Dorado Wastewater Treatment Plant
Technically Based Local Limits

August 2023

Puerto Rico Aqueduct And Sewer Authority

Contents

Appendix

Tables Page

Figure

Abbreviations and Acronyms

°C	degree(s) Celsius
°F	degree(s) Fahrenheit
ACGIH	American Conference of Government Industrial Hygienists
AHL	allowable headworks loading
BMP	best management practice
BOD_5	5-day biochemical oxygen demand
BPJ	best professional judgment
CFR	Code of Federal Regulations
EPA	United States Environmental Protection Agency
FOG	Fats, Oils, and Grease
gpd	gallon(s) per day
lb/d	pound(s) per day
LAS	linear alkyl benzene sulfonate
LEL	lower explosive limit
µg/L	microgram(s) per liter
MAHL	Maximum Allowable Headworks Loading
MAIL	Maximum Allowable Industrial Loading
MDL	method detection limit
mg/kg	milligram(s) per kilogram
mg/L	milligram(s) per liter
mgd	million gallon(s) per day
ML	Method Limit
N/A	not applicable
NAICS	North American Industry Classification System
NO_2	nitrite
NO_3	nitrate
NPDES	National Pollutant Discharge Elimination System
PAH	polyaromatic hydrocarbon
PCB	polychlorinated biphenyl
POC	pollutant of concern
POTW	publicly owned treatment works
PRASA	Puerto Rico Aqueduct and Sewer Authority

PRWQSR	Puerto Rico Water Quality Standards Regulation
QA/QC	quality assurance and quality control
RL	Reporting Limit
SIC	Standard Industrial Code
SIU	significant industrial user
SU	standard unit(s)
TBLL	technically based local limit
TKN	total Kjeldahl nitrogen
TN	total nitrogen
TSS	total suspended solids
WQC	Water Quality Certificate
WWTP	wastewater treatment plant

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 (POTW). 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 (CWA 402(b)(8), 33 U.S.C. § 1342(b)(8) *et seq.*). Requirements to develop technically based local limits (TBLLs) are specified in 40 CFR 403.5(c).

This TBLL evaluation was prepared to meet NPDES requirements for the Dorado Wastewater Treatment Plant (WWTP). These limits have been developed in accordance with EPA's Technical Support Document *Local Limits Development Guidance* (EPA 2004) and in accordance with NPDES Permit No. PR0020460-Part IV (A)(1)(b).

In response to these standards, conditions, and requirements, the local limits in Table ES-1 have been developed for the Dorado WWTP.

Table ES-1. Local Limits Summary

Parameter	Local Limit	Page
Arsenic	0.49 mg/L	Refer to Note a
Cadmium	0.20 mg/L	Refer to Note a
Chromium	5.0 mg/L[b]	Refer to Note a
Copper[c]	0.05 mg/L	Refer to Note a
Cyanide (Free)	0.07 mg/L	Refer to Note a
Silver	2.51 mg/L	Refer to Note a
Lead	1.45 mg/L	Refer to Note a
Mercury	0.0001 mg/L	Refer to Note a
Nickel	0.44 mg/L	Refer to Note a
Molybdenum	0.45 mg/L	Refer to Note a
Selenium	0.22 mg/L	Refer to Note a
Surfactants	SIU specific	5-7
Zinc	3.49 mg/L	Refer to Note a
Flow	No Local Limit Needed	6-1
BOD_5	No Local Limit Needed[e]	6-1
TSS	No Local Limit Needed[e]	6-1
Total Nitrogen ($TKN+NO_3+NO_2$)	40 mg/L	6-2
Phenols[d] (phenolic substances)	1.0 mg/L	6-4

Table ES-1. Local Limits Summary

Parameter	Local Limit	Page
pH	6.5 to 10.0 SU	6-4
Fats, Oils, and Grease (FOG)	50 mg/L total FOG	6-5
Temperature	40°C (104°F) at POTW; 60°C (140°F) from SIU	6-5
Flammability	No two consecutive readings at ≥5% LEL, and no reading of ≥10% LEL allowed	6-5
Total Toxic Organics	No Limit	6-5

[a] Local Limits Calc Page 2 on line 69 of "TBLL Calc-Dorado.xlsm" (Appendix C).

[b] The calculated limit is 34.17 mg/L. The Resource Conservation and Recovery Act (RCRA) sets a limit of 5.0 mg/L for chromium, which is not technically based but statutorily is classified as a hazardous waste. While wastewater is not covered by RCRA because of the Domestic Sewer Exclusion, PRASA elects to not allow the discharge of waste that would otherwise be classified as "hazardous;" therefore, a limit of 5.0 mg/L is adopted.

[c] Original TBLL calculation generated a negative maximum allowable industrial loading because of uncontrolled copper in the influent. Modeling generates the 0.05 mg/L value.

[d] Total phenols minus unsubstituted phenol.

[e] Concentrations are set as standards for surcharges and not local limits. PRASA reserves the right to base increased surcharges on concentrations above normal domestic waste strength, which is set at 250 mg/L BOD_5 and 250 mg/L TSS. Surcharges up to 250 mg/L may be subject to the most current calculated cost of treatment per pound of BOD and TSS. High-strength waste exceeding 250 mg/L may be subject to increased rates in response to improving or providing additional infrastructure to meet regulatory discharge requirements.

°C = degree(s) Celsius
°F = degree(s) Fahrenheit
BOD_5 = 5-day biochemical oxygen demand
LEL = lower explosive limit
mg/L = milligram(s) per liter
NO_2 = nitrite
NO_3 = nitrate
PRASA = Puerto Rico Aqueduct and Sewer Authority
SIU = significant industrial user
SU = standard unit(s)
TKN = total Kjeldahl nitrogen
TSS = total suspended solids

1. Introduction

The Dorado Wastewater Treatment Plant (WWTP) is located at PR Road 693, Km 5.6, Dorado, Puerto Rico. The plant operates under National Pollutant Discharge Elimination System (NPDES) permit number PR0020460.

This document uses recent test data to develop technically based local limits (TBLLs) that are specific to current conditions in the Dorado WWTP collection system. These TBLLs have been established in response to NPDES Permit No. PR0020460- Part IV (A)(1)(b).

The following appendices are provided:

- Appendix A Priority Pollutants Detected At or Above MDL
- Appendix B Guidance on the Selection of Pollutants of Concern
- Appendix C Data Sheets Used in “TBLL Calc-Dorado.xlsm”
- Appendix D Puerto Rico Water Quality Standards Worksheet
- Appendix E Phenolic Compounds Regulated by Puerto Rico Water Quality Standards
- Appendix F Long-hand Calculation of Lead Local Limits
- Appendix G Definitions

2. Local Limits Development Methodology

2.1 Guidance Documents

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

- *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)

This document provides the rationale and legal support for local limits developed in relation to technically based environmental criteria using the U.S. Environmental Protection Agency (EPA)-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 Dorado WWTP TBLLs:

1. Characterize the Dorado 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/operational criteria that apply to the specific treatment systems.

3. Select parameters 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 includes a minimum list of EPA-required pollutants. Pollutants selected may be individual elements or compounds, such as metals or halogenated organic compounds, which 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 and evaluate 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 while remaining compliant with applicable criteria.

5. Compile test data and model pollutant fate 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]) while remaining compliant with applicable criteria.

7. After applying all calculations for all criteria, use the smallest mass that ensures that environmental and regulatory criteria will be met. This is referred to as the maximum allowable headworks loading (MAHL).

8. Subtract the domestic loading and a safety and growth factor from the MAHL; the remaining allowable pollutant loading is the MAIL available to industry.

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

9. Once the MAIL has been calculated, allocate the mass to the industries based on one of the prescribed methods found in the *Local Limits Development Guidance* (EPA 2004). These allocations 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.

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

3.1 Treatment System

The Dorado WWTP is permitted to discharge a maximum daily flow limit of 4.05 million gallons per day (mgd). Currently, the average monthly flow is approximately 1.61 mgd. Table 3-1 lists the estimated as-built design capabilities as established in the last plant upgrade.

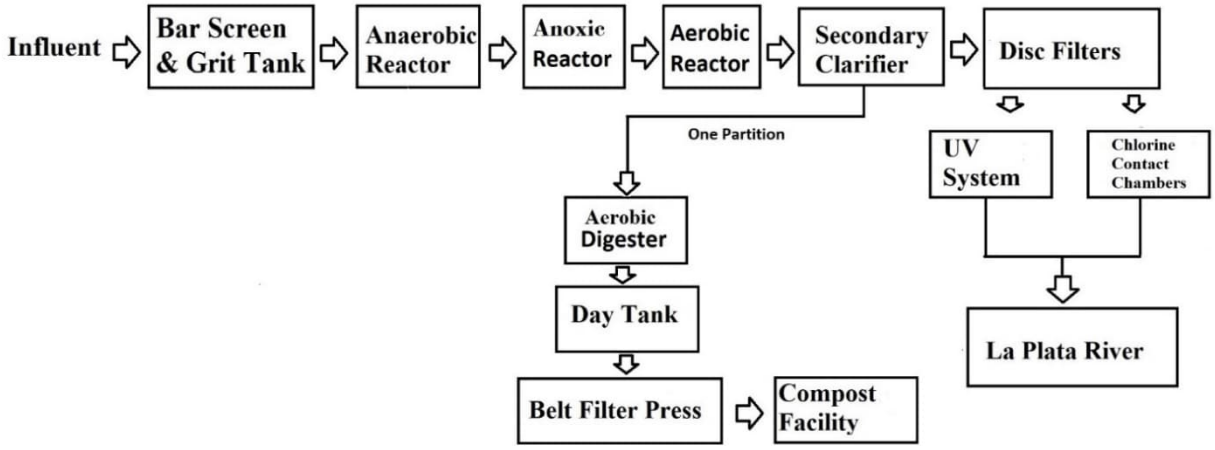
Table 3-1. Dorado WWTP Estimated Capacities

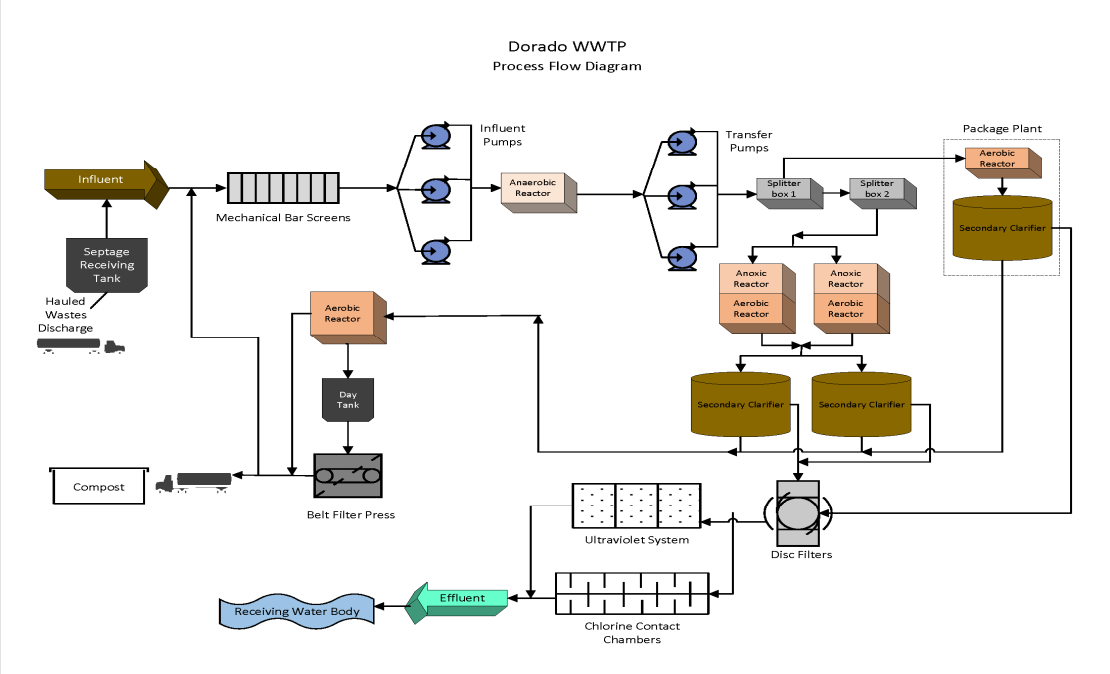
Item	Daily	Annual Average
Flow (mgd)	4.05	1.61
BOD_5 (lb/d)	8,444	2,189
TSS (lb/d)	8,444	2,350

lb/d = pound(s) per day
BOD_5 = 5-day biochemical oxygen demand
TSS = total suspended solids

The treatment process consists of mechanical bar screening, anaerobic reactors, anoxic reactors, aerobic reactor, secondary clarification, disc filtration, and ultraviolet treatment or chlorination prior to discharge.

The sludge-handling facilities consist of aerobic digestion followed by a belt filter press. The sludge cake is transported by truck and composted. Figure 3-1 shows the treatment train and a schematic of the plant's unit processes (including an aerial view of the facility). The block diagram included in Figure 3-1 shows one partitioning coefficient (removal factor) after total overall plant removal is present in the system.





