36.88%	Can't Do	94.22%	40.75%
25														
26	SAMPLE 2													
27	Date:	LOCATION	Arsenic (T)	Cadmium	Chrome (T)	Copper	Cyanide	Lead	Mercury	Molybdenum	Nickel	Selenium	Silver	Zinc
28	8/14/2021	Influent	0.61 ug/l	0.164 ug/l	1.66 ug/l	26.5 ug/l	ND	1.57 ug/l	0.0675 ug/l	0.71 ug/l	2.23 ug/l	0.19 ug/l	0.172 ug/l	125. ug/l
29	8/15/2021	Effluent	0.33 ug/l	0.026 ug/l	0.59 ug/l	3.51 ug/l	ND	0.658 ug/l	0.0011 ug/l	0.35 ug/l	1.52 ug/l	0.18 ug/l	0.02 ug/l	78.8 ug/l
30	8/14/2021	Prim._Clar.	0.57 ug/l	0.123 ug/l	1.19 ug/l	30.3 ug/l	ND	1.34 ug/l	0.0448 ug/l	0.85 ug/l	2.18 ug/l	0.37 ug/l	0.178 ug/l	109. ug/l
31		Sludge												
32		Sludge Wet												
33	Aqueous	ML/RL												
34	Sludge	ML/RL												
35	Primary Removal Rate:		6.56%	25.00%	28.31%	Can't Do	Can't Do	14.65%	33.63%	Can't Do	2.24%	Can't Do	Can't Do	12.80%
36	Overall Removal Rate		45.90%	84.15%	64.46%	86.75%	Can't Do	58.09%	98.37%	50.70%	31.84%	5.26%	88.37%	36.96%
37														
38	SAMPLE 3													
39	Date:	LOCATION	Arsenic (T)	Cadmium	Chrome (T)	Copper	Cyanide	Lead	Mercury	Molybdenum	Nickel	Selenium	Silver	Zinc
40	8/15/2021	Influent	0.57 ug/l	0.17 ug/l	1.62 ug/l	28.8 ug/l	ND	1.45 ug/l	0.105 ug/l	0.83 ug/l	2.5 ug/l	0.46 ug/l	0.182 ug/l	139. ug/l
41	8/16/2021	Effluent	0.35 ug/l	0.046 ug/l	0.63 ug/l	3.46 ug/l	ND	0.646 ug/l	0.0012 ug/l	0.48 ug/l	1.51 ug/l	0.25 ug/l	0.04 ug/l	81.4 ug/l
42	8/15/2021	Prim._Clar.	0.53 ug/l	0.158 ug/l	1.35 ug/l	32. ug/l	ND	1.54 ug/l	0.0638 ug/l	0.86 ug/l	2.57 ug/l	0.41 ug/l	0.248 ug/l	140. ug/l
43	8/16/2021 3419ASLG	Sludge	2.52 mg/kg	1.41 mg/kg	16.8 mg/kg			12.9 mg/kg		6.36 mg/kg	14.5 mg/kg	5.56 mg/kg	3.21 mg/kg	949. mg/kg
44		Sludge Wet												
45	Aqueous	ML/RL												
46	Sludge	ML/RL												
47	Primary Removal Rate:		7.02%	7.06%	16.67%	Can't Do	Can't Do	Can't Do	39.24%	Can't Do	Can't Do	10.87%	Can't Do	Can't Do
48	Overall Removal Rate		38.60%	72.94%	61.11%	87.99%	Can't Do	55.45%	98.90%	42.17%	39.60%	45.65%	78.02%	41.44%
49														

Appendix B - Removal Factors Calculation Spreadsheet (RFCS

Influent/Primary Effluent/Effluent Monitoring and Removal Factors

0

Line Number

Sample Data

Enter ADRE or MRE all lines in 5-8 will reflect the chosen method based on entry: MRE

Use Domestic Approximation Y or N: Y

			Arsenic (T)	Cadmium	Chrome (T)	Copper	Cyanide	Lead	Mercury	Molybdenum	Nickel	Selenium	Silver	Zinc
1	**SUMMARY DATA**													
50	**SAMPLE 4**													
51	Date:	LOCATION	Arsenic (T)	Cadmium	Chrome (T)	Copper	Cyanide	Lead	Mercury	Molybdenum	Nickel	Selenium	Silver	Zinc
52	8/16/2021	Influent	0.55 ug/l	0.509 ug/l	1.55 ug/l	31.3 ug/l	ND	1.72 ug/l	1.11 ug/l	0.86 ug/l	2.28 ug/l	0.67 ug/l	0.196 ug/l	135. ug/l
53	8/17/2021	Effluent	0.35 ug/l	0.046 ug/l	0.63 ug/l	3.69 ug/l	ND	0.646 ug/l	0.109 ug/l	0.48 ug/l	1.51 ug/l	0.25 ug/l	0.04 ug/l	81.4 ug/l
54	8/16/2021	Prim._Clar.	0.73 ug/l	0.311 ug/l	1.54 ug/l	34.8 ug/l	ND	1.75 ug/l	0.15 ug/l	1.17 ug/l	2.73 ug/l	0.52 ug/l	0.267 ug/l	159. ug/l
55		Sludge												
56		Sludge Wet												
57	Aqueous	ML/RL												
58	Sludge	ML/RL												
59	Primary Removal Rate:		Can't Do	38.90%	0.65%	Can't Do	Can't Do	Can't Do	86.49%	Can't Do	Can't Do	22.39%	Can't Do	Can't Do
60	Overall Removal Rate		36.36%	90.96%	59.35%	88.21%	Can't Do	62.44%	90.18%	44.19%	33.77%	62.69%	79.59%	39.70%
61														
62	**SAMPLE 5**													
63	Date:	LOCATION	Arsenic (T)	Cadmium	Chrome (T)	Copper	Cyanide	Lead	Mercury	Molybdenum	Nickel	Selenium	Silver	Zinc
64	8/17/2021	Influent	0.55 ug/l	0.237 ug/l	1.53 ug/l	41.7 ug/l	ND	1.8 ug/l	1.11 ug/l	1.23 ug/l	2.89 ug/l	0.35 ug/l	0.215 ug/l	143. ug/l
65	8/18/2021	Effluent	0.37 ug/l	0.044 ug/l	0.61 ug/l	3.16 ug/l	ND	0.741 ug/l	0.0012 ug/l	0.46 ug/l	1.6 ug/l	0.06 ug/l	0.014 ug/l	98. ug/l
66	8/17/2021	Prim._Clar.	0.67 ug/l	0.213 ug/l	1.47 ug/l	34.6 ug/l	ND	2.26 ug/l	0.15 ug/l	1.5 ug/l	3.27 ug/l	0.48 ug/l	0.255 ug/l	160. ug/l
67		Sludge												
68		Sludge Wet												
69	Aqueous	ML/RL												
70	Sludge	ML/RL												
71	Primary Removal Rate:		Can't Do	10.13%	3.92%	17.03%	Can't Do	Can't Do	86.49%	Can't Do	Can't Do	Can't Do	Can't Do	Can't Do
72	Overall Removal Rate		32.73%	81.43%	60.13%	92.42%	Can't Do	58.83%	99.89%	62.60%	44.64%	82.86%	93.49%	31.47%
73														
74	**SAMPLE 6**													
75	Date:	LOCATION	Arsenic (T)	Cadmium	Chrome (T)	Copper	Cyanide	Lead	Mercury	Molybdenum	Nickel	Selenium	Silver	Zinc
76	8/18/2021	Influent	0.73 ug/l	0.189 ug/l	2.17 ug/l	43.5 ug/l	ND	2.13 ug/l	0.0936 ug/l	0.89 ug/l	3.39 ug/l	0.39 ug/l	0.21 ug/l	147. ug/l
77	8/19/2021	Effluent	0.38 ug/l	0.032 ug/l	0.62 ug/l	2.78 ug/l	ND	0.685 ug/l	0.001 ug/l	0.47 ug/l	1.64 ug/l	0.2 ug/l	0.014 ug/l	91.6 ug/l
78	8/18/2021	Prim._Clar.	0.8 ug/l	0.201 ug/l	1.61 ug/l	41. ug/l	ND	1.87 ug/l	0.095 ug/l	1.53 ug/l	3.78 ug/l	0.25 ug/l	0.236 ug/l	167. ug/l
79	8/19/21 6737ASLG	Sludge	2.38 mg/kg	9.09 mg/kg	20.1 mg/kg			20.2 mg/kg		6.58 mg/kg	17. mg/kg	7.76 mg/kg	3.31 mg/kg	760. mg/kg
80		Sludge Wet												
81	Aqueous	ML/RL												
82	Sludge	ML/RL												
83	Primary Removal Rate:		Can't Do	Can't Do	25.81%	5.75%	Can't Do	12.21%	Can't Do	Can't Do	Can't Do	35.90%	Can't Do	Can't Do
84	Overall Removal Rate		47.95%	83.07%	71.43%	93.61%	Can't Do	67.84%	98.92%	47.19%	51.62%	48.72%	93.33%	37.69%
85														
86	**SAMPLE 7**													
87	Date:	LOCATION	Arsenic (T)	Cadmium	Chrome (T)	Copper	Cyanide	Lead	Mercury	Molybdenum	Nickel	Selenium	Silver	Zinc
88	8/19/2021	Influent	0.67 ug/l	0.182 ug/l	4.87 ug/l	36. ug/l	ND	2.51 ug/l	0.306 ug/l	1.01 ug/l	3.22 ug/l	0.63 ug/l	0.228 ug/l	161. ug/l
89	8/20/2021	Effluent	0.37 ug/l	0.027 ug/l	4.49 ug/l	2.42 ug/l	ND	0.606 ug/l	0.0012 ug/l	0.39 ug/l	1.77 ug/l	0.18 ug/l	0.02 ug/l	91.8 ug/l
90	8/19/2021	Prim._Clar.	0.68 ug/l	0.169 ug/l	1.7 ug/l	32.5 ug/l	ND	1.6 ug/l	0.0539 ug/l	1.29 ug/l	3.25 ug/l	0.3 ug/l	0.2 ug/l	135. ug/l
91		Sludge												
92		Sludge Wet												
93	Aqueous	ML/RL												
94	Sludge	ML/RL												
95	Primary Removal Rate:		Can't Do	7.14%	65.09%	9.72%	Can't Do	36.25%	82.39%	Can't Do	Can't Do	52.38%	12.28%	16.15%
96	Overall Removal Rate		44.78%	85.16%	7.80%	93.28%	Can't Do	75.86%	99.61%	61.39%	45.03%	71.43%	91.23%	42.98%
97														

Appendix B - Removal Factors Calculation Spreadsheet (RFC

Influent/Primary Effluent/Effluent Monitoring and Removal Factors

0

Line Number

Sample Data

Enter ADRE or MRE all lines in 5-8 will reflect the chosen method based on entry: ADRE

Use Domestic Approximation Y or N: Y

			Arsenic (T)	Cadmium	Chrome (T)	Copper	Cyanide	Lead	Mercury	Molybdenum	Nickel	Selenium	Silver	Zinc
1	**SUMMARY DATA**													
2	Ave. Influent Conc.		0.620 ug/L	0.231 ug/L	2.157 ug/L	33.943 ug/L	#DIV/0!	1.853 ug/L	0.412 ug/L	0.876 ug/L	2.734 ug/L	0.427 ug/L	0.197 ug/L	140.429 ug/L
3	Ave. Effluent Conc.		0.359 ug/L	0.037 ug/L	1.171 ug/L	3.336 ug/L	#DIV/0!	0.653 ug/L	0.017 ug/L	0.433 ug/L	1.601 ug/L	0.209 ug/L	0.023 ug/L	85.971 ug/L
4	Ave. Primary Effluent Conc.		0.664 ug/L	0.200 ug/L	1.499 ug/L	34.971 ug/L	#DIV/0!	1.761 ug/L	0.091 ug/L	1.163 ug/L	2.976 ug/L	0.386 ug/L	0.233 ug/L	149.857 ug/L
5	Ave. Primary Removal (ADRE)		6.79%	17.65%	20.65%	10.83%	#DIV/0!	21.04%	56.34%	#DIV/0!	2.24%	30.38%	12.28%	14.47%
7	Ave. Overall Removal (ADRE)		41.68%	82.27%	55.32%	89.68%	#DIV/0!	63.65%	97.75%	48.80%	40.48%	52.77%	88.32%	38.71%
9	Effluent Variation (COV)		0.05	0.24	1.78	0.19	#DIV/0!	0.08	18.09	0.12	0.06	20.00	0.62	0.09
10	Average Sludge Conc.		2.45 mg/kg	5.25 mg/kg	18.45 mg/kg	#DIV/0!	#DIV/0!	16.55 mg/kg	#DIV/0!	6.47 mg/kg	15.75 mg/kg	6.66 mg/kg	3.26 mg/kg	854.5 mg/kg
11	Ambient Receiving Water Conc.		0.000 ug/L	0.000 ug/L	0.000 ug/L	0.000 ug/L	0.000 ug/L	0.000 ug/L	0.000 ug/L	0.000 ug/L	0.000 ug/L	0.000 ug/L	0.000 ug/L	0.000 ug/L
12	AVE Industrial Conc.		0.0 ug/L	0.0 ug/L	0.0 ug/L	0.0 ug/L	0.0 ug/L	0.0 ug/L	0.0 ug/L	0.0 ug/L	0.0 ug/L	0.0 ug/L	0.0 ug/L	0.0 ug/L
13	**SUMMARY (ABOVE)**													
14	**SAMPLE 1**													
15	Date:	LOCATION	Arsenic (T)	Cadmium	Chrome (T)	Copper	Cyanide	Lead	Mercury	Molybdenum	Nickel	Selenium	Silver	Zinc
16	8/13/2021	Influent	0.66 ug/l	0.165 ug/l	1.7 ug/l	29.8 ug/l	ND	1.79 ug/l	0.0894 ug/l	0.6 ug/l	2.63 ug/l	0.3 ug/l	0.173 ug/l	133. ug/l
17	8/14/2021	Effluent	0.36 ug/l	0.036 ug/l	0.63 ug/l	4.33 ug/l	ND	0.59 ug/l	0.0014 ug/l	0.4 ug/l	1.66 ug/l	0.34 ug/l	0.01 ug/l	78.8 ug/l
18	8/13/2021	Prim._Clar.	0.67 ug/l	0.228 ug/l	1.63 ug/l	39.6 ug/l	ND	1.97 ug/l	0.0806 ug/l	0.94 ug/l	3.05 ug/l	0.37 ug/l	0.244 ug/l	179. ug/l
19		Sludge												
20		Sludge Wet												
21	Aqueous	ML/RL												
22	Sludge	ML/RL												
23	Primary Removal Rate:		Can't Do	Can't Do	4.12%	Can't Do	**Can't Do**	Can't Do	9.84%	Can't Do	Can't Do	Can't Do	Can't Do	Can't Do
24	Overall Removal Rate		45.45%	78.18%	62.94%	85.47%	Can't Do	67.04%	98.41%	33.33%	36.88%	Can't Do	94.22%	40.75%
25														
26	**SAMPLE 2**													
27	Date:	LOCATION	Arsenic (T)	Cadmium	Chrome (T)	Copper	Cyanide	Lead	Mercury	Molybdenum	Nickel	Selenium	Silver	Zinc
28	8/14/2021	Influent	0.61 ug/l	0.164 ug/l	1.66 ug/l	26.5 ug/l	ND	1.57 ug/l	0.0675 ug/l	0.71 ug/l	2.23 ug/l	0.19 ug/l	0.172 ug/l	125. ug/l
29	8/15/2021	Effluent	0.33 ug/l	0.026 ug/l	0.59 ug/l	3.51 ug/l	ND	0.658 ug/l	0.0011 ug/l	0.35 ug/l	1.52 ug/l	0.18 ug/l	0.02 ug/l	78.8 ug/l
30	8/14/2021	Prim._Clar.	0.57 ug/l	0.123 ug/l	1.19 ug/l	30.3 ug/l	ND	1.34 ug/l	0.0448 ug/l	0.85 ug/l	2.18 ug/l	0.37 ug/l	0.178 ug/l	109. ug/l
31		Sludge												
32		Sludge Wet												
33	Aqueous	ML/RL												
34	Sludge	ML/RL												
35	Primary Removal Rate:		6.56%	25.00%	28.31%	Can't Do	Can't Do	14.65%	33.63%	Can't Do	2.24%	Can't Do	Can't Do	12.80%
36	Overall Removal Rate		45.90%	84.15%	64.46%	86.75%	Can't Do	58.09%	98.37%	50.70%	31.84%	5.26%	88.37%	36.96%
37														
38	**SAMPLE 3**													
39	Date:	LOCATION	Arsenic (T)	Cadmium	Chrome (T)	Copper	Cyanide	Lead	Mercury	Molybdenum	Nickel	Selenium	Silver	Zinc
40	8/15/2021	Influent	0.57 ug/l	0.17 ug/l	1.62 ug/l	28.8 ug/l	ND	1.45 ug/l	0.105 ug/l	0.83 ug/l	2.5 ug/l	0.46 ug/l	0.182 ug/l	139. ug/l
41	8/16/2021	Effluent	0.35 ug/l	0.046 ug/l	0.63 ug/l	3.46 ug/l	ND	0.646 ug/l	0.0012 ug/l	0.48 ug/l	1.51 ug/l	0.25 ug/l	0.04 ug/l	81.4 ug/l
42	8/15/2021	Prim._Clar.	0.53 ug/l	0.158 ug/l	1.35 ug/l	32. ug/l	ND	1.54 ug/l	0.0638 ug/l	0.86 ug/l	2.57 ug/l	0.41 ug/l	0.248 ug/l	140. ug/l
43	8/16/2021 3419ASLG	Sludge	2.52 mg/kg	1.41 mg/kg	16.8 mg/kg			12.9 mg/kg		6.36 mg/kg	14.5 mg/kg	5.56 mg/kg	3.21 mg/kg	949. mg/kg
44		Sludge Wet												
45	Aqueous	ML/RL												
46	Sludge	ML/RL												
47	Primary Removal Rate:		7.02%	7.06%	16.67%	Can't Do	Can't Do	Can't Do	39.24%	Can't Do	Can't Do	10.87%	Can't Do	Can't Do
48	Overall Removal Rate		38.60%	72.94%	61.11%	87.99%	Can't Do	55.45%	98.90%	42.17%	39.60%	45.65%	78.02%	41.44%
49														

Appendix B - Removal Factors Calculation Spreadsheet (RFCS

Influent/Primary Effluent/Effluent Monitoring and Removal Factors

0

Line Number

Sample Data

Enter ADRE or MRE all lines in 5-8 will reflect the chosen method based on entry: ADRE