Dorado Wastewater Treatment Plant

Figure 3-1. Dorado WWTP Treatment Unit Processes and Site Aerial

3.2 Industrial Users

The Puerto Rico Aqueduct and Sewer Authority (PRASA) has issued permits to one significant industrial user (SIU) that contributes flow to the Dorado WWTP. Table 3-2 provides identification data for this SIU, along with the permitted flow limit. Additional test data for this user are available from PRASA's Industrial Pretreatment Program.

Table 3-2. Significant Industrial User and Respective Permitted Flow

SIU	Permit No.	Process Description (SIC/NAICS)	Federal Category	Category Description	Authorized Flow (gpd)
Caribe Holding (Cayman) Co. Ltd. DBA PuraCap Caribe	GDA-10-704-005	325412 – Pharmaceutical Preparation Manufacturing	439, Subpart D	Pharmaceutical Manufacturing Point Source	60,000
				Total Authorized Flow	60,000

gpd = gallon(s) per day
SIC = Standard Industrial Classification
NAICS = North American Industrial Classification System

Caribe Holding is a categorical industrial user (CIU) as defined in the 40 CFR 439, Subpart D pharmaceutical manufacturing point source category description.

3.3 Receiving Stream

After tertiary treatment, effluent from the Dorado WWTP discharges to the La Plata River. The La Plata River is listed in the NPDES permit as a Class SB water, which is "coastal waters and estuarine waters intended for use in primary and secondary contact recreation, and for propagation and maintenance of desirable species, including threatened or endangered species." The NPDES permit has not authorized a mixing zone dilution allowance for this discharge; therefore, the dilution ratio is set at 1:1.

3.4 Applicable Criteria

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

- Water quality standards
- NPDES permit limits
- Biosolids regulations for disposal
- Worker health and safety (toxicity, flammability, and explosivity)
- Plant capacity
- Other applicable best professional judgment (BPJ)

These criteria were used to select the POCs and are further discussed in Section 4.

4. POC Selection and Sampling and Analysis

4.1 POC Selection

Toxic pollutants selected for these derivations consist of the EPA national pollutant list of 11 metals plus cyanide. Chromium has been analyzed as total chromium. Additionally, EPA lists BOD_5, TSS, and ammonia as pollutants that should be discussed. Ammonia is discussed as total nitrogen (TN), as TN is listed as an NPDES limit. Flow, pH, flammability, temperature, phenols, and fats, oils, and grease (FOG) are discussed in relation to protecting the treatment works, the collection system, and workers. A criterion exists for phenol compounds in the Puerto Rico General Limits; consequently, phenols are considered as a POC. The prior local limits were completed in 1999 and included beryllium, magnesium, and surfactants. The only criterion for beryllium is for biosolids that are incinerated. Currently, the sludge generated at Dorado WWTP is disposed of for composting. As a consequence, a beryllium limit is no longer applicable. The criteria for magnesium also have been dropped from the PRWQSR and no other criteria exist for this metal. Finally, the previous local limits set a limit for surfactants. However, the issue of surfactants is complicated by the fact most surfactants in the system are fully biodegradable and do not pass through the system. The remaining surfactants consist of a large assortment of compounds that are present only in very specific industries. A limit of total surfactants at the industrial discharge point, therefore, is not technically feasible. Refer to Section 4.2 for surfactants included in this document for use in deriving industry-specific limits.

Historical test data from January 1, 2018, to February 1, 2023, were reviewed for the Dorado WWTP effluent and sludge samples. This review did not identify POCs other than those discussed previously. Because the database contained limited testing for organic pollutants, priority pollutant scans were added to the site-specific testing to determine whether toxic organic pollutants were present in the system. Table 4-1 provides the full list of parameters selected for evaluation.

Table 4-1. Pollutants Selected for Local Limits Evaluation

Arsenic	Flammability	Selenium
BOD_5	Flow	Silver
Cadmium	FOG	Temperature
Chromium (Total)	Lead	Total Nitrogen ($TKN+NO_3+NO_2$)
Copper	Mercury	TSS
Cyanide (Free)	Molybdenum	Zinc
Phenols	Nickel	
	pH	

NO_2 = nitrite
NO_3 = nitrate
TKN = total Kjeldahl nitrogen

4.2 Surfactants (as MBAS)

Surfactants are divided into non-ionic, cationic, and anionic categories. The MBAS test measures only anionic substances. Results of the test can vary significantly from laboratory to laboratory, depending on application of a backwash that removes interference.

The most common class of compounds found in anionic surfactants is referred to as linear alkyl benzene sulfonate (LAS). LAS is the most common ingredient in dishwashing and laundry detergent. In turn, LAS consists of a straight chain molecule with a sulfonated benzene ring substituted at some point along the chain (refer to Figure 4-1). The chain typically consists of 10 to 16 carbon atoms but can be shorter or longer depending on the type of surfactant as designed by the manufacturer. Terzic et al. (1992) and OECD SIDS (2005) show that long chain surfactants with the ring substituted on the end of the chain are the most biodegradable while shorter chains that have been substituted near the middle show the lowest degree of biodegradability. LAS adheres strongly to solid particles in the waste stream, and as much as 35% of the LAS is removed if primary clarification is present because the solids are removed from the waste stream. The LAS is further reduced by 98 to 99% in activated waste and further reduced in aerobic digestion. LAS is not reduced in anaerobic digestion and some anaerobic sludges have been measured at more than 1% LAS as dry sludge. However, studies also indicate that once land-applied, LAS is quickly biodegraded once it enters the aerobic conditions of the soil and does not show detrimental effects to the environment when land applied.

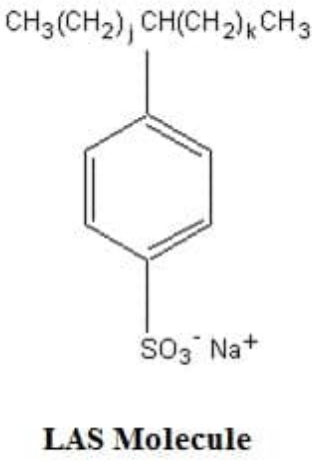


Figure 4-1. Linear Alkyl Benzene Sulfonate Molecule

While LAS is the chief source of anionic surfactants and is easily biodegraded at treatment plants, some anionic surfactants are not easily eliminated. According to Scott and Jones (2000), “the removal of constituents in detergent formulations such as fluorescence whitening agents, or naphthalene sulfates used in chemical, pharmaceutical and textile industries and also the organotin compounds in marine antifouling paints such as tributyltin is much less efficient. In the case of naphthalene sulfate, 95% of these pollutants is still present in WWTP effluents.”

Because many compounds contribute to MBAS including non-surfactants and because each reactive compound (both surfactant and non-surfactant) exhibits a different level of biodegradability, a single limit for all industry has not been adopted. A headworks analysis will predominantly measure the response of the prevalent LAS compound at the influent but conversely the effluent tests results will be principally composed of more refractory compounds. Because an aerobic process is present in the wastewater treatment system (which removes most surfactants), this limit derivation does not set a limit. Instead, new industry should be screened for non-detergent-type surfactants and if such surfactants exist, an industry-specific limit should be adopted.

4.3 Sampling and Analysis

The historical database does not include concurrent sampling of influent and effluent locations. Concurrent sampling is necessary to develop partitioning coefficients (removal factors) for conservative pollutants (metals). Sampling must be conducted concurrently at specific sites in the treatment system (including the collection system prior to the plant) to understand and determine how the pollutants will be either removed via sludge or discharged into the receiving waters. This ratio of removal is known as the *removal rate*, *removal coefficient*, or *partitioning coefficient*.

Concurrent sampling in the Dorado WWTP treatment system was conducted from December 4 to December 11, 2022. Tables 4-2 and 4-3 list the testing schedules. Per EPA’s *Local Limit Development Guidance* (EPA 2004), composite sampling was conducted for seven consecutive days for all tests, except

cyanide, which (as a non-conservative parameter) was taken as a series of grab samples. Table 4-3 lists pollutants included in the testing regimen. Laboratory analytical methods with the appropriate sensitivity and quality assurance and quality control (QA/QC)[2] were required. The laboratory analytical results exceeded data reporting requirements. Where the best testing methods available were insufficient to generate removal factors, the *Local Limits Development Guidance* (EPA 2004), which provides default values (book values), was used as an alternative. Instances where book values were used are noted and discussed.

Table 4-2. Sample Schedule

Location	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
Influent	1	1	1	1	1	1	1	
Final Effluent		1	1	1	1	1	1	1
Sludge			1		1			
Domestic		1				1		
Total	1	3	3	2	2	3	2	1

Table 4-3. Parameters Selected for Laboratory Analysis in Each Sample

Pollutant	Influent	Effluent	Sludge	Domestic
Arsenic	X	X	X	X
Cadmium	X	X	X	X
Chromium Total	X	X	X	X
Copper	X	X	X	X
Cyanide (Free)	X	X		X
Lead	X	X	X	X
Nickel	X	X	X	X
Mercury	X	X	X	X
Selenium	X	X	X	X
Silver	X	X	X	X
Zinc	X	X	X	X
Nitrogen (NH_3, NO_3, NO_2)	X	X		
% Solids			X	
Priority Pollutants	X	X		

NH_3 = ammonia

[2] Original laboratory reports (more than 4,000 pages) have not been included herein but are available upon request.

Cyanide testing was not conducted in the sludge samples because of the non-conservative nature of cyanide and the lack of a disposal criterion.[3]

Appendix A provides influent and effluent priority pollutant test data that show results at or above the method detection limits (MDLs). Using guidance found in the *Guidance Manual on the Development and Implementation of Local Discharge Limitations under the Pretreatment Program* (EPA 1987) (summarized in Appendix B), no organic pollutant qualified as a POC.

Table 4-4 lists the laboratories that conducted the testing.

Table 4-4. Laboratories Used for Testing

Parameter	Laboratory
Cyanide	Specialty Analytical
Metals, Dioxin, Organic Pesticides, PAHs, PCBs, Priority Pollutants 624/625, Nitrogen	ALS Environmental

PAHs = polycyclic aromatic hydrocarbons
PCBs = polychlorinated biphenyls

[3] Cyanide does not collect in the sludge. Instead, cyanide reduction occurs in the wastewater treatment process because some microbiota 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 each laboratory were reviewed and verified using data qualifiers and laboratory data QA/QC documentation. All data greater than the method limit (ML) (equivalent to the lowest standard used to calibrate the analytical method) were used to develop estimated removal efficiencies. If any data point for either the influent or the effluent was less than the ML, at EPA's request, one-half the ML was used. The lab reports a reporting limit (RL) for each parameter. Jacobs confirmed that the reported RLs followed the methodology to produce valid MLs using standards at the levels specified. Domestic samples are typically taken from low-flow areas, which are not representative of the flow entering the plant. As an alternative, the test data from the influent are used to represent domestic contributions. In this method, referred to as "domestic approximation," the data used for domestic contributions consist of all dischargers, including domestic, commercial, and industrial. Use of these data is a conservative assumption. These data, along with data on other pollutants, were entered into a spreadsheet titled "TBLL Calc-Dorado.xlsm" that automates the calculation of limits as described herein. Appendix C provides all pages used from the "TBLL Calc-Dorado.xlsm."

5.2 Removal Efficiency

The Dorado WWTP requires calculating one removal factor for activated sludge treatment. Removal factors for each pollutant are automatically calculated in the "TBLL Calc-Dorado.xlsm" file. Each day's data points for influent, final effluent, and (for days available) sludge are entered as separate sample set "pairs" in the "TBLL Calc-Dorado.xlsm" on the Sample Data Page. Some data entered in the portion of the "TBLL Calc-Dorado.xlsm" section that calculates removal efficiencies are near the MDL, which reduces the accuracy of the calculated value. The reasonableness of each removal factor must be considered; therefore, the resulting values were compared to the *Local Limit Development Guidance* (EPA 2004) values shown in Table 5-1 as a cross-check.

Table 5-1. Pollutant Percent Removal Efficiencies (%) Through Activated Sludge Treatment

Pollutant	Second Decile	Median	Eighth Decile	Generated by "TBLL Calc-Dorado.xlsm"	Adopted Removal Factor
Arsenic	31	45	53	35.2	35.2
Cadmium	33	67	91	78.2	78.2
Chromium, Total	68	82	91	78.5	78.5
Copper	67	86	95	92.6	92.6
Cyanide	41	69	84	Cannot Calculate	69
Lead	39	61	76	92.4	92.4
Mercury	50	60	79	88.8	88.8
Molybdenum	NP	NP	NP	69.5	69.5
Nickel	25	42	62	60.3	60.3
Selenium	33	50	67	49.1	49.1

Table 5-1. Pollutant Percent Removal Efficiencies (%) Through Activated Sludge Treatment

Pollutant	Second Decile	Median	Eighth Decile	Generated by "TBLL Calc-Dorado.xlsm"	Adopted Removal Factor
Silver	50	75	88	91.3	91.3
Zinc	64	79	88	82.5	82.5

NP = Book value not published or available

The QA/QC documentation is reviewed in calculating removal factors. The data pairs are then input into the "TBLL Calc-Dorado.xlsm" file, which calculates a removal factor for each data pair. When a data pair contains at least one non-detect, or when the effluent is greater than the influent, the spreadsheet indicates that a removal factor cannot be calculated. The data pairs for which a removal factor can be calculated are then averaged for the final removal factor used in later calculations. The average values of the individual data pair removal factors are shown in line 5 of the Sample Data Page 1 of Appendix C.