Use Domestic Approximation Y or N: Y

			Arsenic (T)	Cadmium	Chrome (T)	Copper	Cyanide	Lead	Mercury	Molybdenum	Nickel	Selenium	Silver	Zinc
1	**SUMMARY DATA**													
50	**SAMPLE 4**													
51	Date:	LOCATION	Arsenic (T)	Cadmium	Chrome (T)	Copper	Cyanide	Lead	Mercury	Molybdenum	Nickel	Selenium	Silver	Zinc
52	8/16/2021	Influent	0.55 ug/l	0.509 ug/l	1.55 ug/l	31.3 ug/l	ND	1.72 ug/l	1.11 ug/l	0.86 ug/l	2.28 ug/l	0.67 ug/l	0.196 ug/l	135. ug/l
53	8/17/2021	Effluent	0.35 ug/l	0.046 ug/l	0.63 ug/l	3.69 ug/l	ND	0.646 ug/l	0.109 ug/l	0.48 ug/l	1.51 ug/l	0.25 ug/l	0.04 ug/l	81.4 ug/l
54	8/16/2021	Prim._Clar.	0.73 ug/l	0.311 ug/l	1.54 ug/l	34.8 ug/l	ND	1.75 ug/l	0.15 ug/l	1.17 ug/l	2.73 ug/l	0.52 ug/l	0.267 ug/l	159. ug/l
55		Sludge												
56		Sludge Wet												
57	Aqueous	ML/RL												
58	Sludge	ML/RL												
59	Primary Removal Rate:		Can't Do	38.90%	0.65%	Can't Do	Can't Do	Can't Do	86.49%	Can't Do	Can't Do	22.39%	Can't Do	Can't Do
60	Overall Removal Rate		36.36%	90.96%	59.35%	88.21%	Can't Do	62.44%	90.18%	44.19%	33.77%	62.69%	79.59%	39.70%
61														
62	**SAMPLE 5**													
63	Date:	LOCATION	Arsenic (T)	Cadmium	Chrome (T)	Copper	Cyanide	Lead	Mercury	Molybdenum	Nickel	Selenium	Silver	Zinc
64	8/17/2021	Influent	0.55 ug/l	0.237 ug/l	1.53 ug/l	41.7 ug/l	ND	1.8 ug/l	1.11 ug/l	1.23 ug/l	2.89 ug/l	0.35 ug/l	0.215 ug/l	143. ug/l
65	8/18/2021	Effluent	0.37 ug/l	0.044 ug/l	0.61 ug/l	3.16 ug/l	ND	0.741 ug/l	0.0012 ug/l	0.46 ug/l	1.6 ug/l	0.06 ug/l	0.014 ug/l	98. ug/l
66	8/17/2021	Prim._Clar.	0.67 ug/l	0.213 ug/l	1.47 ug/l	34.6 ug/l	ND	2.26 ug/l	0.15 ug/l	1.5 ug/l	3.27 ug/l	0.48 ug/l	0.255 ug/l	160. ug/l
67		Sludge												
68		Sludge Wet												
69	Aqueous	ML/RL												
70	Sludge	ML/RL												
71	Primary Removal Rate:		Can't Do	10.13%	3.92%	17.03%	Can't Do	Can't Do	86.49%	Can't Do	Can't Do	Can't Do	Can't Do	Can't Do
72	Overall Removal Rate		32.73%	81.43%	60.13%	92.42%	Can't Do	58.83%	99.89%	62.60%	44.64%	82.86%	93.49%	31.47%
73														
74	**SAMPLE 6**													
75	Date:	LOCATION	Arsenic (T)	Cadmium	Chrome (T)	Copper	Cyanide	Lead	Mercury	Molybdenum	Nickel	Selenium	Silver	Zinc
76	8/18/2021	Influent	0.73 ug/l	0.189 ug/l	2.17 ug/l	43.5 ug/l	ND	2.13 ug/l	0.0936 ug/l	0.89 ug/l	3.39 ug/l	0.39 ug/l	0.21 ug/l	147. ug/l
77	8/19/2021	Effluent	0.38 ug/l	0.032 ug/l	0.62 ug/l	2.78 ug/l	ND	0.685 ug/l	0.001 ug/l	0.47 ug/l	1.64 ug/l	0.2 ug/l	0.014 ug/l	91.6 ug/l
78	8/18/2021	Prim._Clar.	0.8 ug/l	0.201 ug/l	1.61 ug/l	41. ug/l	ND	1.87 ug/l	0.095 ug/l	1.53 ug/l	3.78 ug/l	0.25 ug/l	0.236 ug/l	167. ug/l
79	8/19/21 6737ASLG	Sludge	2.38 mg/kg	9.09 mg/kg	20.1 mg/kg			20.2 mg/kg		6.58 mg/kg	17. mg/kg	7.76 mg/kg	3.31 mg/kg	760. mg/kg
80		Sludge Wet												
81	Aqueous	ML/RL												
82	Sludge	ML/RL												
83	Primary Removal Rate:		Can't Do	Can't Do	25.81%	5.75%	Can't Do	12.21%	Can't Do	Can't Do	Can't Do	35.90%	Can't Do	Can't Do
84	Overall Removal Rate		47.95%	83.07%	71.43%	93.61%	Can't Do	67.84%	98.92%	47.19%	51.62%	48.72%	93.33%	37.69%
85														
86	**SAMPLE 7**													
87	Date:	LOCATION	Arsenic (T)	Cadmium	Chrome (T)	Copper	Cyanide	Lead	Mercury	Molybdenum	Nickel	Selenium	Silver	Zinc
88	8/19/2021	Influent	0.67 ug/l	0.182 ug/l	4.87 ug/l	36. ug/l	ND	2.51 ug/l	0.306 ug/l	1.01 ug/l	3.22 ug/l	0.63 ug/l	0.228 ug/l	161. ug/l
89	8/20/2021	Effluent	0.37 ug/l	0.027 ug/l	4.49 ug/l	2.42 ug/l	ND	0.606 ug/l	0.0012 ug/l	0.39 ug/l	1.77 ug/l	0.18 ug/l	0.02 ug/l	91.8 ug/l
90	8/19/2021	Prim._Clar.	0.68 ug/l	0.169 ug/l	1.7 ug/l	32.5 ug/l	ND	1.6 ug/l	0.0539 ug/l	1.29 ug/l	3.25 ug/l	0.3 ug/l	0.2 ug/l	135. ug/l
91		Sludge												
92		Sludge Wet												
93	Aqueous	ML/RL												
94	Sludge	ML/RL												
95	Primary Removal Rate:		Can't Do	7.14%	65.09%	9.72%	Can't Do	36.25%	82.39%	Can't Do	Can't Do	52.38%	12.28%	16.15%
96	Overall Removal Rate		44.78%	85.16%	7.80%	93.28%	Can't Do	75.86%	99.61%	61.39%	45.03%	71.43%	91.23%	42.98%
97														

Appendix C
Oregon Department of Environmental Quality
Local Limits Workbook

Enter General POTW Information in the Yellow Shaded Areas

The spreadsheet will automatically calculate removal efficiencies when the user enters influent/effluent data. If the user desires to override these calculations (e.g., to enter literature values for removal efficiencies), then these removal efficiencies should be entered in the turquoise columns.

Average Pollutant Concentrations									Removal Efficiencies (Percent of pollutant removed)			Industrial Contributary Flow (mgd)	Safety Factor + Growth Allowance Factor (Percent)
Pollutant	POTW Influent (mg/L)	Primary Effluent (mg/L)	Secondary Effluent (mg/L)	Final Effluent (mg/L)	Effluent Coefficient of Variation	Non-Industrial (mg/L)	Sludge To Digester (mg/L)	Biosolids To Disposal (mg/kg)	Through Primary	Through Secondary	Overall POTW		
Antimony													
Arsenic	0.00062	0.000664		0.000359	0.6	0.00062		2.45	6.79		42.10	0.122	11
Barium													
Cadmium	0.000231	0.0002		0.000037	0.6	0.000231		5.25	13.42		83.98	0.122	11
Chromium	0.002157	0.001499		0.001171	0.6	0.002157		18.45	30.51		45.71	0.122	11
Copper	0.033943	0.034971		0.003336	0.6	0.033943			10.83		90.17	0.122	11
Cyanide	0.00002	0.00002		0.00002	0.06	0.00002			27.00		41.00	0.122	11
Iron												0.122	11
Lead	0.001853	0.001761		0.000653	0.6	0.001853		16.55	4.96		64.76	0.122	11
Mercury	0.000412	0.000091		0.000017	0.6	0.000412			77.91		95.87	0.122	11
Molybdenum	0.000876	0.001163		0.000433	0.6	0.000876		6.47	10.00		50.57	0.122	11
Nickel	0.002734	0.002976		0.001601	0.6	0.002734		15.75	14.00		41.44	0.122	11
Selenium	0.000427	0.000386		0.000209	0.6	0.000427		6.66	9.60		51.05	0.122	11
Silver	0.000197	0.000233		0.000023	0.6	0.000197		3.26	12.28		88.32	0.122	11
Thallium												0.122	11
Zinc	0.140429	0.149857		0.085971	0.6	0.140429		854.5	14.47		38.78	0.122	11

Flow Information		Sludge Information		udge Land Application Informati	
POTW Flow (mgd)	1.17	Flow to Digester (mgd)	0.0176	Site Use Duration (years)	
Industrial Flow (mgd)	0.122	Flow to Disposal (mgd)	0.00195	Site Area (acres)	
Non-Industrial Flow (mgd)	1.048	Percent Solids to Disposal	18	Compost? Y/N	

POTW Name: Hood River Wasrewater Treatment Plant

POTW Contact: Alex Rodriguez

Enter Pass-Through Information in the Yellow Shaded Areas

Pollutant	NPDES Permit Limit (µg/L)	Receiving Stream Background (µg/L)	RPA Workbook Daily Maximum Permit Limit (µg/L) (Aquatic Toxicity)	RPA Workbook Daily Maximum Permit Limit (µg/L) (Human Health)	Pass Through Allowable Loading (lbs/day)
Antimony					#VALUE!
Arsenic		1.29	3482.6575		58.6894
Barium					#VALUE!
Cadmium		0.028	18.7344		1.1413
Chromium		0.24	3389.9193		60.9305
Copper		1.49	82.9130		8.2319
Cyanide			316.7902		5.2393
Iron			108000.0000		#VALUE!
Lead		0.208	132.0155		3.6554
Mercury		0.00273	1.1302		0.2673
Molybdenum		0.76	NA		NA
Nickel		0.38	2734.3642		45.5633
Selenium		0.42	129.0695		2.5731
Silver		0.004	9.8532		0.8235
Thallium					#VALUE!
Zinc		3.11	654.7813		10.4365

Dilution Information (From Mixing Zone Study)		Water Hardness Information	
RMZ Dilution Factor at 7Q10 Flow	108	Stream Hardness (mg/L)	55
ZID Dilution Factor at 1Q10 Flow	**15**	Effluent Hardness (mg/L)	
RMZ Dilution Factor at Harmonic Mean Flow		Hardness at RMZ at 7Q10 Flo	54.5
RMZ Dilution Factor at 30Q5 Flow		Hardness at ZID at 1Q10 Flow	51.3

Note: Make sure that dilution *factors* are entered above. Dilution *factors* and dilution *ratios* are derived from mixing zone studies or modeling. A dilution *factor* equals the sum of the upstream river flow and the effluent flow divided by the effluent flow. A dilution r*atio* equals the upstream river flow divided by the effluent flow. Thus, a dilution *factor* equals the dilution *ratio* + 1. This workbook uses dilution *factors* in the calculations.

Enter Inhibition Concentrations (in mg/L) in the Yellow Shaded Areas

Pollutant	Secondary Processes				Tertiary Processes			Sludge Digestion Processes			Inhibition Allowable Loading (lbs/day)
	Activated Sludge	Nitrification	Other Secondary	Allowable Loading (lbs/day)	Tertiary Processes	Other Tertiary	Allowable Loading (lbs/day)	Anaerobic Digester	Other Digestion	Allowable Loading (lbs/day)	
Antimony											
Arsenic	0.1			1.0469				1.6		0.5579	0.5579
Barium											
Cadmium	5			56.3513				20		3.4956	3.4956
Chromium	50			702.0539				130		41.7441	41.7441
Copper	1			10.9429				40		6.5113	6.5113
Cyanide	2.5			33.4171				4		1.4320	1.4320
Iron											
Lead	3			30.8027				340		77.0640	30.8027
Mercury	0.5			22.0891							22.0891
Molybdenum											
Nickel	3			34.0388				10		3.5420	3.5420
Selenium											
Silver								13		2.1604	2.1604
Thallium											
Zinc	5			57.043143				400		151.4028	57.0431

Enter Sludge Quality Information in the Yellow Shaded Areas

Pollutant	Standard From 40 CFR Part 503 Table 1 or Table 3 (mg/kg)	AnnualApplication Rate Limit (kg/hectare/year)	Disposal Limit Based on Annual Application Rate (mg/kg)	Cumulative Application Rate Limit (kg/hectare)	Disposal Limit Based on Cumulative Application Rate (mg/kg)	Overall Sludge Disposal Criterion (mg/kg)	Sludge Quality Allowable Loading (lbs/day)
Antimony							
Arsenic	41					41	0.2851
Barium							
Cadmium	39					39	0.1359
Chromium							
Copper	1500					1500	4.8696
Cyanide							
Iron							
Lead	300					300	1.3561
Mercury	17					17	0.0519
Molybdenum	75					75	0.4341
Nickel	420					420	2.9668
Selenium	100					100	0.5734
Silver							
Thallium							
Zinc	2800					2800	21.1362

40 CFR Part 503

Standards for the

Use or Disposal of

Sewage Sludge

========>

Pollutant	Table1 Ceiling Concentrations (mg/kg)	Table 2 Cumulative Loading Rates (kg/hectare)	Table 3 Clean Sludge (mg/kg)	Table 4 Annual Loading Rates (kg/hectare/year)
Arsenic	75	41	41	2.0
Cadmium	85	39	39	1.9
Chromium				
Copper	4300	1500	1500	75
Cyanide				
Lead	840	300	300	15
Mercury	57	17	17	0.85
Molybdenum	75			
Nickel	420	420	420	21
Selenium	100	100	100	5.0
Silver				
Zinc	7500	2800	2800	140

Allocation of Maximum Allowable Headworks Loadings

						Local Limit (mg/L)	
Pollutant	Maximum Allowable Headworks Loading (lbs/day)	Basis of Maximum Allowable Headworks Loading	Safety Factor (lbs/day)	Actual Uncontrollable Loading (lbs/day)	Maximum Allowable Industrial Loading (lbs/day)	Using Total Industrial Flow	Using Industrial Contributary Flow
Antimony	#VALUE!	#VALUE!					
Arsenic	0.2851	Sludge Quality	0.0314	0.0054	0.2483	0.2441	0.2441
Barium	#VALUE!	#VALUE!					
Cadmium	0.1359	Sludge Quality	0.0150	0.0020	0.1190	0.1169	0.1169
Chromium	41.7441	Inhibition	4.5919	0.0189	37.1334	36.4955	36.4955
Copper	4.8696	Sludge Quality	0.5357	0.2967	4.0373	3.9679	3.9679
Cyanide	1.4320	Inhibition	0.1575	0.0002	1.2743	1.2524	1.2524
Iron	#VALUE!	#VALUE!					#VALUE!
Lead	1.3561	Sludge Quality	0.1492	0.0162	1.1907	1.1703	1.1703
Mercury	0.0519	Sludge Quality	0.0057	0.0036	0.0426	0.0419	0.0419
Molybdenum	0.4341	Sludge Quality	0.0478	0.0077	0.3787	0.3722	0.3722
Nickel	2.9668	Sludge Quality	0.3264	0.0239	2.6166	2.5716	2.5716
Selenium	0.5734	Sludge Quality	0.0631	0.0037	0.5066	0.4979	0.4979
Silver	0.8235	Pass Through	0.0906	0.0017	0.7312	0.7186	0.7186
Thallium	#VALUE!	#VALUE!					#VALUE!
Zinc	10.4365	Pass Through	1.1480	1.2274	8.0611	7.9226	7.9226

Appendix D
Long-hand Calculation of Arsenic Local Limits

Hood River

Long Hand Calculation of Local Limit - Arsenic

Allowable Headwork Loading (AHL) Based on Protection of Water Quality

Acute WQS, Chronic WQS, PRWQSR, and NPDES Permit Limits

POTWs are required to prohibit nondomestic user discharges in amounts that result in violation of Water Quality Standards and/or NPDES Limits.

Federal WQ criteria are found at: http://water.epa.gov/scitech/swguidance/standards/criteria/current/index.cfm
Oregon WQS are found at: https://www.epa.gov/wqs-tech/water-quality-standards-regulations-oregon#state
NPDES Limits are found in NPDES Permit # OR0020524
Where a dilution factor has been approved, the factor applies to the Water Quality Standards but not to NPDES limits.
Dilution factors applied are derived from: NPDES Permit

Use Federal	Y or N
	N

Hardness Utilized: 55

Arsenic

				Dissolved to Total Conversion Factor (CF)
Federal WQS Acute =		NA	µg/L	1.00
Federal WQS Chronic =		NA	µg/L	1.00
Oregon	Acute = 340	340.0	µg/L	1.00
Oregon	Chronic = 150	150.0	µg/L	1.00
	HH = 2.1	2.1	µg/L	1.00
	NPDES = NA	NA	µg/L	1.00

The Allowable Headworks Loadings in Table A are calculated using the following equation:

$$Lwqs = \frac{(8.34)(Ccrit)(Qpotw * \text{Dilution Factor})}{(1\text{-}Rpotw)}$$

Where:

Lwqs = Maximum allowable headworks loading (lbs/day) based on NPDES permit limits or Water Quality Criteria (NPDES effluent limits or WQ criteria expressed as mg/L)
Ccrit= (POTW average flow in mgd)
Qpotw= (1 is equivalent to no dilution factor)
Dilution Factor = (Overall Removal Factor as a decimal)
Rpotw =

Table A

Federal Acute	Federal Chronic	OR Acute	OR Chronic	HH	NPDES
Arsenic	Arsenic	Arsenic	Arsenic	Arsenic	Arsenic
		0.340	0.150	0.002	
1.17	1.17	1.17	1.17	1.17	1.17
14.00	107.00	14.00	107.00	126.00	1.00
41.7%	41.7%	41.7%	41.7%	41.7%	41.7%
Water Quality Based AHLs		lb/d			
		79.64	268.54	4.43	

Arsenic

Calculation of most Stringent WQS AHL

$$Lwqs = \frac{(8.34 \text{ lb/gal} \times 0.00210 \text{ mg/L} \times 1.17 \text{ mgd} \times 126 :1)}{1 - 0.4168} = 4.43 \text{ lb/d}$$

Hood River

Long Hand Calculation of Local Limit - Arsenic

Allowable Headwork Loading (AHL) Based on Sludge Criteria **Arsenic**

Maximum headwork loadings to protect sludge quality are derived based on criteria found in 40 CFR 503 in Table 3
The Allowable Headworks Loading in Table B are calculated using the following equation:

$$Lin = \frac{(8.34)(Cslcrit)(SGsldg)(PS/100)(Qsldg)}{Rpotw}$$

Where:

Lin = Allowable Headwork Pounds per Day
Cslcrit = Limiting sludge criteria (mg/kg)(Table 3)
SGsldg = Specific Gravity of the Sludge kg/L
PS = Percent solids in the sludge to disposal (%)
Qsldg = Sludge flow to disposal (mgd)
Rpotw = POTW removal efficiency (as a decimal)

The daily sludge flow and percent solids is not available
Values used are based on standard design estimation methods.

Table B

40 CFR 503 Pollutant	Table 3 Clean Sludge (mg/kg)	Table 1 Ceiling Sludge (mg/kg)
Arsenic	41	75
Cadmium	39	85
Chromium	NA	NA
Copper	1500	4300
Cyanide	NA	NA
Lead	300	840
Mercury	17	57
Molybdenum	NA	75
Nickel	420	420
Selenium	100	100
Silver	NA	NA
Zinc	2800	

Arsenic
41
1
2.0
0.017
41.7%

Sludge Quality Based AHL
0.285 lb/d

Arsenic

$$Lin = \frac{(8.34 \text{ lb/g} \times 41 \text{ mg/L} \times 1 \text{ kg/L} \times 2.00\% \text{ solids} \times 0.017 \text{ mgd} =}{0.4168} = .285 \text{ lb/d}$$

Hood River

Long Hand Calculation of Local Limit - Arsenic

Allowable Headwork Loading (AHL) Based On Inhibition **Arsenic**

Literature Values for inhibition are found in Appendix G of the EPA Local Limits Guidance 2004.
The criteria used to calculate inhibition are shown in Table C for: Activated Waste
The following equation was used to derive the allowable headwork loadings shown in Table C.

For Secondary Treatment Inhibition the equation is:

$$Linhib2 = \frac{(8.34)(Ccrit)(Qpotw)}{(1-Rprim)}$$

Where:

Linhib2 = Maximum allowable headworks loading (lbs/d) based on inhibition of secondary process
Ccrit = Inhibition level (mg/L) for Activated Sludge
Rprim = Primary removal efficiency as a decimal, (if no primary - zero)
Qpotw = POTW average flow

Note: When a range has been indicated the low range value has been selected.