5.3 Calculation of Allowable Headworks Loadings

Using the adopted removal factors, the standard methodology from EPA's *Local Limits Development Guidance* (EPA 2004) is used to calculate the highest quantity of each pollutant that can be received at the headworks to the treatment plant and still comply with the applicable criteria. 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, Rule 1301.1(J)(1) of the Puerto Rico Water Quality Standards Regulation (PRWQSR) sets metals limits derived from natural log functions that vary with water hardness. The formulas are similar to the translators described in Appendix J of EPA's Second Edition of the *Water Quality Standards Handbook* (EPA 1994). The federal criteria values required to achieve compliance are calculated as shown in Appendix C. Because a hardness value was not available for Dorado, the hardness value used in Appendix C is 160 milligram(s) per liter (mg/L), which was measured in the City of Vega Baja near the Dorado plant. The values were then placed on line 16 of the Local Limits Calc Page 1 of Appendix C (note that for metals with NPDES limits more stringent than shown in Appendix D, the NPDES permit limit has been placed in line 16, as discussed in the next section). Line 17 shows the water criterion SB waters. Consequently, the most stringent of federal water quality or PRWQSR criteria have been used to calculate the limits.

The federal water quality limits are automatically calculated in the file "TBLL Calc-Dorado.xlsm" on the Publicly Owned Treatment Works (POTW) Limits page (which also uses hardness in a natural log function). Federal values are then automatically transferred in the spreadsheet to the acute and chronic criteria, which appear in lines 14 and 15 of the Local Limits Calc Page 1 of Appendix C. Once water quality criteria are calculated, the AHLs based on water quality are calculated as follows:

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

where:

L_{wq} = MAHL (lb/d) based on water quality criteria

C_{wq} = Chronic or acute criteria

Q_{potw} = POTW average flow (mgd)

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

5.3.2 NPDES Criteria

NPDES permit limits for metals are typically developed based on water quality criteria and follow the same equation provided in the water quality section, except that the C_{wq} is replaced by the NPDES permit limit, and a dilution factor is not allowed. Table 5-2 lists the pollutants with NPDES limits for the Dorado WWTP.

Table 5-2. Dorado WWTP NPDES Limits

Pollutant	Limit (µg/L)
Copper	3.73
Cyanide (Free)	1.0

µg/L = microgram(s) per liter

The NPDES permit limit for copper in Table 5-3 was less stringent than the calculated Water Quality Certificate (WQC) criteria. The copper limit generated in Appendix C, therefore, was manually entered in replacement of the PRWQSR criteria on line 16 Local Limits Calc Page 1 of the "TBLL Calc-Dorado.xlsm" file (see Appendix C).

Once the NPDES limits are entered, the AHLs are calculated as follows:

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

where:

L_{wq} = MAHL (lb/d) based on NPDES limit

C_{npdes} = NPDES Limit

Q_{potw} = POTW average flow (mgd)

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

5.3.3 Sludge Quality

Treatment plants are required to prohibit non-domestic discharges in amounts that violate applicable sludge disposal or use regulations or restrict the plant from using its chosen sludge disposal option.

Currently, the sludge from the Dorado WWTP is composted, which means the appropriate approach focuses on total metals in the sludge. This approach compares sludge quality to 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 in line 19 of the Local Limits Calc Page 1 in Appendix C and is used to calculate local limits based on sludge disposal.

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

where:

L_{in} = MAHL based on sludge criteria (lb/d)

PS = Percent solids in the sludge to disposal (%)

Q_{sldg} = Sludge flow to disposal (mgd)

C_{slcrit} = Limiting sludge criteria (milligrams per kilogram [mg/kg])

R_{potw} = 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. The results for the Dorado WWTP sludge, sampled during the period of local limits testing, is a small fraction of the 40 CFR 403 Biosolids Class A (Table 3) limits that must be met to classify a sludge as a "clean sludge." This suggest that these pollutants are typically only present in low levels throughout the entire Dorado waste collection system.

5.3.4 Impact on Wastewater Treatment Plant

Treatment plants must protect against non-domestic discharges that inhibit the treatment processes or operations or would cause POCs in the discharge to exceed permitted limits. 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 *Local Limits Development Guidance* (EPA 2004). For the Dorado WWTP, calculation of inhibitory AHLs must be conducted for secondary treatment inhibition (activated sludge). Activated waste inhibition levels are found on line 17 of the Local Limits Calc Page 1 in Appendix C and are used to calculate local limits on line 69 of the Local Limits Calc Page 2. The following equation is used 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

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

5.4 Limit Selection

The "TBLL Calc-Dorado.xlsm" spreadsheet automates the calculation of limits so that a limit is generated for each criterion. Table 5-4 displays the MAHL[4] selection process, followed by calculation of the MAIL as mass loadings. This format facilitates verification that the smallest AHL has been selected.

Table 5-3 presents the AHLs calculated in pounds for each limiting criterion considered. The smallest of the AHLs is referred to as the MAHL because it is the highest loading that may be seen at the headworks for which all criteria will be met.

Table 5-3 also presents the current domestic loading. This domestic loading is subtracted from the MAHL, along with a safety factor (10% of the MAHL), to calculate the MAIL. The mass remaining is used, along with known industrial discharges, to calculate the maximum concentrations that can be discharged.

Table 5-3. Selection Table Using AHL, MAHL, and MAIL

Pollutant	AHL Federal Water Quality Criteria Acute [WQC-A] (lb/d)	AHL PRWQSR Water Quality Criteria Chronic [WQC-C] (lb/d)	AHL NPDES Water Quality Limits [NPDES] (lb/d)	Activated Sludge Inhibition (lb/d)	AHL Sludge Based on Table 3 40 CFR 50 [SD] (lb/d)	Domestic Loading (lb/d)	MAIL[a] (lb/d)	Basis
Arsenic	7.46	3.94	N/A	1.34	0.27	0.02	0.25	PRWQSR
Cadmium	0.41	0.11	0.49	13.43	0.13	0.00	0.10	PRWQSR
Chromium	159.70	19.04	7.95	134.27	N/A	0.03	7.12	PRWQSR
Copper	5.02	3.21	0.66	13.43	2.94	0.59	0.66	NPDES
Cyanide	0.12	0.23	0.04	1.34	0.00	0.01	0.03	NPDES
Lead	26.20	1.02	N/A	13.43	0.83	0.02	0.73	WQS-C
Mercury	0.30	0.00	0.00	1.34	0.05	0.00	0.00	WQS-C
Molybdenum	N/A	N/A	N/A	N/A	0.27	0.02	0.22	SD
Nickel	71.37	7.93	N/A	13.43	1.76	0.03	0.22	PRWQSR
Selenium	N/A	0.13	N/A	N/A	0.50	0.01	0.11	WQS-C
Silver	1.40	N/A	N/A	3.36	N/A	0.00	1.25	WQS-A
Zinc	13.38	12.12	N/A	4.03	7.32	1.88	1.74	WQS-C

[4] The MAHL is shown in line 63 of the Local Limits Calc Page 2 Appendix C, but the spreadsheet calculates a concentration limit for each AHL and selects the smallest value.

Table 5-3. Selection Table Using AHL, MAHL, and MAIL

Pollutant	AHL Federal Water Quality Criteria Acute [WQC-A] (lb/d)	AHL PRWQSR Water Quality Criteria Chronic [WQC-C] (lb/d)	AHL NPDES Water Quality Limits [NPDES] (lb/d)	Activated Sludge Inhibition (lb/d)	AHL Sludge Based on Table 3 40 CFR 50 [SD] (lb/d)	Domestic Loading (lb/d)	MAIL[a] (lb/d)	Basis

[a] The MAIL in this column has had 10% of the MAHL subtracted.

N/A = not applicable
SD = sludge disposal
WQS-A = Federal Water Quality Standard-Acute
WQS-C = Federal Water Quality Standard-Chronic

5.5 Uniform Allocation to Permitted Industrial Users

Local limits developed for this document are based on uniform allocation of available pollutant loading applied to permitted industrial users. In this method, the mass of a regulated pollutant is distributed equally to industrial flow (in this case an assumed flow) and each industry receives the same concentration-based limits. Derivation of uniform limits is driven by inputs for industrial flow on line 13 of the Basic Data Page 1 of Appendix C and the maximum allowable industrial loading (MAIL) on line 64 on the Local Limits Page 2 of Appendix C. Table 5-4 presents the selected limits found in line 69 of the Local Limits Calc Page 2 in Appendix C. The resulting limits in Table 6-1 are compared to the generally applicable local limits found in Section 2.05 of the Puerto Rico Rules and Regulations for the Supply of Water and Sewer Service.

Table 5-4. Comparison of Puerto Rico General Limits and Previous (1999) Local Limits with New Limits

Parameter	Puerto Rico General Limits[a]	Previous Dorado WWTP Local Limits Adopted 1999	Current Calculated Technically Based Limit and Proposed Limit
Arsenic	No Limit	0.014 mg/L	0.49 mg/L
Beryllium	No Limit	0.075 mg/L	No Limit
Cadmium	0.1 mg/L	0.084 mg/L	0.20 mg/L
Chromium (Total[b])	1.0 mg/L	0.8 mg/L	5.0 mg/L
Copper	1.0 mg/L	1.0 mg/L	0.05 mg/L[c]
Cyanide	0.1 mg/L	0.1 mg/L	0.07 mg/L
Lead	0.2 mg/L	0.2 mg/L	1.45 mg/L
Manganese	4.0 mg/L	0.23 mg/L	No Limit
Mercury	0.05 mg/L	0.0007 mg/L	0.0001 mg/L
Molybdenum	No Limit	No limit	0.45 mg/L
Nickel	0.5 mg/L	0.5 mg/L	0.44 mg/L

Table 5-4. Comparison of Puerto Rico General Limits and Previous (1999) Local Limits with New Limits

Parameter	Puerto Rico General Limits[a]	Previous Dorado WWTP Local Limits Adopted 1999	Current Calculated Technically Based Limit and Proposed Limit
Selenium	0.2 mg/L	0.19 mg/L	0.22 mg/L
Silver	0.05 mg/L	0.05 mg/L	2.51 mg/L
Surfactant	No Limit	8.1 (MBAS) (mg/L)	SIU specific
Zinc	0.5 mg/L	0.5 mg/L	3.49 mg/L
Flow	No Limit	SIU specific	SIU specific
BOD_5	No Limit	250–4,401 mg/L	250 mg/L[d]
TSS	No Limit	250–5,106 mg/L	250 mg/L[d]
pH	5.0 to 10.0 SU	6.5 to 9.0 SU	6.5 to 10.0 SU
Total Nitrogen	No Limit	No Limit	40 mg/L
Phenols[e]	1.00 mg/L	0.5 mg/L	1.0 mg/L
FOG	50 mg/L Total FOG	50 mg/L Total FOG	50 mg/L Total FOG
Temperature	60°C (140°F)	60°C (140°F)	40°C (104°F) at the POTW 60°C (140°F) at discharge point
Flammability	No Limit	Flashpoint (°F) >140	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

[a] PRASA Rules and Regulations for the Supply of Water and Sewer Services, Section 2.05 (June 2003)

[b] The calculated limit is 14.2 mg/L. The Resource Conservation and Recovery Act (RCRA) sets a limit of 5.0 mg/L for chromium, which is not technically based but statutorily is classified as hazardous waste. While wastewater is not covered by RCRA because of the Domestic Sewer Exclusion, PRASA elects to not allow the discharge of waste that would otherwise be classified as "hazardous," and therefore, a limit of 5.0 mg/L is adopted.

[c] The original TBLL calculation generated a negative MAIL because of uncontrolled copper in influent. Modeling generates the 0.05 mg/L value.

[d] Concentrations are set as standards for surcharges. PRASA reserves the right to base increased surcharges on concentrations in excess of normal domestic waste strength, which is set at 250 mg/L for BOD_5 and 250 mg/L for TSS. Surcharges up to 250 mg/L may be subject to the most current calculated cost of treatment per pound of BOD and TSS. High-strength waste above 250 mg/L may be subject to increased rates in accordance with accelerated need to improve or provide additional infrastructure to meet regulatory requirements for discharge.