Table C

Pollutant	Inhibition Secondary Activated Sludge	Nitrogen Inhibition
Arsenic	0.1	1.5
Cadmium	1-10	5.2
Chromium	1-100	.25-1.9
Copper	1	.05-.48
Cyanide	0.1-5	.34-.5
Lead	1.0-5.0	0.5
Mercury	0.1-1	
Nickel	1.0-5.0	.25-.5
Selenium		
Silver		
Zinc	.3-10	.08-.5

Arsenic
0.1
6.8%
1.17

Arsenic

$$Linhib2 = \frac{(8.34\ lb/gal \times 0.10\ mg/L \times 1.17\ mgd)}{1 - 0.0679} = 1.05\ lb/d$$

Activated Waste Inhibition Based AHL
1.05 lb/d

For Anaerobic Inhibition the equation is:

Literature Values for inhibition are found in the EPA Local Limits Guidance 2004 Appendix G.
The criteria used to calculate inhibition are shown in Table D for: Anaerobic Digestion
The following equation was used to derive the allowable headwork loadings shown in Table D

$$Linhibdgstr = \frac{(8.34)*(Ccrit)(Qdig)}{Rpotw}$$

Where:

Linhibdgstr = Maximum allowable headworks loading (lbs/d) based on inhibition of Anaerobic Digestion
Ccrit = Inhibition level (mg/l) for Anaerobic Digestion
Qdig = Sludge flow to disposal (mgd)
Rpotw = POTW removal efficiency (as a decimal)

Table D

Pollutant	Inhibition Anaerobic Sludge
Arsenic	1.6
Cadmium	20
Chromium	130
Copper	40
Cyanide	4
Lead	340
Mercury	NA
Nickel	10
Selenium	NA
Silver	13
Zinc	400

Arsenic
1.6
0.0174
41.68%

Arsenic

$$Linhibdgstr = \frac{(8.34\ lb/gal \times 1.6\ mg/L \times 0.017\ MGD)}{41.68\%} = 0.557\ lb/d$$

Anaerobic Digestion Based AHL
0.557 lb/d

Hood River
Long Hand Calculation of Local Limit - Arsenic

Arsenic

Selection of Lowest AHL Representing Maximum Allowable Headworks Loading (MAHL)

The smallest of the above calculated values is selected as the MAHL.

Selection of MAHL lb/d										
	Federal Acute	Federal Chronic	OR Acute	OR Chronic	LA HH	NPDES	Sludge Quality	Secondary Inhibition	Anaerobic Inhibition	Maximum Allowable Headworks Loading (MAHL)
Arsenic			79.64	268.54	4.43		0.285	1.05	0.5570578	0.285

Calculation of the Maximum Allowable Industrial Loading (MAIL)

The domestic (uncontrollable) sources and a safety/growth factor are subtracted from the MAHL to calculate the MAIL as follows:

$$MAIL = (MAHL)(1\text{-}SF) - L_{unc})$$

Where:

MAIL = Maximum available industrial loading, lbs/day

	Arsenic
MAHL = Maximum allowable headworks loading, lbs/day	0.285
SF = Safety and Growth factor, as a decimal	11%
L_{unc} = Loadings from uncontrolled sources	0.005

Using conservative approach L_{unc} has been established using (domestic flow =average plant influent-permitted industrial flow) and average influent concentration as follows:

L_{unc} = (average Influent concentration in mg/L)(average domestic flow to POTW)(8.34)

lb/d) X (1 -

Arsenic

L_{unc} = 0.62 ug/L./1000ug/mg X 1.05 mgd X 8.34) = 0.005 lb/d

MAIL = (0.285 lb/d X (1 - 11%) - 0.005418998 lb/d) = 0.249 lb/d

Hood River
Long Hand Calculation of Local Limit - Arsenic

Calculation of Industrial Local Limit mg/l using Uniform Allocation Method

The uniform allocation method divides the MAIL by the industrial flow and a factor of 8.34 to convert to a concentration based limit using the following equation:

$$\text{Local Limit} = \frac{\text{MAIL lb/d}}{(8.34 \times Q_i)}$$

Q_i = Total Industrial Flow, mgd | 0.122 mgd

Arsenic

Arsenic Local Limit = 0.249 lb/d divided by (8.34 X 0.122 MGD) = **0.244 mg/L**

Appendix E
Oregon Water Quality Standards at 55 mg/L Hardness

OAR 340-041-8033
Table 30
Aquatic Life Water Quality Criteria for Toxic Pollutants

The concentration for each compound listed in Table 30 is a criterion established for waters of the state in order to protect aquatic life. The aquatic life criteria apply to waterbodies where the protection of fish and aquatic life is a designated use. All values are expressed as micrograms per liter (µg/L). Compounds are listed in alphabetical order with the corresponding information: the Chemical Abstract Service (CAS) number, whether there is a human health criterion for the pollutant (i.e. "y"= yes, "n" = no), and the associated aquatic life freshwater and saltwater acute and chronic criteria. *Italicized* pollutants are not identified as priority pollutants by EPA. Dashes in the table column indicate that there is no aquatic life criterion.

Unless otherwise noted in the table below, the acute criterion is the Criterion Maximum Concentration (CMC) applied as a one-hour average concentration, and the chronic criterion is the Criterion Continuous Concentration (CCC) applied as a 96-hour (4 days) average concentration. The CMC and CCC criteria may not be exceeded more than once every three years. Footnote A, associated with eleven pesticide pollutants in Table 30, describes the exception to the frequency and duration of the toxics criteria stated in this paragraph.

No.	Pollutant	CAS Number	Human Health Criterion	Freshwater (µg/L)		Saltwater (µg/L)	
				Acute Criterion (CMC)	Chronic Criterion (CCC)	Acute Criterion (CMC)	Chronic Criterion (CCC)
4	Arsenic	7440382	y	340 [C, D]	150 [C, D]	69 [C, D]	36 [C, D]
[C] *Criterion is expressed in terms of "dissolved" concentrations in the water column.* [D] *Criterion is applied as total inorganic arsenic (i.e. arsenic (III) + arsenic (V)).*							
14	Cyanide	57125	y	22 [J]	5.2 [J]	1 [J]	1 [J]
[J] *This criterion is expressed as µg free cyanide (CN)/L.*							
28	Mercury (total)	7439976	n	2.4	0.012	2.1	0.025
36	Selenium	7782492	y	*See* **C , L**	4.6 [C]	290 [C]	71 [C]
[C] *Criterion is expressed in terms of "dissolved" concentrations in the water column.* [L] *The CMC=(1/[(f1/CMC1)+(f2/CMC2)]µg/L) * CF where f1 and f2 are the fractions of total selenium that are treated as selenite and selenate, respectively, and CMC1 and CMC2 are 185.9 µg/L and 12.82 µg/L, respectively. See expanded endnote F for the Conversion Factor (CF) for selenium.*							
37	Silver	7440224	n	*See* **C , F**	0.10 [C]	1.9 [C]	--
[C] *Criterion is expressed in terms of "dissolved" concentrations in the water column.* [F] *The freshwater acute criterion for this metal is expressed as a function of hardness (mg/L) in the water column. To calculate the criterion, use formula under expanded endnote F at bottom of Table 30.*							

OAR 340-041-8033
Table 30
Aquatic Life Water Quality Criteria for Toxic Pollutants

Endnote E: Equation for Hardness-Dependent Freshwater Cadmium Acute Criteria

The freshwater criterion for this metal is expressed as total recoverable with two significant figures, and is a function of hardness (mg/L) in the water column. Criteria values based on hardness are calculated using the following formula (CMC refers to the acute criterion):

$$\mathbf{CMC} = (\exp(m_A*[\ln(\text{hardness})] + b_A))$$

Chemical	m_A	b_A	m_C	b_C
Cadmium	1.128	-3.828	N/A	N/A

Endnote F: Equations for Hardness-Dependent Freshwater Metals Criteria and Conversion Factor Table

The freshwater criterion for this metal is expressed as dissolved with two significant figures, and is a function of hardness (mg/L) in the water column. Criteria values based on hardness are calculated using the following formulas (CMC refers to the acute criterion; CCC refers to the chronic criterion):

$$\mathbf{CMC} = (\exp(m_A*[\ln(\text{hardness})] + b_A))*CF$$

$$\mathbf{CCC} = (\exp(m_C*[\ln(\text{hardness})] + b_C))*CF$$

"CF" is the conversion factor used for converting a metal criterion expressed as the total recoverable fraction in the water column to a criterion expressed as the dissolved fraction in the water column.

Chemical	m_A	b_A	m_C	b_C
Cadmium	N/A	N/A	0.7409	-4.719
Chromium III	0.8190	3.7256	0.8190	0.6848
Lead	1.273	-1.460	1.273	-4.705
Nickel	0.8460	2.255	0.8460	0.0584
Silver	1.72	-6.59	--	--
Zinc	0.8473	0.884	0.8473	0.884

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Table 30
Aquatic Life Water Quality Criteria for Toxic Pollutants

The conversion factors (CF) below must be used in the equations above for the hardness-dependent metals in order to convert total recoverable metals criteria to dissolved metals criteria. For metals that are not hardness-dependent (i.e. arsenic, chromium VI, selenium, and silver (chronic)), or are saltwater criteria, the criterion value associated with the metal in Table 30 already reflects a dissolved criterion based on its conversion factor below.

Conversion Factor (CF) Table for Dissolved Metals

Chemical	Freshwater		Saltwater	
	Acute	Chronic	Acute	Chronic
Arsenic	1.000	1.000	1.000	1.000
Cadmium	N/A	1.101672-[(ln hardness)(0.041838)]	0.994	0.994
Chromium III	0.316	0.860	--	--
Chromium VI	0.982	0.962	0.993	0.993
Copper	N/A	N/A	0.83	0.83
Lead	1.46203-[(ln hardness)(0.145712)]	1.46203-[(ln hardness)(0.145712)]	0.951	0.951
Nickel	0.998	0.997	0.990	0.990
Selenium	0.996	0.922	0.998	0.998
Silver	0.85	0.85	0.85	--
Zinc	0.978	0.986	0.946	0.946

OAR 340-041-8033
TABLE 31
Aquatic Life Water Quality Guidance Values for Toxic Pollutants

Effective April 18, 2014

Water Quality Guidance Values Summary [A]

The concentration for each compound listed in Table 31 is a guidance value that DEQ may use in application of Oregon's Toxic Substances Narrative (340-041-0033(2)) to waters of the state in order to protect aquatic life. All values are expressed as micrograms per liter (µg/L) except where noted. Compounds are listed in alphabetical order with the corresponding EPA number (from National Recommended Water Quality Criteria: 2002, EPA-822-R-02-047), corresponding Chemical Abstract Service (CAS) number, aquatic life freshwater acute and chronic guidance values, and aquatic life saltwater acute and chronic guidance values.