[e] Total phenols minus unsubstituted phenol

°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, and FOG was also evaluated. Worker health and safety limits for temperature, flammability, and toxicity were also considered. Table 6-1 summarizes resultant 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 Parameters

Pollutant	Minimum Limit	Maximum Limit
Temperature	N/A	40°C (104°F) at the POTW 60°C (140°F) at discharge point
Flammability	N/A	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
pH	6.5 SU	10.0 SU
Phenols[a] (Phenolic Substances)	N/A	1.0 mg/L (Total phenols minus unsubstituted phenol)
Total Nitrogen	N/A	40 mg/L
FOG	N/A	50 mg/L Total FOG

[a] Total phenols minus unsubstituted phenol

N/A = not applicable

6.1 Flow

The Dorado WWTP is designed to treat a daily average flow of 4.05 mgd. The plant currently receives a monthly average daily flow of approximately 1.61 mgd. Consequently, the Dorado WWTP currently has additional capacity available for industrial use, and a local limit is not needed. It is recommended, however, that if an industry is found with a high percentage of flow, industry-specific limits should be established. The limits should be based on a case-by-case technical review of the industry's actual needs, as demonstrated by historical monitoring records and a review of the industry's best management practices (BMPs). This approach should be considered for all existing and new industry.

6.2 BOD_5 and TSS

Using the estimated as-built design capacity of 8,444 lb/d for both BOD_5 and TSS in Section 3.1, the Dorado WWTP apparently has excess capacity for both pollutants. Average monthly influent BOD_5 from October 31, 2018, to February 28, 2023, was calculated at 2,189 lb/d; for TSS during the same period, the loading was 2,350 lb/d.

Local limits for BOD_5 and TSS are not adopted because establishing such limits using the uniform allocation method implies that discharges may not be accepted above such a limit, even if capacity is

available. Because of economic incentives, when adequate capacity is available, surcharges are a better way to control these POCs. When industrial discharges contain BOD and TSS concentrations not greater than 250 mg/L, a surcharge system that charges the actual cost per pound of BOD and TSS as the actual cost for treatment provides for industry to pay an equitable share of the cost of treatment. When industrial waste exceeds 250 mg/L for either parameter, a higher surcharge is warranted due to contributions that accelerate the need to increase treatment plant capacity. PRASA reserves the right to establish and charge surcharges that account for the cost of treatment on industrial waste.

PRASA will also use industry-permit-specific technically based limits whenever an industry is found to have significant potential to discharge waste with BOD or TSS in significant quantities. Industry-specific limits help to reduce unnecessary loadings to the WWTP and extend the time periods between costly facility upgrades to meet NPDES permit limits and requirements. Industry-specific limits should be based on the available capacity at the WWTP, technically achievable limits using industry-supplied pretreatment, and industrial BMPs.

6.3 Total Nitrogen

TN is defined by the PRWQSR as the sum of TKN plus NO_3 plus NO_2. TKN is the sum of nitrogen from protein plus ammonia. The NPDES permit has not authorized a mixing zone dilution allowance for this discharge; therefore, the dilution ratio is set at 1:1.

The PRWQSR limit of 5,000 µg/L is the limiting factor for local limits. When a treatment plant has been designed to remove nitrogen, the removal is based on proper operation. The Dorado plant was originally designed to remove nitrogen. Some processes, however, that were designed to remove nitrogen are not online and in need of refurbishment. Consequently, the plant must be treated as one that is not designed to remove nitrogen. TN is ubiquitous to both industrial, commercial, and residential discharges to the system, and nitrogen control, in a plant that does not remove nitrogen, cannot be achieved through the use of local limits. According to the Metcalf and Eddy's reference "Wastewater Engineering," typical domestic waste contains a medium level of 40 mg/L of TN. Consequently, a local limit set to medium domestic strength of 40 mg/L is set in this document.

6.4 pH

The lower local limit for pH recommended at the Dorado WWTP is more stringent than the Puerto Rico General Limits.[5] This is warranted because nitrogen removal at the plant depends on maintaining sufficient alkalinity. Low pH discharges could potentially interfere. Therefore, the limit of 6.5 to 10.0 SU is adopted.

6.5 Phenols

The PRWQSR regulates phenol and a subset of phenolic derivatives. The PRWQSR limits phenol at 10 mg/L for freshwater and 860 mg/L for marine discharges. Appendix E lists the regulated phenolic compounds and their limits.

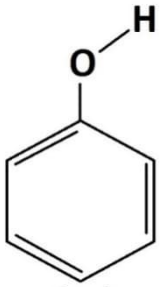
The phenol molecule consists of a 6-carbon ring, with a hydroxyl (OH) group bonded (substituted) at one of the carbons. This substance is significantly less toxic than other phenolic compounds and is even the active ingredient in some throat sprays. Derivatives of phenol occur when another substance (such as a

[5] Pretreatment limits are set island-wide (referred to herein as the "general limits") for metals at all WWTPs in Puerto Rico, as contained and specified in the *Rules and Regulations for the Supply of Water and Sewer Service*.

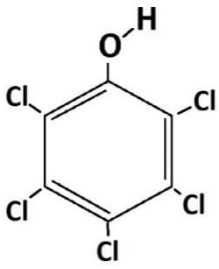
halogen) is bonded (substituted) at one of the carbons in the ring. As more chlorine (or other halogen) substitution occurs, the toxicity of the resulting compounds becomes increasingly higher.

As an example, pentachlorophenol is formed when each of the open points in the ring is attached to a chlorine. Pentachlorophenol has all available points substituted and is limited by the PRWQSR to 1 µg/L.

A reference value for unsubstituted phenol is available for both domestic concentration (0.025 µg/L) and for a removal factor (median value 90%) across activated sludge treatment. Based on these references, a local limit could significantly exceed 90 mg/L.



Phenol



Pentachlorophenol

Reference data for the more toxic forms of substituted phenols, however, are not available. Consequently, it is not possible to develop a local limit for each compound in Appendix E based on reference data.

Currently, the general limit in the PRASA Rules and Regulations for the Supply of Water and Sewer Services, Section 2.05, contains a limit of 1.0 mg/L for phenolic compounds. This limit is applied to the sum of the individual concentrations of toxic phenolic substances on the list of priority pollutants, analyzed using procedures in accordance with 40 CFR 136, Table 1C. This limit will be retained with the modification that the limit applies to phenolic compounds, excluding unsubstituted phenol.

6.6 Fats, Oils, and Grease

A local limit of 50 mg/L for oil and grease is established in the Puerto Rico General Limits. This limit is protective and is retained.

6.7 Temperature

Prior to this TBLL evaluation, local limits for temperature were established in the Puerto Rico Pretreatment Limits[6] at 60°C (140°F).

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)).

The 60°C (140°F) limit at the point of discharge into the Dorado WWTP sanitary sewer system is both in keeping with the general limit and with a BPJ limit (which has been observed in other TBLLs to be set as high as 65°C [150°F]). The rationale is based on worker health and safety concerns and helps to achieve the other temperature limit. The 60°C (140°F) limit is retained.

6.8 Flammability

Local limits for flammability were previously adopted prohibiting any discharge with a closed-cup flashpoint less than 140°F (60°C). An additional LEL local limit is added in this evaluation 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%, with no single LEL meter reading of 10% or greater.

[6] *Ibid*.

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

6.9 Toxic Organic Pollutants

No toxic organic POCs were identified in this system by reviewing the priority pollutant scans. Therefore, system-wide local limits were not developed for toxic organic pollutants. Instead, PRASA will address toxic organic pollutants using industry-permit-specific technically based limits whenever a toxic compound is identified in an industrial discharge. Developing such a limit is similar to developing TBLLs as applied from the waste discharge from the industry to the effluent discharge from the Dorado WWTP. Establishing limits should be based on use of permissible exposure limits, time weighted averages, any additional information from toxicological references (such as the American Conference of Governmental Industrial Hygienists [ACGIH]), and (as appropriate) Henry's constant.

7. Local Limits Implementation

The new local limits will apply to all non-domestic 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

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Appendix A
Priority Pollutants Detected At or Above MDL

List of Priority Pollutants found at or above MDL

One Scan Each Influent and Effluent

For All reports organic compounds are not listed if results were at or below MDL

Sample Date	Method	5/26/2020	Number of Results Above MDL		Result Influent µg/l	Result Effuent µg/l	MDL	RL
624	Volatile Organic Compounds (GC/MS)	1	Chloroform	2.6		1.2	
		1	Toluene	1.6		1.2	
625	Semivolatile Organic Compounds	1	Diethyl phthalate	0.93		0.2	
608	Organochlorine Pesticides	0					
608.2	Organochlorine Pesticides	0					
612	Organochlorine Pesticides	0					
617	Organochlorine Pesticides	0					
8082A	PCB	0					
622	Organophosphorous Pesticides	0					
625	PAH Semi Volatile	0					
1613B	Tetra Chlorinated Dioxins & Furans ID HRGC/HRMS	0					

F - Detected but too low to quantify
m matrix effect was present
J Result is an estimated value

List of Priority Pollutants found at or above MDL

One Scan Each Influent and Effluent

For All reports organic compounds are not listed if results were at or below MDL

Sample Date	Method	Number of Results Above MDL		Result Influent µg/l	Result Effuent µg/l	MDL	RL
4/27/21							
624	Volatile Organic Compounds (GC/MS)	0					
		0					
		0					
625	Semivolatile Organic Compounds	1	Di(2-ethylhexyl)phthalate	4.6		0.2	
		1	Diethyl phthalate	1.87		0.2	
		1	Phenol	4.67		0.25	
608	Organochlorine Pesticides	0					
608.2	Organochlorine Pesticides	0					
612	Organochlorine Pesticides	0					
617	Organochlorine Pesticides	0					
8082A	PCB	0					
622	Organophosphorous Pesticides	0					
625	PAH Semi Volatile	0					
1613B	Tetra Chlorinated Dioxins & Furans ID HRGC/HRMS	0					

F - Detected but too low to quantify
m matrix effect was present
J Result is an estimated value

List of Priority Pollutants found at or above MDL

One Scan Each Influent and Effluent

For All reports organic compounds are not listed if results were at or below MDL

Sample Date	Method	Number of Results Above MDL		Result Influent µg/l	Result Effuent µg/l	MDL	RL
	3/8/2022						
624	Volatile Organic Compounds (GC/MS)	0					
		0					
		0					
625	Semivolatile Organic Compounds	1	Di(2-ethylhexyl)phthalate		1.13	0.2	
608	Organochlorine Pesticides	0					
608.2	Organochlorine Pesticides	0					
612	Organochlorine Pesticides	0					
617	Organochlorine Pesticides	0					
8082A	PCB	0					
622	Organophosphorous Pesticides	0					
625	PAH Semi Volatile	0					
1613B	Tetra Chlorinated Dioxins & Furans ID HRGC/HRMS	0					

F - Detected but too low to quantify
m matrix effect was present
J Result is an estimated value

Appendix B
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 POTW's 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 POTW's influent is more than 1/500* of the applicable sludge criteria.*
- *The maximum concentration of the pollutant in the POTW's 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 ACGIH screening level for fume toxicity.

Appendix C
Data Sheets Used in
“TBLL Calc-Dorado.xlsm”

Line Number

Basic Data

1	Name of Facility:	**Dorado WWTP**	
2	Point of Contact:	Dara Osborne	
3	Person Entering Data:	Dara Osborne	
4	Reviewer:	Wayne Heinemann	
5	**GENERAL INFORMATION:**	(Data in colored cells below required)	
6	Receiving Water Hardness (if fresh)	**160**	<----- Number must be between 25 and 400
7	(M)arine, (F)resh, or (B)oth Discharges	**F**	<----- Enter only letters "M", "F", or "B"
8	Sludge: Class A (A) or (C)eiling level	**A**	<----- Enter only letters "A" or "C"
9	Plant: (A)ctivated sludge or (O)ther	**A**	<----- Enter only letters "A" or "O"
10			
11	Total Plant Flow (in MGD)	**1.61 MGD**	<----- For flows typically the most critical situation (one that
12	Domestic & Commercial Flow (in MGD)	**1.55 MGD**	yields the lowest local limits) is the lowest flow month, but run
13	Industrial Flow (in MGD)	**0.06 MGD**	several scenarios if there is any doubt. Adopt the lowest limits.
14	Infiltration/Inflow (by subtraction)		
15	Acute Dilution Factor	**1. : 1**	<----- Based on 1Q10+avg plnt flow
16	Chronic Dilution Factor	**1. : 1**	<----- Based on 7Q10 + avg plnt flow
17	Dilution Factor for _Health___	**1. : 1**	<----- Enter Chronic DF if not otherwise determined
18	Digester Flow (in MGD)	**0.0144 MGD**	<----- recommend: 0.01441 MGD @ 2% solids
19	Dry Sludge Production Rate (US Tons/day)	**1.3092 T/D**	<----- recommend: 1.30917 T/D
20			
21	**Default Method for Calculating Limits**	**Customize as needed for specific pollutants at "LOCLIMIT.XLS" Rows 45-49**	
22	Sampling Data Available (inf, eff, sludge) (Y/N)	**Y**	<--- "Y" if sampling data available, otherwise defaults presumed
23	Credit present loading of existing sources (Y/N)	**N**	<-- reduce influent to domestic using "loclimit.xls" row 28
24	Adjust for receiving water pollution (Y/N)	**N**	<-- requires receiving water data in "loclimit.xls" row 29
25	Use Observed Overall Removal Rate (Y/N)	**N**	<-- Always say "Y" if good data available from the POTW
26	Use Observed Primary Removal Rate (Y/N)	**N**	<-- If primary effluent sample data is obtained say "Y"
	Fraction of Loading Reserved for Safety	**5.00%**	< --Recommend 5%
	Fraction of loading Reserved for Growth	**5.00%**	< -- Unless system is near capacity, or rapid City growth, recommend 5%
27	Total Fraction of Loading Capacity held in reserve	**10.00%**	<-- Enter .1 for 10%, etc.