1	Antimony	7440360	9,000	1,600		

State of Oregon Department of Environmental Quality

OAR 340-041-8033 TABLE 40 Human Health Water Quality Criteria for Toxic Pollutants

Effective April 18, 2014

Human Health Criteria Summary

The concentration for each pollutant listed in Table 40 was derived to protect Oregonians from potential adverse health impacts associated with long-term exposure to toxic substances associated with consumption of fish, shellfish, and water. The "organism only" criteria are established to protect fish and shellfish consumption and apply to waters of the state designated for fishing. The "water + organism" criteria are established to protect the consumption of drinking water, fish, and shellfish, and apply where both fishing and domestic water supply (public and private) are designated uses. All criteria are expressed as micrograms per liter (µg/L), unless otherwise noted. Pollutants are listed in alphabetical order. Additional information includes the Chemical Abstract Service (CAS) number, whether the criterion is based on carcinogenic effects (can cause cancer in humans), and whether there is an aquatic life criterion for the pollutant (i.e. "y"= yes, "n" = no). All the human health criteria were calculated using a fish consumption rate of 175 grams per day unless otherwise noted. A fish consumption rate of 175 grams per day is approximately equal to 23 8-ounce fish meals per month. For pollutants categorized as carcinogens, values represent a cancer risk of one additional case of cancer in one million people (i.e. 10^{-6}), unless otherwise noted. All metals criteria are for total metal concentration, unless otherwise noted. Italicized pollutants represent non-priority pollutants. The human health criteria revisions established by OAR 340-041-0033 and shown in Table 40 do not become applicable for purposes of ORS chapter 468B or the federal Clean Water Act until approved by EPA pursuant to 40 CFR 131.21 (4/27/2000).

OAR 340-041-8033
Table 40
Human Health Water Quality Criteria for Toxic Pollutants

No.	Pollutant	CAS Number	Carcinogen	Aquatic Life Criterion	Human Health Criteria for the Consumption of:	
					Water + Organism (µg/L)	Organism Only (µg/L)
6	Antimony	7440360	n	n	5.1	64
7	Arsenic (inorganic) [A]	7440382	y	y	2.1	2.1(freshwater) 1.0 (saltwater)
34	Copper [F]	7440508	n	y	1300	--
[F] *Human health risks from copper are primarily from drinking water, therefore no "organism only" criterion was developed. The "water + organism" criterion is based on the Maximum Contaminant Level (MCL) established under the Safe Drinking Water Act.*						
35	Cyanide [G]	57125	n	y	130	130
85	Nickel	7440020	n	y	140	170
100	Selenium	7782492	n	y	120	420
113	Zinc	7440666	n	y	2100	2600

Federal vs Oregon WQC at Hood River Receiving Stream Hardness

Hardness = 55 **Ln Hardenss = 4.00733319**

		Acute Dissolved	CF	Acute Total	Chronic	CF	Chronic Total	HH
Antimony	Federal	9,000. ug/l		9,000. ug/l	1,600. ug/l		1,600. ug/l	14. ug/l
	Oregon	9,000. ug/l			1,600. ug/l			5.1 ug/l
Arsenic	Federal	360. ug/l		360. ug/l	190. ug/l		190. ug/l	NA
	Oregon	340. ug/l	1	340. ug/l	150. ug/l	1	150. ug/l	2.1 ug/l
CADMIUM	Federal	1.998 ug/l	1	1.936 ug/l	0.78 ug/l	0.88	0.663 ug/l	NA
	Oregon	1.224 ug/l	NA	#VALUE!	0.174 ug/l	0.9340132	0.162 ug/l	
Chromium	Federal	176.3104277	0.32	550.97 ug/l	109.091 ug/l	0.86	126.85 ug/l	
	Oregon	563. ug/l	0.982	552.862 ug/l	52.816 ug/l	0.962	50.809 ug/l	1,300. ug/l
Copper	Federal	10.1 ug/l	0.96	10.512 ug/l	7.094 ug/l	0.96	7.39 ug/l	NA
	Oregon	See Ligand Model		#VALUE!			0. ug/l	
Cyanide	Federal	22			5.2 ug/l			700. ug/l
	Oregon	22		0. ug/l	5.2 ug/l		0. ug/l	130. ug/l
Lead	Federal	38.14272881	0.99	38.528 ug/l	1.486 ug/l	0.99	1.501 ug/l	NA
	Oregon	25.6 ug/l	-0.009382517	(0.2 neg!)	1.486 ug/l	-0.369802	(0.5 neg!)	
Mercury	Federal	2.470588235			0.012 ug/l			0.14 ug/l
	Oregon	2.4		0. ug/l	0.012 ug/l		0. ug/l	
Molybdenum	Federal	NA			NA			NA
	Oregon	NA		NA	NA		NA	
Nickel	Federal	855.258596		853.548 ug/l	95.079 ug/l			610. ug/l
	Oregon	199.9 ug/l	0.998	199.523 ug/l	31.456 ug/l	0.997	31.362 ug/l	140. ug/l
Selenium	Federal	20			5. ug/l			170. ug/l
	Oregon		0.996	0. ug/l	4.6 ug/l	0.922	4.241 ug/l	120. ug/l
Silver	Federal	1.451522606			NA			NA
	Oregon	0.012	0.85	0.01 ug/l	0.1 ug/l	0.85	0.085 ug/l	
Zinc	Federal	70.51415063			63.868 ug/l			NA
	Oregon	63.1 ug/l	0.978	61.694 ug/l	63.081 ug/l	0.986	62.198 ug/l	2,100. ug/l

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Appendix F
Significant Industrial User Test Data for POCs (2021)

Full Sail Brewing Company

SUMMARY DATA		Arsenic (T)	Cadmium	Chrome (T)	Copper	Cyanide	Lead	Mercury	Molybdenum	Nickel	Selenium	Silver	Zinc
Ave. Industry Concentration.		2.405 ug/L	0.037 ug/L	2.640 ug/L	23.650 ug/L	ND	2.910 ug/L	0.001 ug/L	2.430 ug/L	3.075 ug/L	1.110 ug/L	0.027 ug/L	66.350 ug/L
8/17/2021	Influent	2.75 ug/l	0.047 ug/l	2.83 ug/l	20.7 ug/l		2.56 ug/l	0.0008 ug/l	2.19 ug/l	3.81 ug/l	1.51 ug/l	0.029 ug/l	93.1 ug/l
8/18/2021	Influent	2.06 ug/l	0.027 ug/l	2.45 ug/l	26.6 ug/l		3.26 ug/l	0.0006 ug/l	2.67 ug/l	2.34 ug/l	0.71 ug/l	0.024 ug/l	39.6 ug/l

Hood River Juice Company

SUMMARY DATA		Arsenic (T)	Cadmium	Chrome (T)	Copper	Cyanide	Lead	Mercury	Molybdenum	Nickel	Selenium	Silver	Zinc
Ave. Industry Concentration.		1.550 ug/L	0.049 ug/L	3.280 ug/L	10.330 ug/L	ND	0.394 ug/L	0.000 ug/L	0.125 ug/L	2.275 ug/L	0.520 ug/L	0.030 ug/L	27.750 ug/L
8/17/2021	Influent	1.44 ug/l	0.027 ug/l	2.32 ug/l	3.96 ug/l		0.164 ug/l	0. ug/l	0.17 ug/l	0.91 ug/l	0.11 ug/l	0.039 ug/l	11.1 ug/l
8/18/2021	Influent	1.66 ug/l	0.07 ug/l	4.24 ug/l	16.7 ug/l		0.624 ug/l	0.0004 ug/l	0.08 ug/l	3.64 ug/l	0.93 ug/l	0.021 ug/l	44.4 ug/l

pFriem Family Brewers

SUMMARY DATA		Arsenic (T)	Cadmium	Chrome (T)	Copper	Cyanide	Lead	Mercury	Molybdenum	Nickel	Selenium	Silver	Zinc
Ave. Industry Concentration.		8.640 ug/L	0.461 ug/L	2.095 ug/L	34.950 ug/L	ND	0.402 ug/L	0.001 ug/L	1.500 ug/L	2.715 ug/L	1.450 ug/L	0.041 ug/L	89.300 ug/L
8/17/2021	Influent	10.9 ug/l	0.602 ug/l	2.26 ug/l	41.8 ug/l		0.342 ug/l	0.0015 ug/l	1.86 ug/l	2.36 ug/l	1.63 ug/l	0.053 ug/l	98.9 ug/l
8/18/2021	Influent	6.38 ug/l	0.319 ug/l	1.93 ug/l	28.1 ug/l		0.461 ug/l	0.0011 ug/l	1.14 ug/l	3.07 ug/l	1.27 ug/l	0.029 ug/l	79.7 ug/l

Turtle Island Foods

SUMMARY DATA		Arsenic (T)	Cadmium	Chrome (T)	Copper	Cyanide	Lead	Mercury	Molybdenum	Nickel	Selenium	Silver	Zinc
Ave. Industry Concentration.		0.575 ug/L	0.049 ug/L	6.290 ug/L	28.200 ug/L	ND	1.107 ug/L	0.000 ug/L	3.560 ug/L	13.750 ug/L	0.440 ug/L	0.023 ug/L	59.900 ug/L
8/17/2021	Influent	0.34 ug/l	0.035 ug/l	5.16 ug/l	29.8 ug/l		0.773 ug/l	0.0007 ug/l	3.63 ug/l	11.6 ug/l	0.27 ug/l	0.024 ug/l	41.4 ug/l
8/18/2021	Influent	0.81 ug/l	0.063 ug/l	7.42 ug/l	26.6 ug/l		1.44 ug/l	0.0003 ug/l	3.49 ug/l	15.9 ug/l	0.61 ug/l	0.022 ug/l	78.4 ug/l

Appendix G
Procedures for Performance-based BOD, TSS, and Flow Limits

Appendix G. Procedures for Performance-based BOD, TSS, and Flow Limits

Limits for conventional pollutants such as, but limited to 5-day biochemical oxygen demand (BOD), total suspended solids (TSS), and flow for a City's industries is often either not attempted or is based on continual attempts to provide the capacity requested by the industry. For jurisdictions that are successfully attracting economic growth, this can lead to over allocation and result in either inability to continue pursuit of economic growth or expensive upgrades to treatment plant capacity and usually both.