Line Number

Basic Data

	Which Conservative Pollutants to Limit? (Bold = Required by EPA)	
2	**Check (or Un-Check) for Each Pollutant**	Develop Local Limit? (check for YES)
3	Antimony	☐
4	**Arsenic (T)**	☑
5	Arsenic (penta or +5)	☐
6	Beryllium	☑
7	**Cadmium**	☑
8	**Chromium(+6)**	☐
9	Chromium (T)	☑
10	**Copper**	☑
11	**Cyanide**	☑
12	**Lead**	☑
13	**Mercury**	☑
14	**Molybdenum**	☑
15	**Nickel**	☑
16	**Selenium**	☑
17	**Silver**	☑
18	Thallium	☑
19	TributylTin	☐
20	**Zinc**	☑
21	Add #1	☐
22	Add #2	☐
23	Add #3	☐
24	Add #4	☐
25		

ENTER DATA FROM PLANT SAMPLING IN THIS SPREADSHEET

	Negative MAIL (Y or N)	Y
	Influent Cu modeled	**45.7 ug/l**
Line Number	Influent Cu Calculated	60.4571 ug/l
	Result	0.00 mg/l

COPPER
Adopt as Limit

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	Anti												
2	Ave. Influent Conc.		1.637 ug/L	0.092 ug/L	2.651 ug/L	45.700 ug/L	0.496 ug/L	1.393 ug/L	0.095 ug/L	1.650 ug/L	2.360 ug/L	0.500 ug/L	0.284 ug/L	145.486 ug/L
3	Ave. Effluent Conc.		1.034 ug/L	0.016 ug/L	0.463 ug/L	3.847 ug/L	2.267 ug/L	0.083 ug/L	0.004 ug/L	0.477 ug/L	0.874 ug/L	0.686 ug/L	0.019 ug/L	21.343 ug/L
4	Ave. Primary Effluent Conc.													
5	Ave. Primary Removal (ADRE)													
7	Ave. Overall Removal (ADRE)		35.18%	78.15%	78.54%	92.61%	69.00%	92.39%	88.79%	69.54%	60.29%	49.05%	91.25%	82.51%
9	Effluent Variation (COV)		0.06 ug/L	0.2 ug/L	0.1 ug/L	0.19 ug/L	0.7 ug/L	0.18 ug/L	0.97 ug/L	0.47 ug/L	0.05 ug/L	0.7 ug/L	0.21 ug/L	0.11 ug/L
10	Average Sludge Conc.		6.99 mg/Kg	0.79 mg/Kg	43.60 mg/Kg	669.50 mg/Kg	#DIV/0!	14.35 mg/Kg	0.88 mg/Kg	8.10 mg/Kg	22.55 mg/Kg	7.80 mg/Kg	2.81 mg/Kg	1085.00 mg/Kg
11	Ambient Receiving Water Conc.		0.00 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
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)		Click the "+" button to the left of row numbers to review or input data.											
14	SAMPLE 1		Enter only dates and sampling results (white boxes in default pallate)				mdl-RL 0.010 mg/L							
15	Date:	LOCATION	Arsenic (T)	Cadmium	Chrome (T)	Copper	Cyanide	Lead	Mercury	Molybdenum	Nickel	Selenium	Silver	Zinc
16	12/4/2022	Influent	1.36 ug/l	0.051 ug/l	1.36 ug/l	36. ug/l	0.323 ug/l	0.789 ug/l	0.0316 ug/l	1.09 ug/l	1.57 ug/l	0.4 ug/l	0.15 ug/l	85.5 ug/l
17	12/5/2022	Effluent	0.99 ug/l	0.017 ug/l	0.49 ug/l	4.17 ug/l	0.318 ug/l	0.093 ug/l	0.0036 ug/l	0.27 ug/l	0.84 ug/l	0.2 ug/l	0.02 ug/l	24.2 ug/l
18		Prim. Clar.												
19		Sludge												
20		Sludge Wet												
21	Aqueous	ML/RL	0.09/0.50	0.008/0.020	0.03/0.20	0.05/0.10	0.25/0.50	0.006/0.020	0.06/0.5	0.03/0.10	0.04/0.20	0.2/1.0	0.009/0.020	0.5/2.0
22	Sludge	ML/RL	0.06/0.50	0.007/0.020	0.06/0.20	0.04/0.10		0.020/0.050	0.004/0.019	0.020/0.050	0.03/0.20	0.09/1.0	0.004/0.020	0.20/0.50
23	Primary Removal Rate:		Can't Do	Can't Do	Can't Do	Can't Do	**Can't Do**	Can't Do	Can't Do	Can't Do	Can't Do	Can't Do	Can't Do	Can't Do
24	Overall Removal Rate		27.21%	66.67%	63.97%	88.42%	1.55%	88.21%	88.61%	75.23%	46.50%	50.00%	86.67%	71.70%
25														
26	SAMPLE 2		Enter only dates and sampling results (white boxes in default pallate)											
27	Date:	LOCATION	Arsenic (T)	Cadmium	Chrome (T)	Copper	Cyanide	Lead	Mercury	Molybdenum	Nickel	Selenium	Silver	Zinc
28	12/5/2022	Influent	1.97 ug/l	0.139 ug/l	3.57 ug/l	72.1 ug/l	0.52 ug/l	2.44 ug/l	0.266 ug/l	1.51 ug/l	3.09 ug/l	0.6 ug/l	0.704 ug/l	193. ug/l
29	12/6/2022	Effluent	1.03 ug/l	0.011 ug/l	0.44 ug/l	3.57 ug/l	1.9 ug/l	0.069 ug/l	0.002 ug/l	0.36 ug/l	0.86 ug/l	1. ug/l	0.02 ug/l	20.5 ug/l
30		Prim. Clar.												
31	12/6/2022	Sludge	7.03 mg/kg	0.77 mg/kg	43.3 mg/kg	662. mg/kg		14.2 mg/kg	0.95 mg/kg	8.02 mg/kg	22.5 mg/kg	7.6 mg/kg	2.72 mg/kg	1,070. mg/kg
32		Sludge Wet												
33	Aqueous	ML/RL	0.09/0.50	0.008/0.020	0.03/0.20	0.05/0.10	0.25/0.50	0.006/0.020	0.06/0.5	0.03/0.10	0.04/0.20	0.2/1.0	0.009/0.020	0.5/2.0
34	Sludge	ML/RL	0.06/0.50	0.007/0.020	0.06/0.20	0.04/0.10	0. ug/l	0.020/0.050	0.004/0.019	0.020/0.050	0.03/0.20	0.09/1.0	0.004/0.020	0.20/0.50
35	Primary Removal Rate:		Can't Do	Can't Do	Can't Do	Can't Do	Can't Do	Can't Do	Can't Do	Can't Do	Can't Do	Can't Do	Can't Do	Can't Do
36	Overall Removal Rate		47.72%	92.09%	87.68%	95.05%	Can't Do	97.17%	99.23%	76.16%	72.17%	Can't Do	97.16%	89.38%
37														
38	SAMPLE 3		Enter only dates and sampling results (white boxes in default pallate)											
39	Date:	LOCATION	Arsenic (T)	Cadmium	Chrome (T)	Copper	Cyanide	Lead	Mercury	Molybdenum	Nickel	Selenium	Silver	Zinc
40	12/6/2022	Influent	1.63 ug/l	0.072 ug/l	2.91 ug/l	50.7 ug/l	0.475 ug/l	1.64 ug/l	0.0816 ug/l	1.67 ug/l	2.46 ug/l	0.4 ug/l	0.324 ug/l	120. ug/l
41	12/7/2022	Effluent	1.08 ug/l	0.019 ug/l	0.44 ug/l	3.42 ug/l	1.4 ug/l	0.079 ug/l	0.002 ug/l	0.4 ug/l	0.91 ug/l	1. ug/l	0.02 ug/l	22.8 ug/l
42		Prim. Clar.												
43		Sludge												
44		Sludge Wet												
45	Aqueous	ML/RL	0.09/0.50	0.008/0.020	0.03/0.20	0.05/0.10	0.25/0.50	0.006/0.020	0.06/0.5	0.03/0.10	0.04/0.20	0.2/1.0	0.009/0.020	0.5/2.0
46	Sludge	ML/RL	0.06/0.50	0.007/0.020	0.06/0.20	0.04/0.10	0. ug/l	0.020/0.050	0.004/0.019	0.020/0.050	0.03/0.20	0.09/1.0	0.004/0.020	0.20/0.50
47	Primary Removal Rate:		Can't Do	Can't Do	Can't Do	Can't Do	Can't Do	Can't Do	Can't Do	Can't Do	Can't Do	Can't Do	Can't Do	Can't Do
48	Overall Removal Rate		33.74%	73.61%	84.88%	93.25%	Can't Do	95.18%	97.61%	76.05%	63.01%	Can't Do	93.83%	81.00%
49														

ENTER DATA FROM PLANT SAMPLING IN THIS SPREADSHEET

Negative MAIL (Y or N)	Y	**COPPER**
Influent Cu modeled	**45.7 ug/l**	Adopt as Limit
Influent Cu Calculated	60.4571 ug/l	
Result	0.00 mg/l	