Establishing a rationale to establish limits that are both supportive of industry and at the same time best use available plant capacity is an important step. When a clear logic is used to establish limits, such limits become more enforceable and easier to defend. Limits that come from the federal or state regulations, Sewer Use Ordinance, or Categorical Limits are defensible by reference to other documentation. Some limits are defensible because they pass the "plain sense" test. These types of limits can be defended just because common sense supports the limit. For example, a limit on the amount of flammable vapors allowed in the collection system is common sense because of the inherent safety risk of explosion. For some parameters, a limit is desirable but neither the regulations approach nor "plain sense" approach are adequate. This appendix suggests two alternate approaches to limits development that should be used in conjunction with each other whenever the industrial loading has potential to affect compliance with discharge permit compliance.

Method 1 (Bank Account Method)

When the treatment plant is near capacity, the "Bank Account" method should be considered, although it should always be a consideration of conventional pollutant limits. The "Bank Account" method relies on three factors. The first is the treatment plants as built capacity (Maximum Allowable Headworks Loading) in mass. This method relies on existing infrastructure and engineering studies of their capability. Above this level, non-compliance will start to occur.

The second factor is the current total loading (CTL) at the plant. This mass value should be expressed as the average daily loading (CTL_a) and the maximum daily loading (CTL_m).

The third factor is also measured in mass units and consists of the industrial daily contribution (IDC). This should be looked at in several different ways. What is the current average of all of the industries combined (IDC_a)? What is the mass of the maximum reading that have occurred at each industry (IDC_m)? Finally, what is the permitted mass from all sources (IDC_p)?

For any give pollutant:

The current average industrial discharge subtracted from the current average load is the average domestic/commercial contribution (D/CC).

$$CTL_a - IDC_a = D/CC$$

The domestic/commercial contribution must then be subtracted from the as-built design capacity to obtain the current unadjusted Maximum Allowable Industrial Loading ($MAIL_g$).

$$MAHL - D/CC = MAIL_g$$

An additional percentage must usually be subtracted. This is to allow for City growth factor, which is chosen by the utility (5%). Additionally, another factor must be subtracted because most permits require that if the loading gets to a preset percent of design capacity, then the utility must begin to build additional treatment capacity. If the permit specifies 90% capacity, then this means 10% of the capacity must be subtracted. The results in the available $MAIL_a$:

$$MAIL_g - 5\% - 10\% = MAIL_a$$

The $MAIL_g$ is the total mass available to industry. This quantity can then be compared to a Bank Account where the owner has a certain amount to spend on capital improvements. Capacity is then assigned to industry. How this capacity is assigned is based on a number of factors. For example, how much does an industry need to continue operating? How much economic impact does the industry bring to the City?

Two other issues should be monitored, tracked, and documented using the data in this method.

First, total the highest value ever received by each individual industry; this is the IDC_m. The industry would contribute this amount if they all acted in concert and discharged their maximum amount simultaneously. Subtract the IDC_m from the $MAIL_g$. If the result is negative, then the current industrial base has potential to overload the treatment plant. Even plants that seem to have sufficient capacity will sometimes potentially cause a violation if industrial dischargers were to discharge in concert. Effective steps must be taken to control industry. Meaningful surcharges provide incentive to ensure that industries control discharges. Enforcement of permit limits is also helpful if the limits have been properly chosen based on plant capacity.

Second, add the permit limits for each industry; for those industries that do not have a mass limit, use the highest value ever received by each industry IDC_p. Subtract this amount from the $MAIL_g$. If the amount is negative, the utility has authorized more capacity than is available. If the plant becomes overloaded from industry acting in concert at their maximum permitted levels, there will be no legal recourse even if all of the industries have been properly monitored. In this situation, the limits for industries must be evaluated and modified to assure that adequate capacity is available.

Method 2 (Three Standard Deviation Model)

When the treatment plant is not near capacity or the permit writer is attempting to give more leeway to the industry, a second method to determine limits is the three standard deviation model. The theory of this method is that discharge of each pollutant during production will form a bell curve. Bell curves can then be analyzed using standard deviation. Figure G-1 shows a bell curve with 1, 2, and 3 standard deviations subtracted from the mean (average).

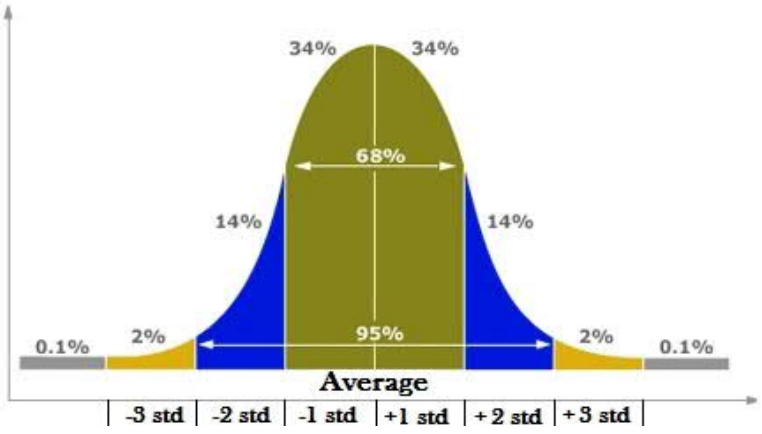


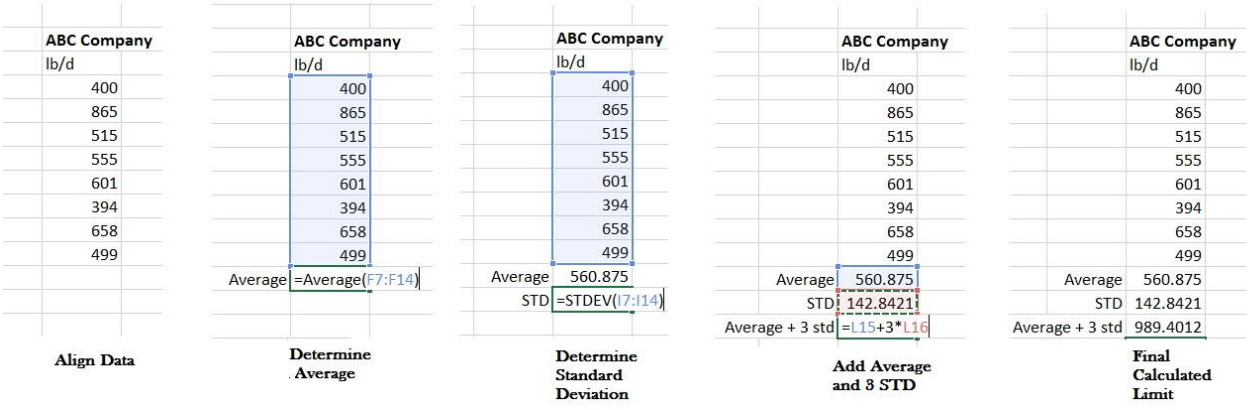
Figure G-1. Bell Curve with 1, 2, and 3 Standard Deviations Subtracted from the Mean (Average)

When applied to the performance of an industry, if three standard deviations are added to the industry's average discharge of a pollutant, there is only a 0.1% chance that the industry is performing normally. There is a 99.9% chance that the industry has not controlled their discharge or has had an abnormal event. If this results in too large of limit, two standard deviations can be used in which there is only a 2.1% chance that the industry is in control.

This method works best with parameters in which the industry already has been receiving a surcharge (such as BOD or TSS) or a parameter for which they are being charged (for example, flow) because the industry is already attempting to control their discharge. This method, however, may result in limits that are too high if the treatment plant is close to maximum capacity. The other issue is the data used. If the industry is only sampling during normal production (which is a requirement of the permit), then the data should be useful. If an industry decides to sample during low production, alters their production for the sampling, or otherwise does not take a representative sample, then the sample taken during that time will skew the results, usually to a lower limit. There must also be enough data; although 8 data points can be used, it is better to have more (ideally 20 or more).

The easiest way to calculate the average and the standard deviation is to use Excel. Table G-1 shows the steps.

Table G-1. Calculation of Average and Standard Deviation Using Excel



Appendix H
Definitions

Definitions

Allowable Headworks Loading (AHL)	The estimated maximum loading of a pollutant that can be received at a publicly owned treatment works (POTW) headworks that should not cause a POTW to violate a particular treatment plant or environmental criterion. AHLs are developed to prevent interference or pass through.
Applicable Criteria	A regulation or standard that must be considered in the development of a local limit.
Best Management Practice (BMP)	Schedules of activities, prohibitions of practices, maintenance procedures, and other management practices to prevent or reduce the pollution of Waters of the United States. BMPs also include treatment requirements, operating procedures, and practices to control plant site runoff, spillage or leaks, sludge or waste disposal, or drainage from raw material storage. (EPA definition)
Best Professional Judgment	Use of experience and technical expertise to determine a course of action for which a clear-cut direction is not available in statutory or research literature.
Biological Treatment	A treatment process that depends on use of microbiological processes to remove pollutants or render them to a less objectionable state.
Book Values	Numeric values that have been determined in research studies to apply to similar processes. Most information is taken from EPA's 2004 *Guidance Manual on Development of Local Limits* (EPA 833-R-04-002A). See also, *Reference Values*.
Categorical User	Industry subject to a category listed in 40 CFR 405-471. By definition, Categorical Users are also listed as Significant Industrial Users.
Chemical Treatment	A treatment process that uses a chemical reaction to reduce pollutants, make pollutants easier to treat, or render them less objectionable. An example includes pH adjustment.
Chemically Enhanced	The addition of chemicals to the waste stream to enhance the actions of a treatment process that is already present in the system.
Platinum-Cobalt (Pt-Co) Scale	The Platinum-Cobalt (Pt-Co) scale is a measure of color. It is a scale where each unit of the scale is defined as the color induced by dissolving 1 milligram per liter (mg/L) of platinum in water using cobalt platinate as the solute.
Composting	The process of adding vegetable matter and accelerating decomposition into a humus-like substance by various microorganisms, including bacteria, fungi, and actinomycetes, in the presence of oxygen. The resulting product is used for soil amendment.
Concurrent Sampling	Sampling conducted at the same time or with a lag period approximately equivalent to the time that the flow is resident in any portion of the system. Concurrent sampling estimates how any given characteristic changes as flow moves through the system.
Conservative Pollutant	Pollutants that are presumed not to be destroyed, biodegraded, chemically transformed, or volatilized within the publicly owned treatment works (POTW). Conservative pollutants introduced to a POTW ultimately exit the POTW solely through the POTW's effluent and sludge. Most metals are considered conservative pollutants.
Control Efficiency	The percent capture of a pollutant that is removed by a control measure installed specifically to remove that pollutant.