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	Anti												
2	Ave. Influent Conc.		1.637 ug/L	0.092 ug/L	2.651 ug/L	45.700 ug/L	0.496 ug/L	1.393 ug/L	0.095 ug/L	1.650 ug/L	2.360 ug/L	0.500 ug/L	0.284 ug/L	145.486 ug/L
3	Ave. Effluent Conc.		1.034 ug/L	0.016 ug/L	0.463 ug/L	3.847 ug/L	2.267 ug/L	0.083 ug/L	0.004 ug/L	0.477 ug/L	0.874 ug/L	0.686 ug/L	0.019 ug/L	21.343 ug/L
4	Ave. Primary Effluent Conc.													
5	Ave. Primary Removal (ADRE)													
7	Ave. Overall Removal (ADRE)		35.18%	78.15%	78.54%	92.61%	69.00%	92.39%	88.79%	69.54%	60.29%	49.05%	91.25%	82.51%
9	Effluent Variation (COV)		0.06 ug/L	0.2 ug/L	0.1 ug/L	0.19 ug/L	0.7 ug/L	0.18 ug/L	0.97 ug/L	0.47 ug/L	0.05 ug/L	0.7 ug/L	0.21 ug/L	0.11 ug/L
10	Average Sludge Conc.		6.99 mg/Kg	0.79 mg/Kg	43.60 mg/Kg	669.50 mg/Kg	#DIV/0!	14.35 mg/Kg	0.88 mg/Kg	8.10 mg/Kg	22.55 mg/Kg	7.80 mg/Kg	2.81 mg/Kg	1085.00 mg/Kg
11	Ambient Receiving Water Conc.		0.00 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
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)		Click the "+" button to the left of row numbers to review or input data.											
50	SAMPLE 4		Enter only dates and sampling results (white boxes in default pallate)											
51	Date:	LOCATION	Arsenic (T)	Cadmium	Chrome (T)	Copper	Cyanide	Lead	Mercury	Molybdenum	Nickel	Selenium	Silver	Zinc
52	12/7/2022	Influent	1.62 ug/l	0.133 ug/l	2.74 ug/l	53.5 ug/l	0.454 ug/l	1.45 ug/l	0.0841 ug/l	1.66 ug/l	2.34 ug/l	0.6 ug/l	0.209 ug/l	139. ug/l
53	12/8/2022	Effluent	1.01 ug/l	0.014 ug/l	0.42 ug/l	3.68 ug/l	4.28 ug/l	0.083 ug/l	0.0021 ug/l	0.4 ug/l	0.94 ug/l	1. ug/l	0.02 ug/l	23. ug/l
54		Prim._Clar.												
55	12/8/2022	Sludge	6.95 mg/kg	0.81 mg/kg	43.9 mg/kg	677. mg/kg		14.5 mg/kg	0.81 mg/kg	8.17 mg/kg	22.6 mg/kg	8. mg/kg	2.9 mg/kg	1,100. mg/kg
56		Sludge Wet												
57	Aqueous	ML/RL	0.09/0.50	0.008/0.020	0.03/0.20	0.05/0.10	0.25/0.50	0.006/0.020	0.06/0.5	0.03/0.10	0.04/0.20	0.2/1.0	0.009/0.020	0.5/2.0
58	Sludge	ML/RL	0.06/0.50	0.007/0.020	0.06/0.20	0.04/0.10	0. ug/l	0.020/0.050	0.004/0.019	0.020/0.050	0.03/0.20	0.09/1.0	0.004/0.020	0.20/0.50
59	Primary Removal Rate:		Can't Do	Can't Do	Can't Do	Can't Do	Can't Do	Can't Do	Can't Do	Can't Do	Can't Do	Can't Do	Can't Do	Can't Do
60	Overall Removal Rate		37.65%	89.47%	84.67%	93.12%	Can't Do	94.28%	97.54%	75.90%	59.83%	Can't Do	90.43%	83.45%
61														
62	SAMPLE 5		Enter only dates and sampling results (white boxes in default pallate)											
63	Date:	LOCATION	Arsenic (T)	Cadmium	Chrome (T)	Copper	Cyanide	Lead	Mercury	Molybdenum	Nickel	Selenium	Silver	Zinc
64	12/8/2022	Influent	2.09 ug/l	0.139 ug/l	4.38 ug/l	114. ug/l	0.615 ug/l	1.87 ug/l	0.133 ug/l	2.6 ug/l	3.33 ug/l	0.7 ug/l	0.319 ug/l	276. ug/l
65	12/9/2022	Effluent	1.08 ug/l	0.016 ug/l	0.41 ug/l	3.23 ug/l	2.16 ug/l	0.073 ug/l	0.005 ug/l	0.37 ug/l	0.9 ug/l	0.3 ug/l	0.02 ug/l	21.4 ug/l
66		Prim._Clar.												
67		Sludge												
68		Sludge Wet												
69	Aqueous	ML/RL	0.09/0.50	0.008/0.020	0.03/0.20	0.05/0.10	0.25/0.50	0.006/0.020	0.06/0.5	0.03/0.10	0.04/0.20	0.2/1.0	0.009/0.020	0.5/2.0
70	Sludge	ML/RL	0.06/0.50	0.007/0.020	0.06/0.20	0.04/0.10	0. ug/l	0.020/0.050	0.004/0.019	0.020/0.050	0.03/0.20	0.09/1.0	0.004/0.020	0.20/0.50
71	Primary Removal Rate:		Can't Do	Can't Do	Can't Do	Can't Do	Can't Do	Can't Do	Can't Do	Can't Do	Can't Do	Can't Do	Can't Do	Can't Do
72	Overall Removal Rate		48.33%	88.49%	90.64%	97.17%	Can't Do	96.10%	96.28%	85.77%	72.97%	57.14%	93.73%	92.25%
73														
74	SAMPLE 6		Enter only dates and sampling results (white boxes in default pallate)											
75	Date:	LOCATION	Arsenic (T)	Cadmium	Chrome (T)	Copper	Cyanide	Lead	Mercury	Molybdenum	Nickel	Selenium	Silver	Zinc
76	12/9/2022	Influent	1.6 ug/l	0.073 ug/l	2.24 ug/l	62.1 ug/l	0.5 ug/l	1. ug/l	0.0433 ug/l	1.46 ug/l	2.17 ug/l	0.5 ug/l	0.168 ug/l	137. ug/l
77	12/10/2022	Effluent	1.11 ug/l	0.02 ug/l	0.5 ug/l	5.34 ug/l	2.64 ug/l	0.112 ug/l	0.0044 ug/l	0.83 ug/l	0.81 ug/l	0.3 ug/l	0.01 ug/l	20.2 ug/l
78		Prim._Clar.												
79		Sludge												
80		Sludge Wet												
81	Aqueous	ML/RL	0.09/0.50	0.008/0.020	0.03/0.20	0.05/0.10	0.25/0.50	0.006/0.020	0.06/0.5	0.03/0.10	0.04/0.20	0.2/1.0	0.009/0.020	0.5/2.0
82	Sludge	ML/RL	0.06/0.50	0.007/0.020	0.06/0.20	0.04/0.10	0. ug/l	0.020/0.050	0.004/0.019	0.020/0.050	0.03/0.20	0.09/1.0	0.004/0.020	0.20/0.50
83	Primary Removal Rate:		Can't Do	Can't Do	Can't Do	Can't Do	Can't Do	Can't Do	Can't Do	Can't Do	Can't Do	Can't Do	Can't Do	Can't Do
84	Overall Removal Rate		30.63%	72.60%	77.68%	91.40%	Can't Do	88.80%	89.84%	43.15%	62.67%	40.00%	94.05%	85.26%

ENTER DATA FROM PLANT SAMPLING IN THIS SPREADSHEET

Negative MAIL (Y or N)	Y	**COPPER**
Influent Cu modeled	**45.7 ug/l**	Adopt as Limit
Influent Cu Calculated	60.4571 ug/l	
Result	0.00 mg/l	

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	Anti												
2	Ave. Influent Conc.		1.637 ug/L	0.092 ug/L	2.651 ug/L	45.700 ug/L	0.496 ug/L	1.393 ug/L	0.095 ug/L	1.650 ug/L	2.360 ug/L	0.500 ug/L	0.284 ug/L	145.486 ug/L
3	Ave. Effluent Conc.		1.034 ug/L	0.016 ug/L	0.463 ug/L	3.847 ug/L	2.267 ug/L	0.083 ug/L	0.004 ug/L	0.477 ug/L	0.874 ug/L	0.686 ug/L	0.019 ug/L	21.343 ug/L
4	Ave. Primary Effluent Conc.													
5	Ave. Primary Removal (ADRE)													
7	Ave. Overall Removal (ADRE)		35.18%	78.15%	78.54%	92.61%	69.00%	92.39%	88.79%	69.54%	60.29%	49.05%	91.25%	82.51%
9	Effluent Variation (COV)		0.06 ug/L	0.2 ug/L	0.1 ug/L	0.19 ug/L	0.7 ug/L	0.18 ug/L	0.97 ug/L	0.47 ug/L	0.05 ug/L	0.7 ug/L	0.21 ug/L	0.11 ug/L
10	Average Sludge Conc.		6.99 mg/Kg	0.79 mg/Kg	43.60 mg/Kg	669.50 mg/Kg	#DIV/0!	14.35 mg/Kg	0.88 mg/Kg	8.10 mg/Kg	22.55 mg/Kg	7.80 mg/Kg	2.81 mg/Kg	1085.00 mg/Kg
11	Ambient Receiving Water Conc.		0.00 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
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)		Click the "+" button to the left of row numbers to review or input data.											
86	SAMPLE 7		Enter only dates and sampling results (white boxes in default pallate)											
87	Date:	LOCATION	Arsenic (T)	Cadmium	Chrome (T)	Copper	Cyanide	Lead	Mercury	Molybdenum	Nickel	Selenium	Silver	Zinc
88	12/10/2022	Influent	1.19 ug/l	0.039 ug/l	1.36 ug/l	34.8 ug/l	0.582 ug/l	0.561 ug/l	0.0248 ug/l	1.56 ug/l	1.56 ug/l	0.3 ug/l	0.117 ug/l	67.9 ug/l
89	12/11/2022	Effluent	0.94 ug/l	0.014 ug/l	0.54 ug/l	3.52 ug/l	3.17 ug/l	0.073 ug/l	0.0118 ug/l	0.71 ug/l	0.86 ug/l	1. ug/l	0.02 ug/l	17.3 ug/l
90		Prim. Clar.												
91		Sludge												
92		Sludge Wet												
93	Aqueous	ML/RL	0.09/0.50	0.008/0.020	0.03/0.20	0.05/0.10	0.25/0.50	0.006/0.020	0.06/0.5	0.03/0.10	0.04/0.20	0.2/1.0	0.009/0.020	0.5/2.0
94	Sludge	ML/RL	0.06/0.50	0.007/0.020	0.06/0.20	0.04/0.10	0. ug/l	0.020/0.050	0.004/0.019	0.020/0.050	0.03/0.20	0.09/1.0	0.004/0.020	0.20/0.50
95	Primary Removal Rate:		Can't Do	Can't Do	Can't Do	Can't Do	Can't Do	Can't Do	Can't Do	Can't Do	Can't Do	Can't Do	Can't Do	Can't Do
96	Overall Removal Rate		21.01%	64.10%	60.29%	89.89%	Can't Do	86.99%	52.42%	54.49%	44.87%	Can't Do	82.91%	74.52%

Local Limits Calculation Page

Line Number	Pollutant:	Arsenic(T)	Cadmium	Chrome (T)	Copper	Cyanide	Lead	Mercury	Molybdenum	Nickel	Selenium	Silver	Zinc
2	**Part II: PLANT DATA - OPEN AND CHANGE "BASICDATA.XLS" VALUES IF FLOWS CONTRIBUTING FOR A PARTICULAR POLLUTANT VARY**												
3	Total Plant Flow (in MGD)	1.61 MGD	1.61 MGD	1.61 MGD	1.61 MGD	1.61 MGD	1.61 MGD	1.61 MGD	1.61 MGD	1.61 MGD	1.61 MGD	1.61 MGD	1.61 MGD
4	Domestic Flow (in MGD)	1.55 MGD	1.55 MGD	1.55 MGD	1.55 MGD	1.55 MGD	1.55 MGD	1.55 MGD	1.55 MGD	1.55 MGD	1.55 MGD	1.55 MGD	1.55 MGD
5	Industrial Flow (in MGD)	0.06 MGD	0.06 MGD	0.06 MGD	0.06 MGD	0.06 MGD	0.06 MGD	0.06 MGD	0.06 MGD	0.06 MGD	0.06 MGD	0.06 MGD	0.06 MGD
6	Infiltration/Inflow (by subtraction)	0. MGD	0. MGD	0. MGD	0. MGD	0. MGD	0. MGD	0. MGD	0. MGD	0. MGD	0. MGD	0. MGD	0. MGD
7	Acute Dilution Factor	1. : 1	1. : 1	1. : 1	1. : 1	1. : 1	1. : 1	1. : 1	1. : 1	1. : 1	1. : 1	1. : 1	1. : 1
8	Chronic Dilution Factor	1. : 1	1. : 1	1. : 1	1. : 1	1. : 1	1. : 1	1. : 1	1. : 1	1. : 1	1. : 1	1. : 1	1. : 1
9	Dilution Factor for HH Limits	1. : 1	1. : 1	1. : 1	1. : 1	1. : 1	1. : 1	1. : 1	1. : 1	1. : 1	1. : 1	1. : 1	1. : 1
10	Digester Flow (in MGD)	0.0144 MGD	0.0144 MGD	0.0144 MGD	0.0144 MGD	0.0144 MGD	0.0144 MGD	0.0144 MGD	0.0144 MGD	0.0144 MGD	0.0144 MGD	0.0144 MGD	0.0144 MGD
11	Dry Sludge Production Rate (US Tons/day)	1.3092 T/D	1.3092 T/D	1.3092 T/D	1.3092 T/D	1.3092 T/D	1.3092 T/D	1.3092 T/D	1.3092 T/D	1.3092 T/D	1.3092 T/D	1.3092 T/D	1.3092 T/D
12	Nitrification	1.5	5.2	.25-1.9,1-100	.05-.48	.34-.5	0.5			.25-.5, 5			.08-.5
13	**Part III: CONCENTRATIONS LIMITING THE POTW DUE TO PASS THROUGH OR INTERFERENCE**												
14	WQ Acute criteria, aquatic life (mg/L)	0.36 mg/l	0.0067 mg/l	2.55 mg/l	0.0276 mg/l	0.022 mg/l	0.1485 mg/l	0.00247 mg/l	NA	2.11 mg/l	0.02 mg/l	0.0091 mg/l	0.1743 mg/l
15	WQ Chronic criteria, aquatic life (mg/L)	0.19 mg/l	0.0018 mg/l	0.304 mg/l	0.0177 mg/l	0.005 mg/l	0.00579 mg/l	0.00001 mg/l	NA	0.2347 mg/l	0.005 mg/l	NA	0.1578 mg/l
16	Other Water Criteria-Human Health	0.036 mg/l	0.0012 mg/l	0.127 mg/l	0.004 mg/L	0.001 mg/L	0.006 mg/l	0.00001 mg/l	NA	0.008 mg/l	0.005 mg/l	0.0085 mg/l	0.15784 mg/l
17	Activated Sludge Inhibition Level	0.1 mg/l	1. mg/l	10. mg/l	1. mg/l	0.1 mg/l	1. mg/l	0.1 mg/l	NA	1. mg/l	NA	0.25 mg/l	0.3 mg/l
18	Anaerobic Digestor Inhibition Level	1.6 mg/l	20. mg/l	NA	40. mg/l	4. mg/l	340. mg/l	NA	NA	10. mg/l	NA	13. mg/l	400. mg/l
19	Class A Sludge standards (40 CFR 503)	41. mg/l	39. mg/l	NA	1,500. mg/l	NA	300. mg/l	17. mg/l	75. mg/l	420. mg/l	100. mg/l	NA	2,800. mg/l
20	Sludge ceiling concentration for beneficial use	75. mg/l	85. mg/l	NA	4,300. mg/l	NA	840. mg/l	57. mg/l	75. mg/l	420. mg/l	100. mg/l	NA	7,500. mg/l
21		Other Water Criteria-Color Code at Input-	Values in Grey Acute Federal WQS		Values in Blue are WQ Chronic criteria, human Health				Values in orange are PRWQS		Values in green are NPDES		
22	**Part IV: POLLUTANT CONCENTRATION ----- SUMMARY**												
23	Estimated Average Industrial Conc.	0. mg/l	0. mg/l	0. mg/l	0. mg/l	0. mg/l	0. mg/l	0. mg/l	0. mg/l	0. mg/l	0. mg/l	0. mg/l	0. mg/l
24	Ambient Concentration (receiving water)	0.0000 mg/L	0.0000 mg/L	0.0000 mg/L	0.0000 mg/L	0.0000 mg/L	0.0000 mg/L	0.0000 mg/L	0.0000 mg/L	0.0000 mg/L	0.0000 mg/L	0.0000 mg/L	0.0000 mg/L
25	Adjusted Domestic concentration	0.00164 mg/l	0.00009 mg/l	0.00265 mg/l	0.0457 mg/l	0.0005 mg/l	0.00139 mg/l	0.00009 mg/l	0.00165 mg/l	0.00236 mg/l	0.0005 mg/l	0.00028 mg/l	0.14549 mg/l
26	Typical Domestic Concentrations	0.003 mg/l	0.003 mg/l	0.05 mg/l	0.061 mg/l	0.041 mg/l	0.049 mg/l	0.0003 mg/l	0.01 mg/l	0.021 mg/l	0.001 mg/l	0.005 mg/l	0.175 mg/l
27	Average Sludge Level (mg/Kg - Dry)	6.99 mg/kg	0.792 mg/kg	43.6 mg/kg	669.5 mg/kg	#DIV/0!	14.35 mg/kg	0.881 mg/kg	8.095 mg/kg	22.55 mg/kg	7.8 mg/kg	2.81 mg/kg	1,085. mg/kg
28	Average Influent Level (mg/l)	0.0016 mg/l	0.0001 mg/l	0.0027 mg/l	0.0457 mg/l	0.0005 mg/l	0.0014 mg/l	0.0001 mg/l	0.0017 mg/l	0.0024 mg/l	0.0005 mg/l	0.0003 mg/l	0.1455 mg/l
29	Average Effluent Level (mg/l)	0.001 mg/l	0. mg/l	0.0005 mg/l	0.0038 mg/l	0.0023 mg/l	0.0001 mg/l	0. mg/l	0.0005 mg/l	0.0009 mg/l	0.0007 mg/l	0. mg/l	0.0213 mg/l
30													
31	**Part V: REMOVAL RATES**												
32	Average Primary Removal Rate	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
33	Average Overall Removal Rate	35.18%	78.15%	78.54%	92.61%	69.00%	92.39%	88.79%	69.54%	60.29%	49.05%	91.25%	82.51%
34	Reference Primary Removal Rate	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
35	Reference 2d Decile Plant Removal	31.00%	33.00%	68.00%	67.00%	41.00%	39.00%	50.00%		25.00%	33.00%	50.00%	64.00%
36	Reference Ave Plant Removal	35.18%	78.15%	78.54%	92.61%	69.00%	92.39%	88.79%	69.54%	60.29%	49.05%	91.25%	82.51%
37	Reference 8th Decile Removal	53.00%	91.00%	91.00%	95.00%	84.00%	76.00%	79.00%		62.00%	67.00%	88.00%	88.00%
38													
39	**Part VI: HOW TO CALCULATE LIMITS:**												
40	Sampling Data Available (inf, eff, sludge) (Y/N)	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
41	Credit present loading of existing sources (Y/N)	N	N	N	N	N	N	N	N	N	N	N	N
42	Adjust for receiving water pollution	N	N	N	N	N	N	N	N	N	N	N	N
43	Use Observed Overall Removal Rate (Y/N)	N	N	N	N	N	N	N	N	N	N	N	N
44	Use Observed Primary Removal Rate (Y/N)	N	N	N	N	N	N	N	N	N	N	N	N
45													
46	**Part VII: LOCAL LIMITS CORRESPONDING TO THE CRITERIA ABOVE BASED ON COMPLIANCE WITH:**												
47	Acute WQ Standards (in mg/l)	14.861 mg/l	0.816 mg/l	319.07 mg/l	8.846 mg/l	1.891 mg/l	52.33 mg/l	0.589 mg/l	NA	142.564 mg/l	1.04 mg/l	2.787 mg/l	22.97 mg/l
48	Chronic WQ Standards (in mg/l)	7.823 mg/l	0.22 mg/l	37.971 mg/l	5.238 mg/l	0.437 mg/l	2.00463 mg/l	0.00042 mg/l	NA	15.795 mg/l	0.25 mg/l	NA	20.45 mg/l
49	Other Water Criteria-Color Code at Input	1.448 mg/l	0.139 mg/l	15.814 mg/l	0.131 mg/l	0.074 mg/l	NA	0. mg/l	NA	0.499 mg/l	0.25 mg/l	NA	20.454 mg/l
50	Sludge Application Limits (in mg/l)	0.506 mg/l	0.256 mg/l	NA	4.692 mg/l	NA	1.618 mg/l	0.095 mg/l	0.503 mg/l	3.45 mg/l	0.984 mg/l	NA	10.876 mg/l
51	Activated Sludge Inhibition (in mg/l)	2.641 mg/l	26.831 mg/l	268.26 mg/l	25.653 mg/l	2.671 mg/l	26.797 mg/l	2.681 mg/l	NA	26.772 mg/l	NA	6.701 mg/l	4.292 mg/l
52	Anaerobic Digestor Inhibition (in mg/l)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Local Limits Calculation Page

Line Number													
54	**Part VIII: SAMPLE QUALITY: COMPARISON OF LOADINGS AND REMOVAL RATES IMPLIED BY SAMPLE DATA**												
55	Pollutants in Influent (per sampling)	0.022 lbs	0.001 lbs	0.036 lbs	0.614 lbs	0.007 lbs	0.019 lbs	0.001 lbs	0.022 lbs	0.032 lbs	0.007 lbs	0.004 lbs	1.953 lbs
56	Pollutants in biosolids (per sampling)	0.018 lbs	0.002 lbs	0.114 lbs	1.753 lbs	#DIV/0!	0.038 lbs	0.002 lbs	0.021 lbs	0.059 lbs	0.02 lbs	0.007 lbs	2.841 lbs
57	Pollutants in effluent (per sampling)	0.014 lbs	0. lbs	0.006 lbs	0.051 lbs	0.03 lbs	0.001 lbs	0. lbs	0.006 lbs	0.012 lbs	0.009 lbs	0. lbs	0.284 lbs
58	% Influent load accounted for: (eff/inf)	145.87%	184.27%	337.96%	294.02%	#DIV/0!	206.82%	185.49%	124.33%	223.04%	440.12%	199.12%	159.97%
59	Current HW Load Implied by Sludge Data:	18.97%	3.75%	1.83%	288.43%	#DIV/0!	4.91%	180.66%	11.15%	34.98%	31.60%	0.58%	85.48%
60	Local Limit implied by %max Biosolids level	0.214 mg/L	0.120 mg/L	NA	1.521 mg/L	NA	0.744 mg/L	0.047 mg/L	0.366 mg/L	1.116 mg/L	0.159 mg/L	NA	6.171 mg/L
61													
62	**PART IX: MASS BASED ANALYSIS**												
63	Limiting MAHL (Dom Load + LL*IUflow)	0.2743 lb/d	0.07 lb/d	7.95 lb/d	0.66 lb/d	0.04 lb/d	0.83 lb/d	0. lb/d	0.27 lb/d	0.28 lb/d	0.13 lb/d	1.4 lb/d	4.03 lb/d
64	Domestic and 10.% reserve for safety and growth	0.02743 lb/d	0.0083 lb/d	0.8291 lb/d	0.6564 lb/d	0.0107 lb/d	0.1008 lb/d	0.0014 lb/d	0.0487 lb/d	0.0585 lb/d	0.0196 lb/d	0.1435 lb/d	2.2835 lb/d
	Septage	0. lb/d	0. lb/d	0. lb/d	0. lb/d	0. lb/d	0. lb/d	0. lb/d		0. lb/d		0. lb/d	0. lb/d
65	Max. Allowable Industrial Loading (MAIL)	0.2468 lb/d	0.0624 lb/d	7.1188 lb/d	(0. neg!)	0.03258 lb/d	0.7268 lb/d	0.00007 lb/d	0.2246 lb/d	0.2215 lb/d	0.1121 lb/d	1.2548 lb/d	1.7447 lb/d
66													
67	**Part X: LOCAL LIMIT RECAP:**	**Arsenic(T)**	**Cadmium**	**Chrome (T)**	**Copper**	**Cyanide**	**Lead**	**Mercury**	**Molybdenum**	**Nickel**	**Selenium**	**Silver**	**Zinc**
68	Industrial Flow (in MGD)	0.06 MGD	0.06 MGD	0.06 MGD	0.06 MGD	0.06 MGD	0.06 MGD	0.06 MGD	0.06 MGD	0.06 MGD	0.06 MGD	0.06 MGD	0.06 MGD
69	Local Limit = MAIL/(8.34*Industrial Flow)	0.493 mg/l	0.125 mg/l	14.23 mg/l	0.000 mg/l	0.065 mg/l	1.452 mg/l	0.0001 mg/l	0.449 mg/l	0.443 mg/l	0.224 mg/l	2.508 mg/l	3.487 mg/l
70					modeled 0.0457 mg/L								
71													

FACILITY: Dorado WWTP
RUN DATE: 6/22/2023

Line Number

WATER QUALITY CRITERIA CALCULATIONS (in ug/L unless otherwise noted)

1	Receiving Water: (F)resh, (M)arine, (B)oth	F
2	Hardness for Use in Calculations:	25.00

3		PRIOR	CAR	WATER QUALITY STANDARD				TOTAL	TOTAL	Total	Conv. Fact.
4		ITY	CIN	FRESH				LIMITING	LIMITING	LIMITING	Marine
5	*POLLUTANT*	PLTNT?	GEN?	ACUTE	CHRONIC	Hhealth	COMMENTS	ACUTE	CHRONIC	HH	dis/tot
7	ARSENIC Inorganic	Y	Y	360. ug/l	190. ug/l	0.018 ug/l	Federal, NTR	360. ug/l	190. ug/l	0.018 ug/l	1.00
10	CADMIUM - Dependent on Hardness in B6	Y	N	0.8 ug/l	0.4 ug/l		Federal	0.8211 ug/l	0.4187 ug/l	0. ug/l	0.99
12	CHROMIUM(T) - Dependent on hardness in $I	N	N	176.3 ug/l	57.2 ug/l			557.9444 ug/l	66.5038 ug/l	0. ug/l	1.00
13	COPPER - Dependent on Hardness in B6	Y	N	4.6 ug/l	3.5 ug/l		Federal	4.801 ug/l	3.6166 ug/l	0. ug/l	0.83
14	CYANIDE	Y	N	22. ug/l	5.2 ug/l	700. ug/l	Federal	22. ug/l	5.2 ug/l	700. ug/l	1.00
15	LEAD - Dependent on hardness in B6	Y	N	13.9 ug/l	0.5 ug/l		Federal	13.98 ug/l	0.5448 ug/l	0. ug/l	0.95
16	MERCURY	Y	N	2.1 ug/l	0.012 ug/l	0.14 ug/l	Federal	2.4706 ug/l	0.012 ug/l	0.14 ug/l	0.85
17	Molybdenum	N	N							NA	
18	NICKEL - Dependent on hardness in B6	Y	N	438.1 ug/l	48.7 ug/l	610. ug/l	Federal	438.9427 ug/l	48.797 ug/l	610. ug/l	0.99
19	SELENIUM	Y	N	20. ug/l	5. ug/l		Federal	20. ug/l	5. ug/l	0. ug/l	1.00
20	SILVER - Dependent on hardness in B6.	Y	N	0.3 ug/l	NA		Federal	0.374 ug/l	NA	0. ug/l	0.85
23	ZINC- Dependent on hardness in B6	Y	N	35.4 ug/l	32.3 ug/l		Federal	36.1528 ug/l	32.7451 ug/l	0. ug/l	0.95