Criteria	A regulation or standard that may be applicable to the development of a local limit.
Design Capacity, Design Flow	The theoretical capacity based on engineering studies. Capacity is typically engineered into the original design. Changes to the system based on the system actually built after design may differ if changes were made to the design during construction, which results in the final "As-Built Capacity."
Dispersion Factor	A factor that describes how air emissions mix with the ambient air after being emitted from the original source.
Domestic (L_{unch})	Domestic waste describes waste that is generated by residential use and light commercial. In practice, the calculations typically treat domestic waste as the flow that remains after all permitted industrial flow is removed from the waste stream, which does not apply a factor for non-permitted commercial. See *Domestic Approximation.*
Domestic Approximation	Domestic sampling typically is taken from low-flow areas, as an alternative, the test data from the influent is used to represent domestic contributions. These data consist of all dischargers, including domestic, commercial and industrial. Use of the data is a conservative assumption.
Domestic Strength	Waste generated from residential use only varies appreciably between communities (for example, average biochemical oxygen demand [BOD] ranges from <180 mg/L to >300 mg/L). Using best professional judgment, the most typical concentration used in local limits and ordinances is 250 mg/L for BOD and for TSS.
Emission Standards	Emission standards are legal requirements governing air pollutants released into the atmosphere.
Guidance Document	Unless otherwise denoted, indicates the use of the U.S. Environmental Protection Agency Office of Wastewater Management 2004 *Local Limits Development Guidance*. EPA Publication EPA 833-R-04-002A. July 2004.
Headworks	The point at which wastewater enters a wastewater treatment plant. The headworks may consist of bar screens, comminutor, wet wells, and/or pumps.
Headworks Analysis	The process of taking concurrent sample at the influent and the effluent of a plant as well as other key sites in the system to determine how much of a pollutant is removed by the treatment system. This information is then used to calculate the maximum quantity of each pollutant that can be received and still meet all applicable criteria.
Implementation	Specification of how Technically Based Local Limits will be applied and to which users will require routine monitoring.
Industrial test data	Monitoring data collected from the discharge point for each industry. For use in local limits, flow is also required to convert to the mass of pollutant contributed to the treatment system.
Industrial User	Any user who is involved in commercial business practice that discharges wastewater that was generated as part of the commercial process at a rate that sufficiently exceeds domestic strength or volume so as to require regulation to protect the treatment process.

Industry-specific Limit	A limit established in individual industrial permits to limit discharge of pollutants that could interfere or use excessive capacity of the treatment plant. Industry-specific limits are placed directly into the industrial permit as specified in the Guidance Manual Table 6-2 row three and are based on a non-uniform allocation of the capacity or maximum allowable industrial loading (MAIL) available to industry. Limits may be based on a range of rationale between implementation of best management practices to requirements to install treatment equipment sufficient to protect the wastewater plant. Ultimately, the publicly owned treatment work (POTW) will want to allocate pollutant loadings in a fair and sensible way that does not favor any one industry or group of industries, considers the economic impacts, maintains compliance with the NPDES permit, and otherwise achieves the environmental goals of the program.
Inhibition	Inhibition occurs when pollutant levels in a publicly owned treatment work's (POTW) wastewater or sludge cause operational problems for biological treatment processes involving secondary or tertiary wastewater treatment and alter the POTW's ability to adequately remove biochemical oxygen demand (BOD), total suspended solids (TSS), and other pollutants.
Interference (positive/negative)	Laboratory test methods are based on attribute(s) of the pollutant being tested. Other materials or sample attributes can interfere with achieving an accurate assessment of the pollutant being tested. When the result that is obtained is higher than the actual value, this is referred to positive interference. When the results are lower than the actual value, the interference is referred to as negative.
Land Application	Land application is the process of spreading treated wastewater sludge onto land for agricultural purposes, improving the lands nutrient and organic matter content. Land application is subject to regulatory requirements under 40 CFR 503.
Landfill Option	Disposal of sludge in an approved landfill. The landfilling of sludge is subject to regulations in 40 CFR 257.
Lower Explosive Limits (LEL)	The minimum concentration in air at which a gas or vapor will explode or burn in the presence of an ignition source.
Maximum Allowable Headworks Loading (MAHL)	The estimated maximum loading of a pollutant that can be received at a publicly owned treatment works (POTW) headworks without causing pass through or interference. The most protective (lowest) of the AHLs (see AHL definition) estimated for a pollutant.
Maximum Allowable Industrial Loading (MAIL)	The estimated maximum loading of a pollutant that can be received at a publicly owned treatment works (POTW) headworks from all permitted industrial users and other controlled sources without causing pass through or interference. The MAIL is usually calculated by applying a safety factor to the maximum allowable headworks loading (MAHL) and discounting for uncontrolled sources, hauled waste, and growth allowance.
Method Detection Limit (MDL)	The minimum concentration of an analyte that can be measured and reported with 99 percent confidence that the analyte concentration is present as determined by a specific laboratory method in 40 CFR Part 136, Appendix B.
Non-conservative Pollutant	Pollutants that are presumed to be destroyed, biodegraded, chemically transformed, or volatilized within the publicly owned treatment works (POTW) to some degree.
Nondomestic Discharge	Any discharge to the collection system from a permitted source.

Other Permitted User	A source of discharge that has been given a discharge permit but does not fit the definition of categorical or significant industrial user.
Overall Removal Rate	The percent removal of a specific pollutant that occurs from the point of industrial waste discharge to the NPDES-specified wastewater treatment plant discharge point.
Partition Coefficient	The percent of a specific pollutant removed across a process or the system, synonymous with Removal Factor and Removal Coefficient.
Physical Treatment	A treatment process that uses a physical process to reduce pollutants, make pollutants easier to treat, or render them less objectionable. Examples include settling of particles and shredding of rags and debris.
Plug Flow	Plug flow is the flow of materials through a pipe or processes that do not appreciably mix contents with flow that occurred earlier or later in time.
Pollutant of Concern (POC)	Any pollutant that might reasonably be expected to be discharged to the publicly owned treatment works (POTW) in sufficient amounts to pass through or interfere with the works, contaminate its sludge, cause problems in its collection system, or jeopardize its workers.
Positive Interfering Material	A substance that causes a higher than accurate result in a laboratory tests.
Primary Removal Rate	The percent removal of a specific pollutant that occurs from the point of entry to the point of exit from primary clarifier(s). For a system with multiple treatment processes, the primary removal rate is used in the calculation of inhibition of biological treatment.
Reference Values (that is, Removal Rate)	Numeric values that have been determined in research studies to apply to similar processes. Most information is taken from EPA's 2004 *Guidance Manual on Development of Local Limits* (EPA 833-R-04-002A). See also *Book Values*.
Removal Coefficient	The percent of a specific pollutant removed across a process or the system, synonymous with Removal Factor and Partition Coefficient.
Removal Factor	The percent of a specific pollutant removed across a process or the system, synonymous with Removal Coefficient and Partition Coefficient.
Scrubber equipment	Equipment installed specifically to remove a pollutant from the waste stream; in the context of local limits, scrubber equipment is used to remove metals from emissions from incinerated waste.
Significant Industrial User (SIU)	As defined in 40 CFR 403.3, all users subject to Categorical Pretreatment Standards under 40 CFR 403.6 and 40 CFR chapter I, subchapter N; and any other industrial user that discharges an average of 25,000 gallons per day or more of process wastewater to a publicly owned treatment works (POTW) (excluding sanitary, non-contact cooling, and boiler blowdown wastewater); contributes a process waste stream that makes up 5 percent or more of the average dry weather hydraulic or organic capacity of the POTW treatment plant; or is designated as such by the Control Authority defined in 40 CFR 403.12(a) on the basis that the industrial user has a reasonable potential for adversely affecting the POTW's operation or for violating any pretreatment standard or requirement [in accordance with 40 CFR 403.8(f)(6)].

Site (System) Characterization	A description of the wastewater system including size, capacity, unit processes used, and industries that discharge to the system and receiving stream. The purpose of the site characterization is to create a record of what was present at the time of the limits development for future comparison when determining whether new limits are needed.
Sludge Disposal Option	The method selected to dispose of the solid materials removed from wastewater. The most frequently used options include, but are not limited to, burial in a landfill site, application to land for agricultural purposes, incineration, or conversion to commercial fertilizer.
Sludge Removal Step	Any step in a wastewater treatment plant that removes solid or semi-solid materials from the waste stream.
Standard Calculations	Calculations that follow exact equations specified in the EPA's 2004 *Local Limits Development Guidance* (EPA 833-R-04-002A) for each of the treatment processes found within a wastewater plant.
Surfactant	Surfactants are compounds that lower the surface tension between two liquids or between a liquid and a solid. Surfactants may act as detergents, wetting agents, emulsifiers, foaming agents, and dispersants. Surfactants may be anionic or cationic, with the vast majority being cationic. Surfactant limits are based on methylene blue active substances, which are anionic and are chiefly in the wastewater stream from detergents.
Surrogate	A value adopted to complete a calculation when a true value is not available because the test data are below the method detection limit (MDL). EPA guidance indicates that the MDL, one-half the MDL, or zero may be used. Unlike book values, surrogates are not based on previous studies or data and can cause very high differences in the removal rates calculated and, consequently, the final local limit. Surrogates are not used in this local limits derivation, except when the effluent is below the MDL and the influent is high enough to indicate that a removal rate is present.
Time-weighted Average Threshold Limit Value (TWA-TLV)	The concentration to which a worker can be exposed for 8 hours per day, 40 hours per week and not have any acute or chronic adverse health effects (commonly accepted exposure limits identified by the American Conference of Government Industrial Hygienists).
Total Metals	Total metals is a descriptor of metal content of a sample after all organic material has been digested using a vigorous acid digestion; it does not include metals that are tightly bound inside inorganic particles, such as grit and sand.
Toxicity Leaching Procedure	A laboratory procedure designed to predict whether a particular waste is likely to leach chemicals into groundwater at dangerous levels. Details are provided in 40 CFR Part 261.
True Color	Color is the preferential reflection or transmittance of a specific light frequency within the visible light range. True color is the color of water after filtration to remove any colored solid or colloidal materials.
Uniform Allocation	A method of developing local limits in which the mass of a pollutant that is available to industry is first determined and is then allocated as the same concentration limit to all industries.