Appendix D
Puerto Rico Water Quality Standards Worksheet

Puerto Rico Water Quality Standards (WQS) Worksheet

Dorado

Substance		Class SB (µg/L)	Class SD (µg/L)	Class SG[a] (µg/L)
&	Aluminum (Al)	---	87 (AL)	---
+,&	Antimony (Sb)	640 (HH)	5.6 (HH)	5.6 (HH)
+,*, &	Arsenic (As)	36 (AL)	10 (DW)	10 (DW)
+,% , &	Cadmium (Cd)	7.95 (AL)	Note 1 (AL)	5.0 (DW)
	Chlorine	7.5 (AL)	11 (AL)	---
+	Cyanide (Free CN)	1.0 (AL)	---	---
+, &	Cyanide	---	4 (HH)	4 (HH)
+, &	Copper (Cu)	3.73 (AL)	Note 3 (AL)	1,300 (DW)
+, &	Chromium III (Cr^{+3})	---	Note 2 (AL)	---
+, &	Chromium VI (Cr^{+6})	50.4 (AL)	11.4 (AL)	---
&	Chromium (Cr)	---	---	100 (DW)
	Fluoride (F)	---	4,000 (DW)	4,000 (DW)
+, &	Mercury (Hg)	0.051 (HH)	0.050 (HH)	0.050 (HH)
+, &	Nickel (Ni)	8.28 (AL)	Note 4 (AL)	610 (HH)
+, &	Silver (Ag)	2.24 (AL)	Note 5 (AL)	---
+,% , &	Lead (Pb)	8.52 (AL)	Note 6 (AL)	15.0 (DW)
+, &	Selenium (Se)	71.14 (AL)	5.0 (AL)	50.0 (DW)
	Sulfide (S) (undissociated H_2S)	2.0 (AL)	2.0 (AL)	---
+, &	Thallium (Tl)	0.47 (HH)	0.24 (HH)	0.24 (HH)
+, &	Zinc (Zn)	85.62 (AL)	Note 7 (AL)	---

Appendix D

Appendix E
Phenolic Compounds Regulated by Puerto Rico Water Quality Standards

Phenol and Phenolic Compounds

	Subtance	Classes SB (ug/L)	Class SD (ug/L)	Class SG (ug/L)[a]
+, *	Pentachlorophenol	0.4 (HH)	0.3 (HH)	0.3 (HH)
	2,4,5-Trichlorophenol	600 (HH)	300 (HH)	300 (HH)
+, *	2,4,6-Trichlorophenol	28 (HH)	15 (HH)	15 (HH)
+	2,4-Dichlorophenol	60 (HH)	10 (HH)	10 (HH)
+	2,4-Dimethylphenol	3,000 (HH)	100 (HH)	100 (HH)
+	2-Chlorophenol	800 (HH)	30 (HH)	30 (HH)
+	2-Methyl-4,6-Dinitrophenol	30 (HH)	2 (HH)	2 (HH)
+	3-Methyl-4,6-Dinitrophenol	2,000 (HH)	500 (HH)	500 (HH)
+	2,4-Dinitrophenol	300 (HH)	10 (HH)	10 (HH)
	Nonyphenol	1.7 (AL)	6.6 (AL)	---
+	Phenol	300,000 (HH)	4,000 (HH)	4,000 (HH)

PUERTO RICO WATER QUALITY STANDARDS REGULATION

Rule 1303, as Amended on April 2019

AL = Protection of the water body for the propagation and preservation of aquatic species or species dependent on the water body.
DW = Protection of the water body for use as source of drinking water supply.
HH = Protection of the water body or aquatic life for reasons of human health.

* = Identifies a substance that may be a carcinogen. The HH Criteria is base on a carcinogenicity risk of 10.5-5
+ = Identifies a priority pollutant.
a = For the protection of ground waters with the potential to be used or that are used as source of drinking water supply, the applicable water quality standard is the Drinking Water (DW) or Human Health (HH) criteria. For those ground waters that flow into other water bodies, the applicable water quality standard for ground waters is the most stringent criteria resulting from the comparison between the standard applicable to the classification of the water body into which it flows and the DW or HH criteria applicable to ground waters.

Appendix F
Long-hand Calculation of Lead Local Limits

Dorado WWTP

Long Hand Calculation of Local Limit - Lead

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
Puerto Rico WQS are found at: https://www.epa.gov/wqs-tech/water-quality-standards-regulations-puerto-rico
NPDES Limits are found in NPDES Permit # PR0020460
Where a dilution factor has been approved, the factor applies to the Water Quality Standards but not to NPDES limits.
Dilution Factor Applied are derived from: NPDES Permit

	Y or N
Use Federal	N

Hardness Utilized: 160

Lead

Federal WQS Acute = 13.9
Federal WQS Chronic = 0.5
Acute = 148.6 ug/l
Chronic = 5.788 ug/l
HH = NA
NPDES = NA

		Dissolved to Total Conversion Factor (CF)
NA	µg/L	1.00
NA	µg/L	1.00
148.5	µg/L	0.99
5.787	µg/L	1.00
NA	µg/L	1.00
NA	µg/L	1.00

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

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

Where:

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

Table A

Federal Acute	Federal Chronic	Acute	Chronic	HH	NPDES
Lead	Lead	Lead	Lead	Lead	Lead
		0.149	0.006		
1.61	1.61	1.61	1.61	1.61	1.61
1.00	1.00	1.00	1.00	1.00	1.00
92.4%	92.4%	92.4%	92.4%	92.4%	92.4%
Water Quality Based AHLs		lb/d			
		26.20	1.02		

Lead

Calculation of most Stringent WQS AHL

$$Lwqs = \frac{(8.34 \text{ lb/gal} \times 0.00579 \text{ mg/L} \times 1.61 \text{ mgd} \times 1:1)}{1 - 0.9239} = 1.02 \text{ lb/d}$$

Allowable Headwork Loading (AHL) Based on Sludge Criteria

Lead

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

Table 1

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

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.

Lead
300
1
2
0.01441
92.4%

Table B

Pollutant	40 CFR 503 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	

Sludge Quality Based AHL
0.83 lb/d

Lead

$$Lin = \frac{(8.34 \text{ lb/g X } 300 \text{ mg/L X } 1.0585 \text{ kg/L X } 2\% \text{ solids X } 0.014 \text{ mgd} =}{0.9239} = .83 \text{ lb/d}$$

Allowable Headwork Loading (AHL) Based On Inhibition — Lead

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 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.

Lead

$$Linhib2 = \frac{(8.34 \text{ lb/gal} \times 1.00 \text{ mg/L} \times 1.61 \text{ mgd})}{1 - 0.9239} = 176.4 \text{ lb/d}$$

Table C

	Pollutant	Inhibition Secondary Activated Sludge	Nitrogen Inhibition
	Arsenic	0.1	1.5
	Cadmium	1-10	5.2
Lead	**Chromium**	1-100	.25-1.9
1	**Copper**	1	.05-.48
92.4%	**Cyanide**	0.1-5	.34-.5
1.61	**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

Activated Waste Inhibition Based AHL
176.44 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)

Lead
340
0.01441
92.39%

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

Anaerobic Digestion Based AHL
44.227 lb/d

Lead

$$Linhibdgstr = \frac{(8.34\ lb/gal \times 340\ mg/L \times 0.014\ MGD)}{92.39\%} = 44.227\ lb/d$$

Lead

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	Acute	Chronic	HH	NPDES	Sludge Quality	Secondary Inhibition	Anaerobic Inhibition	Maximum Allowable Headworks Loading (MAHL)
Lead			26.20	1.02			0.826	176.44	44.2268059	0.826

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

	Lead
MAHL = Maximum allowable headworks loading, lbs/day	0.826
SF = Safety and Growth factor, as a decimal	10%
L_{unc} = Loadings from uncontrolled sources	0.018

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)

Lead

L_{unc} = 1.3928571 ug/L./1000ug/mg X 1.55 mgd X 8.34) = 0.018 lb/d

MAIL = (0.83 lb/d X (1 - 10%) - 0.018 lb/d) = 0.726 lb/d

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 0.06 mgd

Lead

Lead Local Limit = 0.73 lb/d divided by (8.34 X 0.06 MGD) = **1.450 mg/L**

Appendix G
Definitions

Appendix G. 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 treatment plant or environmental criterion. AHLs are developed to prevent process interference or pass-through of POCs.
Applicable Criteria	A regulation, standard, or theoretically derived detrimental concentration that must be considered in developing a local limit.
Best Management Practice (BMP)	Schedules of activities, prohibitions of practices, maintenance procedures, and other management practices used 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 (BPJ)	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 using microbiological processes to remove pollutants or transform 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 Publication EPA 833-R-04-002A). See also Reference Values.
Categorical User	An 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.
Cobalt (Pt/Co) Scale	The Cobalt (Pt/Co) scale is a measure of color where each unit of the scale is defined as the color induced by dissolving 1 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 a 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	Regulations or standards that may be applicable to the development of a local limit.
Design Capacity, Design Flow	The theoretical treatment capacity based on engineering studies that is typically engineered into the original design. During construction, changes may be made for a variety of reasons, 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 Waste	Domestic waste describes waste that is generated by residential and light commercial use. 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 waste. See Domestic Approximation.
Domestic Approximation	Domestic sampling typically is taken from low-flow areas; as an alternative, influent test data are used to represent domestic contributions. These data include all dischargers (domestic, commercial, and industrial). Use of these data is a conservative assumption.
Domestic Strength	Waste generated solely from residential use varies appreciably between communities (for example, average biochemical oxygen demand [BOD] ranges from <180 mg/L to >300 mg/L). Using BPJ, the most typical concentration used in local limits and ordinances is 250 mg/L for BOD and for total suspended solids (TSS).
Emission Standards	Emission standards are legal requirements governing air pollutants released into the atmosphere.
General Limit(s)	Limits that are taken from the Puerto Rico Aqueduct and Sewer Authority Rules and Regulations for Supply of Water and Sewer Services.
Guidance Document	Unless otherwise denoted, indicates the use of the U.S. Environmental Protection Agency Office of Wastewater Management's *Local Limits Development Guidance*. EPA Publication EPA 833-R-04-002A (July 2004).
Headworks	The point at which wastewater enters a wastewater treatment plant (WWTP). The headworks may consist of bar screens, comminutor, wet wells, and/or pumps.
Headworks Analysis	The process of taking concurrent samples at the influent and the effluent of a plant, as well as at other key sites in the system, to determine how much of a pollutant is removed by the treatment system. This information is used to calculate the maximum quantity of each pollutant that can be received at the WWTP and still meet all applicable criteria.
Implementation	Specification of how technically based local limits will be applied and 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 pollutants contributed to the treatment system.

Industrial User	Any user that is involved in commercial business practice that discharges wastewater that was generated as part of the commercial process at a rate that exceeds domestic strength or volume to the point that its effluent requires regulation to protect the POTW treatment process.
Industry-specific Limit	A limit established in individual industrial permits to limit discharge of pollutants that could interfere with WWTP processes or excessively use WWTP treatment capacity. Industry-specific limits are placed directly into industrial permits, 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 rationales, from implementation of BMPs to requirements to install treatment equipment sufficient to protect the WWTP. Ideally, the POTW owner allocates pollutant loadings in a manner 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 POTW's 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 BOD, TSS, and other pollutants.
Interference (positive/negative)	Laboratory test methods are based on attributes of the parameters being tested. Other materials or sample attributes can interfere with achieving an accurate assessment of the parameter being tested. When the result obtained is higher than the actual value, this is referred to as positive interference. When the result is lower than the actual value, the interference is referred to as negative interference.
Land Application	Land application is the process of spreading treated wastewater sludge onto land for agricultural purposes, improving the land's 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 POTW's headworks without causing pass-through of POCs or interference with treatment processes. The most protective (lowest) of the AHLs estimated for a pollutant.
Maximum Allowable Industrial Loading (MAIL)	The estimated maximum loading of a pollutant that can be received at a POTW's headworks from all permitted industrial users and other controlled sources without causing pass-through of POCs or interference with treatment processes. The MAIL is usually calculated by applying a safety factor to the 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% confidence that the analyte concentration is present as determined by a specific laboratory method in 40 CFR Part 136, Appendix B.

Minimum Level (ML)	Minimum Level (ML) is the term used by EPA instead of limit of quantitation (LOQ); it is defined as the concentration at which the entire analytical system must give a recognizable signal and acceptable calibration point. The ML is the concentration in a sample that is equivalent to the concentration of the lowest calibration standard analyzed by a specific analytical procedure, assuming that all of the method-specified sample weights, volumes, and processing steps have been followed.
Non-conservative Pollutant	Pollutants that are presumed to be destroyed, biodegraded, chemically transformed, or volatilized within the POTW to some degree.
Non-domestic Discharge	Any discharge to the collection system from a permitted source.
Other Permitted User	A source of discharge to the POTW 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 WWTP 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	Treatment 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 treatment processes that does 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 POTW in sufficient amounts and/or concentrations to pass through treatment in objectionable concentrations, interfere with the treatment process, contaminate sludge, cause problems in the collection system, or jeopardize 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 a primary clarifier. For a system with multiple treatment processes, the primary removal rate is used in calculating biological treatment inhibition.
Reference 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 Publication 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 POTW (excluding sanitary, non-contact cooling, and boiler blowdown wastewater); contributes a process waste stream that makes up 5% 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 local 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 Publication 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 introduced into 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 ML. In such cases, EPA guidance indicates that the ML, one-half the ML, 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 ML and the influent is high enough to indicate that a removal rate is present.